REPORT TO COUNTY COUNCIL

2023 Annual Energy Report

To: **Warden and Members of County Council**

From: **Director of Public Works**

RECOMMENDATION

1. **That County Council receive Report PW 2024-17 entitled "2023 Annual Energy Report" as information.**

REPORT HIGHLIGHTS

- The purpose of this report is to summarize the County's 2023 renewable energy (RE) generation results, as well as provide an overview of annual energy consumption and greenhouse gas (GHG) emissions by County-owned facilities and fleet assets in 2023.
- The County's annual RE generation has increased by approximately 125% since 2015 baseline levels, with 4.1 million kilowatt hours (ekWh) of RE produced in 2023 from various solar, biogas and geothermal applications. Of note, annual RE generation as a percentage of total energy consumption (known as "RE mix from generation") has reached 7.6% in 2023 which is approaching 2/3^{rds} of the County's 2025 target of 11.7%.
- County facilities consumed just over 46.6 million equivalent ekWh of energy in 2023, costing about $4.87 million. While the total energy consumption by facilities has increased 0.7% since 2015, the actual energy use intensity for buildings/minor assets and water/wastewater treatment plants has reduced by 24.5% and 8.5% respectively. This illustrates significant energy consumption avoidance despite expanded provisions of municipal services to accommodate community growth over this period.
- The County's fleet and equipment consumed approximately 7.5 million ekWh of energy in 2023, including $1.0 million fuel purchases of unleaded gasoline and diesel (697,082 litres), compressed natural gas (20,304 kg) and diesel (6,207 litres) for facilities backup generating equipment. Approximately 33% of the County's in-service fleet (56 out of 171 units) has been converted to alternative fuels in 2023 to reduce fuel consumption and GHG emissions.
- County facilities and fleet produced 5,527 tonnes of carbon dioxide equivalent (tCO2e) in GHG emissions in 2023. Total GHG emissions have reduced by 11.2% since 2015 (100% RE Plan target is 11% by 2025) with the actual GHG intensity for facilities and fleet decreasing by about 25.9% and 19.5% respectively. This illustrates significant GHG emission avoidance despite expanded provisions of municipal services to accommodate community growth over this period.

IMPLEMENTATION POINTS

As required by O. Reg. 25/23, the 2023 energy consumption data and GHG emissions will be reported through the Broader Public Sector reporting portal by July 1, 2024.

Financial Impact

There are no financial impacts as a result of this report. Any required actions that will result in expenditures have been accounted for in the 2024 Operating and Capital budgets based on the County's *2019 Energy Management Plan, 2022-2032 Renewable Energy Action Plan and 2021-2025 Green Fleet Plan.*

Communications

Upon Council approval, this Council report will be circulated to Area Municipalities and Smart Energy Oxford as information outlining progress of Oxford County's corporate organization relating to the goals of the *100% RE Plan* and the *Future Oxford Community Sustainability Plan*.

As all municipalities are required under *O. Reg. 25/23: Broader Public Sector: Energy Reporting and Conservation and Demand Management Plans*, the County communicates energy performance to the Ministry of Energy, via annual energy consumption and GHG emissions reporting. This is completed annually, as well as through the County's *2019 Energy Management Plan* (EMP) and its associated five-year updates (next iteration later in 2024).

Annual energy updates are posted to the Oxford County website at www.oxfordcounty.ca/en/your-government/reports-and-publications.aspx, with highlights shared on social media.

2023-2026 STRATEGIC PLAN

Oxford County Council approved the 2023-2026 Strategic Plan on September 13, 2023. The Plan outlines 39 goals across three strategic pillars that advance Council's vision of "Working together for a healthy, vibrant, and sustainable future." These pillars are: *(1) Promoting community vitality, (2) Enhancing environmental sustainability, and (3) Fostering progressive government*.

The recommendation in this report supports the following Strategic Plan pillars and goals:

		
Promoting community vitality	**Enhancing environmental sustainability**	**Fostering progressive government**
Goal 1.2 – Sustainable infrastructure and development	Goal 2.1 – Climate change mitigation and adaptation	Goal 3.1 – Continuous improvement and results-driven solution

See: Oxford County 2023-2026 Strategic Plan

DISCUSSION

Background

On June 24, 2015, Oxford County Council unanimously passed the 100% RE goal by 2050. This was followed up when County Council adopted the 100% RE Plan on June 27, 2018, which lays out a strategic approach to achieving the goal of 100% RE by 2050. This initiative seeks to reduce energy consumption while at the same time increasing RE generation to achieve net-zero performance across the geographical County by the year 2050.

The 100% RE Plan is based on a community-wide initiative. The County organization is a major contributor to the potential achievement of the 100% RE Plan by addressing the energy consumption and generation potential of the County's facility and fleet portfolio, striving to be a leader within the community and demonstrating active support for this important community goal.

As shown in Figure 1 below, the 100% RE Plan has a number of contributor groups, including individual residents, organization groups, businesses residing in the community and governments, which include the area municipalities, as well as the County organization.

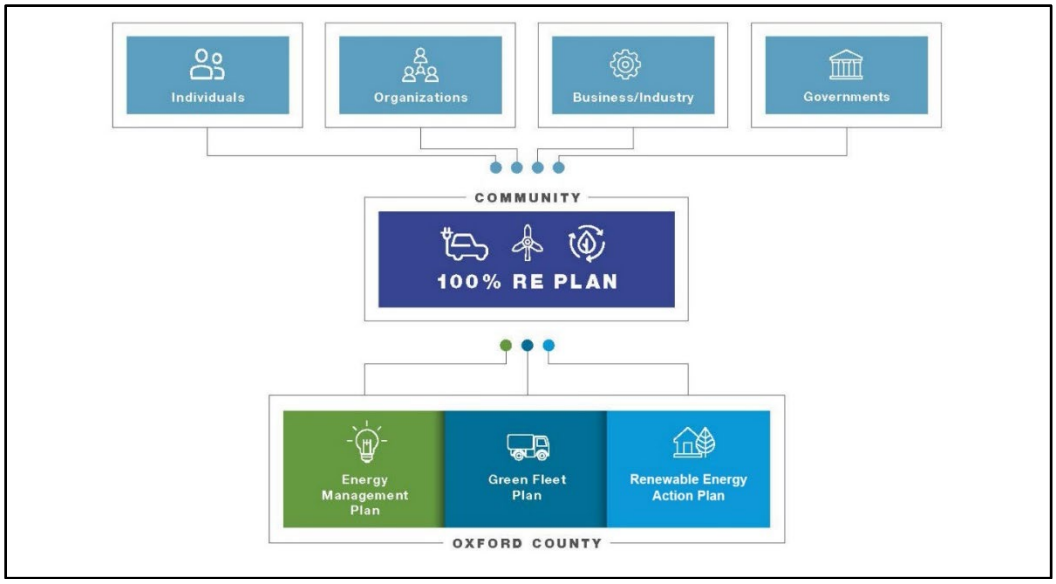

Figure 1 – 100% RE Plan Contributors

Over the last number of years, Oxford County has set organizational goals to help advance the progress of the 2050 100% RE community goal. Of note, the County has developed and implemented various plans to drive efforts of energy conservation and RE generation (or harvesting) as follows:

- ***2019 Energy Management Plan*** – On August 14, 2019, County Council approved Report PW 2019-33, which outlined the County's updated Energy Management Plan (EMP-2019) for 2019 through to the end of 2023. EMP-2019 is the second iteration of the County's EMP, with the first being enacted in 2014. As required by provincial regulation O. Reg. 25/23, this EMP is required to be updated every five years, with the next update due by July 2024. The focus of this plan is on energy conservation and GHG emission reductions.

- ***2021-2025 Green Fleet Plan*** – On June 9, 2021, County Council adopted Report PW 2021-23, which outlined the County's 2021-2025 Green Fleet Plan (GFP-2021) building off the former *2016 Green Fleet Plan*. This is the second iteration of the GFP and specifically targets the reduction of GHG emissions through progressive transformation of the County's fleet towards lower carbon alternative fuels and energy reduction.

- ***2022-2032 Renewable Energy Action Plan*** – On August 10, 2022, County Council approved Report PW 2022-37, which outlined the County's 10-year Renewable Energy Action Plan (REAP) for 2022 through to 2032. The REAP will expand upon the County's existing renewable energy systems through a proposed multi-year capital implementation plan comprised of an additional solar PV system, geothermal / air source heat pump, heat recovery and wood pellet boiler technology applications. The focus of this plan is on RE generation (harvesting), as well as energy conversion in order to reduce GHG emissions.

Management of energy and GHG emissions plays an integral role in reducing GHG emissions and energy consumption, improving energy efficiency, establishing financial stability and increasing RE harvesting. Management includes planning, implementing, verifying and reporting. For this reason, the County organization has established and adopted the EMP, GFP, and REAP, each of which plays a role in identifying where the County may reduce energy dependence and resulting GHG emissions in support of the community's 100% RE Plan. These plans provide a roadmap, along with actionable items required to meet the targets. Refer to Table 1 below for a summary of how the County organization is progressing with respect to targets as identified in the 100% RE Plan.

Table 1 – 100% RE Plan Energy and GHG Target Status

Description	Current 2023	Intermediate Target 2025	Final Target 2050
Total Energy reduction from 2015	**2.1%**	10.5%	54%
Total GHG emissions reduction from 2015	**11.2%**	11%	47%
Total Renewable Energy Mix	**7.6%**	11.7%	80.3%

Comments

Oxford County, as an organization, owns, operates and maintains various assets that affect energy consumption and GHG emissions as well as RE utilization (also referred to as harvesting).

To differentiate where energy is consumed, how GHG's are emitted, and where RE is utilized, these assets have been broken down into three main service areas including Facilities, RE Utilization and Fleet. To come up with cumulative energy consumption, various energy types are quantified into a single metric by converting to ekWh which assists in comparing year-to-year metrics across all commodities (i.e. electricity, natural gas, gasoline, diesel, etc.).

A summary of the County's energy metrics is outlined in Attachment 1.

Facilities

The County operates 281 individual buildings across 245 facility sites that consume energy such as electricity, natural gas or propane. These assets have been organized by operation type to line up in general with *O.Reg. 25/23 Broader Public Sector* reporting requirements and are comprised of 89 facility building locations (i.e. non-process assets including administrative offices, housing, patrol yards, libraries, etc.), 97 plant locations (i.e. treatment plants and pumping stations) and 59 minor asset locations (i.e. street lighting, COIN Towers and stand-alone public Electric Vehicle Chargers).

These assets consumed a total of 26.7 million kWh of electricity, 1.5 million m^3 of natural gas, 60,000 litres of propane and 6,207 litres of diesel in 2023, for total purchased energy consumption of just over 43 million ekWh. In 2023, the total utility cost was $4.87 million, with $4.17 million related to electrical and $699,000 in natural gas (propane).

For asset comparison purposes, these values can be represented as an Energy Use Intensity (EUI) represented as either ekWh per square meter (SM) (non-process assets), or as ekWh per megalitre (ML) of fluid moved (plant process assets). The per SM and per ML net-energy usage intensity comparison of each individual operation type is summarized in Table 2 below. The RE consumed by buildings and plants are broken out and included as a separate line, to show the RE contribution towards total energy consumption requirements. In 2023, the gross consumption of energy by the County was the equivalent of 46.6 million kWh, which is a 0.7% increase from 2015 consumption levels of 46.3 million kWh.

Table 2 – 2023 Facilities Consumption by Operation Type

Operation Type	Area (SM)	Flow (ML)	Energy (ekWh)	EUI (ekWh/SM)	EUI (ekWh/ML)
Woodingford Lodge (LTC)	15,664	-	8,384,381	535	-
Human Services (Multi-Unit Housing)	29,660	-	5,829,182	197	-
Public Works (Admin, libraries, EMS stations, childcare, etc.)	22,398	-	3,795,210	169	-
Human Services (Single Family Townhouses)	13,664	-	2,280,566	167	-
Public Works (Patrol Yard Facilities)	8,855	-	1,122,332	127	-
Public Works (Waste Facilities)	7,167	-	302,042	42	-
Buildings RE Consumption	-	-	828,015	9	
Public Works (Street/Traffic Lighting)	-	-	68,680	-	-
Public Works (COIN Towers/EV chargers)	-	-	203,200	-	-
Public Works (Wastewater Plants)	13,192	17,523	13,293,087	-	759
Public Works (Water Plants)	5,911	10,705	7,798,721	-	729
Plant RE Consumption	-	-	2,723,784	-	96
TOTAL	**116,511**	**28,228**	**46,629,200**	**-**	**-**

While overall energy consumption has risen slightly, the EUI for both SM (non-process building / minor assets) and ML of flow (plant process – water and wastewater treatment plant assets) has reduced significantly as shown in Table 3, resulting in significant energy consumption avoidance while supporting a growing community. Based on 2015 energy intensities and using updated variables, the 2023 energy consumption would have been projected to be 53.3 million ekWh (increase of 15.1% over 2015 actuals) had no energy conservation measures been in place.

Another factor of influence includes weather temperatures, in which total heating and cooling degree days reduced by 13% over 2015 actuals. Due to complexity of applying this variable to the various facilities, it has not been included in the baseline adjustments as indicated. A further illustration of actual energy consumption, as well as avoidance based on the 2015 EUI baseline is shown in Figure 2.

Table 3: Facilities Energy Intensity Overview

Service Area	2015 EUI	2023 EUI	Reduction
Buildings/Minor Assets	310 ekWh/SM	234 ekWh/SM	**24.5%**
Plants	922 ekWh/ML	844 ekWh/ML	**8.5%**

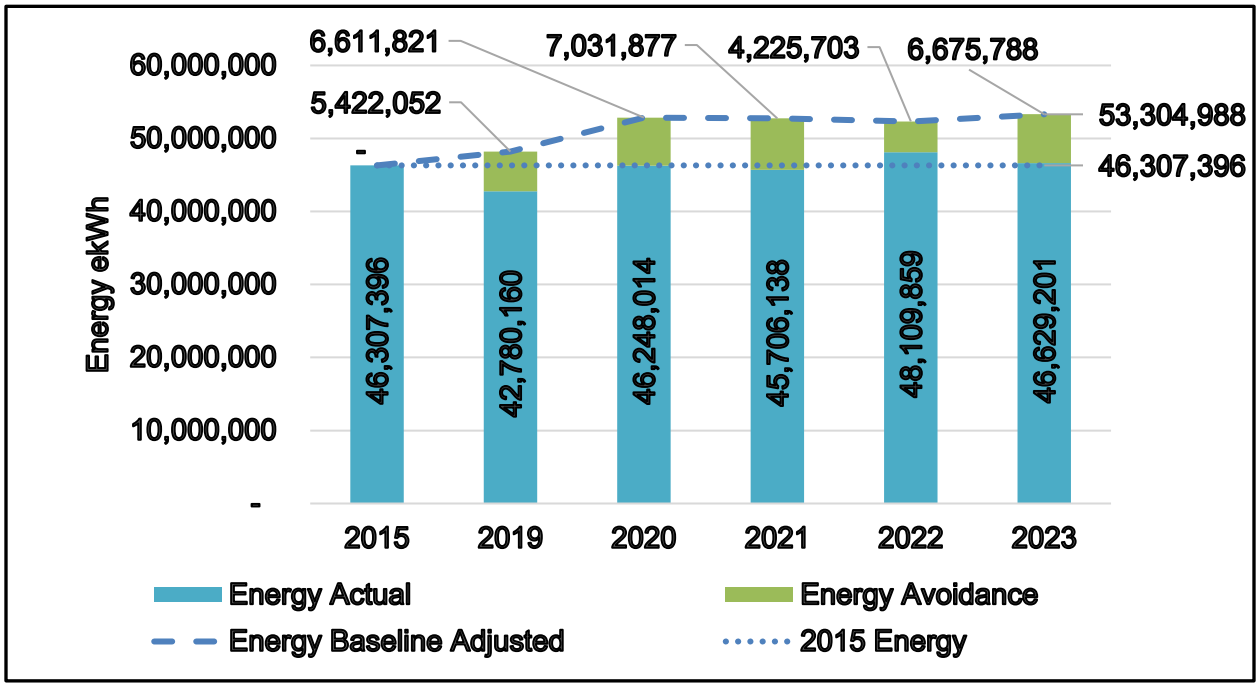

Figure 2 – Facilities Energy Consumption and Avoidance Trending (2015 to 2023)

Renewable Energy Utilization

The County's RE assets are divided into sub-categories based on technology type including biogas boiler, geothermal (ground source and air source), solar PV (feed-in tariff and net-metered) and solar thermal, and may expand in the future as new technologies emerge or are implemented (i.e. biomass, wood pellet boiler, etc.) as per the *REAP*. These existing assets are summarized in Table 4 below, showing the overall portfolio production for 2023.

The majority of the RE energy that is harvested across the County's portfolio is utilized by County assets directly on the site where the system is located, with a smaller percentage of systems (i.e. FIT/micro-FIT systems) fully exporting RE back to the electrical grid generating revenue. In 2023, 3.55 million ekWh were consumed on site, while 595,000 ekWh were exported back to the electrical grid. Overall, all RE produced is considered an offset to the total energy consumption needs of the County.

Table 4: County RE System Performance

RE Harvesting Technology	Asset Count (#)	Utilization Actuals 2023 (ekWh)
Solar PV (Feed-in-Tariff and Net- Metered)	22	1,897,000
Biogas (Ingersoll and Woodstock WWTPs)	2	2,092,000
Geothermal (Social Housing - 111 Brock Street)	1	138,000
Solar Thermal (Social Housing - 742 Pavey Street)	1	20,000
TOTAL	**26**	**4,147,000**

Since 2015, total annual RE harvesting has gone from 1,843,000 ekWh to 4,147,000 ekWh, representing an increase of 125% (refer to Figure 3). This total RE harvested by the County would be enough to supply the annual energy needs for 86 typical family homes in southwestern Ontario. In 2023, the amount of RE harvested as a percentage of the total energy consumption (considered the RE mix from generation) was 7.6% which exceeds the 100% RE Plan target of 5.3% (2020) and is progressing towards the 2025 target of 11.7%.

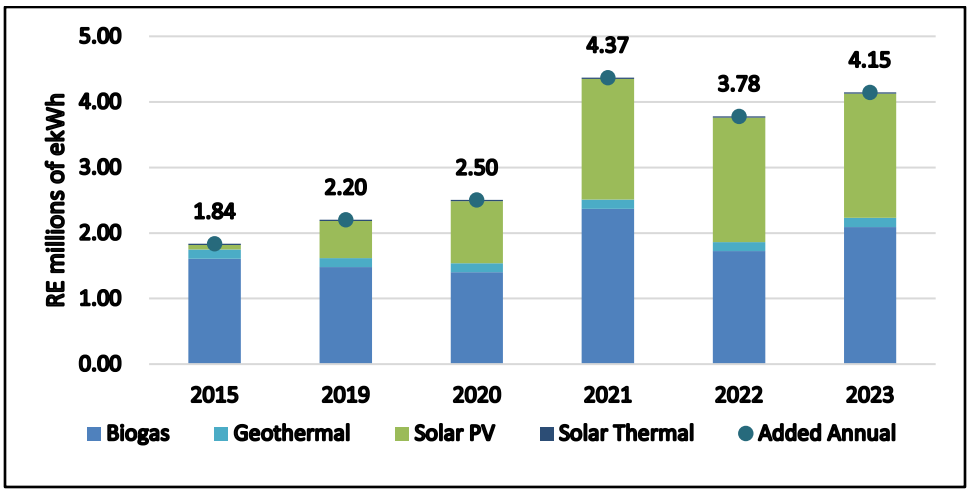

Figure 3 – Annual RE Harvesting Trending (2015 to 2023)

It is important to note that this RE industry is rapidly changing and in order to achieve some of the identified future targets of the 100% RE Plan, regulatory restrictions related to Virtual Net-Metering and other constraints will need to continue to be advocated for in order to expand potential deployment capacity. County staff will continue to look for opportunities to provide feedback and influence regulatory decision-making.

Fleet

The County's fleet travelled just under 2.8 million km in 2023. These assets can be organized into the following sub-categories:

- Commercial (light-duty vehicles, cars, SUVs, etc.)
- Industrial (heavy vehicles, including plows, leachate trucks, vacuum trucks, tractors, etc.)
- Paramedical (ambulances, first response units, etc.)
- Equipment (all unlicensed, off-road vehicles including compactors, forklifts, etc.)

Fleet assets are powered by a variety of fuels, including gasoline, diesel, CNG and battery electric. In 2023, fleet fuel costs across all fuel types were a combined $1.05 million. Table 5 summarizes the fleet assets, kilometres driven, fuel equivalent consumption and fuel efficiency.

Table 5: 2023 Fleet Asset Utilization Overview

Fuel Type	Fleet Type	Asset Count	Travel Distance (km)	Fuel * (eL unleaded)	Efficiency (eL/100 km)
Fuel Unleaded (Includes HEV)	Commercial	57	1,190,250	170,983	14.4
	Paramedical	22	742,990	121,897	16.4
	Equipment	2	250	92	36.8
Subtotal (L)		**81**	**1,933,490**	**292,972**	**15.2**
Fuel Diesel	Commercial	5	59,143	9,582	16.2
	Industrial	24	354,436	187,879	53.0
	Paramedical	2	68,994	10,087	14.6
	Equipment	31	10,286	201,704	1,960.9
Subtotal (L)		**62**	**492,860**	**409,252**	**83.0**
Fuel CNG (kg)	Industrial	**4**	**38,913**	**30,732**	**78.9**
Dual Fuel - Unleaded / CNG (eL)	Commercial	**15**	**294,545**	**40,845**	**13.9**
Fuel Propane (L)	Equipment	**3**	**245**	**99**	**40.3**
Fuel Electric	Commercial	3	23,152	489	2.1
	Equipment	1	384	<1	0.0
Subtotal (kWh)		**4**	**23,536**	**489**	**2.1**
Dual Fuel - Unleaded / Electric (eL)		**2**	**14,108**	**290**	**2.1**
TOTAL		**171**	**2,797,697**	**774,679**	**27.7**

* Note: Fuel consumption has been converted to equivalent gasoline (eL unleaded or eL) for all fuel types to demonstrate a common “apples to apples” comparison. Using this comparison, the eL is actually more than actual volumes consumed due to conversions (i.e. a litre of diesel has a higher energy content than a litre of unleaded gasoline so when expressed as eL the volume is greater).

As of the end of 2023, 33% of the County’s fleet (56 out of 171 units) have been converted to alternative fuels to reduce GHG emissions. Of note in 2023, the County added 19 alternative fuel vehicles to the County’s fleet, of which 11 were included in the GFP-2021, and 8 added (GFP-Added). The upgrades included 16 conversions to Hybrid Electric (HEV), 1 to Battery Electric (BEV), and 2 to CNG. In addition, 2 vehicles were converted from dual-fuel unleaded/CNG to HEV and 1 from dual-fuel unleaded/CNG to BEV. These upgrades are projected to avoid 288,000 ekWh per year in energy consumption and 81 tCO2e per year in GHG emissions.

By the end of 2024, it is projected that 36% of the County’s fleet (61 of 171) will have been converted to alternative fuels; including 2 from diesel to duel-fuel unleaded/CNG, 1 from unleaded to dual-fuel unleaded/CNG, 1 from unleaded to BEV, and 1 from unleaded to HEV.

The County will continue to seek alternative fuel conversions where viable and available in the industry.

Greenhouse Gas Reductions

Reducing the County's overall GHG emissions has been a strong driver for ongoing initiatives, including the REAP and GFP. As the County continues to grow as an organization to support a growing community (i.e. a larger staff complement equating to more space, a larger fleet, etc.), the overarching goal of reducing emissions remains. However, it should be noted that the growth of the organization may translate to an emissions avoidance, and is not always a clear reduction simply based on the number of buildings, size of the fleet, etc.

In 2023, the County emitted the equivalent of 5,527 tCO2e in GHGs (3,694 tCO2e Facilities and 1,833 tCO2e Fleet), which is an 11.2% decrease from 2015 emissions of 6,223 tCO2e (3,984 tCO2e Facilities and 2,239 tCO2e Fleet). The 100% RE Plan includes a GHG emissions reduction target of 11% by 2025 which works out to a 1.1% year over year GHG reduction from 2015 or target of 5,675 tCO2e in GHGs for the County in 2023.

Despite this decrease, the GHG intensity (GHG per SM, per ML and per km driven) has actually reduced substantially more compared to the 2015 baseline (refer to Table 6), resulting in significant GHG emissions avoidance while supporting a growing community. Based on 2015 GHG emissions intensities and using updated variables, GHG emissions would have been projected to be 6,928 tCO2e (increase of 20.2% over the 2015 baseline) had no energy conservation measures been in place. A further illustration of actual GHG emissions, as well as avoidance based on the 2015 emission intensity baseline and 100% RE Plan GHG emissions reduction target is shown in Figure 4.

Table 6: GHG Emissions Intensity Overview

Sector	2015 GHGI	2023 GHGI	Reduction
Facility GHG/SM	0.037 tCO2e	0.027 tCO2e	27.0%
Facility GHG/ML	0.048 tCO2e	0.037 tCO2e	22.9%
Fleet GHG/100 KM	0.082 tCO2e	0.066 tCO2e	19.5%

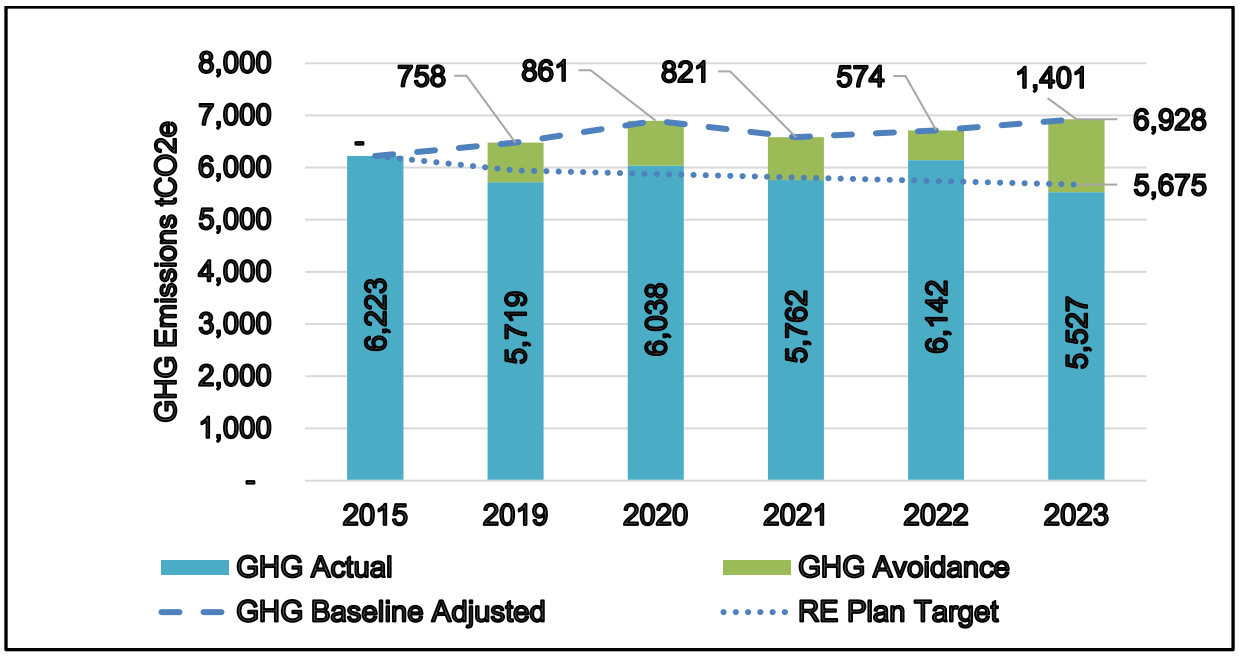

Figure 4 – GHG Emissions and Avoidance Trending (2015 to 2023)

In 2023, the top energy fuel source utilized by County assets was electricity, which makes up over 49% of all energy consumption, but only equates to 12% of all GHG emissions. The top fuel source contributing to GHG emissions is natural gas, at just over 52% of all GHG emissions, but only makes up just over 29% of all energy consumption. The fuel source with the highest GHG intensity was diesel making up only 7% of energy consumption, but contributing 19% of all GHG emissions. Refer to Figure 5 below for a comparison of energy consumption versus GHG emissions by fuel source type.

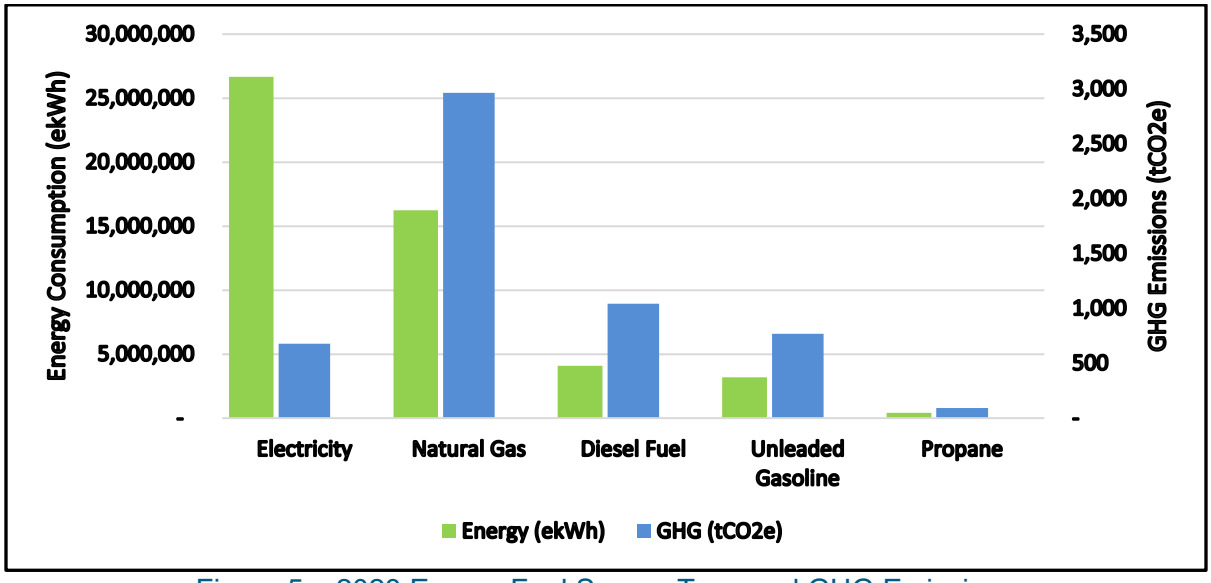

Figure 5 – 2023 Energy Fuel Source Type and GHG Emissions

In order to provide further clarity, Table 7 below outlines the GHG emissions per 1 million ekWh consumption for each fuel type. These numbers help to illustrate the importance of the REAP and GFP initiatives to implement alternative fuel sources where appropriate, as well as the EMP for overall conservation and energy demand reduction.

Table 7: GHG Emission Rates

Energy Type	GHG/1 million ekWh (tCO2e)
Diesel Fuel	254.8
Unleaded Gasoline	241.6
Propane	219.2
Natural Gas/CNG	182.6
Electricity	25.4

2023 Plan Updates

In 2023, the County completed a number of initiatives identified in the EMP-2019, GFP-2021 and REAP-2022.

Overall, the 2023 facility initiatives related to the EMP-2019 and REAP-2022 are anticipated to add 57,900 ekWh in RE harvesting and reduce energy consumption by 29,600 ekWh, for a total annual net energy avoidance of 87,500 ekWh.

Key changes to the Plans, which will affect targets, include deferral of design work for the 300 Juliana (WFL-Woodstock) GSHP (ground source heat pump) project identified in the REAP-2022. This project was originally slated to commence construction in 2024, and was anticipated to provide an annual net energy reduction of just over 3.3 million ekWh, of which 3.2 million ekWh was from renewable energy ground source heating recovery. Due to coordination around future plans at the Woodingford Lodge Woodstock, this project has been removed from the County's current capital plan and is being deferred until further notice. This project equated to approximately 39% of the total RE harvesting potential identified in the REAP-2022.

As well, a preliminary feasibility study was completed to assess the energy potential from the landfill gas collection system at the Oxford County Waste Management Facility. The initial findings showed potential for economically feasible utilization and staff are planning to include a funding request for further investigation as part of the 2025 Business Plan and Budget.

CONCLUSIONS

The 2023 Annual Energy Report demonstrates Public Works' continued administration of the County's comprehensive energy portfolio in order to effectively manage cost while striving to contribute to the 100% RE goal.

Through future years' budgets, the County organization will continue to work to reduce energy consumption and GHG emissions further below the 2015 baseline in the coming years through planned ongoing implementation of the EMP, the REAP and the GFP.

SIGNATURES

Report author:

Original signed by

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Coordinator of Energy Management

Departmental approval:

Original signed by

David Simpson, P.Eng., PMP
Director of Public

Approved for submission:

Original signed by

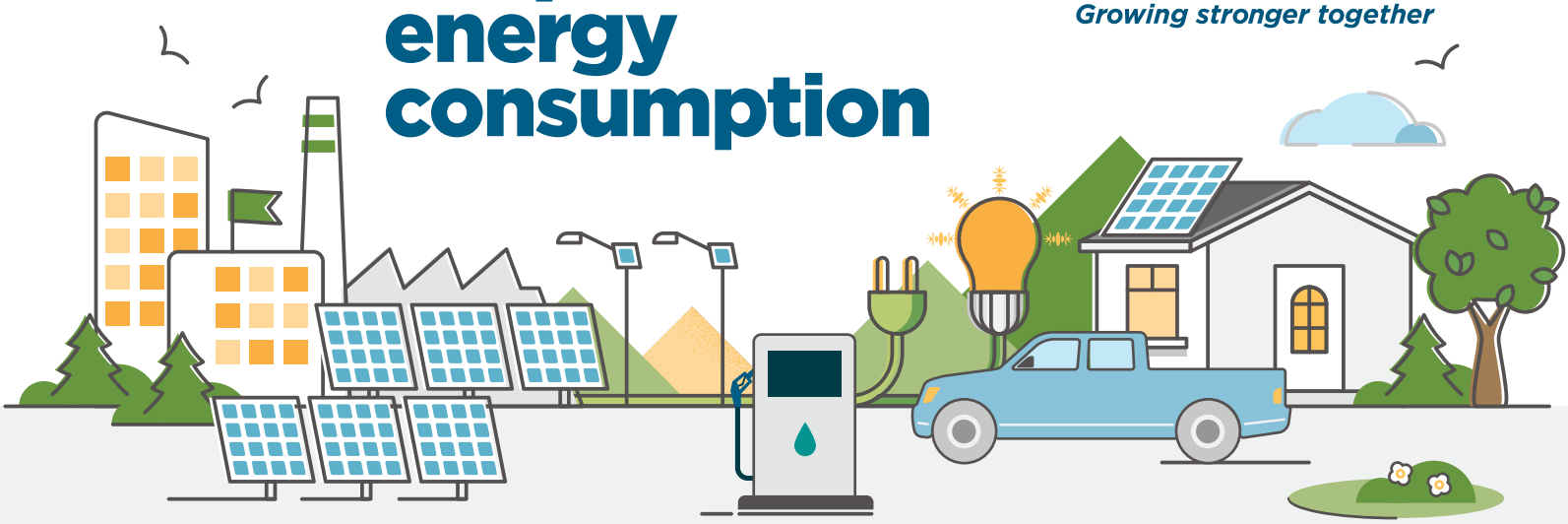
Benjamin R. Addley
Chief Administrative Officer

ATTACHMENT

Attachment 1 – Overview of 2023 Corporate Energy Consumption

2023 Corporate energy consumption

Oxford County
Growing stronger together



54.09 million ekWh
Total energy consumed
(facilities and fleet)
4.9% from 2022

775 thousand equivalent gas litres
Fleet fuel consumed
(unleaded, diesel, CNG, electric, propane)
15.7% from 2022

5.87 million dollars
Total energy cost
(facilities and fleet)
3.7% from 2022

Energy use by service area

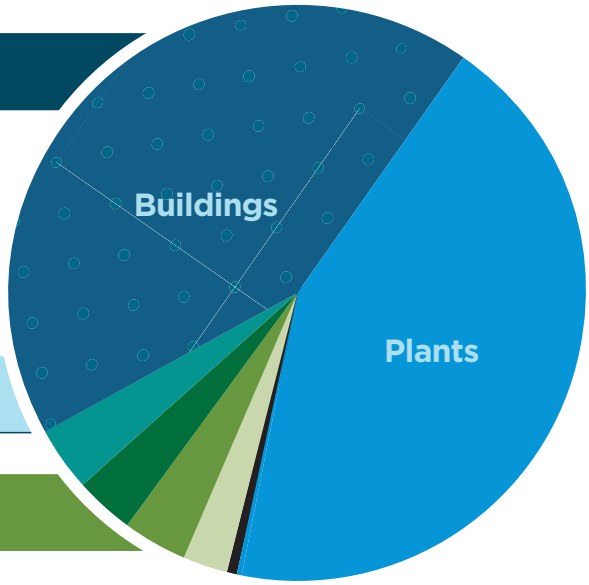
CORPORATE FACILITIES (46,629 eMWh) | 3.1%/2022

Buildings
22,532 eMWh

Plants
23,825 eMWh

Minor Assets*
272 eMWh

TOTAL COST: $4.87 MILLION | 11.7%/2022



CORPORATE FLEET (7,458 eMWh) | 15.8%/2022

Commercial
2,139 eMWh

Equipment
1,944 eMWh

Industrial
2,105 eMWh

Paramedical
1,271 eMWh

TOTAL COST: $1.0 MILLION | 23.1%/2022

* **Minor assets include:** street lighting, communication towers, etc.

Facilities area (square metres)

116,511 SM

2.8% from 2022

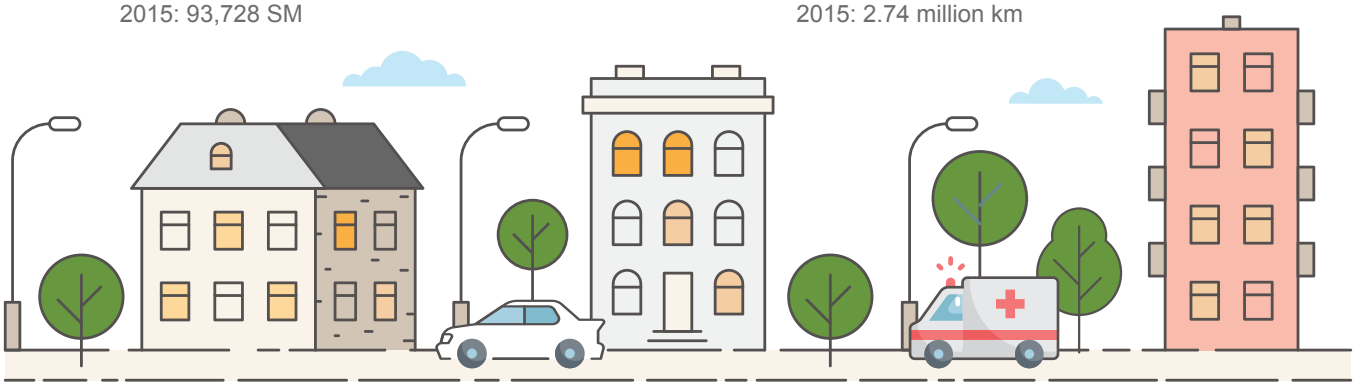
2015: 93,728 SM

Fleet travel (kilometres)

2.8 million

4.1% from 2022

2015: 2.74 million km

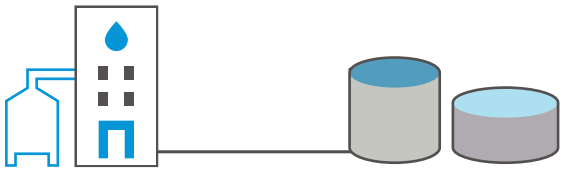


Water & Wastewater treatment and distribution (megalitres)

28,228 ML

2.8% from 2022

2015: 24,948 ML



Total greenhouse gas emissions (facilities and fleet)

5,527 tCO2e

10.0% from 2022

2015: 6,223 tCO2e

natural gas

1,537,500 m³

7.3% from 2022

2015: 1,414,000 m³

purchased electricity

26,676,500 kWh

2.4% from 2022

2015: 29,379,600 kWh

renewable energy generated

4,147,000 ekWh

13.1% from 2022

2015: 1,843,131 ekWh