Conservation and Demand Management Plan (2024-2028)

Regional Municipality of Niagara

Niagara Region

ALADACO
The Power of Conservation

June 27, 2024

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CAO Message

Niagara Region has been actively committed to developing strategies to reduce the Region's impact on the environment for the past 10 years through our Energy Conservation and Demand Management Plans (CDMP). These meaningful plans guide the Region forward with solutions that focus on the long-term benefits of proactively addressing our collective footprint on Niagara's environment.

In 2023, Niagara Regional Council approved reaching Net-Zero by 2050, in principle. Regional staff were tasked with developing a Corporate Climate Change Action Plan (CCAP). The Region's third CDMP (2024-2028) was developed in conjunction with the CCAP. I'm pleased that we met the energy efficiency reduction targets for buildings that were set in the 2019-2023 CDMP.

As we now look ahead to the next five years, the 2024-2028 CDMP ambitiously sets an emissions reduction target of 20 per cent for our facilities, including water and wastewater facilities. The Region's corporate-wide approach to energy management aligns with our Council Strategic Priority of a *Green and Resilient Region*.

I approve the Region's CDM Plan and am fully supportive and appreciative of staff efforts in working towards achieving these goals.

Ron Tripp

CAO

Niagara Region

Executive Summary

This Conservation and Demand Management Plan (CDMP) outlines the Regional Municipality of Niagara's (RMON) plans over the next five years (2024-2028) to manage and reduce energy consumption and greenhouse gas (GHG) emissions across its facilities. This Plan is crafted in alignment with the requirements of Ontario Regulation 25/23 (O.Reg 25/23) and supports Regional Council's broader commitment of attaining Net-Zero GHG emissions (Scope 1 and 2) by 2050.

Reflecting on the previous CDMP (2019-2023), the RMON successfully met its overall energy and GHG reduction objectives for buildings (exclusive of Water & Wastewater Facilities). The energy and carbon conservation measures (ECMs) implemented during this period have yielded financial benefits, with annual cumulative cost savings amounting to **$330,470**. This achievement underscores the effectiveness of RMON's energy management and emission reduction strategies during this previous CDMP cycle.

For the upcoming period (2024-2028), RMON has set an ambitious **20% emissions reduction target** from buildings and water and wastewater (W&WW) facilities relative to 2023 levels. The Plan outlines a series of future ECMs as well as highlights the critical role of transitioning from natural gas to electric heating systems to achieve these reduction targets.

A preliminary review of the remaining useful life of RMON's natural gas assets suggests that the 20% emissions reduction target is possible by electrifying (fuel-switching) natural gas assets reaching end-of-life between 2024-2028. The estimated cost premium for fuel switching is **$6.3M** above the like-for-like replacement costs for natural gas heating assets. Although there will be an increase to operational costs in the near-term; the change to electrification will become more cost-efficient over their life cycles as the federal carbon charge continues to apply upward pressure to the price of natural gas.

This CDMP was developed in conjunction with the RMON's 2024 Corporate Climate Change Action Plan (CCAP). The reduction targets and associated projects described in this CDMP effectively form the short-term goals and plans in the CCAP for buildings and Water Waste Water (W&WW) facilities. Alignment of these documents means that each updated CDMP (per the 5-year O.Reg 25/23 cycle) will continuously inform updated CCAP goals in these sectors. This integration with the CCAP allows for sustained momentum towards the Net-Zero goal and reaffirms RMON's commitment to environmental and fiscal responsibility.

List of Acronyms

ASHP – Air source heat pump

BTU – British thermal unit

CCAP – Corporate Climate Change Action Plan

CDMP – Energy Conservation and Demand Management Plan

CE&FM – Construction, Energy & Facilities Management

ECMs – Energy and Carbon Conservation Measures

ekWh – Equivalent kilowatt-hour

FIT – Feed-in-tariff

GHG – Greenhouse Gas

kWh – Kilowatt-hour

RMON – Regional Municipality of Niagara

Sqft – Square foot

tCO_2e – Tonne (metric) of carbon dioxide equivalent

W&WW – Water and Wastewater

Introduction

The Regional Municipality of Niagara ("RMON") engaged Aladaco Consulting ("Aladaco") to develop a 5-year (2024-2028) Energy Conservation and Demand Management Plan (CDMP) that is due to be posted on the Region's website by July 1, 2024.

This document has been designed to be accessible and compliant with AODA (Accessibility for Ontarians with Disabilities Act) guidelines, ensuring that all readers can easily access and understand its content. The document includes clear language and structure in alignment with standards for accessible information. Graphs presented in this document are described in alternative text (alt-text), and their corresponding data tables will be made available upon request.

This CDMP was developed in accordance with the requirements described in Ontario Regulation 25/23 – Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans, made under the Electricity Act (1998).

Energy consumption described herein is split into two categories – electricity and natural gas. Electricity consumption is measured in kilowatt-hours (kWh) and natural gas is measured in cubic metres (m^3). Equivalent kilowatt-hours (ekWh) are the combination of electricity and natural gas consumption in a common unit of energy. All energy data was provided to Aladaco by the RMON.

The CDMP is divided into three main sections: Assessment of Past Goals; Pathway to the Present; and, Looking to the Future.

1. **Assessment of Past Goals:** Compares 2023 results to the goals set in the 2019-2023 CDMP. This section is sub-labelled as the **"Past"** and is inclusive solely of the data required to assess achievement of past goals set (i.e. 2023 goal with 2018 baseline).
2. **Pathway to the Present:** Provides an overview of 2019-2023 energy consumption and GHG emission for RMON facilities both at the portfolio and facility category levels. This section includes a list of projects completed throughout this time that contributed to energy and GHG reductions, and also includes information related to renewable energy generation and solar thermal assets. While this data is historical, the result of the analysis is an updated 2023 GHG emission baseline which serves as the basis for the goals described in the Looking Forward section.
3. **Looking to the Future:** Sets out goals for the 2024-2028 CDMP time horizon, with information related to the projects necessary to achieve those goals and the

associated cost implications. Also includes recommended next steps provided by Aladaco to the RMON.

Each section is further divided using facility categories as per the definitions described in O.Reg 25/23 Table 1:

- **Administrative Offices -** Administrative offices and related facilities, including municipal council chambers.
- **Ambulance Buildings -** Ambulance stations and associated offices and facilities.
- **Police and Court Services Buildings -** Police stations and associated offices and facilities.
- **Public Works/Yards/Service Centers/Fleet Facilities -** Storage facilities where equipment or vehicles are maintained, repaired, or stored.
- **Water and Wastewater – Plants/Remotes/Miscellaneous -** Buildings or facilities related to the treatment of water or sewage.

The 2019-2023 CDMP also voluntarily included **Long Term Care** facilities and further added **Childcare** and **Regional Transit/Go Train** facilities after 2019.

To further support energy efficiency and decarbonization across RMON broader operations, the list of facility categories will be expanded for the 2024-2024 CDMP to include **Housing**, and **Waste Management** facilities.

The full list of facilities, split by facility category, can be found in Appendix A – Facility List.

Energy Management at the RMON

While everyone is responsible for energy use across Regional buildings, responsibilities are coordinated with various staff members contributing at different levels. Over time, the composition of the team dedicated to Energy and Climate Change has evolved.

Prior to 2019, roles were established within Corporate Services for managing energy in Corporate and Long Term Care buildings and overseeing projects in Water & Wastewater. Following the declaration of a climate change emergency in 2021, new positions were created to address this pressing issue.

With a commitment to Net-Zero by 2050 (in principle), sanctioned by Council, staff members are now organized into three main areas: Energy Management and projects in buildings, Energy Management and projects in Water & Wastewater, and Climate Change for the oversight of the Corporate Change Action Plan and Community Initiatives.

These teams collaborate with departments across the organization to align efforts and budgets with the goals of the Corporate Energy CDM Plan, including Waste Management, Transit and Housing as recent additions to the Plan.

1. Assessment of Past Goals

This section contains an evaluation of whether the RMON was successful in hitting the facility category targets set in the 2019-2023 CDMP. The facility categories that were included in the 2019-2023 CDMP were:

- Administrative Offices
- Ambulance Buildings
- Long Term Care Facilities
- Police and Court Services Buildings
- Public Works/Yards/Service Centers/Fleet Facilities
- Water and Wastewater Facilities

In addition to the above, the RMON added two types of facilities after the 2019-2023 CDMP publishing:

- Child Care Facilities (with an associated facility category target)
- Regional Transit/Go Train facilities (added to Public Works/Yards/Service Centers/Fleet Facilities)

1.1 Buildings (non Water and Waste-Water Facilities)

Per the 2019-2023 CDMP, all non-W&WW facility categories had specific energy intensity (ekWh/ft^2) targets set to reach by the end of 2023 with an overall target reduction of 7.8% (9.7% electricity reduction and 7.4% natural gas reduction).

The RMON was successful in hitting this target for non-W&WW facilities at the building portfolio level (Figure 1).

Figure 1 - Portfolio Level Buildings Results vs. Target

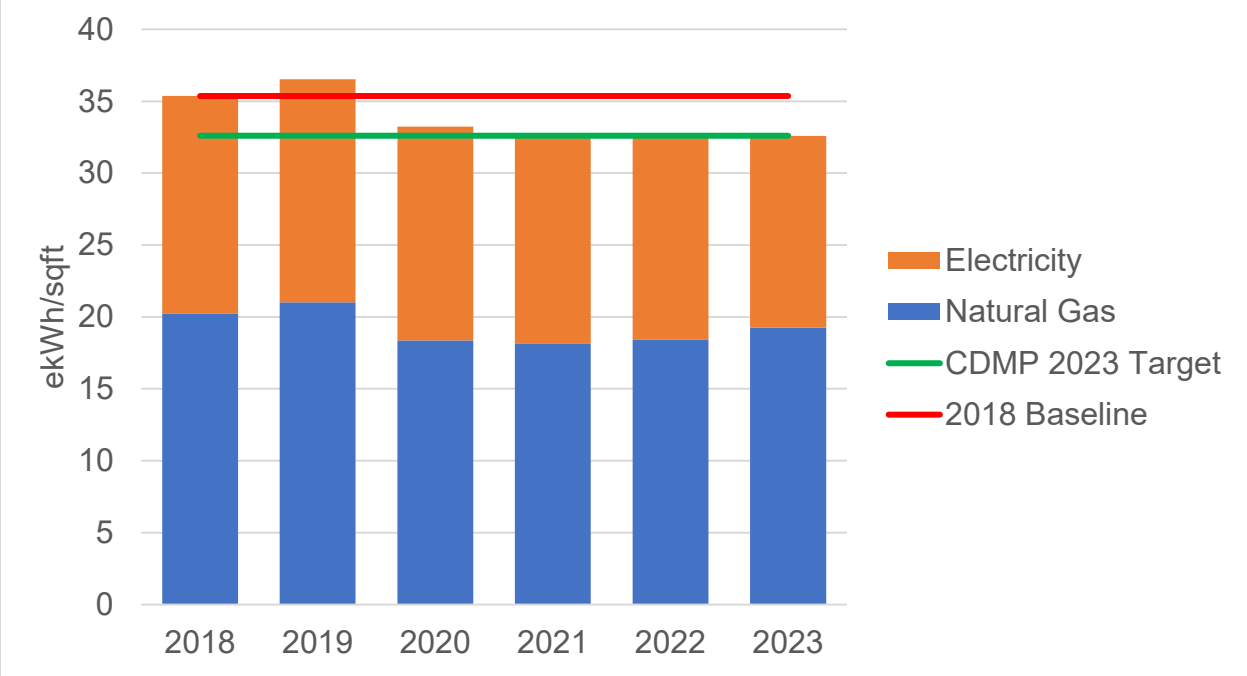
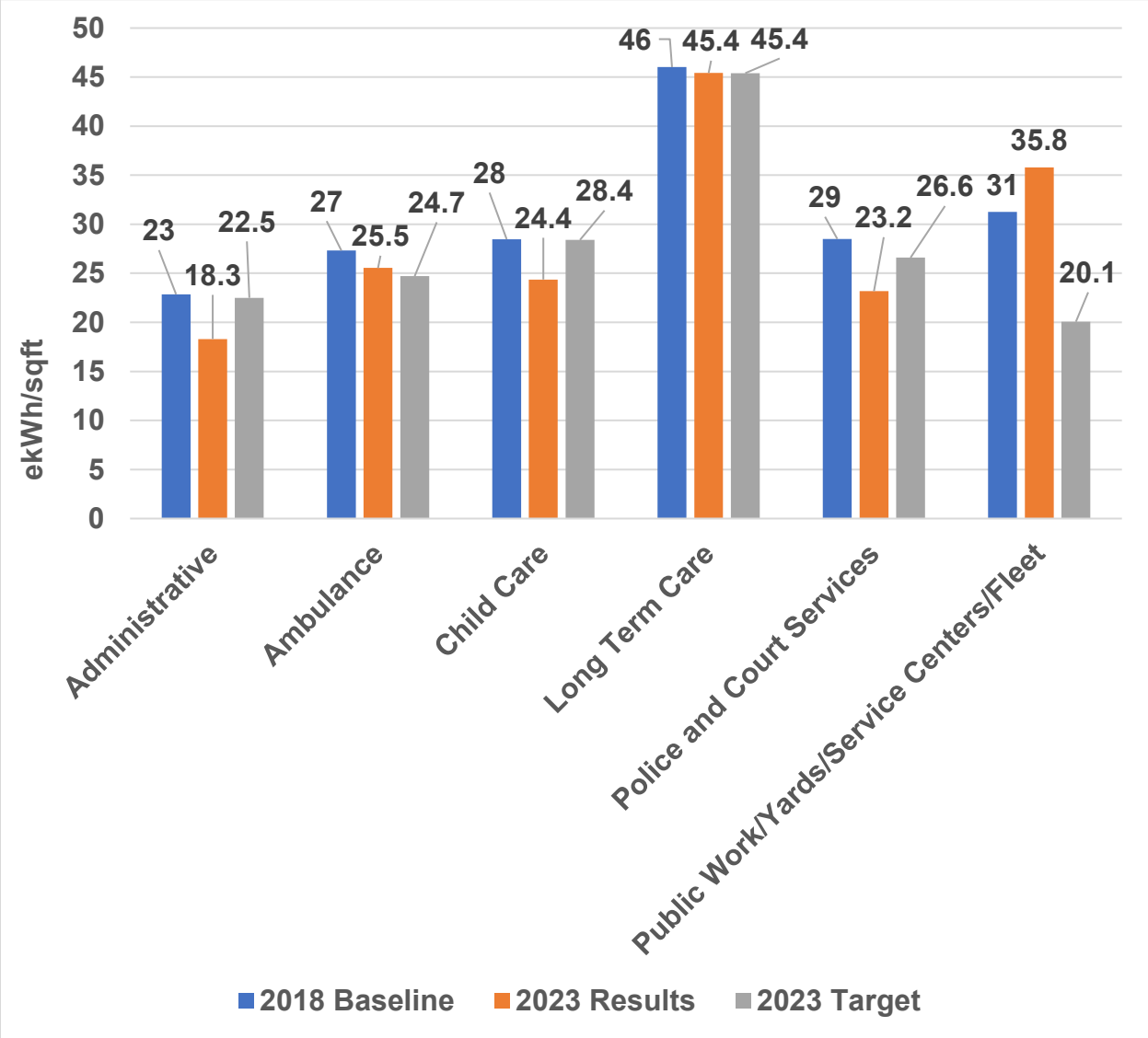


Figure 2 below illustrates results at the category level. This is further explored in section 1.3 Results by Facility Category.

Figure 2 - Facility Category Level Buildings 2023 Results vs. Targets



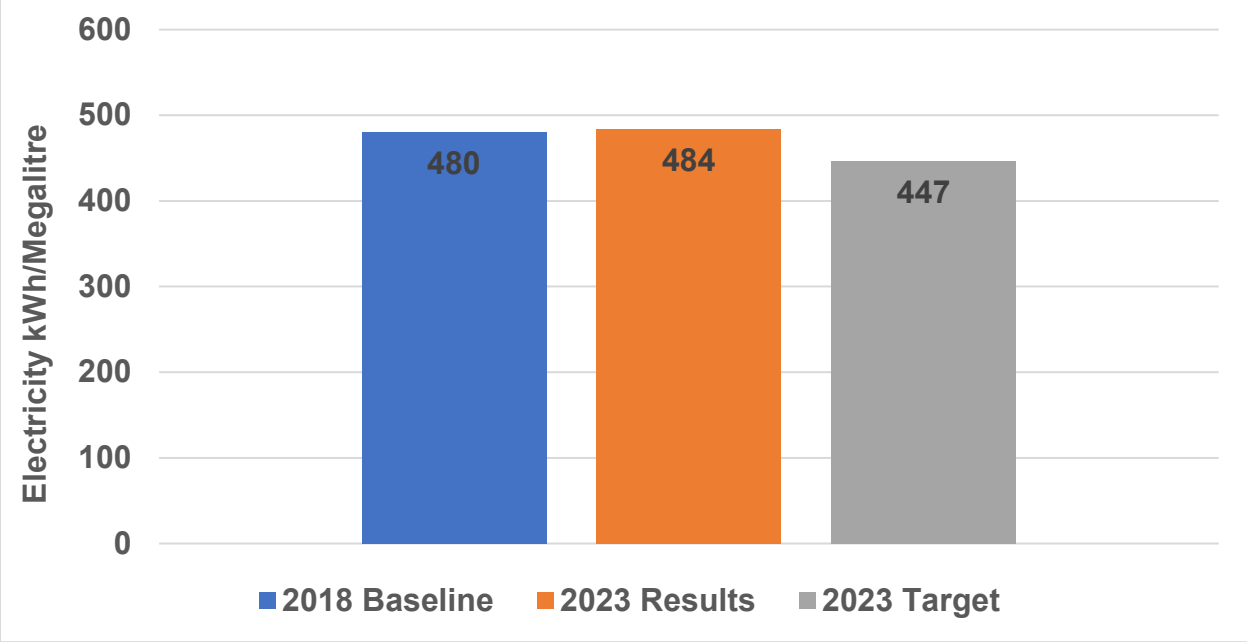
1.2 Water and Waste-Water Facilities

For W&WW, an electricity consumption target was set, normalized by megaliters (ML).

The RMON was not successful in hitting the W&WW target of 7% electricity reduction (Figure 3).

Further details about the results for each facility category, including notes and rationale, can be found in their respective sections below.

Figure 3 - W&WW 2023 Results vs Target



1.3 Results by Facility Category

The following sub-sections break down the 2023 performance results of each building in their category compared to the 2023 target set in the 2019 CDMP.

i. Administrative Offices

2019-2023 CDMP Target: Bring facilities to their respective Ontario Average energy use intensity with a target of 22.5ekWh/ft^2.

Results: Figure 4 breaks down the results of the Administrative offices by site address. On an overall basis, the RMON was successful in achieving the target.

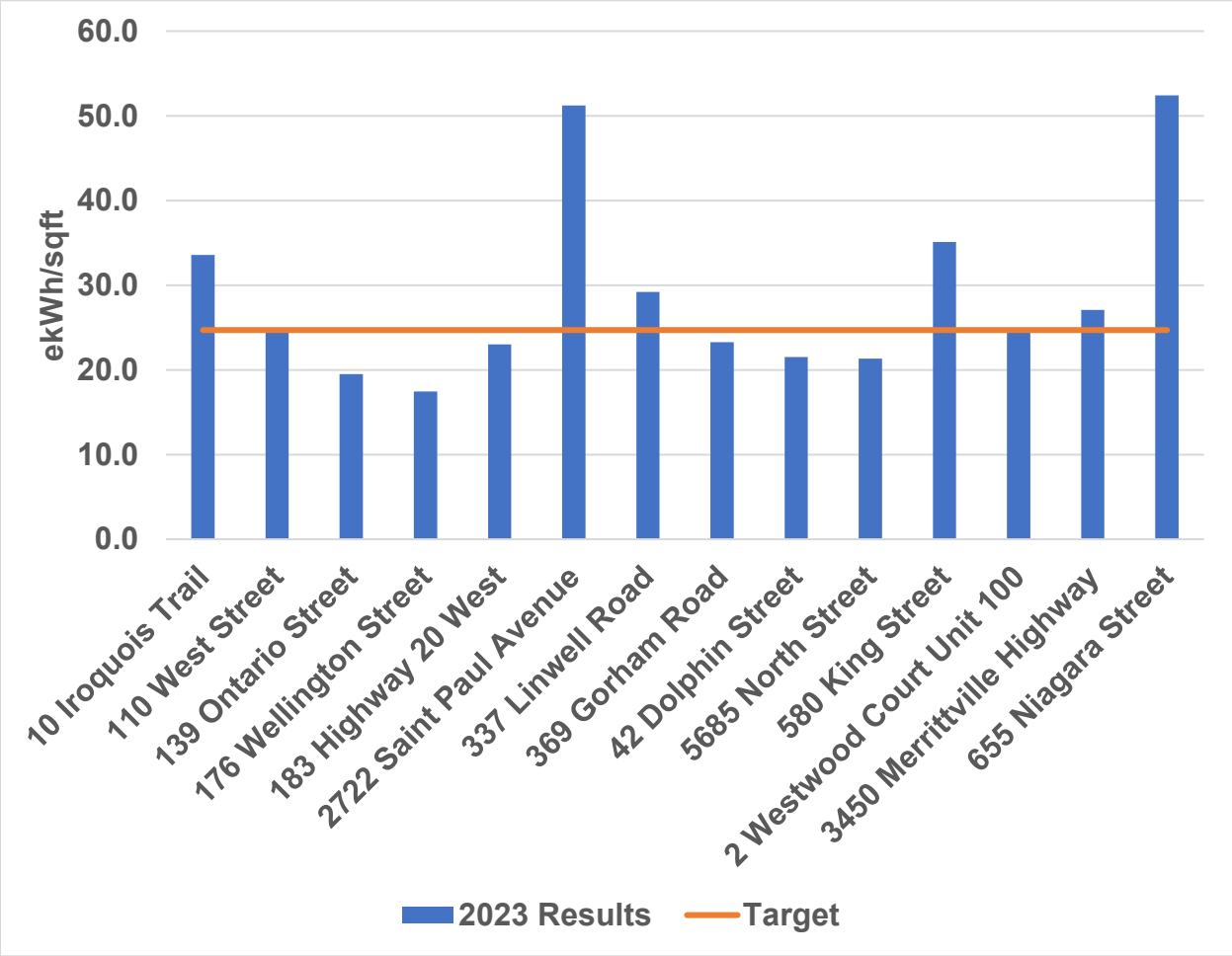
Figure 4 - Administrative offices 2023 Results vs Target

ii. Ambulance Buildings

2019-2023 CDMP Target: Bring facilities to their respective Ontario Average energy use intensity with a target of 24.7ekWh/ft^2.

Results: Figure 5 breaks down the results of the Ambulance buildings by site address. On an overall basis, the RMON was not successful in achieving the target. While Figure 2 shows that the Ambulance Buildings category was close to meeting the 24.7 ekWh/ft^2 target on an overall basis, Figure 5 shows that two facilities (2722 Saint Paul Avenue, Niagara Falls and 655 Niagara Street, Welland) substantially drove up the average. These facilities will be investigated in detail for efficiency opportunities within the 2024-2028 CDMP timeframe.

Figure 5 - Ambulance buildings 2023 Results vs Target

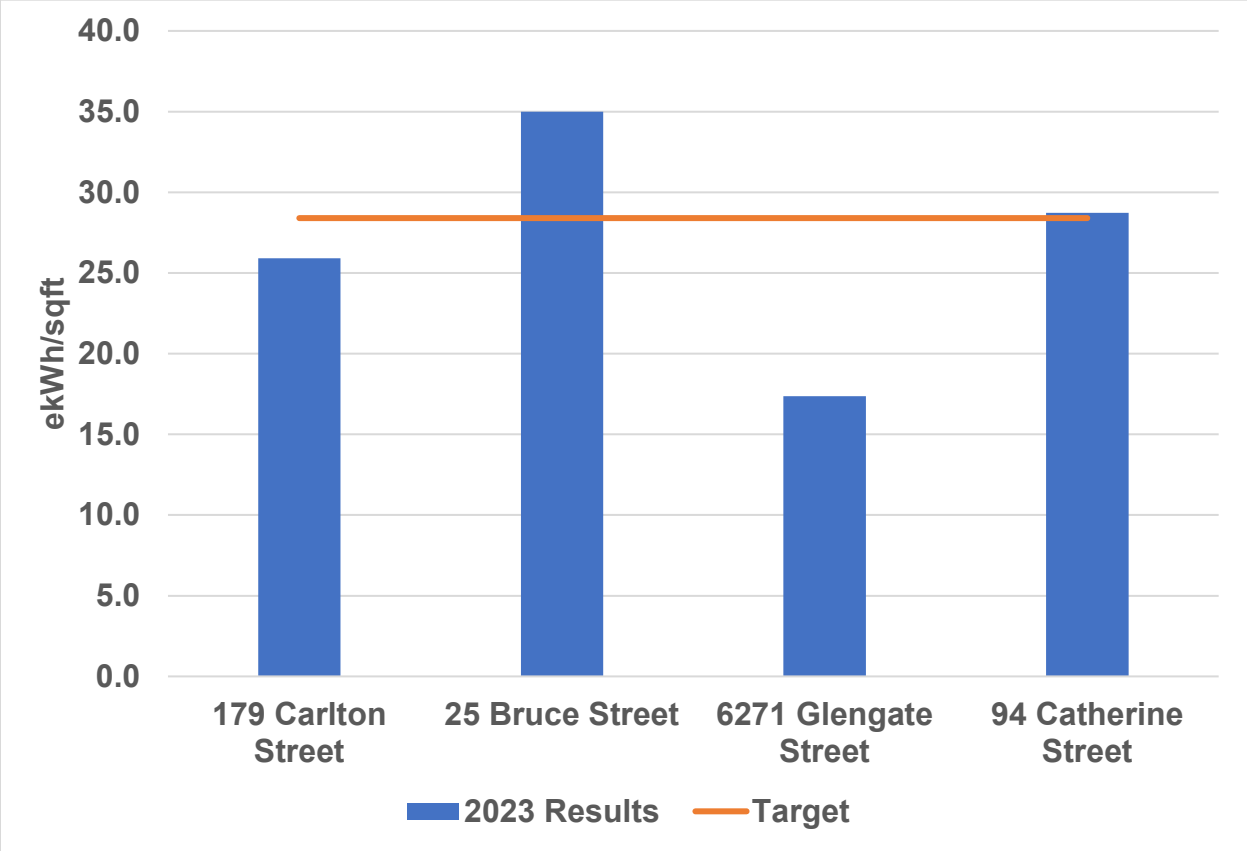


iii. Child Care

2019-2023 CDMP Target: Bring facilities to their respective Ontario Average energy use intensity with a target of 28.4ekWh/ft^2.

Results: Figure 6 breaks down the results of the Child Care facilities by site address. On an overall basis, the RMON was successful in achieving the target.

Figure 6 - Child Care facilities 2023 Results vs Target

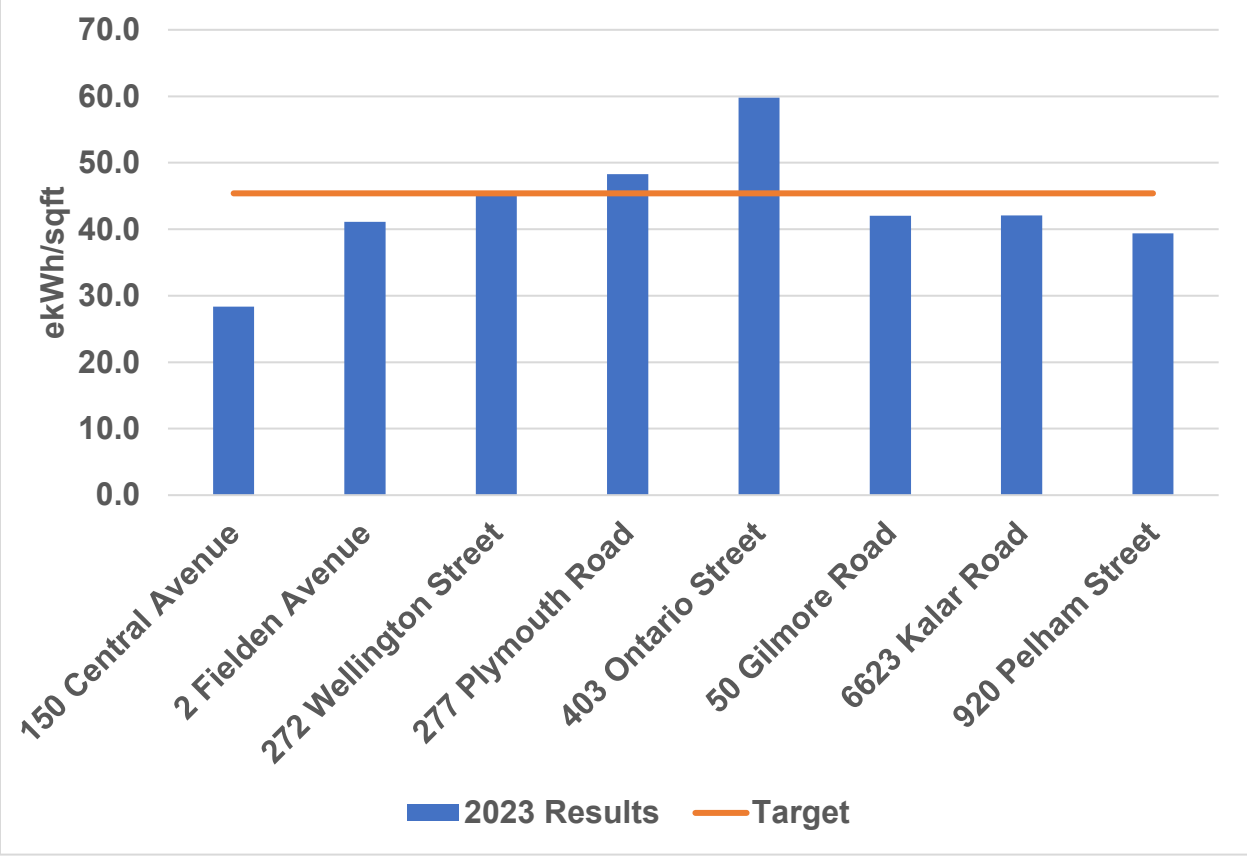


iv. Long Term Care

2019-2023 CDMP Target: Bring facilities to their respective Ontario Average energy use intensity with a target of 45.4ekWh/ft^2.

Results: Figure 7 breaks down the results of the Long-Term Care facilities by site address. On an overall basis, the RMON was successful in achieving the target. Note that the worst performing facility, 403 Ontario Street (Linhaven and T. Roy Adams), is an old facility that is currently being rebuilt (to be completed in 2025). The energy intensity of the replacement facility is expected to be improved over the current facility. Additionally, both 272 Wellington Street and 50 Gilmore will be closed in September 2024 and merged into a new Long Term Care facility at 60 King St. in Fort Erie. This new facility is also expected to be more efficient than its predecessors.

Figure 7 - Long Term Care facilities 2023 Results vs Target

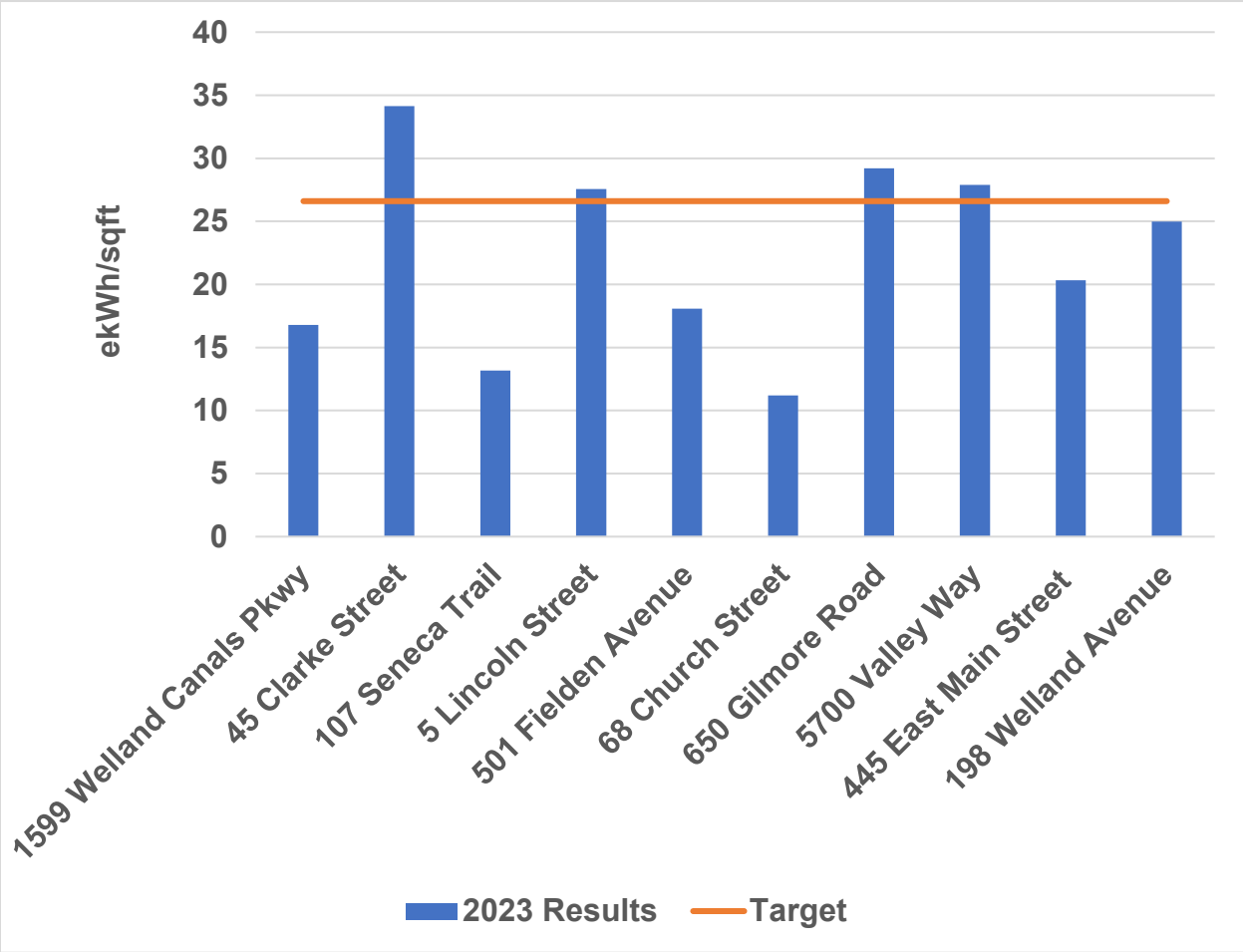


v. Police and Court Services

2019-2023 CDMP Target: Bring facilities to their respective Ontario Average energy use intensity with a target of 26.6ekWh/ft.^{2}

Results: Figure 8 breaks down the results of the Police and Court Services facilities by site address. On an overall basis, the RMON was successful in achieving the target.

Figure 8 - Police and Court Services facilities 2023 Results vs Target



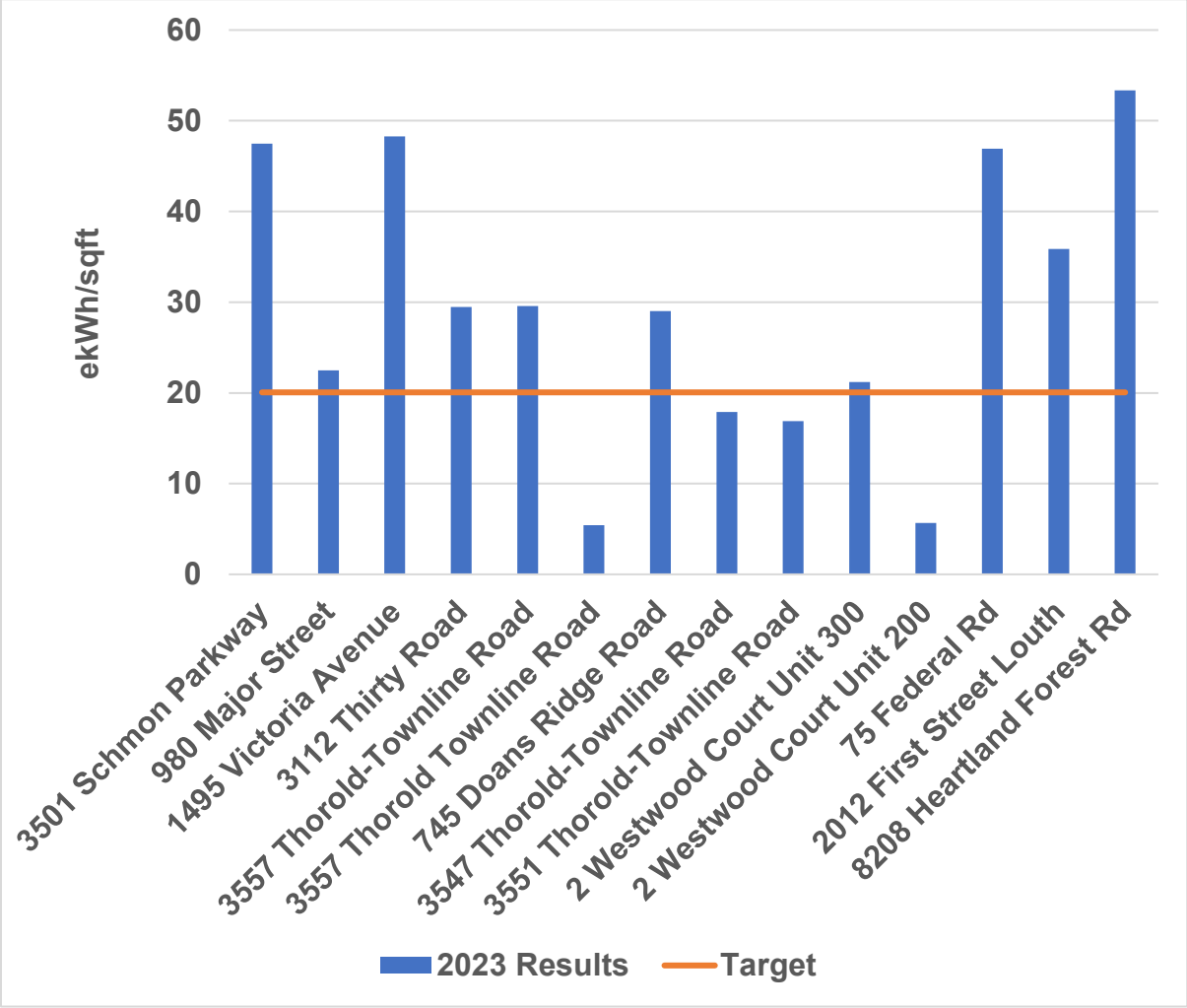
vi. Public Works/Yards/Service Centers/Fleet Facilities

2019-2023 CDMP Target: Bring facilities to their respective Ontario Average energy use intensity with a target of 20.1ekWh/ft^2.

Results: Figure 9 breaks down the results of the Public Works/Yards/Service Centers/Fleet facilities by site address. Overall, the RMON was not successful in achieving the target due to:

- The addition of energy-intensive Niagara Transit Commission (NTC) facilities. Per Figure 9, three of the most energy-intensive facilities in this category are 75 Federal, 2012 First Street Louth and 8208 Heartland Forest Road. These facilities were recently added to the RMON portfolio and were thus not considered in the 2019-2023 CDMP
- The benchmark EUI is not representative of RMON facilities as it is based on storage facilities without cooling (generally) and doesn't consider process or site loads, such as hot fences for truck block heaters in the winter. As the RMON continues to add additional facilities to their CDMP, some of these facilities, while fitting the "storage facilities" description of O.Reg 25/23, actually have significant HVAC and other loads that are not represented in the benchmark EUI. As a result, the benchmark EUI is a poor indicator of performance for the mixed-use facilities now included in this facility category. Moving forward, the new goals (for all facility categories) are related to absolute GHG emissions and not EUI benchmarks

Figure 9 - Public Works/Yards/Service Centers/Fleet facilities 2023 Results vs Target



vii. Water and Wastewater

2019-2023 CDMP Target: Reduce normalized electricity consumption by 7% (based on the volume of water or wastewater treated in megalitres).

Results: Figure 10 (Wastewater) and Figure 11 (Water) break down the results of the Water and Wastewater plants by site. Note that the data for plants also includes the energy consumption for their respective remotes (pumping stations) to be able to compare entire systems.

On an overall basis, the RMON was not successful in achieving the target. While the RMON continues to reduce electricity consumption at these facilities, these efforts are outweighed by the energy impacts of climate variability and the improved treatment methods required to meet evolving regulatory quality in this sector.

However, despite these challenges the RMON was able to reduce natural gas consumption by over 456,000ekWh (see Figure 12) while managing a 5% increase in overall treated flow between 2018 and 2023. These efforts to reduce natural gas consumption are in alignment with the RMON's new goals and resulted in a GHG emission reduction of approximately 85tCO_2e.

Figure 10 - Wastewater Plants and Remotes 2023 Results vs Target

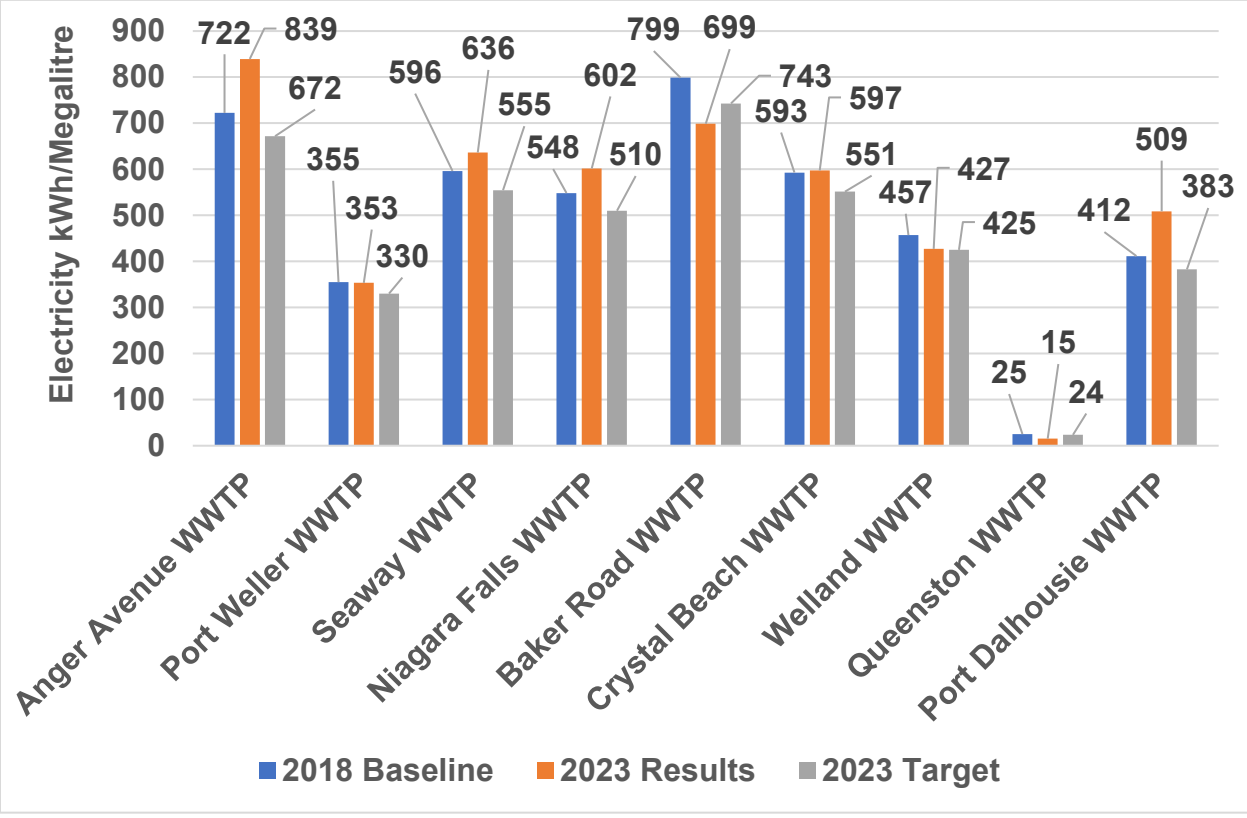


Figure 11 - Water Plants and Remotes 2023 Results vs Target

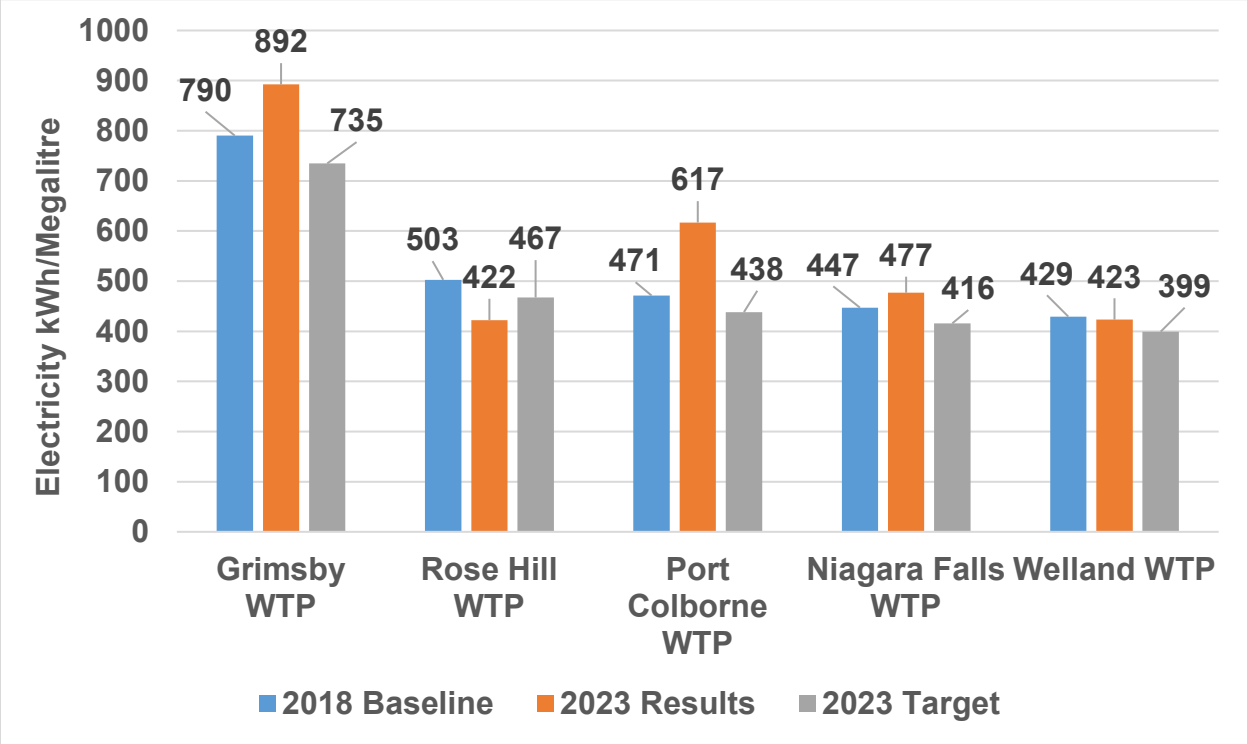
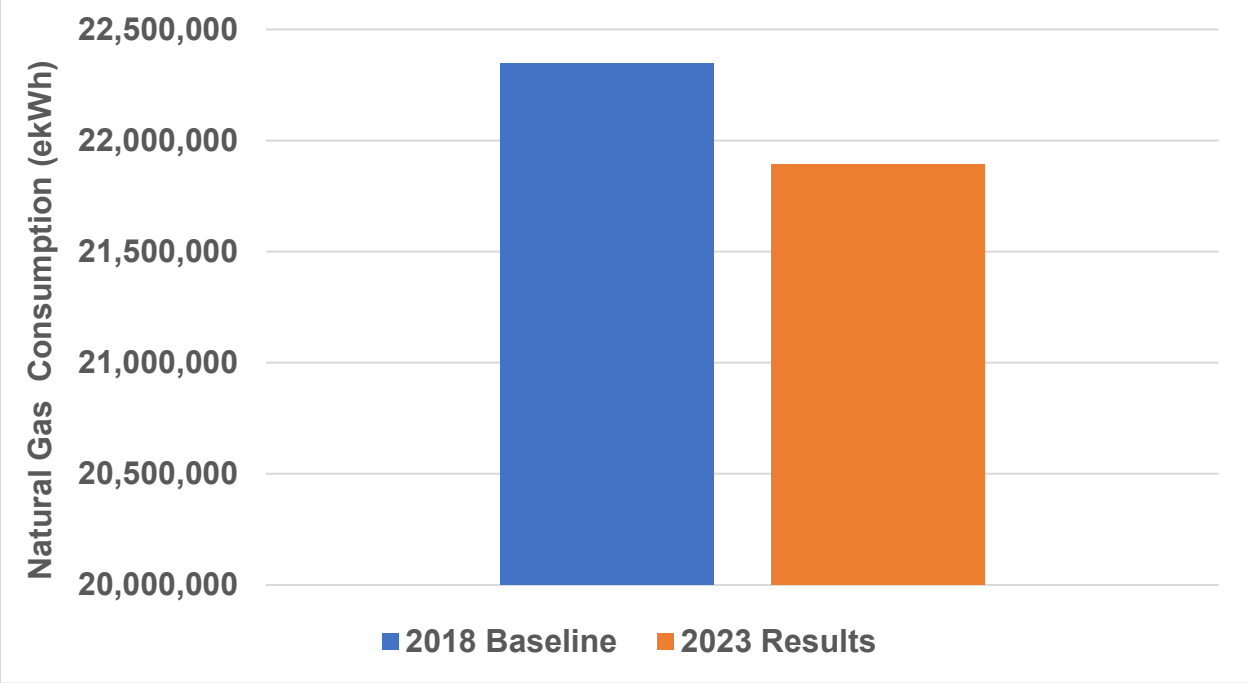


Figure 12 - W&WW Natural Gas Reductions 2023 vs 2018



2. Pathway to the Present

This section provides an overview of the RMON's energy consumption and GHG emissions from 2019-2023, as well as details on renewable energy and solar thermal assets as required by O.Reg 25/23.

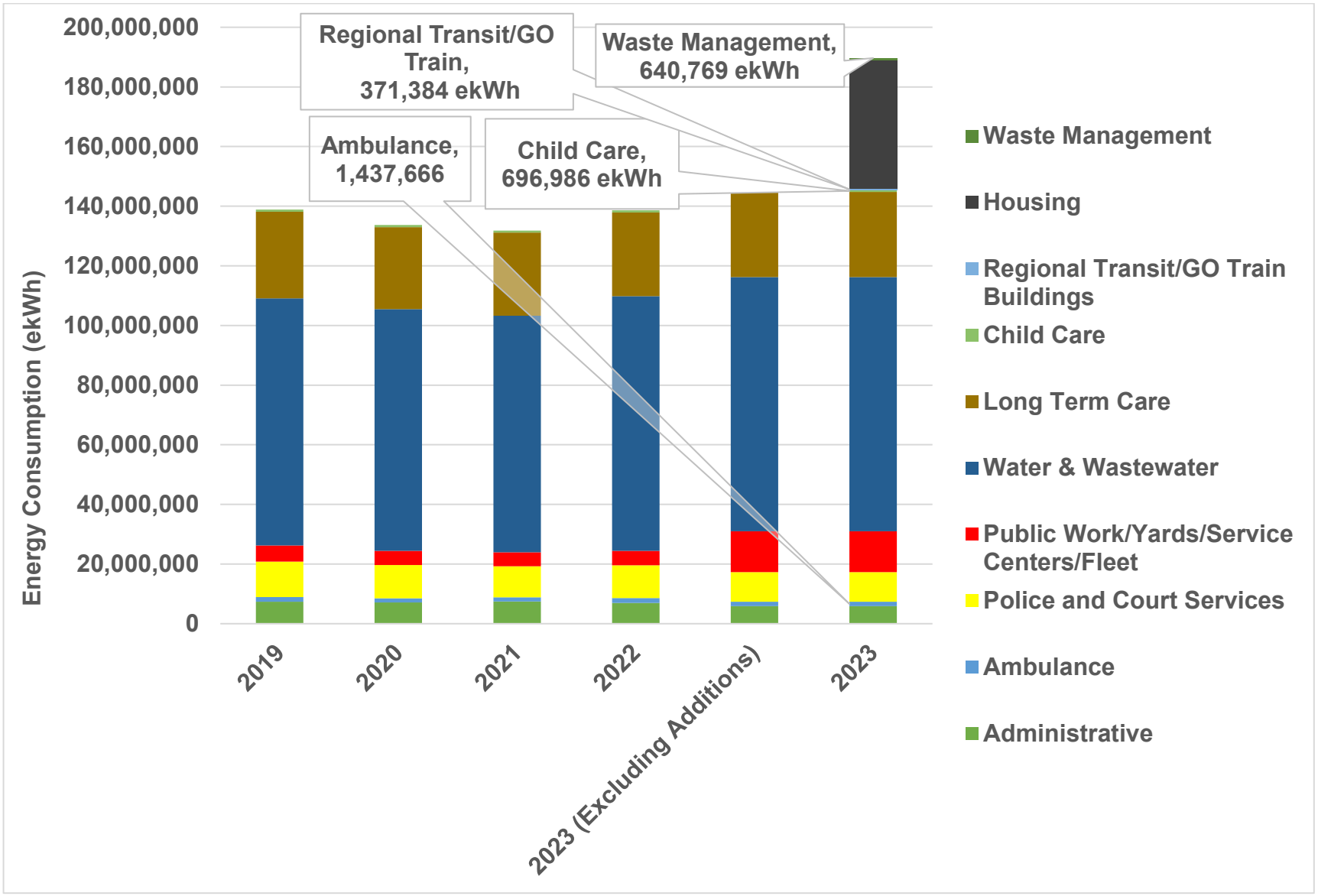
2.1 2019-2023 Portfolio Energy Consumption

Figure 13 summarizes the RMON's energy consumption (ekWh) from 2019-2023, split by facility category. There is a notable increase in energy consumption in the new 2023 baseline that is primarily driven by the inclusion of new facility categories (namely Housing, Waste Management, and Regional Transit/GO Train Buildings).

As previously mentioned, these facility categories were not included in the past CDMP (and are not required by O.Reg 25/23). However, they will be included in the RMON's CDMPs moving forward and contribute to the new Region-wide 2023 baseline.

An additional stacked column was provided that excludes the impact of these new inclusions for comparison purposes. Data callouts have been provided for those facility categories with small contributions that would otherwise not be visible in this graph.

Figure 13 - RMON 2019-2023 Energy Consumption by Facility Category

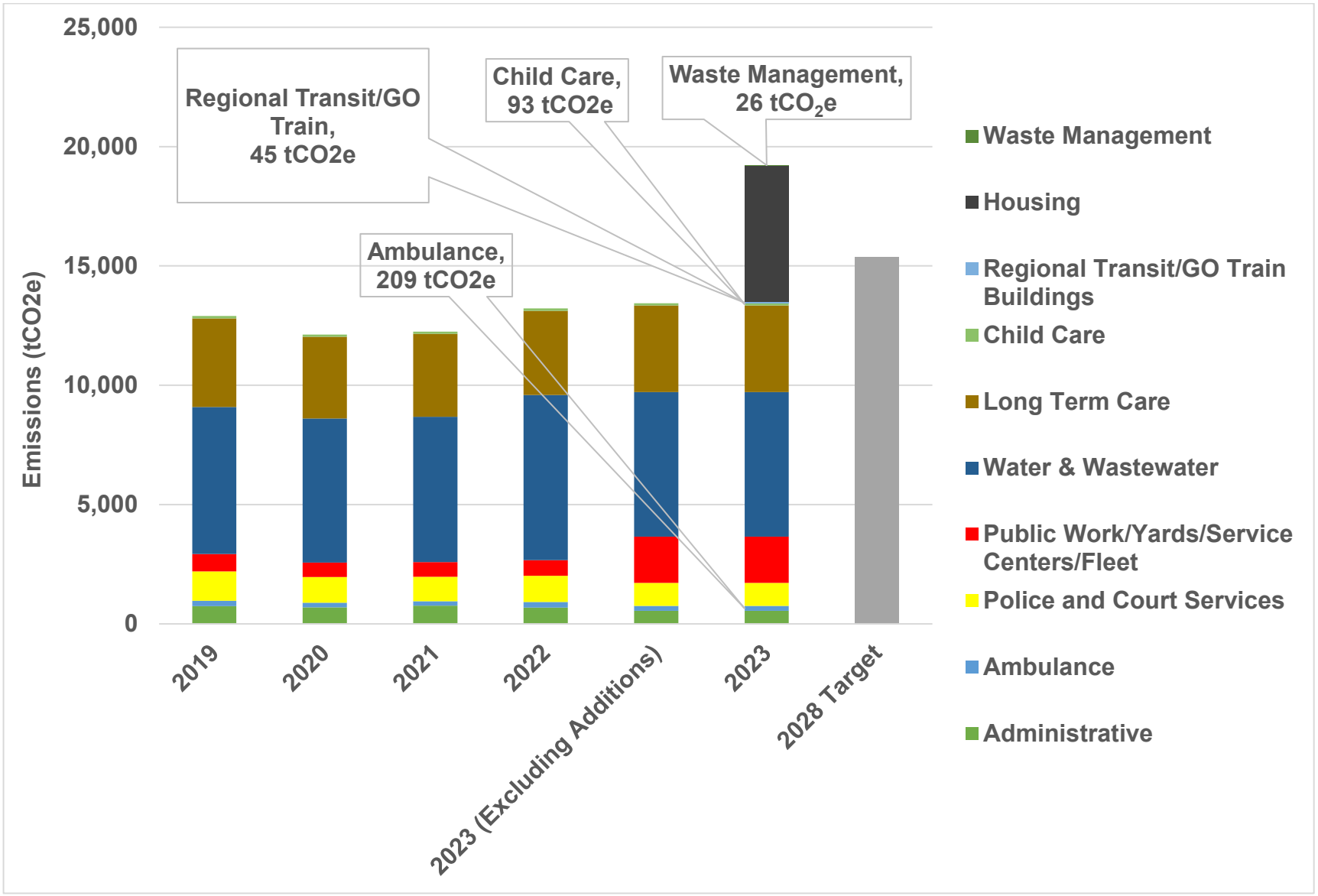


2.2 2019-2023 Portfolio GHG Emissions

Figure 14 summarizes the RMON's GHG emissions (tCO_2e) from 2019-2023, split by facility category. There is a notable increase in GHG emissions in 2023 that is primarily driven by the inclusion of new facility categories (namely Housing, Waste Management, and Regional Transit/GO Train Terminals). As aforementioned, these facility categories were not previously included in the past CDMP (and are not required by O.Reg 25/23), however will be included in the RMON's CDMPs on a voluntary basis moving forward. An additional stacked column was provided that excludes the impact of these new inclusions for comparison purposes. Data callouts have been provided for those facility categories with small contributions that would otherwise not be visible in this graph.

Additional details for each facility category can be found in their respective subsections .

Figure 14 - RMON 2019-2023 GHG Emissions by Facility Category



In 2023, the RMON's total GHG emissions for Buildings and W&WW were 19,217 tCO_2e. Approximately 84% (or 16,119 tCO_2e) of these GHG emissions were Scope 1 emissions, and 16% (or 3,099 tCO_2e) were Scope 2 emissions. These are the baseline values that form the basis of the 2024-2028 Goals.

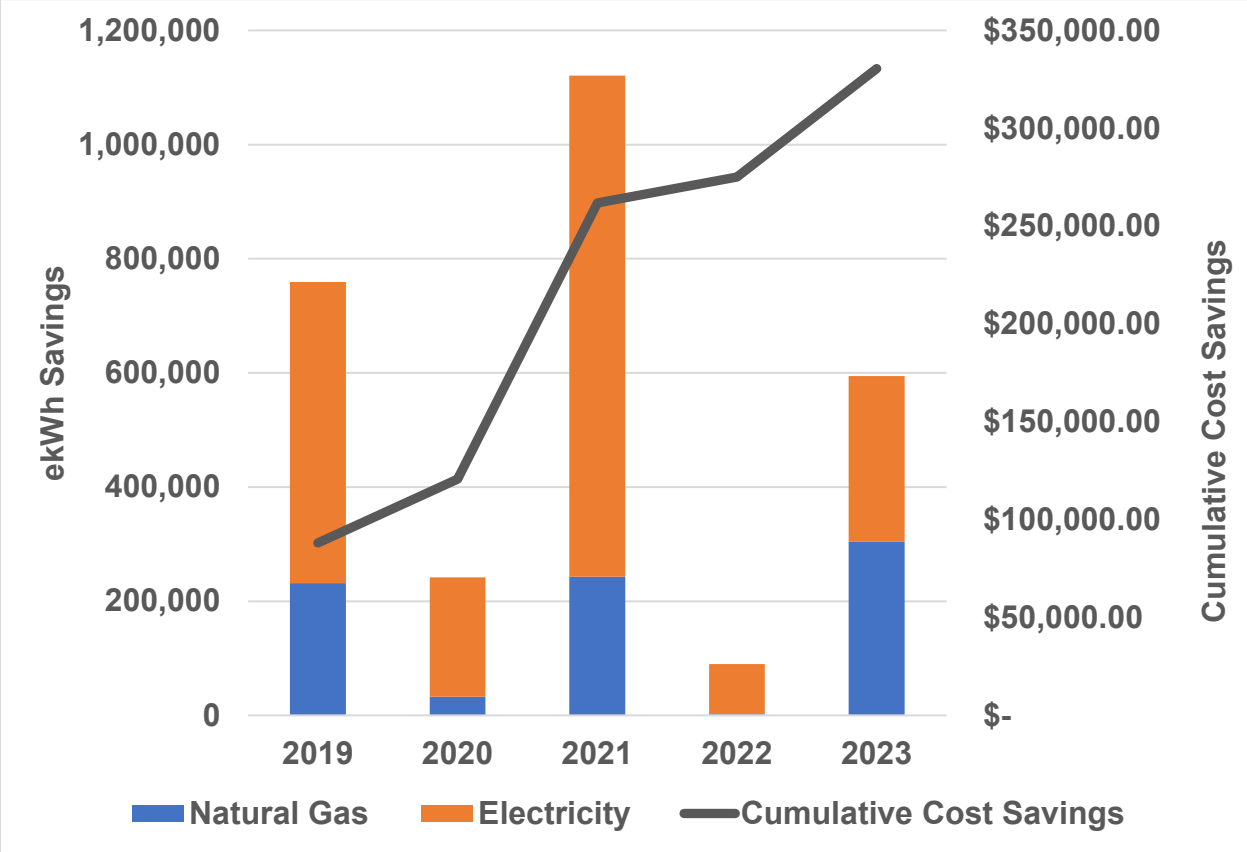
A bar representing the 2028 Target (discussed further in the 2024-2028 Goals section) is included in Figure 14 as well as in the GHG figures in each of the respective facility category subsections.

2.3 2019-2023 Portfolio Completed ECM's and Accumulated Cost Savings/Avoidance

Figure 15 below summarizes the estimated annual energy savings (split by electricity and natural gas on the primary Y axis) and cumulative cost savings (secondary Y axis) from projects/ECMs implemented from 2019-2023. The cumulative annual cost savings totals **$330,470.**

This project list was provided as part of the data required for the RMON's 2018 Corporate Emissions Inventory Report which was completed in 2023. A full list of these projects, along with the groups responsible, can be found in Appendix B – 2019-2023 Completed ECMs. Note that while all projects had expected electricity and/or natural gas savings (and therefore GHG and cost savings), the magnitude of savings was not available for some projects and their impacts are not considered in Figure 15. These are shown as blanks and/or N/As in the list included in Appendix B – 2019-2023 Completed ECMs.

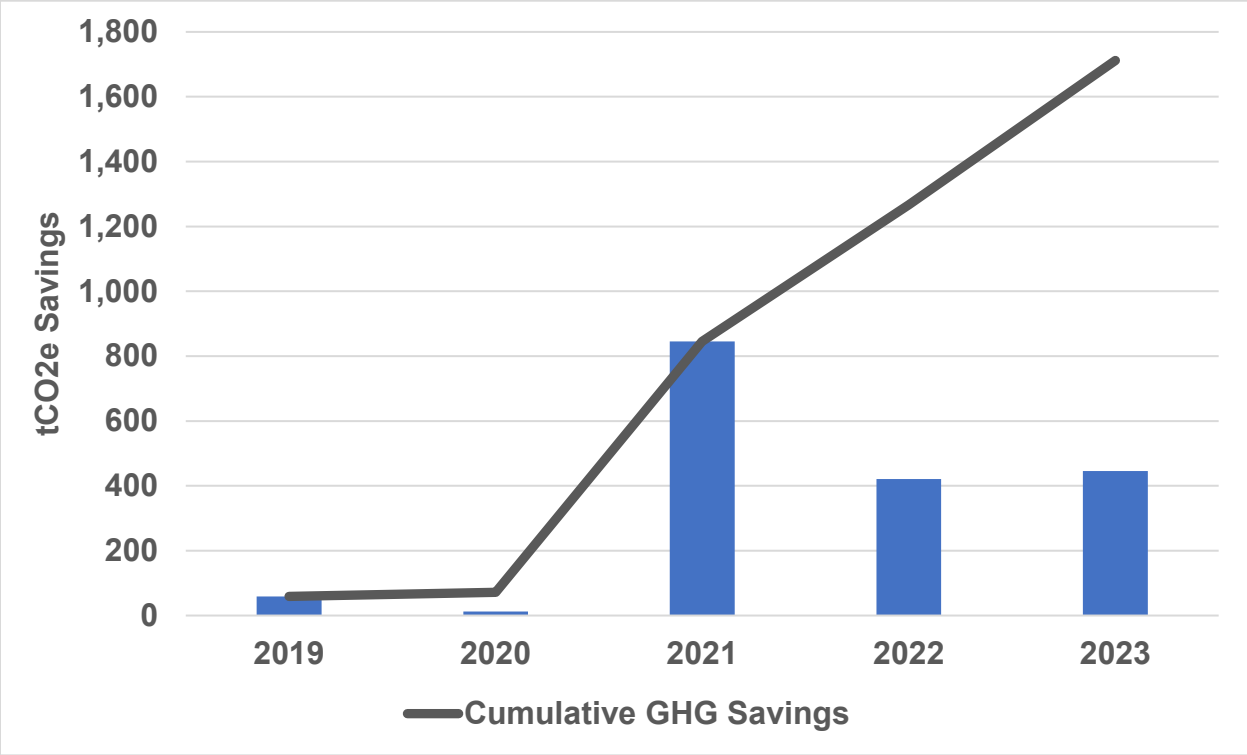
Figure 15 - 2019-2023 Completed ECMs Energy and Cost Savings Summary



2.4 2019-2023 Portfolio Completed ECM's and GHG emissions reduction

Figure 16 below summarizes the GHG emissions reduction from the same group of projects from 2019-2023.

Figure 16 - 2019-2023 Completed ECMs GHG Savings Summary



Note that in 2021 and 2022 there were several Water and Wastewater projects that reduced GHG emissions through improved efficiency of natural gas and digester gas boilers. The GHG emissions savings estimates were known for each project, however the magnitude of natural gas and digester gas savings was not provided. For this reason, the GHG impact was included in Figure 16 but the energy savings impact was not included in Figure 15.

2.5 Energy Consumption and GHG Emissions Reductions by Facility Category

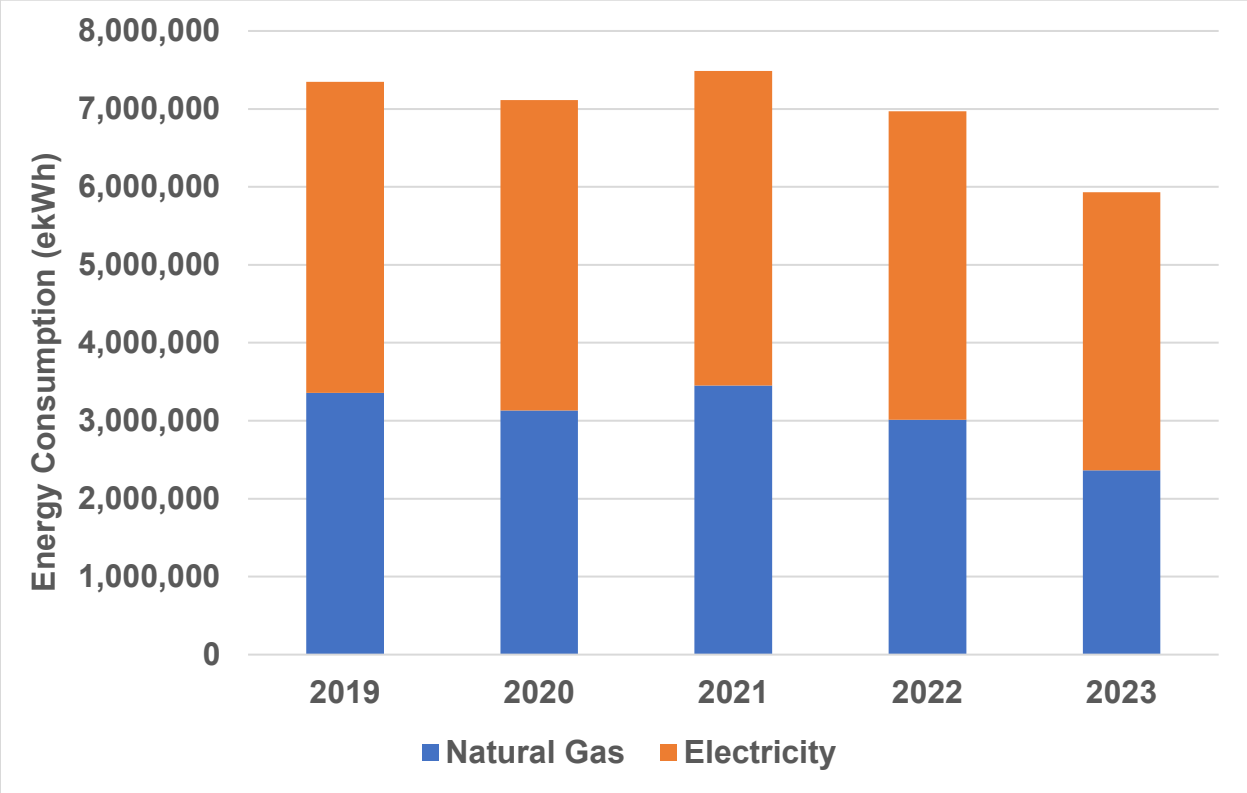
This section contains energy consumption and greenhouse gas (GHG) emissions for each category of buildings from 2019 to 2023. In most cases there is a realization of energy and GHG emissions reduction due to capital projects. You can see in Appendix A the list of facilities included in each category, and in Appendix B the list of ECM projects that have helped to reduce energy and emissions.

i. Administrative Offices

2019-2023 Energy Consumption

Figure 17 summarizes the 2019-2023 energy consumption for Administrative offices split by electricity and natural gas consumption.

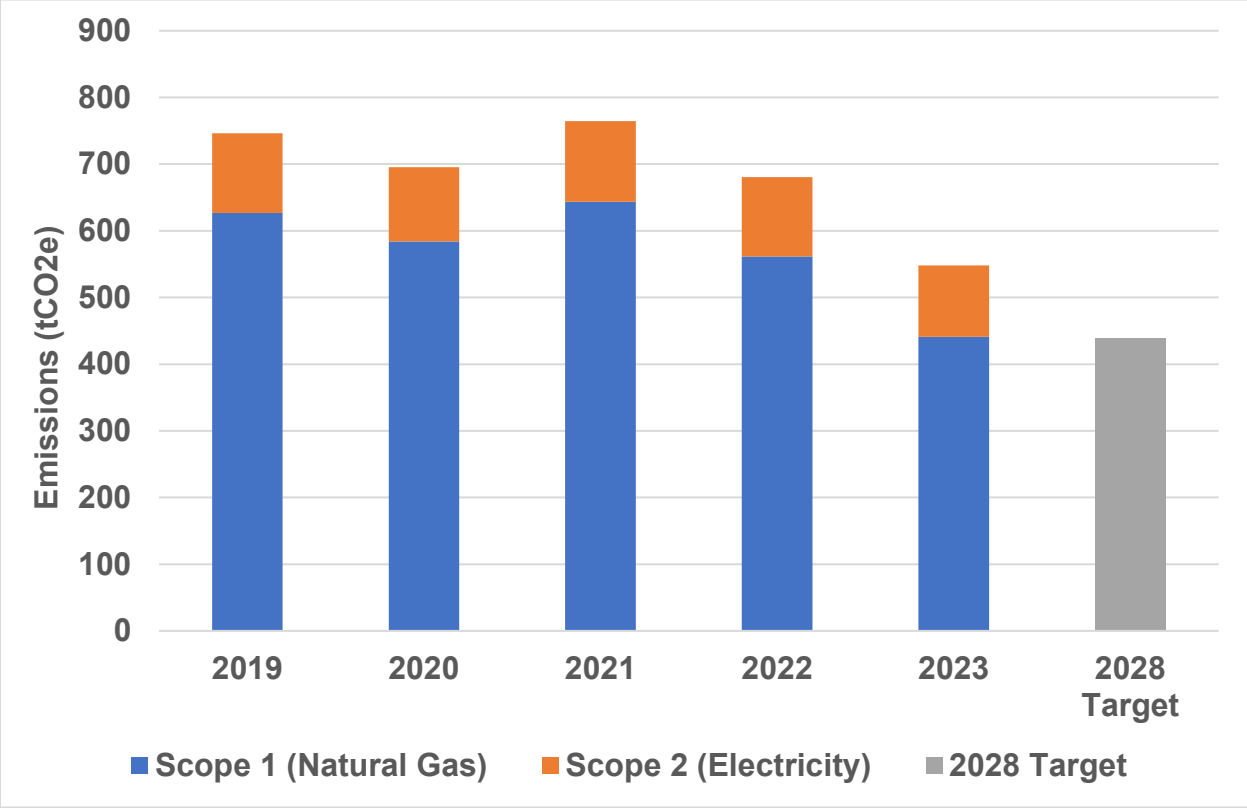
Figure 17 - Administrative offices 2019-2023 Energy Consumption



2019-2023 GHG Emissions

Figure 18 summarizes the 2019-2023 GHG emissions for Administrative offices split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference.

Figure 18 - Administrative offices 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

Potential future ECMs for Administrative offices proposed in past energy audits have the potential to reduce emissions with annual cost savings. Examples of these projects include: Faucet aerator upgrades, DHW heating upgrades, insulating hot water pipes, interior and exterior lighting retrofits, PV systems, variable speed pumps, CO2 sensors, HX insulation, DWH recirc pumps, replacing boilers with high efficiency units, DDC controlled thermostats, solar thermal systems, geothermal systems, Solar PV systems and replacing windows.

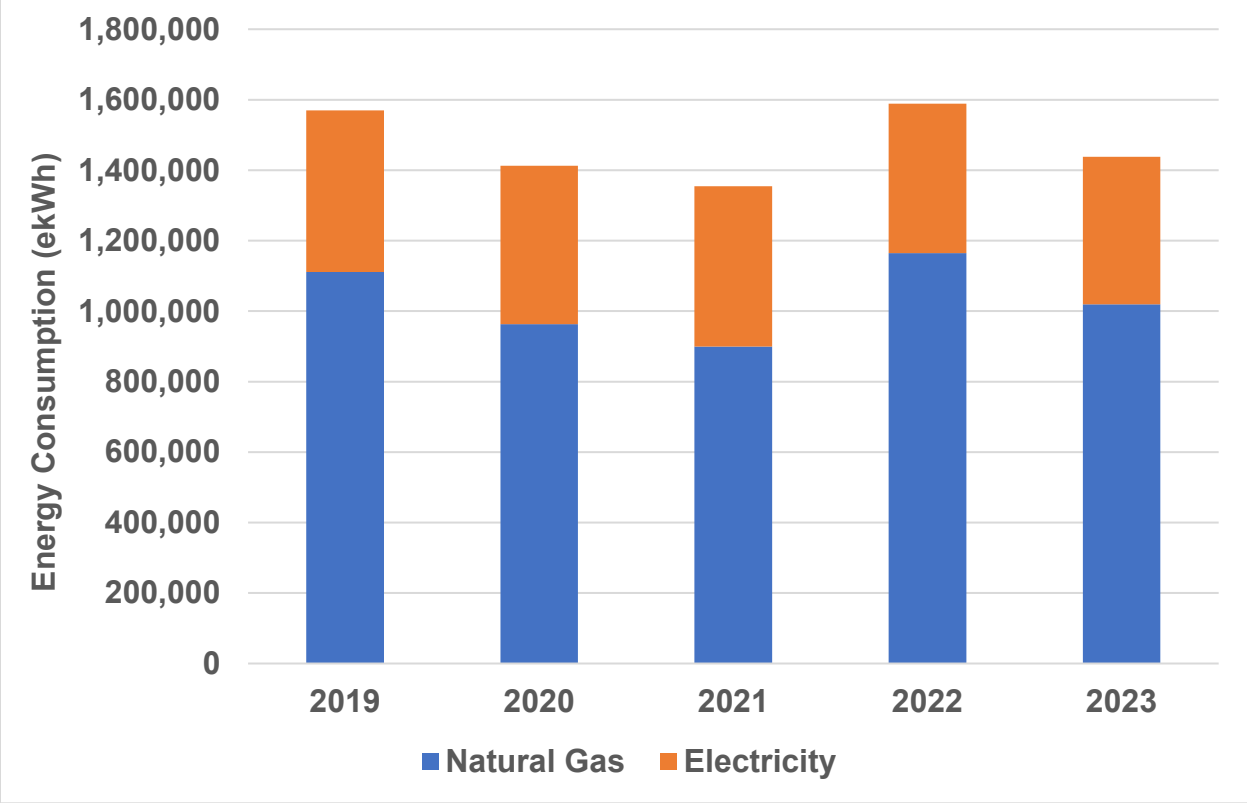
Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $4M, with GHG reduction of 247 tCO2e and annual cost reduction of $95,352.

ii. Ambulance Buildings

2019-2023 Energy Consumption

Figure 19 summarizes the 2019-2023 energy consumption for Ambulance buildings split by electricity and natural gas consumption.

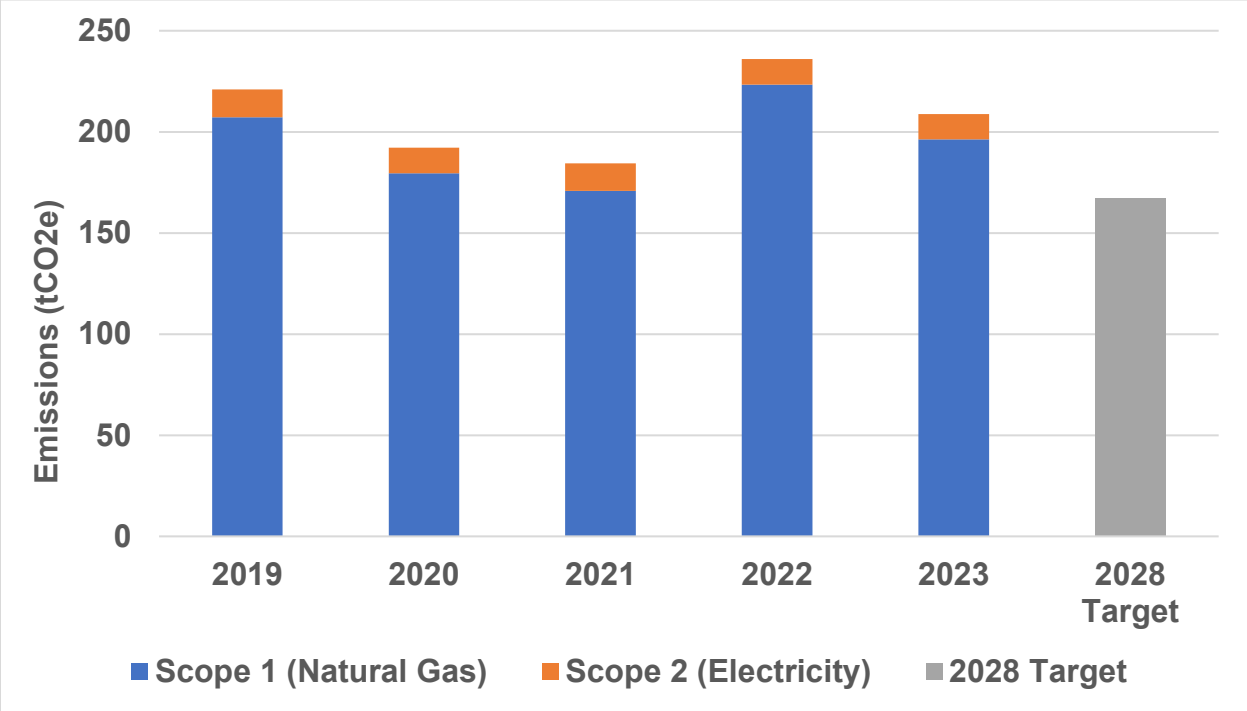
Figure 19 - Ambulance buildings 2019-2023 Energy Consumption



2019-2023 GHG Emissions

Figure 20 summarizes the 2019-2023 GHG emissions for Ambulance buildings split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference.

Figure 20 - Ambulance buildings 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

Potential future ECMs for Ambulance buildings proposed in past energy audits have the potential to reduce emissions with annual cost savings. Examples of these projects include: shower fixture upgrades, faucet aerator upgrades, RTU replacement with low GHG, set ambulance bays to a lower temp, insulate DHW piping, installing lockable thermostat covers for heaters, and upgrading the LED lighting.

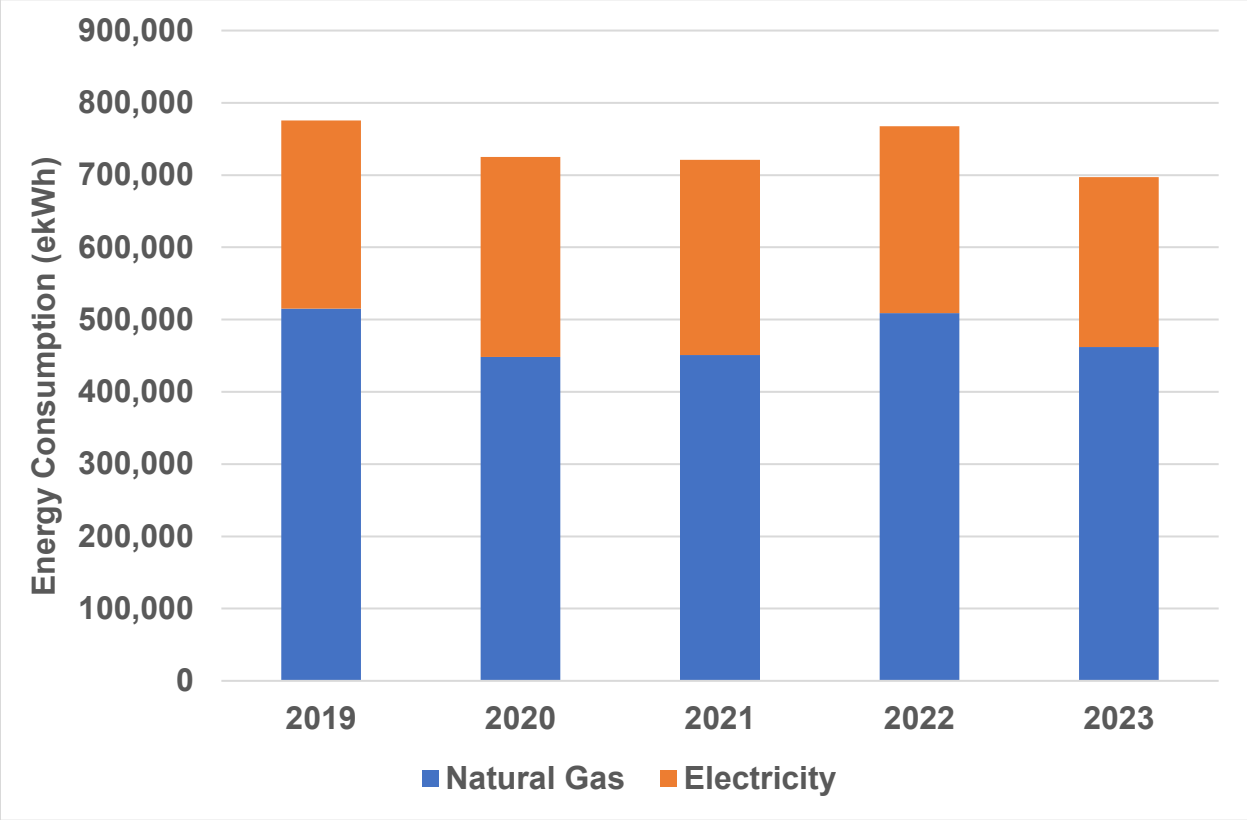
Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $84,370, with GHG reduction of 27.4 tCO2e and annual cost reduction of $2,331.

iii. Child Care

2019-2023 Energy Consumption

Figure 21 summarizes the 2019-2023 energy consumption for Child Care facilities split by electricity and natural gas consumption.

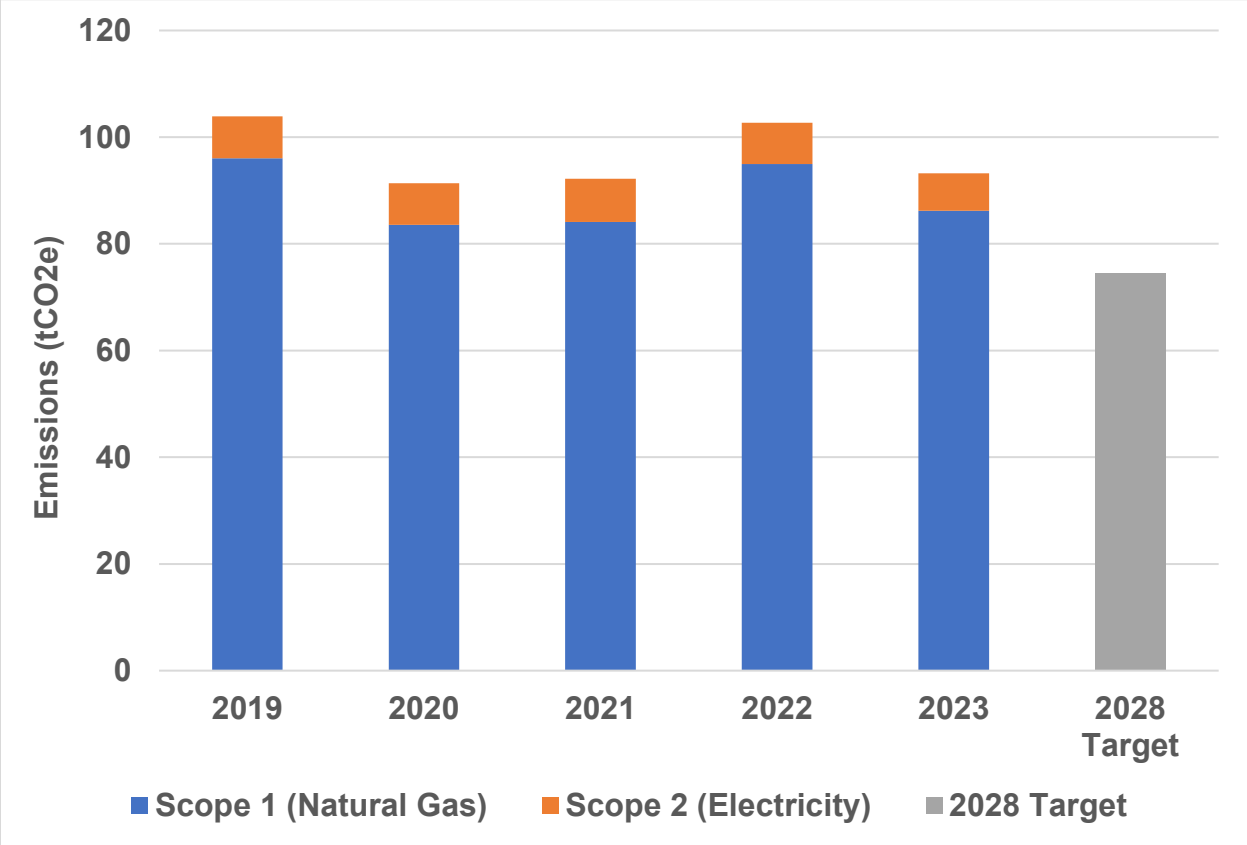
Figure 21 - Child Care facilities 2019-2023 Energy Consumption



2019-2023 GHG Emissions

Figure 22 summarizes the 2019-2023 GHG emissions for Child Care facilities split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference.

Figure 22 - Child Care facilities 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

Potential future ECMs for Child Care facilities proposed in past energy audits have the potential to reduce emissions with annual cost savings. Examples of these projects include: faucet aerator upgrades, RTU and furnace replacement with low GHG, DHW heater upgrade, programmable thermostats for setbacks and insulate HW piping.

Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $264,055, with GHG reduction of 35.1 tCO2e and annual cost reduction of $3,138.

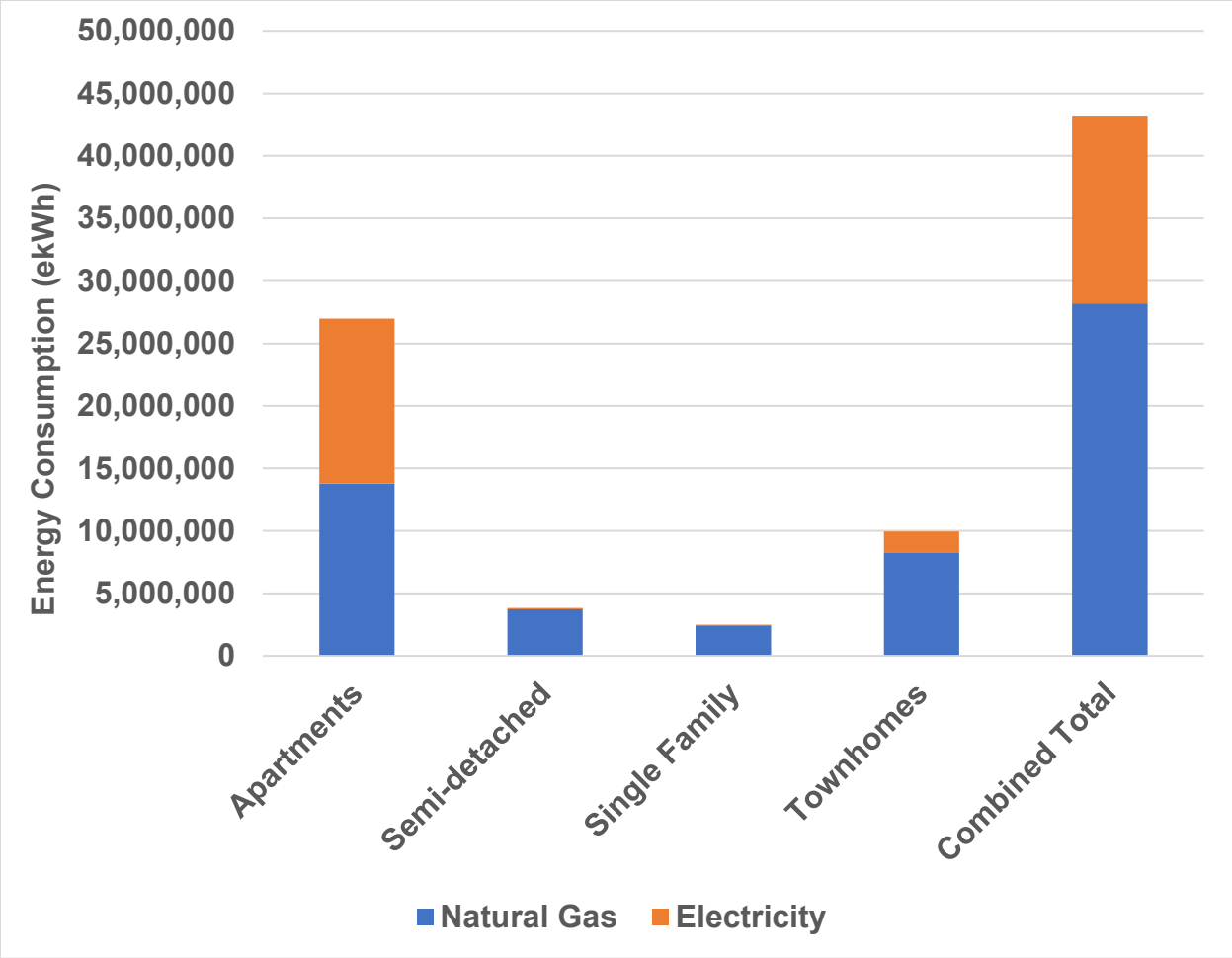
iv. Housing

2023 Energy Consumption

Figure 23 summarizes the 2023 energy consumption for Housing buildings split by housing type. Note that this facility category was added in 2023, therefore no historical data is included in this CDMP.

In 2023, 65% of energy consumption came from natural gas and 35% from electricity.

Figure 23 - Housing buildings 2019-2023 Energy Consumption

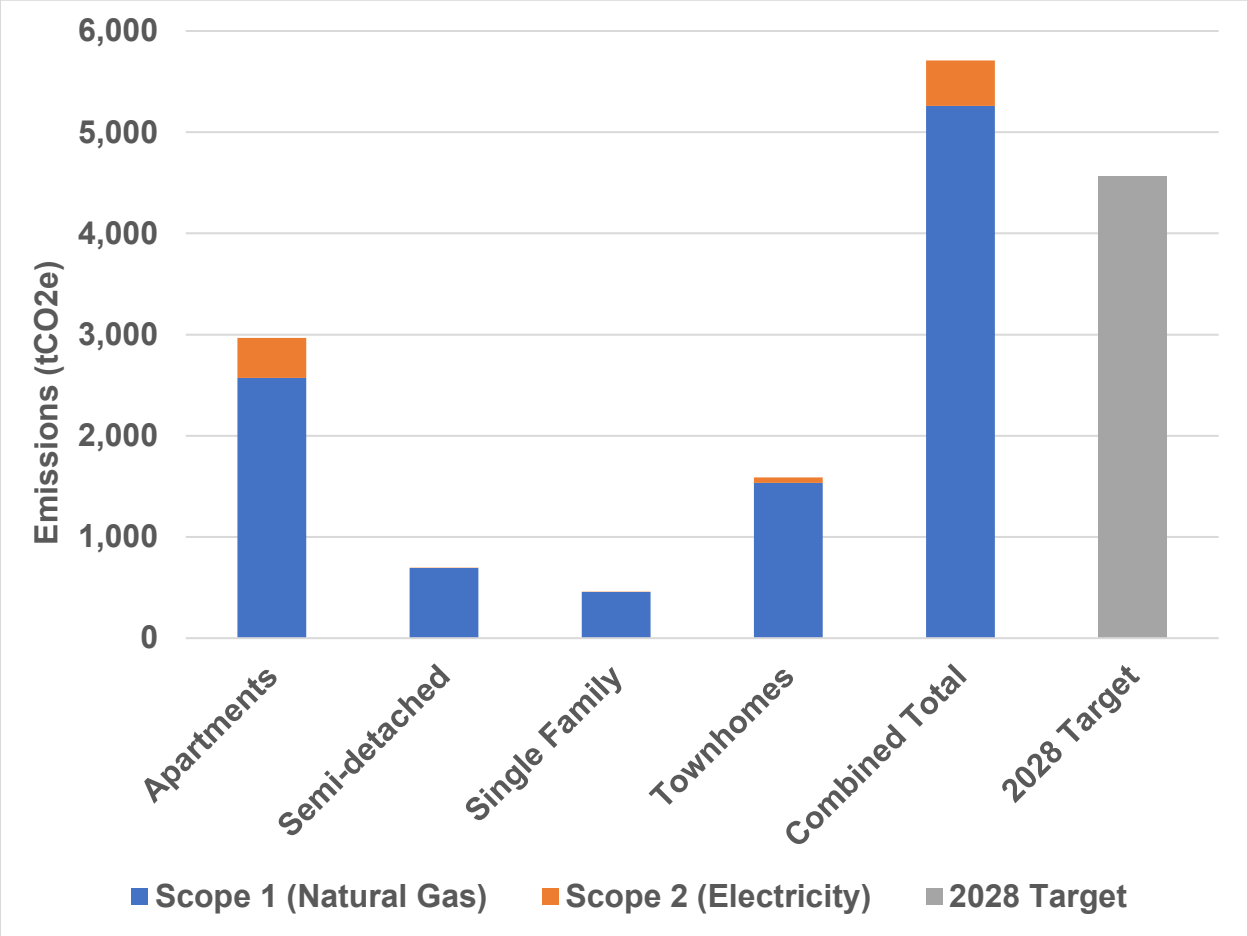


2023 GHG Emissions

Figure 24 summarizes the 2019-2023 GHG emissions for Housing buildings split by housing type. Note that this facility category was added in 2023, therefore no historical data is included in this CDMP. The 2028 target (20% below 2023 levels) is also shown for reference.

In 2023, 92% of emissions were Scope 1 (natural gas-related) and 8% were Scope 2 (electricity-related).

Figure 24 - Housing buildings 2019-2023 GHG Emissions

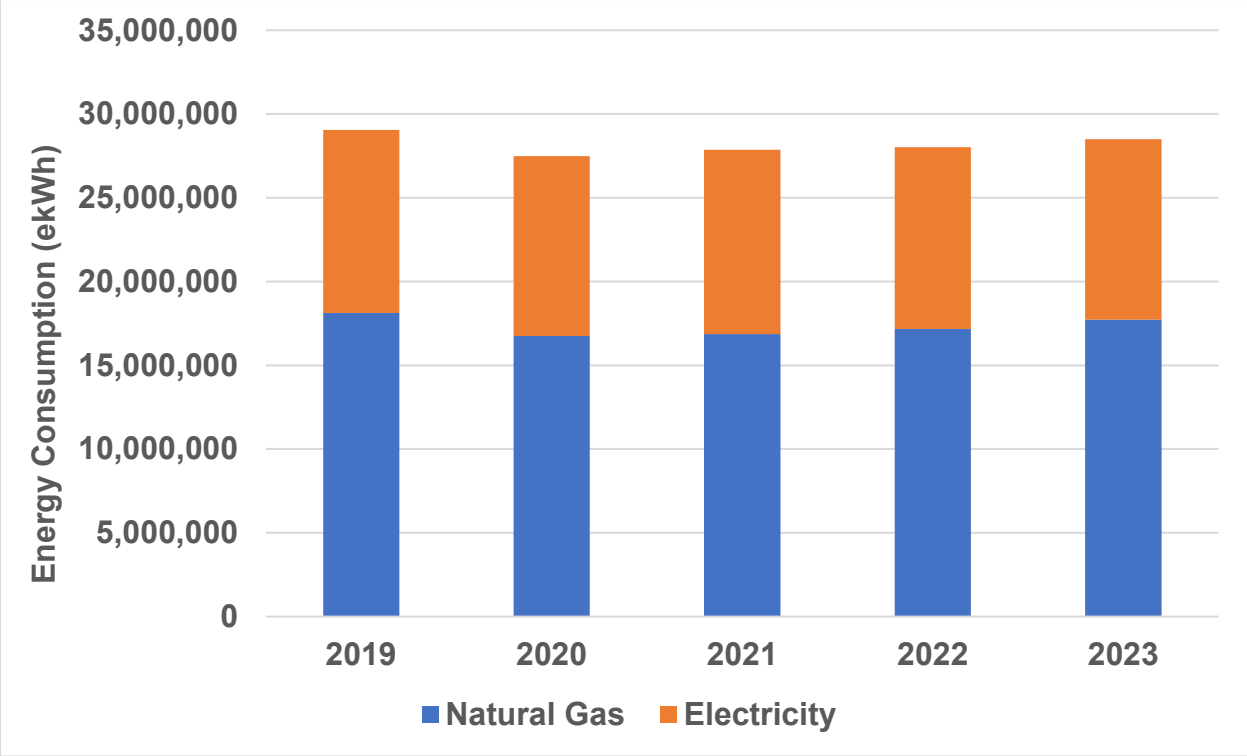


v. Long Term Care

2019-2023 Energy Consumption

Figure 25 summarizes the 2019-2023 energy consumption for Long Term Care facilities split by electricity and natural gas consumption.

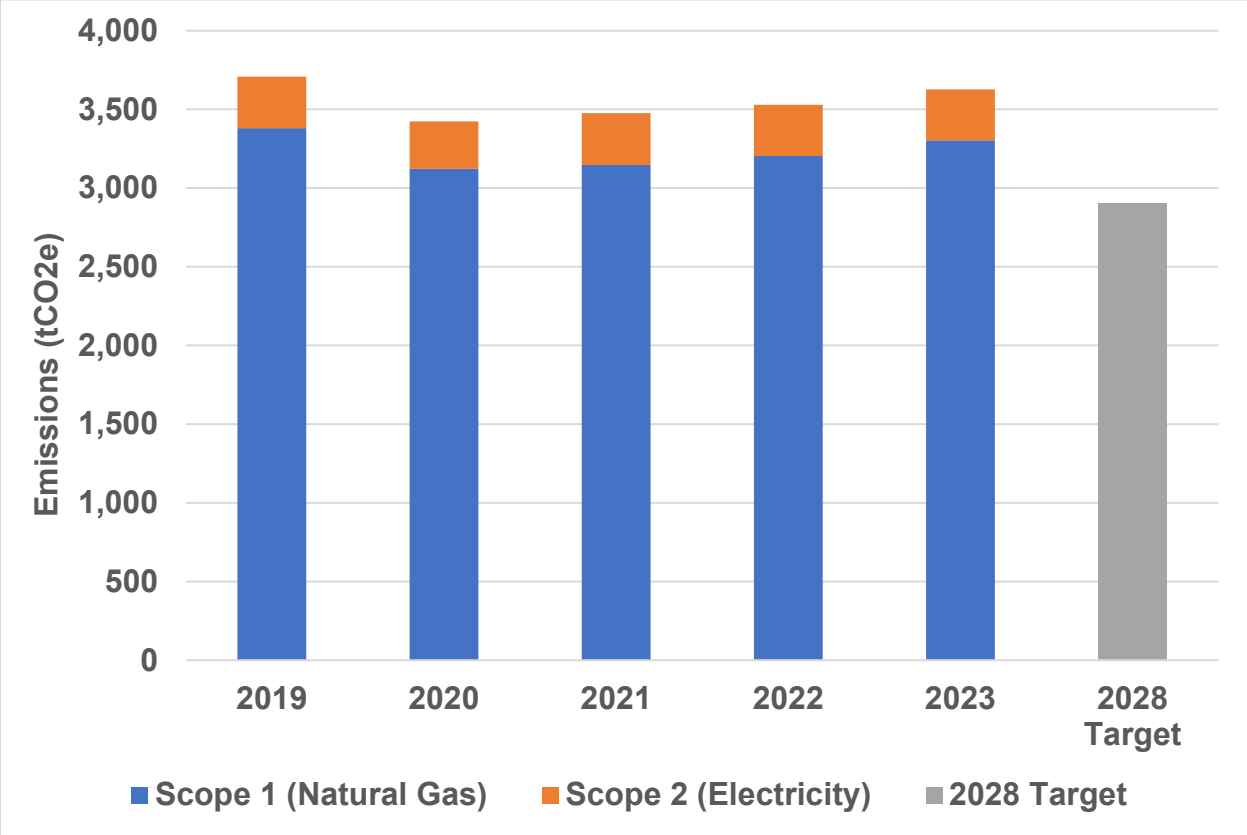
Figure 25 - Long Term Care facilities 2019-2023 Energy Consumption



2019-2023 GHG Emissions

Figure 26 summarizes the 2019-2023 GHG emissions for Long Term Care facilities split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference.

Figure 26 - Long Term Care facilities 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

Potential future ECMs for Long Term Care facilities proposed in past energy audits have the potential to reduce emissions with annual cost savings. Examples of these projects include: install timer on DWH recirc pump; insulate HW pipes; occupancy controls for vending machines; energy savings device for commercial fridges; water fixture replacement, high efficiency spray valves, replace aging windows, doors, and sealants; ozone technology for washing machines; setback for HVAC equipment where possible; LED lighting retrofits; variable speed drives on HVAC equipment; boiler set-backs.

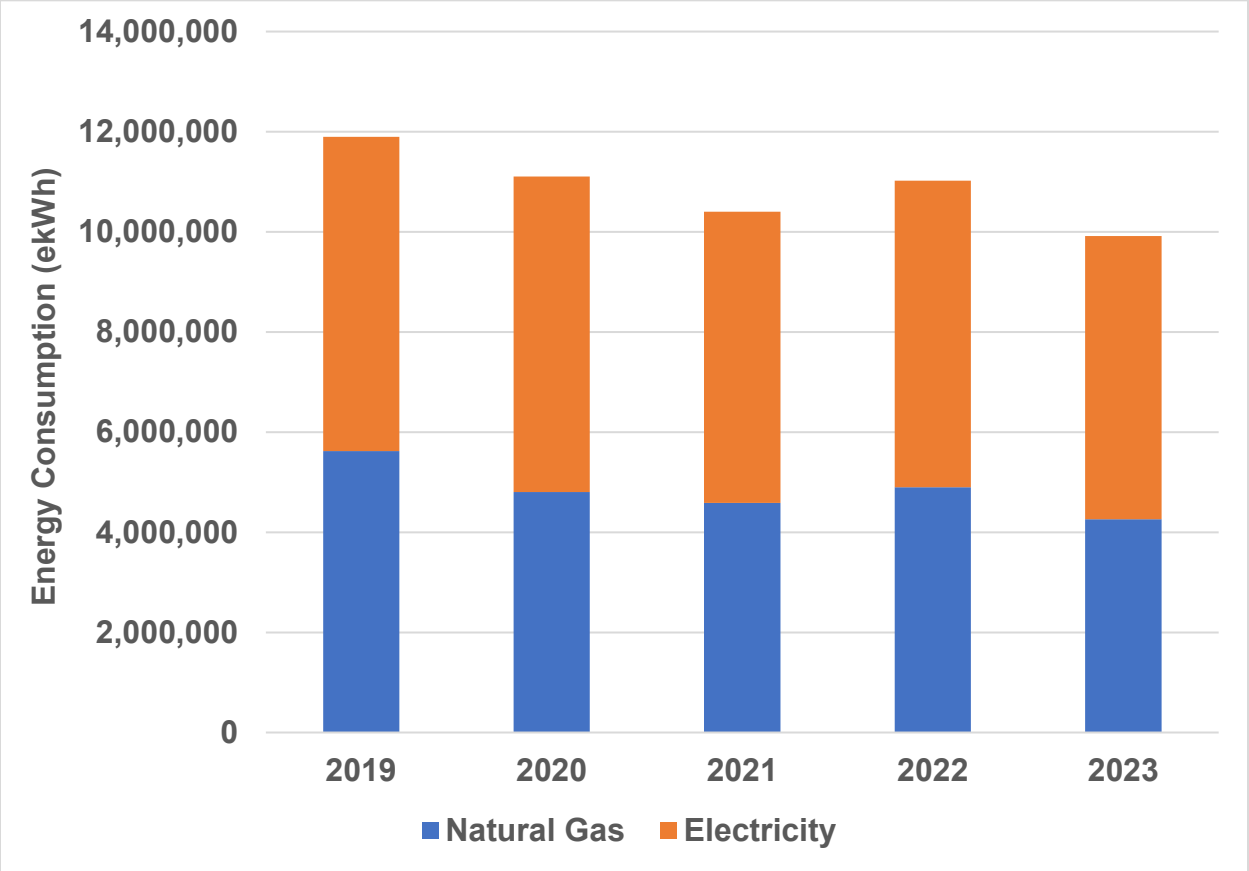
Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $586,220, with GHG reduction of186.6 tCO2e and annual cost reduction of $113,634.

vi. Police and Court Services Facilities

2019-2023 Energy Consumption

Figure 27 summarizes the 2019-2023 energy consumption for Police and Court Services facilities split by electricity and natural gas consumption.

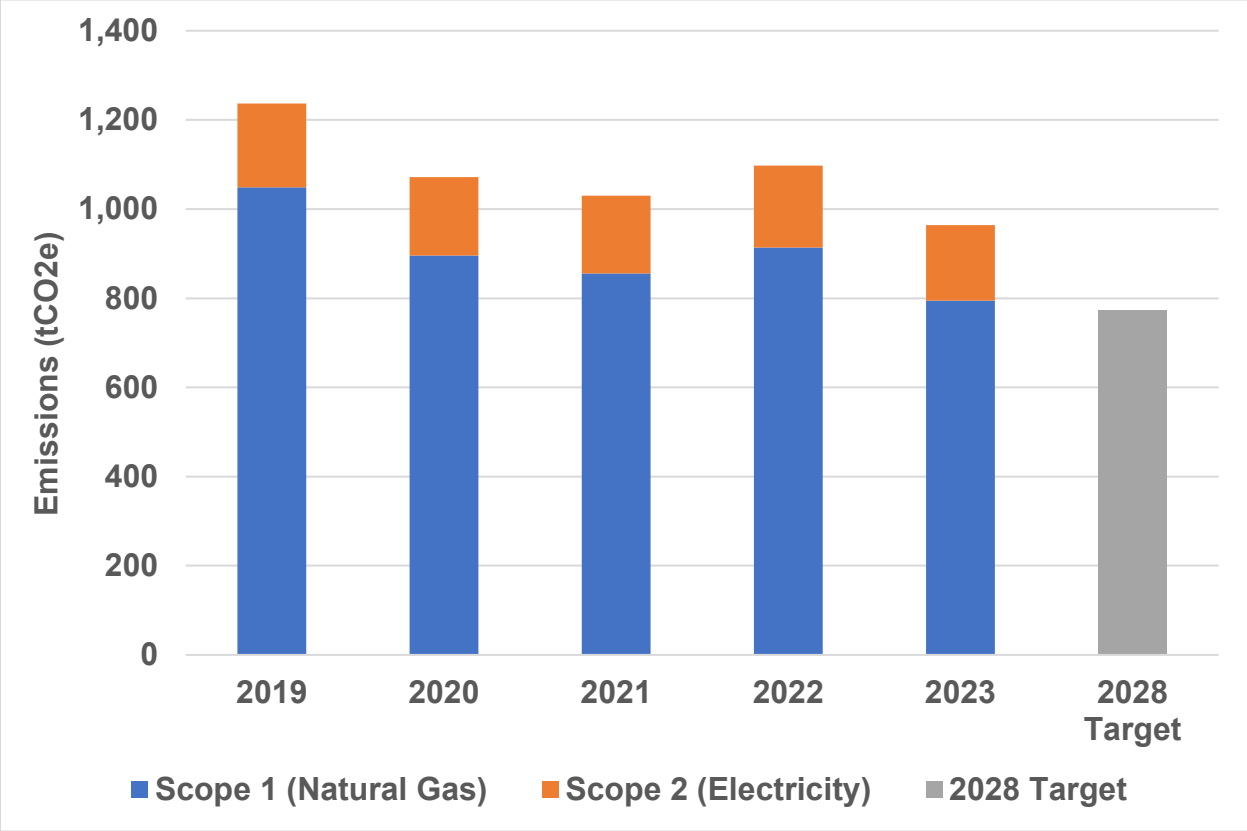
Figure 27 - Police and Court Services facilities 2019-2023 Energy Consumption



2019-2023 GHG Emissions

Figure 28 summarizes the 2019-2023 GHG emissions for Police and Court Services facilities split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference.

Figure 28 - Police and Court Services facilities 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

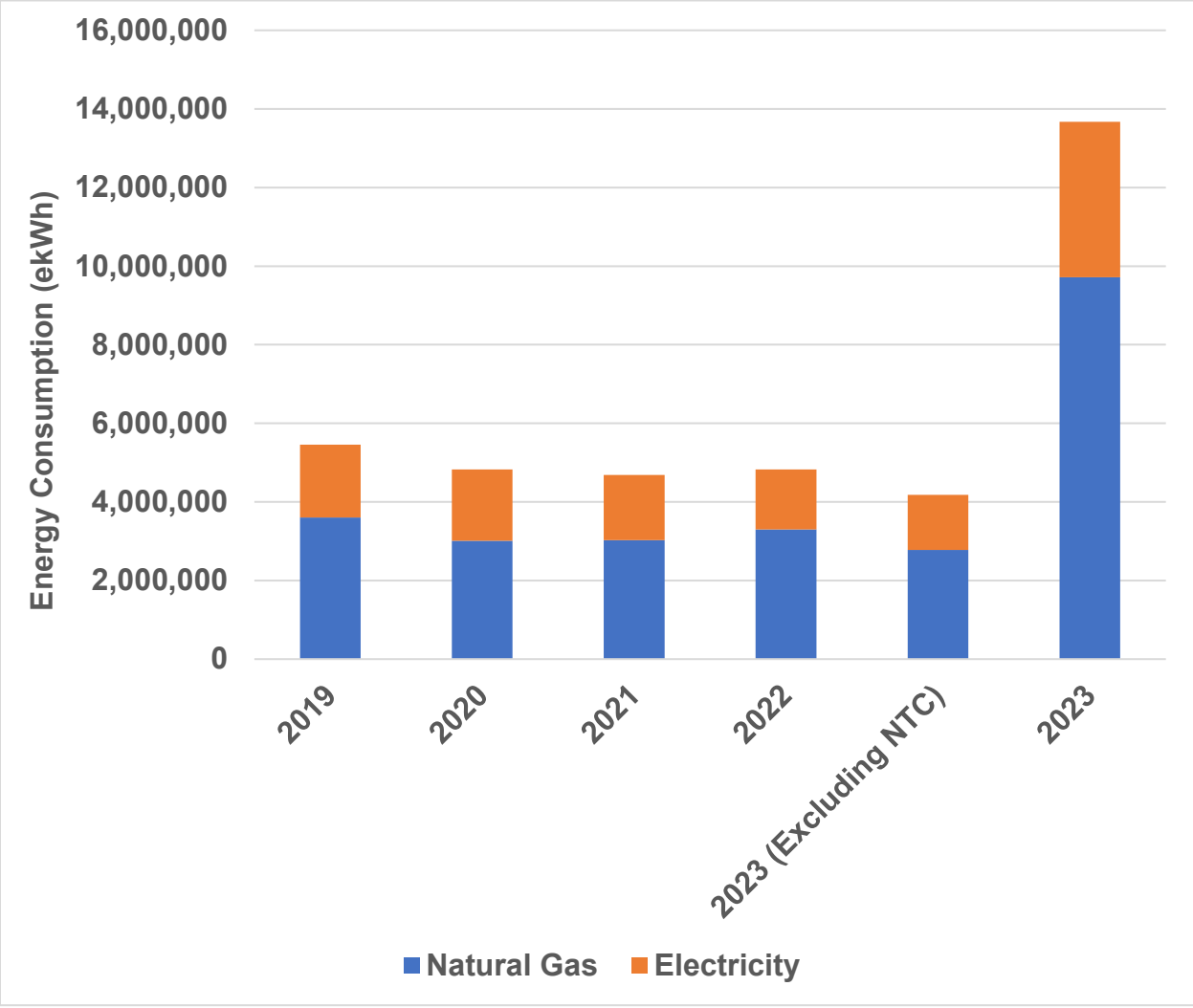
Potential future ECMs for Police and Court Services facilities proposed in past energy audits Have the potential to reduce emissions with annual cost savings. Examples of these projects include: shower and faucet fixture upgrades; RTU replacement with low GHG; DWH equipment upgrade; temperature set-backs where possible. Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $561,780, with GHG reduction of 74.5, but actually have a net increase in operating cost of $1,545 due mostly to the impact of the low GHG RTU's (ie. Heat pumps).

vii. Public Works/Yards/Service Centers/Fleet Facilities

2019-2023 Energy Consumption

Figure 29 summarizes the 2019-2023 energy consumption for Public Works/Yards/Service Centers/Fleet facilities split by electricity and natural gas consumption. An additional stacked column was added to show the impact of excluding the three Niagara Transit Commission (NTC) fleet facilities in this facility category.

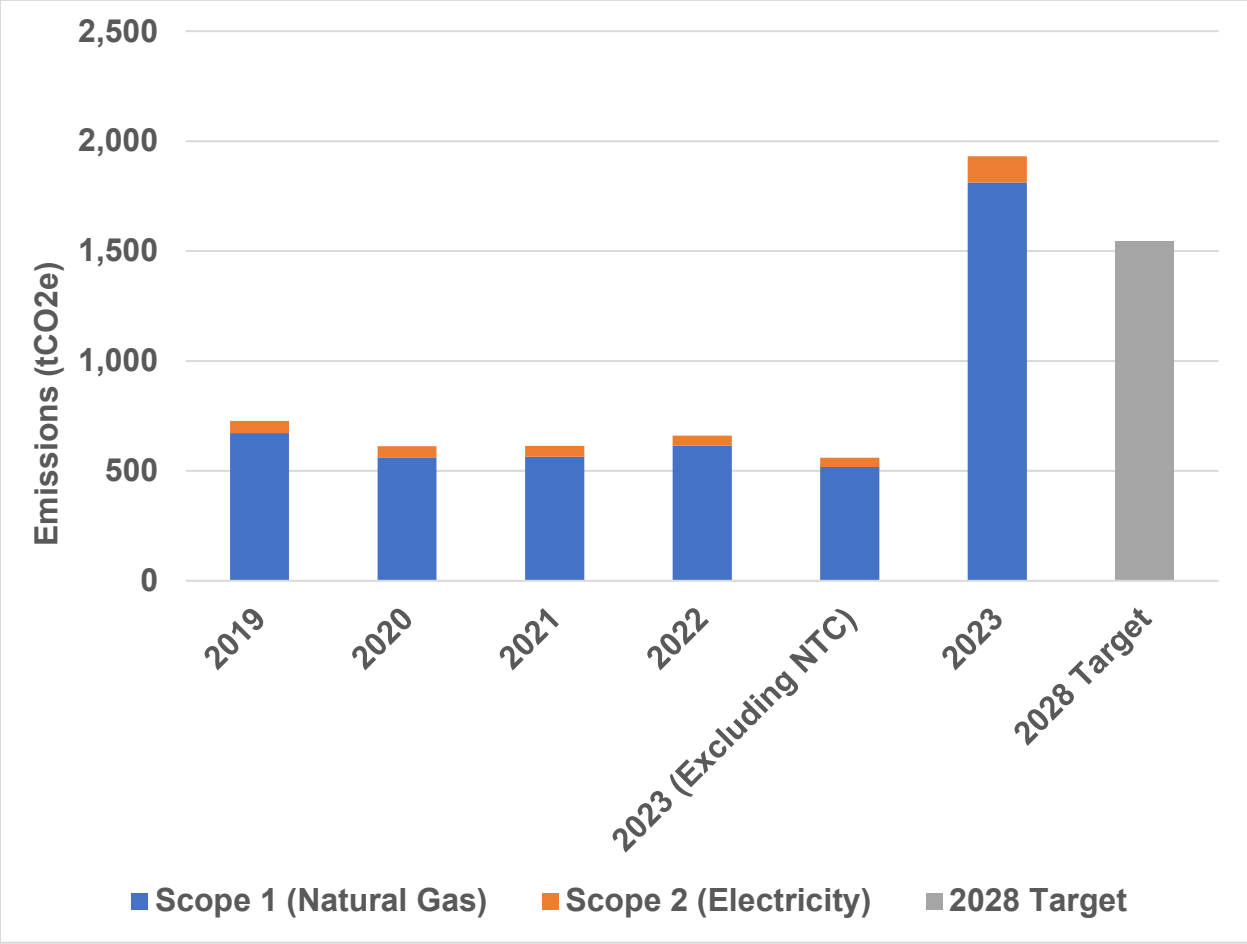
Figure 29 - Public Works/Yards/Service Centers/Fleet facilities 2019-2023 Energy Consumption



2019-2023 GHG Emissions

Figure 30 summarizes the 2019-2023 GHG emissions for Public Works/Yards/Service Centers/Fleet facilities split by Scope 1 and Scope 2 emissions. An additional stacked column was added to show the impact of excluding the three Niagara Transit Commission (NTC) fleet facilities in this facility category. The 2028 target (20% below 2023 levels) is also shown for reference.

Figure 30 - Public Works/Yards/Service Centers/Fleet facilities 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

Potential future ECMs for Public Works/Yards/Service Centers/Fleet facilities proposed in past energy audits have the potential to reduce emissions with annual cost savings. Examples of these projects include: insulate HW pipes; domestic water fixture upgrades; roof mounted solar PV systems; DHW recirc loop pump; occupancy controls for vending machine; installing building controls; installing photo cells for outside

lighting; upgrading to Energy Star appliances; deploying computer power management technologies; installing heat recovery ventilators; upgrading shower heads.

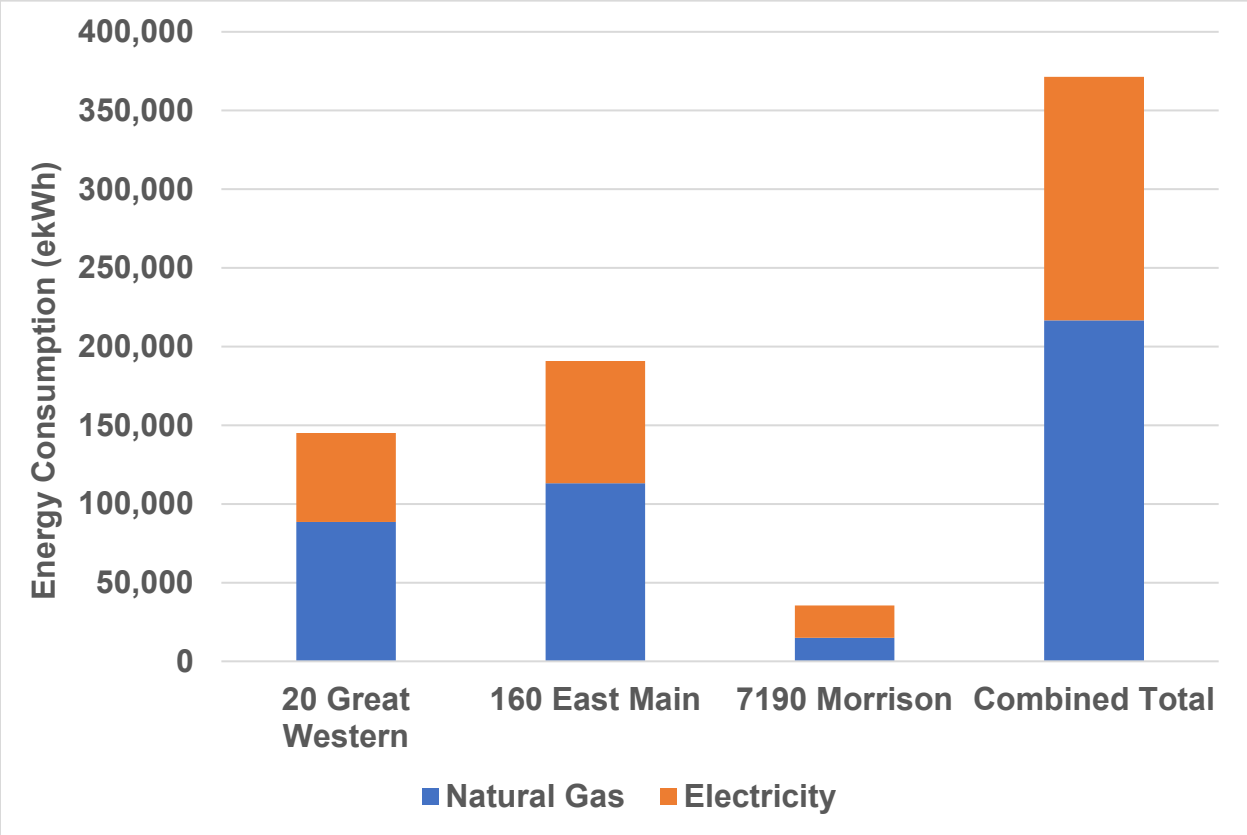
Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $1,159,570, with GHG reduction of 71.4 tCO2e and annual cost reduction of $104,110.

viii. Regional Transit/GO Train Terminals

2023 Energy Consumption

Figure 31 summarizes the 2023 energy consumption for Regional Transit/GO Train Terminals split by electricity and natural gas consumption. Note that this facility category was added in 2023, therefore no historical data is included in this CDMP.

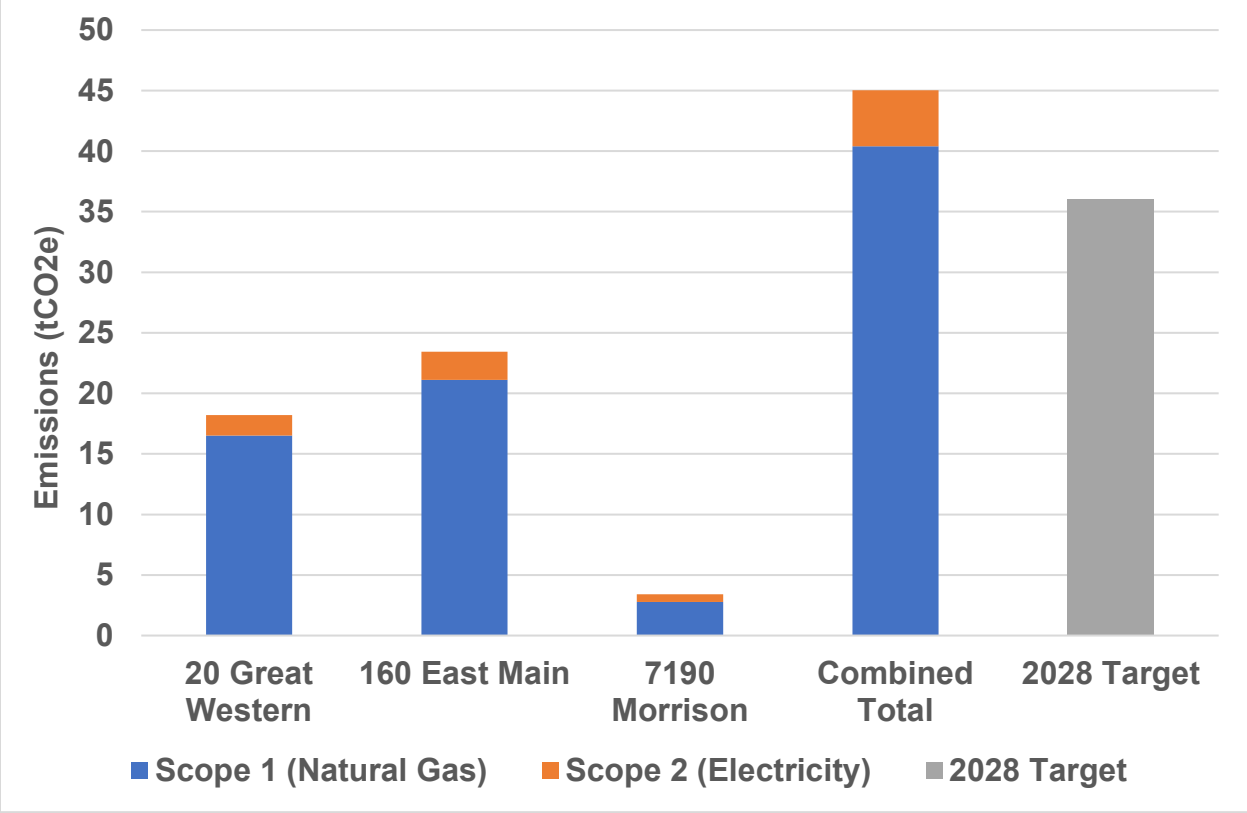
Figure 31 - Regional Transit/GO Train Terminals 2023 Energy Consumption



2023 GHG Emissions

Figure 32 summarizes the 2019-2023 GHG emissions for Regional Transit/GO Train Terminals split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference. Note that this facility category was added in 2023, therefore no historical data is included in this CDMP.

Figure 32 - Regional Transit/GO Train Terminals 2023 GHG Emissions

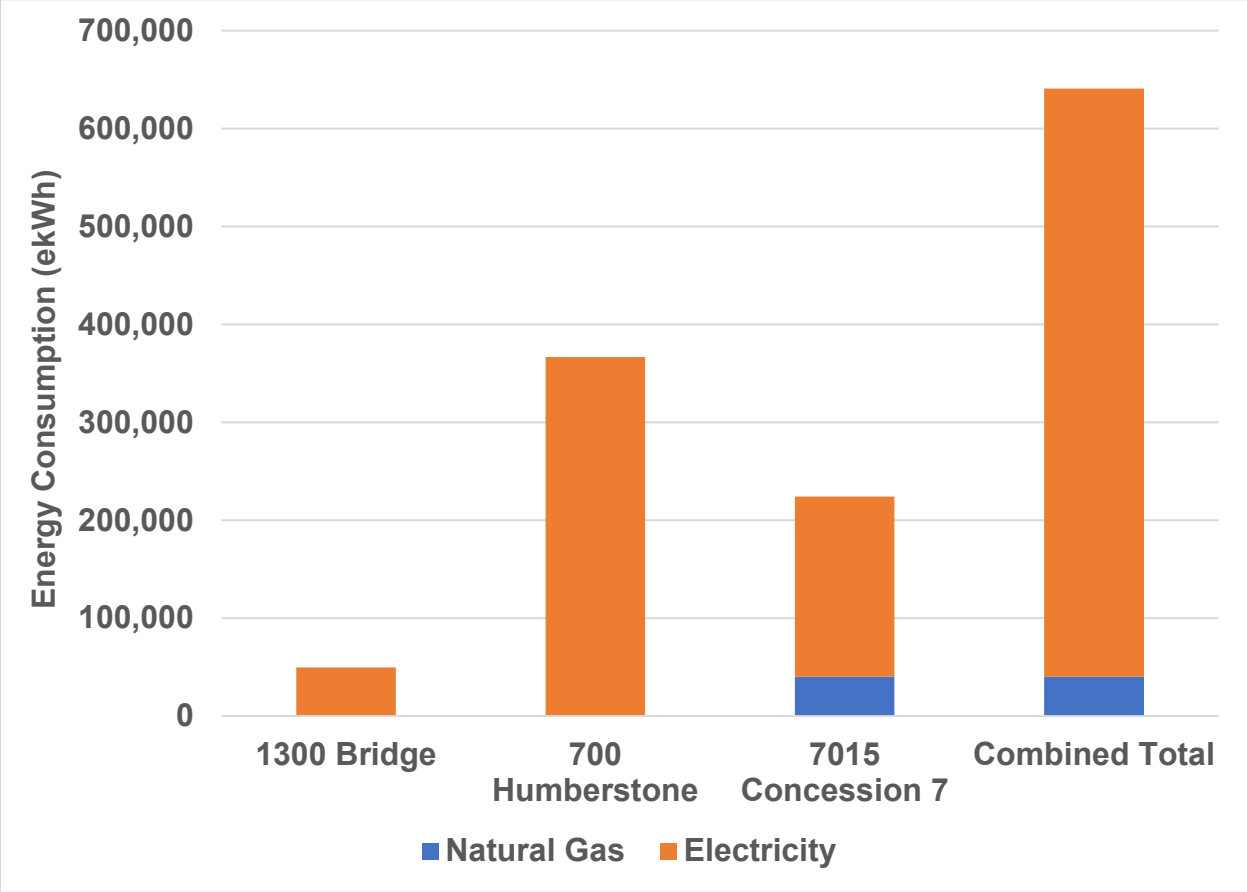


ix. Waste Management Facilities

2023 Energy Consumption

Figure 33 summarizes the 2023 energy consumption for Waste Management facilities split by electricity and natural gas consumption. Note that this facility category was added in 2023, therefore no historical data is included in this CDMP.

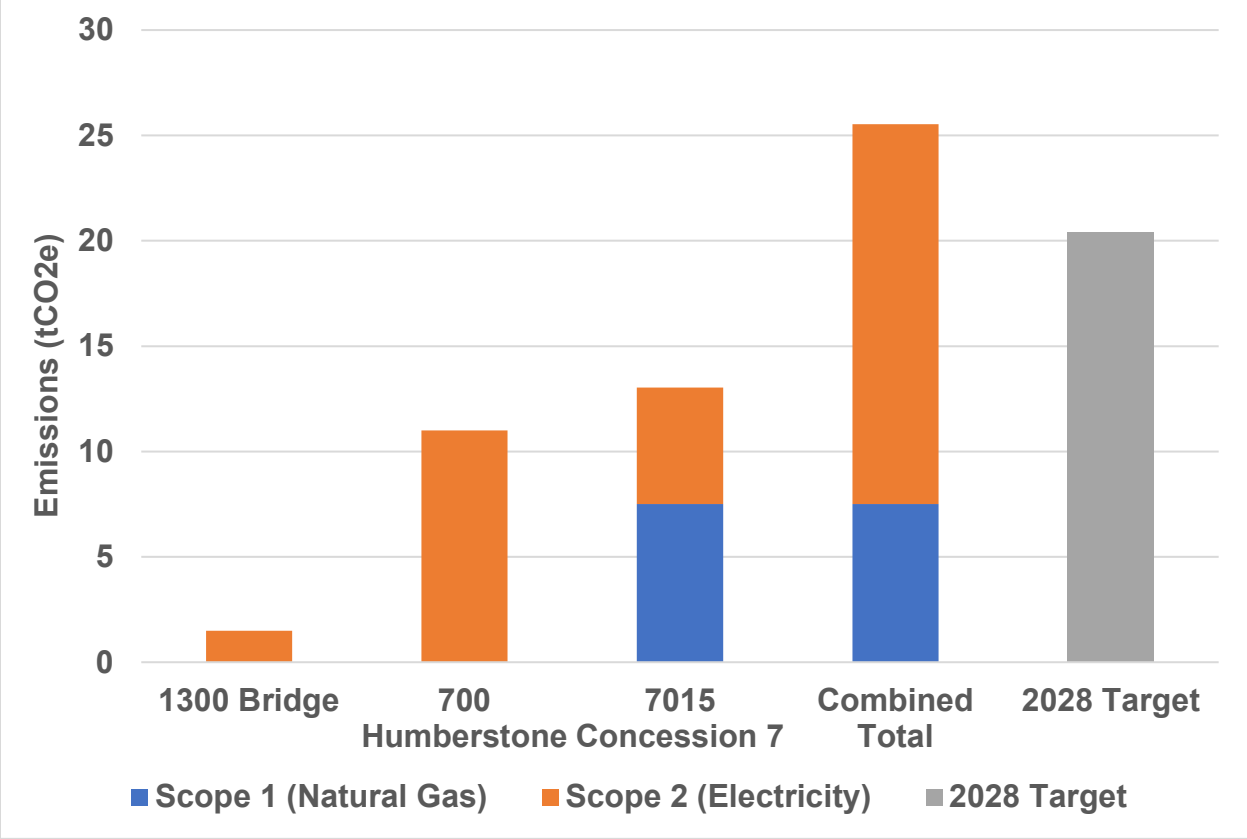
Figure 33 - Waste Management facilities 2023 Energy Consumption



2023 GHG Emissions

Figure 34 summarizes the 2019-2023 GHG emissions for Waste Management facilities split by Scope 1 and Scope 2 emissions. The 2028 target (20% below 2023 levels) is also shown for reference. Note that this facility category was added in 2023, therefore no historical data is included in this CDMP.

Figure 34 - Waste Management facilities 2023 GHG Emissions



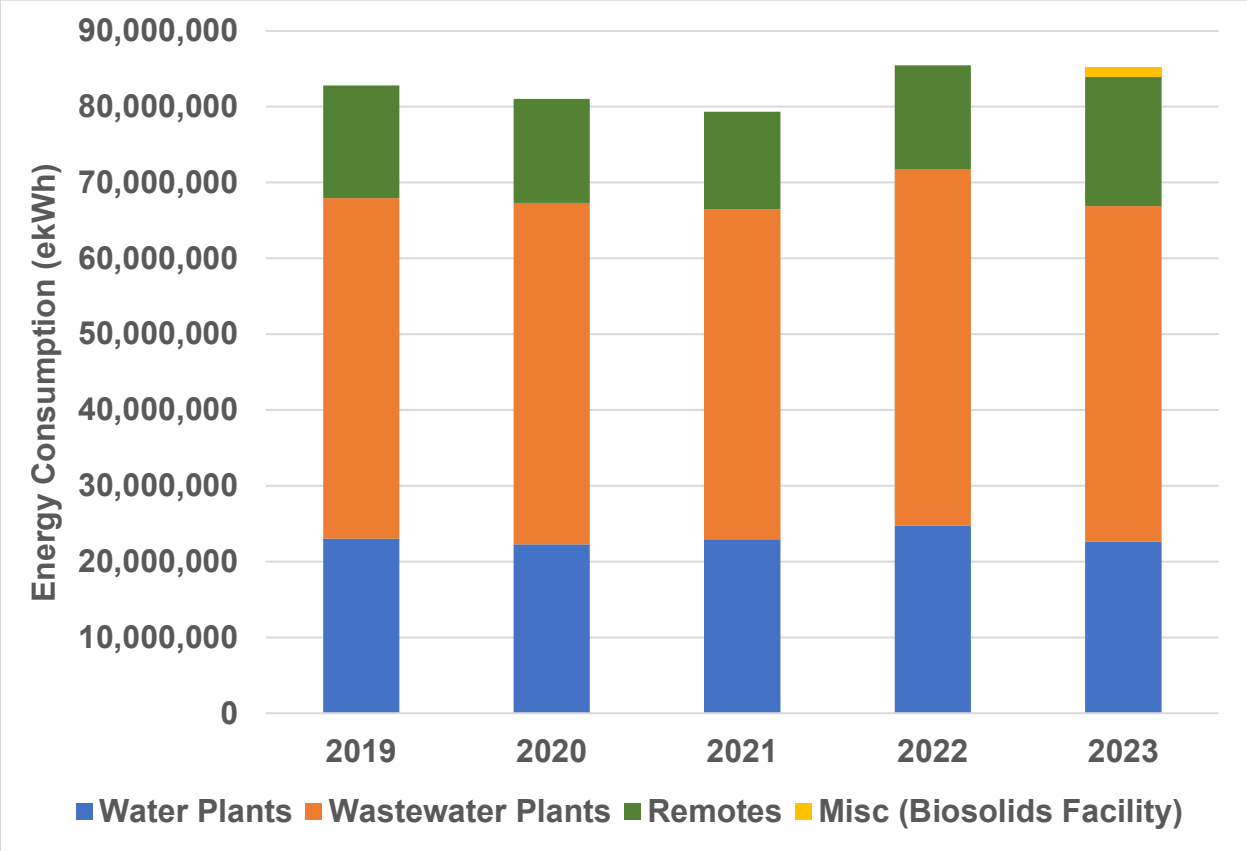
x. Water and Wastewater – Plants/Remotes/Miscellaneous

2019-2023 Energy Consumption

Figure 35 summarizes the 2019-2023 energy consumption for Water and Wastewater facilities split by plants, remotes and the Biosolids Facility (added in 2023).

In 2023, 26% of energy consumption came from natural gas and 74% from electricity.

Figure 35 - Water and Wastewater facilities 2019-2023 Energy Consumption



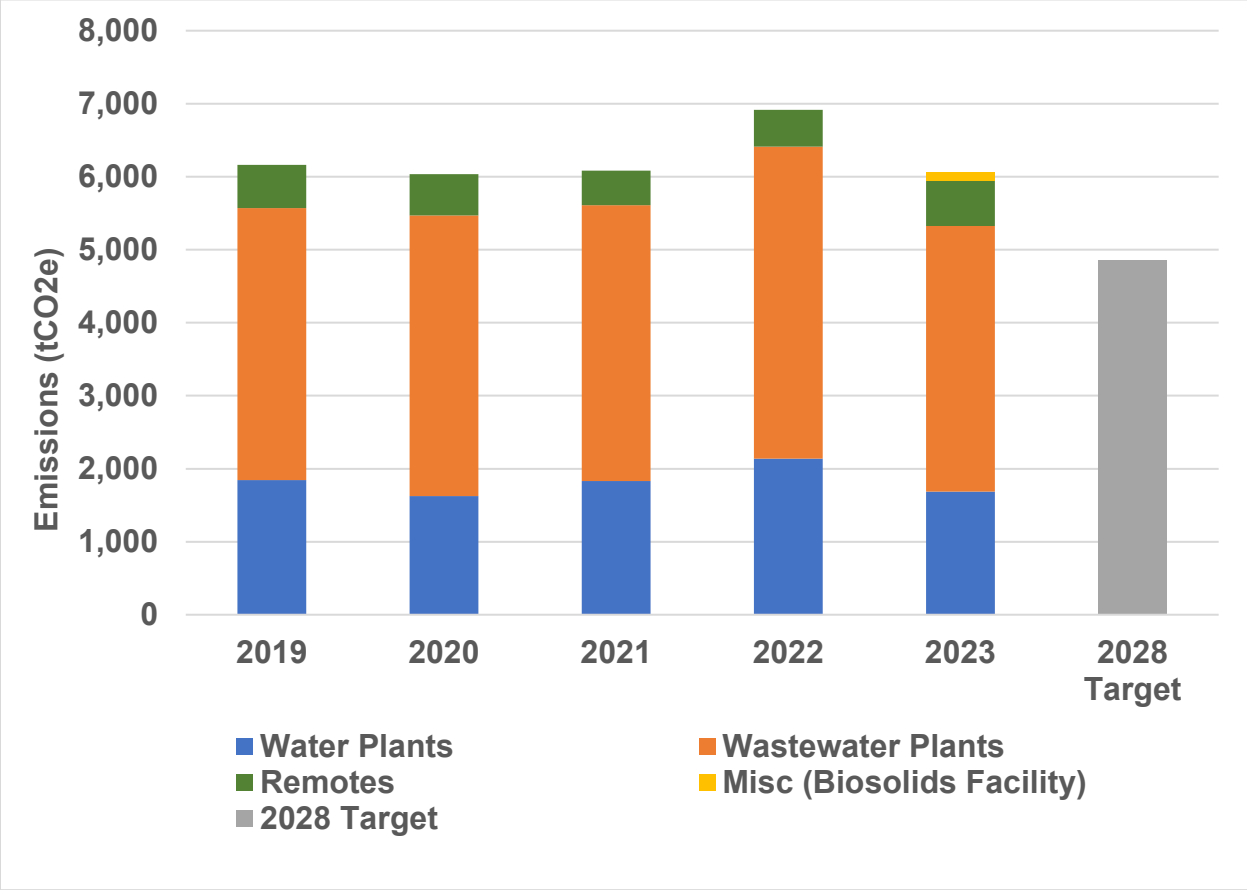
As per the additional Water and Wastewater requirements in O.Reg 25/23, the volumetric flow of water or wastewater treated (in megalitres per year) for all RMON plants is included in Appendix D – Water and Wastewater Plant Volumetric Flow Rates.

2019-2023 GHG Emissions

Figure 36 summarizes the 2019-2023 GHG emissions for Water and Wastewater facilities split by split by plants, remotes (pumping stations) and the Biosolids Facility (added in 2023). The 2028 target (20% below 2023 levels) is also shown for reference.

In 2023, 69% of emissions were Scope 1 (natural gas-related) and 31% were Scope 2 (electricity-related).

Figure 36 - Water and Wastewater facilities 2019-2023 GHG Emissions



Future Suggested Energy Conservation Measures

Potential future ECMs for Water and Wastewater facilities proposed in past energy audits have the potential to reduce emissions with annual cost savings. Examples of these projects include: degritting blower operating improvements; degritting blower control VFD; solids retention time control; electric space heater controls; bypass screen building ventilation; filter building heating controls; RAS pump optimization; Digester gas cogeneration unit; optimize speed of submersible pumps; change mechanical aerators to diffused air; flow control of pumps; pre-precipitation with alum; digester mixer

upgrade; odour control blower scheduling; unit heater controls; utilization of waste bio-gas; LED lighting upgrades; return activated sludge pumping flow controls; optimization of raw sewage pump control; optimization of grit blower operation; channel blower optimization; enhanced clarifier performance; insulate HX lines; electric BBH and UH controls; utilize site bio-gas; motor right-sizing improvements; dissolved oxygen measurement for blower control; optimization of blower aeration system; effluent pump operation controls; diffused air aeration of bioreactor operation; plant effluent heat recovery; destratification fans; lighting occupancy sensors.

Estimates from the previous Energy Audits put the capital cost of these opportunities in the range of $2.85M, with GHG reduction of 135 tCO2e and annual cost reduction of $565,782.

2.6 Renewable Energy

i. Solar Photovoltaic (PV)

Solar PV has been installed at a total of 27 facilities as a means of clean, renewable energy generation. None of the electricity generated from these installations is utilized on site but rather is fed back into Ontario's provincial electricity grid through IESO's MicroFIT program. The amount of electricity produced (on an annual basis) for each installation is summarized in Table 1 below.

Table 1 - RMON Annual Solar Photovoltaic Generation by Site

Site	Installed Size (kW)	2018 kWh	2019 kWh	2020 kWh	2021 kWh	2022 kWh	2023 kWh
3390 Fifth	10	0	0	10,621	1,697	10,933	10,441
1 Bowden	10	741	0	0	0	3,446	11,378
NR Headquarters	10	11,093	10,755	11,532	11,121	9,867	10,725
10 Iroquois	10	12,370	12,039	12,796	12,844	12,686	12,391
110 West	10	10,958	4,931	11,234	11,445	11,334	10,631
139 Ontario	10	11,682	11,439	12,285	11,886	1,829	10,359
177 Highway 20	10	11,129	10,876	11,550	11,432	11,502	11,257
179 Carlton	10	9,309	9,786	11,997	12,113	11,894	11,435
200 Division	10	11,373	10,964	11,658	11,502	11,440	10,982
25 Bruce	10	9,320	9,553	9,865	9,799	8,936	9,605
250 Thorold	10	10,440	11,214	11,805	11,617	11,672	11,043
277 Plymouth	10	11,630	11,597	11,893	11,586	11,343	10,924
317 Albany	10	11,140	11,347	12,069	11,726	10,963	10,897
337 Linwell	10	10,509	10,081	7,985	9,253	10,864	10,596

Site	Installed Size (kW)	2018 kWh	2019 kWh	2020 kWh	2021 kWh	2022 kWh	2023 kWh
347 Baker	10	0	3,433	11,696	11,394	11,312	9,635
3557 Townline	10	11,571	11,288	11,232	11,624	11,963	11,343
369 Gorham	10	11,380	11,183	12,023	11,875	11,218	11,561
42 Dolphin	10	11,350	8,939	12,279	12,597	11,766	11,766
4281 Kent	10	0	125	11,594	11,165	11,241	10,671
45 Clarke	10	11,428	10,971	11,897	11,716	11,587	11,352
501 Fielden	10	11,196	11,388	12,357	12,272	11,861	11,925
6271 Glengate	10	10,045	7,919	10,649	10,466	9,964	9,919
650 Gilmore	10	11,875	11,797	12,686	12,466	12,005	11,892
745 Doan's Ridge	10	11,586	11,948	12,891	12,947	12,221	12,256
7775 Jubilee	10	10,691	10,330	10,016	10,357	9,952	9,389
920 Pelham	10	11,740	11,727	12,229	12,418	11,480	11,463
94 Catherine	10	9,998	10,120	11,332	10,957	10,777	10,307
	Totals:	**254,552**	**245,749**	**300,170**	**290,273**	**286,056**	**296,144**

ii. Solar Thermal

The domestic hot water system at the Northland Pointe Long Term Care site (2 Fielden Avenue, Port Colborne) includes a solar thermal system. The solar thermal system consists of 21 solar panels, each with a series of 24 tubes connected to them. This system absorbs thermal energy from the sun and uses it to preheat domestic hot water, effectively offsetting natural gas consumption and reducing GHG emissions. An image of this solar thermal system, located on the roof of this site, can be seen in Figure 37 below. The water temperature for the solar system is monitored by a British thermal unit (BTU) meter.

Figure 37 - Northland Pointe Solar Thermal System

3. Looking to the Future

3.1 2024-2028 Goals

In alignment with the Region's upcoming Corporate Climate Change Action Plan and commitment to Net-Zero emissions (Scope 1 and 2) from Corporate activities by 2050, the RMON commits to a goal of **20%** reduction in buildings and W&WW emissions by 2028 (from 2023 levels).

Much of the reduction required to meet this target will be realized by fuel-switching natural gas assets to electric alternatives. This is described in more detail in the Future Energy Conservation Measures section.

Table 2 provides a summary of the baseline and 2028 target emissions split by buildings and W&WW. Note that the total may not add due to rounding. Progress towards these goals will be tracked on an annual basis and achievement will be assessed in the next CDMP update (2029-2033), published on the Region's website or before July 1st, 2029.

Table 2 - RMON 2024-2028 GHG Emissions Reduction Goals

Sector	2023 Baseline (tCO_2e)	2028 Goal (tCO_2e)	Reduction (tCO_2e)
Buildings	13,153	10,522	2,631
Water and Wastewater	6,065	4,852	1,213
Total	19,217	15,374	3,843

3.2 Future Strategies to meet 20% reduction

The following strategies are recommended to meet the 20% reduction target:

- **i.** Continue with identified ECMs from past Energy Audits for the future
- **ii.** Focus on Fuel Switching Projects
- **iii.** Explore opportunities for the transfer of energy.
- **iv.** Reducing building portfolio size
- **v.** Long term planning to reach Net-Zero by 2050
- **vi.** General guidance for Energy Conservation Measures (ECM's) towards GHG reduction impact
- **vii.** Education and training

i. Continue with previously Identified ECMs

ECMs from previously completed energy audits have been listed in Appendix B. The lists of potential future ECM projects from past Energy Audits, where available, are summarized in each sub-section under Section 2.5 above.

Not all categories include facilities that have had energy audits completed, and therefore not all have a dedicated section for future ECMs. In these cases, the RMON should prioritize and investigate the buildings with the highest GHG emissions and energy use intensity and will facilitate future audits as necessary. Considerations for those audits, in alignment with the RMON's Net-Zero by 2050 target, are provided in the Future Energy Audit Considerations section.

ii. Focus on Fuel Switching Projects

Even if all the proposed measures from audits described in Section 2.5 were implemented, the RMON would not achieve the goals outlined in this CDMP. A significant portion of the emissions reductions required to achieve this goal will be enabled by fuel-switching of natural gas space and domestic hot water heating equipment to electric heat pump technologies.

Using RMON-provided master asset registries, Aladaco conducted a high-level assessment of the remaining useful life of natural gas fueled assets for Construction, Energy & Facilities Management (CE&FM) buildings and Housing. The results indicated that roughly 16% of natural gas assets in CE&FM buildings and 29% of natural gas assets in Housing buildings will be due for replacement/renewal between 2024-2028.

Although the values above are preliminary and do not consider factors such as system sizes/heating capacities or include this information for facilities from all sectors within this CDMP, the datapoint does support the premise that a 20% target is reasonable to anticipate primarily through fuel-switching end-of-life natural gas assets. Following this replacement approach improves the economics of decarbonization which is discussed in more detail in the cost section.

The types of fuel-switching measures mentioned above were not contemplated in most past audits but will be a primary consideration for future audits as well as the forthcoming **GHG Reduction Pathway Studies** being commissioned by the RMON for archetypal buildings in several facility categories.

Niagara Region and the Township of Wainfleet have been approved for an FCM grant and are in partnership with a consultant who will examine 12 buildings to develop a strategy for achieving a significant reduction in CO_2 equivalent emissions and establishing a Net-Zero GHG emissions building approach. The reports will examine three alternative pathways to determine the feasibility of attaining the targeted GHG

reduction of Net Zero by 2050. The Niagara Region will use the reports to develop the Capital Asset Management plan for the next 20 years and help to define the critical path for success.

iii. Explore opportunities for the transfer of energy

Investigate synergies with WW&W and any opportunities to transfer waste bio-gas towards building heat, along with investigating options for district energy systems, especially for new buildings.

iv. Reducing building portfolio size

Investigate “Right sizing” building portfolios and increase asset utilization in order to reduce building square footage, which will have a direct reduction of emissions.

v. Long term planning to reach Net-Zero by 2050

Complete the FCM funded GHG Reduction Pathway Study, which will help with a strategy to achieve Net Zero for 12 sample buildings.

This study will prioritize projects and initiatives along with providing cost, GHG reductions and energy savings, and will be extrapolated to help planning for other Region buildings.

vi. General guidance for ECM GHG reduction impact

A list of common ECMs that may also be considered can be found in Appendix C – Common ECM List. An average effective useful life (EUL) of 15 years was estimated for future projects described in this CDMP.

vii. Education and Training

In addition to the above, educational efforts focused on energy consumption and greenhouse gas reductions in RMON buildings can yield tangible benefits through changes in behaviour. Teaching occupants about simple actions like adjusting thermostat settings, utilizing natural light, and properly insulating windows can lead to significant energy savings. By fostering awareness and providing practical knowledge, educational initiatives empower building occupants to play an active role in mitigating climate change and promoting sustainability.

3.3 Cost to Implement Fuel Switching

i. Capital Cost

The minimum cost to achieve the 20% 5-year GHG emissions reduction target through fuel switching is estimated to be **$25.2M**. This amount includes a premium of **$6.3M** to the current end of life replacement value of $18.9M for natural gas heating assets.

Without detailed design, this cost should be treated as a rough order of magnitude minimum estimate and is based on using commercial air-source heat pump (ASHP) technologies as the primary electrification measure and that minimal infrastructure upgrades (e.g. ducting, electrical equipment, civil work, etc) will be required.

Additionally, the cost estimate does not include the use of ground-source/geothermal technologies due to capital cost required to implement. As ground-source/geothermal technologies result in significantly higher GHG reductions as well as lower long-term operating costs, the pathway study will provide a review of future opportunities.

ii. Operating Costs

As described throughout this CDMP, much of the GHG reductions required to hit the 20% reduction target will be achieved through fuel-switching natural gas equipment to electric alternatives (namely heat pumps). These projects have operational costs implications that are changing with time. Currently, heating with electricity via heat pumps costs more than heating with natural gas, even though heat pumps are more efficient. This is simply because electricity rates are significantly higher than the natural gas rate for a common unit of energy (such as a kWh). However, as the Federal Carbon Charge in Canada continues to rise (and subsequently drives the price of natural gas upwards), it is expected that there will be a crossover point sometime around 2030 where it becomes more economical to heat with electricity via heat pumps than with the natural gas equivalent.

The probability and timing of the crossover point is highly speculative and is impacted by factors such as:

- Changes in the federal carbon legislation
- Other changes to utility costs (electricity and natural gas)
- Choice of technology for comparison, for example, ground source heat pumps are more efficient than air source heat pumps, therefore they offer lower operational costs.

The forthcoming GHG Reduction Pathway Studies will provide more clarity on the extent of these increased operational costs. Implementing other energy savings projects with cost reduction impacts would help to offset this near-term increase in operational

costs. This is illustrated by the annual savings of $330,470.20 achieved by the projects completed between 2019-2023. The RMON is encouraged to continue implementation of those projects listed as Future ECMs in their respective facility category subsections.

3.4 Cost for Future ECMs based on previous Energy Audits

i. Buildings

From past Energy Audits for buildings, the cumulative sum of the Capital costs of the outstanding ECM projects which had focused on higher ROI projects (summarized by the ECM's listed in Section 2.5, sub-sections i, ii, iii, v, vi, vii) was $6.7M with a cost avoidance of $317,000 per year and a reduction of 642 metric tonnes of CO2 equivalent.

ii. Water & Wastewater

From past Energy Audits for Water & Wastewater facilities, the sum of the quantifiable Capital costs of the outstanding ECM projects which had focused on higher ROI projects (summarized by the ECM's listed in Section 2.5 ix.) was $2.8M with a cost avoidance of $566,000 per year and a reduction of 135 metric tonnes of CO2 equivalent.

3.5 Recommended Next Steps

i. Fuel-Switching Considerations

As described within this CDMP, the majority of emissions reductions required to hit the 20% reduction target by 2028 will be enabled by fuel-switching natural gas systems (primarily space and domestic hot water heating) to electric heat pump alternatives. The RMON is encouraged to pay close mind to when these natural gas assets are up for renewal and fuel-switch in alignment with capital replacement schedules. In this way only cost "premiums" will be attributed to achievement of GHG reduction goals (as capital costs for one-for-one replacements, in most cases, should already be considered in budgeting).

Furthermore, the upcoming GHG Reduction Pathway Studies should be leveraged to refine GHG savings and project cost estimates for these types of projects.

ii. Future ECM Priorities from previous Energy Audits

There is mention of ECM's in this CDMP that were extracted from previous energy audits. The relative cost to decarbonize (in $/tCO$_2$e) can be calculated from the figures provided. Those projects with the lowest relative cost to decarbonize should be the highest priority for implementation as the RMON moves towards the 2028 goal and

beyond. This same recommendation for prioritization equally applies to any new ECM that are identified by the RMON.

iii. Future Energy Audit Considerations

The ECMs from past audits described within this report typically focused on energy and cost savings. As the RMON moves forward with the commitment to Net-Zero emissions by 2050, future audits should be suitably aligned and should:

- Have a primary purpose of GHG emissions reductions and achieving the Net-Zero goal
- Clearly describe the estimated GHG reduction impacts in tCO_2e for each ECM identified, calculated using electricity and natural gas emission factors agreed upon by the RMON
- Prioritize facilities with the highest absolute GHG emissions as they represent the largest potential for decarbonization

Audits should continue to consider energy and cost savings as a means to balance the rising cost of utilities.

Disclaimer

This document was prepared by Aladaco in close collaboration with the Niagara Region Manager of Energy Management and is intended solely for Niagara Region use. Other parties should not rely on this report in whole or in part. The information contained herein is based on data available at the time of preparation and is subject to limitations, assumptions, and qualifications stated herein.

Aladaco applied professional judgment in the development of this report with respect to estimates and opinions on costs, schedules, and technical matters, based on its experience and the information available at the time of report preparation. Aladaco cannot guarantee the accuracy of such estimates or opinions due to potential changes in market conditions or other factors outside of its control. Reliance on these estimates is at the reader's own risk.

By acceptance of this report, the RMON acknowledges these limitations and confirms that the report satisfies the requirements of the scope of work.

Appendices

Appendix A – Facility List

Table 3 - Full Facility List

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Administrative	St. Catharines Community Services Employment Office	234 Bunting Road	St. Catharines	29,504
Administrative	Welland Community Services Employment Office	250 Thorold Road	Welland	25,870
Administrative	Niagara Falls Community Services Employment Office	5853 Peer Street	Niagara Falls	21,710
Administrative	Niagara Region HQ - John Campbell Building East, West & Data Center	1815 Sir Isaac Brock Way	Thorold	198,392
Administrative	St. Catharines Public Health Sexual Health Centre	277 Welland Avenue	St. Catharines	5,704
Administrative	Welland PH Satellite Office/Sexual Health Centre (Division St)	200 Division Street	Welland	18,030
Administrative	Fort Erie Public Health	1264 Garrison Road, Unit 12	Fort Erie	3,450
Administrative	Niagara Falls PH Satellite Office / Sexual Health Centre	7835 McLeod Road	Niagara Falls	21,500
Ambulance	West Lincoln/Grimsby Ambulance Base	10 Iroquois Trail	Grimsby	3,358
Ambulance	Smithville Ambulance Base	110 West Street	West Lincoln	3,474
Ambulance	St. Catharines Ontario Street Ambulance Base	139 Ontario Street	St. Catharines	9,408

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Ambulance	NOTL Ambulance Base	176 Wellington Street	Niagara-on-the-Lake	2,190
Ambulance	Pelham Ambulance Base	183 Highway 20 West	Pelham	3,357
Ambulance	Niagara Falls Ambulance Base	2722 Saint Paul Avenue	Niagara Falls	975
Ambulance	St. Catharines Linwell Road Ambulance Base	337 Linwell Road	St. Catharines	2,100
Ambulance	Ridgeway Ambulance Base	369 Gorham Road	Fort Erie	3,360
Ambulance	Port Colborne Ambulance Base	42 Dolphin Street	Port Colborne	7065
Ambulance	Niagara Falls Ambulance Base	5685 North Street	Niagara Falls	5,990
Ambulance	Welland Ambulance Base	580 King Street	Welland	6,792
Ambulance	Glendale Base	2 Westwood Court Unit 100	Niagara-on-the-Lake	3,000
Ambulance	Thorold EMS Station at HQ	3450 Merrittville Highway	Thorold	3,470
Ambulance	Abbey Road EMS Base	655 Niagara Street	Welland	1,750
Child Care	St. Catharines Regional Child Care Centre	179 Carlton Street	St. Catharines	8,923
Child Care	Welland Regional Child Care Centre	25 Bruce Street	Welland	4,410
Child Care	Branscombe Early Learning and Family Centre	6271 Glengate Street	Niagara Falls	11,180
Child Care	Fort Erie Regional Child Care Centre	94 Catherine Street	Fort Erie	4,090
Housing - Apartments	14 Centre Street,	14 Centre Street	St. Catharines	83,436
Housing - Apartments	30 Robinson Street North, Grimsby	30 Robinson Street North,	Grimsby	33,384

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Housing - Apartments	4278 Queen Street, Beamsville	4278 Queen Street	Beamsville	40,560
Housing - Apartments	45 Ormond Street South, Thorold	45 Ormond Street South	Thorold	21,280
Housing - Apartments	15 Gale Crescent, St.Catharines	15 Gale Crescent	St. Catharines	149,600
Housing - Apartments	479 Carlton Street, St.Catharines	479 Carlton Street	St. Catharines	143,180
Housing - Apartments	436, 438, 440, 442 Scott Street, St.Catharines	436, 438, 440, 442 Scott Street	St. Catharines	40,880
Housing - Apartments	527 Carlton Street, St.Catharines	527 Carlton Street	St. Catharines	80,000
Housing - Apartments	12 St. David's Road East, Thorold	12 St. David's Road East	Thorold	6,300
Housing - Apartments	52 Ormond Street, North, Thorold	52 Ormond Street, North	Thorold	2,700
Housing - Apartments	561 Steele Street, Port Colborne	561 Steele Street	Port Colborne	28,784
Housing - Apartments	211 King Street, Welland	211 King Street	Welland	92,240
Housing - Apartments	124 Elmview Street, Welland	124 Elmview Street	Welland	37,400
Housing - Apartments	557 Steele Street, Port Colbrorne	557 Steele Street	Port Colborne	25,760
Housing - Apartments	61 Woodcroft Crescent	61 Woodcroft Crescent	Welland	17,578
Housing - Apartments	140 Elmview Street, Welland	140 Elmview Street	Welland	18,886
Housing - Apartments	235W Fitch Street, Welland	235W Fitch Street	Welland	22,064
Housing - Apartments	235E Fitch Street, Welland	235E Fitch Street	Welland	64,584
Housing - Apartments	207 Roach Avenue, Welland	207 Roach Avenue	Welland	8,480

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Housing - Apartments	60 York Street, Welland	60 York Street	Welland	37,800
Housing - Apartments	4520 Huron Street, Niagara Falls	4520 Huron Street	Niagara Falls	53,100
Housing - Apartments	5130 Portage Road, Niagara Falls	5130 Portage Road	Niagara Falls	54,112
Housing - Apartments	1A Bowden Street, Fort Erie	1A Bowden Street	Fort Erie	5,535
Housing - Apartments	6858, 6868 Ailanthus, Niagara Falls	6858, 6868 Ailanthus	Niagara Falls	59,078
Housing - Apartments	6566, 6575, 6586, 6603, 6612, 6625 Kiwanis Crescent, Niagara Falls	6566, 6575, 6586, 6603, 6612, 6625 Kiwanis Crescent	Niagara Falls	23,040
Housing - Apartments	132 Idylewylde Street, Fort Erie	132 Idylewylde Street	Fort Erie	6,799
Housing - Apartments	300 Davy Street, Niagara-on-the-lake	300 Davy Street	Niagara-on-the-lake	30,181
Housing - Apartments	4900 Buckley Avenue, Niagara Falls	4900 Buckley Avenue	Niagara Falls	153,734
Housing - Apartments	317 Albany Street, Fort Erie	317 Albany Street	Fort Erie	27,573
Housing - Apartments	3874 Portage Road, Niagara Falls	3874 Portage Road	Niagara Falls	79,447
Housing - Apartments	6388 Hawkins Street, Niagara Falls	6388 Hawkins Street	Niagara Falls	50,440
Housing - Apartments	7180 Heximer Street, Niagara Falls	7180 Heximer Street	Niagara Falls	18,600
Housing - Apartments	5528 Buchanan Avenue, Niagara Falls	5528 Buchanan Avenue	Niagara Falls	14,857
Housing - Apartments	5017 Victoria Avenue, Niagara Falls	5017 Victoria Avenue	Niagara Falls	11,800

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Housing - SemiDetached	Brackencrest Road, Green Maple Drive, St. Augustine Drive, St.Catharines	Brackencrest Road, Green Maple Drive, St. Augustine Drive	St. Catharines	17,600
Housing - SemiDetached	Galbraith Street, Powerview Avenue, Wallace Street, St.Catharines	Galbraith Street, Powerview Avenue, Wallace Street	St. Catharines	39,202
Housing - SemiDetached	Christopher Street, Dundonald Street, St. Catharines	Christopher Street, Dundonald Street	St. Catharines	61,752
Housing - SemiDetached	Victory/Gatfield, Welland	Gatfield Avenue	Welland	34,422
Housing - SemiDetached	Roach Avenue, Welland	Roach Avenue	Welland	41,080
Housing - SemiDetached	Silvan Drive, Welland	Silvan Drive	Welland	8,800
Housing - Single Family	Mclaughlin Street, Welland	Mclaughlin Street	Welland	58,810
Housing - Single Family	Leaside Drive, McCrae Drive, New Leaf Street, Welland	Leaside Drive, McCrae Drive, New Leaf Street	Welland	5,500
Housing - Single Family	Bowen Road, Crooks Street, Highland Avenue, Jessie Street, Fort Erie	Bowen Road, Crooks Street, Highland Avenue, Jessie Street	Fort Erie	24,375
Housing - Single Family	Arad Street, Churchill Street, Dell Avenue, Skinner Street, Niagara Falls	Arad Street, Churchill Street, Dell Avenue, Skinner Street	Niagara Falls	60,750

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Housing - Townhomes	10 Old Pine Trail St.Catharines	10 Old Pine Trail	St. Catharines	76,000
Housing - Townhomes	45 Manchester Avenue, St.Catharines	45 Manchester Avenue	St. Catharines	107,660
Housing - Townhomes	59 Rykert Street, St.Catharines	59 Rykert Street	St. Catharines	97,080
Housing - Townhomes	725 Welland Avenue, St.Catharines	725 Welland Avenue	St. Catharines	42,688
Housing - Townhomes	709 King Street, Port Colborne	709 King Street	Port Colborne	4,540
Housing - Townhomes	6938, 6980, 7032 Ailanthus, Niagara Falls	6938, 6980, 7032 Ailanthus	Niagara Falls	39,040
Housing - Townhomes	6165 McLeod Road, Niagara Falls	6165 McLeod Road	Niagara Falls	25,030
Housing - Townhomes	3896, 3980, 3916 3946 Sinnicks Avenue, Niagara Falls	3896, 3980, 3916 3946 Sinnicks Avenue	Niagara Falls	16,200
Housing - Townhomes	6902 Waters Avenue, 6905 Warden Avenue, Niagara Falls	6902 Waters Avenue, 6905 Warden Avenue	Niagara Falls	72,840
Housing - Townhomes	1-31Bowden Street, Fort Erie	1-31Bowden Street	Fort Erie	28,600
Housing - Townhomes	7775 Jubilee Drive, Niagara Falls	7775 Jubilee Drive	Niagara Falls	30,677
Long Term Care	LTC Deer Park Villa	150 Central Avenue	Grimsby	56,941
Long Term Care	LTC Northland Pointe	2 Fielden Avenue	Port Colborne	98,361
Long Term Care	LTC Upper Canada Lodge	272 Wellington Street	Niagara-on-the-Lake	46,796

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Long Term Care	LTC Rapelje Lodge	277 Plymouth Road	Welland	78,695
Long Term Care	LTC Linhaven and T.Roy Adams	403 Ontario Street	St. Catharines	143,936
Long Term Care	LTC Gilmore Lodge	50 Gilmore Road	Fort Erie	48,824
Long Term Care	LTC The Meadows of Dorchester	6623 Kalar Road	Niagara Falls	78,016
Long Term Care	LTC Woodlands of Sunset	920 Pelham Street	Welland	75,670
Police and Court Services	NRPS Police Tactical Unit	1599 Welland Canals Pkwy	St. Catharines	18,352
Police and Court Services	NRPS Grimsby #8 District (45 Clarke St)	45 Clarke Street	Grimsby	8,180
Police and Court Services	NRPS Welland Gun Range (Training Centre)	107 Seneca Trail	Welland	21,480
Police and Court Services	NRPS Welland #3 District	5 Lincoln Street	Welland	25,995
Police and Court Services	NRPS Port Colborne #6 District	501 Fielden Avenue	Port Colborne	5,260
Police and Court Services	NRPS St. Catharines #1 District	68 Church Street	St. Catharines	75,280
Police and Court Services	NRPS Fort Erie #5 District	650 Gilmore Road	Fort Erie	14,000
Police and Court Services	NRPS HQ / 2 District	5700 Valley Way	Niagara Falls	207,000
Police and Court Services	Welland Court Site	445 East Main Street	Welland	20,397
Police and Court Services	1 District Police Services	198 Welland Avenue	St. Catharines	31,829
Public Work/Yards/Service Centers/Fleet	Niagara Region HQ - Environmental Centre	3501 Schmon Parkway	Thorold	18,996
Public Work/Yards/Service Centers/Fleet	Central Maintenance - Water & Wastewater Services	980 Major Street	Welland	25,391

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Public Work/Yards/Service Centers/Fleet	Pelham Patrol Yard Main Building	1495 Victoria Avenue	Pelham	4,140
Public Work/Yards/Service Centers/Fleet	Smithville Patrol Yard Main Building	3112 Thirty Road	West Lincoln	10,200
Public Work/Yards/Service Centers/Fleet	Thorold Patrol Yard Main Building	3557 Thorold-Townline Road	Thorold	5,940
Public Work/Yards/Service Centers/Fleet	Household Hazardous Waste Building	3557 Thorold Townline Road	Thorold	1,446
Public Work/Yards/Service Centers/Fleet	Welland Patrol Yard Administration Building (Bldg "A")	745 Doans Ridge Road	Welland	17,329
Public Work/Yards/Service Centers/Fleet	Public Works Service Centre	3547 Thorold-Townline Road	Thorold	45,730
Public Work/Yards/Service Centers/Fleet	NRPS Police Fleet	3551 Thorold-Townline Road	Thorold	19,050
Public Work/Yards/Service Centers/Fleet	Westwood EMS Fleet Centre	2 Westwood Court Unit 300	Niagara-on-the-Lake	14,892
Public Work/Yards/Service Centers/Fleet	Westwood EMS Fleet Centre Extension	2 Westwood Court Unit 200	Niagara-on-the-Lake	10,567
Public Work/Yards/Service Centers/Fleet	NTC - Welland Facility	75 Federal Rd	Welland	18,485
Public Work/Yards/Service Centers/Fleet	NTC - St Catharines Facility	2012 First Street Louth	St. Catharines	85,553
Public Work/Yards/Service Centers/Fleet	NTC - Niagara Falls - WEGO/GO Transit Facility	8208 Heartland Forest Rd	Niagara Falls	104,328

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Regional Transit/GO Train Terminals	GO Station - Niagara Falls	4267 Bridge Street	Niagara Falls	10,200
Regional Transit/GO Train Terminals	GO Station - St. Catharines	20 Great Western Street	St. Catharines	12,500
Regional Transit/GO Train Terminals	NTC - Welland Terminal	160 E Main St, Welland, ON L3B 3W8	Welland	2,800
Regional Transit/GO Train Terminals	NTC - NF Bus Terminal RioCan Mall	7190 Morrison St Unit D103 & E106, Niagara Falls, L2E7K5	Niagara Falls	1,216
Waste Management	Bridge Street Landfill Site and Recycling Drop off Depot	1300 Bridge Street	Fort Erie	202
Waste Management	Humberstone Landfill Site	700 Humberstone Road	Welland	10,094
Waste Management	Niagara Road 12 Landfill Site	7015 Concession 7 Road	West Lincoln	14,864
Water & Wastewater - Misc	Biosolids Facility	8719 Chippawa Creek Rd, Niagara Falls	Niagara Falls	7,947
Water & Wastewater - Remotes	Anger WWTP Remotes	1 Anger Avenue	Fort Erie	N/A
Water & Wastewater - Remotes	NOTL WWTP Remotes	1738 Lakeshore Road	Niagara-on-the-Lake	N/A
Water & Wastewater - Remotes	NOTL WWTP Remotes	27 Lombardy Avenue	St. Catharines	N/A

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Water & Wastewater - Remotes	Seaway WWTP Remotes	30 Prosperity Avenue	Port Colborne	N/A
Water & Wastewater - Remotes	NF WWTP Remotes	3450 Stanley Avenue	Niagara Falls	N/A
Water & Wastewater - Remotes	Baker Road WWTP Remotes	160 Lake Street	Grimsby	N/A
Water & Wastewater - Remotes	Crystal Beach WWTP Remotes	500 Ridgeway Road	Fort Erie	N/A
Water & Wastewater - Remotes	Welland WWTP Remotes	505 River Road	Welland	N/A
Water & Wastewater - Remotes	Queenston WWTP Remotes	5 River Frontage Road	Niagara-on-the-Lake	N/A
Water & Wastewater - Remotes	Grimsby Water Remotes	300 North Service Road, 320 North Service Road	Grimsby	N/A
Water & Wastewater - Remotes	Rose Hill Water Remotes	300 Rose Hill Road	Fort Erie	N/A
Water & Wastewater - Remotes	Port Colborne Water Remotes	323 King Street	Port Colborne	N/A
Water & Wastewater - Remotes	NF Water Remotes	3599 Macklem Street, 3661 Macklem Street	Niagara Falls	N/A
Water & Wastewater - Remotes	Welland Water Remotes	4 Cross Street	Welland	N/A

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Water & Wastewater - Remotes	Port Dalhousie WWTP Remotes	40 Lighthouse Road	St. Catharines	N/A
Water & Wastewater - Remotes	Decew Falls Water Remotes	2700 Decew Road	Thorold	N/A
Water & Wastewater - Wastewater	Anger Avenue Wastewater Treatment Plant / Anger Avenue S.P.S.	1 Anger Avenue	Fort Erie	39,139
Water & Wastewater - Wastewater	Niagara on the Lake Wastewater Treatment Plant	1738 Lakeshore Road	Niagara-on-the-Lake	4,155
Water & Wastewater - Wastewater	Port Weller Wastewater Treatment Plant	27 Lombardy Avenue	St. Catharines	35,726
Water & Wastewater - Wastewater	Seaway Wastewater Treatment Plant	30 Prosperity Avenue	Port Colborne	42,187
Water & Wastewater - Wastewater	Niagara Falls Wastewater Treatment Plant (S-1)	3450 Stanley Avenue	Niagara Falls	45,858
Water & Wastewater - Wastewater	Baker Road Wastewater Treatment Plant	160 Lake Street	Grimsby	46,396
Water & Wastewater - Wastewater	Crystal Beach Wastewater Treatment Plant	500 Ridgeway Road	Fort Erie	39,195
Water & Wastewater - Wastewater	Welland Wastewater Treatment Plant	505 River Road	Welland	44,687
Water & Wastewater - Wastewater	Queenston Wastewater Treatment Plant	5 River Frontage Road	Niagara-on-the-Lake	155
Water & Wastewater - Wastewater	Port Dalhousie Waste Water Treatment Plant (P9)	40 Lighthouse Road	St. Catharines	40,796

Facility Category	Facility Name	Facility Address	Municipality	Facility Area (ft^2)
Water & Wastewater - Water	Grimsby Water Treatment Plant	300 North Service Road, 320 North Service Road	Grimsby	38,016
Water & Wastewater - Water	Rose Hill Water Treatment Plant / Rose Hill WTP Backwash P.S	300 Rose Hill Road	Fort Erie	18,741
Water & Wastewater - Water	Port Colborne Water Treatment Plant	323 King Street	Port Colborne	24,924
Water & Wastewater - Water	Niagara Falls Water Treatment Plant	3599 and 3661 Macklem Street	Niagara Falls	62,610
Water & Wastewater - Water	Welland Water Treatment Plant / Welland WTP Backwash Pumping Station	4 Cross Street	Welland	28,432
Water & Wastewater - Water	Decew Falls Water Treatment Plant	2700 Decew Road	Thorold	59,003

Appendix B – 2019-2023 Completed ECMs

Table 4 - RMON 2019-2023 Completed ECM List

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
CE&FM and LTC buildings						
2017	LTC Northland Pointe	Upgrade industrial laundry washing machines w/ controlled ozone technology		11,789	22.8	$4,716
2018	745 Doan's Ridge Rd 277 Plymouth Rd	LED lighting retrofits	256,506		7.7	$38,476
2019	250 Thorold Rd 200 Division St 745 Doan's Ridge Rd 980 Major St 3547 Thorold Townline Rd 42 Dolphin St ext LTG	LED lighting retrofits	72,380		2.2	$10,857
2020	1815 Sir Isaac Brock Way (Campbell West) 2 Cushman Rd	LED lighting retrofits	209,076		6.3	$31,361

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2021	Multiple sites*	LED lighting retrofits	594,086		17.8	$89,113
2021	198 Welland Ave	LEED silver certification	30,391	3,375	7.4	$5,909
2021	250 Thorold Rd	HVAC (boiler and control) upgrades	55,193	14,487	29.6	$14,074
2022	745 Doan's Ridge Rd 3112 Thirty Rd 3557 Thorold Townline Rd 3547 Thorold Townline Rd 3501 Schmon Pkwy	Roof insulation upgrade (3557 Thorold Townline) and LED lighting retrofits	88,401		2.7	$13,260
2022	3112 Thirty Rd	Roof insulation upgrade		154	0.3	$62
2023	1815 Sir Isaac Brock Way (Campbell East) 6623 Kalar Rd	LED lighting and controls retrofits	224,835		6.7	$33,725
2023	501 Fielden Ave	Exterior LED lighting retrofit	2,947		0.1	$442
2023	3112 Thirty Rd	Window upgrades	1,146	1,586	3.1	$806

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2023	25 Bruce St	Roof insulation upgrade		361	0.7	$144
2023	3547 Thorold Townline Rd 3557 Thorold Townline Rd 745 Doan's Ridge Rd 1495 Victoria Ave 3112 Smithville Rd	Garage door heater controls		20,502	39.6	$8,201
2023	920 Pelham St	LED lighting retrofit	61,758		1.9	$9,264
Water/Wastewater						
2018	3599 Macklem St	Phase 1 LED lighting retrofit	15,892		0.5	$2,384
2018	3599 Macklem St	Phase 2 LED lighting retrofit	7,221		0.2	$1,083
2018	135 Talbot Ave	LED lighting retrofit	8,301		0.2	$1,245
2021	505 River Rd RR 1	High efficiency boiler upgrades			387.0	N/A
2021	27 Lombardy St	High efficiency boiler upgrades			387.0	N/A
2021	27 Lombardy St	Exterior LED lighting and controls retrofit	24,430		0.7	$3,665

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2022	3450 Stanley Ave	High efficiency boiler upgrades			350.0	N/A
2022	3599 Macklem St	High efficiency boiler upgrades			67.8	N/A
2023	40 Lighthouse Rd	Replacement for Port Dalhousie Wastewater Treatment Plant.			380.0	N/A
2024	960 Major St	Exterior LED lighting and controls retrofit	87,360		2.6	$13,104
2024	300 Rose Hill Rd	LED lighting retrofit	16,924		0.5	$2,539
2024	3599 Macklem St	LED lighting retrofit	14,349		0.4	$2,152
Housing						
2019	3874 Portage Rd	DHW Upgrades		3,258	6.3	$1,303
2019	15 Gale Cres	DHW Heater Upgrades		8,152	15.8	$3,261
2019	4520 Huron St	Domestic Hot Water Replacement		4,209	8.1	$1,684
2019	5130 Portage Rd	DHW Heater Upgrades		3,189	6.2	$1,276

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2019	211 King St	DHW Plant replacement		3,530	6.8	$1,412
2019	4900 Buckley Ave	Exterior Insulating Finishing System			N/A	N/A
2019	5130 Portage Rd	Heat Control System	121,975		3.7	$18,296
2019	4520 Huron St	Heat Control System	60,540		1.8	$9,081
2019	211 King St	Heat Control System and booster pump upgrade	80,047		2.4	$12,007
2019	30 Robinson St	Heat Control System	39,695		1.2	$5,954
2019	3874 Portage Rd	Heat Control System	6,309		0.2	$946
2019	4278 Queen St	Heat Control System	29,620		0.9	$4,443
2019	479 Carlton St	Heat Control System			N/A	N/A
2019	557 Steele St	Heat Control System			N/A	N/A

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2019	561 Steele St	Heat Control System			N/A	N/A
2020	557 Steele St	Door Replacements			N/A	N/A
2020	Roach Ave	Door Replacements			N/A	N/A
2020	14 Centre St	Makeup Air Unit Control System		3,158	6.1	$1,263
2020	6858 Ailanthus Ave	Heat Control System			N/A	N/A
2020	6868 Ailanthus Ave	Heat Control System			N/A	N/A
2021	4520 Huron St	Elevator Modernization			N/A	N/A
2021	14 Centre St	Heat Control System	156,639		4.7	$23,496
2021	3874 Portage Rd	Makeup Air Unit Control System		1,159	2.2	$464
2021	45 Ormond St	Window & Door Replacement			N/A	N/A
2021	4900 Buckley Ave	Makeup Air Unit Control System		4,444	8.6	$1,778
2021	45 Manchester Ave	Flat Roof (Insulation)			N/A	N/A

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2021	124 Elmview St	Heat Control System			N/A	N/A
2021	140 Elmview St	Heat Control System			N/A	N/A
2021	235 Fitch Str (West)	Heat Control System	11,381		0.3	$1,707
2021	300 Davy St	Heat Control System			N/A	N/A
2022	6905 Warden Ave & 6902 Waters Ave	Transformers Replacement			N/A	N/A
2022	132 Idylewylde St	Heat Control System			N/A	N/A
2022	1A Bowden St	Heat Control System			N/A	N/A
2022	45 Ormond St (South)	Heat Control System			N/A	N/A
2022	61 Woodcroft Cres	Heat Control System			N/A	N/A
2022	4520 Huron St	Exterior Insulating Finishing System			N/A	N/A
2022	30 Robinson St	Exterior Insulating Finishing System			N/A	N/A

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2023	4900 Buckley Ave	DHW Boiler Replacement		6,881	13.3	$2,752
2023	317 Albany St	Heat Control System			N/A	N/A
2023	479 Carlton St	Window & Patio Door Replacements			N/A	N/A
2023	52 Ormond St	Exterior Insulating Finishing System			N/A	N/A
2023	12 St.Davids Rd	Exterior Insulating Finishing System			N/A	N/A
2023	7775 Jubilee Dr	Exterior Lighting Upgrades (LED)			N/A	N/A
2023	59 Rykert St	Exterior Lighting Upgrades (LED)			N/A	N/A
2023	Scott St	Window Replacement			N/A	N/A
2023	4900 Buckley Ave	Flat Roof (Insulation)			N/A	N/A
2021	14 Centre St	Storm doors and exterior doors replacement	5,753		0.2	$863

Year Completed	Site Address(es)	Project Description	Est. Electricity Savings (kWh)	Est. Natural Gas Savings (m^3)	Est. Emissions Reduction (tCO2e)	Est. Annual Cost Savings ($)
2019	15 Gale Cres	Electric heat controls	117,346		3.5	$17,602

*Sites include: 3547 Thorold Townline Rd, 10 Iroquois Trail, 110 West St, 139 Ontario St, 183 Highway 20 West, 2722 Saint Paul Ave, 337 Linwell Rd, 369 Gorham Ave, 42 Dolphin St, 5685 North St, 580 King St, 25 Bruce St, 6271 Glengate St, 94 Catharine St, 3501 Schmon Pkwy, 277 Welland Ave, 1495 Victoria Ave, 3112 Thirty Rd, 3557 Thorold Townline Rd, 745 Doan's Ridge Rd, 45 Clarke St, 107 Seneca Trail, 5 Lincoln St, 501 Fielden, 3551 Thorold Townline Rd, 650 Gilmore Rd Unit 1, 650 Gilmore Rd Unit 2, 2 Westwood Crt Unit 300, 2 Westwood Crt Unit 100, 2 Westwood Crt Unit 200, 3450 Merrittville Hwy, 1264 Garrison Rd Unit 2, 655 Niagara St, 3501 Schmon Pkwy

Appendix C – Common ECM List

Table 5 - Common ECM List

Description of Measure	GHG Reduction Impact	Cost Implications
LED Lighting Retrofits (Interior/Exterior)	LOW	LOW
Building Insulation Upgrades	LOW	HIGH
High-Efficiency HVAC Systems	MEDIUM	HIGH
Solar Photovoltaic Panel Installation	MEDIUM	HIGH
Energy Management Systems	MEDIUM	MEDIUM
Water-Saving Fixtures Installation	LOW	LOW
Advanced Lighting Controls	LOW	LOW
Window Upgrades for Improved Insulation	MEDIUM	MEDIUM
Natural Gas Space Heating to Electric Heat Pump Conversions	HIGH	HIGH
Natural Gas DHW Heating to Electric Heat Pump Conversions	HIGH	HIGH
Waste Heat Recovery Systems	HIGH	HIGH
Variable Frequency Drives for HVAC and Pumps	MEDIUM	MEDIUM
High-Efficiency Boilers	MEDIUM	MEDIUM
Building Automation and Control Systems	MEDIUM	HIGH
Smart Metering and Energy Use Monitoring	LOW	MEDIUM
Re-insulating Thermal Distribution Piping	LOW	LOW
Demand-Controlled Ventilation	MEDIUM	MEDIUM

Appendix D – Water and Wastewater Plant Volumetric Flow Rates

Table 6 - Water and Wastewater Plant Volumetric Flow Rates

W&WW Site	2019 ML/year	2020 ML/year	2021 ML/year	2022 ML/year	2023 ML/year
Anger Avenue Wastewater Treatment Plant / Anger Avenue S.P.S.	5,525	4,955	4,744	4,791	4,668
Niagara on the Lake Wastewater Treatment Plant	0	2,130	2,043	2,322	2,492
Port Weller Wastewater Treatment Plant	14,309	12,329	12,123	13,057	13,878
Seaway Wastewater Treatment Plant	4,947	4,137	3,834	3,819	4,189
Niagara Falls Wastewater Treatment Plant (S-1)	14,930	12,863	12,849	14,077	15,511
Baker Road Wastewater Treatment Plant	7,625	6,568	6,227	7,556	8,663
Crystal Beach Wastewater Treatment Plant	2,297	2,077	1,928	1,928	2,038
Welland Wastewater Treatment Plant	12,174	12,438	11,748	12,076	13,457
Queenston Wastewater Treatment Plant	9,623	6,093	6,325	7,496	10,127
Grimsby Water Treatment Plant	5,130	5,770	5,447	5,445	5,344
Rose Hill Water Treatment Plant / Rose Hill WTP Backwash P.S	4,085	4,029	4,273	4,648	4,640

W&WW Site	2019 ML/year	2020 ML/year	2021 ML/year	2022 ML/year	2023 ML/year
Port Colborne Water Treatment Plant	2,657	2,515	2,333	2,537	2,741
Niagara Falls Water Treatment Plant	15,764	14,719	14,648	15,403	15,743
Welland Water Treatment Plant / Welland WTP Backwash Pumping Station	8,231	9,027	8,976	8,822	8,786
Port Dalhousie Waste Water Treatment Plant (P9)	13,440	12,463	11,649	10,741	10,690
Decew Falls Water Treatment Plant	19,463	19,537	18,553	19,329	19,312

Appendix E – Assumption and Factor Table

Table 7 - Assumptions and Factors Table

Metric	Value	Source
Electricity Rate	$0.15/kWh	RMON-provided
Natural Gas Rate	$0.40/m^3	RMON-provided
Electricity Emissions Factor - 2019	30gCO_2e/kWh	2019 National Inventory Report, Table A13-7
Electricity Emissions Factor - 2020	28gCO_2e/kWh	2020 National Inventory Report, Table A13-7
Electricity Emissions Factor - 2021	30gCO_2e/kWh	2021 National Inventory Report, Table A13-7
Electricity Emissions Factor - 2022	30gCO_2e/kWh*	2021 National Inventory Report, Table A13-7
Electricity Emissions Factor - 2023	30gCO_2e/kWh*	2021 National Inventory Report, Table A13-7
Marketable Natural Gas Emissions Factor	1932.4gCO_2e/m^3	2021 National Inventory Report, Tables A6. 1-1, A6. 1-3

*Note that there has not been a National Inventory Report update since the measurement year of 2021. The Electricity and Natural Gas emissions factors for 2023 use the values provided for 2021, as no better data is yet available.