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Downtown District Energy Initiative

Business Case - Phase 1A and 2

Integrated Infrastructure Services |

Renewable Energy Systems

City of Edmonton

Project Sponsor: Tom Lumsden

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TABLE OF CONTENTS

Change History 4
Document Approval 4
1. Executive Summary 5
2. Profile Background 7
2.1. Problem / Opportunity 10
2.2. Current Situation 12
3. Profile/Initiative Description 15
3.1. Initiative Description 15
3.2. Initiative Justification / Urgency of Need 18
3.3. Potential Long Term Development Scenarios 19
3.4. Scope 24
3.5. Out of Scope 25
3.6. Anticipated Outcomes / Critical Success Factors 25
4. Strategic Alignment 26
4.1. Corporate Goals/Council Outcomes 26
4.2. Related Departmental Plan 29
5. Context Analysis 30
6. Alternatives 31
6.1. Options Considered 31
6.2. Communications and Outreach Plan 34
7. Analysis of Options 34
7.1. Financial and Environmental Analysis and Impact 35
7.2. Tangible Benefits 38
7.3. Intangible Benefits 38
8. Organizational Change Impact 39
8.1. Impact on Interested Parties 40
8.2. Business and Operational Impact 41
9. Key Risk(s) and Mitigation Strategy 42
10. Conclusion and Recommendations 44
10.1. Conclusion 44
10.2. Recommendations 45
10.3. Project Responsibility and Accountability 47
11. Business Case Review, Approval & Sign Off 48
12. Appendices 49

Change History

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Document Approval

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1	Christian Felske	Director, Renewable Energy Systems	June 11, 2025

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Version #	Approver Name and Title	Signature	Signing Date
1	Craig Walbaum, Acting Deputy City Manager, IIS		June 13, 2025

1. Executive Summary

The Downtown District Energy Initiative (DDEI) is a key action supporting Council's vision for a Climate Resilient City - aligned with the Community Energy Transition Strategy and Climate Change Adaptation and Resilience Strategy. It has been decades in the making, and throughout its various iterations, City Council has been engaged in discussions and has provided direction at key decision points.

At present, the DDEI is a City-owned thermal energy utility, delivered in partnership with EPCOR through a design, build, finance, operate and maintain agreement. The DDEI is expected to be built over 20 years in multiple phases (see Figure 2). The first phase of the overarching DDEI will provide heat. It includes the construction of a central energy centre in the Winspear Centre for Music. In Phase 1 of the initiative, this central energy centre will be connected and provide thermal energy to the Winspear, Century Place and Chancery Hall. Construction of Phase 1 started in 2024, with DDEI utility operations expected to begin in Q3 2025.

This business case outlines a three-pronged approach for continued growth of the DDEI. This growth is necessary to establish a corporate anchor load in the downtown, to grow from that stage on and to provide a pathway to fully realize Council's vision of a fully decarbonized, large-scale district energy network, which supports the City's target of net zero emissions for City buildings by 2040 and for the entire city by 2050. This approach includes:

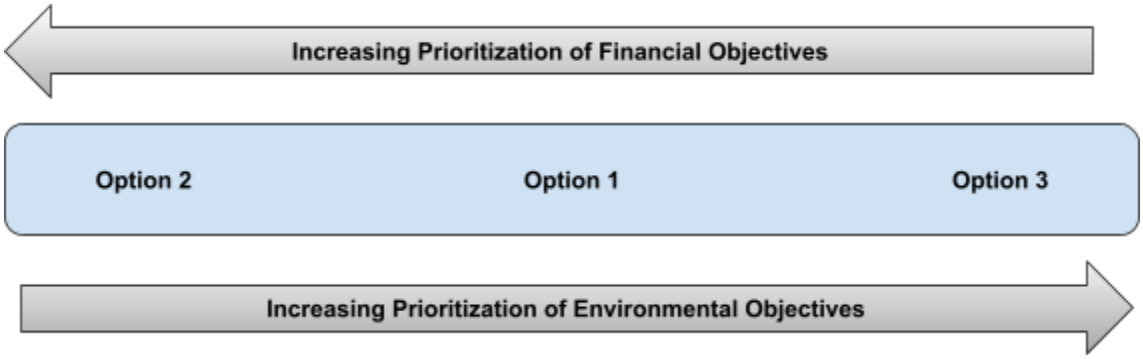
1. **City Leadership** - Full design and expansion of the DDEI to connect the next three City-owned anchor loads in Phase 1A (City Hall, Citadel and Stanley A. Milner Library). This fully establishes an anchor load in the downtown, consisting of six mostly City-owned and operated buildings.
2. **Growth Planning** - Advance design work for Phase 2 to prepare to serve privately owned properties. This would include eventually a second energy centre and extension of the DDEI to privately owned building clusters and two new prominent downtown developments — Station Lands and Village at ICE District.
3. **Awareness Building** - Implement a communications and Outreach Plan to increase awareness of the DDEI and engage in conversations with private building owners in the identified area. The goal of this work is to increase overall awareness of the overarching initiative and encourage connections.

The primary focus of this business case is to recommend a pathway for the near-term expansion of the DDEI to further establish an anchor load in the downtown, more specifically for the design and delivery of infrastructure to complete Phase 1A servicing to three additional City owned and operated buildings and the conceptual design work for Phase 2 expansion which will serve privately owned buildings, beyond the six buildings establishing the anchor load in the downtown. The following three alternatives were

evaluated as part of this business case:

- **Option #1 - Future Proof** (**Recommended)** - Advance Phase 1A development with natural gas infrastructure and operation, future proof the system for future renewable electricity use, advance conceptual design of Phase 2.
- **Option #2 - Business-as-usual** - Advance Phase 1A development with natural gas infrastructure and operation, advance conceptual design of Phase 2.
- **Option #3** - **Deep Carbon Reduction** - Advance Phase 1A development with renewable electricity infrastructure and operation, advance conceptual design of Phase 2.

Based on the available information and data provided in this business case, Administration recommends Option 1 and that the associated budget adjustment be fully approved.



Option #1 provides the optimal balance between ensuring the financial health of a new, growing utility, while positioning the Utility to be able to achieve higher GHG reductions in the future through use of the installed electric boilers if funding becomes available to purchase electricity. This is of particular importance given the corporate target of net zero emissions by 2040, as the buildings slated for connection to the DDEI in the near future (Phase 1 and 1A) are City-owned and operated. While the initial focus will be on the operation of natural gas infrastructure for Phase 1A, the simultaneous installation of electrical boiler capacity provides operational flexibility for easy and timely fuel switching in the future.

Financial forecasts, based on current information, also highlight that this option will establish the anchor load for the Utility (Phase 1 and 1A) in a financially sustainable manner both in the short and long-term. Financial sustainability is largely achieved due to the fact that the initial capital investment for Phase 1 and proposed capital investment for Phase 1A are funded through tax-supported debt and pay-as-you-go. As a result, the Utility will not be responsible for debt servicing costs on the debt as they will be financed through tax-levy dollars as opposed to utility rate revenues.

It is important to note that, based on current information, future expansion that focuses on greater decarbonization will result in a financial model that is not sustainable on its own without subsidization due primarily to a combination of higher capital and/or operating costs of renewable energy technologies. Future business cases supporting potential phase expansions will be presented to City Council for approval, with updated cost estimates and evaluation of technologies, before future decisions are needed to be made.

In parallel with conceptual design work for Phase 2, Administration will implement a Communications and Outreach Plan to generate awareness and buy-in for expansion of the DDEI to privately owned properties. Together, these efforts will prime future Phase 2 utility growth to identified buildings with an immediate focus on the two new developments in the downtown core, such as Station Lands and Village at ICE District.

Should Council approve the recommendation (Option #1) within this business case, an estimated $18.3 million in costs will be incurred for the planning, design and construction of the utility expansion to complete Phase 1A infrastructure and advance conceptual design of Phase 2. The project implementation within the Integrated Infrastructure Services (IIS) Department would follow the Capital Project Governance Policy C591 and the Project Development and Delivery Model.

To fund the proposed expansion, Administration proposes that Utility Committee recommend to City Council to approve the use of the existing capital budget in CM-83-0001 (District Energy Network Strategy and District Energy Nodes), pending Council's direction on which Option to advance. Capital profile CM-83-0001 was set up and will continue to be utilized to fund design and development of District Energy Nodes in accordance with the District Energy Strategy, including the Downtown District Energy Initiative. As outlined, building out the Downtown District Energy Initiative remains a key action in the Strategy as the age and environmental impact of buildings in the Downtown remain significant, compared to other nodes.

Administration has brought forward a capital budget adjustment to transfer existing funding from CM-83-0001 to 20-83-9001 (Downtown District Energy Initiative) which will result in no new capital funding approvals being required. Both capital profiles are primarily financed through tax supported debt.

2. Profile Background

The City of Edmonton, in partnership with EPCOR, is nearing completion of Phase 1 of the Downtown District Energy Initiative (DDEI). If all DDEI Phases are completed, the system will expand to connect approximately 50 buildings. The DDEI is a key action in the City's Community Energy Transition Strategy, and a priority opportunity area in the District Energy Strategy.

Prior to the City leading the project, the DDEI was explored by various parties, including Edmonton Power in the 1990s and ENMAX starting in 2012. Throughout the initiative's various iterations, City Council has provided direction at key decision points:

- **2012-2014:** District Energy project was initially contemplated for the Boyle Renaissance projects and other developments in the Quarters. A quadruple bottom-line assessment was completed.
- **2015-2016:** Council directed Administration to work with ENMAX and EPCOR on a downtown district energy system.
- **2017-2018:** Conceptual design was completed. ENMAX developed letters of intent with Winspear and EPCOR. City Council approved funding for detailed design.
- **October 2019**: Administration updated Council on the DDEI, which at the time was led by ENMAX. ENMAX informed the City it could no longer own the Downtown District Energy System following the Alberta Utilities Commission's decision to deny regulatory exemption. Council passed a motion to explore self-liquidating financing and public-private partnership options for a City-owned model.
- **April 2020**: Administration recommended a scaled-down approach under City ownership, with the central district energy centre located at the Winspear. City Council passed motions for Administration to bring forward an unfunded capital profile for the energy centre and to continue working with EPCOR or other potential private utility partners on future expansions.
- **May 2020**: City Council approved $27.9 million for the first phase of the DDEI within the 2019-2022 Capital Budget. This was funded through capital profile 20-83-9001 (Downtown District Energy Initiative) primarily through tax supported debt and Pay-As-You-Go.
- **February 2021**: City Council approved the definitive agreements (design, build, operate, maintain and finance) between the City and EPCOR for the DDEI and directed Administration to develop a strategy to address any incremental operating funding shortfalls.
- **June 2022**: Administration and EPCOR jointly recommended moving forward with a heating-only system for Phase 1, and Executive Committee approved an amendment to a contract to accommodate the change from combined heating and power to heating only.
- **July 2023**: City Council approved a capital budget adjustment to capital profile 20-83-9001 (Downtown District Energy Initiative), an increase to $35.9 million, to accommodate the scope change. The funds were transferred from capital profile CM-83-0001 (District Energy Network Strategy and District Energy Nodes) which is funded through tax supported debt. Administration indicated that more detailed

economic analysis was needed to further detail the opportunity and pathway to support growing the DDEI.

This business case outlines a three-pronged approach for continued growth of the DDEI utility, which is necessary to remain in step with Council's vision of a fully decarbonized, large-scale district energy network and climate target of net zero emissions for City buildings by 2040 and for the entire city by 2050. This approach includes:

1. **City Leadership** - Full design and construction to expand the DDEI system to connect the next three City-owned anchor loads in Phase 1A (City Hall, Citadel and Stanley Milner Library).
2. **Growth Planning** - Advance design work for Phase 2 to prepare to serve privately owned properties. This would include eventually a second energy centre and extension of the DDEI to privately owned building clusters and two new prominent downtown developments — Station Lands and Village at ICE District
3. **Awareness Building** - Implement a Communications and Outreach Plan to increase awareness of the DDEI for the growth planning exercise and engage in conversations with private building owners in the study area. The goal of this work is to increase overall awareness of the overarching initiative and encourage connections.

A significant amount of infrastructure needs to be built before new district energy projects can receive energy services. These utilities often start with just a few customers and have to manage capital investment funding gaps. Financial support is often required. It is also common for district energy utilities to be started with natural gas, with renewable energy sources integrated as they become economically feasible

Design and construction for Phase 1 was approved by Council to be funded through tax-supported pay-as-you-go and debt. This business case recommends funding design and construction for Phase 1A and conceptual design for Phase 2 through funds available in capital profile CM-83-0001. Capital profile CM-83-0001 District Energy Strategy/District Energy Nodes was approved by Council to provide funding for the design and development of District Energy networks in the City of Edmonton. This capital profile has $25.3 million of approved budget remaining as of May 31, 2025 and is funded through tax-supported debt.

Administration is recommending $18.3 million from this profile to be used as funding for construction and design of Phase 1A ($17.3 million) and conceptual design for Phase 2 ($1 million). As this work will be funded through tax-levy funding sources, the Utility will not be responsible for debt servicing costs related to the invested capital infrastructure. This will also result in Phases 1 and 1A, based on current information, to be forecasted to be financially sustainable in the short and long-term. However, continued expansion of future

phases, with green infrastructure will not result in a financially sustainable utility and will require some form of operating subsidization to maintain operations.

The DDEI can be financially sustainable over the long term, provided that a critical mass of customers is achieved to support each expansion, low-carbon energy sources are introduced carefully as technology evolves, rates are thoughtfully designed, and other additional external funding sources/operating subsidies are provided to maintain operations (i.e. grant, CRL or tax-levy) if more advanced GHG reduction scenarios are desired. As noted in the United Nations Environment Programme report *District Energy in Cities: Unlocking the Potential of Energy Efficiency and Renewable Energy,* "having only a short-term vision of the business case for district energy can be detrimental." Administration will therefore update this business case on an ongoing basis to reflect future potential investment decisions.

As the DDEI's anchor loads for Phase 1 and Phase 1A are recommended to be serviced through natural gas, continued growth of the DDEI is critical to ensure the acceleration of building decarbonization in Edmonton to meet originally planned GHG reductions. Continued expansion will require a critical mass of utility customers to be connected to the Utility as well as operating subsidization to financially support the capital investments required to meet the City's environmental goals.

2.1. Problem / Opportunity

The downtown core is Edmonton's most densely built area and a prime opportunity for efficient decarbonization. However, it lags behind other major Canadian cities, such as Vancouver, Toronto, Calgary, Ottawa, which have all built downtown district energy systems. Figure 1 depicts downtown Edmonton, highlighting building boiler stacks and corresponding point sources of emissions. This presents a significant opportunity to reduce community GHG emissions, in alignment with the City of Edmonton's Community Energy Transition and Adaptation and Strategies.

As of 2022, commercial, residential and institutional buildings together account for 36 per cent of the City of Edmonton's GHG emissions. Decarbonizing these buildings individually would be prohibitively costly, logistically complicated and significantly disruptive to occupants, and technically challenging as tailored solutions would be needed for the diverse building types. These hurdles impede rapid and widespread decarbonization of existing buildings, and are especially challenging. Furthermore, without strong policy requiring building decarbonization and/or availability of incentives for deep energy retrofits, building-level decarbonization at scale is unlikely to materialize within Council's target timeline for GHG reductions. Additionally, the recent removal of the City of Edmonton's Charter Powers related to regulating energy efficiency of individual buildings impedes the ability to mandate GHG emissions reductions on an individual building level.

Figure 1: A North-Facing View of the City of Edmonton's Skyline.

District energy systems, on the other hand, offer a compelling alternative pathway to building decarbonization. By connecting multiple buildings to a central energy centre, district energy enables efficient fuel switching. Once buildings are integrated into the network, the introduction of a low-carbon energy source(s) at the energy centre(s), such as electric boilers coupled with renewable electricity supply, geoexchange or industrial waste heat recovery (often not feasible at the building level), facilitates efficient decarbonization of heating and cooling across the entire connected building stock.

This centralized approach bypasses individual complexities of building retrofits to achieve the same or better emissions reductions at lower cost. By unlocking economies of scale, district energy systems are an impactful solution for achieving significant emissions reductions and increasing local energy resilience. By connecting to a centralized district energy system, buildings in Downtown Edmonton will be able to more cost-effectively reduce their GHG emissions than through individual (i.e., building-scale) retrofits..

As the regulatory body of the DDEI Utility, City Council (at its discretion) may leverage existing jurisdictional authority to implement a mandatory connection bylaw to drive long-term climate objectives. To effectively exercise this authority and achieve GHG emission reductions, the necessary district energy infrastructure must be built and low-carbon energy sources introduced into the mix. A decision on whether to expand the Utility through a bylaw mandating connections as infrastructure is built out versus negotiating individually with building owners in advance of commiting to and installing infrastructure is a decision that will need to be analysed further.

Despite this opportunity to significantly reduce GHG emissions, economic, technical and social challenges remain. The current lower cost and simplicity of natural gas present a

competitive economic hurdle to attract customer connections without incentive. Technical complexities associated with integrating older buildings into a district energy system must also be addressed (e.g., connecting below-grade district energy infrastructure to rooftop or penthouse mechanical rooms and units). Timing of building connections may be challenging, and in the absence of alternative options, building owners have historically replaced equipment at the end of their service life with conventional technologies. In doing so, major decisions are typically delayed until the next equipment replacement cycle. Additionally, a lack of widespread awareness and understanding of the benefits of district energy, coupled with the presence of various interested parties with competing priorities and interests, necessitates a Communications and Outreach Plan. This also includes implementing an attractive rate approach which provides building specific opportunities to fully acknowledge and implement the benefits to connect to a district energy system.

Shifting the mindset to prioritize climate infrastructure investment now to avoid future impacts to costs is key to the overall success of the DDEI. The three-pronged approach recommended and presented in this business case strives to balance current economic realities of growing a new utility in an established urban centre, while remaining in line with the overarching vision of a decarbonized downtown core.

2.2. Current Situation

In 2022, EPCOR and the City completed a high-level feasibility study which provided an assessment of a district energy system that could provide low-carbon thermal energy to buildings in downtown Edmonton to enable building decarbonization. The feasibility study identified approximately 50 buildings and two new developments (Station Lands and Village at ICE District) for phased connection to the district energy system (see Figure 2).

Phase 1: Delivery & Utility Operations

At the time of writing this business case, the City and EPCOR, through a design-build, finance, operate and maintain agreement, are delivering Phase 1 of the DDEI. Phase 1 will provide heating and includes the construction of a central energy centre within a purpose-built building at Winspear, as well as connections and the provision of thermal energy to Winspear (including its expansion), Century Place and Chancery Hall. Construction started in 2024, with utility operations expected to begin in Q3 2025.

While Phase 1 serves as the foundation of the growing utility, it is important to note that the Phase 1 energy centre was designed to serve additional buildings and to integrate low-carbon generating capacity. Furthermore, as noted in IIS01386 - DDEI Project Update, expansion of the downtown district energy system “is required to achieve the project objectives.” In parallel to this business case, Administration is also advancing a bylaw and fiscal policy to establish the DDEI Utility.

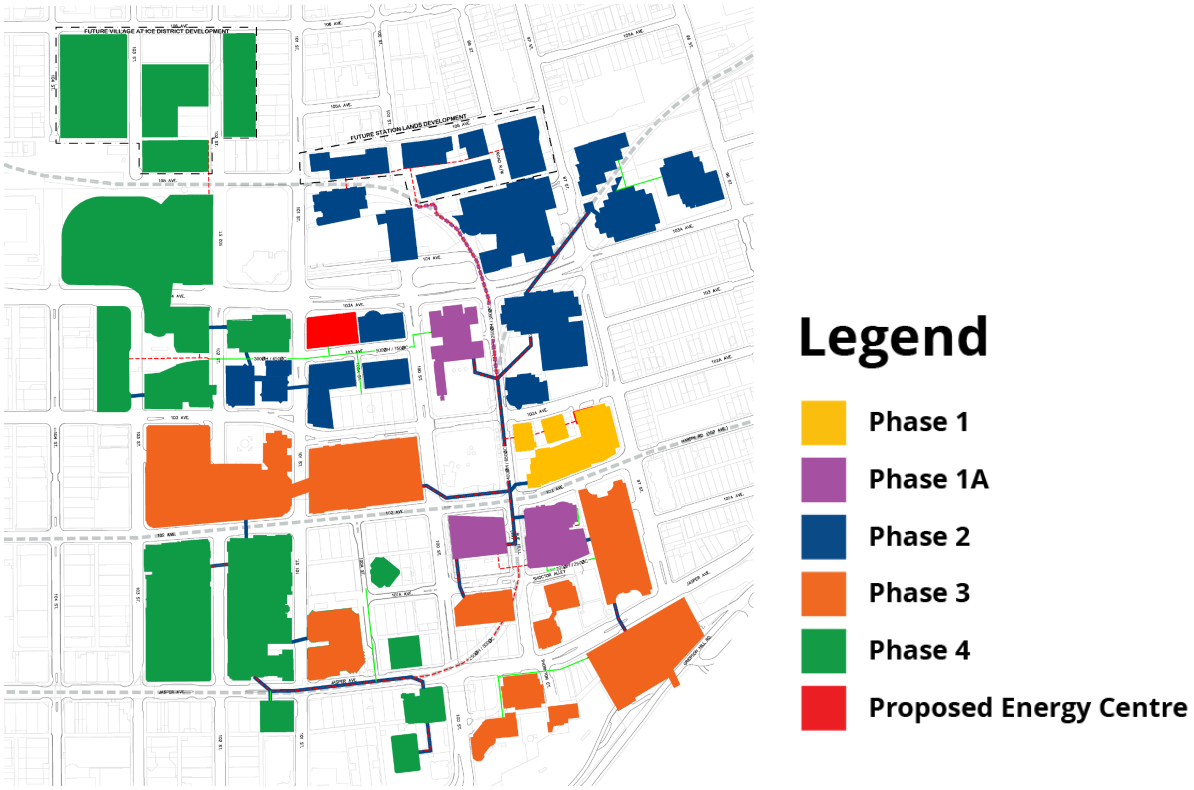


Figure 2: Proposed phased growth of the DDEI

Phase 1A: Additional City-owned Anchor Loads

At present, only high level design work has been completed for infrastructure to connect the next three City-owned buildings (City Hall, Citadel and Stanley A. Milner Library) in Phase 1A. As part of the approach outlined in this business case, it is recommended to advance full design and construction of Phase 1A DDEI to connect these next three City-owned anchor loads which would complete the full first phase of the DDEI.

Phase 2: Dialogue with Developers and Existing Buildings Owners

To date, Administration has spoken with private developers Qualico and Katz Group to understand their interest level in the DDEI. Administration has also completed joint studies to evaluate the feasibility of connecting Qualico's Station Lands development and the Katz Group's Village at ICE District Development to the DDEI. Connecting these new developments to the DDEI offers benefits to the developers by saving costs of heating and cooling infrastructure, as well as other structural work. Connecting to the DDEI has the potential to increase available floor space and to reduce building operating costs. Formal agreements will need to be made with these developers, as well as other private and public owners of buildings in Phase 2. Examples of existing buildings in Phase 2 are the provincially owned, John E. Brownlee building and the Royal Alberta Museum, and privately owned buildings like CN Tower and MNP Tower. Targeted communication and marketing work is essential to attracting additional voluntary building connections.

As outlined in IIS01447 - Village at ICE District Lands Feasibility Study, a feasibility study was completed for Village at ICE District. The study was supported by the Katz Group Real Estate, EPCOR and the City of Edmonton and indicates that integrating Village at ICE District into the DDEI would reduce GHG emissions, while keeping energy costs competitive (subject to further analysis). Administration has ensured that its preliminary design for Phase 2 of the DDEI can integrate Village at ICE. There are no definitive commercial agreements to connect and there is no bylaw mandating connection of this new development to the DDEI. However, the parties have committed to keeping each other informed and engaged in ongoing coordination of the respective developments and district energy system implementation timelines.

A feasibility study for a district energy connection to the Station Lands development was also completed. It concluded that “the expansion of the initial District Energy System, currently built at the Winspear, to connect with the EPCOR Tower and Station Lands development presents a strong and logical opportunity to provide the greenhouse gas footprint reductions at a competitive thermal energy cost.” Qualico has already shown a strong interest in connecting to district energy. It designed the first building at Station Lands — The Switch — to be "district energy ready." Working with Administration and with EPCOR's support, Qualico designed The Switch to connect to existing heating infrastructure at EPCOR Tower. This has led to cost savings, the freeing of more floor space for rent and will allow Station Lands to more easily connect to a wider district energy network in the future. Informal discussions about the growth of Station Lands and its integration into the overall DDEI Initiative are also commencing. However, similar to the Village at ICE development, there are no definitive commercial agreements yet to connect and there is no bylaw mandating connection of the new development to the DDEI Initiative.

The District Energy team is also engaged in the design of the 103A Ave pedway, which is led by the LRT team and will connect Churchill LRT Station to Station Lands. The design ensures that space for district energy piping is allocated in the pedway design and can potentially be incorporated into the pedway construction.

Phase 3+

At present, Administration is focused on Phases 1, 1A and 2. Some building owners and tenants in the Phase 3 and 4 areas of the DDEI, such as City Centre Mall and Canada Place, have approached the City to learn more about the DDEI. Additionally, the City and MacEwan University have begun initial discussions, with a Memorandum of Understanding under development to explore potential integration of their campus into the DDEI.

Administration is implementing a Communications and OutreachPlan to increase awareness of the DDEI more broadly which will advance conversations with private building owners in and near the study area depicted in Figure 2.

Impact of Maintaining Current State

As indicated in the June 2023 report to Executive Committee (IIS01386), to achieve the original GHG reductions required to meet the City's current climate targets in a financially sustainable manner, expansion of the system beyond Phase 1 will be required. Careful consideration will need to be given to balance environmental/GHG reduction goals while factoring in the required future costs of expansion.

Should the current situation be maintained and the recommendation in this business case to expand the DDEI not be approved, a number of negative impacts are likely:

- Environmental: Limited GHG reductions despite high capital investment.
- Market/Reputational: Reduced confidence among interested parties, missed economic development opportunities and a perception of poor planning by the City.

3. Profile/Initiative Description

3.1. Initiative Description

The purpose of the Downtown District Energy Initiative (DDEI) is to provide a low-carbon district energy system that provides heating and cooling thermal energy to core public and private sector buildings in downtown Edmonton. The DDEI supports key actions in the City's climate plans to increase overall energy resilience at a competitive rate structure and works towards financial sustainability.

The focus area for the feasibility study, completed by EPCOR and the City, is the downtown core, which comprises numerous large office buildings, multi-unit residential buildings and commercial or institutional buildings. The study identified 50 existing buildings within the study area which may be suitable for connection to district energy. Additionally, two emerging developments, Village at ICE District and Station Lands, reside within the proposed DDEI area and have been identified as potential connections to the system. The DDEI feasibility study and this business case assume a 75 per cent market penetration rate through Phases 2 to 4. The full system could achieve up to 96 per cent reduction in greenhouse gases versus business as usual.

The boundary of the proposed DDEI area is shown in Figure 2. Of note, the proposed area was largely dictated by the existing pedway system, which will be used to route piping. A phased approach has been outlined for the implementation of the DDEI to achieve the maximum amount of GHG reduction, representing Scenario#4 in Table 1, 2 and 3.

- **Phase 1 (2025 – 2027)**
  - Develop and operate an Energy Centre at the Winspear Centre for Music that provides heating service to the Winspear and its expansion, Century Place and Chancery Hall.
  - Funding approved through capital profile 20-83-9001 (Downtown District Energy Initiative) for $35.9 million through tax-supported debt and Pay-As-You-Go.
- **Phase 1A (2028 – 2030)**
  - Install electric boiler capacity at the existing energy centre as the first level of decarbonization.
  - Expand heating service to City Hall, Stanley A. Milner Library and Citadel Theatre.
  - Funding proposed to be provided through approved capital profile CM-83-0001 (District Energy Network Strategy and District Energy Nodes) which is funded through tax-supported debt.
- **Phase 2 (2031 – 2035)**
  - Construct an additional and much larger capacity main energy centre to provide heating and cooling to the DDEI, utilizing electrical boilers and chillers.
  - Expand cooling services to Phase 1 and 1A buildings.
  - Expand heating and cooling to additional buildings to the north side of downtown, colored blue in Figure 2.
  - Currently unfunded and will be addressed with an updated business case in the future closer to implementation.
- **Phase 3 (2036 – 2040)**
  - Implement waste water treatment plant heat recovery and geo-exchange as the second level of decarbonization.
  - Expand heating and cooling service to buildings to the west and south sides of downtown, colored orange in Figure 2.
  - Currently unfunded and will be addressed with an updated business case in the future closer to implementation.
- **Phase 4 (2041 – 2045)**
  - Further expansion of heating and cooling to buildings to the west and south sides of downtown, colored green in Figure 2.
  - Currently unfunded and will be addressed with an updated business case in the future closer to implementation.

It should be noted that the actual timelines of phase developments above are likely to change as they are dependent on market penetration and other factors. The figure below summarizes the total building area expected to be served by the DDEI:

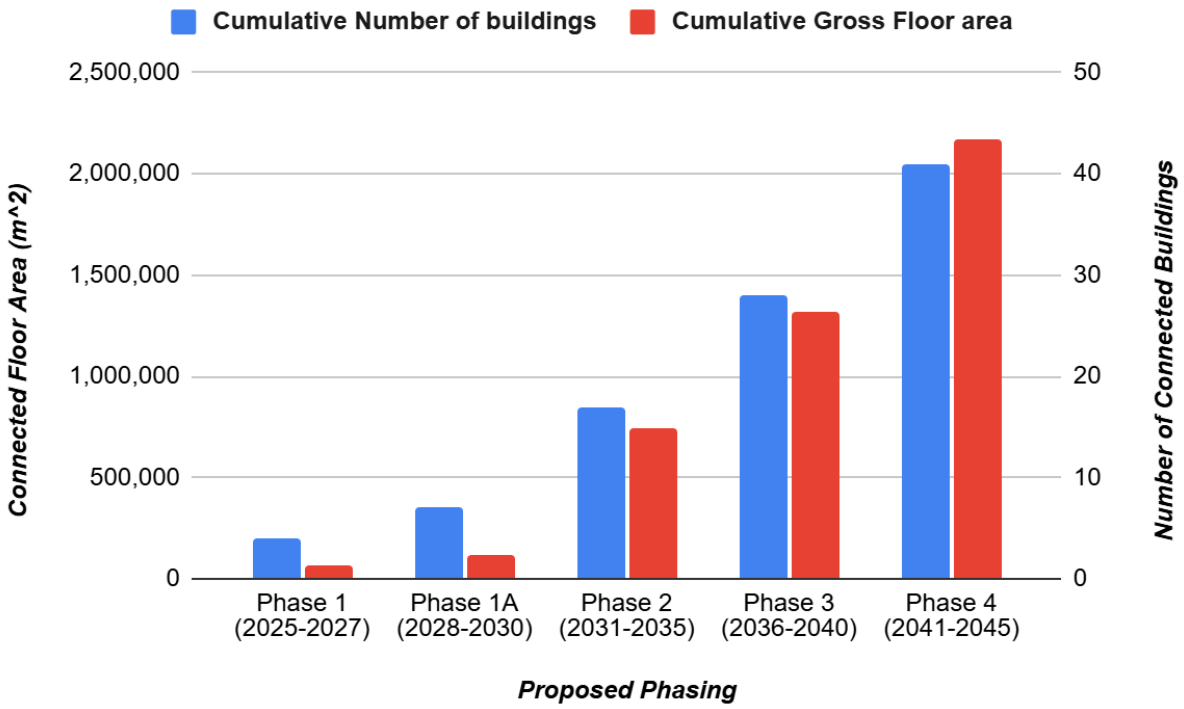


Figure 3: Summary of Building Connections to Thermal Energy Services

The growth of the DDEI reinforces the need for a balanced approach to ensure environmental and financial sustainability of the Utility. Integration of low-carbon technologies comes with a cost premium. In the initial stages, this can significantly impact the long-term financial health of a growing utility due to the need to build a large portion of the capital prior to connecting customers. As shown by Figure 3 above, the majority of system load is expected to be brought online in Phase 2, 3, and 4.

In the long-term, based on current information, integration of low-carbon technologies will result in a system that is not financially sustainable due to the higher capital investments and/or operating costs required to achieve greater GHG reductions. This is also impacted by rate setting principles in the proposed Utility Fiscal Policy as it initially adopts a business-as-usual approach limiting how high utility rates can be to make connecting to the Utility more attractive for potential utility customers. If this direction is desired, long-term financial sustainability would require ongoing operational subsidies and likely a modification to the Utility Fiscal Policy allow for utility rates above business-as-usual to ensure more funding is available to adequately cover both the ongoing expenses of maintaining utility infrastructure and the capital costs required for system upgrades and expansions. This is further explored in Section 3.3 below.

Phases 1 and 1A will connect City-owned and operated buildings, so connections are expected to be relatively straightforward. The six planned buildings will provide an anchor load for the Utility and establish a customer base to demonstrate the viability of the District

Energy system. However, for buildings and developments beyond these phases, there is currently no bylaw in place that mandates connection or any policy in place to incentivize connections to the Utility.

The Communications and Outreach Plan will be essential to build awareness, demonstrate value and encourage connections to the DDEI. To build a sustainable utility, it will be crucial to balance growth in energy loads and connections with the ability to provide GHG-reducing technologies that benefit all customers at competitive rates and fees. The overall goal of the Utility is to achieve GHG emissions reductions in line with the City's net-zero goals for its operations (including its buildings) and the city as a whole.

Key decisions will need to be made along the way to achieve these goals and will be supported by future business cases closer to implementation that will factor more current available information. Administration anticipates that key parameters, such as capital costs, fuel costs, building regulations and incentives, may change significantly over the coming decades, and these could have an impact on how the Utility operates. The adoption of a business-as-usual policy into the Utility fiscal policy is also an important factor that determines whether utility rates paid by customers are competitive for them compared to existing utility services for heating.

3.2. Initiative Justification / Urgency of Need

The growth of the DDEI is a key action identified by the City's Community Energy Transition Strategy and aligns with broader City efforts to establish a large-scale district energy network in Edmonton. There is a growing and urgent need to address GHG emissions produced by heating and cooling buildings, and the DDEI provides a strategic pathway to do so in Edmonton's downtown core.

Due to recent changes by the Government of Alberta, the City now has limited jurisdiction to mandate building-level decarbonization of new or existing buildings through its building code. However, the DDEI offers an effective decarbonization tool that is within municipal control. By establishing and expanding a City-owned district energy system, City Council can choose **how** and **when** to introduce low-carbon energy sources. District energy provides a pathway to decarbonize buildings at scale, that can achieve significant reductions in GHG emissions that would be difficult or impossible to reach through individual building retrofits.

The three-pronged approach recommended in this business case is crucial for several reasons:

- **Timely Decarbonization:** As individual building mechanical systems age and approach the end of life, building owners will soon be faced with decisions about replacement or upgrades. The DDEI provides the foundation to provide, in the future, a more cost-competitive and sustainable alternative compared to building-by-building decarbonization by switching one energy supply to the benefit of multiple buildings.
- **Avoiding Business-as-Usual Replacements:** If the City does not have DDEI infrastructure in place, building owners are likely to proceed with "business-as-usual" replacements, locking in fossil fuels and carbon emissions for at least another building life cycle (20+ years). By connecting to the district energy system, the building will benefit from renewable fuel sources (when introduced) and achieve the resulting GHG reductions.
- **Efficient Expansion:** Proactive planning and design will be vital to ensure that the DDEI can efficiently expand to serve the identified buildings, maximizing the impact of investment and minimizing disruption.
- **Financial Sustainability:** Increasing the number of customers connected to and using energy services (heating and/or cooling) provided by the Utility will be vital to ensuring a critical mass of customers is connected to the Utility to support the required capital infrastructure to meet desired GHG reductions, lower the financial risk with each additional expansion phase, and grow the opportunity for eventual fuel switching to low-carbon energy sources. However, as it stands today, further tax-levy subsidization of capital and yearly operating costs will be required to achieve this goal.

3.3. Potential Long Term Development Scenarios

To provide a long-term outlook of the potential path for the DDEI, Administration has modelled four potential long-term scenarios, based on full buildout, to demonstrate the potential financial and environmental impact given currently available information. These scenarios were developed at a high level to demonstrate the overall trend, impact and range of opportunities for the DDEI based upon the type of fuel used and its impact on greenhouse gas emission reduction. These scenarios are also based on principles established in the proposed Utility Fiscal Policy for the Utility in regards to rate setting, debt financing, operational guidelines, and financial indicators for assessing long-term financial sustainability.

Careful evaluation and decision making will be necessary at each future step of utility growth, as key financial, regulatory and operational factors are expected to change over the next few decades. The cost estimates provided here for Phase 1A are Class 4 and for all the future Phases are Class 5 (as per AACE International No.17R- 97 Rev August 7, 2020). These changes will impact the high-level information presented below. The four potential

scenarios are:

1. **No Decarbonization** - full build-out with fossil fuels, predominantly natural gas, achieving a GHG reduction of 10 per cent
2. **4 MW Electrical Boiler** - full build-out with renewable electricity as a minor energy source, achieving a GHG reduction of 35 per cent
3. **24 MW Electrical Boiler** - full build-out with renewable electricity as the main energy source, achieving a GHG reduction of 75 per cent
4. **Max Decarbonization** - full build-out with deepest decarbonization impact (including waste heat recovery and geo-exchange), achieving GHG reduction of 96 per cent

Table 1 below provides an overview of key parameters, such as capital costs, operating costs, rate revenue, net-present value (NPV) and GHG reduction data for each scenario. Financial analysis is provided through financial modeling and cost estimates based on work provided by external consultants in partnership with Administration. It should be noted that this financial analysis does not include the impact of the federal consumer carbon tax as this was recently removed by the Government of Canada. As such, the analysis is fairly conservative from this perspective, as any impact of potential future pollution pricing is not included.

Forecasted utility revenues are based on regulated utility rates based on “Business As Usual” (BAU) for anchor load utility customers. BAU is, equivalent on average to, what a utility customer would pay based on traditional energy providers, elsewhere in the City of Edmonton, based on estimated avoided costs on thermal energy utility bills, annual boiler maintenance costs, and capital renewal costs. This speaks to the fact that a connection to the district energy system basically replaces natural gas costs and avoids capital boiler replacement and boiler maintenance costs for individual building owners. In general, if DDEI is financing all costs of providing utility service, BAU provides an upper limit in how much the Utility is able to charge utility customers compared to actual cost of service. Future customers in future expansions will need to be evaluated, based on their unique requirements and situation, before connecting them to the Utility to ensure that the most optimum method and value of utility rates is determined (i.e. regulated, negotiated contracts, etc.).

BAU utility rates have been proposed to balance the priorities of ensuring utility rates are reflective of an average building’s energy bills and estimated avoided costs, connecting to the Utility is more attractive from a financial and environmental perspective, and provide the Utility with a revenue stream that can better support short-term financial requirements. Once the system expands in future phases, the goal remains to achieve long-term financial sustainability (including future capital renewal). The application of BAU may need to be revisited in the future if higher GHG reduction options are desired. Establishing regulated rates also ensures transparency for the anchor load customer base, and provides a baseline in which Administration can use to build off from for potential

future customer connections.

A positive NPV signifies a project that is forecasted to generate a positive financial return on investment while a negative NPV is forecasted to generate a negative financial return (i.e. a forecasted funding shortfall). If scenarios are pursued where the resulting NPV represents an overall negative return on financial investment, City Council will need to consider how any potential future funding gaps will be addressed (e.g. options could include, but are not limited to, tax levy support, external grant, CRL funding, or increasing utility rates above BAU). Due to the uncertainty around being able to secure external grants, CRL funding and tax levy support are likely the more realistic funding source. It is also important to weigh non-financial benefits when evaluating each scenario (e.g. GHG reductions) and their relative importance to City Council.

Table 1: NPV Forecast Analysis - Full Buildout (in $millions)

Scenario	Description	Capital Investment	Annual Operating Costs	Annual Rate Revenue	NPV	GHG Reduction		Cost of GHG Reduced
		Total	Average	Average	30 Year	[%]	[tCO2] 30 Year	[$/tCO2]
1	No Decarbonization	372	23	33	106	10	140,000	-757
2	4 MW Electric Boiler	374	30	33	16	35	400,000	-40
3	24 MW Electric Boiler	374	45	33	-161	75	900,000	179
4	Max Decarbonization	632	46	33	-172	96	1,200,000	143

As anticipated, achieving higher GHG reductions requires higher capital costs, due to more expensive carbon-reducing technology, and higher operating costs to utilize less carbon intensive energy sources (relative to natural gas). Scenario #4 (with maximum decarbonization) leads to a 96 per cent reduction in GHG emissions but produces a negative NPV of $172 million. Scenario #3 (utilizing 24 MW of electric boiler capacity) results in a 75 per cent reduction in GHG emissions and a negative NPV of $161 million. Although both scenarios are forecasting similar NPV results, Scenario #4 results in a more cost effective cost of GHG reduced ($143/tCO2) compared to Scenario #3 ($179/tCO2). The analysis also confirms the trend that additional funding support would be currently needed to pursue options that would achieve higher GHG emission reduction outcomes.

Both Scenario #1 and #2 are forecasted to result in a positive NPV ($106 million and $16 million, respectively) and therefore are forecasted to provide a positive return on investment. This is primarily due to the utilization of natural gas boilers (Scenario #1) or utilizing reduced electric boiler capacity (Scenario #2). Both scenarios also produce a lower amount of GHG reductions at 10 and 35 per cent respectively.

It is also important to consider that forecasted operating costs, relative to capital investments in Phase 1 and Phase 1A, do not include any debt servicing costs as capital expenditures for the two phases are forecasted to be funded primarily through tax supported debt. This essentially means that the Utility is being provided cash flow by the City of Edmonton, which the Utility is using to pay for Phase 1 and 1A capital expenditures. As such, the cost of debt servicing remains with the City of Edmonton. This will allow for the anchor load/customer base to be established in a more financially sustainable manner from a Utility perspective. Future capital investments (i.e. Phase 2 and beyond) are forecasted to be fully utility financed. In other words, without tax levy support, the financial forecasts would not be as favourable as presented and inherently include more risk. Future business cases supporting potential phase expansions will consider this impact and be presented to City Council for approval before future decisions are needed to be made.

From an operational perspective, if more renewable energy sources are proposed to be utilized in the future, the overall financial forecast is less favourable due to the higher costs of those energy sources. This is further impacted by the establishment of utility rates being based on BAU as revenue streams collected to provide the utility services will be capped.

The cost of GHG reduced (last column) is a measure of the cost efficiency of reducing GHG emissions for each scenario. It is calculated by dividing the net-present value by the amount of GHG reduced. A positive value in this column (as in Scenarios #3 and #4) is seen as the necessary climate investment to achieve the greenhouse gas goals. A negative cost of GHG reduced (as in Scenario #1 and #2), on the other hand, indicates that the project retains a positive return of investment for each tonne of the greenhouse gas emission reductions that would be simultaneously achieved.

To further explore the impact of forecasted capital cost investments, Table 2 below highlights the planned capital costs for each future expansion phase.

Table 2: Capital Costs by Phase - Full Buildout (in $ millions)

Scenario	Description	Phase 1	Phase 1A	Phase 2	Phase 3	Phase 4	Full Buildout
		2025-2027	2028-2030	2031-2035	2036-2040	2041-2045	2046-2054
1	No Decarbonization	36	21	96	88	131	372
2	4 MW Electric Boiler	36	23	96	88	131	374
3	24 MW Electric Boiler	36	23	96	88	131	374
4	Max Decarbonization	36	23	104	287	182	632

Per Table 2 above, Scenario #4 (Max Decarbonization) is the most capital intensive over the full buildout with the majority of the investment occuring in Phase 2, 3 and 4 compared to

the other three scenarios.

In contrast, the other three scenarios are similar in overall capital investment as well as in timing of capital spend. This is primarily due to new natural gas and electric boilers essentially costing the same. The major difference in the overall NPV outcomes are a result of the cost of operating the boilers as natural gas is historically cheaper than electricity. As such the difference in financial impact, relative to capital costs, for these three scenarios is immaterial.

As the majority of capital costs are planned during Phases 2, 3, and 4, coinciding with increases in required system load (Figure 3), major decisions regarding the decarbonization approach will not be necessary until closer to 2031 and decisions around pursuing max decarbonization will not be necessary until closer to 2036. This is further reinforced by the fact that the planned capital spend for Phase 1 and Phase 1A are similar for all the identified scenarios above.

This trend is also seen in Table 3 which shows the cumulative cash flows at the end of each expansion phase. Cumulative cash flows represent the life-to-date net balance (revenues less operating and capital costs) at a point in time. In other words, a positive balance is reflective of the Utility having generated enough total cash flow to cover all operating and capital costs to date ("breaking even" or achieving "payback").

Table 3: Cumulative Cash Flows by Phase - Full Buildout (in $ millions)

Scenario	Description	Phase 1	Phase 1A	Phase 2	Phase 3	Phase 4	Full Buildout
		2025-2027	2028-2030	2031-2035	2036-2040	2041-2045	2046-2054
1	No Decarbonization	1	4	9	30	90	288
2	4 MW Electric Boiler	1	-3	-20	-33	-16	79
3	24 MW Electric Boiler	1	-3	-45	-122	-209	-373
4	Max Decarbonization	1	-3	-51	-135	-245	-387

As noted above, Scenario #1 and #2 are forecasted to generate positive cumulative cash flows by the end of the full buildout with Scenario #1 being less risky as it is forecasted to achieve minor positive cash flows in the short term. In contrast, Scenario #3 and #4 are forecasted to generate negative cumulative cash flows by the end of full buildout due to higher operational and capital costs required to support greater GHG reductions. As such, based on current information, if Scenario #3 or #4 are desired to be pursued, alternative funding sources would be needed in the future to ensure long-term financial sustainability.

However, similar to Table 2, the cumulative cash flows for each scenario are also similar for Phase 1 and Phase 1A due to major expansions/decision points not being scheduled until

Phase 2 and beyond. As noted previously, the variance between the scenarios is due to Scenario #2, #3, and #4 utilizing electric boilers and/or other more environmentally efficient technology such as geoexchange or waste heat recovery to provide utility services.

As such, Phase 1 and the next proposed expansion (Phase 1A) are currently on a path to essentially a no-decarbonization buildout (Scenario #1). As Scenario #1 is forecasted to return a positive NPV, this results in the planned near term buildout being financially sustainable, in the long term, with the Utility already breaking even during the Phase 1 period. As highlighted above, this also remains true through all future potential phases and increases as more customers are connected in future years.

Continued expansion of future phases with renewable energy infrastructure will result in a utility that is not self-sustainable, based on current information, and will require some form of operating subsidization to maintain operations.

It is important to note that the presented financial analysis is high level and based on current information available and will need to be updated as more detailed estimates are available closer to the potential implementation of future expansion phases. Administration will provide the required information, as available, to City Council at future critical milestones, along with updated business cases, to support future capital expansion investment decisions.

As such, the further and primary focus of this business case is to recommend a pathway for the near-term expansion of the DDEI, more specifically on the design and delivery of Phase 1A and the conceptual design for Phase 2.

3.4. Scope

The scope of this business case includes the review of three options for achieving the anticipated outcomes above for the next two phases of development, more specifically advancing the design and delivery of Phase 1A and starting the conceptual design of Phase 2. Additional details of these three options are provided in Section 6 (Alternatives) and Section 7 (Analysis of Options). Implementing a Communications and Outreach Plan (see Section 6.2 and Appendix #1) is integral to growth of the DDEI, and is included in each option.

- **Option #1 - Future Proof** (**Recommended)** - Advance Phase 1A development with natural gas infrastructure and operation, future proof the system for future renewable electricity use, advance conceptual design of Phase 2.
- **Option #2 - Business-as-usual** - Advance Phase 1A development with natural gas infrastructure and operation, advance conceptual design of Phase 2.
- **Option #3** - **Deep Carbon Reduction** - Advance Phase 1A development with renewable electricity infrastructure and operation, advance conceptual design of Phase 2.

3.5. Out of Scope

The following are excluded from the scope of this business case:

- Any updates on the provincial or federal regulatory framework for district energy systems
- Renovations or modifications to buildings to connect to the district energy system or to become district energy ready
- Expansion to buildings currently not identified in the growth plan
- Infrastructure and provision of cooling service

3.6. Anticipated Outcomes / Critical Success Factors

The DDEI will supply reliable and sustainable thermal energy services for the growing service area. Specific anticipated outcomes are:

Table 4: Critical Success Factors and Measures

Critical Success Factor	Measure
Operational Readiness	Operational readiness • [Year] of operation
Operational Capacity	Operational uptime • [per cent]
Energy Supply	Provision of required heating demand capacity with sufficient redundancy • [kwh] of thermal energy provided • [per cent] of energy supplied by low-carbon energy source over time
Sustainability	GHG's reduced annually • [tCO2e/year]
Awareness among Interested Parties	Education / information sessions • [#] of attendance • Surveyed awareness and understanding
New Customer / Market Adoption	• [#] of MOUs, letters of intent or agreements signed • [#] new buildings connection and/or floor area connected
Community Sentiment	Sentiment analysis from various sources • [#] of organizations / groups supporting

	the initiative ● [per cent] of key interested parties publicly endorsing the project
Financial Sustainability	● Net Income ● Cash Position ● Debt Service Coverage Ratio ● Debt to Net Assets Ratio ● Rate Setting within BAU guidelines

4. Strategic Alignment

4.1. Corporate Goals/Council Outcomes

City Plan and Connect(Ed)monton

The DDEI is aligned with key City of Edmonton strategic documents. It supports all four of City Council's strategic goals outlined in Connect(Ed)monton - Healthy City, Urban Places, Regional Prosperity and Climate Resilience. It further aligns with the City Plan and the "Greener as we Grow" Big City Move:

- Greener as we Grow:
    - Edmonton is a city of possibility and passion. Our growth should drive climate resilience ahead and strengthen our natural systems. As a livable city, development and sustainability must be allies, not competitors. To lighten our collective footprint, Greener As We Grow is a commitment to use growth as a catalyst for good design and conscientious decisions. Greener As We Grow puts Edmontonians at the forefront of two important trends for our region: continuing to develop a healthy city while also paying attention to what will surely be one of the great challenges of our future — protecting and enhancing our land, air, water and biodiversity.
- City Plan Policy Intention 2.4.2 Ensure public buildings and infrastructure are sustainable and resilient
    - Direction 2.4.2.2 Enable green energy generation and distribution systems.

Table 5: City of Edmonton Corporate Strategic Alignment

Connect(Ed)monton Climate Resilience Indicator(s)	City Plan Strategic Measure(s)	City Plan Targets
Renewable Energy Use Community Greenhouse Gas Emissions (GHG)	GHG Emissions / person in Edmonton Total GHG Emissions in Edmonton Total volume / number of carbon sinks in Edmonton Community GHGs expressed as per cent of carbon budget City GHGs expressed as per cent of carbon budget	Net per person GHG emissions are nearing zero Total community wide greenhouse gas emissions below 135 megatonnes carbon budget

Community Energy Transition Strategy and Action Plan and Climate Resilient Edmonton: Adaptation Strategy and Action Plan

The Climate Resilient Edmonton: Adaptation Strategy and Action Plan was presented to the Executive Committee of City Council in November 2018. It was developed to help the City respond to the impacts of climate change and protect the community, infrastructure and services. District energy was identified as an action that could better prepare Edmontonians for changing weather extremes.

- **Goal:** Edmonton has resilient energy systems
- **Action #15:** The City of Edmonton identifies and assesses opportunities to increase the resilience of Edmonton's energy systems

In 2019, the City of Edmonton declared a climate emergency ahead of the Cities IPCC Science and Climate Change Conference. To establish a sustainable path forward, two documents were presented and adopted by Council in 2021:

- Revised **Community Energy Transition Strategy**
- **C627A Climate Resilience Policy**

Together, these documents were designed to ensure the City's climate targets are aligned with the Paris Agreement commitment of limiting global temperature rise to 1.5°C. Through these documents, the following climate targets were established by the City of Edmonton:

Table 6: City of Edmonton Climate Targets

Year	Targets[1]
2025	• Achieve a 35 per cent reduction in community-based GHG emissions.
2030	• Achieve carbon neutral operations for City of Edmonton. • A 50 per cent overall reduction in community-based GHG emissions. • A 35 per cent reduction in energy consumption per person.
2040	• Achieve net-zero **corporate** greenhouse gas emissions
2050	• Achieve net-zero **community-based** greenhouse gas emissions.

The Community Energy Transition Strategy and Action Plan sets four pathways to realize these targets. One pathway involves moving to more renewable and resilient energy systems, and proposes building a city-wide district energy network. Together with a shift to emission-neutral electricity, district energy could contribute up to a 36 per cent reduction in GHG emissions.

Edmonton is the northernmost city in North America with a population of over one million and a significant portion of its emissions come from heating buildings. District energy systems present an opportunity to decarbonize the heating and cooling of those buildings at scale.

The City of Edmonton's Community Energy Transition Strategy outlined immediate actions to advance the creation of Edmonton's first District Energy Strategy, including the identification of district energy opportunity areas. Another recommended action called for the development of the first two district energy opportunity areas — Blatchford and Downtown. This business case outlines options for the expansion of the Downtown District Energy Initiative, and is a continuation of the work in the energy transition strategy.

[1] Reductions as compared to 2005 levels.

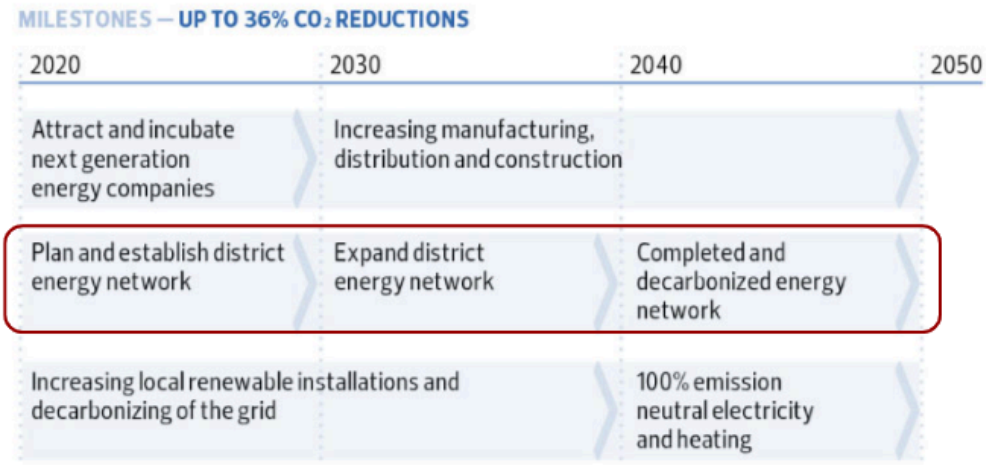


Figure 4: Milestones for the District Energy Strategy

4.2. Related Departmental Plan

In alignment with the City of Edmonton Corporate Business Plan, the Integrated Infrastructure Services (IIS) Business Plan takes the long-term goals identified in ConnectEdmonton and the City Plan and breaks them down into measurable actions within the 2023-2026 budget cycle.

The IIS plan links the department's strategic actions with Council's budget decisions and outlines how we will deliver services and construction projects Edmontonians have come to expect. The plan also prioritizes important work and strategic objectives in three ways: Transforming for the Future, Serving Edmontonians and Managing the Corporation.

The implementation of "Renewable District Energy Systems" is a key strategic initiative in the IIS Business Plan, supporting the department's objective to "make transformational impacts in our community." The plan outlines three renewable energy projects that support City Council's 10-year climate resilience goal to reduce greenhouse gas emissions:

- A City-wide District Energy Strategy supports the expansion and development of low-carbon district energy systems throughout Edmonton. These renewable energy projects support City Council's climate resilience goal to reduce greenhouse gas emissions. Two district energy systems identified in the plan are currently under construction:
    - The **Blatchford Renewable Energy Utility** supports the Blatchford development by providing renewable heating, cooling and hot water services to homes, businesses and schools in the community.
    - The **Downtown District Energy Initiative** supports the implementation of a district energy network in the Downtown core that will achieve deeper energy efficiencies and carbon reductions.

5. Context Analysis

Other major urban centres in Canada have established district energy systems in their downtown cores.

Metro Vancouver
Metro Vancouver represents a significant growth area for the industry, with district energy serving as the cornerstone for each municipality's sustainability plans. District heating systems are established in Vancouver, Burnaby, Richmond, Surrey and North Vancouver. The region has attracted international recognition for this work, with recent highlights including heat recovery from Burnaby's Waste-to-Energy Facility set to serve existing and future district energy systems; the creation of a new zero-emission district heating and cooling system in Vancouver; and the development of a sewer heat recovery system in Richmond.

Calgary
Calgary's district heating system was established around 15 years ago and now serves approximately more than 20 buildings in the downtown core. The system's existing combined heat and power system provides high-efficiency thermal energy to customers, with funding recently secured to install additional low-carbon capacity.

Greater Toronto Area
District heating and cooling systems are prevalent in Toronto, Markham, Cornwall, Windsor, Hamilton, Sudbury and London, Ontario. Toronto has multiple district energy systems. The district heating and cooling system owned by Enwave provides thermal energy services to more than 190 buildings in the downtown. A deep-lake water cooling system and associated thermal storage facility shifts electricity usage from the grid during off-peak hours, helping to reduce costs and dependence on the grid. Markham District Energy operates two district heating and cooling systems that serve around 1.2 million square metres of building space. The city recently received around $270 million in funding and incentives to develop the world's largest wastewater energy transfer project, helping to advance the city's goal of becoming net-zero by 2050.

Ottawa
The federal government is nearing completion of a $1.3 billion project to transform its existing district heating and cooling systems that serves 80 federal buildings in the National Capital Region. The federal government is reviewing options to make this system carbon neutral by 2030.

Montreal
Montreal's district heating and cooling system was opened in 1947 and serves more than a third of the city centre. In total, almost two million square meters of building space are supplied by the network. The system is core to the city's goal of decarbonization of its

energy supply downtown and achieving carbon neutrality by 2030.

Across the Canadian district energy landscape, there are varying regulatory environments, ownership structures, decarbonization pathways, connection incentives and governance models. Although there are no direct comparators for Edmonton's Downtown District Energy Initiative there are some commonalities. For example, the introduction of low-carbon energy sources often takes place gradually, in order to balance financial and sustainability outcomes. Additionally, municipal ownership and/or involvement in the early stages of district energy development is common to ensure alignment with policy objectives and to manage early investment risks.

6. Alternatives

6.1. Options Considered

This section expands on the three alternatives considered for the immediate expansion of the DDEI into the design and delivery of Phase 1A and the start of the conceptual design of Phase 2, and their relationship with the full buildout scenario analysis in Section 3.3 as well as supported by financial/environment analysis provided in Section 7. What connects all three options is the opportunity for the City to lead the development of the Downtown District Energy Initiative by example, and by operating and building up the anchor load in the downtown, simultaneously applying lessons learned from connecting corporate assets prior to extending the system to privately owned buildings in Phase 2 and beyond.

Option #1 - Future Proof (Recommended)

Advance Phase 1A development with natural gas infrastructure, future proof the system for renewable electricity and advance conceptual design of Phase 2

- This option includes all design and subsequent construction activities to extend generation capacity and the distribution piping system to the next three City-owned buildings: City Hall, Stanley A. Milner Library and Citadel Theatre. The utility would operate as heating-only until the infrastructure for cooling is integrated, which is anticipated with full implementation of Phase 2 (cooling is out of scope for this business case).
- In order to operate the Utility within current financial constraints, this option would extend natural gas boiler operation but in parallel integrate electric boiler capacity for future more focused use. When operated with renewable electricity, the electric boilers would lead to immediate GHG reductions. Incorporating electric boilers will result in an increase to capital costs, but more significantly impact operating costs, if operated in a more prominent role. This option aligns with Council's expectations and demonstrates continued City leadership to manage the Utility within current fiscal restraints, while retaining the option to operate GHG reduction technologies in

the future. This sets the Utility up to reduce GHG emissions significantly for City-owned and operated assets — in line with the corporate emission target of net zero by 2040.

- Across all options, conceptual design work for Phase 2 is included along with the roll out of a Communications and Outreach Plan, which is necessary to initiate conversations with nearby private building owners and new developments, such as Village at ICE District and Station Lands.
- The expected capital costs for the design and delivery work for this option is $18.3 million. More detail on costs and impacts is provided in section 7.1.
- Option 1 is the most flexible of the three options and allows the pursuit of any of the four full buildout scenarios presented in Section 3.3. Future decisions on utility growth from Phase 2 onwards will inform which long term scenario this option is most closely aligned.

Option #2 - Business-as-usual

Advance Phase 1A with natural gas infrastructure and advance conceptual design of Phase 2

- This option includes the expansion of natural gas boiler capacity and would not include the installation of electric boiler capacity, as in Option 1. While this option aligns with Council's expectations to manage the Utility within current fiscal restraints, it does not provide the readiness of low-carbon infrastructure for GHG reduction. Specifically, excluding the electrical boiler infrastructure now for deeper carbon reduction would delay the system's ability to contribute to the corporate target of net zero emissions by 2040. This option would result in lower capital costs and also results in lower operating costs, compared to operation of electrical boilers.
- If Option 2 was chosen, electric boilers could be added in the future.
- Across all options, conceptual design work for Phase 2 is included along with the roll out of a Communications and Outreach Plan, which is necessary to initiate support and/ enable conversations with nearby private building owners and new developments, such as Village at ICE District and Station Lands, to inform connection opportunities.
- The expected capital costs for the design and delivery work for this option is $16.3 million. More detail on costs and impacts is provided in section 7.1.
- This option is most closely aligned with Scenario 1 presented in Section 3.3.

Option #3 - Deep Carbon Reduction

Advance Phase 1A design with renewable electricity infrastructure and advance conceptual design of Phase 2

- This option includes the design and delivery and instant focused operation of additional electric boiler infrastructure.
- This option aligns with Council's expectations and demonstrates continued City leadership to manage the district energy utility and prioritizes immediate GHG emissions reduction — in line with the corporate target of net zero emissions by 2040. However, this option increases financial pressure on the Utility and impacts its initial financial performance as a result of higher operating costs, through the higher costs of electricity versus natural gas. Incorporating electric boilers will increase capital costs slightly, but significantly increase operating cost.
- Across all options, conceptual design work for Phase 2 is included along with the roll out of a Communications and Outreach Plan, which is necessary to initiate support and/ enable conversations with nearby private building owners and new developments, such as Village at ICE District and Station Lands, to inform connection opportunities.
- The expected capital costs for the design and delivery work for this option is $18.3 million. More detail on costs and impacts is provided in section 7.1.
- This option is aligned with Scenarios 2, 3 and 4 in Section 3.3. Future decisions on utility growth from Phase 2 onwards will inform which scenario the full build out of this option is most closely aligned with.

All three options will be assessed based on the anticipated outcomes leading to the critical success factors for the district energy utility:

- **Operational Readiness**
  - Provide sustainable energy when it will be needed
- **Energy Supply**
  - Operational readiness to support existing and growth of connected buildings
- **Operational Capacity**
  - Operational uptime of 100 per cent
- **Sustainability**
  - Supporting the climate objectives of a growing district energy system
- **Financial Prudence**
  - Grow the DDEI in alignment with existing financial constraints, fiscal policy and utility rate structure
- **Reputational Considerations**
  - Protect Edmonton's reputation as a climate resilient city

6.2. Communications and Outreach Plan

The recorded experiences of other municipalities across North America have demonstrated that building strong public support and understanding of district energy and its benefits is crucial to the subsequent success of such systems, including attracting customers. The Communications and Outreach Plan overview is provided in Appendix #1 of this business case, and is integral to the successful growth of the DDEI. This multifaceted strategy is centered around raising general awareness and understanding of the initiative itself, work to date, what's coming, and introducing the value proposition for 'why district energy'.

Communicating the value proposition that the DDEI offers to building owners and interested parties will be a critical component of the plan. This includes highlighting tangible benefits for private building owners who connect to the system, such as:

- comparable or potentially lower utility costs,
- protection against future building code requirements,
- a significant reduction in infrastructure investment requirements,
- valuable space savings which could be converted to revenue generating space,
- the unique opportunity to receive and utilize renewable energy sources to support organizational sustainability goals, operating and maintenance costs if City Council in future supports the use of renewable energy within the DDEI.

Targeted outreach will be necessary to cultivate key partnerships and secure buy-in from key interested parties. Administration has been actively collaborating with BOMA Edmonton, whose membership represents a significant portion of building owners and managers in the region, to develop a series of educational sessions including a focus on the DDEI and its benefits. This collaborative effort will ensure that property owners and managers (i.e., key decision makers) have a thorough understanding of the initiative and its potential to positively impact their operations and bottom line.

Communication efforts will be monitored and evaluated to assess effectiveness, and necessary adjustments will be made as needed to ensure that messaging and outreach efforts are resonating with target audiences. This may involve conducting surveys or focus groups, tracking website and social media engagement, and analyzing media coverage to gauge public perception and understanding of the DDEI.

7. Analysis of Options

This section identifies overall value contribution and costs incurred to realize the proposed initiative.

7.1. Financial and Environmental Analysis and Impact

This section describes, in depth, the comprehensive analysis comparing the feasible alternatives for this business case: design and delivery of Phase 1A and conceptual design of Phase 2. The following cost estimates provided for Phase 1A are Class 4 and for Phase 2 are Class 5 (as per AACE International No.17R- 97 Rev August 7, 2020).

Figure 5 below provides an overview between the expected capital costs for all considered options. These costs are allocated to expected design, construction costs, owner's engineer and contingency costs for Phase 1A and 2.

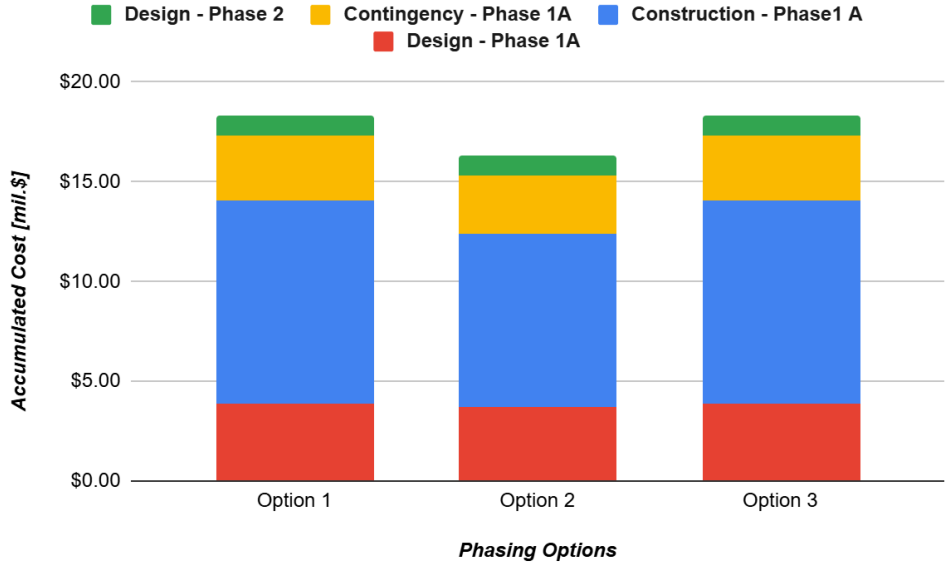


Figure 5: Capital Costs Comparison for all Options

As expected, the capital costs between all options only differ in the addition and connection of electrical boilers in Options #1 and #3 ($18.3 million each). The cost for Option #2 ($16.3 million) is about $2 million lower as synergies with existing natural gas boiler infrastructure and additions can be achieved and further investment to modify the energy centre for electric boiler addition is no longer required. These amounts are slightly different from the capital costs for Phase 1A identified in Table 2 (Section 3.3) due to those costs including estimates for other initiatives that will need to be determined in planning for Phase 2 (i.e. cooling services). All forecasted capital costs for the three options are able to be funded through the current approved capital profile CM-83-0001 to expand the District Energy Network Strategy and District Energy Nodes.

The current long term impact comparing the impact of the three options over a 30 year period related to the construction and operating of Phase 1 and 1A only, can be found in Table 7 below. It should be noted that this financial analysis does not include the impact of the federal consumer carbon tax as this was recently removed by the Government of Canada. As such, the analysis is fairly conservative from this perspective, as any impact of potential future pollution pricing is not included.

Table 7: Outcome Summary - Phase 1 and 1A Only (in $ millions)

Options	Description	Capital Investment	Annual Operating Costs	Annual Rate Revenue	NPV	GHG Reduction		Cost of GHG Reduced
		Total	Average	Average	30 Year	[%]	[tCO2] 30 Year	[$/tCO2]
1	Install electric boiler but only operate natural gas	51.0	1.9	2.4	4.0	5	9,000	-444
2	Install and operate only natural gas - No Decarbonization	49.0	1.9	2.4	4.0	5	9,000	-444
3	Install and Operate electric boiler - Max Decarbonization	51.0	5.3	2.4	-25.0	84	126,000	198

Financial analysis for the proposed options continues to show the trend that early investment in deeper GHG reducing technologies, as suggested in Option #3, will have a negative impact on the financial health of the Utility, especially in its earliest stages with a negative NPV of $25 million. In contrast, Options #1 and #2 highlight that the continuation of utilizing natural gas infrastructure for the Utility's anchor load provides a positive NPV of $4 million. In other words, based on current information, construction of Phase 1 and Phase 1A only, under Options #1 and #2, are expected to result in a positive return on investment over the 30 year financial model.

This trend is also further reflected in Table 8 below which reflects the cumulative cash flows as of the end of each expansion phase. Phases are shown to remain consistent with time periods shown in previous tables. Financial analysis is only representative of the buildout and operation of Phase 1 and 1A only and does not represent the full buildout of the system as shown previously in Section 3.3.

Table 8: Cumulative Cash Flows by Phase - Phase 1 and 1A Only (in $ millions)

Options	Description	2025-2027	2028-2030	2031-2035	2036-2040	2041-2045	2046-2054
1	Install electric boiler but only operate natural gas	1.1	2.6	4.4	6.5	8.8	13.9
2	Install and operate only natural gas - No Decarbonization	1.1	2.6	4.4	6.5	8.8	13.9
3	Install and Operate electric boiler - Max Decarbonization	1.1	-4.5	-18.9	-34.8	-52.3	-88.1

Similar to Table 7 above, going down the path of max decarbonization (Option #3) at this early stage will result in a forecasted deficit in cumulative cash flows at the end of Phase 1A

as well as a much larger deficit at the end of 2054. This is due to the utilization of electricity rather than natural gas once the electrical boilers are installed. On the other hand, Options #1 and #2 both forecast positive cumulative cash flows by the end of Phase 1 and continue to increase to $14 million by the end of 2054. In other words, based on current information, both options are forecast to be financially sustainable in the long-term and provide future cash flow for renewal of capital infrastructure in the future.

It is important to note that the highlighted financial results in Table 7 and Table 8, for Phase 1 and Phase 1A only, are a result of the capital expenditures being supported by tax levy funding. If future expansion phases are not supported in a similar fashion with tax levy support, the financial results will likely not be as favourable. Future business cases supporting potential phase expansions will consider this impact and be presented to City Council for approval before future decisions are needed to be made.

Figure 6 below, displays the expected GHG reductions for all three options. As shown, the utilization of natural gas as the main fuel results in the GHG impact being significantly lower than for renewable electricity. While Options #1 and #2 achieve an expected 300 tonnes of CO2 reduction per year, the introduction of renewable electricity increases this to 4,200 tonnes reduced per year — 14 times higher. It should be noted that Option #1 includes electrical boiler capacity, that when operated in the future, can achieve GHG emissions reduction in line with Option #3. Delaying the installation of electric boilers would likely result in higher capital costs, relative to installing it now in Phase 1A, due to inflation and the rising costs of this infrastructure. Option #1 will also allow the Utility more flexibility to switch to electricity as a fuel source on a more timely basis, as economically possible, to reduce greater carbon emissions over time as more buildings are connected.

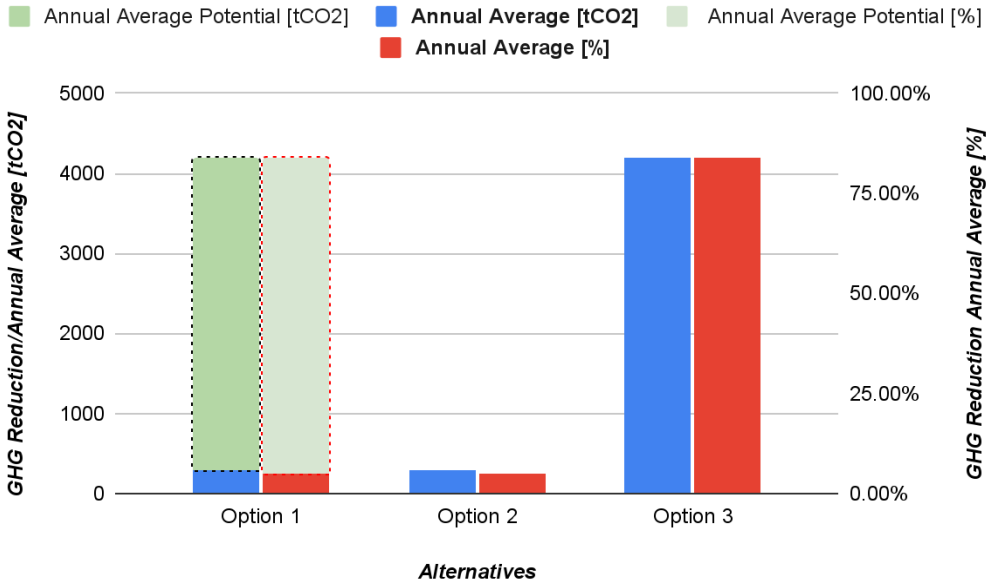


Figure 6: Greenhouse Gas Reduction Potential

The operating cost of greenhouse gas reduced (last column) in Table 7 above is a measure of the cost efficiency of reducing greenhouse gas emissions for each scenario. It is

calculated by dividing the net-present value by the accumulated amount of greenhouse gas reduced. A positive value in this column, as in Scenario #3 indicates the necessary climate investment to achieve the greenhouse gas goals. A negative cost of GHG reduced as in Scenario #1 and #2, on the other hand, indicates that the project retains a positive return of investment for each tonne of the greenhouse gas emission reductions that would be simultaneously achieved.

7.2. Tangible Benefits

The tangible benefits and the impacts on all three options are listed in the table below:

Table 9: Tangible Benefits by Option

Tangible Benefits	Option 1	Option 2	Option 3
Energy Supply	Able to provide	Able to provide	Able to provide
Operational Capacity	Able to provide	Able to provide	Able to provide
Sustainability	Future proof	Low	High
Financial Prudence	Existing capital budget, less operational strain	Existing capital budget, less operational strain	Existing capital budget, high operational strain
Building Connections Confirmed	Yes	Yes	Yes

7.3. Intangible Benefits

The tangible benefits and the impacts on all three options are listed in the table below:

Table 10: Intangible Benefits by Option

Intangible Benefits	Option 1	Option 2	Option 3
Reputation	In tact, if properly mitigated	Not in tact	In tact
Enhance Climate Resilience	Retained	Low	High
Local Economic Development	Yes	Yes	Yes

8. Organizational Change Impact

The City of Edmonton is the owner of the Downtown District Energy Utility, which is delivered in partnership with EPCOR. The City is responsible for overarching utility ownership and management, with City Council acting as the regulating body for budget and rate approval. The City is also responsible for driving the low-carbon objectives of the Utility, in alignment with the City's climate action plans. EPCOR is the City's design,build, finance, operate and maintain partner for the DDEI, so the organizational change impact for all presented options is very minor. The proposed options are expected to be handled, like the first phase, within the boundary of the agreement with EPCOR.

Table 11: Organizational Change Summary

Function	Option 1	Option 2	Option 3
City Resources			
IIS, Renewable Energy Systems Downtown District Energy Utility - Ownership & Management	Minor change	Minor change	Minor change
IIS, Facility Planning and Design Design development	No change	No change	No change
IIS, Facility Infrastructure Delivery Potential delivery	No change	No change	No change
Contract Resources			
EPCOR Design, build, operate, maintain and financing partner	No change	No change	No change
Others (Consultants, Contractors, etc.) Design development, owner's engineering services	No change	No change	No change

8.1. Impact on Interested Parties

Key interested parties and how they will be impacted by the DDEI are summarized below:

Table 12: Stakeholder Impact Summary

Interested Party	City Relationship	Type of Impact	Impact of Recommended Option
City Council	Internal	Direct	Reputational impact to City's sustainability goals and Community Energy Transition and Adaptation Strategies.
Renewable Energy Systems	Internal	Direct	Capital and operating costs, management of interested parties both internally and externally, further engagement of marketing and commercial activities.
IIS Planning & Design, and Delivery	Internal	Direct	Will affect operation and level of support depending on the what option is chosen.
IIS, Lifecycle Management	Internal	Direct	Consideration of City renewal budget for City-owned assets connecting to the DDEI system.
FCS, Real Estate	Internal	Direct	City owned assets will be required to connect to the DDEI system.
CO, Facility Maintenance Services	Internal	Direct	Reduction in ongoing servicing requirements for City assets related to services provided by the DDEI Utility.
Winspear Centre for Music	External	Indirect	Some impact in terms of construction, depending on the option chosen (e.g., whether additional equipment added to the energy centre).
EPCOR	External	Direct	In alignment with the existing Design, Build, Maintain, Operate and Finance agreement.
EXISTING **Downtown District**	External	Indirect	Some impact. Customers will see the same infrastructure and energy delivery

Energy Utility Customers			system and will also benefit from renewable integration, depending on the option chosen.
***NEW* Downtown District Energy Utility Customers**	External	Direct	Ability to become a customer of the Downtown District Energy Utility.
Edmontonians	External	Indirect	Reputational impact to City's sustainability goals and Community Energy Transition and Adaptation Strategies.

8.2. Business and Operational Impact

Table 13: Business and Operational Impact Summary

Options	Operational Strategy	Challenges	Benefits
Option #1	• Continue with project design and delivery • Prepare Communications and Outreach Plan	• Minimal as in alignment with the original development plan • No immediate carbon reduction opportunity	• Municipal owned and operated buildings • Direct thermal load available • Future proof buildings to reduce corporate emissions • In line with original plan • Within anticipated and existing budget • Time to properly implement marketing and communications strategy for next phases
Option #2	• Continue with project design and delivery • Prepare Communications and Outreach Plan	• Minimal as in alignment with the original development plan • No immediate carbon reduction opportunity	• Municipally owned and operated buildings • Direct thermal load available • Future decarbonization infrastructure would have to be added • In line with original plan • Within anticipated and existing budget • Time to properly implement marketing

			and communications strategy for next phases
Option #3	• Continue with project design and delivery • Prepare Communications marketing and Outreach Plan	• Minimal as in alignment with the original development plan • Impacted financial health of the young utility	• Municipally owned and operated buildings • Direct thermal load available • In line with original plan • Immediate reduction of corporate GHG emissions • Within anticipated and existing budget • Time to properly implement marketing and communications strategy for next phases

9. Key Risk(s) and Mitigation Strategy

A detailed risk matrix was developed for the DDEI. The majority of the risks and mitigation strategies do not differ for all options and have to be managed with careful considerations.

Table 14: Risk Matrix - All Options

Risk Description	Likelihood	Impact	Risk Score (without mitigations)	Risk Mitigation	Risk Score (with mitigations)
Navigating the future financial and environmental sustainability of the Downtown District Energy Initiative, as future phases beyond Phase 2 might not be tax levy subsidized	Almost certain	Severe	High	Administration will return to Council when key milestones and decisions for existing and future Phases are required. Opportunity for external funding grants, CRL support or others to offset continued tax-levy support	**Medium**

Construction costs exceed the estimated cost from the feasibility study	Likely	Severe	High	Progress the district energy concept and refine cost estimates in advance of major Council decisions with the design-build team. Maintain industry standard contingencies and allowances.	**Medium**
Internal system improvements beyond good industry practices, increasing the project scope and costs	Likely	Severe	High	Engage internal collaborators and refine cost estimates in advance of major Council decisions with the design-build team.	**Low**
Unplanned equipment maintenance, short-term reduction of the production capacity	Almost certain	Major	High	Install plant equipment with redundancies typical of good industry practices.	**Low**
External parties block the immediate expansion.	Possible	Worst Case	High	Engage external parties and discuss opportunities for utilities to support the project.	**Low**
Required pipe alignments are not approved or pipe routing is not technically feasible.	Likely	Severe	High	Identify priority utility rights-of-way and designate for future district energy usage. Review existing utility clearance guidelines and request variances that don't align with good industry practices.	**Low**

10. Conclusion and Recommendations

10.1. Conclusion

This business case outlines a three-pronged approach for continued growth of Edmonton's DDEI. This approach is necessary to ensure the DDEI remains in step with the goal of creating a fully decarbonized, large-scale district energy network across the city, and helping to meet climate targets of net zero emissions — for the corporation by 2040 and the community by 2050. This approach includes:

- **City Leadership** - Full design and expansion of the DDEI to connect the next three City-owned anchor loads in Phase 1A (City Hall, Citadel and Stanley A. Milner Library).
- **Growth Planning** - Advance design work for Phase 2, which includes a second energy centre and extension of the DDEI to serve privately owned buildings and two new prominent downtown developments — Station Lands and Village at ICE District.
- **Awareness Building** - Implement a communications and outreach plan to increase awareness of the DDEI and engage in conversations with private building owners in the identified area. The goal of this work is to increase overall awareness of the overarching initiative and encourage connections.

This business case carefully evaluated three options to further expand the DDEI through Phases 1A and 2, and carefully considered the financial and environmental sustainability of a young growing utility:

- **Option #1 - Future Proof** (**Recommended)** - Advance Phase 1A development with natural gas infrastructure, future proof the system for renewable electricity and advance conceptual design of Phase 2.
- **Option #2 - Business-as-usual** - Advance Phase 1A with natural gas infrastructure and advance conceptual design of Phase 2.
- **Option #3** - **Deep Carbon Reduction** - Advance Phase 1A design with renewable electricity infrastructure and advance conceptual design of Phase 2.

All three options were assessed based on the anticipated outcomes leading to the critical success factors for the DDEI:

- operational readiness
- the ability to supply thermal energy loads
- operational capacity
- environmental sustainability impacts
- financial prudence and current constraints
- reputational considerations for the City

Special considerations were given to the capital costs, operational costs, rate revenue requirement, net present value (funding gap) and the ability to reduce greenhouse gas

emissions in alignment with the City's climate objectives.

Caution is needed when balancing the environmental and financial sustainability of the DDEI in its early stages of operations and growth. Integration of low-carbon technologies comes at a cost premium, which in the initial stages could significantly impact the long term financial health of a growing utility. The Utility will need to continue to balance this financial reality at critical developmental milestones (e.g., new connections or phases).

From a regulatory perspective, Phases 1 and 1A are City-owned and operated buildings, so connections are expected to be relatively straightforward. However, for buildings and developments beyond these phases, there is no current policy in place that mandates or incentivizes connections to the DDEI.

A strong value proposition will be developed and strategically timed to align with new connection opportunities as they arise. This, along with targeted communications and outreach, will be essential to building awareness and encouraging future connections. Being aware of these opportunities and balancing the development of the Utility will be key in building a sustainable utility over time.

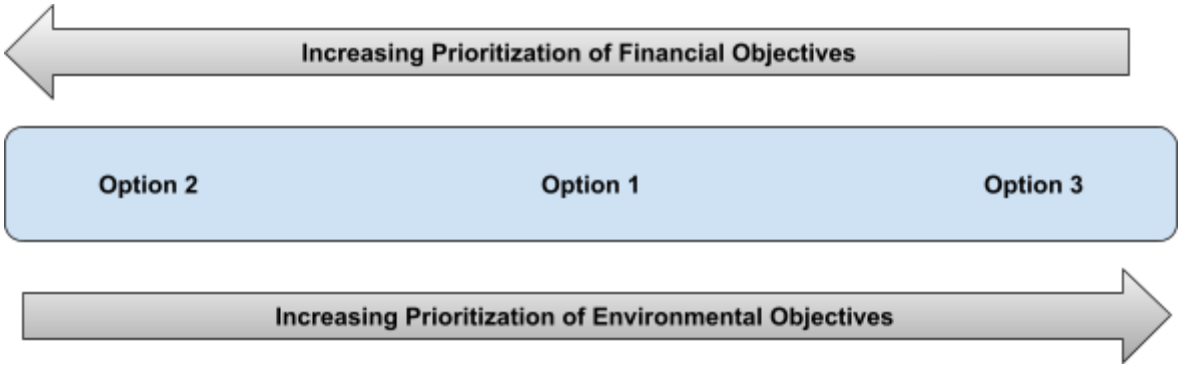
10.2. Recommendations

Based on the analysis completed, Administration recommends expanding the DDEI, as outlined in:

- **Option 1 (Future Proof):** Advance Phase 1A development with natural gas infrastructure, future proof the system for renewable electricity and advance conceptual design of Phase 2

Justification

Option #1 provides the best balance between the financial health of a growing utility and future-proofing the Utility to achieve necessary GHG reductions in the future. This is of particular importance, given the City of Edmonton's corporate target to reach net zero emissions by 2040, as the buildings in Phase 1A are City-owned and operated. While the initial focus will be on natural gas infrastructure in the capital growth and initial operation of the DDEI, the simultaneous installation of electrical boiler capacity provides operational flexibility for ease and timely fuel switching in the future.



In parallel with conceptual design work for Phase 2, Administration will implement a Communications and Outreach Plan to generate awareness and buy-in for the DDEI. Together, these efforts will prime future utility growth to the identified existing buildings and the two new developments (Village at ICE District and Station Lands).

While Option #2 presents the strongest financial outcome, it defers investment in future proofing or low-carbon technologies to a later date, resulting in only modest GHG reduction. Option #3 presents the strongest environmental outcome by achieving the deepest GHG reductions, but comes with the highest capital and operating costs, which will be challenging for the financial sustainability of the Utility.

Project Resourcing and Implementation Strategy

If the recommendation is supported, the project is planned to be delivered within the existing design, build, operate, maintain and finance agreement with EPCOR. Administration will start the design work and will re-engage Council at critical project decisions, in accordance with the Project Development and Delivery Model. In addition to internal project management resources, an owner's engineer will be engaged to provide project oversight and accountability services. As outlined in Appendix #1, Administration will implement a Communications and Outreach Plan. It is expected that at certain critical junctions, additional commercial support will be needed.

Given the significant amount of engineering, strategic planning and communications work, additional resources will be necessary to ensure effective oversight and growth of the DDEI.

To fund the proposed expansion, Administration proposes that Utility Committee recommend to City Council to approve the use of the existing capital budget in CM-83-0001 (District Energy Network Strategy and District Energy Nodes) to fund this work, pending Council's direction on which Option to advance. That budget was set up and will continue to be utilized to fund design and development of District Energy Nodes in accordance with the District Energy Strategy. As outlined, building out the Downtown District Energy Initiative remains the key action in the Strategy as the age and environmental impact of buildings in the Downtown remain significant, compared to other nodes. Hence this budget adjustment

at move is recommended to complete the work described in Option 1 of this Report (build Phase 1A with natural gas and electric boilers, design Phase 2, outreach). If accepted, Administration has brought forward an administrative capital budget adjustment to transfer existing funding from CM-83-0001 to 20-83-9001 (Downtown District Energy Initiative) which will result in no new capital funding approvals being required. Both capital profiles are primarily funded through tax supported debt.

Should Council approve the recommendation (Option 1) within this business case, an estimated $18.3 million for the planning, design and construction of the utility expansion would be incurred. The project implementation within the Integrated Infrastructure Services (IIS) Department would follow the Capital Project Governance Policy C591 and the Project Development and Delivery Model.

10.3. Project Responsibility and Accountability

Table 15: Summary of Impact among Affected Parties

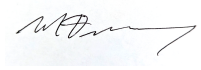
Roles	Responsibilities
Profile Owner: **● Renewable Energy Systems Section**	● Budgeting for the profile by allocating and approving project budgets ● Cash flowing for the profile ● Tracking and reporting for the profile ● Tracking funding sources for the profile ● Prioritizing work within the profile ● Variance Reporting for the profile ● Accountable for outcomes of the program(s) within profile ● Providing direction on project outcomes
● Infrastructure Planning and Design **● Infrastructure Delivery**	● Providing direction for the execution of the project ● Enabling appropriate budget to complete the project ● Assigning resources (people) for the project ● Supporting project objectives, including: ○ Securing additional resources and budget ○ Elevating issues to profile owner and removing barriers
EPCOR	City of Edmonton's design, build, operate, maintain and finance partner.

Consultants	Undertakes consulting and design work in accordance with the prescribed scope, standards, and specifications provided by the City of Edmonton
Contractors	Performs work in accordance with a project's plans and specifications
Corporate Procurement and Supply Services Branch	Procurement services, as needed
Subject Matter Experts	Provide support to the project and review of key project deliverables

11. Business Case Review, Approval & Sign Off

The business case has been developed by the Renewable Energy Systems section. The project team consists of members from Renewable Energy Systems in Integrated Infrastructure Services, Financial Services and Utility Regulation Sections, and external support by a technical consulting team. All project team members have participated in the project and have reviewed the documentation generated to develop the business case, as well as the business case itself.

Table 16: Business Case Sign Off

Name	Title	Section/Branch/ Department	Signature
Christian Felske	Director	Renewable Energy Systems	
Daniel Alberkant	Senior Engineering Program Manager	Renewable Energy Systems	
Marc Dowdell	Engineering Project Manager	Renewable Energy Systems	
Lydia Fialka	District Energy Strategy Lead	Renewable Energy Systems	

Stephen Cheung	Director	Financial Services	
Tracey Sass	Finance Manager	Financial Services	

12. Appendices

12.1. Appendix 1 - Summary of DDEI Communications and Outreach Plan