Appendix B

Oakville District Energy Feasibility Study

October 10th, 2024

RATHCO ENG

URBAN EQUATION

Presentation Agenda

1. Team Introductions
2. District Energy System (DES) Introduction
3. History of DES at the Hospital District
4. Project Scope
5. Milestone 2 – Project Kickoff
6. Milestone 3 – Modelling and Design
7. Milestone 4 – Economic and Financial Analysis
8. Milestone 5 – Implementation Planning
9. Project Outcomes
10. Next Steps

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Introduction – Rathco Team

John Rathbone, President, P.ENG

Rathco's President, John Rathbone, is a Professional Engineer and certified Project Management Professional with extensive experience in energy systems as well as a solid foundation of experience in environmental engineering (water & wastewater). John has led local and international teams on the planning, design, and implementation of multiple district energy systems.

Mairead Kennedy, Vice President, P.ENG

Rathco's Vice President is a Professional Engineer and Certified Energy Manager with over 17 years experience in developing and leading district energy and civil infrastructure project initiatives in Canada, the US, the UK, and Eastern Europe.

Alisha Sealey, Energy Strategist, P.ENG

Alisha is an Energy Strategist with Rathco ENG. She is a Professional Engineer and LEED Green Associate with cross-industry experience. Alisha has experience in district energy systems of various scales, from a few buildings to city-scale. She has experience working with several low-carbon technologies, including heat pumps, geo-exchange, wastewater energy exchange, biomass, and more.

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Introduction – UE Team

Jenny McMinn, Senior Advisor

Jenny excels at leading multi-disciplinary teams on cutting-edge green projects, including those targeting One Planet Living, LEED Platinum, the Living Building Challenge, and the WELL standard. A LEED-accredited professional, Jenny holds degrees in architecture and environmental studies from the University of Waterloo.

Fin MacDonald, Senior Consultant

Fin is an ESG and carbon management professional with over 10 years' experience managing sustainability programs and advising clients on sustainability strategy. As a senior consultant at Urban Equation, Fin supports ESG, district energy, sustainability strategy, and green development standards work.

Darynne Hagen, District Energy Consultant

Darynne is an experienced energy systems professional with over 5 years of experience working in the energy sector. As a consultant, Darynne assists clients in the assessment and implementation of district energy systems to support their project goals.

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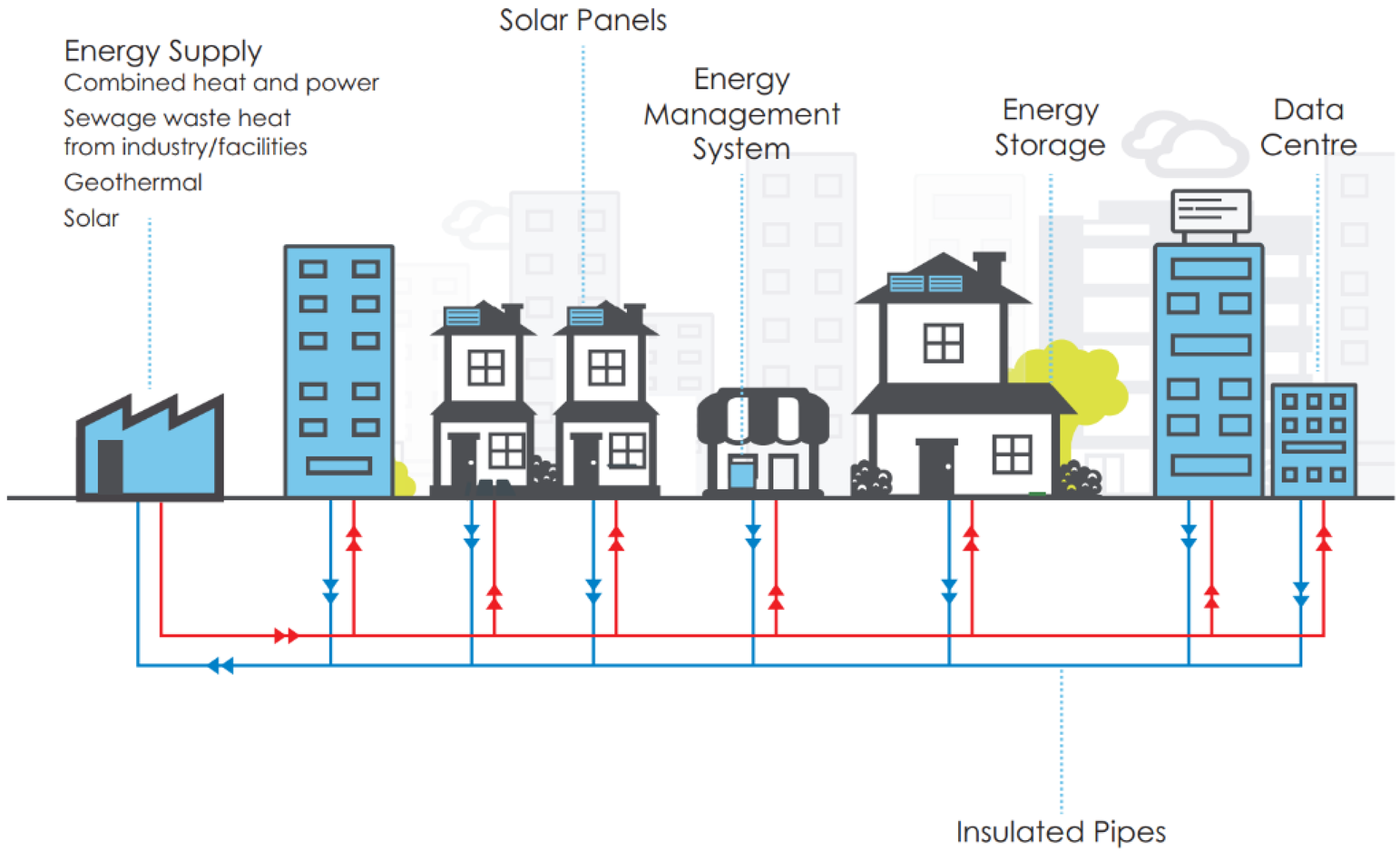
Introduction to District Energy

- District Energy Systems Include:
  - **Thermal Generation** (Heating, Colling and Domestic Hot Water generation)
  - **Thermal Distribution Network** (Buried Pipes distributing hot, cool or ambient temperature water)
  - **Customer Connections** (the interface or energy exchange point between the DES and the customer building



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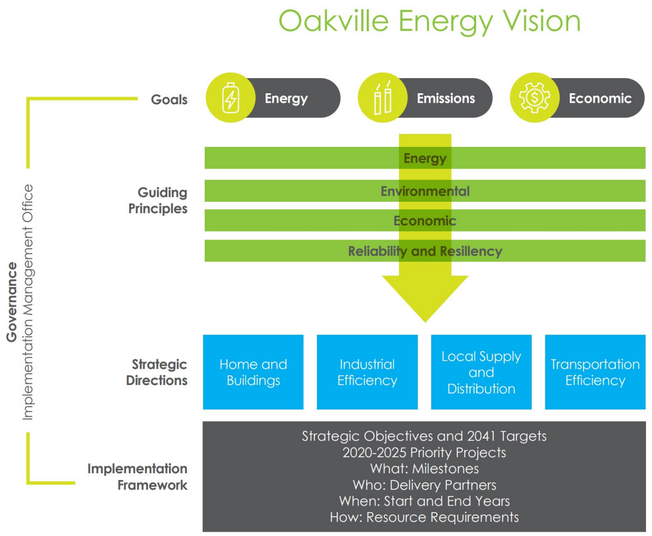
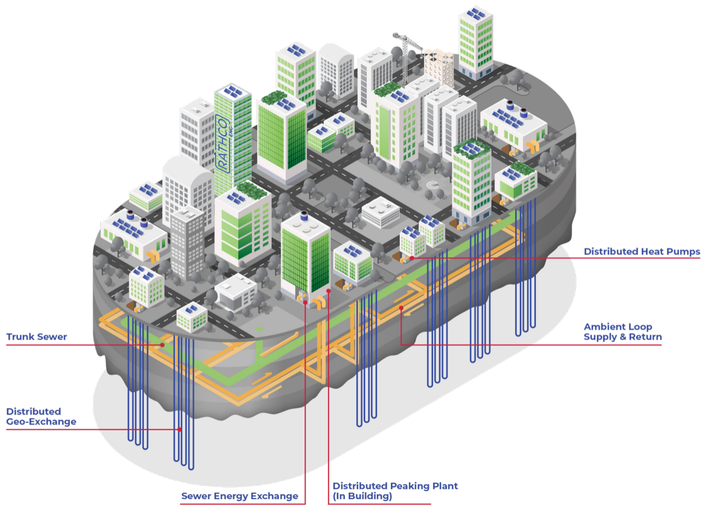
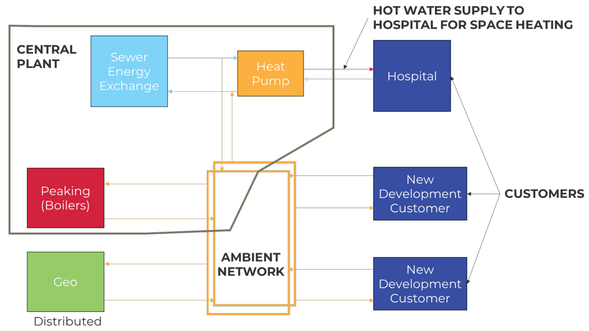
Project History







2018 – 2020
Community Energy Strategy
(Garforth International)

2021 - 2022
Prefeasibility Study
(Rathco + Damgaard)

2023 - 2024
Detailed Feasibility Study
(Rathco + Urban Equation)

The Town of Oakville's commitment to ambitious district energy planning began with the Community Energy Strategy which set the parameters, direction and ambition for DES in Oakville. This was followed by a heat mapping and opportunity assessment prefeasibility study in 2021 that identified the Hospital District as one of a number of DES opportunities in the City. Based on guidance from the Town, the Hospital District was selected as a prime opportunity for development to greater detail in a detailed feasibility study.

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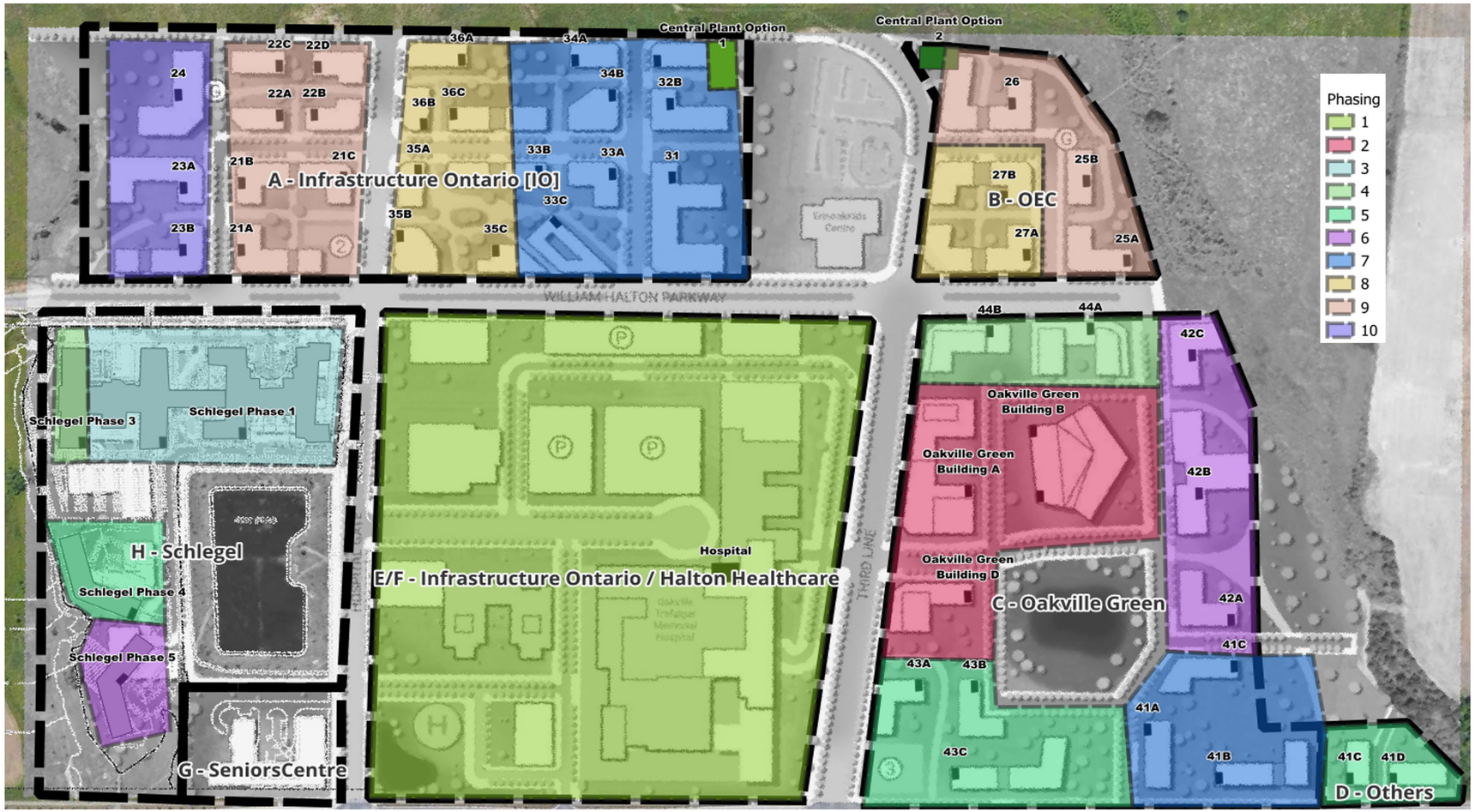
Project Overview

- 10-phase district energy system
  - geo-exchange
  - sewer heat recovery
  - peaking boilers
  - heat pumps
- Can provide low carbon heating and cooling to ~950,000 sq.m of development at full buildout
- Anchored by the hospital

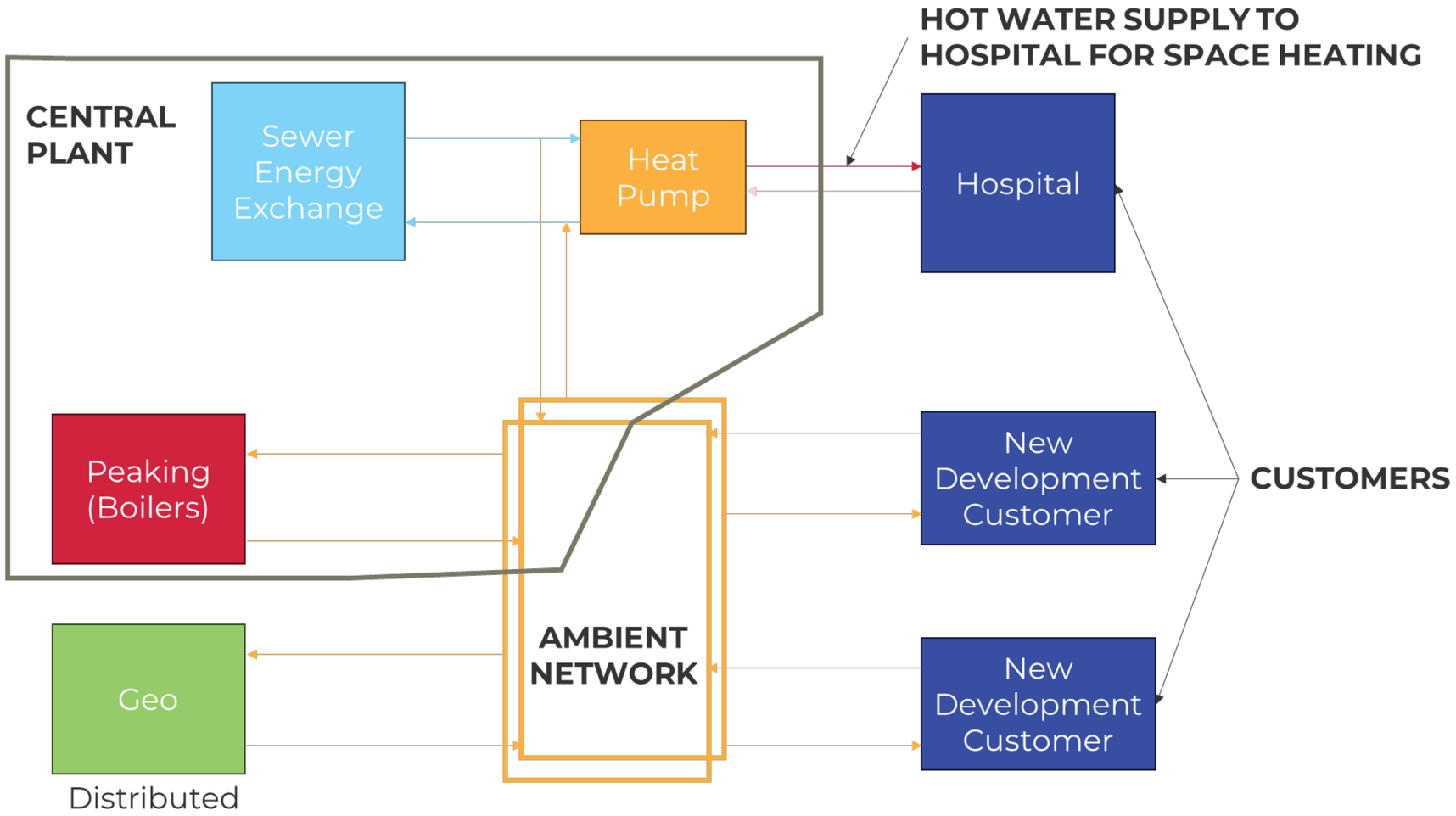


Technical Modelling and Design

Changes from Pre-Feasibility

- A connection to the existing hospital building (based on feedback from ToO)

- The dedicated hot water loop is removed and instead the ambient network will provide domestic hot water to the buildings via a water-to-water heat pump.



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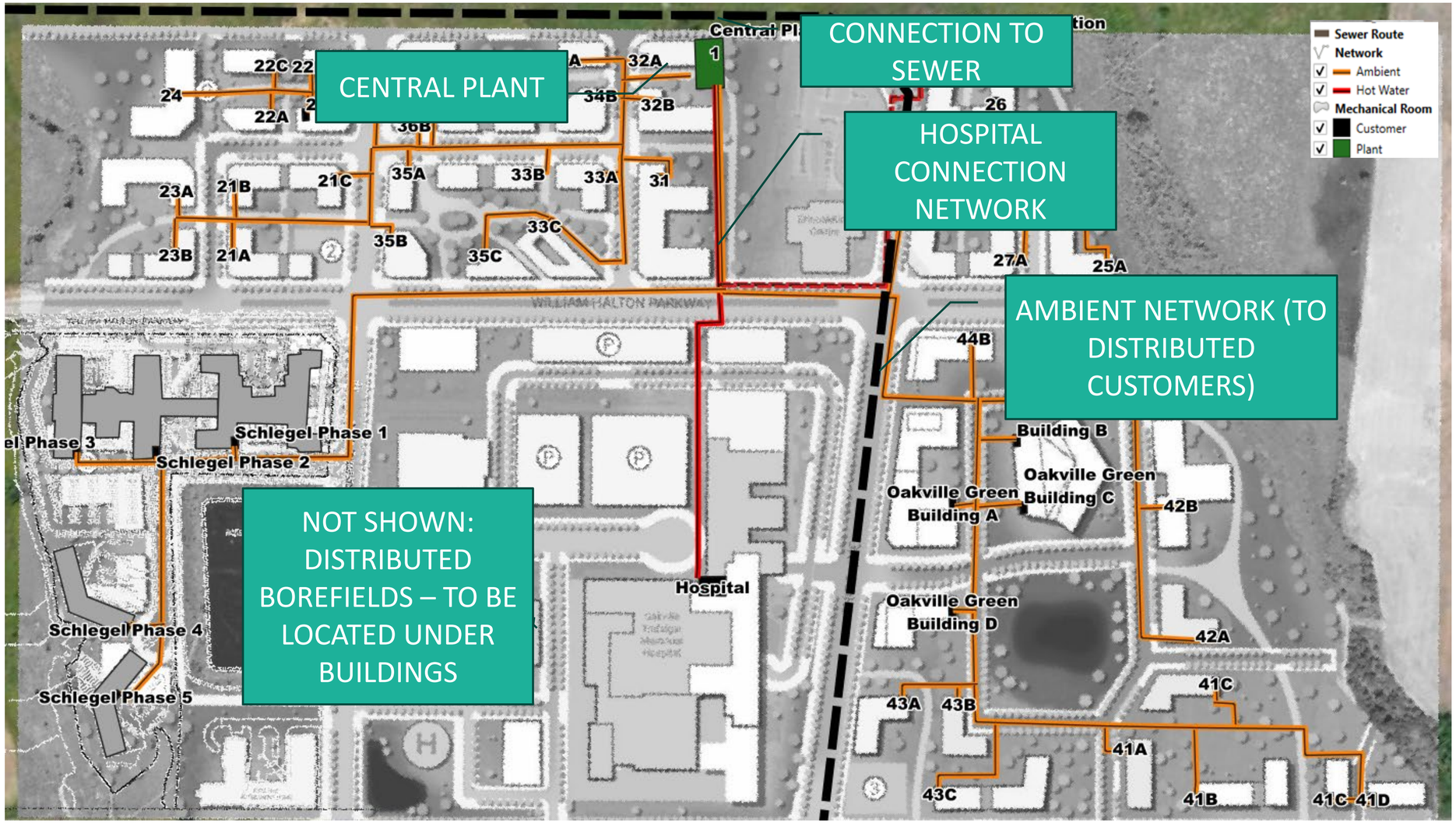
Technical Modelling and Design



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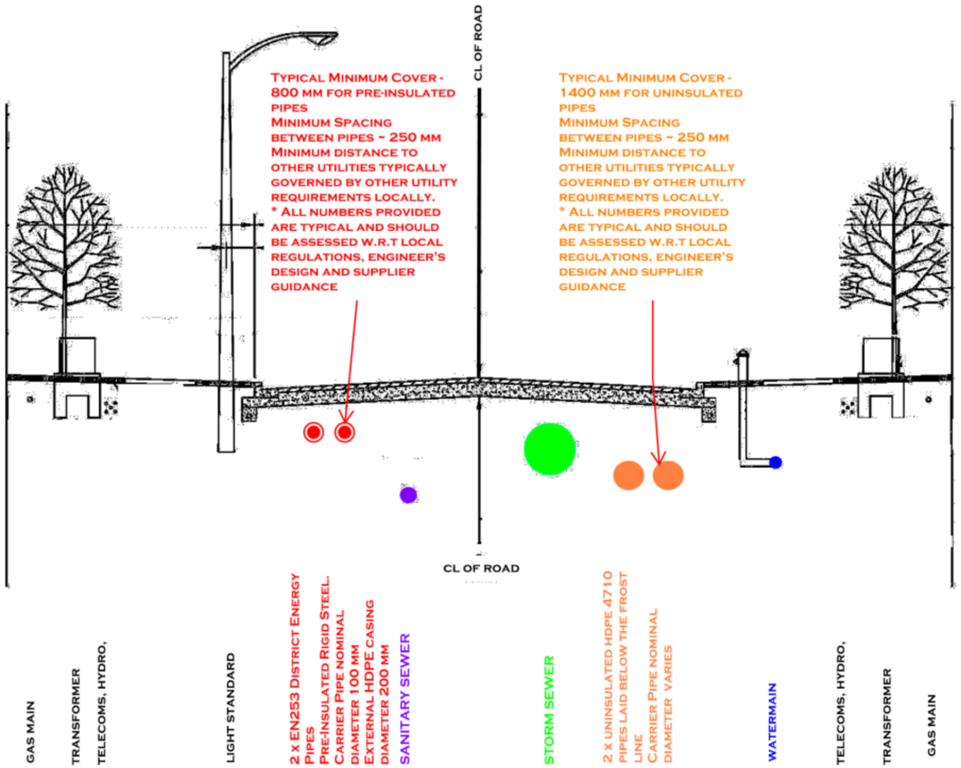
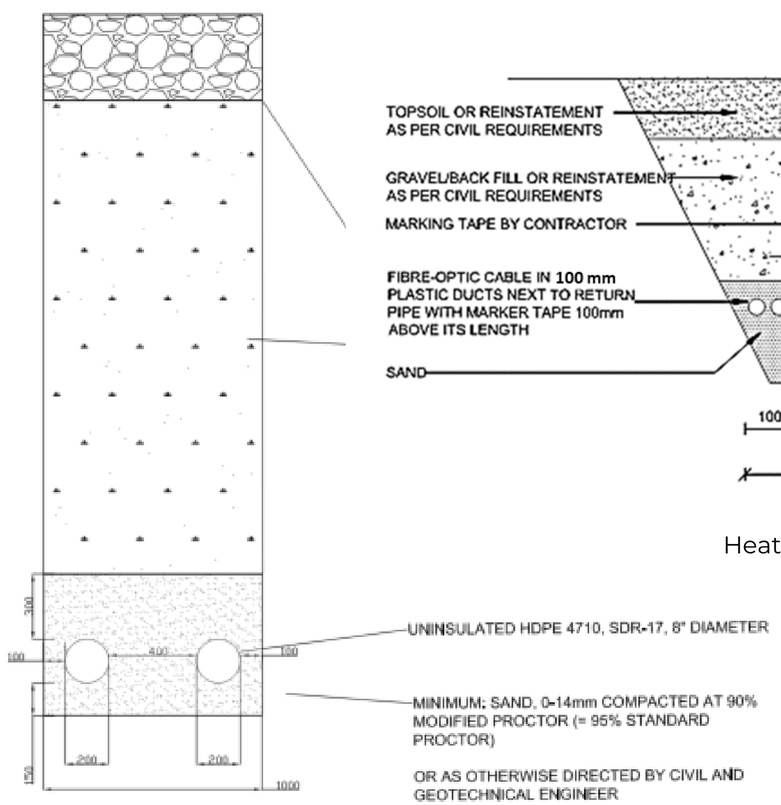
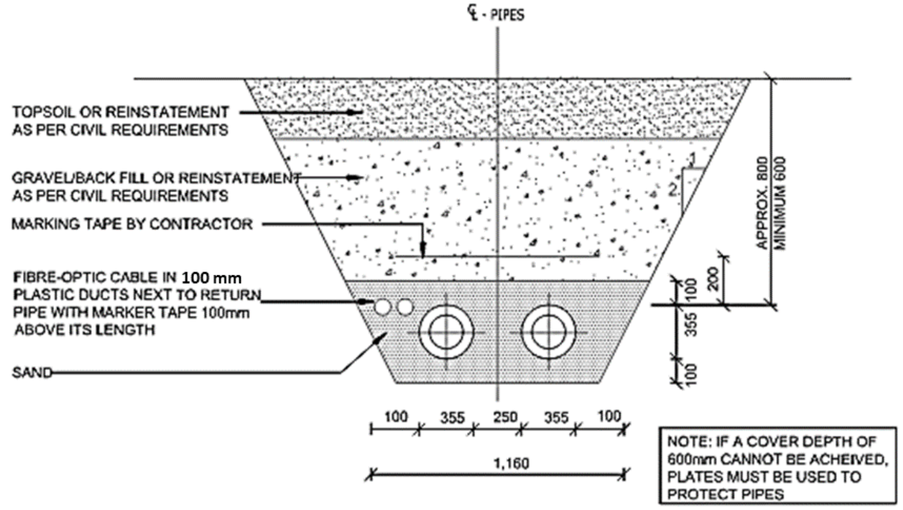
Technical Modelling and Design



Network Piping in Street – Illustrative (Orange – Ambient), (Red – Hospital Heating Water)



Ambient Loop Cross Section



Heating Water Cross Section

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Technical Modelling and Design

- Capital, operation and maintenance costs defined.
- DES Investment: $140 M over 10 phases (22 years)

- System is designed to provide 100% of energy to all new developments at full build out.

- The effective emissions reduction achieved is 62% compared to Business as Usual.

- The technical solution has a well-defined track record of implementation with high reliability.

	Total – 2024 Dollars
Central Energy Recovery	38,131,680
Sewer Interface	7,454,060
Geo-Exchange Manifold Rooms	40,243,003
Network	13,366,402
Customer Connections	21,928,300
Total System Capital Costs	121,123,444
Contingency	18,168,517
Total Incl. Contingency	**139,291,961**

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Economic and Financial Analysis

Milestone 4 – Led by Urban Equation

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Scope and Approach

Milestone 4: Economic and Financial Analysis

Milestone Goal: To determine the economic viability of the DES as configured, based on current market conditions.

Milestone Scope and Approach:

- Carry out fuel cost study and funding assessment to influence model inputs.
- Establish other inputs, based on market understanding and previous stakeholder engagement.
- Create financial model:
    - Layout capital costs, operating costs and projected revenues for each phase, based on preliminary phasing plan.
    - Escalate costs based on market escalators
    - Determine unlevered rate of return and net present value for ‘DES Owner’ based on 30-year term for each phase.
- Carry out sensitivity analysis to determine inputs and criteria that are critical to project success.

Funding Sources Scan

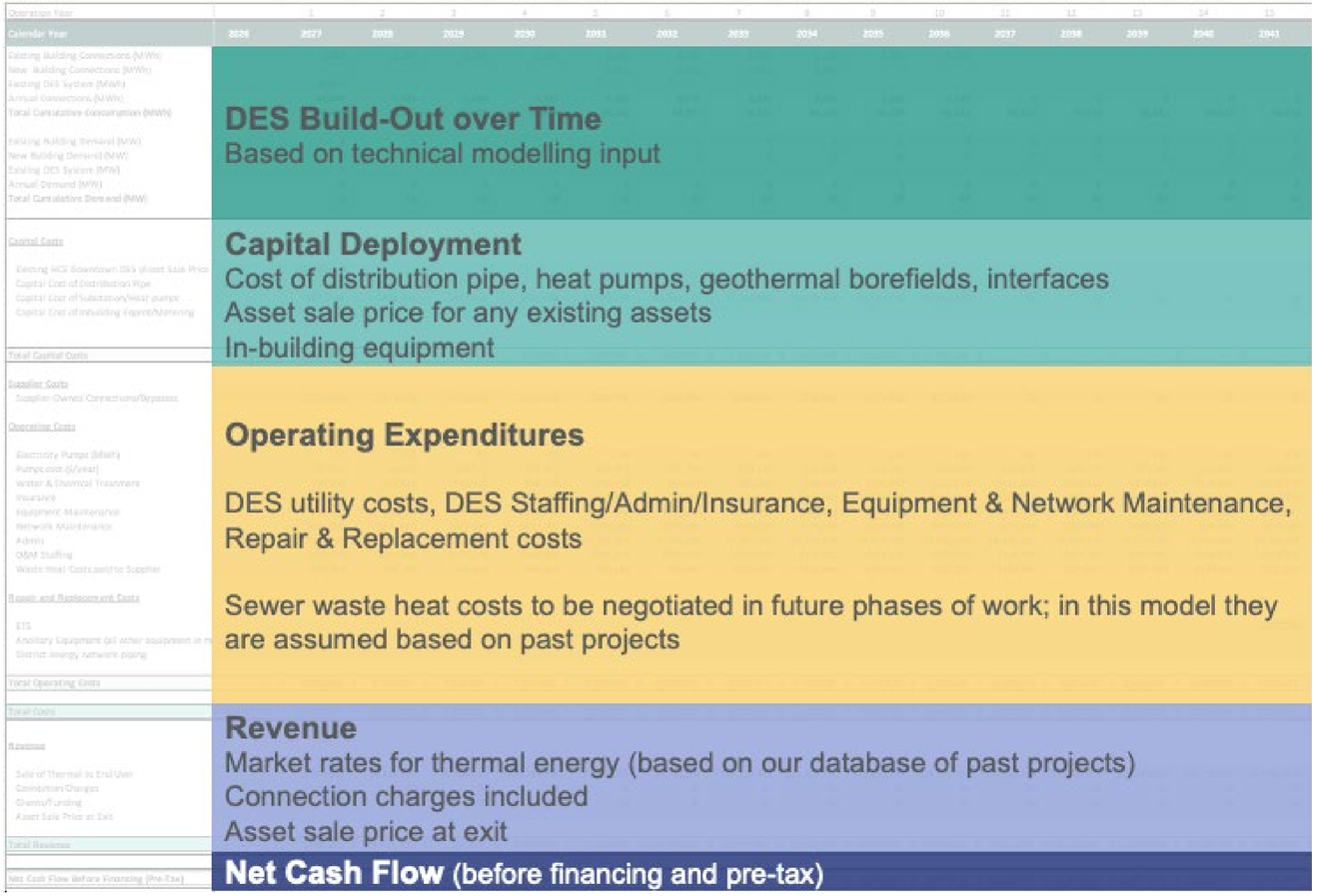
Milestone 4: Economic and Financial Analysis

- Desktop study carried out to determine various government funding sources available (including Federal, Provincial and Municipal).
- Federation of Canadian Municipalities (FCM) – Green Municipal Fund: Interest free loans of up to $10 million (80% of project costs). Up to 15% of the loan could be awarded as a grant.
- Innovation, Science, and Economic Development Canada – Strategic Innovation Fund: Low/no interest loans with a minimum contribution of $10 million with total project cost of at least $20 million.
- Canada Infrastructure Bank: Low interest loans tied to emissions savings.
- Other potential funding sources include:
  - Canada Community Building Fund
  - Low Carbon Economy Challenge
  - Towards Net Zero – Communities
  - Commercial Buildings Retrofit Incentive
  - Energy Innovation Program
  - Clean Technology Investment Tax Credit

Model Approach

Milestone 4: Economic and Financial Analysis

- **Global Benefit Approach**: A global benefit, life-cycle cost perspective balancing the impact on the vertical developers, end users (residents/tenants), DES operator, and sewer heat suppliers. The allocation of cost/benefit by party is to be determined
- **Revenue Assumptions:** Sets an estimate for revenue equivalent to market rates for thermal energy
- **Finance Assumptions:** Evaluates the investment without the cost of financing, without the benefit of funding, and pre-tax.
- **Term length** – 30 years from start of Phase 1 operations



Model Assumptions: Staying Conservative

Milestone 4: Economic and Financial Analysis

To ensure the results presented to the Town were adequately conservative and rates remained competitive for future DES customers, the following assumptions were carried in the model:

- **Terminal Value:** Results have been presented both with and without terminal value of the DES (ie. the 'sale price' after 30 years).
- **Hospital Rates:** Hospital has been modelled to have lower rates, since they're only using heating energy.
- **Customer Rate Discount:** All assumed DES thermal energy rates and connection costs were discounted by 20% from the calculated 'business as usual' costs.
- **Owner Discount Rates:** Discount rates for both the public and private DES owner (11% and 9%, respectively) were intentionally set to be conservative.
- **Financing Facility Interest**: The model assumed the DES owner is paying interest costs on the full debt facility every year, rather than the draws. As loan structures are unique to each lending facility, a conservative assumption was made.

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Model Results

Milestone 4: Economic and Financial Analysis

- Typical minimum UIRR in the market is 8-12% - still showing a very strong business case
- Assumed a construction start date of 2027, and revenue generation beginning in 2028 with a term of 30 years.
- Terminal value shows small impact on unlevered IRR.

District Energy System – Including Terminal Value		
Capital Costs	$202	M
Operating Costs	$404	M
TOTAL COSTS	**$605**	**M**
Thermal Energy Sales	$586	M
Connection Charges	$117	M
Terminal Value	$470	M
TOTAL REVENUE	**$1,173**	**M**
TOTAL PROFIT (FV)	**$706**	**M**
TOTAL PROFIT (PV)	**$13.8**	**M**
UIRR (pre-tax, excluding funding/financing)	**13.3**	**%**

District Energy System – Excluding Terminal Value		
Capital Costs	$201	M
Operating Costs	$404	M
TOTAL COSTS	**$605**	**M**
Thermal Energy Sales	$586	M
Connection Charges	$117	M
Terminal Value	$0	M
TOTAL REVENUE	**$703**	**M**
TOTAL PROFIT (FV)	**$236**	**M**
TOTAL PROFIT (PV)	**($1.2)**	**M**
UIRR (pre-tax, excluding funding/financing)	**10.7**	**%**

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Sensitivity Analysis Results

Milestone 4: Economic and Financial Analysis

Base Case

Supplier	UIRR	NPV
DES	10.7%	($1.2M)
WHS	-	$1.4M

Carried out a sensitivity analysis on a variety of inputs including capital costs, operating costs, escalation rates and revenues. Most analyses showed limited impact on returns – the table below highlights the critical inputs.

Risk / Lever	Scenarios	Target or current	Realistic Upside	DES (% UIRR)	DES NPV ($2024)	WHS NPV ($2024)	Realistic Downside	DES (% UIRR)	DES NPV ($2024)	WHS NPV ($2024)	Proposed Sensitivity Range
Heating Demand	Increase or decrease	69,540 MWh	20,000 (29%)	14.0%	$12.6M	$1.4M	-20,000 (-29%)	6.53%	$(15M)	$1.4M	+/- 50%
Revenues / Thermal Energy Rates	Increase or decrease	Market-based	20%	14.4%	$14.6M	$1.7M	-10%	8.37%	$(9.2M)	$1.2M	-10% to 20%
Capital Cost	Increase or decrease	0%	-10%	12.6%	$5.6M	$1.4M	30%	6.5%	$(21.7M)	$1.4M	-10% to 30%
Commodity Costs	Increase or decrease	0%	-30%	12.7%	$6.9M	$1.4M	30%	8.4%	$(9.3M)	$1.4M	-30% to 30%
Carbon tax	Removed	5% (after 2030)	No carbon tax	11.1%	$503K	$1.4M	6.5% after 2030	10.6%	$(1.6M)	$1.4M	Rates defined up to 2030. 5% after.
Thermal Energy Escalator	Increase or decrease	4%	5.5%	15.2%	$21.4M	$1.7M	2.5%	3.34%	$(18.3M)	$1.1M	2.5% to 5.5%

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Ownership Options Assessment

Milestone 5: Implementation Planning

- Ownership model used to layer in financing assumptions to determine levered rates of return.
- Considered both 100% public and private ownership of the DES, modelling both with and without terminal value for the public owner, as per Town's direction.
  - Note that without a terminal value (i.e. asset sale), the DES Owner would continue to generate revenue for the asset, which would result in higher rates of return than what is shown below.

Ownership Model	Description	Financing Assumptions	Terminal Value Included?	Levered Internal Rate of Return (UIRR)	Net Present Value (NPV)
100% Private Ownership	A project company owned and led by private developer/ investor	• Private: 40% equity contribution; 60% debt • Cost of Capital: 7.95% (prime + 100 bps) • Discount Rate: 9%	Yes	9.53%	$4.2M
100% Public Ownership	A project company owned and led by public company and the Town of Oakville	• Public: 20% equity; 80% debt • Cost of Capital: 6.3% (10 yr Canada bond rate + 3%) • Discount Rate: 11%	Yes No	10.4% 3.26%	($2.9M) ($13M)

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Town Planning – Policy Recommendations

Milestone 5: Implementation Planning

To gain a better understanding of the barriers to DES implementation, as well as municipal policy tools that can be implemented to overcome those barriers, UE:

- Conducted a desktop analysis to discover common barriers to DES, as well as tools available to Ontario municipalities to support DES implementation and uptake.
- Layered in feedback from market sounding assessment and meeting with the Town
- Results:

Barriers to DES implementation include:

- Cost competition with market rates
- High upfront costs
- Extensive buildout schedules
- Land use planning uncertainty
- Revenue uncertainty
- Significant stakeholder coordination

Municipal Planning tools to overcome these challenges include:

- Green development standards
- Property taxation rebates
- Development charge rebates
- Accelerated approval timelines
- Official plans
- Zoning by-laws

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Milestone 4 and 5 Takeaways

What have we learned?

- The business case for the district energy system owner is strong and resilient to typical market changes, as shown through the sensitivity analysis.
- The Halton Region would experience a strong financial upside through waste heat revenue generation, without needing to invest any capital in the system.
- The market sounding was positive overall:
  - Landowners and developers are interested in connecting to the DES, but require more information and want to ensure that it's cost competitive with their business-as-usual.
  - All district energy providers in the local market are interested in supporting the project.
  - No local regulatory agencies expressed any major concerns with the feasibility of the system, but all expressed the need to remain engaged as the process moves along.
- The major risks identified in the risk analysis can be mitigated according to the mitigation plans outlined in the risk register.

Overall, we recommend that the Town move forward with this project.

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Questions?

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Appendix

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Fuel Cost Study

Milestone 4: Economic and Financial Analysis

- Provided background information on fuel costs in Ontario and documented why certain fuel costs were used in the economic model to assess economic viability of the Oakville District Energy System.
- Overall, fuel cost rates in Ontario were difficult to estimate because the rates depend on volume of consumption and the required capacity/demand. The fuel cost study provided the following outcomes:
  - one default rate for electricity: **$0.135/kWh** and one high volume rate for large-scale energy consumers at **$0.10/kWh**
  - one average rate for natural gas that will be uniform across all end user types: **$0.033/ekWh**
  - thermal energy can be supplied at equivalent market rates, offsetting the building's total equivalent costs of providing thermal energy (heating, cooling, DHW): **$165/MWh**

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Model Inputs

Milestone 4: Economic and Financial Analysis

The following table summarizes the various assumed inputs for the business model.

Criteria	Assumption	Criteria	Assumption	Criteria	Assumption
Start Date	2028	Class A Electricity Price	$0.100/kWh	Thermal Energy Escalator (%)	4.0%
PPA Term	30 years	Class B Electricity Price	$0.135/kWh	Sewer Waste Heat	$3.00/MWh
DES Discount Rate	11%	Electricity Escalator	3.5%	Market rate for Thermal Energy	$132/MWh
Sewer Heat Supplier Discount Rate	9%	Natural Gas Price (incl carbon)	$0.033/ekWh	Market Rate for Heating Energy (Hospital Only)	$85/MWh
Terminal Capitalization Rate	5%	Natural Gas Escalator	3.5%	Upfront Connection Charge – Heating & DWH	$720,000/MW
CPI Escalator	3.5%	Carbon Tax Escalator (after 2030)	5%	Upfront Connection Charge – Cooling	$1,480,000/MW

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