

# Duluth Energy Systems

## *Advancing a Community Energy System*



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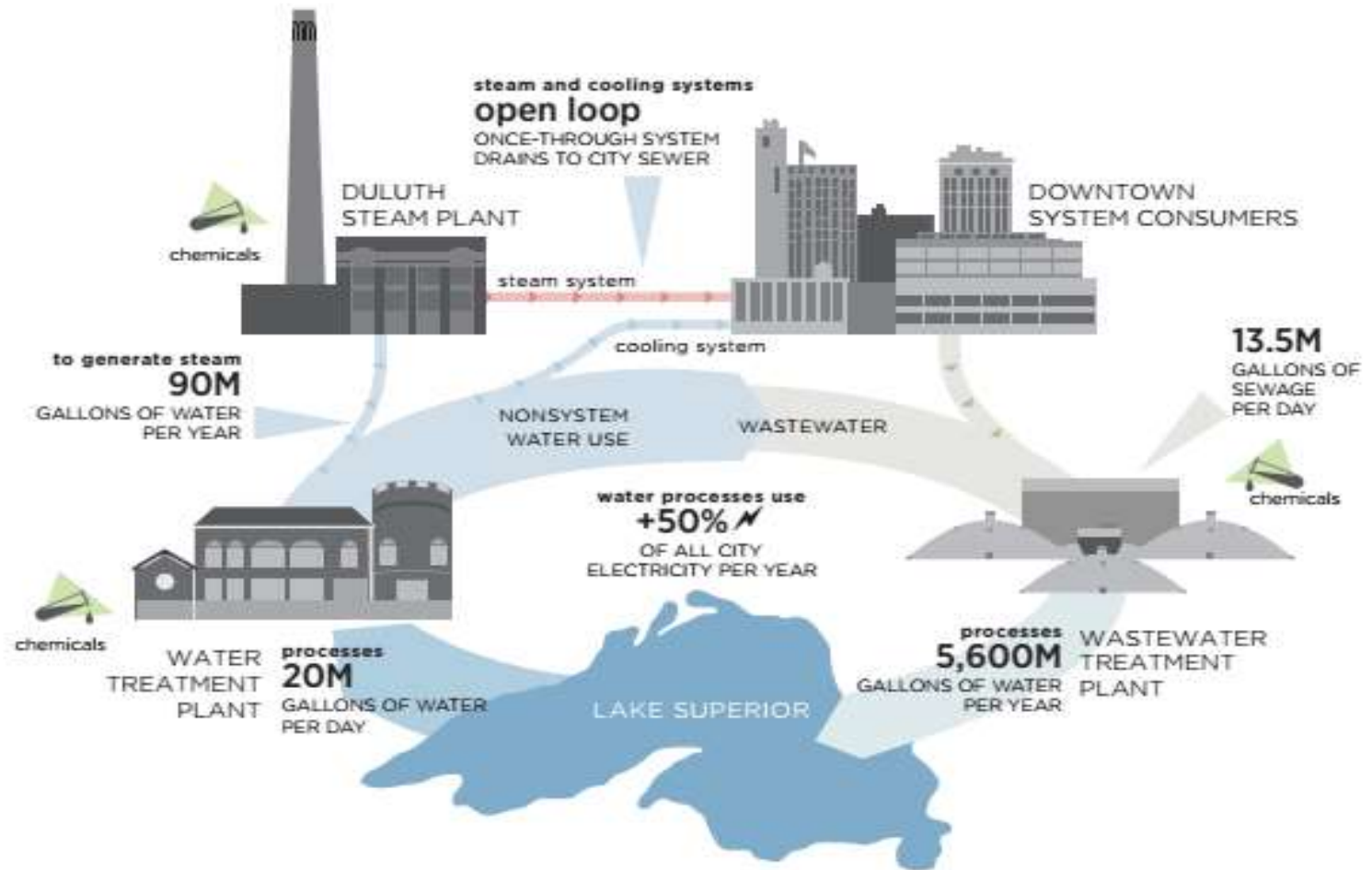
# Duluth Energy Systems

- Owned by the City of Duluth
- 160 customers
- 220 MMBtu/hr peak load - 400,000 MMBtu energy usage per year
- 750 tons chilled water load
- 80+ year old 1st generation system
- Once-through steam system
- Coal as the primary fuel (through winter 18-19)
- Ever-Green hired in 2012 to operate, manage, and advance the system



# System Challenges – Circa 2012

- Short-term contracts with customers
- Aging infrastructure with deferred maintenance
- Aging workforce
- Inefficient system operations – once-through steam system
- Over 90 million gallons of water consumed annually
- Out of sight – out of mind
- Lack of system champion



# Duluth Energy Systems Vision

- **At the source:** Investment in plant and production updates to improve efficiency and reliability. Integrate fuels with a lower carbon footprint.
- **In distribution:** Replace steam with more efficient hot water.
- **In the community:** Reconnect Duluth Energy Systems as a partner to local business and an environmental steward.
- **For the future:** Grow the system, delivering value to new customers every year.





# DES System Advancement

In 2013, Ever-Green delivered a System Master Plan that included the following recommendations:

- System refinancing
- Long-term customer contracts
- Natural gas combustion for summer load
- Integration of biomass as a base fuel
- Steam to hot water conversion
- Customer base growth strategies
- Establishment of a System Advisory Group



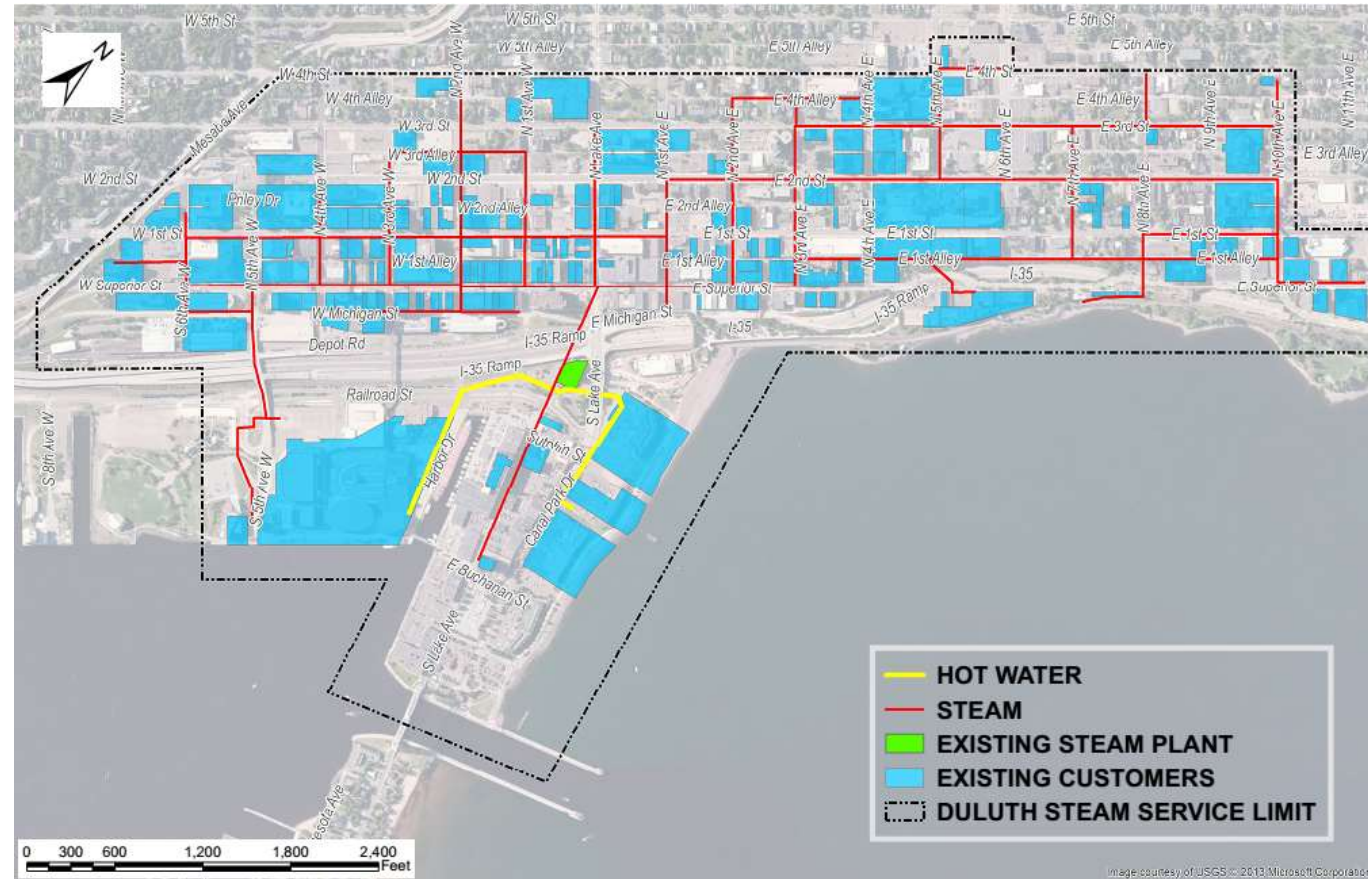
# System Refinancing

- 2012 - Ever-Green advised the City of Duluth to refund the outstanding tax-exempt debt with taxable bonds
- The \$5.5 million taxable bond issuance provided DES the opportunity to sign customers to long-term agreements
- The refinancing also lowered the average bond interest rate from 4.1% to 1.4% which allowed DES to reduce the bond term by one year



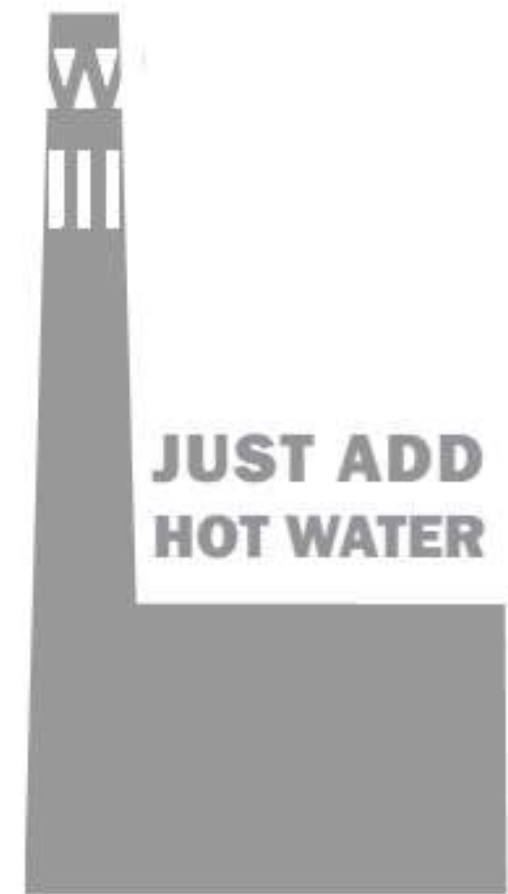
# Long-Term Customer Contracts

- 55% of customers now on long-term agreements (80% with hospitals)
- 10-year to 25-year agreements
- Steam, hot water, and chilled water services
- Government, residential, hotel, commercial buildings
- Building confidence in system longevity



# Hot Water Conversion Project Financing

- Became the City's highest bonding priority
- \$30 million system advancement program
- \$22 million of state-issued grants over two legislative sessions
- 4 year effort. 2 years of outreach and education. Funding in years 3 and 4 with bipartisan support.
- Significant local leadership through two City administrations
- Community-led support with local champions
- The major Superior Street infrastructure change had to be timed with moving DES forward





# Steam to Hot Water Conversion



# Phase I Conversion: Summer, 2018

- Twelve buildings
- Mostly hydronic internal systems
- Hotel, library, residential, and office
- 21.8 MMBtu/hour
- 5,800 feet of pipe installed ranging from 8" to 1-1/4"





# Customer Conversion Strategies

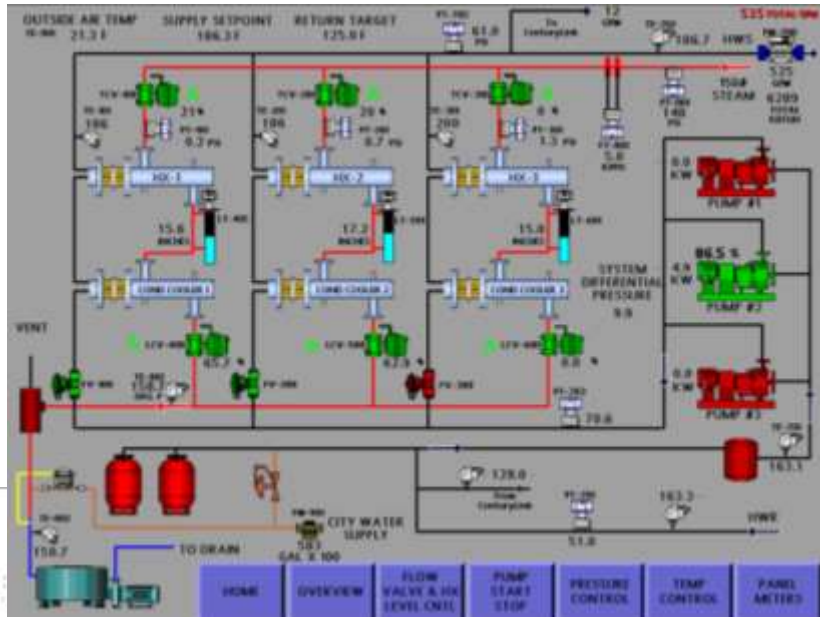
- Design-build vs. design-bid-build
- Packaged ETS skids vs. stick-built
- Coordination with building owner, building engineer, DES operations, distribution contractor, building contractor, and ETS manufacturer
- Secondary side steam to HW conversions (coils, radiators, etc.)
- Skeletons on the secondary side



# Distributed Steam to HW Conversion



- Originally contemplated as a shipping container in a parking lot
- Located in the basement of a customer building (Century Link)
- Temporary vs permanent
- Prefabricated vs stick-built
- Monitored and controlled remotely





# Project Construction



Existing Steam Pipe Asbestos Abatement



Hot Water Distribution Construction

# Project Construction



Direct Bury Valves/Drains/Vents



Service Laterals



Building Connections



# Project Construction



Twin-Pipe Connection



Twin-Pipe Connection



Twin Pipe  
Customer Connection

# Project Construction



Crew Coordination



Testing All Joints



Chasing Moisture Conditions



# Proven Results for Phase I Customers

- 32% reduction in system losses
- 30% reduction in energy rates
- Investment in upgraded building mechanical systems
- Condensate disposal issues eliminated



# System Growth – Medical District



Expanded services to the growing medical district



# Planned Essentia & St. Luke's Expansion



Images courtesy of City of Duluth

# An Ongoing Transformation

- Culture change
- Public-private partnership
- Community outreach – public education campaigns
- Customer engagement and education
- System Advisory Group
- Renewable Fuel Oil integration in 2019
- Customer building efficiency improvement
- Strategic steam to hot water conversions beyond Superior Street





# Thank You

Michael Ahern

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# Public-Private Partnership

“The City of Duluth is seen as a municipal leader for energy efficiency throughout the region. Our collaboration with Ever-Green Energy is a huge part of what makes our success possible. From expanding district energy to transitioning away from coal into an innovative renewal fuel oil, Ever-Green has brought tangible strategy and vision to our work and has helped us transform Duluth for decades to come.”

Mayor Emily Larson, March 2017