

Implementing District Energy's 4th Generation: a Case Study in Minneapolis

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SVP System Development



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Common Themes

- Energy systems for the district
- Partnership
- Set a common vision
- Leverage local resources
- Leverage existing assets
- One size does not fit all
- Look to the next generation of district energy



University Avenue District

2 systems
currently serve
downtown Mpls
1 proposed

U of M East
Bank Campus

U of M St. Paul
Campus

University
Avenue District
Energy System
(Proposed)

U of M
West Bank
Campus

Fairview
Hospital

Augsberg
College

RockTenn

District Energy
St. Paul, EPUC, +
5 local college
systems



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Proposed Land Use

New Buildings, Businesses, and Increased Density



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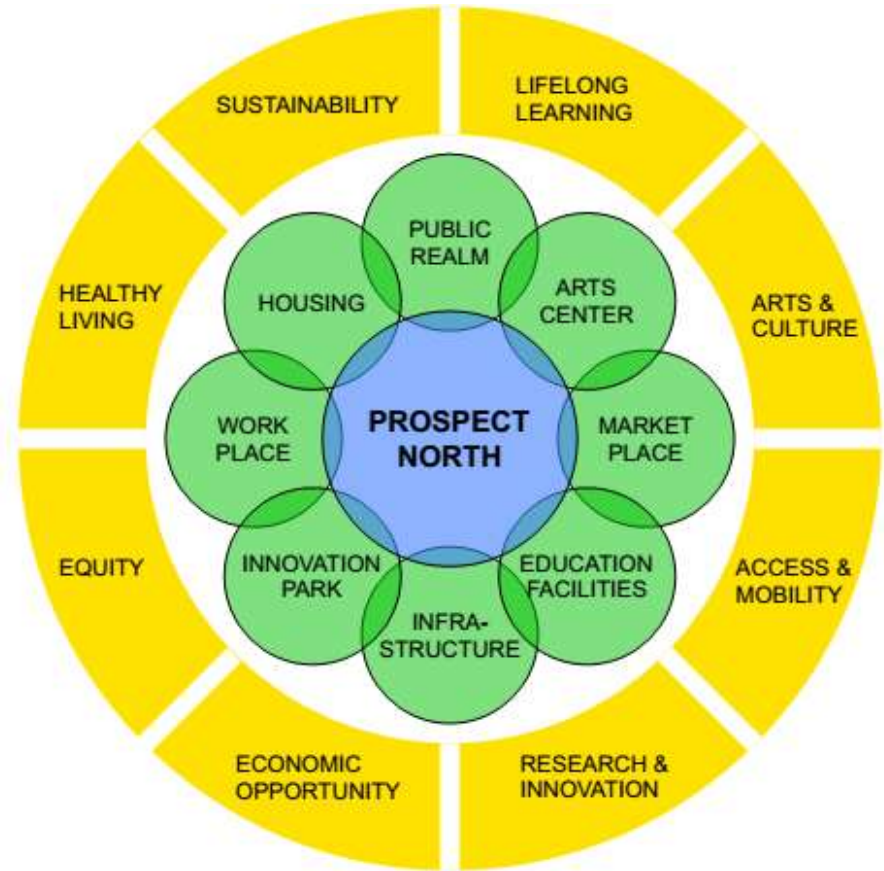
University Avenue District Partnership

- Prospect Park 2020 (neighborhood group)
- University of Minnesota College of Design
- U of M Real Estate Foundation
- University Enterprise Laboratories
- Urban Land Institute
- City of Minneapolis
 - Community Planning & Economic Development
 - Public Works
- City of St. Paul
- Hennepin County
- Metropolitan Council
- Greater MSP
- McKnight Foundation
- Minneapolis Public Housing Authority
- Metro CERTS (clean energy resource teams)
- Family Housing Fund
- Mississippi Watershed Management Organization
- Trust for Public Land
- Blue Cross/Blue Shield
- The Cornerstone Group
- Aeon Properties
- Cornerstone Properties
- United Properties
- Prospect Park Properties
- The Wall Companies
- Xcel Energy
- CenterPoint Energy



Sustainable District Planning

- District energy
- District stormwater
- District parking
- District traffic management
- Eco-District
- District carbon goals



University Avenue District Energy Vision

The University Avenue District energy system will be an urban model for sustainability, resilience, partnership, innovation, and economic development.



University Avenue District: Guiding Principles

Sustainability

- Develop alternative energy solutions and a model of efficient energy that supports a healthy community and environment.
- Foster partnerships with government, industry, the neighborhood, and the local stakeholders.

Resilience

- Deliver reliable, cost-competitive, and equitable energy solutions to customers under a financially sustainable model.
- Implement adaptable infrastructure solutions that are flexible to market and technology changes and can evolve with the changing needs of the area throughout redevelopment.

Innovation

- Establish the District as a national model and living laboratory for the development of innovative and integrated energy systems
- Differentiate the District as a destination district that promotes a culture of environmental stewardship, economic growth, and community prosperity.



Study Area



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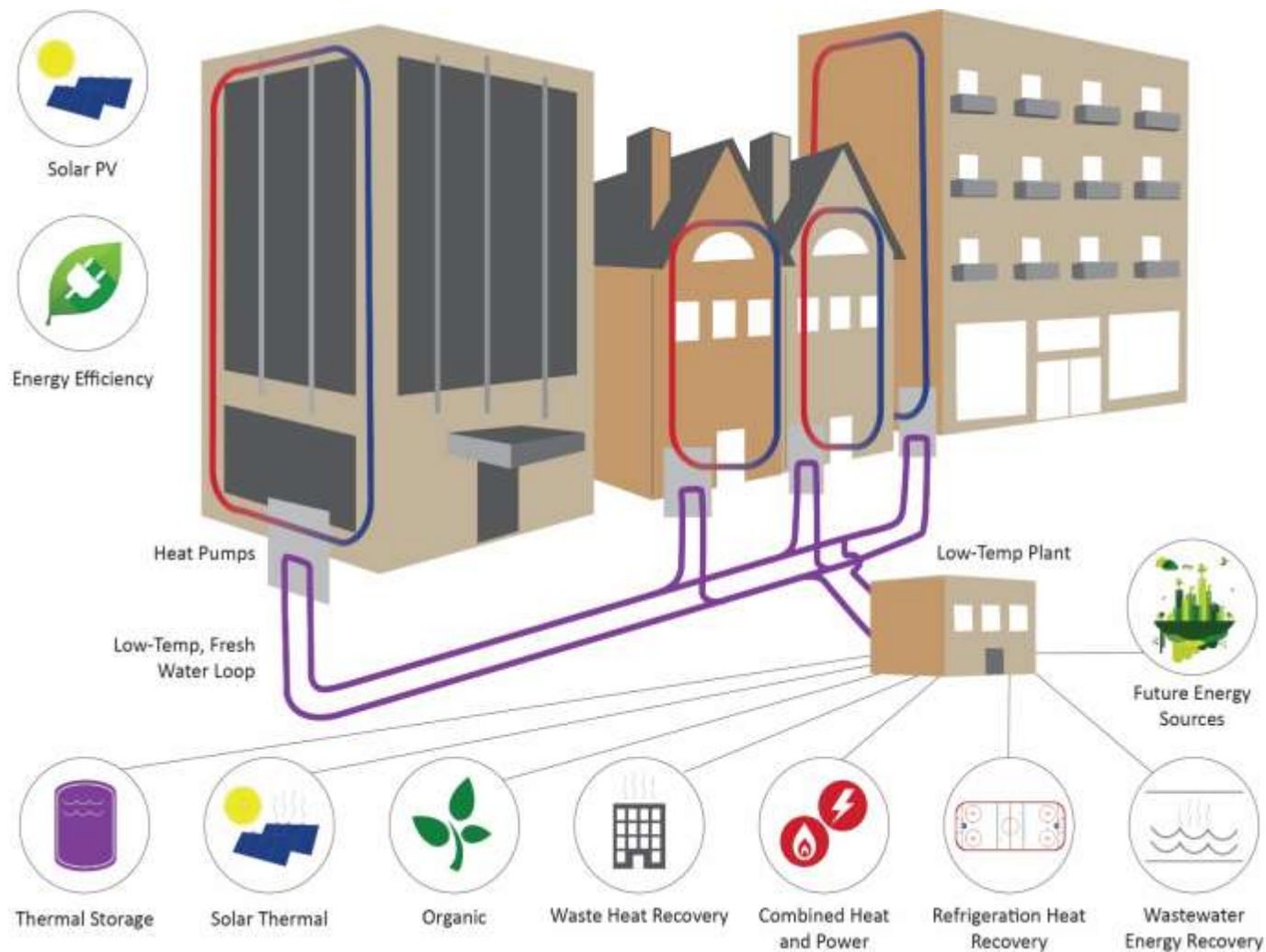
Upcoming Development



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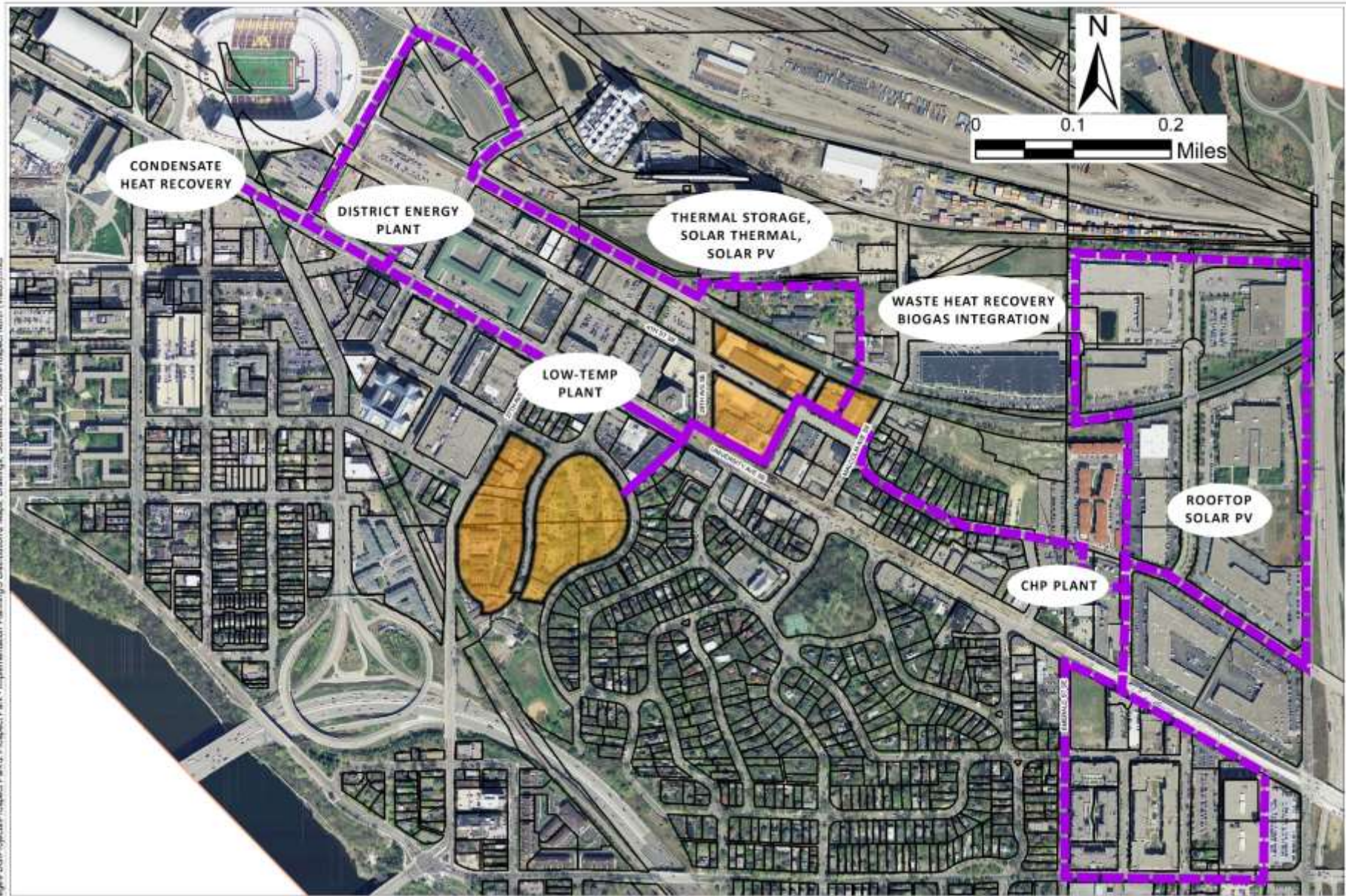
Vision for the District's Energy System



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System Vision Map

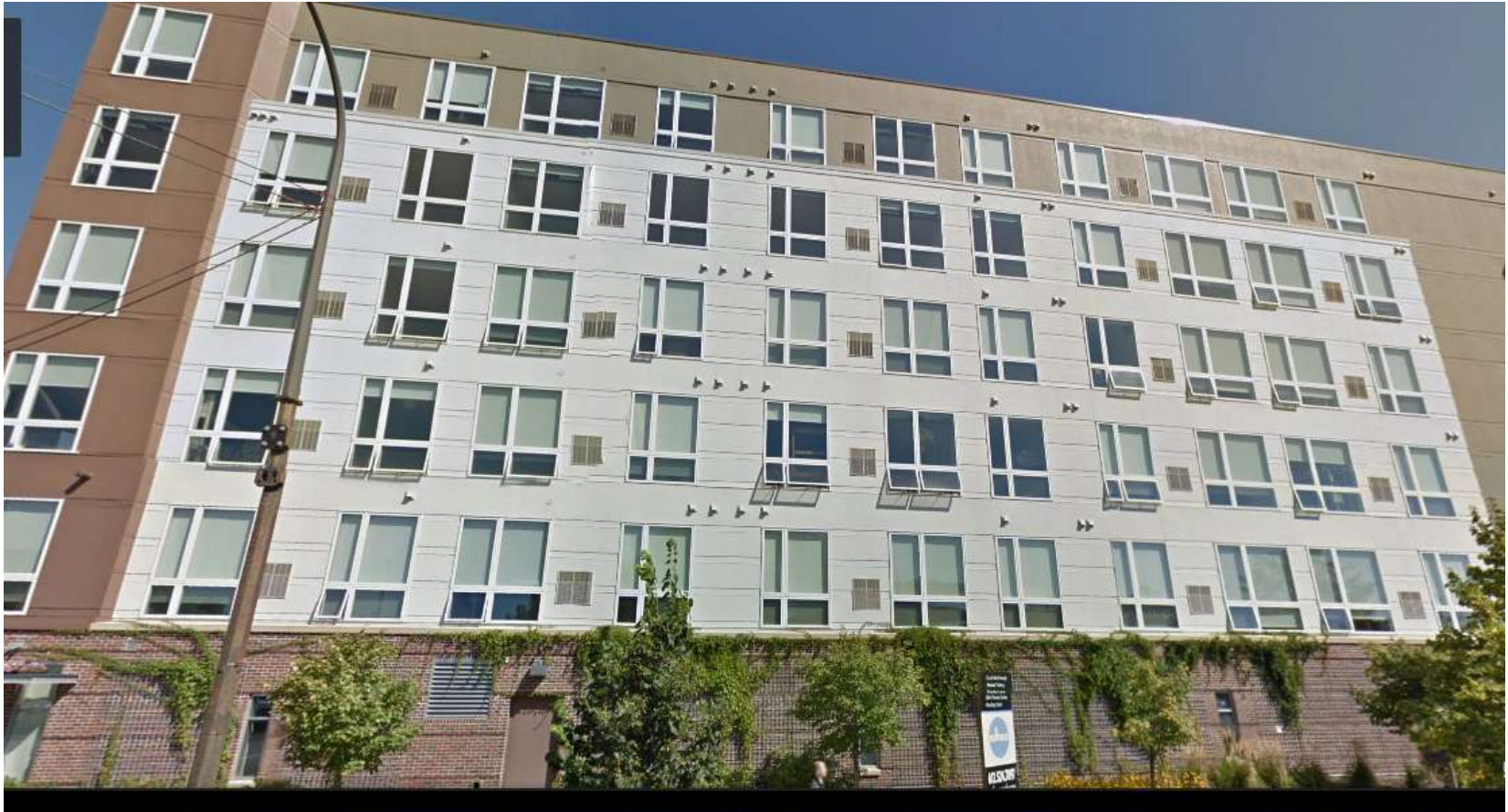


Achieving the Energy Vision

- Wastewater energy recovery
- Solar PV
- Solar thermal
- Thermal storage
- Waste heat capture
- CHP integration
- Advanced distribution grids
- Advanced metering



Competition



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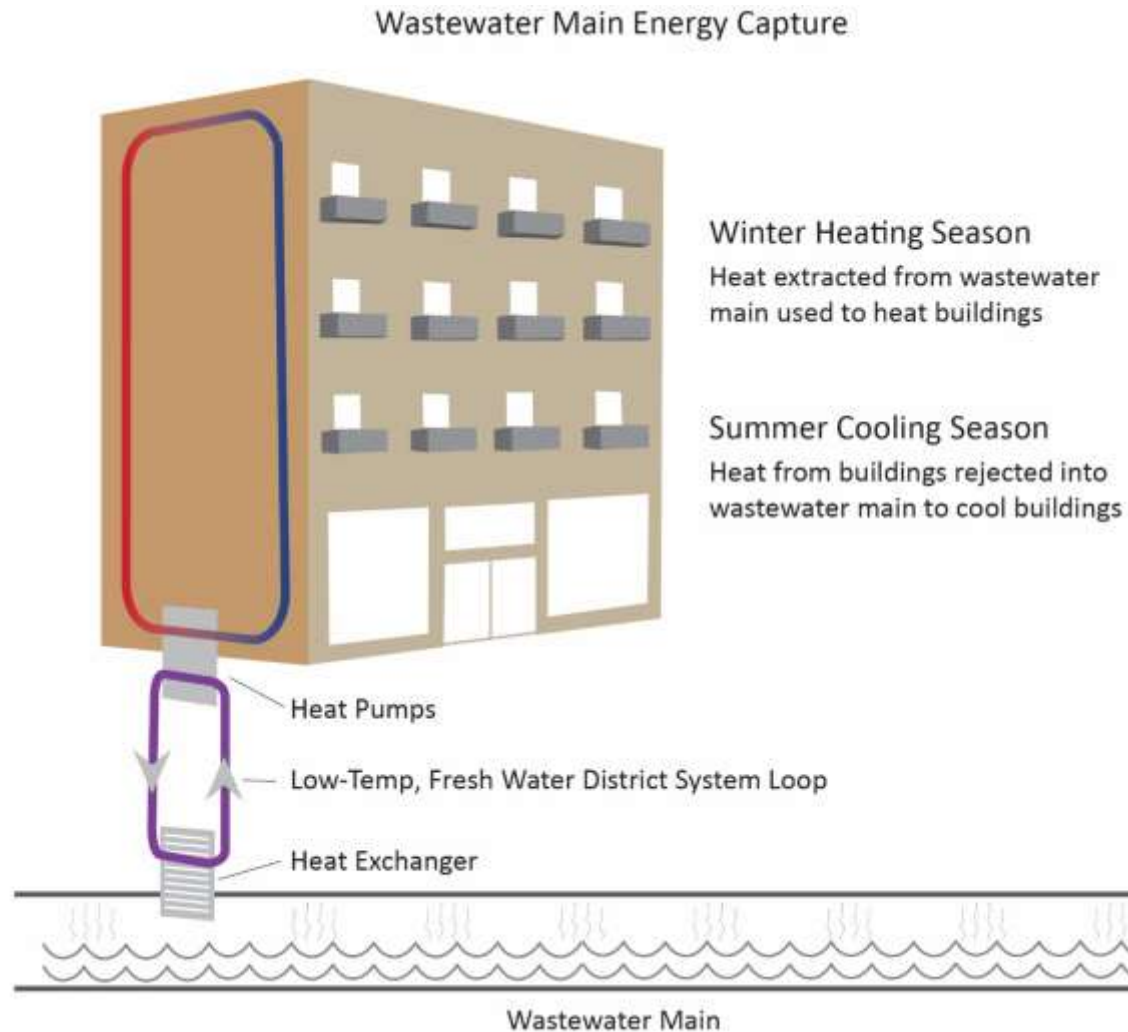
Initial Phase



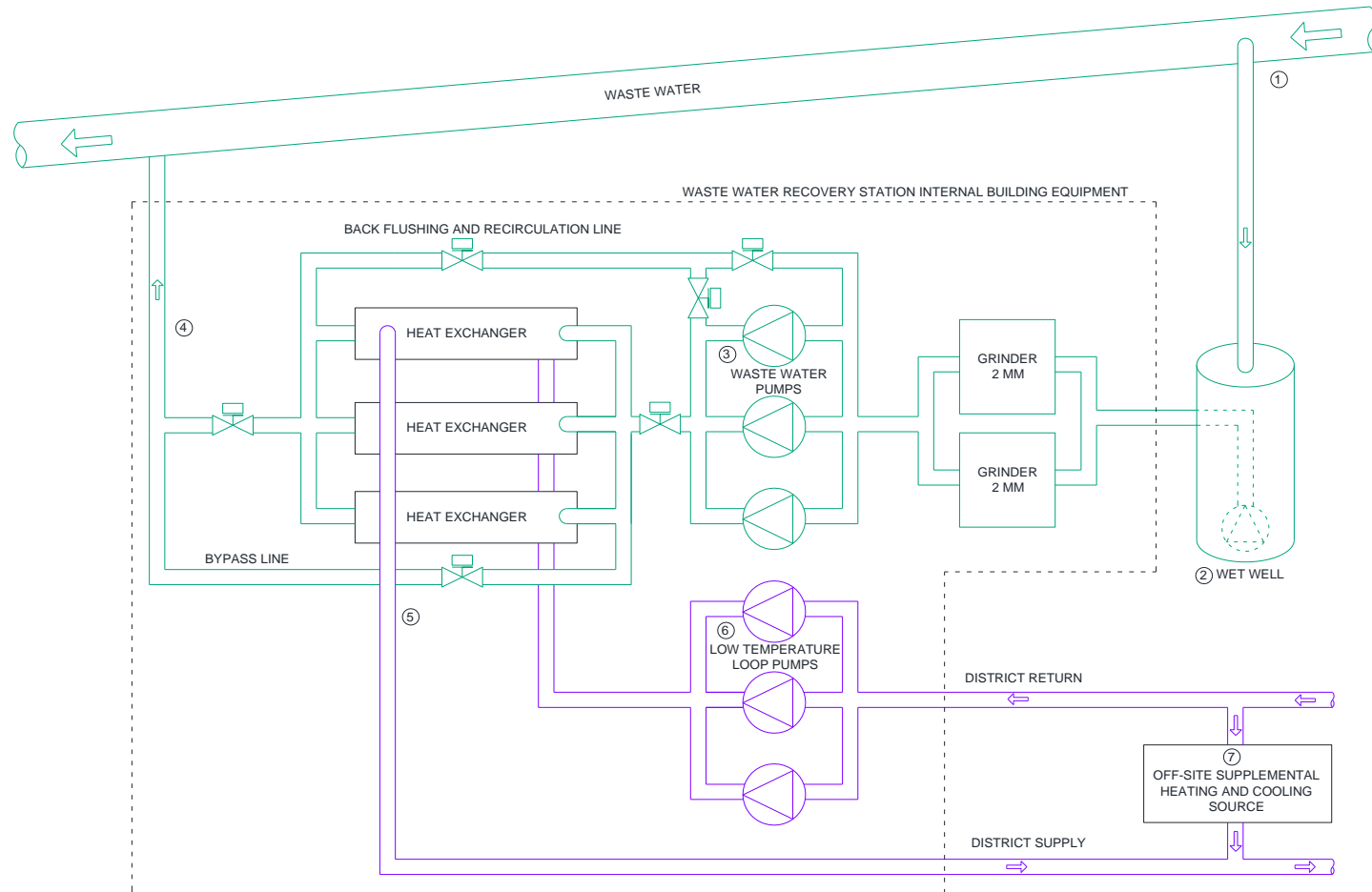
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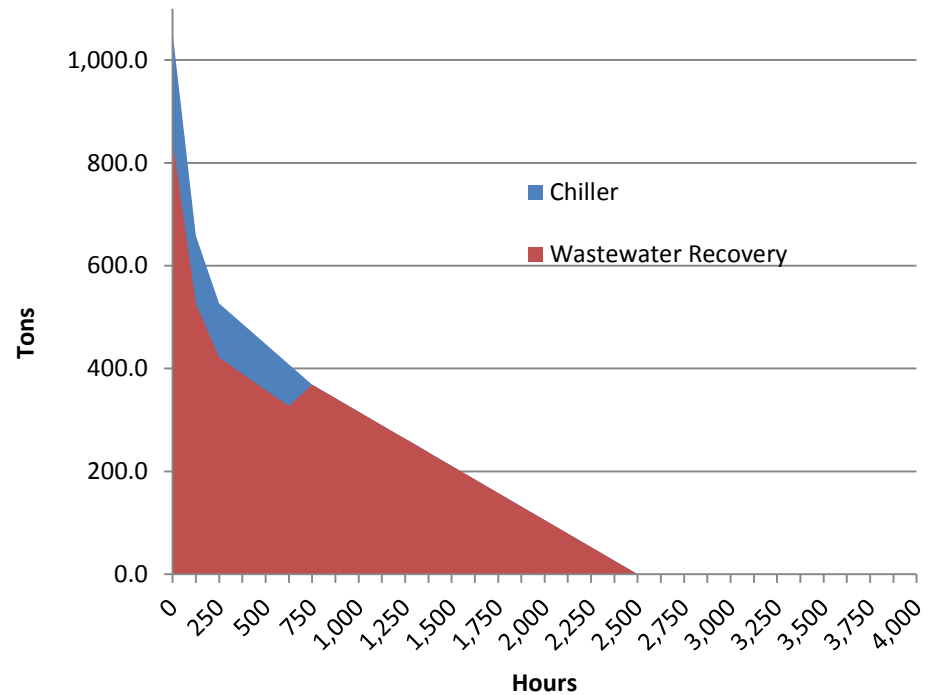
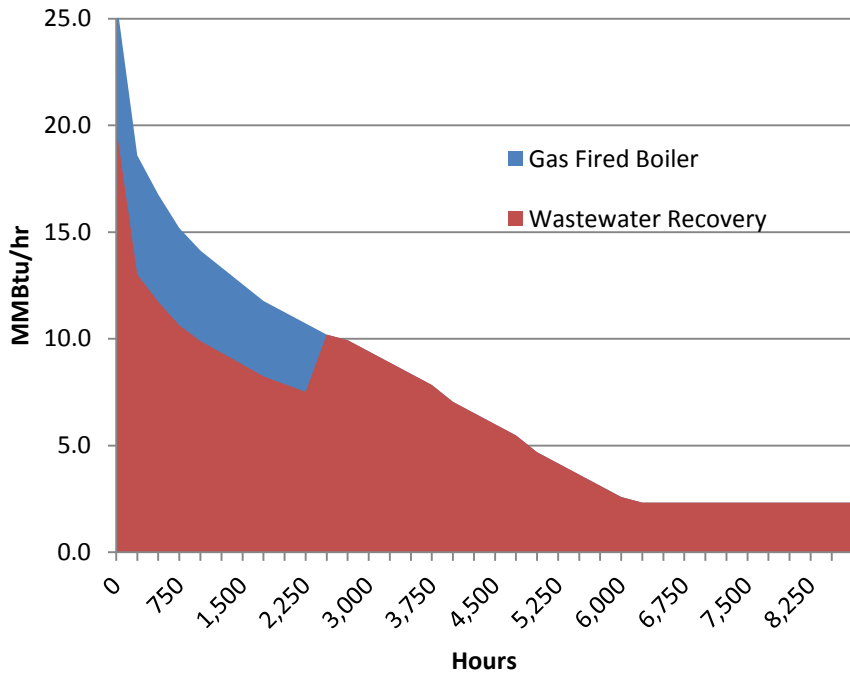
Wastewater Energy Recovery



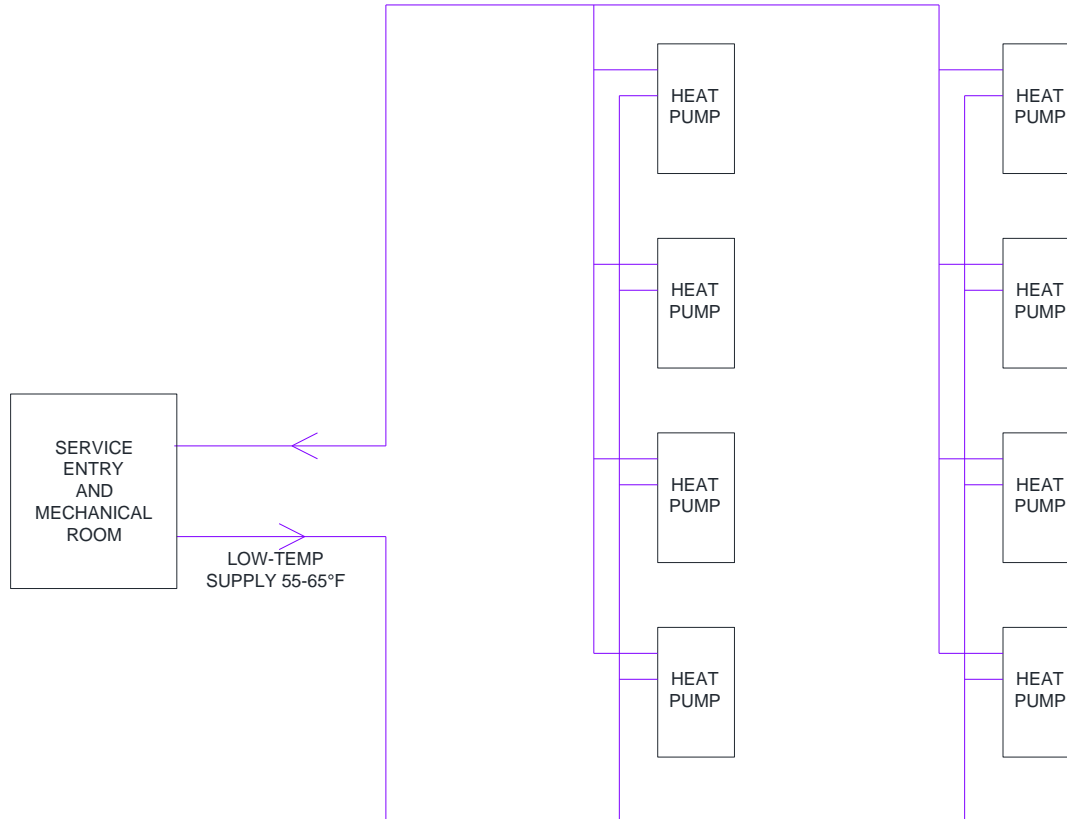
Wastewater Energy Recovery



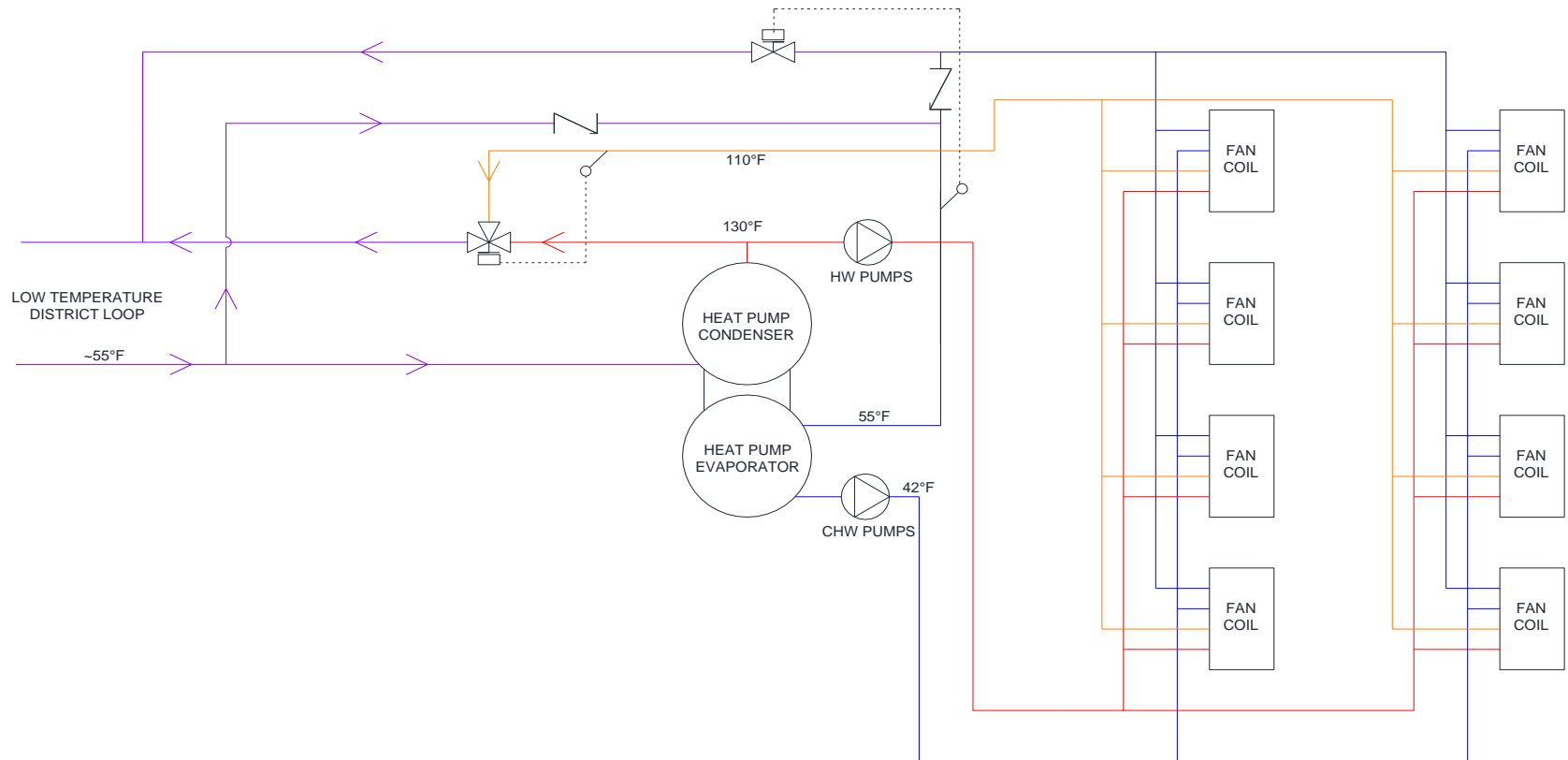
Energy Source & Delivery Solutions



Building Loop Base Option – Distributed Heat Pumps



Building Loop Enhanced Option – Mechanical Room Heat Pump with Fan Coils



Model Assumptions

- Private non-profit business structure
- 25-year energy service agreements
- 6% cost of debt
- 70% sewer main availability for heating
- 80% sewer main availability for cooling
- 2% inflation
- 3.93% natural gas acceleration rate (EERC)
- 2.53% electricity acceleration rate (EERC)
- 100% debt financing
- Franchise and easements
- Energy transfer station location



Estimated Greenhouse Gas Reductions – Initial Implementation

	Unit	Energy Usage	Tons CO2
Heat Pumps	kWh	3,209,961	1,671
Gas Fired - Heating	MMBtu	36,819	2,154
Air conditioner - Cooling	kWh	657,041	342
Total On-Site, Stand-Alone Emissions			4,167
Heat Pumps	kWh	4,124,768	2,147
Peaking - Gas Usage	MMBtu	12,746	746
Peaking - Electric Usage	kWh	100,778	52
Pumping Station	kWh	859,415	447
Total District Energy System Emissions			3,392
Savings			775
Percent Emissions Reduction			19%



Estimated Greenhouse Gas Reductions – with Renewable Redundancy

	Unit	Energy Usage	Tons CO2
Heat Pumps	kWh	3,209,961	1,671
Gas Fired - Heating	MMBtu	36,819	2,154
Air conditioner - Cooling	kWh	657,041	342
Total On-Site, Stand-Alone Emissions			4,167
Heat Pumps	kWh	4,124,768	2,147
Peaking - Gas Usage	MMBtu	0	0
Peaking - Electric Usage	kWh	0	0
Pumping Station	kWh	859,415	447
Total District Energy System Emissions			2,594
Savings			1,573
Percent Emissions Reduction			38%



Financial Analysis (25-year est.)

With 6% cost of debt

	District Energy	On-Site, Stand-Alone	Savings
Initial Developer Costs	\$11,170,000	\$11,560,000	\$390,000
25 Year Tenant Costs	\$38,550,000	\$39,440,000	\$890,000
25 Year Building Owner Costs	\$12,610,000	\$17,960,000	\$5,350,000
Total	\$62,330,000	\$68,960,000	\$6,630,000

With 4.5% cost of debt

	District Energy	On-Site, Stand-Alone	Savings
Initial Developer Costs	\$11,170,000	\$11,560,000	\$390,000
25 Year Tenant Costs	\$36,200,000	\$39,440,000	\$3,240,000
25 Year Building Owner Costs	\$11,680,000	\$17,960,000	\$6,280,000
Total	\$59,050,000	\$68,960,000	\$9,910,000



Next Steps

- Refine projected developer costs
- Business formation
- Wastewater main access
- Utility coordination
- Customer contracts
- Plant location
- Redundant energy source
- System growth plan
- Design & engineering
- Permitting and regulatory approvals
- Franchise agreements and easements
- Construction and equipment procurement contracts
- Financial rating
- Community outreach & education



University Avenue District - Good to Great

2015

Planning:

- District Stormwater
- District Energy
- District management
- District parking
- Street grid
- Signature green spaces

2016

- **Phase I 4th St** (rebuild 29th-Malcolm)
- **Phase I district energy** (heating/cooling)
- **Phase I district stormwater mgmt** (MWMO)
- **4th St SSD** (or equal) established
- **Initial Private Development begins**

2017

- **Phase II 4th St** (rebuild 29th – Huron)
- **Phase II shared stormwater mgmt** (MWMO)
- **Signature green spaces**

2018

- **Greenway across University Ave**
- **Initial private development opens:** AEON, Cornerstone, Harlem Irving & Prospect Park Properties, MPHA Glendale Townhomes
- **District parking opens**

2019+

- **Phase II energy system built**
- **Granary Corridor connections built**
- **Co-generation of power**
- **Sustainable fuel source**



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Questions?

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