

To: Warden and Members of County Council

From: Director of Public Works

2022 Annual Energy Report

RECOMMENDATION

1. That County Council receive Report PW 2023-24 entitled “2022 Annual Energy Report” as information.

REPORT HIGHLIGHTS

- The purpose of this report is to summarize the County’s 2022 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 2022.
- The County’s annual RE generation has increased by approximately 100% since 2015 baseline levels, with 3.67 million ekWh of RE produced in 2022 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 6.4% in 2022 which exceeds the 100% RE Plan target of 5.3% (2020 target).
- County facilities consumed just over 48.1 million equivalent kilowatt hours (ekWh) of energy in 2022, costing about \$4.4 million. While the total energy consumption by facilities has increased 3.9% since 2015, the actual energy use intensity for buildings/minor assets and water/wastewater treatment plants has reduced by 17.4% and 5.7% 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 8.9 million ekWh of energy in 2022, including \$1.3 million fuel purchases of unleaded gasoline and diesel (819,705 litres), compressed natural gas (28,600 kg) and diesel (14,000 litres) for facilities backup generating equipment. By 2022 year end, approximately 21% of the County’s in-service fleet (35 out of 167) has been converted to alternative fuels to reduce GHG emissions.
- County facilities and fleet produced 6,142 tonnes of carbon dioxide equivalent (tCO₂e) in GHG emissions in 2022. While total GHG emissions have only reduced by 1.3% since 2015 (100% RE Plan target is 11% by 2025), the actual GHG intensity for facilities and fleet has decreased by up to 19.3 and 9.0% 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. 507/18, the 2022 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 2023 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, Future Oxford 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. 507/18: 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 in 2024).

Annual energy updates are posted to the Oxford County website at www.oxfordcounty.ca/publications, with highlights shared on social media.

Strategic Plan (2020-2022)

					
WORKS WELL TOGETHER	WELL CONNECTED	SHAPES THE FUTURE	INFORMS & ENGAGES	PERFORMS & DELIVERS	POSITIVE IMPACT
		3.iii.	4.ii.		

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 demonstrate 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 lower-tier municipalities, as well as the County organization.

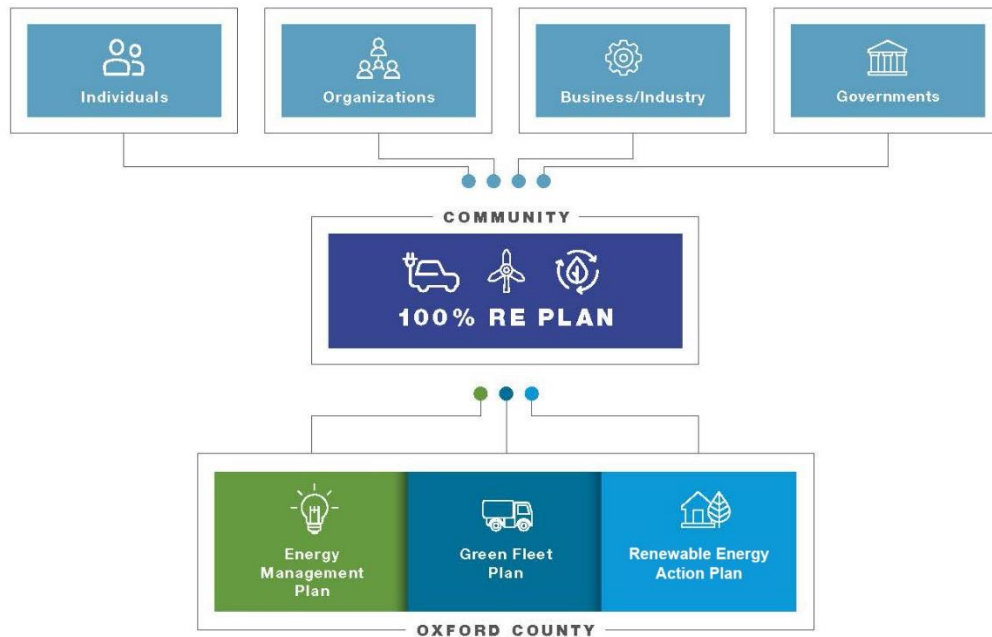


Figure 1 – 100% RE Plan Contributors

Over the last number of years, Oxford County has set organizational goals to help advance 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 No. 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. 507/18, 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.

- **2022-2032 Renewable Energy Action Plan** – On August 10, 2022, County Council approved Report No. 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.
- **2021-2025 Green Fleet Plan** – On June 9, 2021, County Council adopted Report No. PW 2021-23, which outlined the County’s 2021-2025 Green Fleet Plan (GFP-2021) building off of 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.

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 GFP, EMP and REAP, each of which play a role in identifying where the County may reduce energy dependence and resulting GHG emissions in support of the community 100% RE Plan. These plans provide a roadmap, along with actionable items required to meet the targets.

This report plays an integral role in transparent reporting on energy and GHG emissions performance of County assets, and provides an annual checkpoint on each of the noted plans.

Comments

Oxford County, as an organization, owns, operates and maintains various assets which 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. In order 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 233 Facilities locations (comprised of 305 individual buildings) 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. 507/18 Broader Public Sector reporting requirements and are comprised of 91 facility building locations (i.e. non-process assets including administrative offices, housing, patrol yards, libraries, etc.), 101 plant locations (i.e. treatment plants and pumping stations) and 41 minor asset locations (i.e. street lighting, COIN Towers and stand-alone Electric Vehicle Chargers).

These assets consumed a total of 27.34 million kWh of electricity, 1.66 million m³ of natural gas, 61,424 litres of propane and 14,000 litres of diesel in 2022, for total purchased energy consumption of just over 45 million ekWh. In 2022, the total utility cost was \$4.36 million, with \$3.75 million related to electrical and \$612,000 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 energy usage intensity comparison of each individual operation type is summarized in Table 1 below. In 2022, the gross consumption of energy by the County was the equivalent of 48,109,859 kWh, which is a 3.9% increase from 2015 consumption levels of 46,307,396 kWh.

Table 1 – 2022 Facilities Consumption by Operation Type

Operation Type	Area (SM)	Flow (ML)	Energy (ekWh)	EUI (ekWh/SM)	EUI (ekWh/ML)
Woodingford Lodge (LTC)	15,664	-	8,422,666	538	-
Human Services (Multi-Unit Housing)	29,422	-	6,488,201	221	-
Public Works (Admin, libraries, EMS stations, child care, etc.)	20,402	-	4,290,250	210	-
Human Services (Single Family Townhouses)	13,664	-	2,490,091	182	-
Public Works (Patrol Yard Facilities)	8,416	-	1,226,803	146	-
Public Works (Waste Facilities)	7,007	-	290,337	41	-
Buildings RE Consumption	-	-	792,284	8	-
Public Works (Street/Traffic Lighting)	-	-	160,509	-	-
Public Works (COIN Towers/EV chargers)	39	-	85,156	-	-
Public Works (Wastewater Plants)	13,060	16,356	13,916,070	-	851
Public Works (Water Plants)	5,628	11,097	7,734,570	-	697
Plant RE Consumption			2,212,922		81
Total	113,302	27,453	48,109,859		

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 2, resulting in significant energy consumption avoidance while supporting a growing community. A further illustration of actual energy consumption as well as avoidance based on the 2015 EUI baseline is shown in Figure 2.

Table 2: Facilities Energy Intensity Overview

Service Area	2015 EUI	2022 EUI	Reduction
Buildings/Minor Assets	310 ekWh/SM	256 ekWh/SM	17.4%
Plants	922 ekWh/ML	869 ekWh/ML	5.7%

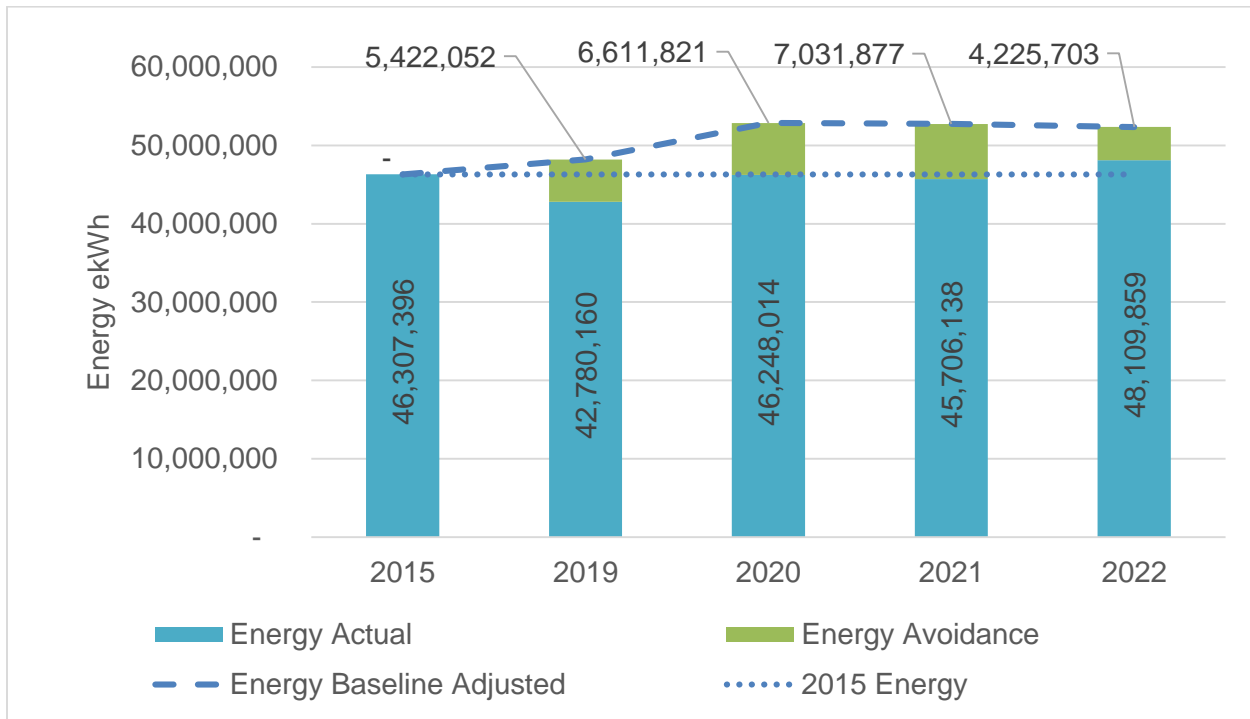


Figure 2 – Facilities Energy Consumption and Avoidance Trending (2015 to 2022)

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 3 below showing the overall portfolio production for 2022.

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 2022, 3,005,206 ekWh were consumed on site, while 661,794 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 3: County RE System Performance

RE Harvesting Technology	Asset Count	Utilization Actuals 2022 (ekWh)
Solar PV (Feed-in-Tariff and Net- Metered)	19	1,901,000
Biogas (Ingersoll and Woodstock WWTPs)	2	1,608,000
Geothermal (Social Housing - 111 Brock Street)	1	138,000
Solar Thermal (Social Housing - 742 Pavey Street)	1	20,000
Total	23	3,667,000

Since 2015, total RE harvesting has gone from 1,843,131 ekWh to 3,667,000 ekWh, representing an increase of 99%. In 2022, the amount of RE harvested as a percentage of the total energy consumption (considered the RE mix from generation) was 6.4% which exceeds the 100% RE Plan target of 5.3% (2020) and is progressing towards the 2025 target of 11.7%.

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 over 2.9 million km in 2022. 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 2022, fleet fuel costs across all fuel types were a combined \$1.3 million. Equivalent gasoline (eLitres Unleaded, or eL) is used for vehicles with dual fuel types. Since energy content is different for a litre of gasoline versus a litre of diesel or kg of CNG, etc, using equivalent units can be utilized for an apples-to-apples comparison approach.

A summary of these fleet assets, the kilometres driven and fuel equivalent consumed is summarized in Table 4 below. Fuel consumption has been converted to eL for all fuel types to demonstrate a common 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).

Across the fleet portfolio, the average fuel efficiency is 31.5 eL/100km. To date 21% of the County's fleet (35 out of 167) have been converted to alternative fuels to reduce GHG emissions. The County will continue to seek alternative fuel conversions where viable and available in the industry.

Table 4: Fleet Asset Utilization Overview

Fuel Type	Fleet Type	Asset Count	Travel Distance (km)	Fuel Equivalent (eL unleaded)	Efficiency (eL/100 km)
Fuel Unleaded	Commercial	54	1,094,681	177,054	16.2
	Paramedical	7	252,643	43,369	17.2
	Equipment	2	1,367	10,796	789.6
Subtotal Unleaded (L)		63	1,348,691	231,219	17.1
Fuel Diesel	Commercial	5	60,249	7,601	12.6
	Industrial	26	369,350	233,491	63.2
	Paramedical	4	127,710	22,044	17.3
	Equipment	31	55,184	233,556	423.2
Subtotal Diesel (L)		66	612,493	496,692	81.1
Subtotal Fuel CNG (kg)	Industrial	2	41,512	45,838	110.4
Subtotal Dual Fuel - Unleaded / CNG (eL)	Commercial	21	397,174	48,253	12.1
Subtotal Fuel Propane (L)	Equipment	3	324	99	30.4
Fuel Electric	Commercial	1	7,949	221	2.8
	Equipment	1	755	<1	<1
Subtotal Electric (kWh)		2	8,704	221	2.5
Dual Fuel – Unleaded / Electric	Commercial	1	11,054	344	3.1
	Paramedical	9	500,000	97,384	19.5
Subtotal Dual Fuel – Unleaded / Electric Total (eL)		10	511,054	97,728	19.1
TOTAL		167	2,919,952	920,050	31.5

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 not always a clear reduction simply based on the number of buildings, size of the fleet, etc.

In 2022, the County emitted the equivalent of 6,142 tCO₂e in GHGs (3,967 tCO₂e Facilities and 2,175 tCO₂e Fleet), which is a **1.3% 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 5,744 tCO₂e in GHGs for the County in 2022.

Despite this relatively small decrease, the GHG intensity (GHG per SM, per ML and per km driven) has actually reduced substantially compared to the 2015 baseline (refer to Table 5), resulting in significant GHG emissions avoidance while supporting a growing community. 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 3.

Table 5: GHG Emissions Intensity Overview

Sector	2015 GHGI	2022 GHGI	Reduction
Facility GHG/SM	0.037 tCO ₂ e	0.030 tCO ₂ e	19.3%
Facility GHG/ML	0.048 tCO ₂ e	0.041 tCO ₂ e	14.1%
Fleet GHG/100 KM	0.082 tCO ₂ e	0.074 tCO ₂ e	9.0%

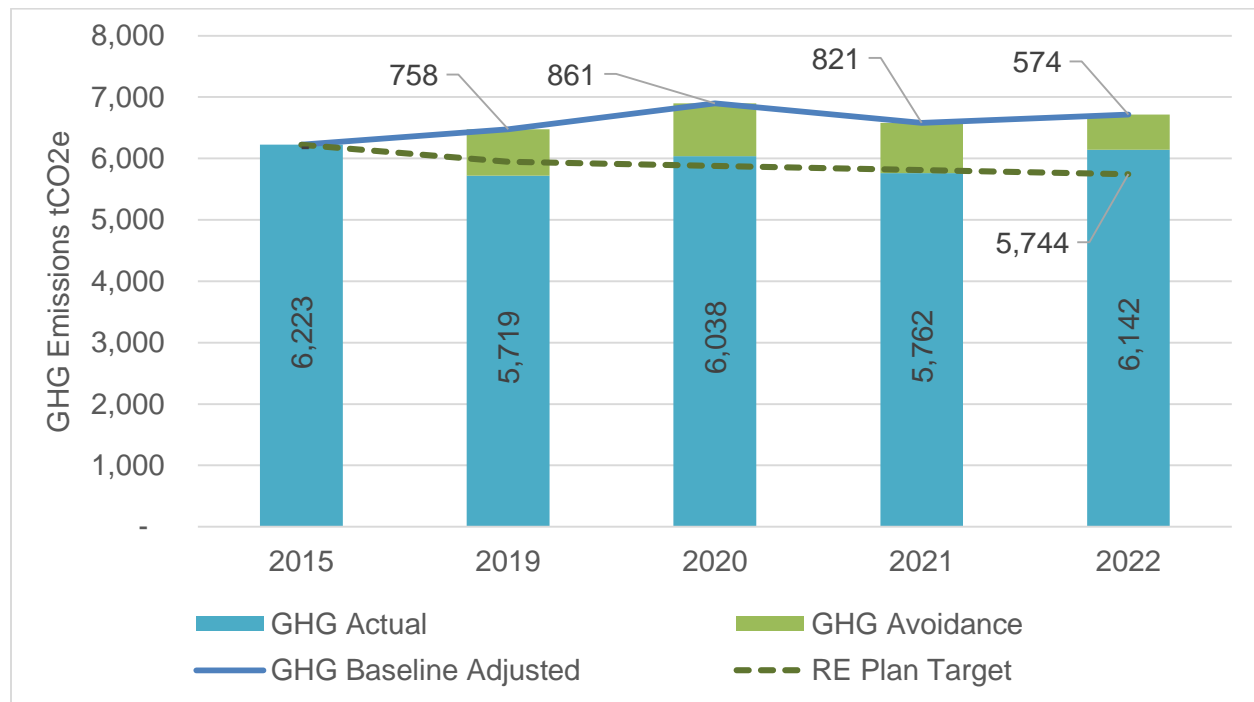


Figure 3 – GHG Emissions and Avoidance Trending (2015 to 2022)

In 2022, the top energy fuel source utilized by County assets was electricity, which makes up over 50% of all energy consumption, but only equates to 11% of all GHG emissions. The top fuel source contributing to GHG emissions is natural gas, at just over 51% of all GHG emissions, but only makes up just over 32% of all energy consumption. The fuel source with the highest GHG intensity was diesel making up only 9% of energy consumption, but contributing 20% of all GHG emissions. Refer to Figure 4 below for a comparison of energy consumption versus GHG emissions by fuel source type.

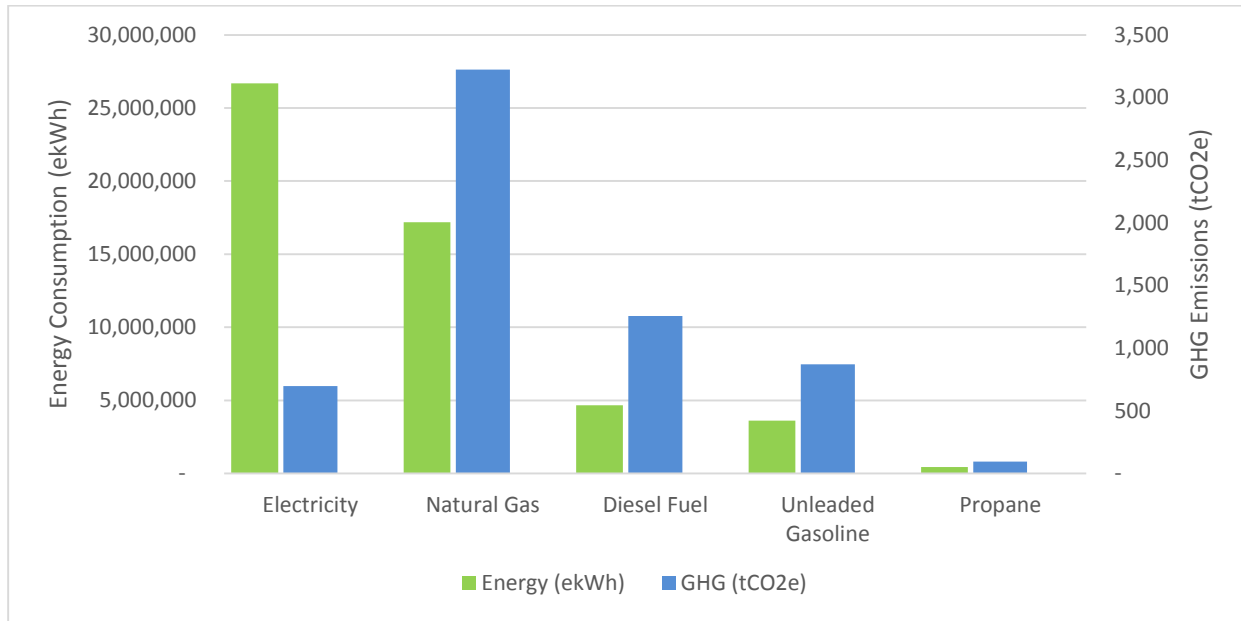


Figure 4 - Energy and GHG by Commodity Type

In order to provide further clarity, Table 6 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 6: 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

Conclusions

The 2022 Annual Energy Report demonstrates Public Works' continued oversight 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

Nathan E. Gerber, A.Sc.T., CEM, CMVP
Coordinator of Energy Management

Departmental Approval:

Original signed by

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

Approved for submission:

Original signed by

Benjamin R. Addley
Chief Administrative Officer

ATTACHMENT

Attachment 1 – Overview of 2022 Corporate Energy Consumption