2022 Annual Report on Energy Commodity Price Hedging
Energy Initiatives, CFEM, Public Works

September 2023

Linda Campbell

Manager, Energy Management

Corporate Facilities and Energy Management Division

Public Works Department

Introduction

The City of Hamilton's 2022 Annual Report on Energy Commodity Price Hedging deals exclusively with the City's energy commodity price hedging agreements and utility rate optimization transactions for natural gas, electricity and fuel.

Hedging is a risk management strategy to reduce price volatility by entering into energy supply contracts direct with commodity suppliers to fix the price for specific volumes and terms in the future. Rate optimization ensures that the correct utility rate class is selected for each account to reduce utility-related commodity costs (e.g. global adjustment for Class A customers).

Utility Rates and Commodity Strategies Results

The utility rates and commodity strategies the City participated in for 2022 include Global Adjustment (GA) rate changes and natural gas hedging programs. For the 2022 calendar year, there was a total of $3.43 M cost benefit; $3.56 M as a result of global adjustment savings for Class A rate customers and a loss of $0.13 M when compared to the agreed benchmark[1] from hedging of natural gas.

Table 1: 2022 Utility Rates and Commodity Strategies Results

2022 Results	$M		% Levy	% Rate
Global Adjustment	$	3.56	26%	74%
Natural Gas Hedging	-$	0.13	68%	32%
Total	$	3.43	25%	75%

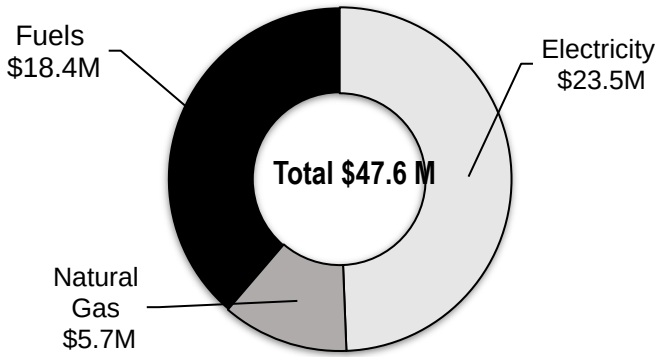
Further breakdown of these results can be found in the Global Adjustment and Natural Gas Risk Management sections in the report.

Overall Costs

In the City's 2022 Annual Energy Report (PW21049(b)) the total actual energy costs for electricity, natural gas and fuels were reported at $47.6 M. Overall, this is a 12% increase over 2021 energy costs. As outlined in the Annual Energy Report, the results in 2022 represent a more typical operational year for the City. The breakdown is shown in Figure 1.

[1] Benchmark of natural gas hedging activities against the procurement program offered by the Association of Municipalities of Ontario / Local Authority Services (AMO / LAS), posted annual rate.

Figure 1: 2022 Total Energy Costs (Electricity, Natural Gas & Fuel) in Millions (M)[2]

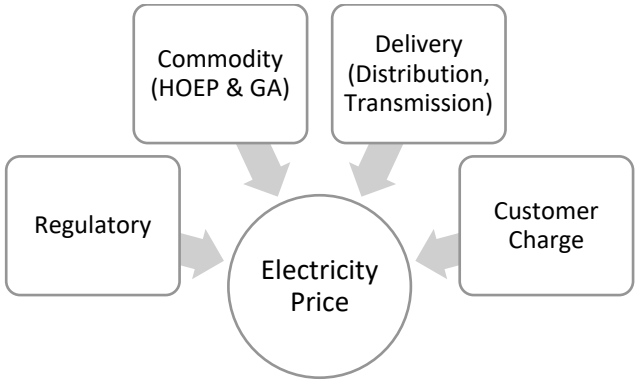


The electricity and natural gas costs, including those from district heating and cooling are incurred by City-owned buildings / facilities, Hamilton Water, Public Works Operations and Street and Traffic lighting. It excludes CityHousing Hamilton. Utilities include Alectra Utilities, Hydro One and Enbridge Gas Inc. Sites with only partial data may be excluded. Fuel costs here include diesel, unleaded gasoline and compressed natural gas (CNG) for all Fleet, Operations and Transit vehicles but does not include Hamilton Police Services or Darts vehicles.

Electricity

The electricity price comprises commodity, delivery, regulatory and customer charge. These vary depending on rate class and billing type. Hamilton is served by two local distribution companies (Alectra Utilities and Hydro One). Both Alectra Utilities and Hydro One are regulated by the Ontario Energy Board (OEB) and must get approval for any rate changes.

Figure 2: Sample Electricity Price Components



[2] Totals differ due to rounding. Actual total energy costs = $47,597,098

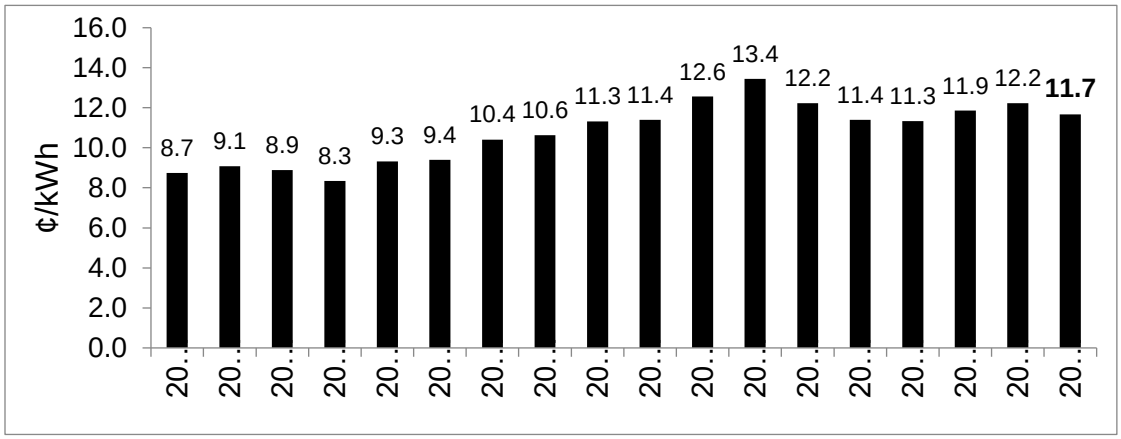
In 2022, the City's overall expenditure for electricity was $23.5 M. Electricity costs in 2022 decreased by 6% compared to 2021. The City's overall average price of electricity per kilowatt-hour (kWh) decreased by 5% from 12.2 ¢/kWh in 2021 to 11.7 ¢/kWh in 2022.

Table 2: Electricity Cost Comparison

Electricity	2022	2021	% Difference	Result
Cost ($M)	$23.5	$25.0	-6%	↓
Unit Price (¢/kWh)	11.7	12.2	-5%	↓

The average price for electricity, shown year over year, from 2005 to 2022 is outlined below in Figure 3.

Figure 3: City of Hamilton Annual Average Electricity Price – All In (¢/kWh)



There are a variety of factors that impact electricity cost, some of which are consumption, regulatory changes, market activity and weather.

In 2022, consumption had decreased by 2% compared to 2021. There were milder temperatures which require less electricity to cool buildings during the summer months as shown by the decrease in cooling degree days (CDD). CDD is a measure of how much (in degrees) and for how long, the outside air temperature was higher than 18°C. The cooling degree days overall in Hamilton were 6% lower in 2022 compared to 2021 and 9% lower than the five-year average.

Also contributing to cost reduction from 2021 was the removal certain regulatory cost items that had been related to cost recoveries from COVID-19 rate relief programs. Those were no longer being applied in 2022.

The electricity market in Ontario itself is complex and volatile. The commodity portion of the electricity price is made up of the Hourly Ontario Electricity Price (HOEP) and the Global Adjustment (GA). When the HOEP is low, the GA increases to cover the costs of generation. The monthly costs vary depending on consumer demand, generation mix, weather conditions and how often each type of generation is offered into the market[3].

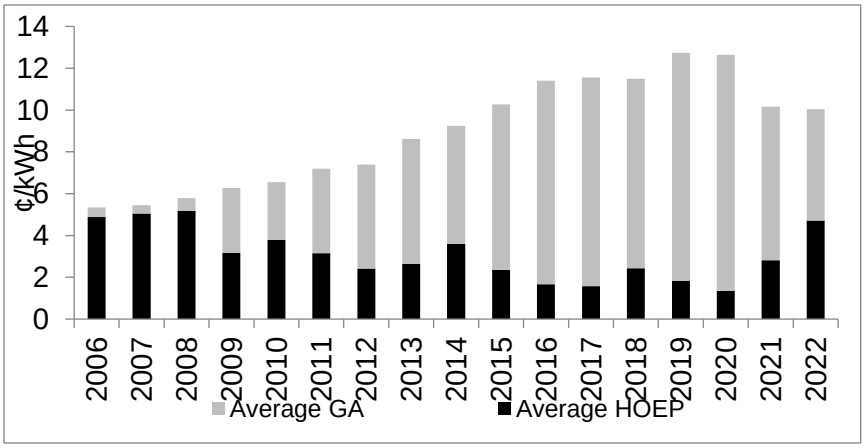
The annual average HOEP in 2022 was 4.71 ¢/kWh, and the average GA price component in 2022 was 5.33 ¢/kWh. The overall combined average commodity price for electricity was a 1% decrease from 2021.

Table 3: Annual Average HOEP & GA Comparison

Price(¢/kWh)	2022	2021	% Difference	Result
HOEP	4.71	2.81	68%	⬆
GA	5.33	7.35	-27%	⬇
Combined	10.04	10.16	-1%	⬇

It is possible to fix the price on forward terms for the HOEP. However, doing so does little to protect against the greater fluctuations of the GA, which typically makes up the larger portion of commodity costs. Staff recommendations have been to not hedge against the HOEP due to unfavourable market conditions. In 2022, the average HOEP was almost on par with the average annual GA, (47% and 53% respectively), as illustrated in Figure 4.

Figure 4: Electricity Commodity - Annual Average Price of HOEP and GA 2006-2022



[3] https://www.ieso.ca/en/Learn/Electricity-Pricing-Explained/The-Value-of-Electricity-Markets

Global Adjustment

The Global Adjustment (GA) is a market mechanism to account for differences between the market price and the rates paid to regulated and contracted generators and for conservation and demand management programs. Most of the GA costs are from contracts that the Independent Electricity System Operator (IESO) has with generators, many of which are fixed price or guaranteed revenue agreements. There is no market mechanism to hedge specifically against the GA rate.

When spot prices (HOEP) are lower, the generator does not earn enough revenue to meet its revenue guarantees. In that case, the IESO pays the generator to make up this difference and the costs are recovered from consumers through the GA. Therefore, in a month when the market price of electricity is low, the GA will be higher and conversely when market prices are high, the GA will be lower.

For billing of the GA costs, most commercial consumers are on a Class B rate. Class B consumers pay a regulated GA rate set monthly and posted by the IESO. Eligible, high electrical demand customers can opt for a Class A rate. Class A rate customers pay the GA costs based on their percentage contribution to the total monthly provincial GA costs, calculated on the top five peaks during a peak setting period. This is called the peak demand factor (PDF). Class A customers can impact their GA costs by reducing demand during peak periods, resulting in lower costs.

Class A sites within the City include 900 Woodward Avenue, 700 Woodward Avenue, 850 Greenhill Avenue, 78 Kenilworth North and CUP Operations. In July 2022, Tim Hortons Field was re-added (it had fallen off during the 2020-2021 period due to COVID-19 closures). The results for 2022 was a cost benefit of $3.56M as shown in Table 4.

Table 4: 2022 Global Adjustment Class A Results

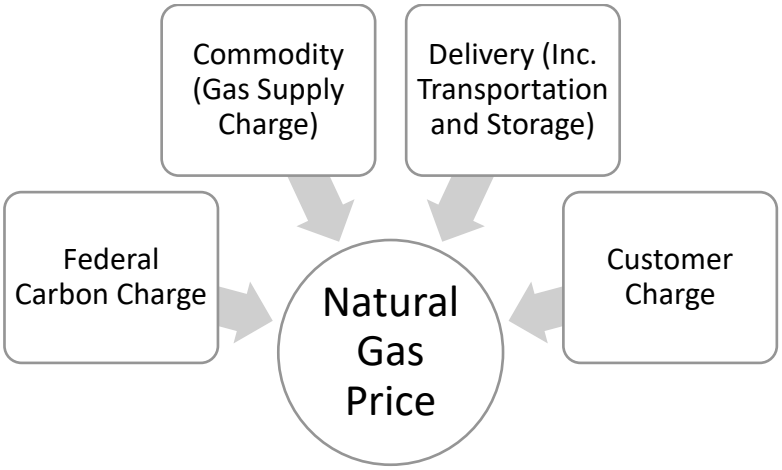
Global Adjustment Class A Results	2022 Results	Cumulative Results*
Levy (Tax) Supported Budget	$ 929,594	$ 12,144,620
Rate Supported Budget	$ 2,628,391	$ 38,189,304
Total Cost Benefits:	$ 3,557,985	$ 50,333,924

*Annual cumulative benefits 2011-2022

Natural Gas

The natural gas price includes gas supply charges (commodity), delivery, federal carbon charge and customer charges. Hamilton is served by one local distribution company, Enbridge Gas Inc.

Figure 5: Sample Natural Gas Price Components



The City's overall expenditure for 2022 natural gas was $5.7 M for City facilities. This is an increase of 10% over 2021 costs. There was an increase of 6% in natural gas consumption compared to 2021 totals, which was not unexpected. The biosolids production activity with Hamilton Water increased in 2022, and usage from heating of buildings had returned to pre-pandemic levels. The heating degree days (HDD) which is a measure of how much and for how long the outside temperature was lower than 18° C were 8% higher in 2022 than in 2021 and 1% higher than the 5-year average.

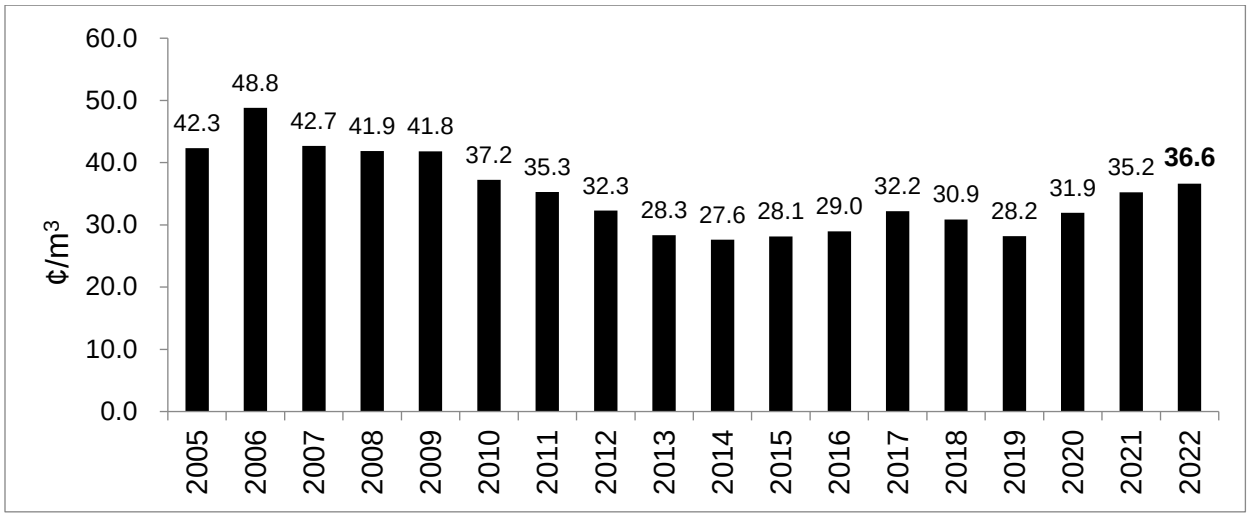
The overall average unit price was 36.6 cents per cubic metre (¢/m^3), which was a 4% increase compared to 2021.

Table 5: Natural Gas Cost Comparison

Natural Gas	2022	2021	% Difference	Result
Cost ($M)	$5.7	$5.1	10%	↑
Unit Price (¢/m^3)	36.6	35.2	4%	↑

The average price for natural gas, year over year, from 2005 to 2022 is outlined below in Figure 6.

Figure 6: City of Hamilton Annual Average Natural Gas Cost – All in (¢/m^3)



The largest impact to costs continues to be the annual increase to the Federal Carbon Charge (FCC). The FCC, mandatory for provinces without a designated carbon reduction plan, was implemented in Ontario starting August 2019. The FCC is charged per cubic meter of consumption and is included on Enbridge Gas bills. The FCC is set to increase annually every April and does increase costs as a result. The charge for the January to March 2022 period was 7.83 ¢/m^3 and increased to 9.79 ¢/m^3 as of April 2022.

Natural Gas Risk Management

Natural gas can be a volatile commodity. There are many factors that can influence prices in natural gas markets including weather, supply, demand, world political events and changes to refining and extraction technologies for the gas itself. To maintain control of costs and minimize the degree of price volatility, the City has purchased its natural gas directly from the wholesale market (since June 2006). The City has supply agreements with multiple parties to allow for competitive purchasing.

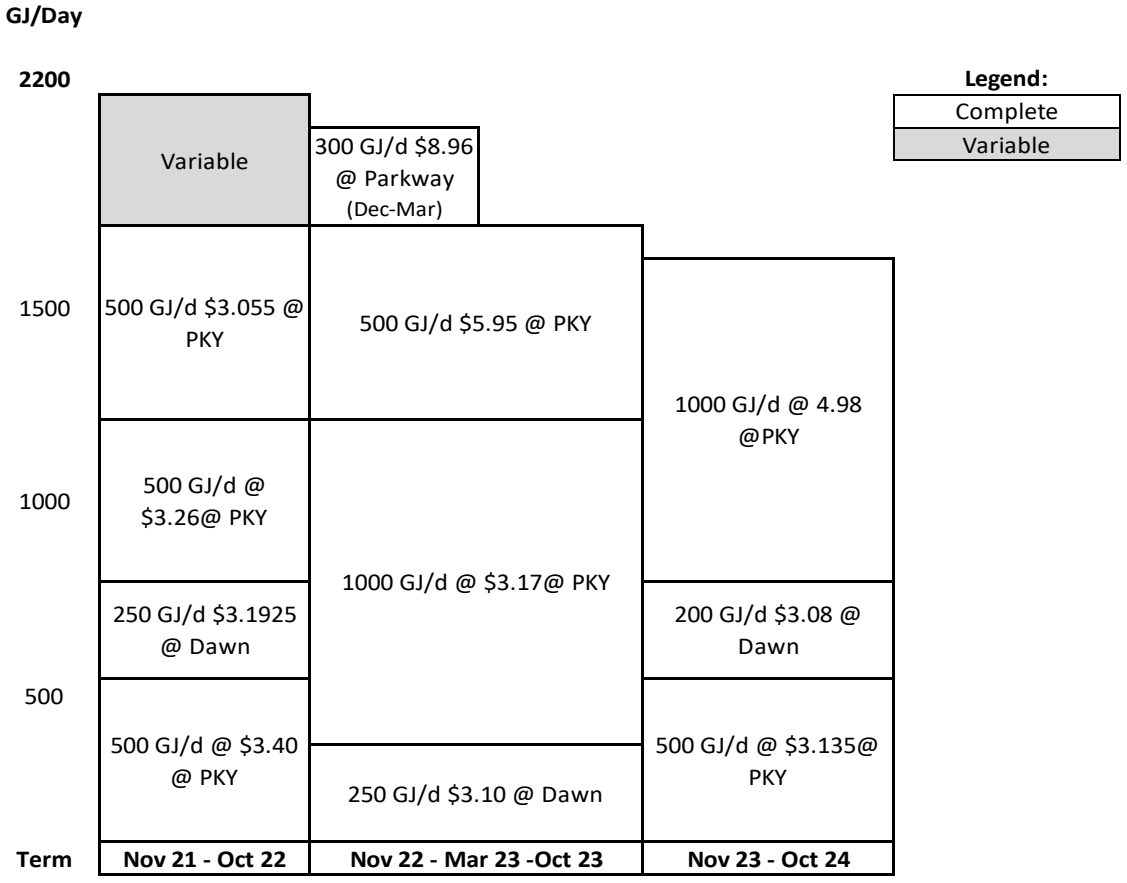
Overall, the strategy is dynamic and adapts to changes in market conditions. For example, a portion of natural gas supply may be purchased as much as two to three years in advance to protect against market volatility while other portions are purchased just a month or two in advance. Fixing the price on a portion of the City's natural gas volumes results in better budget predictability and protection against market fluctuations, particularly during extreme weather conditions or unforeseen events.

The City purchases natural gas for City-owned facilities (excluding CityHousing Hamilton) and for the Transit natural gas bus fleet, which is then compressed (CNG) for fuelling . The average 2022 price for the natural gas (commodity only) was $4.30 per gigajoule (GJ) ($0.166/$m^3$) including a blend of hedged and unhedged (variable)

volumes. This does not include any Enbridge Gas charges such as delivery, storage or federal carbon charge which make up the total price.
For the majority of 2022, an average of 78% of natural gas supply was fully hedged. This was based on 2022 volume requirements across all contracts. A portion of volumes for forward terms have also been hedged. Figure 7 provides a profile of the completed hedges shown with volumes (GJs) and prices.

The natural gas market trended upward in 2022, particularly with short-terms (such as next day or next month). There was increased demand for natural has both domestically and abroad, as unrest triggered pressure on prices. Prices in the summer months were higher than typical for that time of year. Forward terms for purchases into 2024 and 2025 also increased. Staff monitors the market and continues to develop strategies for purchasing into the forward terms to capture agreeable market opportunities and help mitigate volatile and uncertain periods.

Figure 7: Natural Gas Hedge Profile (as of January 2023)



Notes on Figure 7:

- GJ/Day = Gigajoule per day
- PKY = Parkway Ontario delivery point
- Dawn = Dawn Ontario delivery point

The City benchmarks its natural gas hedging performance against the procurement program that is offered by the Association of Municipalities of Ontario / Local Authority Services (AMO/LAS). The AMO/LAS purchasing program is available for municipalities that do not have their own hedging programs. The comparison is shown in Figure 8 with overall results shown in Table 6. In 2022, the posted AMO rate was less than the actual cost of the City's commodity. Although hedging did mitigate some of the higher prices in mid-2022, overall the City's price was 4% higher.

Figure 8: Annual Average Price Comparison of City to AMO/LAS Natural Gas Program[4]

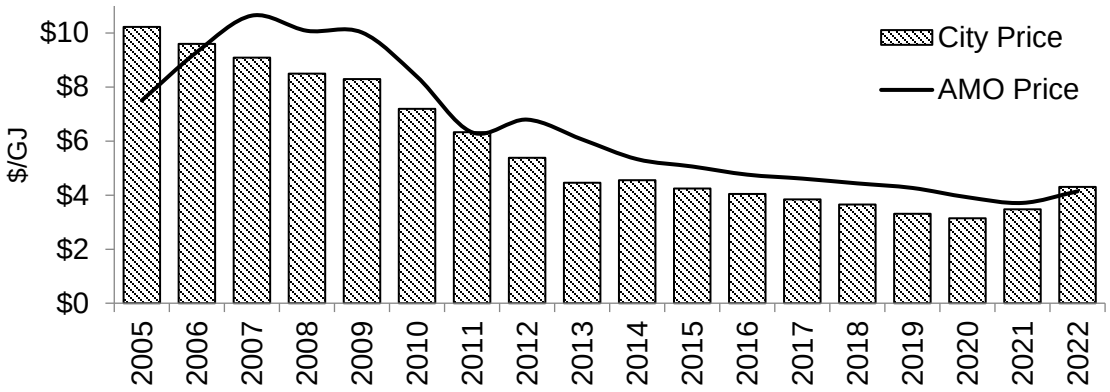


Table 6: Performance of Natural Gas Hedging Activity Compared to AMO/LAS Program

Natural Gas Hedging Performance Results	2022 Results	Cumulative Results[5]
Levy (Tax) Supported Budget	-$ 86,195	$ 7,720,686
Rate Supported Budget	-$ 41,320	$ 1,379,759
Total Cost Benefits:	-$ 127,514	$ 9,100,445

Although hedging activities do serve to effectively manage the commodity portion of natural gas prices, controlling consumption plays a role in managing the overall costs of natural gas.

Natural Gas Agreements for Supply, Transportation, Storage and Delivery

In 2022, the City had master agreements for natural gas supply in place with Shell Energy North America (Canada) Inc., Tidal Energy Marketing Inc., Royal Bank of

[4] As posted on LAS program website. https://www.las.on.ca/

[5] Performance relative to AMO/LAS Natural Gas Hedging Program 2006-2022

Canada and Twin Eagle Resource Management Canada LLC. All current supply counterparties have credit ratings that are compliant with the Corporate Energy Policy. [6]

In addition, the City has contracts in place with Enbridge Gas that are required to facilitate the transportation, delivery and storage of the City's natural gas supply. The utility agreements include a direct purchase agreement for City sites, two T1 rate storage contracts for managing Transit CNG and Hamilton Water biosolids plant and an M13 rate production contract for renewable natural gas.

Direct Purchase Agreements (DPA) with Enbridge Gas

DPAs outline the terms of service for delivery of natural gas, including designated delivery points, contract volumes and storage. The parameters are shown below in gigajoules (GJ) which is the unit in which gas is purchased to meet the requirements. Prices and consumption data on Enbridge Gas bills are reported in cubic metres (1 GJ = ~26 cubic metres (m3)). In 2022, the agreements and parameters on contract renewal were:

- SA7020 for 1,032 GJ/day – 254 miscellaneous City natural gas accounts which run from November 1 to October 31 each year.
- T1 for 692 GJ/day (increased to 832 GJ/day as of September 2022) - For Transit's CNG bus fleet and transit site. The contract runs September 1 to August 31 each year.
- T1 for 460 GJ/d (as of May 1, 2022) – For Hamilton Water biosolids production operation. The contract runs from May 1 to April 30 each year.

Each DPA has its own specific delivery requirements, at different points along the variety of pipelines within North America and are reviewed and renewed annually. DPAs may also be amended throughout the year or adjusted to meet specific parameters.

Compressed Natural Gas (CNG)

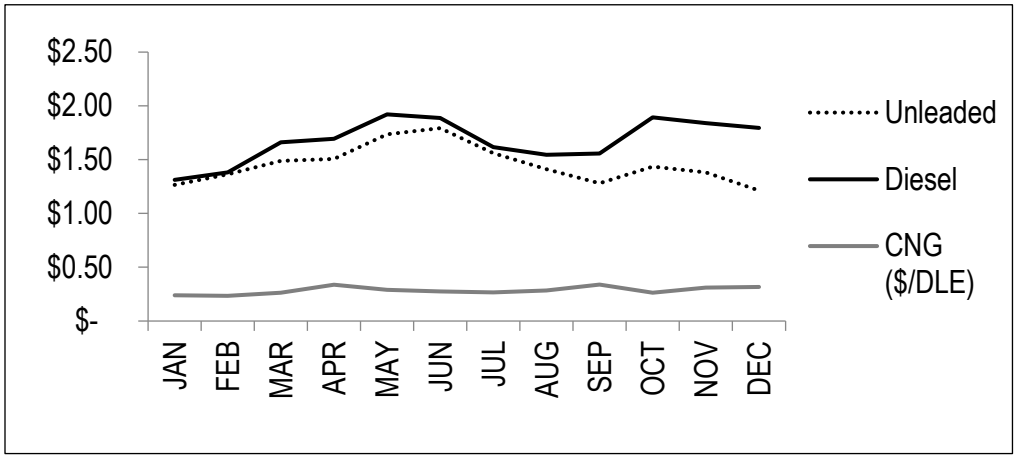
Natural gas is also purchased for Transit's fleet of natural gas buses. The CNG station at the Mountain Transit Centre services the fleet of existing and growing number of natural gas buses for the City.

The CNG station operates under a natural gas storage contract (T1) noted above. The T1 is a daily-balanced contract with storage availability. The difference between the daily volumes purchased and consumed are injected or withdrawn from the storage account. The contract allows for greater flexibility in managing the supply but must be reviewed daily to adhere to specific storage parameters.

[6] Twin Eagle Resource Management Canada LLC is a private company and ratings are not publicly posted, however their financial statements are available for review. The City is in the process of determining requirements for a financial review.

The Transit fleet of natural gas buses totalled around 188 by the end of 2022 and is expected to increase with a series of replacements from diesel to CNG. Natural Gas has a lower cost compared to diesel; however, it does operate at approximately 75% efficiency per diesel litre equivalent when compared to diesel bus usage. In 2022, the total cost of natural gas for the buses was $1.97 M. Figure 9 shows the City's monthly fuel prices with CNG price converted to diesel equivalent (DLE).

Figure 9: 2022 Monthly Average Fuel Prices[7] for Diesel, Unleaded Gasoline and CNG



When converted to diesel equivalent dollars and adjusting for efficiency[8], Transit spent $6.5 M less in fuel costs using CNG buses than they would have using only diesel buses.

Table 7: 2022 Cost Benefit of CNG as Compared to Diesel

2022		
Diesel Litre Equivalent (L)		6,891,128
Number of DLE Litres of Diesel Required*		5,099,435
DSL cost at $1.66/L (Average Fuel Price)	$	8,486,282
2022 CNG Cost	$	1,973,601
Avoided fuel cost by using CNG	$	6,512,681

Traditional Fuel Supply

The City of Hamilton purchases diesel and gasoline fuel for its fleet of vehicles including buses, waste collection vehicles, snow removal trucks, street sweepers, forestry and parks vehicles, as well as Fire and Emergency Services vehicles. In addition, the City purchases fuel for Hamilton Police Services. In 2022, the City's fuel procurement strategy was using a bulk supply agreement with Suncor Energy Products Partnership.

[7] Prices include Fleet charge of 3.5 cents per litre for diesel and gasoline.
[8] Average of CNG buses run at ~75% of DLE compared to average DSL bus.

Fuel contracts are reviewed annually and based on pricing, deliverability and fuel types, the strategy can be adjusted accordingly.

The pricing for diesel and gasoline for 2022 was the daily "rack" price of each required fuel type from Hamilton terminal with negotiated discounts, delivery charges and taxes. Paying daily rack pricing for fuel assures the City is getting the lowest available price on the market for that day. Suncor Energy Products Partnership has a credit rating that is compliant with the Corporate Energy Policy.

The 2022 budget prices for diesel and gasoline were both set at $1.10 per litre. The actual average diesel and gasoline unit prices ended 2022 over budget, and overall costs were 33% over the set budget. Prices for diesel and gasoline increased steadily in 2022 as provincial and global demand for fuels increased, and political unrest resulted in upward pressure on prices for oil. Also, consumption was slightly less, the increase in costs saw the variance of actual to budget was over $4.7 M in 2022. Table 8 shows the 2022 results as compared to budget.

Table 8: 2022 Actual Fuel Consumption and Costs Compared to Budget
(Diesel and Gasoline)

Fuel Type	2022 Budget	2022 Actual	2022 Variance (Actual - Budget)
Diesel Consumption (L)	8,064,792	7,664,103	- 400,689
Diesel Cost ($)	$ 8,871,268	$ 12,754,304	$ 3,883,036
Diesel Unit Price ($)	$ 1.10	$ 1.66	$ 0.56
Gasoline Consumption (L)	2,552,471	2,541,761	- 10,710
Gasoline Cost ($)	$ 2,807,730	$ 3,703,290	$ 895,560
Gasoline Unit Price ($)	$ 1.10	$ 1.46	$ 0.36
Total Consumption (L)	10,617,262	10,205,864	- 411,399
Total Costs ($)	$ 11,678,998	$ 16,457,594	$ 4,778,596

Purchasing wholesale fuel does help insulate the City from some of the costs associated with fuel that might otherwise be purchased at the at public fuel stations, largely associated marketing fees. However, City prices do include Fleet's fee of 3.5 cents per litre.

Fuel Risk Management

Like other commodities, diesel and gasoline markets are volatile and are impacted by many local and global factors. One method to manage volatility is to hedge volumes for a forward term at a set price. This is typically achieved by using a financial hedge to manage fluctuations in the market. Although the City has hedged in the past and staff

continue to monitor related markets for favorable opportunities, no volumes were hedged in 2022 or are currently hedged for future.

Contract Agents

Managing the annual energy cost of over $47 M requires continuous attention within an ever-changing energy industry. To maximize available expertise, the City uses outside consultants (Contract Agents) to assist staff with the complex energy commodity markets and associated regulatory frameworks. In 2022, the City had a professional services agreement with Jupiter Energy Advisors Inc. to assist with the day-to-day management of the City's natural gas portfolio.

Additionally, the City reviews several market-based publications and engages with outside parties to further gather information on factors influencing pricing both domestically and globally.

Consistency with City Energy Commodity Hedging Policy and Goals

The agreements executed during the reporting period are consistent with the City's Commodity Price Hedging Policy and Goals:

- The agreements have provided for a price of natural gas that was more stable and therefore, less risky than it would have been omitting the agreements;
- The actions taken through the authority of the Energy Commodity Policy have reduced uncertainty about energy costs, which have a direct impact on the City's financial position. It has also enabled staff to respond to favourable market conditions;
- Credit ratings for the City's primary commodity suppliers remain above the minimum threshold outlined in the policy;
- Commodity hedging provides municipalities with added flexibility to potentially mitigate or manage potential price fluctuations.

Glossary of Common Acronyms and Terms

CDD = Cooling Degree Days: Is a measure of how much (in degrees) and for how long, the outside air temperature was higher 18°C.

Class A / Class B: The rate classes for global adjustment that is based on electrical demand. Class A is eligible high demand enrolled in the ICI program; Class B is a typical commercial demand customer.

Commodity Hedging is the process of fixing prices for specific terms for natural gas, fuels or electricity (commodities).

Corporate Energy & Sustainability Policy is the revised and renamed corporate policy (previously the Corporate Energy Policy) governing energy-related decisions for corporately run assets.
CNG = Compressed Natural Gas: Natural Gas that is compressed at a station for fuelling vehicles.

DLE = Diesel Litre Equivalent

GA = Global Adjustment: Makes up a portion of the electricity commodity with the HOEP.

GJ = Gigajoule: Unit of measure that natural gas is typically purchased in from suppliers. 1 GJ = 26.8 m3.

HDD = Heating Degree Days: Is a measure of how much (in degrees) and for how long, the outside air temperature was lower than 18°C.

HOEP = Hourly Ontario Electricity Price: Makes up a portion of the electricity commodity with the GA.

ICI = Industrial Conservation Initiative: The global adjustment initiative by the IESO for high demand customers eligible as Class A.

IESO = Independent Electricity System Operator: the market operator for Ontario electricity.

kWh = Kilowatt-hour

Market Price refers to (in this case) the current price that the commodity can be bought or sold and is influenced by supply and demand factors.

m^3 = Cubic Metres: Unit of measure that natural gas is billed in by Enbridge gas.

OEB = Ontario Energy Board: Regulatory board for utilities.

Rack Price refers to the price of diesel or gasoline at the distribution terminal, loaded and ready for delivery.

Rate Optimization refers to ensuring that utility accounts are assigned to the appropriate rate class to result in best cost benefit.

Unit Cost is the total price of variable and fixed costs per unit. In this report it refers to unit costs of electricity, natural gas and fuels.

Utility Rates refers to the rate classes identified by local utility providers.