Energy and Related Costs at Municipal Facilities

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Prepared by:	Shawn Turner Energy Initiatives
Recommended by:	General Manager of Corporate Services

Report Summary

This report provides information regarding energy use and related costs at all municipal facilities as requested by Council through Resolution CC2024-294.

Relationship to the Strategic Plan, Health Impact Assessment and Climate Action Plans

This report pertains to objective 3.2 (Develop and Strengthen Strategies and Policies to Mitigate Impact of Climate Change) under the “Climate Change” strategic priority by outlining a way to improve climate resilience.

Financial Implications

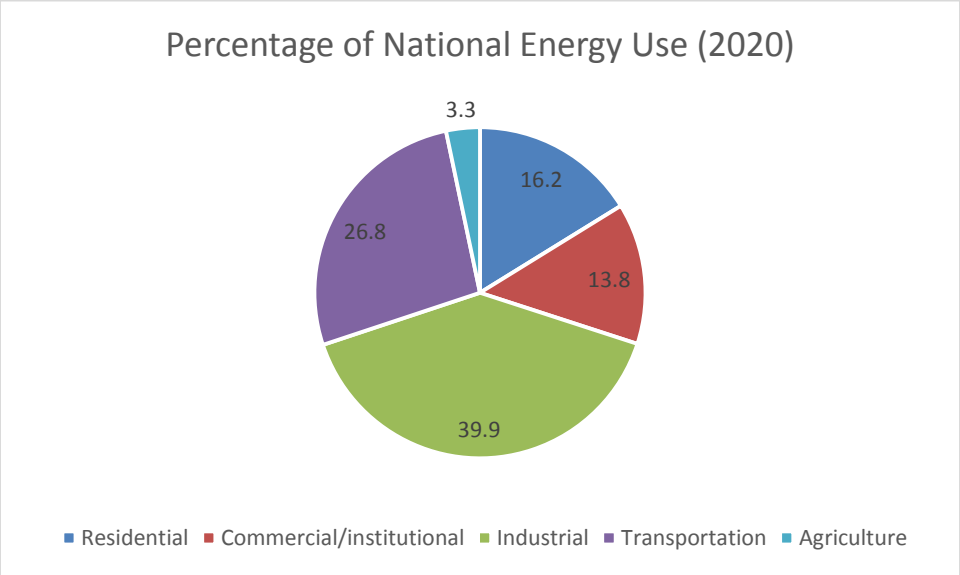
There are no financial implications associated with this report.

Background

The Community Energy and Emissions Plan (CEEP) is the long-term plan to reduce carbon emissions and pollution in Greater Sudbury. It responds to City Council’s Climate Emergency declaration in May 2019, which included a commitment to achieve net-zero emissions by 2050. That means reducing greenhouse gas emissions (GHG) caused by human activity to as close to zero as possible and removing remaining emissions from the atmosphere. Similarly, the Government of Canada’s 2030 Emissions Reductions Plan outlines a target to cut greenhouse gas (GHG) emissions by 40 percent below 2005 levels by 2030 and achieve net-zero emissions by 2050.

Energy use in Canada can be categorized into 5 sectors – industrial, residential, commercial/institutional, transportation and agriculture. As can be seen in Figure 1 below (Natural Resources Canada), the industrial sector is the largest consumer of energy at approximately 40% followed by transportation (26.8), residential (16.2), commercial/institutional (13.8), and agriculture (3.3).

Figure 1



The energy intensity (equivalent kWh consumed per square foot) at City facilities also mirrors this consumption pattern by sector. The City's Water and Wastewater facilities are the largest consumers of energy per square foot, followed by a mix of residential and institutional facilities.

Overall, total energy use at City facilities (excluding housing operations) in 2023 was 109,851,045 equivalent kWh. This was a decrease in consumption of 9.8% from 2022 as evidenced in Figure 2 below. A 14% decline in natural gas consumption was complimented by a 6% and 10% decline in electricity and district energy – hot water. This was partially offset by a 14% increase in district energy- chilled water use.

Figure 2: All Facilities (excluding housing operations)- Energy Consumption (equivalent kWh)

Energy Source	2022	2023	Change	Percentage Change
Electricity	58,289,600	54,877,590	-3,412,010	-6%
Natural gas	59,421,470	51,217,281	-8,204,189	-14%
District energy - Hot water	3,613,430	3,268,310	-345,120	-10%
District energy - Chilled water	427,637	487,864	60,227	14%
Totals	**121,752,137**	**109,851,045**	**-11,901,092**	**-10%**

Similarly, total energy use at housing operations also declined by 11% in equivalent kWh. Natural gas and electricity consumption declined by 13% and 5% respectively per Figure 3 below.

Figure 3: Housing Operations- Energy Consumption (equivalent kWh)

Energy Source	2022	2023	Change	Percentage Change
Natural Gas	33,059,029	28,745,417	-4,313,612	-13%
Electricity	8,306,249	7,873,017	-433,232	-5%
Totals	**41,365,278**	**36,618,434**	**-4,746,844**	**-11%**

In most facilities that do not have energy intensive processes (industrial), the demand for energy is primarily for space and water heating (60-70%), with lighting, cooling and appliances comprising the remainder of the energy consumption. Decreased natural gas consumption over the 2022-2023 period are largely explained by the variances in temperatures. The average temperature in 2023 was 1.3 degrees warmer than 2022 and the average low temperature was 5.9 degrees warmer in 2023 resulting in decreased demand for heating. Even though energy utilization was lower in 2023 compared to 2022, energy costs did not decline at the same rate. Figures 4 & 5 below portray the change in costs over this period for city facilities and housing operations respectively.

Figure 4: All Facilities (excluding housing operations)- Energy Costs

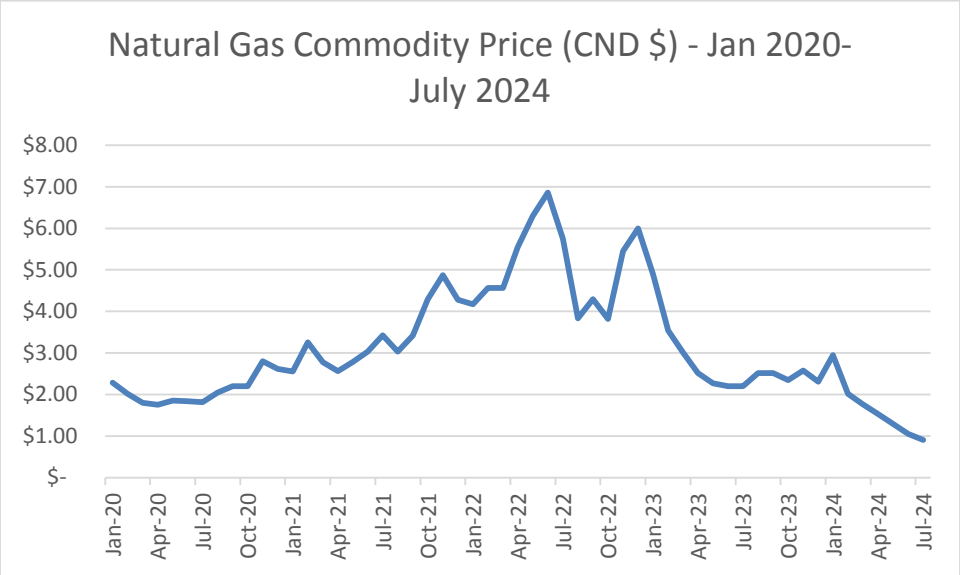
Energy Source	2022	2023	Change	Percentage Change
Electricity	8,279,063	7,813,145	-465,918	-6%
Natural gas	2,650,967	2,559,243	-91,724	-3%
District energy - Hot water	180,474	229,428	48,954	27%
District energy - Chilled water	86,312	93,071	6,759	8%
Totals	**11,196,816**	**10,694,887**	**-501,929**	**-10%**

Figure 5: Housing Operations- Energy Costs

Energy Source	2022	2023	Change	Percentage Change
Electricity	1,040,786	992,139	-48,647	-5%
Natural gas	1,037,161	1,325,592	288,431	28%
Totals	**2,077,947**	**2,317,731**	**239,784**	**12%**

While electricity costs were in step with the declines in electricity consumption, natural gas costs did not mirror the reduced consumption. This is largely the result of fluctuations in the commodity markets for natural gas. Figure 6 below depicts the commodity price changes in natural gas from January 2020 - July 2024. There were significant increases in the commodity price in 2022 and into 2023. These price increases in the spot market take approximately 6-8 months to be realized at the consumer level. As such, these high prices were felt in the 2023 calendar year.

Figure 6



A comprehensive list of energy consumption and costs can be found in the attached Appendices:

Appendix A – Energy Consumption and Costs- City Facilities (Data summarized according to facility type with graphs depicting energy use and costs)

Appendix B – Energy Consumption and Costs – Greater Sudbury Housing (Data summarized according to facility type with graphs depicting energy use and costs).

Opportunities to Reduce Energy Use

To reduce energy consumption in a facility, several upgrades can be considered. Upgrades to insulation, windows and doors, lighting, and HVAC systems, along with energy-efficient appliances and renewable energy sources, can significantly impact energy savings. These upgrades not only reduce costs but also contribute to a more sustainable and comfortable environment.

There are cyclical opportunities to address existing infrastructure, such as the natural transition at the end of serviceable life or upgrades due to a change in service or operation. Different types of infrastructure have different degrees of longevity, for example building HVAC systems (moderate longevity) versus their envelopes (high longevity). Increased energy efficiency can be realized by investing in appropriate upgrades during cycles of infrastructure maintenance and renewal. Additionally, the cost/benefit of various types of infrastructure improvements also vary significantly. Lighting and HVAC related upgrades have a more significant financial impact than many other upgrades as they tend to benefit most from technological improvements and ability to “right size”. These upgrades tend to reduce energy consumption by 15-30% and have payback periods between 4-10 years.

The City has taken steps to reduce energy consumption at facilities through various upgrades to processes, lighting, replacement of higher efficiency HVAC equipment and investments in renewable energy production and building automation systems. Some examples are illustrated in figure 7 below.

Figure 7 - Select Facility Refurbishments- Energy Reductions			
Description	**Locations**	**Annual kWh Saved**	**Annual Savings ($)**
Replace lighting with efficient LED	Arenas, community centers, libraries, TDS, P.M., Parks depots, Transit and parking lots	2,211,315	$287,471
Solar PV installations	Countryside Arena	245,437	$80,729
Solar PV installations	Pioneer Manor	218,431	$71,864
Pumps, Blowers, piping systems control system	Chelmsford WWTP	454,000	$59,060
Pumps, Blowers, piping systems control system	Coniston WWTP	87,672	$12,274
Pumps, Blowers, piping systems control system	David Street WTP	81,883	$10,665
Pumps, Blowers, piping systems control system	Dowling WWTP	303,300	$39,429
UV system, controls, PD pump replacement	Levack WWTP	163,024	$22,823
HVAC equipment replacement	Howard Armstrong Centre	98,800	$13,000
Intake and treated water pump, control systems and piping	Wahnapitae WTP	196,000	$64,734
Blowers, clarifier upgrades Piping, pumps, Controls	Sudbury WWTP	1,421,670	$184,300
Pumps, Blowers, piping systems control system	Valley East WWTP	377,030	$51,765
Ozone Laundry conversion, heat recovery ventilator	Pioneer Manor	1,241,000	$27,909
HVAC equipment, heat recovery ventilators	1160 Lorne	4,960	$5,544
Chiller head pressure and controls project	Countryside arena	33,299	$4,329
Building Automation Systems	TDS, 1160 Lorne, Transit Terminal, Lionel Lalonde Centre	168,560	$23,090

Utilizing asset management principles to maximize existing value to facility components and adhere to replacement cycles, the city will continue to replace high energy consuming HVAC equipment with more efficient equipment and add building controls when and where feasible.

Further Facility Energy Performance Initiatives

Staff in the Assets and Fleet Services division are working with an energy conservation company to audit and detail an energy reduction project at some of the City's major facilities including Pioneer Manor, Lionel Lalonde Centre, 1120 and 1160 Paris Street. The expectation is that the audit will outline a project scope that will reduce energy consumption, bear a positive financial return on the investment of new HVAC related equipment and the return on investment will be guaranteed by the conservation company. Staff will provide further information upon completion of the audit process.

Conclusion

City staff are taking steps in line with Council's CEEP goals to reduce greenhouse gas emissions at City facilities as a part of regular work and project plans. Projects aimed at lighting, renewable energy, plant process improvements, controls and HVAC refurbishments are often the projects that offer the largest return on investment both financially and in energy reduction. Combining these projects with the end of the natural life cycle of existing equipment assists in deriving full value from prior and future investments. The City will continue to use these opportunities to utilize scarce capital funds in the most effective manner to be able to reduce energy consumption while capitalizing on grant opportunities that become available.