



Corporate Strategic Energy Management Plan 2022

January 2023



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Executive Summary

The Corporate Strategic Energy Management Plan (SEMP) is the City of Kelowna's blueprint for becoming more energy efficient, reducing its corporate greenhouse gas emissions, and supporting a more sustainable future for Kelowna. The SEMP outlines the recommended 2030 corporate energy and emissions targets and details the plan to achieve progress toward these targets and beyond.

Energy is essential to the City of Kelowna's operations. It is used to power, heat, cool and operate corporate buildings, to fuel fleet vehicles, and to provide important services to the community such as water, liquid waste management, parks and outdoor facilities, waste management, and streetlighting.

Where are we now?

In 2021, the City consumed a total of 72.7 equivalent gigawatt hour (eGWh) worth of electricity and natural gas in its corporate building profile. The City spent a total of \$8.15 million on energy costs for its buildings and fleet. These energy costs are projected to increase.

Corporate GHG emissions have decreased by 0.7% overall since 2007. Unfortunately, the City is not on the trajectory to reach the GHG emissions target set in the 2017 Corporate Energy and GHG Emissions Plan to reach 12% below 2007 levels by 2022.

Where do we want to go?

The Corporate Strategic Energy Management Plan recommends the endorsement of targets that align with provincial targets to reduce absolute corporate greenhouse gas emissions by **40% below 2007 levels by 2030; and to achieve net zero by 2050**. The SEMP also recommends the endorsement of an energy use intensity target for the Top 25 GHG emitting buildings by **20% below 2012 levels by 2030**.

It is recommended that the following two KPIs be adopted and tracked to assess progress and the general success of this SEMP over time:

KPIs	
GHG Emissions Reductions (tCO ₂ e/ year)	Reduced Energy Use Intensity (ekWh/m ²)
Targets	
40% reduction (tCO ₂ e) by 2030 from 2007 levels (409 tCO ₂ e/ year)	20% reduction in energy use intensity by 2030 from 2012 levels

How will we get there?

The business-as-usual emission model projects that corporate emissions will reach 11,400 tonnes of carbon dioxide equivalent (tCO₂e) by 2030. If all projects within the Multi-Year Action Plan (see Section 6.4) are implemented, the City is projected to emit around 8,500 tCO₂e by 2030. Even with the most aggressive planned projects being implemented, the City is still anticipating a gap of around 4,000 tCO₂e to reach the emissions target of 40% below 2007 by 2030 (4,580 tCO₂e).

The SEMP describes processes for identifying energy projects and the prioritization of these projects. The continual updating and tracking of the Multi-Year Action Plan will be critical. The SEMP also outlines actions that were identified through the Energy Management Assessment in July 2022.

Ultimately, significant investments in the following areas will be required to reach the proposed 2030 targets. An effective way to prioritize these investments is to focus on completing actions on at the top of the list first and then work downward:

Actions and Initiatives		
1	Optimize Existing Assets	<ul style="list-style-type: none">• Maintain an aggressive continuous optimization program with staffing to ensure equipment and systems are operating as per design
2	Energy Efficiency and Electrification	<ul style="list-style-type: none">• Replace end-of-service life equipment with more efficient models• Retrofit mechanical systems to more efficient designs• Switch to low-carbon heating systems
3	Deep Retrofits	<ul style="list-style-type: none">• Convert to lower temperature heating systems where possible• Upgrade building envelopes when deemed appropriate
4	Renewables	<ul style="list-style-type: none">• Install renewables like solar photovoltaic, geo-exchange and wastewater heat recovery and cooling systems where suitable• Secure Renewable Natural Gas and Biodiesel to cover shortfalls in GHG emissions reduction.

Knowing the source of the greatest emissions and energy consumption within the organization is key to addressing them. The City is well established to monitor, analyze, track changes, and report on energy use and building performance using actual consumption data, which allows for the comparison of performance of building sites, energy use, emissions generated, and utility rate costs.

The City of Kelowna is well-positioned to build upon its renewed sense of direction and commitments and has strong internal support for investing in measures that further reduce energy consumption and advances the decarbonization of the City's buildings and fleet.

1. City of Kelowna's Commitment

1.1. Purpose

Environmental concerns and the need to be responsible with our use of energy resources are driving organizations to change the way energy use and energy costs are viewed. Rather than being an inevitable cost of doing business, energy can be considered a manageable input, much like any other resource cost.

This Corporate Strategic Energy Management Plan (SEMP) is the City of Kelowna's forward-looking business plan for reducing energy consumption, utility costs, and greenhouse gas (GHG) emissions from our buildings, fleet and outdoor spaces.

The SEM Plan outlines the recommended 2030 corporate energy and emissions targets and details the recommended plan to achieve progress toward these targets and beyond.

The structure of the SEM Plan, and how it fits into a cycle of continual improvement for the City, is depicted below.

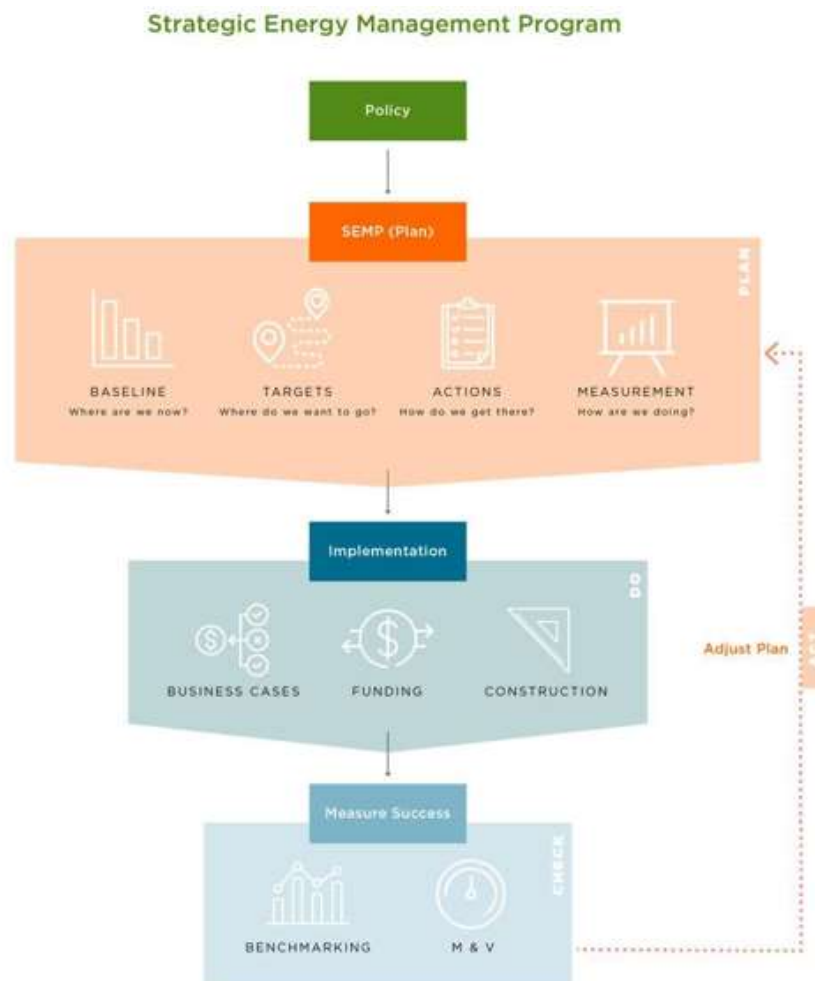


Figure 1: SEM Framework for City of Kelowna

While stand-alone energy management projects can be impactful, they can often be more impactful and more economically efficient if coordinated with other energy management and building maintenance projects. This SEMP provides the “big picture” view and establishes an ongoing framework for optimizing overall energy use and helping the City achieve long-term success.

Figure 2 shows the circular steps that have been adopted as part of the SEMP planning process. This closed-loop feedback approach is most effective in demonstrating results that will justify further investment in efficiency. Savings demonstrated from implemented projects encourage further investment in energy initiatives.



Figure 2: Closed-loop Planning Process

1.2 Baseline and Boundary

The SEMP uses utility and facility data to establish the City’s current energy performance baseline.

The boundary of the SEMP and associated targets and actions is currently limited to all owned and leased **assets** (buildings, fleet and outdoor spaces) that the City pays the utility or fueling costs for that fall under the management of the following departments:

- Building Services
- Parks Services
- Utility Services (includes water, wastewater, and solid waste operations)
- Protective Services (includes Fire and Police)
- Fleet Services
- Kelowna Airport Authority

The City has established 2012 as the base period for all energy comparisons and continues to use 2007 as the GHG emissions baseline¹.

Although the existing and targeted emissions reported herein, include those from both Building Services and Fleet Services, a detailed Green Fleet Strategy is being maintained separately. Additionally, the Kelowna International Airport has a separate GHG Emissions Reduction Policy (Airport, 2022) that is also being measured and maintained separately.

2. Where are we now?

2.1 Organizational Summary

Kelowna is located on the traditional, ancestral, unceded territory of the syilx/Okanagan people in an area of 214 square kilometres. Kelowna is the largest community in the Regional District of Central Okanagan with a population of over 144,500. The general organizational profile includes approximately:

- 160 owned and leased sites
- 1200 employees
- 1,500,000 sqft of floor space²
- 8,260 tonnes of carbon dioxide equivalent (tCO₂e) Greenhouse Gas Emissions in 2021

The City of Kelowna provides municipal services to residents, including recreation, culture, and parks; water, storm water and sewer utilities; fire and rescue; community planning and development; local road infrastructure and engineering services; waste and recycling collection; and more.

The SEMP encompasses all the energy consumed by the City to provide these municipal services (also commonly referred to as the City's "corporate" energy use). The SEMP does not cover community energy use which is the energy used across the City by residents and businesses.

Energy is essential to the City of Kelowna's operations. It is used to power, heat, cool and operate community and administrative buildings, to fuel fleet vehicles, and to provide important services to the community such as water, liquid waste management, parks and outdoor facilities, waste management, and streetlighting. This SEMP is the City's blueprint for becoming more energy efficient, reducing its corporate greenhouse gas emissions and energy costs, and supporting a more sustainable future for Kelowna.

2.2 Organizational Profile

The City is organized into eight divisions. The City employs an Energy Manager who works within the Partnerships and Investment Division under the Building Services Department. The organizational units responsible for ensuring an energy efficient, emissions reduction lens is applied to renewal of

¹ Corporate GHG emissions totaled 8,317 tCO₂e in the 2007 baseline year.

² According to *Building Condition Assessment Tracking* records.

facility assets and system improvements are outlined in Figure 3. The area marked as orange dashed line indicates the anticipated resources required on the Energy Team. Additionally, there is a fleet services team that is responsible for the renewal and improvements of fleet assets.

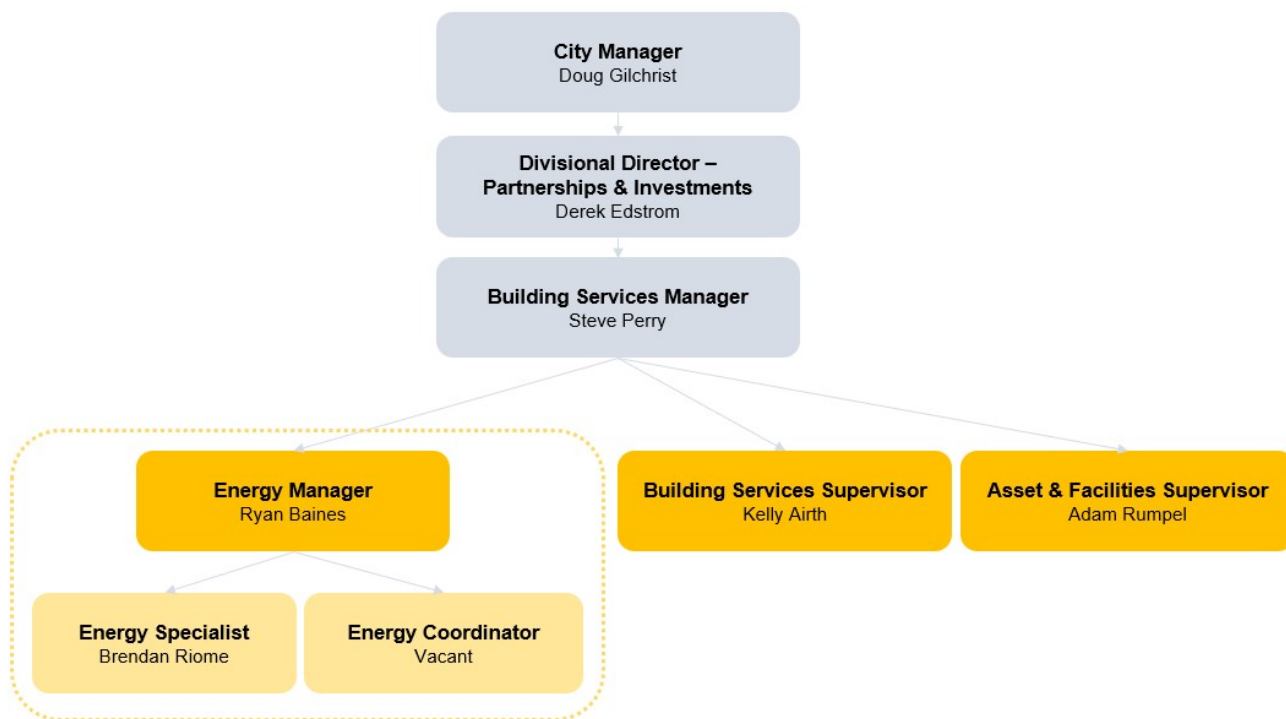


Figure 3: Energy Team Organizational Structure

2.3 Organizational alignment

The City of Kelowna's five-year Community Climate Action Plan (CCAP) endorsed in 2018, set targets of 4% GHG emissions reductions below 2007 levels by 2023. Since the 2018 CCAP's development, new Intergovernmental Panel on Climate Change (IPCC) research findings and calls to action have been published.

The IPCC asserts that global GHG emissions must be reduced by 40 to 45 percent below 2010 levels by 2030 and reach net-zero by 2050 to limit global warming to below 1.5 degrees Celsius and avoid catastrophic climate change impacts. In response to these findings, Federal and Provincial climate change directives have adopted more aggressive GHG emissions reduction targets and timelines. In British Columbia, the Province published the CleanBC Report (2018) which sets targets to reduce GHG emissions by 40% by 2030 (below 2007 levels); and to achieve net zero by 2050.

In response to the IPCC findings and Federal and Provincial policy changes, Kelowna is in the process of adopting a new community-wide emissions reduction target³. It is anticipated that the target will align or exceed the provincial GHG emissions reduction targets.

³ As found in the *Climate Resilience Kelowna GHG Modeling and Targeting Council Report* on June 20, 2022.

The corporate energy management program, through the means of the Corporate Strategic Energy Management Plan will recommend the endorsement of targets that align with provincial targets to reduce absolute corporate greenhouse gas emissions by **40% below 2007 levels by 2030; and to achieve net zero by 2050.**

Figure 10 in Section “4.1: Corporate GHG Emissions Forecasting”, shows where the City is today in terms of corporate GHG emissions and where it plans to be by 2030, assuming all the identified energy and emissions reduction projects can be implemented.

2.4 Historical Corporate Energy

The City of Kelowna has been making efforts to reduce both corporate and community greenhouse gas emissions for many years. Below are some highlighted planning and resource efforts that pertain to the corporate energy program:

- In 2001, the City of Kelowna joined the Federation of Canadian Municipalities (FCM) Partners for Climate Protection (PCP).
- In 2008, the City of Kelowna signed on to the BC Climate Action Charter. By signing the Charter, the City committed to measuring and reporting on GHG emissions profiles and making progress towards becoming carbon neutral.
- In 2011, City Council adopted the 2011 Corporate Energy and GHG Emissions Plan, creating the initial framework for the corporate energy and GHG reduction goals. A 2007 energy and emission baseline was created, but by 2009, emissions had increased to 8,808 tCO₂e, due mainly to the addition of the H₂O aquatic center. The Business-As-Usual forecast for 2017 predicted that GHG emissions would rise to 10,118 tCO₂e, a 22% increase from the 2007 baseline.
- In 2015, the City joined FortisBC's Energy Specialist Program and Council gave direction to hire a Corporate Energy Specialist to oversee the Energy Committee and assist the efforts of City staff to further reduce corporate energy.
- In 2017, the Corporate Energy and GHG Emissions Plan was adopted. The target was set to reduce GHG emissions by 12% below 2007 levels by 2022. The City had mitigated an increase in its corporate energy use even during a 10-year period of 16.8% population growth and reported on a 7% decrease in annual corporate emissions.
- In 2020, the Energy Manager role was created.
- In 2021, the Green Fleet Strategy was established for light duty vehicles. A roadmap was developed that would achieve: a 49% EV adoption rate; a 49% reduction of emissions; and a 2% reduction in the life cycle cost of these fleet.

2.5 Energy Management Assessment

An initial stage of developing and implementing a long-term SEMP is to complete an Energy Management Assessment (EMA) or a gap analysis of the current program. As part of the process, Prism Engineering facilitated an in-person session in July 2022.

Fifteen participants from the City of Kelowna attended the session.

The Energy Management Assessment reviewed the extent that the City of Kelowna has incorporated energy management and carbon reduction practices into its operations and governance and identified priorities for actions to be taken in the next 3-5 years.

To evaluate these practices and priorities, the Prism ENGAGE EMA tool reviewed four key energy management areas of influence – **business, operations, people and technology** – which are described in the table below.

Area of Influence	Description
Business	Assesses the overall organizational structure, strategies and plans relating to energy management.
Operations	Assesses the company's operations and actions towards implementing energy management plans and targets.
People	Assesses the extent to which people are responsible and accountable for energy management.
Technology	Assesses what technologies and projects have been identified, funded and put in place to achieve savings.

Using an online polling software and discussion, the group reviewed 20 attributes within these areas of influence and provided a score based on how well an attribute is integrated into the company's governance and operational structure. A general version of the scale is detailed in the table below.

Score Level	Description
4 Advanced	Fully developed and integrated energy management as part of a broader sustainability or corporate image program.
3 Integrated	Energy management system with capacity and activities as an integral part of the business operation and strategy.
2 Structured	Formal energy management activities and action plan as a stand-alone initiative.
1 Initial	Ad hoc energy reduction activities, driven by current issues, led by interested/knowledgeable individuals.
0 No Action	No explicit activity or capacity.

The outcome of the EMA session resulted in an **overall current score of 1.2 and an overall target score of 3.0.**

This score indicates that the City of Kelowna has an initial energy management program with some structured energy management activities. The organization is striving to achieve a more integrated energy management program that becomes a fundamental part of business, operation and strategic planning.

As part of this session, the group developed a prioritized list of actions for the next 3-5 years, which is detailed within Section “6.5 Energy Management Assessment Actions”.

2.6 Buildings Energy Profile 2021

The City’s corporate buildings energy profile over the years (2012 – 2021) is detailed in Figure 4. Between 2013 and 2014 there is a significant increase in total energy use at the City from 38.5 equivalent gigawatt hours (eGWh) per year to 63.2 eGWh. From 2014, the total energy use trends consistently upward until 2019 when it reaches 75.7 eGWh. In 2020, there is a decrease in total energy use (70.6 eGWh), likely due to Covid-19 and the decreased use of buildings. In 2021, energy use totals 72.7 eGWh.

Electricity use saw a significant increase between 2013 to 2014 from 21.3 GWh to 44.1 GWh, and it remains consistent between 2014-2016. Starting in 2017, there is an increasing consumption trend until 2019. Then electricity use drops from 53.3 GWh in 2019 to 49.7 GWh in 2020. In 2021 electricity use totals 51.5 GWh.

Fuel (natural gas) use also saw an increase between 2013 to 2014 from 17.2 eGWh to 19.2 eGWh. The fuel use remains consistent between 2015 to 2021 (ranging between 20.1 eGWh to 23.3 eGWh). In 2021 fuel use in buildings totals 21.3 eGWh.

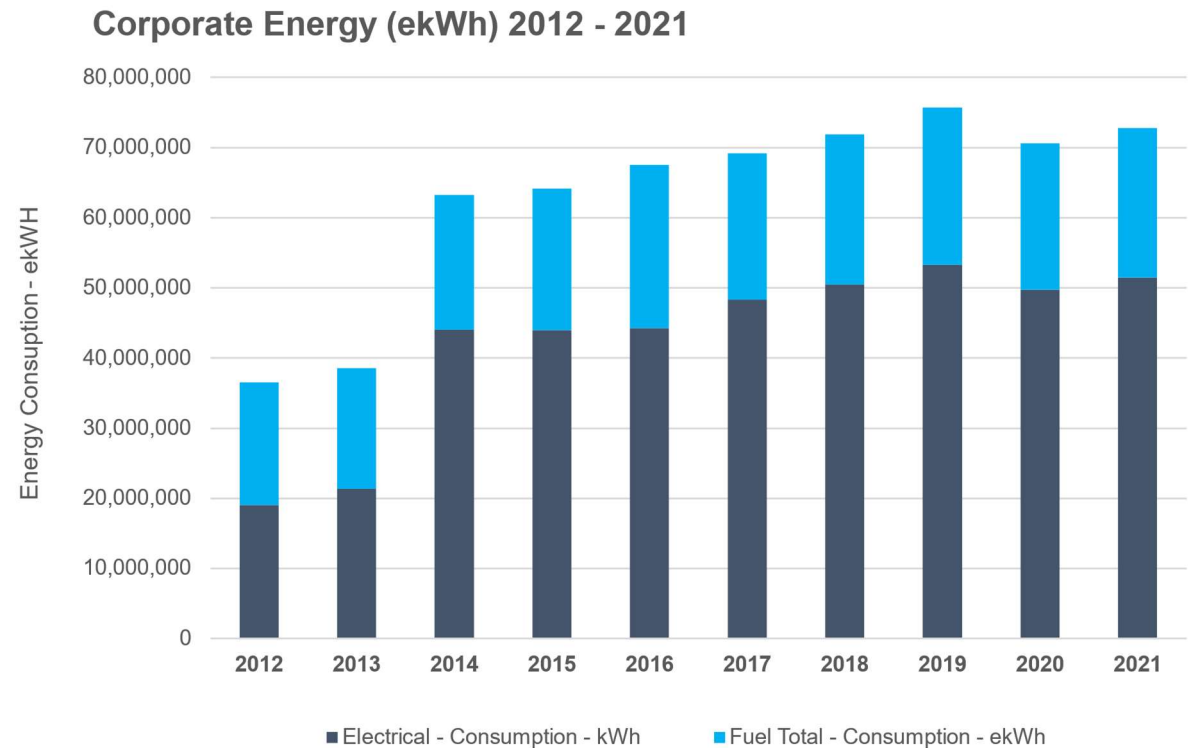


Figure 4: Corporate Energy Consumption (ekWh) 2012 - 2021

2.7 GHG Emissions Profile 2021

Understanding the City's GHG emissions profile, which includes buildings and fleet is crucial to developing mitigation measures. The City's corporate GHG profile has been measured and publicly reported since 2007.

The City's corporate GHG emissions totals 8,260 tCO₂e in 2021. Figure 5 shows a year-over-year trend with a consistent annual total of GHG emissions between 2015-2018 (ranging between 8,961 to 9,276 tCO₂e), then in 2019 and 2020 there is an increase in annual GHG emissions totals. The increase of emissions in 2020 is due to the emissions intensity factors⁴ increasing from 2.99 tCO₂e/GWh in 2019 to 4.01 tCO₂e/GWh in 2020. The noticeable decrease in GHG emissions (tCO₂e) in 2021 is due to a significant reduction in emissions intensity factors between 2020 and 2021 from 4.01 tCO₂e/GWh to 0.97 tCO₂e/GWh.

Corporate GHG emissions have decreased 0.7% overall since 2007 from 8,317 tCO₂e to 8,260 tCO₂e in 2021. Unfortunately, the City is not on the trajectory to reach the GHG emissions target set in the Corporate Energy and GHG Emissions Plan (2017) to reach 12% below 2007 levels by 2022.

Corporate GHG Emissions (tCO₂e) 2012 - 2021

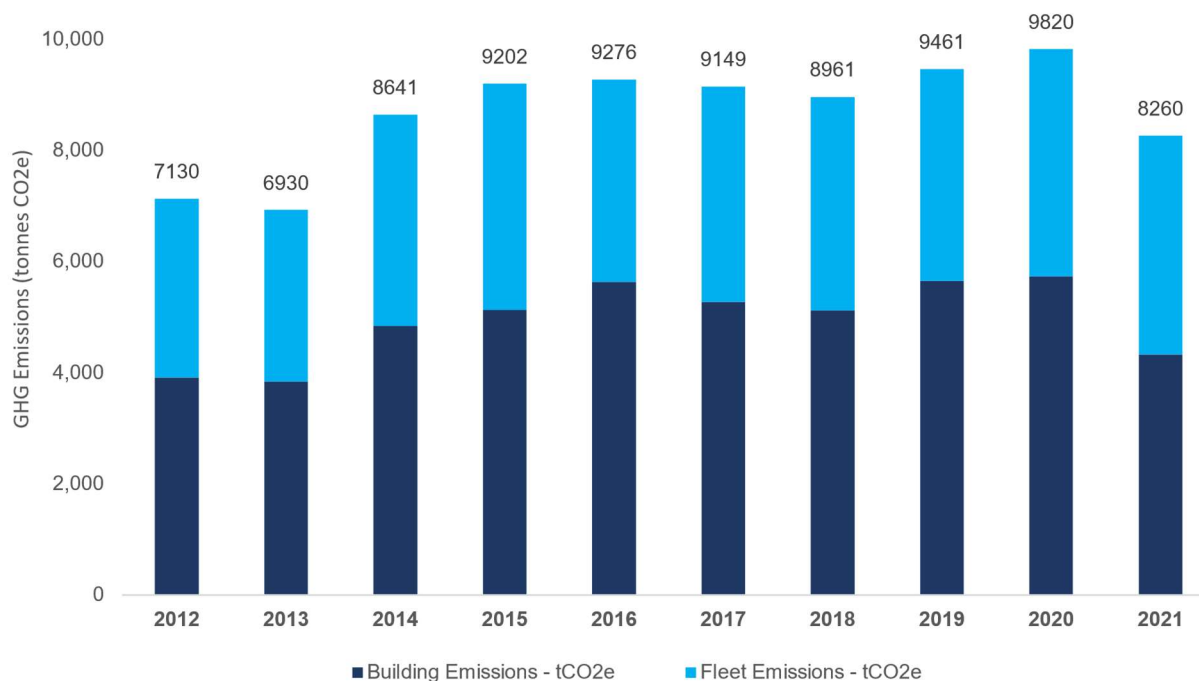
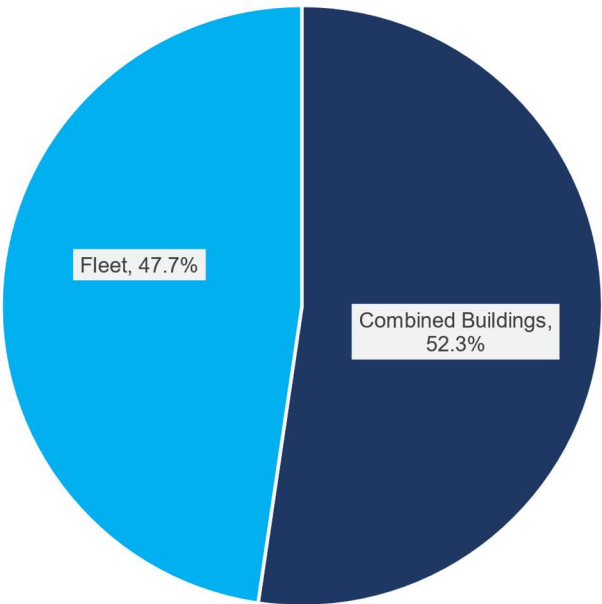


Figure 5: Corporate GHG Emissions (tCO₂e) 2012 - 2021

⁴ The emission intensity factors (tCO₂e/GWh) by year for BC's Integrated Grid is found in Appendix C, and also at: <https://www2.gov.bc.ca/gov/content/environment/climate-change/industry/reporting/quantify/electricity>

As demonstrated in Figure 6, fleet fuels emit 3,937 tCO₂e (47.7%) and buildings emit 4,323 tCO₂e (52.3%) of overall corporate GHG emissions profile (8,260 tCO₂e) in 2021.



Fleet	Combined Buildings
3937 tCO ₂ e	4323 tCO ₂ e

Figure 6: Total Profile Emissions – Fleet Vs. Buildings

Figure 7 demonstrates the percentage of overall building energy consumption by facility type. The two facility types consuming the most building energy are the operations (42.9%) and recreation (23.0%) facility types⁵.

Within the City’s building profile, there are 25 buildings⁶ that contribute to 3,800 tCO2e per year. The Top 25 greenhouse gas emitting buildings (Top 25 emitting buildings) total 88% of the total building emissions, and therefore are a focus of opportunity (see sections 3, 4, & 5).

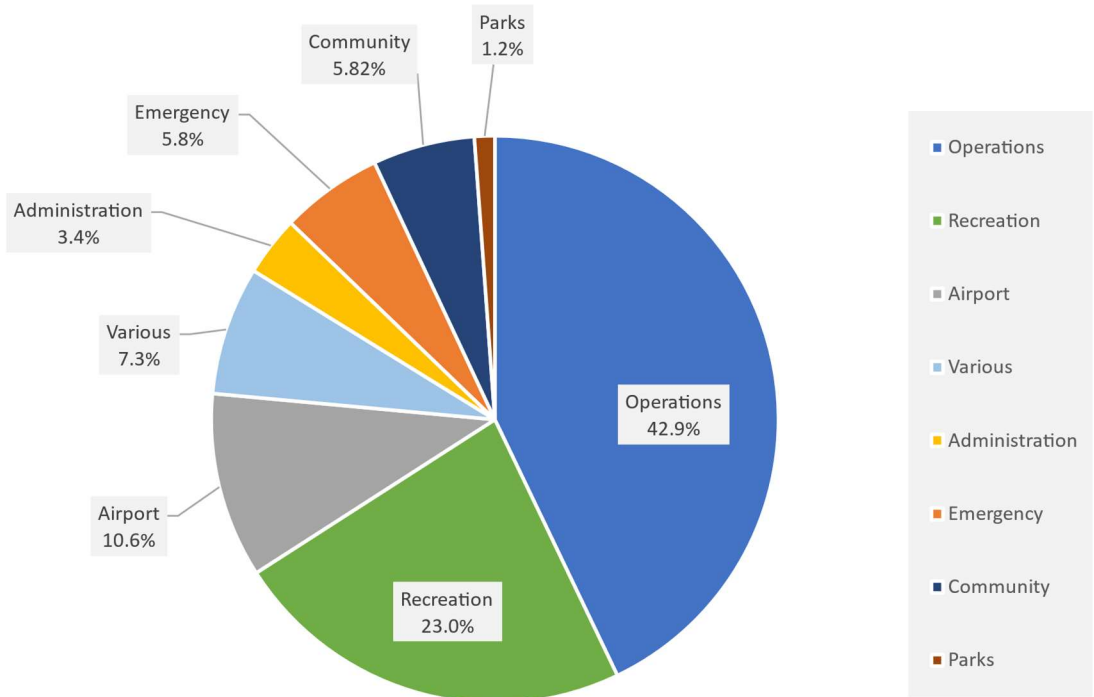


Figure 7: Total Building Energy Consumption by Facility Type

⁵ A list of all buildings by facility type is documented in Appendix B.

⁶ A full list of Top 25 GHG Emitting Buildings by Facility Type is documented in Appendix A.

Figure 8 breaks down the percentage of overall GHG emissions in 2021 by end use, which includes buildings by facility type and fleet. The two facility types emitting the most GHG emissions are recreation (19.6%) and operations (14.0%). Fleet emits 47.7% of the overall corporate GHG emissions.

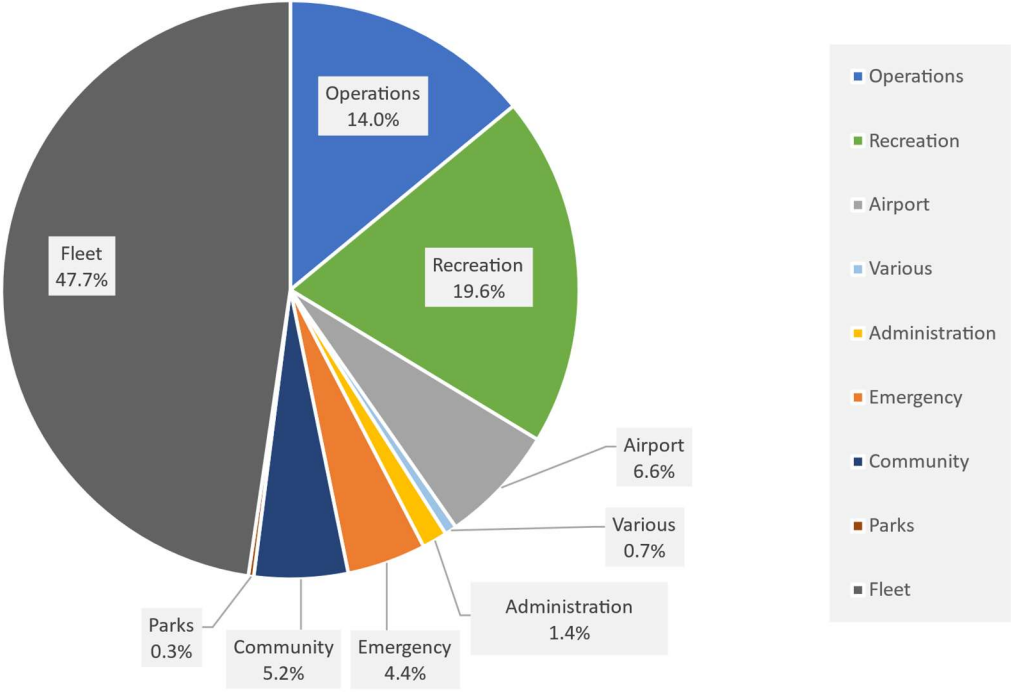
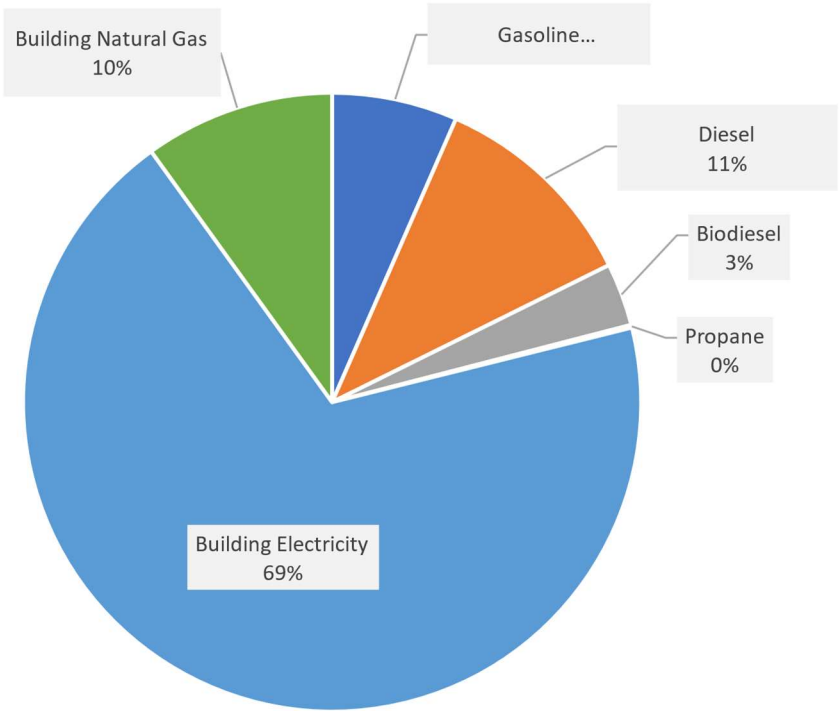


Figure 8: Total GHG Emissions by End Use

2.8 Energy Cost and Profile

The City's utility costs include electricity, natural gas, and fleet fuels such as gasoline, diesel, propane and biodiesel. In 2021 the total utility costs totaled \$8.15 million. \$5.6 million (69%) was spent on building electricity, and another \$800,000 (10%) was spent on building natural gas. The total fleet costs equaled \$1.7 million. Utility costs are anticipated to increase, as well as costs for carbon tax⁷. The City's 2021 emissions portfolio accounted for 8,260 tCO₂e, for a pollution price of \$413,000 at \$50 per tonne. Looking forward to 2030, the pollution price for the same amount of emissions will cost \$1,404,200.



Gasoline	Diesel	Biodiesel	Propane	Building Electricity	Building Natural Gas
\$ 535,091	\$ 906,614	\$ 267,931	\$ 11,701	\$ 5,616,737	\$ 811,291

Figure 9: Total Costs by Fuel Type

⁷ The new carbon tax increase took effect on April 1st, 2022. For all GHGs emitted in 2021, the rate is \$50 per tonne. The carbon tax per tonne increases steadily to \$170 per tonne in 2030.

3. Where do we want to go?

3.1 GHG Emissions Reporting

Up to the end of 2020, as part of a municipality's signing onto the BC Climate Action Charter, the Provincial Government required an annual Climate Action Revenue Incentive Program (CARIP) report which included detailed actions taken to:

- Work towards achieving corporate carbon neutrality
- Measuring and reporting on both corporate and community-wide GHG emissions, and
- Create complete, compact, and energy efficient communities

In 2022, the BC Government launched the Local Government Climate Action Program (LGCAP). Under these programs, the reporting of emissions follows specific guidelines to ensure equity and consistency among all reporting communities. Both CARIP and LGCAP offer 100% of the carbon taxes paid by a municipality to be returned to as a funding source for energy and emissions reduction projects.

The emission reporting in these programs is limited to include "Traditional Services" only – defined as services that are most commonly provided by the majority of local governments. "Non-Traditional Services" are also part of the City of Kelowna's profile and will be tracked separately to "Traditional Services".

3.2 Emissions Savings

There is global recognition of the effects of climate change and critical need to transition away from burning carbon-based fossil fuels, has become widely accepted.

Fortunately, BC has a unique advantage compared to many parts of the world, in that the province's natural landscape allows generation of clean, renewable hydro power for its' citizens. Steps to replace fossil-fuel consumption with electrification options, can significantly reduce harmful greenhouse gas emissions, and help the City of Kelowna move towards meeting its climate action goals.

3.3 Energy Use Intensity

Energy Use Intensity (EUI) is a metric used to measure and compare a building's energy efficiency. Using this metric has the advantage of incorporating a consistent building efficiency target as the City's building space increases with anticipated population growth. A building's EUI is used to track improvements within the building and can be used to compare efficiencies between buildings, especially when used to compare similar buildings. The City uses a benchmark year of 2012 for EUI targets, as it is the first year of robust corporate energy data.

By continually making improvements to the operational efficiency of its building assets, the EUI is reduced, representing long term continual improvement.

Although electricity and natural gas consumption in a building are typically measured using different units, kilo-Watt-hours (kWh) and Gigajoules (GJ) respectively, the EUI calculations are converted to “equivalent” terms – ekWh. These equivalents allow comparison of overall energy usage when different sources exist. The EUI values in this SEMP are expressed as ekWh/m (equivalent kilo-Watt-hours per square meter of building area), and have not been adjusted to varying year-to-year weather conditions.

3.4 Key Performance Indicators and Targets

The SEMP recommends endorsing a corporate GHG emission reduction target and an energy use intensity target. Along with the two 2030 targets, it is recommended that the following two KPIs be adopted and tracked to assess our progress and the general success of this Corporate Strategic Energy Management Plan over time:

KPIs	
GHG Emissions Reductions (tCO2e/ year)	Reduced Energy Use Intensity (ekWh/m2)
Targets	
40% reduction (tCO2e) by 2030 from 2007 levels (409 tCO2e/ year)	20% reduction in energy use intensity by 2030 from 2012 levels

An average annual GHG savings equal to 409 tCO2e is required to meet the 40% below 2007 levels by 2030 emissions reduction target. An average annual energy savings equal to 822,740 ekWh is another metric that can be considered when aiming to meet the 40% below 2007 levels by 2030 emissions reduction target.

An EUI target of 242 ekWh/m2 is required to meet the 20% below 2012 levels.

The SEMP is also recommending a long-term target to achieve net zero by 2050, as noted previously in Section 2.3.

4. Projections and Analysis

4.1 Corporate GHG Emission Forecasting

Figure 10 outlines the GHG emissions trend over the years. The red solid line represents the business-as-usual (BAU) trajectory. The blue solid area represented the total GHG emissions from 2012 to 2021. As stated in Section “2.7: GHG Emission Profile 2021”, there is a significant decrease in emissions between 2020 and 2021 due to emissions factor changes. For this reason, the model forecast uses the 2020 GHG emissions totals as the starting point for planned project implementation. The yellow range represents the forecasted savings for all conservative and aggressive planned building and green fleet⁸ projects⁹. Preliminary details of the building projects are listed in the Multi-Year Action Plan (Table 1).

The BUI line projects that the corporate emissions will reach 11,400 tCO₂e by 2030. If all identified projects within the Multi-Year Action Plan (see Table 1) are implemented, the City is projected to emit around 8,500 tCO₂e by 2030. Even with the most aggressive planned projects being implemented, the City is still anticipating a gap of around 4,000 tCO₂e to reach the 2030 emissions target (see Figure 10).

This analysis emphasizes how critical it is that investments are made in low or, preferably zero carbon technologies, and to become more aggressive with carbon reduction initiatives. Refer to other actions and initiatives that will help close the gap in Section “6: How do we get there” of this report.

⁸ Fleet projects incorporated from Kelowna's *Green Fleet Strategy* Sept 2021.

⁹ The forecasted savings graph does not include the Kelowna Airport Authority targets, as there were no identified energy savings projects associated with those buildings.

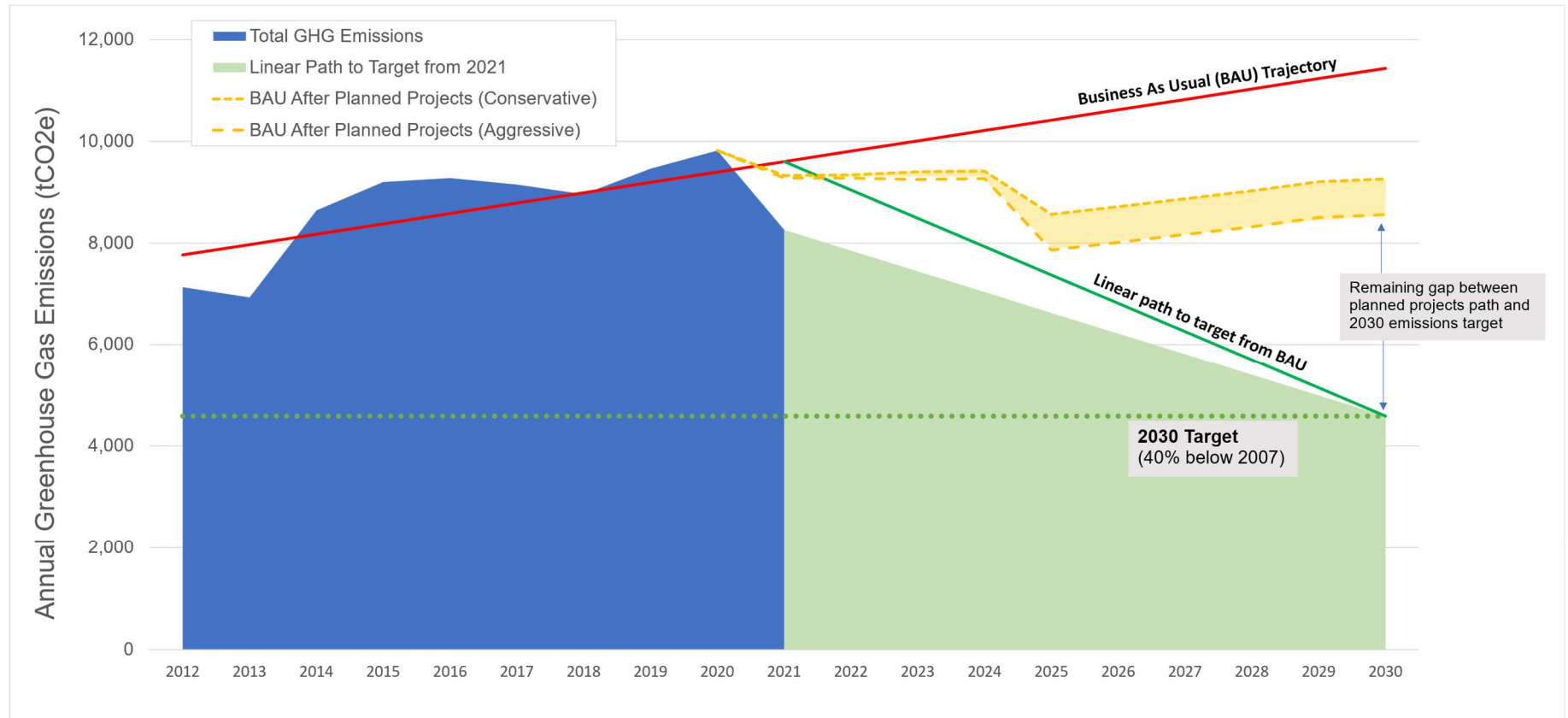


Figure 10: Emissions by Year with Future Projections

4.2 Corporate Energy Forecasting

Significantly reducing the use of energy is critical when considering the GHG emission reduction targets. Reaching the target will require significant investments in electrification, or other clean energy sources when renewing assets that are at the end of their useful economical service life. The Energy Team will need to examine asset renewal opportunities recognizing that emission-reducing opportunities are governed by each asset’s expected life cycle. A total life-cycle cost analysis considering capital cost, ongoing operations, maintenance, and energy and carbon tax costs for proposed new assets is important in the decision-making process.

Figure 11 provides the total energy use (ekWh) and GHG emissions (tCO₂e) totals for the City’s Top 25 emitting buildings from 2012 projected out to 2030. The Top 25 emitting buildings equals 88% of the overall building emissions. To achieve a GHG emissions reduction of 40% below 2007 levels by 2030, the forecasting model indicates that the City should aim for an annual energy savings equal to 822,740 ekWh.

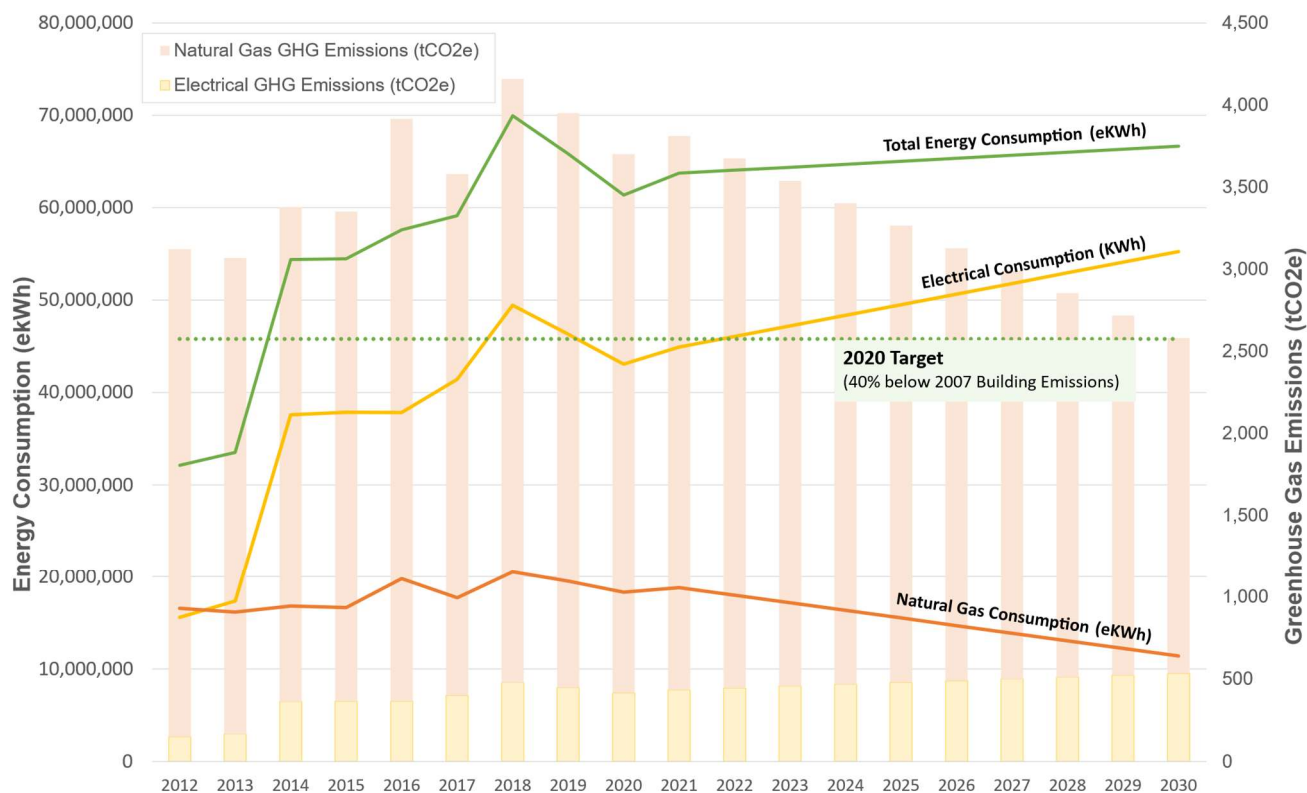


Figure 11: Annual Fossil Fuel Reduction Target – Top 25 Emitting Buildings

4.3 Corporate Energy Use Intensity Forecasting

One of the City's key objectives is improving each building's energy efficiency, whenever possible. The SEMP recommends a target to reduce the averaged Energy Use Intensity (EUI) of the Top 25 emitting buildings¹⁰ by 20% below 2012 levels, equivalent to 242 ekWh/m²¹¹. An even greater 'Stretch' operating target of 182 ekWh/m² has been set to encourage going beyond normal abilities and create novel approaches and solutions.

Concerted effort will be required to shift the trend line for the EUI to decrease to the 20% target as illustrated in the Figure below. It is worth noting, that between 2013 and 2014 there was a floor area increase with the addition of Parkinson Activity Centre¹². In 2016 Kelowna Police Services Building was also added to the portfolio¹³, while removing the previous detachment. In 2020 there is a drop in EUI likely due to the impact of Covid-19 on facility use.

By continually implementing improvements to the operational efficiency of building assets, the EUI will be driven down.

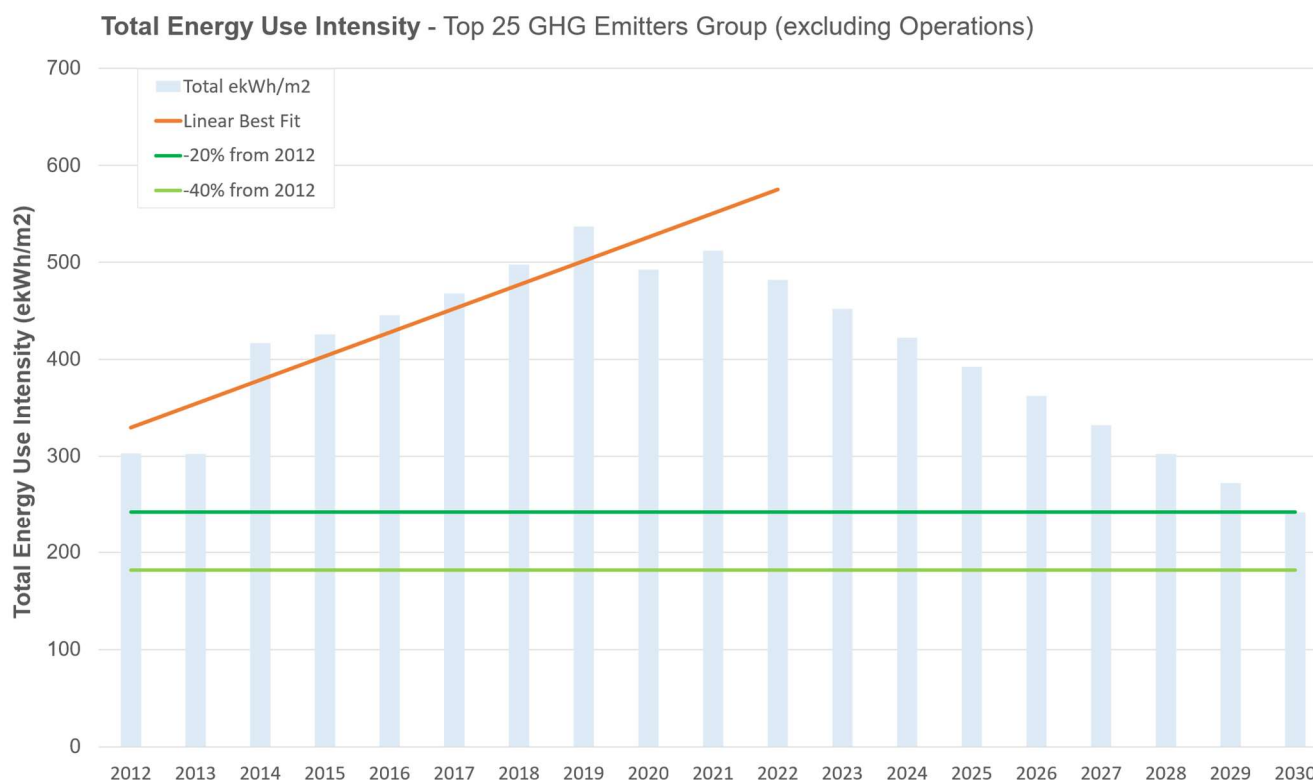


Figure 12: Total Energy Use Intensity – Top 25 Emitting Buildings

¹⁰ The EUI targets exclude select Operations sites within the Top 25 emitting buildings such as: WWTF Admin, Brandt's Creek Treatment Facility, pump stations, Streetlights, booster stations and lift stations.

¹¹ EUI changes for each year are based on the net effect of energy reductions calculated for each project, divided by the total floor area of the 25 top emitting buildings (96,422 m²).

¹² Parkinson Activity Centre totals 1,234 m² of floor space.

¹³ Kelowna Police Services Building totals 9,536 m² of floor space.

5. Facility Benchmarks

To evaluate the effectiveness of efficiency measures implemented and to identify new opportunities for improvement, it is necessary to monitor and compare individual building energy performance over time. Facility Benchmarking compares how each facility is currently performing against a benchmark year (a reference point), and its performance relative to other similar facility types within the organization.

As energy data for individual buildings became more robust in 2012, this is the year selected as the baseline year for buildings built prior to this date. However, for buildings built after 2012, the year the building came into operation is used as the benchmark.

In the following section, the City's top GHG emitting buildings are broken into facility groups based on building usage. This allows for the comparison of building energy performance data amongst comparative buildings. For each building graphed, the first bar represents the Energy Use Intensity (EUI) for the baseline year (2012) followed by bars representing the EUI for the past 5 years. Figures 13-16 below show each building's historical EUI, compared to the total average EUI for 2021's Top 25 GHG emitting buildings and the 20% EUI reduction target.

In general, there are several factors that come into play when comparing facilities, including such things as building design, location, climate, building age, type of construction, operating equipment type and condition, building controls, hours of use, and occupancy levels.

The total energy use represents electricity and fossil fuel consumed to meet building needs for heating, cooling, lighting, ventilation, domestic hot water, computers, building automation systems, and process loads. Process loads generally include all mechanical equipment like pump motors, actuation devices, electric vehicle charging equipment, refrigeration systems in ice arenas, elevators, and kitchen equipment.

5.1 Community Buildings

Community buildings have varied staff operating hours, generally between 7 am and 4:30 pm. These facilities account for about 5.82% of corporate energy use, and 5.2% of the overall corporate GHG emissions in 2021.

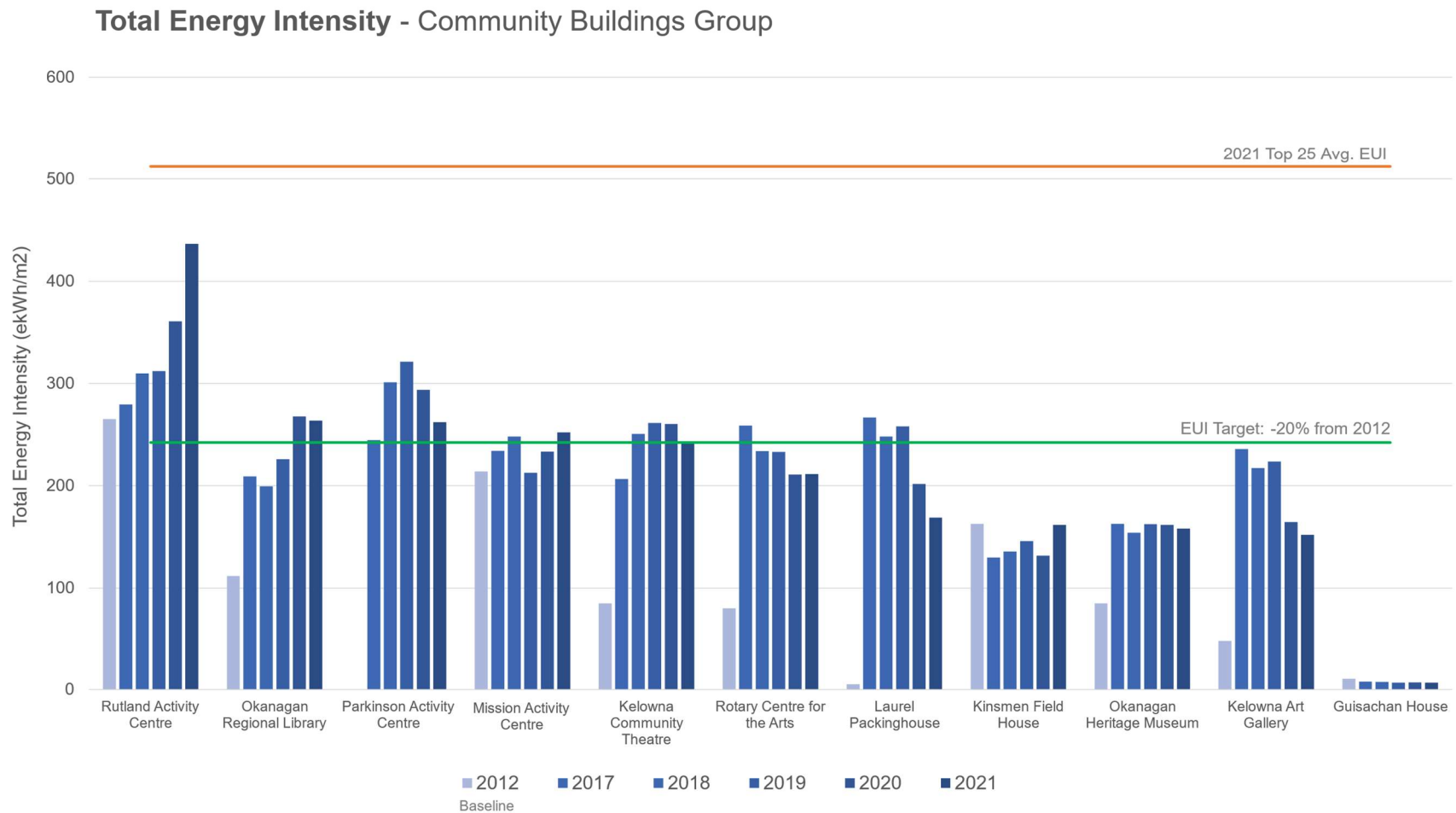


Figure 13: Total Energy Use Intensity - Community Buildings Group

5.2 Administrative Buildings

Administrative buildings are generally operated from Monday to Friday, 8 am to 4:30 pm providing service to the public. These facilities account for about 3.4% of corporate energy use, and 1.4% of the overall corporate GHG emissions in 2021. The Chapman Parkade – Security Centre is a notable outlier which highlights an opportunity for further exploration.

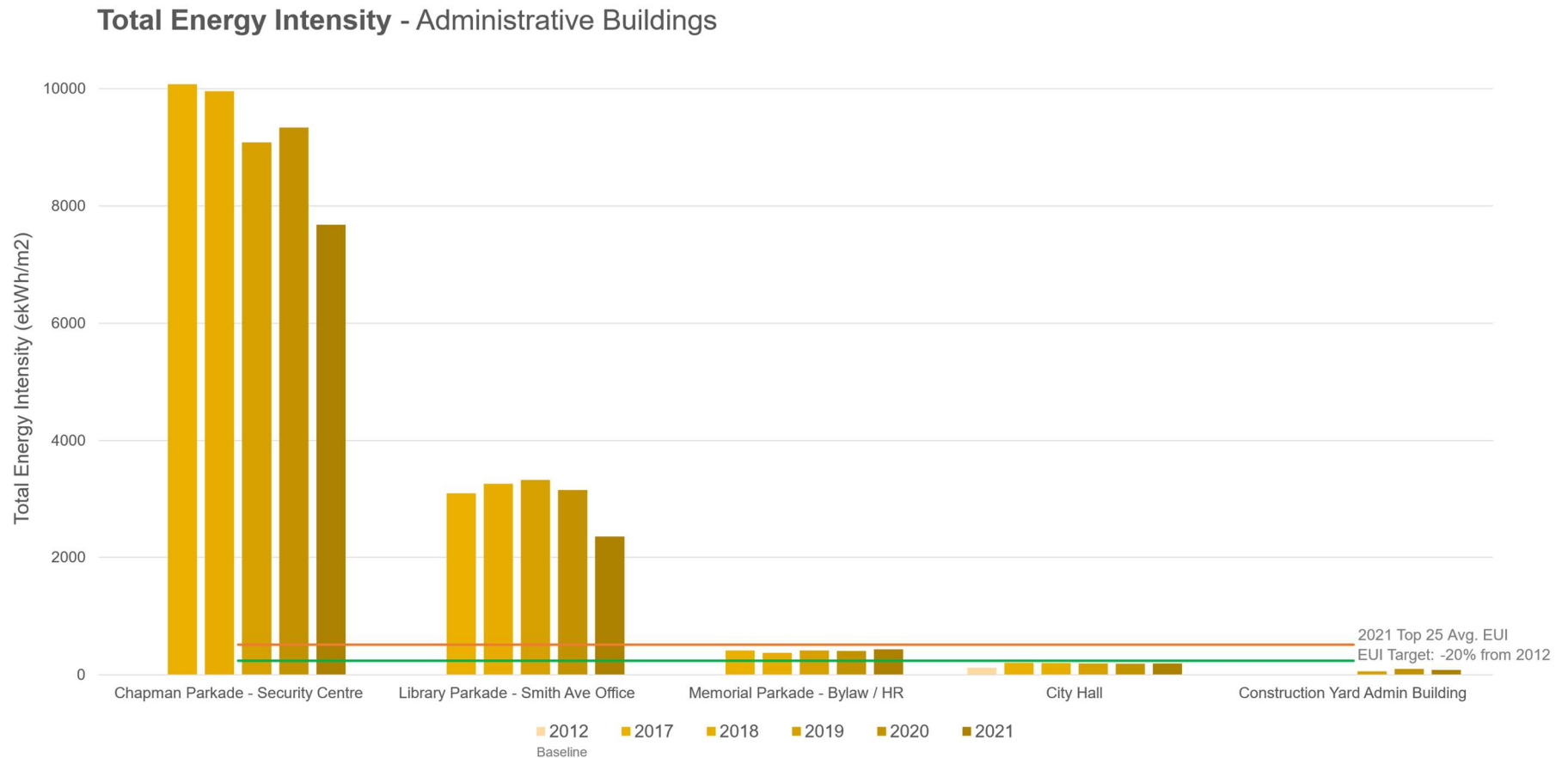


Figure 14: Total Energy Use Intensity - Administrative Buildings

5.3 Emergency Buildings

Fire Rescue and Police Services provide 24-hour service to the public, and as a result require intense use of energy to operate these facilities. These facilities accounted for about 5.8% of the corporate energy use, and 4.4% of the overall corporate GHG emissions in 2021. The Kelowna Police Services Building (KPSB) was added to the portfolio in 2016.

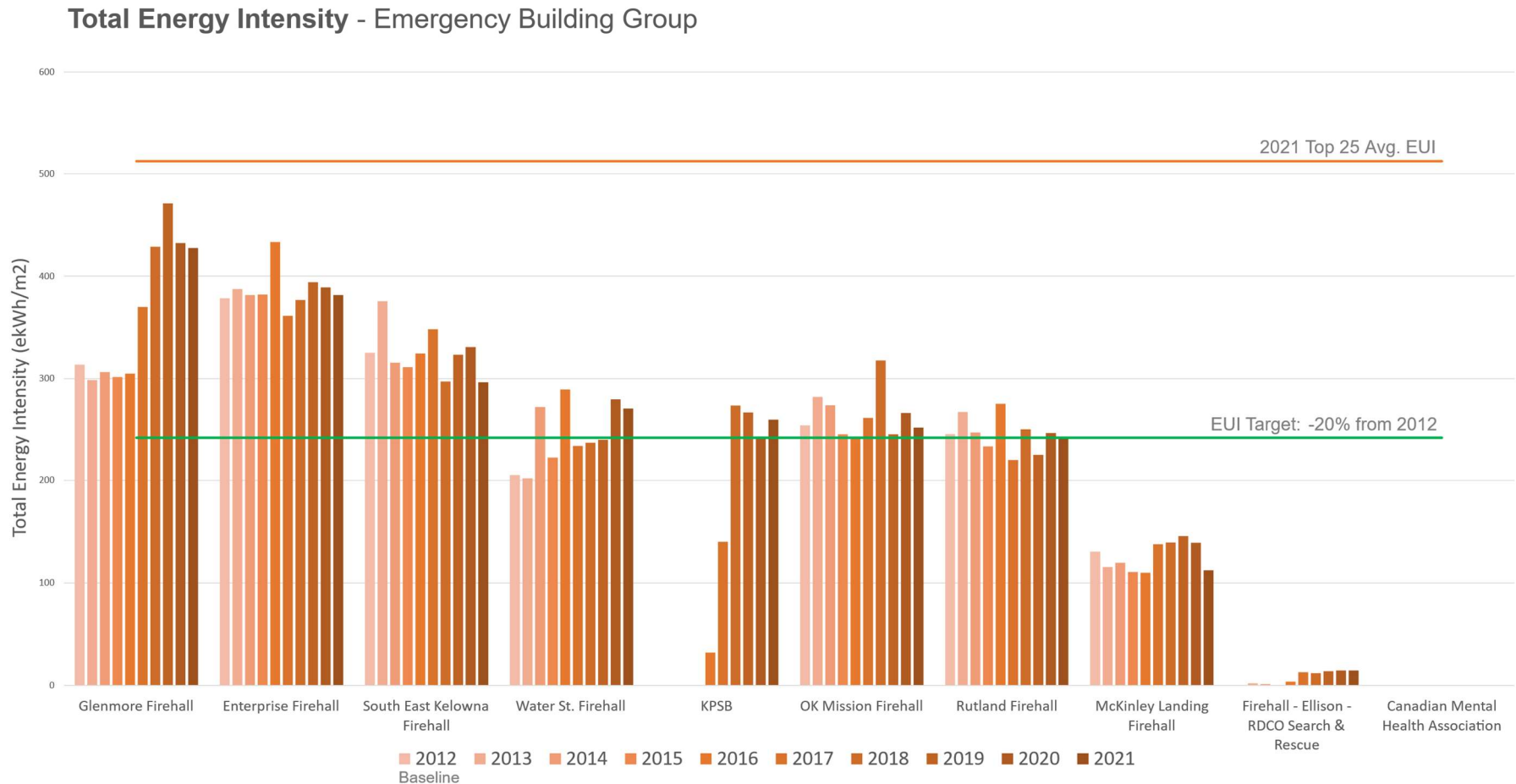


Figure 15: Total Energy Use Intensity - Emergency Building Group

5.5 Recreation Buildings

Recreation facilities, especially aquatics and arenas, have the highest energy needs and produce the large amounts of emissions. Overall, recreation facilities consume about 23.0% of the City's corporate energy use and represent 19.6% of overall corporate GHG emissions in 2021. These buildings are a primary source of energy reduction opportunities and will yield a significant source of corporate GHG emission reductions.

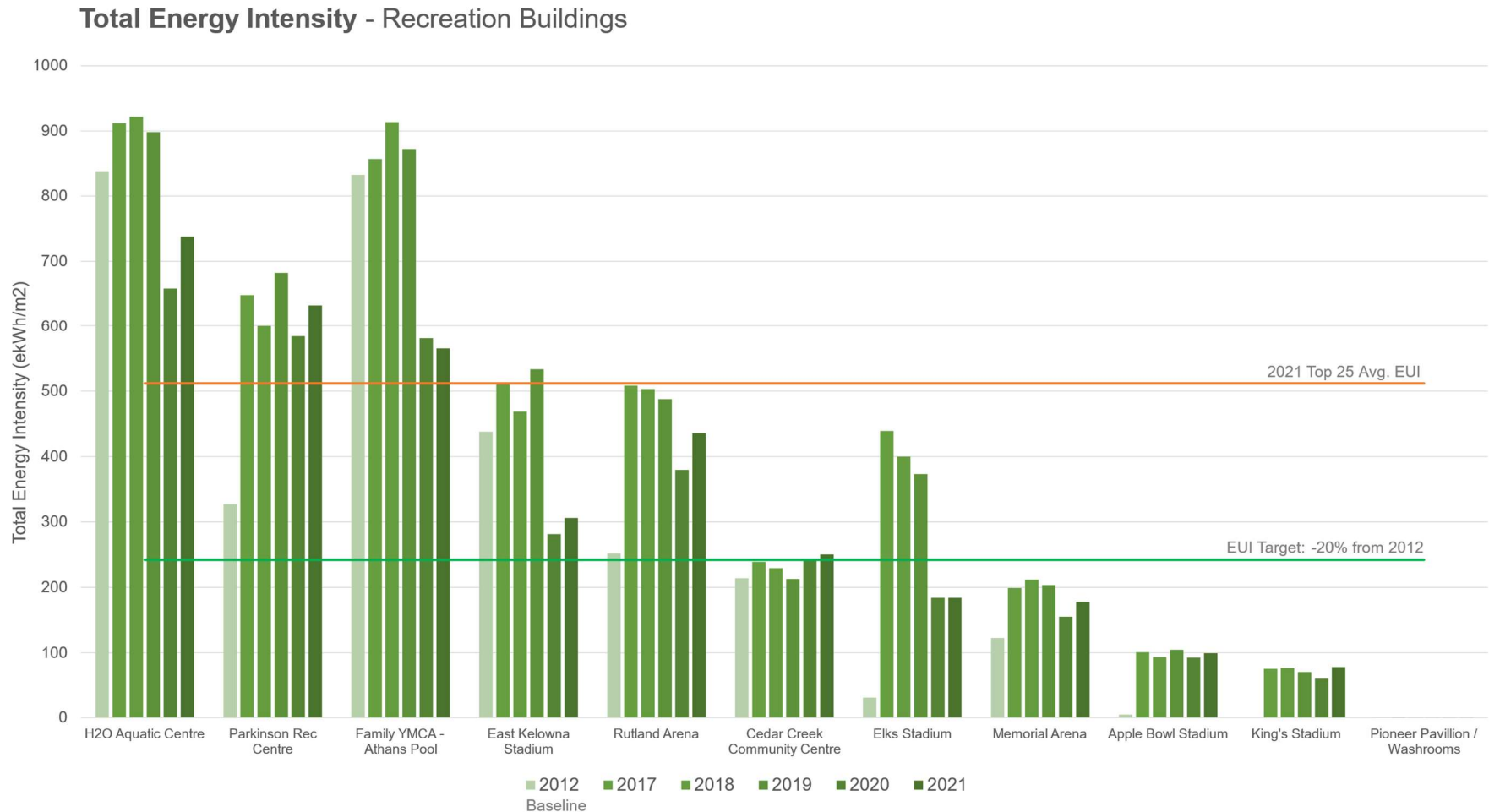


Figure 16: Total Energy Use Intensity - Recreation Buildings

6. How do we get there?

Ultimately, significant investments will be required to reach the proposed 2030 targets. Further exploration is required to calculate an order of magnitude or a range of costing for the estimated investment required for each of the areas identified below. Typically, costing is completed at the project level, but it could also be explored by taking the current projects in the Multi-Year Action Plan and using the cost estimates as order of magnitude costs for similar projects on other buildings in the future. An effective way to prioritize these investments is to focus on completing actions on at the top of the list first and then work downward:

Actions and Initiatives		
1	Optimize Existing Assets	<ul style="list-style-type: none"> • Maintain an aggressive continuous optimization program with staffing to ensure equipment and systems are operating as per design
2	Energy Efficiency and Electrification	<ul style="list-style-type: none"> • Replace end-of-service life equipment with more efficient models • Retrofit mechanical systems to more efficient designs • Switch to low-carbon heating systems
3	Deep Retrofits	<ul style="list-style-type: none"> • Convert to lower temperature heating systems where possible • Upgrade building envelopes when deemed appropriate
4	Renewables	<ul style="list-style-type: none"> • Install renewables like solar photovoltaic, geo-exchange and wastewater heat recovery and cooling systems where suitable • Secure Renewable Natural Gas and Biodiesel to cover shortfalls in GHG emissions reduction.

6.1 Identification of Energy Projects

Over a longer time horizon, the Energy Team and stakeholders need to identify additional projects that can lower GHG emissions. Identifying low and zero-carbon initiatives in varying states of readiness to implement provides value and considered-investments when funding is made available. Strategic project planning is a key component of decarbonizing the City's facilities and assets however, the availability of funds to implement low-carbon solutions, will be a challenge. Limited resources further emphasize the importance of the prioritization and timing of asset renewals to

ensure maximum, economical service lives are realized without impacting levels of service at facilities or necessitating the premature renewal of assets to meet energy and emission targets.

Energy reducing projects are funded from the City's Energy Reserve, except for Utility related projects and Operation related projects¹⁴. Currently there is a total of \$3.5 million within this reserve, with approximately \$2.5 million allocated to future projects and approximately \$500,000 is added each year from the savings achieved from the LED streetlight project.

Energy projects are identified through several streams:

- **Energy Audits:** A detailed analysis of building operations carried out by a qualified engineering consultant that seeks opportunities and assesses the technical and financial viability of energy and emissions saving opportunities.
- **Capital Projects:** The Energy Team applies an energy-efficiency and emissions reduction lens to renovations, retrofits and asset replacements.
- **Facility Operators:** Integration of staff knowledge and experience with energy consuming systems, building components, unique facility use circumstance.

6.2 Prioritization of Energy Projects

Projects need to be prioritized to match the needs, service levels, and climate action targets set by the City. Some of the key elements considered are:

1. End of life and asset renewal cycles
2. Risk associated with failure of the asset
3. GHG reductions available
4. Energy savings potential
5. Fiscal performance (operations and maintenance savings, marginal capital cost increase, total cost of ownership)

Upon identification and prioritization of projects, a more detailed engineering and preliminary costing analysis is carried out to confirm technical feasibility and quantify energy savings and emission reductions to minimize risks and uncertainty. This further analysis ultimately lends itself to improved strategic project planning, selection, and delivery. Study costs can sometimes be supported with financial assistance by FortisBC, Natural Resources Canada, CleanBC, and other programs. Once a study is complete and the project benefits have been confirmed, further capital incentive funding are sought through available application processes. Next steps are to complete preliminary design work, obtain probable construction costs, and secure project funding, then transition into detailed design, procurement, and construction phases.

As projects are executed, the Energy Team supports the project management and liaises with Operations to prepare for the new equipment and systems being installed. Once the project is complete and turned over to Operations, the Energy Team reviews operational data to confirm the energy savings align with projected targets and completes close out activities to finalize any rebates or incentive agreement requirements. After implementation and some time in service, the Energy Team ensures the calculated energy and emission savings are in accordance with the actual

¹⁴ Upgrades that take place at the Wastewater Treatment Plant, the Kelowna International Airport and the Landfill are examples of Operations related projects.

performance and records the progress towards meeting targets and contractual obligations to outside agencies.

The City's overall performance is measured by trending our key performance indicators over time. The Energy Team also evaluates the performance of individual projects based on avoided energy consumption (reductions in kWh or GJ of energy); comparing the energy consumption values before and after construction. This then allows calculation of the emissions reductions resulting from the project.

6.3 Funding

The funding required to implement all the current project list¹⁵ for existing facilities, is estimated around \$19.5M, in 2022 dollars. Since many projects identified in the MYAP are replacing end-of-life assets or identified deficiencies that need replacement, the total project budget is a high-level estimate and does not incorporate a breakdown of incremental costs compared to like-for-like replacement.¹⁶ Incremental costs of these projects are often a small additional cost to the project. Further breakdown of costs could be considered for future exploration, as well as developing a funding strategy for energy projects. As with most things, the costs for implementing energy consumption and emission-reduction initiatives are expected to increase over time.

6.4 Multi-Year Action Plan

As part of the energy management program, ongoing opportunities have been tracked into a Multi-Year Action Plan (MYAP). The MYAP list identifies energy saving opportunities, and the projected GHG emissions¹⁷ reduction associated with each project. The MYAP evolves as new and potentially better opportunities are uncovered through energy studies and advances in technology.

As of November 2022, the majority of projects shown in 2021 and 2022 of the MYAP have budget approval through the City's 2021 and 2022 Financial Plans. Capital requests have been submitted for projects in future years, but approval is uncertain until Council completes the annual budgetary cycle. Funds for approved projects within the Provisional Budget are typically in place by the beginning of January each year.

Table 1 is the current project list of the MYAP for planned initiatives from 2021 to 2030.

¹⁵ This list includes all the conservative and aggressive projects that have been identified. Projects are at varying stages and the list is anticipated to evolve.

¹⁶ Incremental cost "*refers to the additional expenses incurred with respect to a baseline to produce a new output or an equivalent output in a different manner*". It means the additional cost, if any, in design, procurement, construction and long-term maintenance, for achieving a reduction in energy usage or greenhouse gas emissions greater than the reduction that would be achieved under the applicable building code requirements. Source: <https://www.greenclimate.fund/sites/default/files/document/gcf-b21-03.pdf>

¹⁷ Projected GHG emissions savings are based on energy reduction calculated for each project.

Project Implementation Year	Building	Project / Savings Source	Project Status	Estimated Cost	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (GJ/yr)	Annual GHG Savings (tCO ₂ e/yr)
2021	WWTF and Booster Stations	Rev 1 Kelowna Water System Energy Report	Implemented	\$303,950	747,771	0	30
	WWTF	Kelowna WWTF Energy Evaluation	Implemented	\$93,007	296,258	4,230	223
	Okanagan Regional Library	Heating Plant Replacement	Implemented	\$192,600	0	360	18
	H2O Aquatic Centre	Parking Lot Solar Array	Not for Planning	\$2,400,000	1,354,000		54
	Totals:			2,989,557	2,398,029	4,590	325

Project Implementation Year	Building	Project / Savings Source	Project Stage	Estimated Cost	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (GJ/yr)	Annual GHG Savings (tCO ₂ e/yr)
2022	Kelowna Art Gallery	KAG Study Measures Summary	Future	\$382,195	62,375	136	9
	City of Kelowna Main Library	Recommissioning Measures Implementation	Preliminary Investigation	\$24,959	17,980	330	17
	City Hall	Chiller Upgrade and Heat Recovery	Preliminary Investigation	\$1,109,600	-23,700	800	39
	Family YMCA	Lighting, Dehumidification and HVAC	Preliminary Investigation	\$1,253,700	207,688	730	45
	KPSB	Heat Recovery and HVAC Control	Preliminary Investigation	\$24,400	28,633	541	28
	Memorial Arena	Building Control and DDC	Preliminary Investigation	\$65,900	127,706	293	20
	Rotary Centre for the Arts	LED Lighting, Heat Recovery and Condensing Unit Replacement	Potential Project	\$59,658	66,460	121	9
	Totals:			2,920,412	487,142	2,951	167

Project Implementation Year	Building	Project / Savings Source	Project Stage	Estimated Cost	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (GJ/yr)	Annual GHG Savings (tCO2e/yr)
2023	Rotary Centre for the Arts	LED Lighting	Future	\$11,158	69,965	0	3
	WWTF	Blower Upgrade	Future	\$406,000	909,373	0	36
	Enterprise Firehall	GeoExchange System	Preliminary Investigation	\$4,500,000	17,433	1,670	84
	Rotary Centre for the Arts	RTU Replacements	Potential Project	\$859,488	0	180	TBD
	Totals:			5,776,646	996,771	1,850	123

Project Implementation Year	Building	Project / Savings Source	Project Stage	Estimated Cost	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (GJ/yr)	Annual GHG Savings (tCO2e/yr)
2024	H2O Aquatic Centre	Solar PV Installation	Future	\$225,000	136,700	0	5
	City Hall	Lighting Upgrades, heating/HVAC Optimization, Controls	Preliminary Investigation	\$982,200	42,000	1,430	73
	City of Kelowna Main Library	Chilled Water Pump VSD, Controls	Potential Project	\$24,820	1,430	0	0
	KPSB	Lab Exhaust Heat Recovery	Potential Project	\$70,000	27,500	445	23
	Memorial Arena	DHW Upgrades, Zamboni Electrification	Potential Project	\$432,000	TBD	TBD	TBD
	Totals:			1,734,020	207,630	1,875	102

Project Implementation Year	Building	Project / Savings Source	Project Stage	Estimated Cost	Annual Electricity Savings (kWh/yr)	Annual Natural Gas Savings (GJ/yr)	Annual GHG Savings (tCO2e/yr)
2025-2030	H2O Aquatic Centre	Pool System Upgrades, Lighting Upgrades, HRC, DCV,	Preliminary Investigation	\$3,904,000	-615,100	14,230	705
	H2O Aquatic Centre	DE between CNC and H2O	Not for Planning	\$1,200,000	-287,300	3,100	143
	H2O Aquatic Centre	Hot tub HEX, Natatorium RH Sensor replacement	Preliminary Investigation	\$34,200	0	4,480	223
	H2O Aquatic Centre	Rooftop PV Array	Potential Project	\$528,000	325,000	0	13
	City Hall	Envelope Improvements	Preliminary Investigation	\$328,700	1,100	420	21
	Parkinson Rec Centre	New Net-Zero KCC Building	Potential Project	TBD	1,267,732	6,857	393
	Totals:			5,994,900	- 576,300	22,230	1,498

Table 1: Multi-Year Action Plan (MYAP)

6.5 Energy Management Assessment Actions

As part of the Energy Management Assessment that occurred in July 2022, the participants developed a prioritized list of actions for the next 3-5 years. The following table outlines the planned actions for the City of Kelowna's priority attributes. These actions should lead the organization to achieve a more integrated energy management program that becomes a fundamental part of business, operation and strategic planning, and thus will increase momentum towards the targets.

Key Attributes	Priority	Actions
(T5) Technology - Procurement	A	Use energy performance & total life-cycle costs as preferential criteria in capital equipment selection and RFP processes.
		Use carbon performance as a preferential criterion in capital equipment selection and RFP processes.
		Complete energy and life-cycle savings calculations to inform capital equipment selection and RFP processes (do this prior to updating criteria in RFP process).
		Include energy and carbon performance criteria in technical specs during capital equipment selection & include it as one of several selection criteria.
		Update energy performance criteria for RFP processes that is more meaningful than what is currently in place.
(B3) Business - Policy	A	Review your organizations existing policies to see where energy performance could be incorporated.
		Senior management to approve an overarching energy management policy (including a new construction & retrofit policy).
		Research energy policies from internal and peer organizations.
(B1) Business - Leadership	A	Senior management to include energy management goals in long-term organizational plans.
		Senior management to approve an energy management plan with targets and Council provides adequate resources to help sustain it.
(T2) Technology - Carbon	A	Establish communications channels and frequency for senior management to communicate energy performance commitment (incl targets & objectives).
		Identify and annually update a list of carbon reduction opportunities to meet energy and carbon reduction targets.
		Complete carbon reduction modelling to identify the potential and preferred pathways for carbon reduction.
		Prepare and update business case (cost, savings, financial review) for identified opportunities.
		Conduct site audits (including building condition assessments) and establish priority list of carbon reduction opportunities.
		Policy scan of revenue streams or niche opportunities for decarbonizing fleet.
		Complete carbon (GHG) benchmarking for buildings and equipment to identify trends in annual use and comparisons of building performance.

Key Attributes	Priority	Actions
(B4) Business - Investment	A	Include non-financial benefits (i.e., environmental impact) in the business cases for capital projects (including energy ones). Apply a climate lens to all capital projects. Establish an internal price on carbon.
		Update and prioritize the list of energy projects using current rates and economics.
(T1) Technology - Opportunities	A-	Prepare business case (cost, savings, financial review) for identified opportunities, including electrification (include non-financial benefits).
		Create mechanism to track, assess and implement energy improvement ideas that come from staff.
		Institute a process for regularly updating the list of opportunities.
		Continue high level assessments of major equipment and energy end-uses.
(T4) Technology - Reporting	A-	Complete energy benchmarking to identify trends in annual use and comparisons of building performance.
		Track on energy performance against energy targets (KPIs) and report on progress annually to Council.
		Track and report on energy conservation measure results and compare them against expectations using submeter data on significant capital projects.
		Establish energy baselines to measure energy performance against.
		Generate basic monthly & annual energy consumption or performance reports based on monthly utility invoicing.
(P1) People - Roles	A-	Normalize energy use to reflect operating conditions and external environmental factors.
		Establish a method of tracking energy consumption or performance based on monthly utility invoicing (i.e., PUMA).
		Manage a cross-departmental team focused on corporate climate action (include a Terms of Reference).
(O4) Operations - Design	A-	Look at the best technical solutions versus funding partner pressures. Make these positions long-term rather than limiting them by funding timelines established by funding partner.
		Complete resource assessment and hire additional resources (i.e., Energy Specialist-like position(s)) endorsed by Council.
		Fully integrate building operations into the design team for renovations and new builds.
		Ensure that building operations staff are consulted at key stages of renovations and new building design. Include them at the beginning.
	A-	Include technical specs into process from the onset.
		Establish formal process where building ops could be brought into the design process for either new buildings and/or renovations.

Table 2: Energy Management Assessment Action List

7. How are we doing? (Measurement)

Knowing the source of the greatest emissions and energy consumption within the organization is key to addressing them. In 2022, the City engaged the services of Prism Utility Monitoring and Analysis Utility Monitoring Inc. (PUMA) and provided internet-based access to all natural gas and electricity consumption data, allowing PUMA to undertake comprehensive analytics of the provided data. PUMA enables the City to monitor, analyze, track changes, and report on energy use and building performance using actual consumption data. This service is invaluable for comparing the performance of building sites, energy use, emissions generated, and utility rate costs. These can be regularly reported to Facility Managers using this service.

Key facilities within the Top 25 emitting buildings will be monitored quarterly, analyzed for anomalies, and communicated with facility supervisors and managers and the Building Services Manager. Projects are monitored as required, appropriate to the project and a commissioning and reporting approach is developed for major projects.

The KPIs listed in the SEMP will be updated annually to reflect project status, updated data and outcomes, progress made towards targets and to help refine the following year's actions and budget.

8. Communications & Engagement Strategy

Change is complex. Engaging employees to meet the goals of the City's Strategic Energy Management Program isn't a straightforward process. In many cases, City of Kelowna employees will be asked to make changes to current processes and operating procedures. Employees will need to think critically, and problem solve to define these actions. Requirements must be clearly communicated to different employee groups and leadership must visibly and actively support the effort. Successfully managing energy will only be possible if City employees - from senior leadership to middle management to operators - have the awareness, motivation, knowledge, and ability to do so.

One approach to consider is Prosci's Change Management framework. Prosci is a US-based company that conducts research in countries and organizations across the world to determine what factors and approaches are critical to successful change projects in organizations. The research has resulted in a process and set of tools and techniques that help leaders manage "the people side of change to achieve a required business outcome".¹⁸ The Prosci process highlights the importance of visible senior leadership support and emphasizes the need to engage middle management as champions for the change. The research also reveals that to change work processes and culture, each individual involved or affected needs to move through different stages of understanding and integration. Therefore, to affect change, the Energy Team must engage senior leadership, support middle management in championing energy management, and understand how to affect change at an individual level for each City employee. Prosci's ADKAR model provides a framework to understand and manage individual change, further described in Figure 17.¹⁹

¹⁸ <https://www.prosci.com/resources/articles/the-what-why-and-how-of-change-management>

¹⁹ www.prosci.com



Figure 17: Prosci ADKAR Model

8.1 Engagement Objectives

City of Kelowna may adopt a Prosci's ADKAR model to frame its engagement objectives for the City's employees and looks to increase:

- **awareness** that the Energy Management program exists, as well as initiatives underway,
- the **desire** of City employees to engage in energy management initiatives,
- the **knowledge and ability** to help them do so, and
- the **reinforcement** to ensure the initiatives succeed over the long-term.

8.2 Internal Communication Channels

The internal communication channels are listed below:

- Communication boards
- Lunch & Learn/ Workshop
- New employee orientation
- Corporate Climate Action Team
- Employee newsletter
- Employee intranet
- Emails – All company emails

8.3 Communications Calendar 2023

					Timeline for 2023											
Communication / Campaign	Target Audience	Tactic	Team or Person Responsible	Frequency	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Ongoing Energy Reporting																
Energy performance "Dashboards"	Operations Staff	Provide energy performance "Dashboard" reports from PUMA.	Energy Management Team	Quarterly												
Newsletter	All staff	Establish a one-page newsletter template that highlights projects and overall cumulative savings	Energy Management Team	Bi-annual												
Staff Suggestion Campaign																
Create process for energy suggestion.	All staff	Publish campaign details, complete lunch and learn, establish process for staff suggestions and follow up. Recognize staff contributions.	Energy Management Team	Ongoing												
Energy/Corporate Climate Action Team																
Establish a cross-departmental team focused on corporate climate action	Individual Contributors	Create Terms of Reference and meet on a bi-annual or quarterly basis	Energy Management Team	Bi-annual or quarterly												

9. Risks & Challenges

Energy management and GHG reduction activities occur within a broader context and are greatly influenced by external factors such as energy prices, population growth and the political priorities of all levels of government. While these can be volatile, the current context of converging support for climate action and associated funding measures from the Province and Federal sources is promising, at least for the short term. A preliminary list of risks and challenges to conducting energy management activities at the City of Kelowna include:

- Population growth²⁰ and the impact to facilities
- Building use hours or occupancy
- Growth of operational area
- Locking into fossil fuel infrastructure
- Deteriorating performance of existing assets
- Limited capital
- Receiving funding for studies, pre-work and pre-design
- Employee capacity and workload
- Ensuring performance of technologies in a cold climate

10. Recommendations

In addition to the Energy Management Assessment Action List listed in Table 2, this section outlines additional recommendations to continue to explore and advance energy efficiency, while reducing corporate greenhouse gas emissions, and supporting a more sustainable future for Kelowna:

- Update the KPIs listed in the SEMP annually to reflect project status, updated data and outcomes, progress made towards targets and to help refine the following year's actions and budget.
- Meet with Facility Managers and Operations and Maintenance staff to discuss strategic prioritization and provide annual updates to the Multi-Year Action Plan (MYAP). Identify which projects are within the Capital Plan, and whether there is external funding being pursued on each project.
- Track and delineate the “Non-Traditional Services” from the “Traditional Services”. This will allow close monitoring of these services and keep the City in line with the 2021 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions²¹ and LGCAP reporting. Continue to track all owned and leased buildings, which will require tenants to provide energy consumption data within their tenant agreements with the City.

²⁰ Population growth expected to grow by 45,000 people by 2040 (around 30%), as noted in the GHG Emissions Modelling Study, May 2022.

²¹ Resource can be found at: <https://www2.gov.bc.ca/assets/gov/environment/climate-change/cng/methodology/2021-best-practices-methodology.pdf>

- Establish a process to track and report on all contracted services that are categorized as “Traditional Services”, as per LGCAP requirements. Over time, this process likely includes formal contract agreements to require fuel tracking and reporting from all applicable contracted services.
- Develop a more robust fleet emissions tracking process following the 2021 BC Best Practices Methodology for Quantifying Greenhouse Gas Emissions.
- Host an annual meeting with the City’s Building Services Department and Fleet Operations to review energy and emissions management goals and establish suitable reductions in alignment with this framework.
- Complete a more fulsome exploration of risks that could impact energy management and GHG reduction activities. Consider using a risk matrix outlining the risk, issue, impact and response.
- Explore the incremental costs for asset upgrade projects in more detail, as well as estimating an order of magnitude cost for the investment required. This will allow for the development of a more robust funding strategy for energy projects.
- Investigate the use of renewable energy (RNG and biodiesel) to close the gap between the projects identified and the 2030 GHG reduction target.
- Incorporate more provincial benchmarking analysis into the SEMP once there is more data for Interior region municipal buildings²². This will allow for the comparison of similar facility types across municipalities within similar climatic zones.
- Green building efficiency practices need to become business as usual within the City to ensure the wrong equipment is not put into service and maintained for the next 25 years. The best way to do this will be through the development of a Green Building Policy.
- Revisit the SEMP thoroughly by 2025.

11. Closing

This Strategic Energy Management Plan outlines the current state of energy management at the City of Kelowna and its goals for the next 3-5 years. The City of Kelowna is well-positioned to build upon its renewed sense of direction and commitments and has strong internal support for investing in measures that further reduce energy consumption and advances the decarbonization of the City’s buildings and fleet.

²² Currently the data available in provincial benchmarking reports are heavily skewed by the buildings in milder climate zones (i.e., Lower Mainland or Vancouver Island).

Appendix A – Top 25 GHG Emitting Buildings by Facility Type

	Site Name	Facility Type	Floor Area (m ²)	Electricity			Natural Gas				COMBINED TOTAL		
				Consumption (kWh)	Cost (\$)	Emissions (tCO ₂ e)	Consumption (GJ)	Consumption (ekWh)	Cost (\$)	Emissions (tCO ₂ e)	Consumption (ekWh)	Total Energy Use Intensity (ekWh/m ²)	Emissions (tCO ₂ e)
1.	WWTF Admin	Operations	1,144	11,114,457	\$855,059	107.81	11,697	3,249,250	\$118,177	583.28	14,363,707	12,552	691.09
2.	H2O Aquatic Centre	Recreation	8,865	3,507,378	\$337,846	34.02	10,932	3,036,750	\$107,420	545.13	6,544,128	738	579.15
3.	Kelowna International Airport	Airport	1019	4,873,402	\$419,114	43.49	9,982	2,772,778	\$106,560	497.73	7,646,088	542	545.00
4.	Parkinson Rec Centre	Recreation	4,807	1,136,203	\$105,712	11.02	6,857	1,904,644	\$69,711	341.91	3,040,847	633	352.93
5.	Rutland Arena	Recreation	6,531	1,277,592	\$134,374	12.39	5,645	1,568,111	\$57,654	281.49	2,845,703	435.74	293.89
6.	Family YMCA - Athans Pool	Recreation	4,985	1,379,499	\$132,234	13.38	5,184	1,440,111	\$47,298	258.52	2,819,610	566	271.90
7.	KPSB	Emergency	9,536	1,474,200	\$138,150	14.30	3,623	1,006,417	\$38,323	180.66	2,480,617	260	194.96
8.	Okanagan Regional Library	Community	5,462	528,684	\$58,116	5.13	3,282	911,750	\$34,669	163.67	1,440,434	264	168.80
9.	Public Works Yard	Operations	3,525	454,918	\$41,986	4.41	2,540	705,556	\$27,391	126.66	1,160,473	329	131.07
10.	Enterprise Firehall	Emergency	2,502	375,200	\$31,898	3.64	2,087	579,806	\$23,014	104.08	955,006	381.70	107.72
11.	Pump Stations	Operations	n/a	9,697,843	\$986,809	94.07	241	66,843	\$3,214	12.00	9,764,685	n/a	106.07
12.	City Hall	Administration	6,805	777,619	\$88,708	7.54	1,949	541,389	\$21,520	97.19	1,319,008	194	104.73
13.	Memorial Arena	Recreation	5,693	521,917	\$57,325	5.06	1,772	492,111	\$19,884	88.34	1,014,028	178	93.40
14.	Kelowna Community Theatre	Community	2,451	176,672	\$16,690	1.71	1,508	418,815	\$18,251	75.18	595,487	243	76.90
15.	Parks Yard	Operations	694	133,356	\$14,636	1.29	1,473	409,268	\$18,382	73.47	542,624	782	74.76

	Site Name	Facility Type	Floor Area (m ²)	Electricity			Natural Gas				COMBINED TOTAL		
				Consumption (kWh)	Cost (\$)	Emissions (tCO ₂ e)	Consumption (GJ)	Consumption (ekWh)	Cost (\$)	Emissions (tCO ₂ e)	Consumption (ekWh)	Total Energy Use Intensity (ekWh/m ²)	Emissions (tCO ₂ e)
16.	Booster Stations	Operations	n/a	2,240,339	\$292,817	21.73	825	229,165	\$6,803	41.14	2,469,505	n/a	62.87
17.	Rotary Centre for the Arts	Community	3,791	479,832	\$52,446	4.65	1,158	321,722	\$13,813	57.75	801,555	211	62.41
18.	Rutland Activity Centre	Community	902	96,140	\$10,424	0.93	1,070	297,223	\$12,801	53.35	393,363	436	54.29
19.	Lift Stations	Operations	n/a	611,177	\$68,234	5.93	648	180,119	\$9,520	32.33	791,297	n/a	38.26
20.	Street Lights	Various	n/a	3,816,902	\$867,917	37.02	n/a	n/a	n/a	n/a	3,816,902	n/a	37.02
21.	Parkinson Activity Centre	Community	1,234	131,529	\$10,921	1.28	691	192,002	\$8,477	34.47	323,530	262	35.74
22.	Water St. Firehall	Emergency	851	69,457	\$7,611	0.67	581	161,287	\$7,171	28.95	230,744	271	29.63
23.	Building Services	Operations	757	64,560	\$7,095	0.63	521	144,627	\$6,393	25.96	209,187	276	26.59
24.	Okanagan Heritage Museum	Community	1,459	119,717	\$10,237	1.16	400	111,073	\$5,040	19.94	230,790	158	21.10
25.	Capital News Centre	Recreation	18,200	63,179	\$14,226	0.61	363	100,818	\$4,631	18.10	163,997	9	18.71

Appendix B – All Buildings by Facility Type

Site Name	Facility Type
Chapman Parkade - Security Centre	Administration
Construction Yard Admin Building	Administration
Library Parkade - Smith Ave Office	Administration
Memorial Parkade - Bylaw / HR	Administration
City Hall	Administration

Site Name	Facility Type
North Apron Complex	Airport
Kelowna International Airport	Airport
Heavy Equipment Storage Building	Airport
Combined Operations Building	Airport

Site Name	Facility Type
Mission Activity Centre	Community
Okanagan Regional Library	Community
Laurel Packinghouse	Community
Kinsmen Field House	Community
Kelowna Art Gallery	Community
Kelowna Community Theatre	Community
Rotary Centre for the Arts	Community
Rutland Activity Centre	Community
Parkinson Activity Centre	Community
Okanagan Heritage Museum	Community
Guisachan House	Community

Site Name	Facility Type
KPSB	Emergency
Canadian Mental Health Association	Emergency
Enterprise Firehall	Emergency
Firehall - Ellison - RDCO Search & Rescue	Emergency
Glenmore Firehall	Emergency
McKinley Landing Firehall	Emergency
OK Mission Firehall	Emergency
South East Kelowna Firehall	Emergency
Water St. Firehall	Emergency
Rutland Firehall	Emergency

Site Name	Facility Type
WWTF Admin	Operations
Combined Operations Building	Operations

Site Name	Facility Type
Public Works Yard	Operations
Pump Stations	Operations
Parks Yard	Operations
Booster Stations	Operations
Commonage Composting Site Admin Building	Operations
Glenmore Landfill	Operations
Lift Stations	Operations
PRV Stations	Operations
Redlich Pond	Operations
Building Services	Operations
Brandt's Creek Treatment Facility	Operations

Site Name	Facility Type
Beach Access	Parks
Belgo Park	Parks
Ben Lee Water Park - Park Only	Parks
Birkdale Park	Parks
Briarwood Park	Parks
Cameron Park	Parks
Caro Park	Parks
Cemetery	Parks
City Park	Parks
Davie Park	Parks
Gerstmar Public Washroom	Parks
Glenmore Sports Field	Parks
Guisachan Heritage Park	Parks
Gyro Park	Parks
Harris Park	Parks
Hidden Lake Park	Parks
Hollydell Park	Parks
Hollywood Park	Parks
Jack Robertson Park Washrooms	Parks
Kasugai Gardens	Parks
Kinsmen Park	Parks
Lillooet Park	Parks
Lombardy Park	Parks
Mary Ann Collinson Memorial Park	Parks
Maude Roxby Wet Land Walkway	Parks
Millbridge Park	Parks
Mugford Park	Parks
Osprey Park	Parks
Powerline Park	Parks
Providence Park	Parks
Quail PI Park	Parks
Quarry Park	Parks

Site Name	Facility Type
Quilchena Children's Waterpark	Parks
Redridge Park	Parks
Richmond Park	Parks
Rotary Park Changeroom and Concession	Parks
Rowcliffe Park	Parks
Rutland Centennial Park	Parks
Rutland Lions Park	Parks
Sarsons Park Washroom	Parks
Selkirk Park	Parks
South Kelowna Centennial Park	Parks
Strathcona Park	Parks
Stuart Park	Parks
Summerside Park	Parks
Sunset Dr Park	Parks
Sutherland Park	Parks
Water Front Park	Parks
Winslow Park	Parks

Site Name	Facility Type
H2O Aquatic Centre	Recreation
Parkinson Rec Centre	Recreation
Family YMCA - Athans Pool	Recreation
Memorial Arena	Recreation
Capital News Centre	Recreation
Apple Bowl Stadium	Recreation
Cedar Creek Community Centre	Recreation
East Kelowna Stadium	Recreation
Elks Stadium	Recreation
King's Stadium	Recreation
Pioneer Pavilion / Washrooms	Recreation
Rutland Arena	Recreation

Site Name	Facility Type
Street Lights	Various
Bus Shelters	Various
Irrigation Timers	Various
Non-categorized	Various
Residential	Various
Traffic Lights	Various

Appendix C – Electrical Emissions Intensity Factors

City of Kelowna's corporate emissions trends are impacted by electrical emissions intensity factors associated with the BC Integrated Grid. The table below provides the changes to the emission intensity factors by year:

Year	Emission Intensity Factors (tCO ₂ e/GWh)
2012	4.01
2013	3.5
2014	3.16
2015	3.42
2016	3.28
2017	3.17
2018	2.53
2019	2.99
2020	4.01
2021	0.97