Financial Implications

This document provides an estimate of the incremental capital costs associated with adopting the proposed requirements for the High Performance Civic Building Policy (the Policy) and includes a review of the life cycle cost implications. Table 1 summarizes the estimated capital costs, which are explained in greater detail in the report below.

Table 1: Summary of Incremental Capital Costs

	Incremental cost associated with new Policy
LEED Silver Certification	2.0 – 4.0%
25% better than 2017 NECB	0.0 – 3.3%
50% better than 2017 NECB	3.3 – 10%
75% better than 2017 NECB*	10%

** 75% better than 2017 National Energy Code is considered to be equivalent to net-zero energy ready and Passive House levels of performance.*

Capital Costs

Capital budgets for the design and construction of new high-performance buildings requires additional funding for improvements from a conventional building (code) to high performance. The magnitude of this cost is dependent on the level of performance being targeted, such as the level of LEED certification and energy reduction targets. This section outlines the factors that contribute most significantly to increased capital costs: LEED certification, energy targets and building commissioning. Generally higher LEED certification levels and higher energy performance targets will require higher investment, therefore higher initial capital costs.

LEED Certification

Incremental costs associated with LEED certification can be broken down into three categories: certification fees, consultant costs and construction costs. The construction costs make up the bulk of the incremental costs associated with LEED.

LEED certification fees for building design and construction are based on floor area. There is a minimum certification fee of $8,400 for buildings 2500m^2 or less. The average cost of LEED certification for the City of Saskatoon's (City) four existing LEED buildings ranged from 0.02 – 0.3% of the overall project budget.

The LEED program is a third-party verified system, so additional consultant costs are incurred for the increased documentation and administration work associated with submission. The average cost for previous City LEED projects ranged from 0.5 – 1.0% of the overall project budget.

The largest cost associated with LEED is the increase in capital construction cost for achieving the LEED credits. This cost isn't only associated with LEED, it is the cost of constructing a high-performance building, improving environmental outcomes and taking a triple bottom line approach.

At their meeting held on January 29, 2018, City Council resolved in part that:

"1. That the Administration continue to develop a High Performance Civic Building Policy utilizing the principles outlined in this report;"

The principles outlined in the January 29, 2018 Council Report are provided in the following table.

Table 2: Principles for a High Performance Civic Building Policy

Grouping	**Required Performance Criteria**	**Required Project Planning Considerations**
Land Development and Nature	Light pollution control, refrigerant management, native species (landscaping), storm water management best practices.	Wildlife corridors and habitat, wetlands and other sensitive ecosystems, mitigation of bird strikes, brownfield remediation, density/infill development, occupant access to outdoor spaces, native species, reduction of greenhouse gas emissions.
Transportation	Enabling of active transportation, including provision of secure bicycle storage and showers, planning for electric vehicle (EV) infrastructure ("EV ready").	Access to transit, alternative vehicle & transportation incentives.
Energy Efficiency, Water Efficiency, and Renewable Energy	Whole building indoor water use efficiency, mandatory requirements for water fixture efficiencies, maximum annual energy use intensities (kWh/m^2), minimum requirements for lighting efficiencies and lighting power densities (W/m^2), light pollution reduction, minimum requirements for appliances (e.g. EnergyStar), appropriate energy and water monitoring infrastructure and reporting, designated location and structural design planning for future renewables ("solar ready"), commissioning and air tightness requirements, minimization of thermal bridging.	Minimal or zero water for irrigation, grey-water re-use, electrical demand response technology, power factor correction equipment, lighting control strategies, planning for future net-zero energy and net-zero carbon.
Material Selection and Waste Diversion	Onsite storage and collection of recycling and organics, construction and demolition waste diversion during construction, hazardous waste management best practices.	Re-use of materials, recycled content in materials, regional materials, certified wood, bio-based

		materials, material declaration sheets and certifications.
Indoor Environment	Management of outdoor air pollutants, management of indoor air pollutants, tobacco smoke control, minimize presence of volatile organic compounds, design and commissioning for thermal comfort, ventilation standards.	Daylighting, acoustic design, whole building flush out, ventilation effectiveness, employee health and productivity.
Process, Quality Control, and Risk Mitigation	Integrated design process, best practice commissioning, envelope commissioning, air tightness requirement, LEED certification, life-cycle cost analysis, performance measurement, accountability, transparency and reporting.	Support of local green building industry, community education.

Table 2 shows that the Policy has a scope that is broader than greenhouse gas emission reductions and encompasses a broader range of performance, like the categories covered by LEED Certification.

The incremental construction costs are estimated based on studies commissioned by other parties. While the studies provide a range of costs for the City, they don't directly translate due to differing climate and business conditions. The Administration has not conducted local studies to further provide confidence or validation of other external studies.

The City of Edmonton commissioned HDR Corporation in 2014 to provide a comprehensive economic business case comparing different LEED certification levels. Table 3 below shows the results of their study in terms of incremental capital costs. Incremental costs from a 2013 paper by Enermodal Engineering are also listed for comparison.

Table 3: Incremental Construction Costs

LEED Rating	Certified	Silver	Gold	Platinum
Edmonton Study[1]	N/A	2.0 – 5.3%	2.7 – 9.2%	N/A
Small Buildings[2]	3%	7%	10%	15%
Large Buildings[2]	1%	3%	5%	8%

Without conducting our own study, the Edmonton study provides the City with the most applicable information. However, there are important differences to note, such as a new version of LEED being released (LEED v4) since the Edmonton study was conducted. LEED v4 has increased the requirements, making certification harder to achieve and studies on the cost impact are not widely known yet. Another difference to note is that

[1] HDR Corporation. (2014). *The City of Edmonton: Sustainable Return on Investment Analysis of LEED Certification Levels for New Building Construction.* Ottawa.

[2] The Cost of LEED Explained, Enermodal Engineering, 2013, www.enermodal.com/leed-explained.html

Saskatchewan adopted the *2017 National Energy Code for Buildings* (National Energy Code) in 2019. Achieving the energy requirements of LEED can contribute to a large portion of the LEED costs. It is estimated that meeting code will earn 10 of the 18 points for the optimize energy performance credit. With the new National Energy Code in Saskatchewan, this cost is now mandatory for all buildings and no longer considered a cost related to LEED.

Table 4 provides a summary of the incremental costs associated with achieving LEED Silver certification. Since the City currently has a standard to construct all new buildings to LEED Certified, the incremental cost will be to achieve LEED Silver from the current standard of LEED Certified. The costs associated with certification and consultant fees are already a cost that the City incurs and therefore are not considered an incremental cost of this policy.

Table 4: Incremental Cost of Achieving LEED Silver Certification

	Incremental cost over no building certification	Incremental cost associated with the Policy
Certification fees	0.02 – 0.3%	0%
Consultant costs	0.5 – 1.0%	0%
Construction Costs (LEED Silver)	2.0 – 7.0%	2.0 – 4.0%
TOTAL	2.5 – 8.3%	2.0 – 4.0%

Energy Targets

Setting energy targets for the construction of new civic buildings will likely increase the capital cost of the building. This will be dependent on the building type, level of efficiency, climate zone, and project team experience. The studies summarized below provide a range that the City could expect to see when implementing energy targets. Results from the Edmonton studies show that potential costs could increase 0 – 15%, based on the energy targets selected and the building type.

The City of Edmonton, while developing their Sustainable Building Policy, procured an energy and cost benefit analysis to inform the policy's future requirements. The energy and cost benefit analysis was completed for the five most common City of Edmonton building types: fire hall, police station, library, recreation centre and administration building. The results of the analysis show the incremental cost of achieving a 50% energy reduction over 2011 National Energy Code, 50% greenhouse gas emission reduction over 2011 National Energy Code and a maximum heating demand of 50 $kWh/m^2/yr$. For reference the 2017 National Energy Code is considered to achieve energy reductions of 10–14% over the 2011 National Energy Code, translating the Edmonton targets to a 35-40% reduction over the 2017 National Energy Code. The range of costs shown in Table 5 is due to the wide range of design options that can be used to achieve the targets. The low end implements design options that are cheaper to build but still meet the design targets.

Table 5: Results from Morrison Hershfield Edmonton Study[3]

Building Type	Range of Incremental Capital Cost
Fire Hall	0.9 – 6.7%
Administration	0 – 6.5%
Recreation Centre	1.4 – 4.1%
Library	0 – 3.5%
Police Station	1.7 – 7.8%
AVERAGE	**3.3%**

Edmonton had a second study done in 2017 by the engineering consulting firm Perkins + Will. The study involved a new City of Edmonton building that was currently being designed. The building was a mixed-use administration and industrial building that was difficult to optimize for energy performance due to the large number of overhead doors. The firm provided two additional schematic designs, along with the conventional design, that focused on energy efficiency. Table 6 provides a summary of the findings.

Table 6: Results from Perkins + Will Edmonton Study[4]

Scenario	Incremental Capital
40% Above 2011 National Energy Code	5.0 – 6.2%
Net-Zero Energy	9.7% (Net-Zero Ready) 14.7% (Net-Zero)

Efficiency Vermont conducted a study to explore the financial feasibility of net-zero energy buildings. The study examined the energy and financial implications of building to net-zero ready and net-zero standards compared to code for six building types, which included three commercial building types. Results are shown in Table 7.

[3] Morrison Hershfield. (2017). Retrospective Energy and Cost Benefit Analysis.
[4] City of Edmonton. (2017). Policy Analysis and Rationale - '40-40-80' Above Code Energy Performance ans 1% Dedicated Project Capital On-Site Energy Generation.

Table 7: Results from Efficiency Vermont Net-Zero Feasibility Study[5]

	Total Building Cost / sf	Cost above Code $/sf	% of project cost for additional efficiency upgrades
Code Office Open	$ 131	NA	0%
NZR Office Open	$ 140	$ 9	7%
NZ Office Open	$ 153	$ 22	16%
Code Office Closed	$ 154	NA	0%
NZR Office Closed	$ 164	$ 10	6%
NZ Office Closed	$ 178	$ 24	14%
Code Manufacturing	$ 107	NA	0%
NZR Manufacturing	$ 124	$ 17	13%
NZ Manufacturing	$ 137	$ 30	24%

The Edmonton studies mentioned above (Tables 5 and 6) were used to estimate the incremental costs associated with the energy target recommendations for the Policy. Edmonton's targets fall between the 25% and 50% targets (~35 – 40%) considered for the Policy, therefore a range has been used for those values.

Table 8: Estimated Incremental Cost of Energy Targets

	Incremental Capital Cost
Code (2017 National Energy Code)	0%
25% better than Code	0 - 3.3%
50% better than Code	3.3 - 10%
75% better than Code (Net-Zero Energy Ready)	10%
Net-Zero Energy	15%

Building Commissioning

At the regular meeting on January 15, 2018, the Standing Policy Committee on Environment, Utilities and Corporate Services was presented a report on Principles for a High Performance Civic Building Policy. The following is an excerpt from Attachment 6 – Financial and Sustainability Implications:

> "In its 2009 report, the Lawrence Berkley National Laboratory stated that it had the world's largest compilation and meta-analysis of commissioning experience in commercial buildings. Their report is based on a database of 642 buildings in the United States, spanning 26 states, with over 100 million square feet of floor space and $43M USD in commissioning expenditures. Their analysis incorporates feedback and data from over 37

[5] Maclay Architects. (2015, January 30). Net Zero Energy Feasibility Study. Retrieved from Efficiency Vermont: https://www.efficiencyvermont.com/Media/Default/docs/white-papers/efficiency-vermont-net-zero-energy-feasibility-study-final-report-white-paper.pdf

commissioning providers and their database includes public, lodging, higher-education, office, food sales, healthcare, and laboratory buildings."

The report found that the median normalized cost to deliver commissioning was $1.16/ft^2 for new construction or 0.4% of the overall construction cost. The median energy savings for new construction were found to be 13% and the median simple payback time was found to be four point two years. For the entire range of buildings in the Lawrence Berkley National Laboratory database the upper 25 percentile of payback time averaged approximately 11 years and the lower 25 percentile was below two years. Cash-on-cash return on investment for new construction was found to be 23%. More complicated buildings achieved higher returns and lower payback periods and projects with a comprehensive approach to commissioning attained nearly twice the overall median level of savings and five-times the savings of the least-thorough projects. Contrary to common belief cost effectiveness was also almost always achieved in small buildings. The median cost of conserved carbon was found to be -$25/tonne for new construction which can be compared to the +$10/tonne to +$50/tonne of a carbon tax."

Building commissioning is already a City project requirement for the construction of new civic facilities and aligns with requirements needed in LEED certification. Fundamental building commissioning is a mandatory prerequisite in LEED v4. There is also an additional credit that focuses on enhanced building and envelope commissioning for projects looking to achieve greater results. The incremental capital cost associated with building commissioning is estimated at 0.4% of the overall construction cost. With commissioning being a mandatory prerequisite under LEED, that cost is captured under the incremental LEED construction cost.

Life Cycle Costs

Life cycle costing can be used to evaluate the economic performance of the additional investment required to construct a high-performance building. Studies have shown the present value of the life cycle cost savings associated with green buildings can greatly outweigh capital cost increases. A high-performance building will incur financial and social benefits each year. Financial benefits include lower operating costs, utility savings, and reduced demand on municipal infrastructure. Social benefits include non-cash advantages such as increased employee productivity and reduced absenteeism, which are typically hard to monetize. When all benefits are considered, the incremental cost of constructing a high-performance building is outweighed by the value that is gained. Net Present Value is commonly used to communicate these benefits.

At the regular meeting on January 15, 2018, the Standing Policy Committee on Environment, Utilities and Corporate Services was presented the report on Principles for a High Performance Civic Building Policy. The following is an excerpt from Attachment 6 – Financial and Sustainability Implications:

> "The City of Edmonton commissioned HDR Corporation to provide a comprehensive economic business case comparing different LEED

certification levels.[6] The study used the Sustainable Return on Investment (Sustainable ROI) analysis methodology in addition to the typical Financial Return on Investment (Financial ROI) approach. The Sustainable ROI calculation monetizes non-cash benefits and costs including greenhouse gases, air contamination, stormwater, potable water, health and productivity, and transportation. The Sustainable ROI does not capture all of the potential benefits as difficult to monetize items such as the value of daylighting and windows in an office space were not included in the calculation. The study looked at real buildings constructed and operated by the City of Edmonton (a fire hall, police station, and a park administration building) and compares typical City of Edmonton construction requirements to LEED Silver and Gold. Note that "typical" construction requirements for the City of Edmonton were assumed to be beyond the minimum requirements of the building code and that the city "would always pursue some level of sustainability in its buildings".

The following are the main results of the study:

- The aggregate financial results (Financial ROI only) of pursuing LEED Silver over standard construction are overwhelmingly positive for all three buildings, generating 3.6 times more lifecycle benefits than costs, paying for the costs within 8 years, and generating roughly $2.7M in net financial benefits.
- The aggregate triple bottom line results (Sustainable ROI) of pursuing LEED Silver over standard construction are overwhelmingly positive for all three buildings, generating 6.7 times more lifecycle benefits than costs, paying for the costs within 5 years, and generating roughly $5.9M in net benefits.
- The aggregate financial results (Financial ROI only) of pursuing LEED Gold over LEED Silver are positive when aggregated for all three buildings, generating 1.7 times more lifecycle benefits than costs, paying for the costs within 17 years, and generating roughly $0.5M in net financial benefits.
- The aggregate triple bottom line results (Sustainable ROI) of pursuing LEED Gold over LEED Silver are positive for all three buildings, generating 5.5 times more lifecycle benefits than costs, paying for the costs within 6 years, and generating roughly $3.0M in net benefits.

The following two tables present the detailed report findings.

[6] The City of Edmonton: Sustainable Return on Investment Analysis of LEED Certification Levels for New Building Construction, HDR Corporation http://www.edmonton.ca/city_government/documents/Edmonton_LEED_SROI.pdf

Table 9: LEED Silver vs. Standard Construction

Scenario A: LEED Silver vs Standard Construction SROI Analysis - Impacts & Results: 30 Year Study Period	Ellerslie Fire Station	Fort Edmonton Administration	Edmonton Police Service SW Division Station	Aggregate Results		
Discounted Cost and Benefit Categories						
Social Benefit of Reduced Potable Water Use	$2	$2	$90	*$95*		SROI
GHG Social Benefit from Reduced Energy Use (Electricity & Natural Gas)	$251,887	$57,939	$790,415	*$1,100,242*		
CAC Social Benefit from Reduced Energy Use (Electricity & Natural Gas)	$155,584	$32,239	$518,087	*$705,909*		
O&M Cost Savings (Including Energy) at Water/Wastewater Treatment Plants	$218	$247	$9,734	*$10,199*		
Social Benefit of Enhanced Productivity from Indoor Environmental Quality Improvements	$179,663	$81,055	$1,089,901	*$1,350,620*		
GHG Social Benefits from Reduced Truck & Car Distance Travelled	$0	$1,847	$0	*$1,847*		
CAC Social Benefits from Reduced Truck & Car Distance Travelled	$0	$357	$0	*$357*		
Vehicle Operating Cost Savings from Reduced Truck & Car Distance Travelled	$0	$34,023	$0	*$34,023*		
Reduced Social Cost of Accidents from Reduced Truck & Car Distance Travelled	$0	$2,402	$0	*$2,402*		
Reduced Social Cost of Pavement Damage from Reduced Truck & Car Distance Travelled	$0	$331	$0	*$331*		
Reduced Social Cost of Traffic Noise from Reduced Truck & Car Distance Travelled	$0	$212	$0	*$212*		
Reduced Social Cost of Traffic Congestion from Reduced Truck & Car Distance Travelled	$0	$10,786	$0	*$10,786*		
Capital & Soft Costs - Incremental Total For All Credits	($261,400)	($163,390)	($617,950)	*($1,042,740)*	FROI	
Net O&M Cost Impacts (Non-Energy and Water)	$135,266	$67,660	$489,364	*$692,290*		
Potable Water Cost Savings	$6,496	$7,916	$280,939	*$295,351*		
Energy Cost Savings (Electricity & Natural Gas)	$562,693	$113,979	$1,963,365	*$2,640,037*		
Capital Replacement Costs Savings and Residual Value of Investment	$0	$52,866	$65,818	*$118,684*		
Discounted Results						
FROI Net Present Value	**$443,054**	**$79,032**	**$2,181,537**	***$2,703,622***	FROI	
FROI Benefit Cost Ratio	**2.7**	**1.5**	**4.5**	***3.6***		
FROI Discounted Payback Period	**10 y 2 m**	**25 y 7 m**	**6 y 5 m**	***8 y***		
SROI Net Present Value	**$1,030,409**	**$300,472**	**$4,589,764**	***$5,920,645***	SROI	
SROI Benefit Cost Ratio	**4.9**	**2.8**	**8.4**	***6.7***		
SROI Discounted Payback Period	**6 y 1 m**	**11 y 1 m**	**3 y 11 m**	***4 y 9 m***		

The results herein include only the incremental costs and benefits identified when comparing specific buildings involving a hypothetical determination of incremental credits in two build situations: in this case comparing the net benefits of LEED Silver vs Standard Construction (over and above ABC 2006).

Table 10: LEED Gold vs LEED Silver

Scenario B: LEED Gold vs LEED Silver SROI Analysis - Projected Impacts & Results: 30 Year Study Period	Ellerslie Fire Station	Fort Edmonton Administration	Edmonton Police Service SW Division Station	Aggregate Results	
Social Benefit of Reduced Potable Water Use	$2	$4	$56	*$62*	SROI
GHG Social Benefit from Reduced Energy Use (Electricity & Natural Gas)	$32,319	$13,247	$290,631	*$336,196*	
CAC Social Benefit from Reduced Energy Use (Electricity & Natural Gas)	$19,954	$7,101	$190,531	*$217,586*	
O&M Cost Savings (Including Energy) at Water/Wastewater Treatment Plants	$247	$373	$6,025	*$6,645*	
Stormwater Management Benefits (TSS Reduction)	$309,971	$0	$581,242	*$891,213*	
Social Benefit of Enhanced Productivity from Indoor Environmental Quality Improvements	$141,810	$73,435	$752,120	*$967,365*	
Urban Park/Tree Benefits	$37,447	$46,809	$96,081	*$180,336*	
FSC Wood Benefits (Commensurate with Costs)	$0	$1,675	$0	*$1,675*	
GHG Social Benefits from Reduced Truck & Car Distance Travelled	$0	$0	$152	*$152*	
CAC Social Benefits from Reduced Truck & Car Distance Travelled	$0	$0	$234	*$234*	
Vehicle Operating Cost Savings from Reduced Truck & Car Distance Travelled	$0	$0	$1,387	*$1,387*	
Reduced Social Cost of Accidents from Reduced Truck & Car Distance Travelled	$0	$0	$47	*$47*	
Reduced Social Cost of Pavement Damage from Reduced Truck & Car Distance Travelled	$0	$0	$218	*$218*	
Reduced Social Cost of Traffic Noise from Reduced Truck & Car Distance Travelled	$0	$0	$38	*$38*	
Reduced Social Cost of Traffic Congestion from Reduced Truck & Car Distance Travelled	$0	$0	$219	*$219*	
Capital & Soft Costs - Incremental Total For All Credits	($69,386)	($134,520)	($469,399)	*($673,305)*	FROI
Net O&M Costs - Incremental Total For All Credits	$0	$0	$0	*$0*	
Net O&M Cost Impacts (Non-Energy and Water)	($2,128)	$134,312	($8,454)	*$123,730*	
Potable Water Cost Savings	$7,368	$11,966	$173,900	*$193,235*	
Energy Cost Savings (Electricity & Natural Gas)	$72,124	$25,358	$721,311	*$818,793*	
FROI Net Present Value	**$7,979**	**$37,116**	**$417,358**	***$462,454***	FROI
FROI Benefit Cost Ratio	**1.1**	**1.3**	**1.9**	***1.7***	
FROI Discounted Payback Period	**27 y**	**22 y 10 m**	**14 y 8 m**	***16 y 7 m***	
SROI Net Present Value	**$549,730**	**$179,759**	**$2,336,337**	***$3,065,826***	SROI
SROI Benefit Cost Ratio	**8.7**	**2.3**	**5.9**	***5.5***	
SROI Discounted Payback Period	**3 y 9 m**	**11 y 9 m**	**5 y 1 m**	***5 y 5 m***	

Discounted Cost and Benefit Categories

Discounted Results

The results herein include only the incremental costs and benefits identified when comparing specific buildings involving a hypothetical determination of incremental credits in two build situations: in this case comparing the net benefits of LEED Gold vs LEED Silver