
CampusEnergy2021
BRIDGE TO THE FUTURE
Feb. 16-18 | CONNECTING VIRTUALLY
WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16

District Energy Brings Opportunity to the Lansing Community

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Ever-Green Energy

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Q&A Will Not Be Answered Live

Please submit questions in the Q&A box.
The presenters will respond to questions off-line.

Lansing Board of Water and Light (BWL)

- Municipal Utility (Electricity, Water, Steam, & Chilled Water)
- District Energy System Concerns
  - Aging & Inefficient Once-through Steam System
  - Financial Viability of Systems
  - Largest Steam Customer Considering Hot Water Service
- Master Plan Necessary to Provide Guidance

Master Plan Guiding Principles

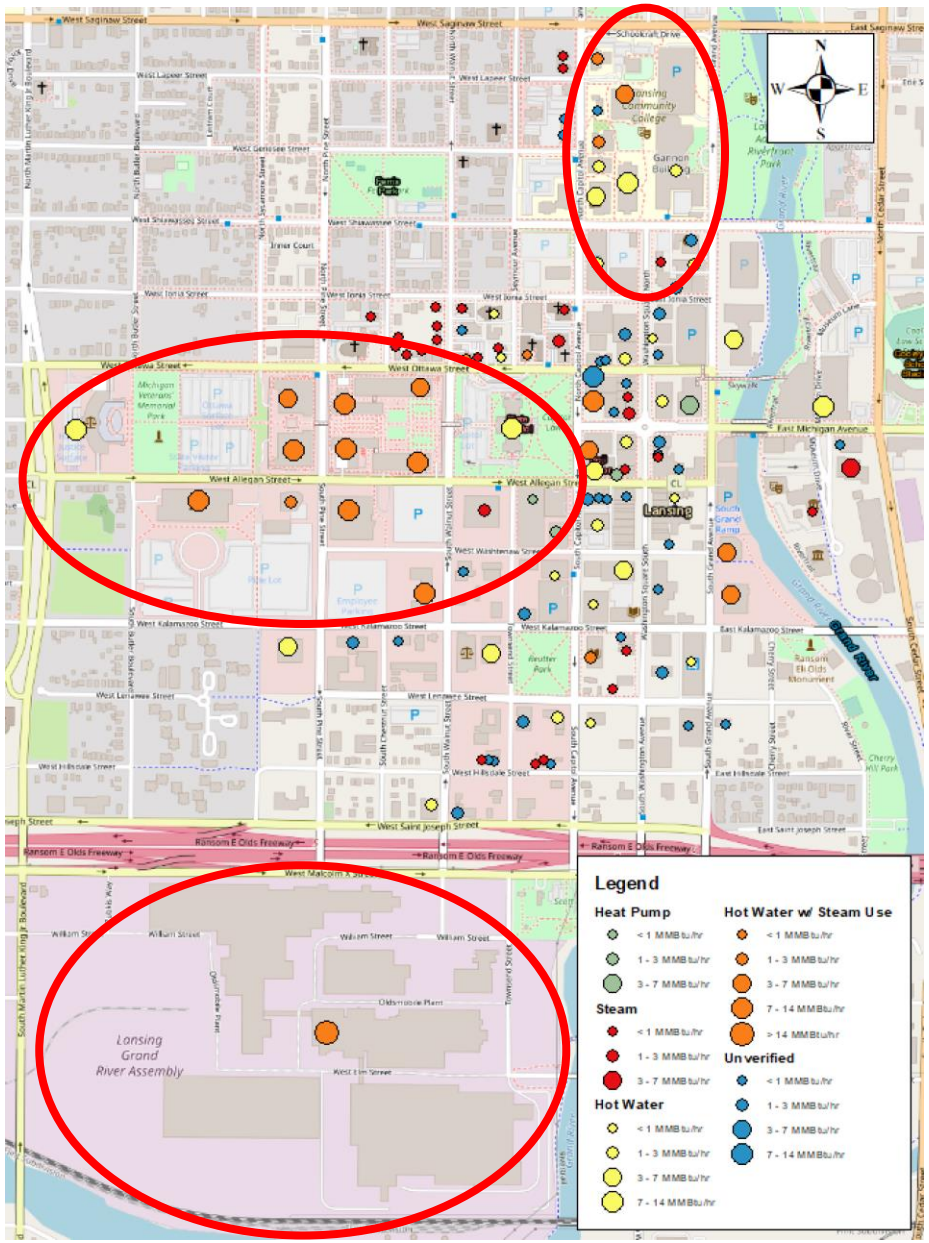
- Long-term system viability
- Financial responsibility
- Implementable advancement solutions
- Phased implementation strategies
- Energy efficiency
- Customer benefits

Master Plan Process

- SWOT Analysis
- Key Customer Meetings
- Systems and Customers Surveys
- Load Assessment
- Growth Potential Analysis
- System Advancement Alternatives Recommendations
- Life Cycle Cost Analysis of Advancement Alternatives

Existing Systems: Steam

- Customers
  - 310 Mlbs/hour peak load 465,000 Mlbs annually
  - Four largest customers convert to HW for almost all their heating needs (76% of total load)
  - Humidification accounts for most of the in-building steam use
  - Very few customers recover energy from condensate



Existing Systems: Steam Distribution

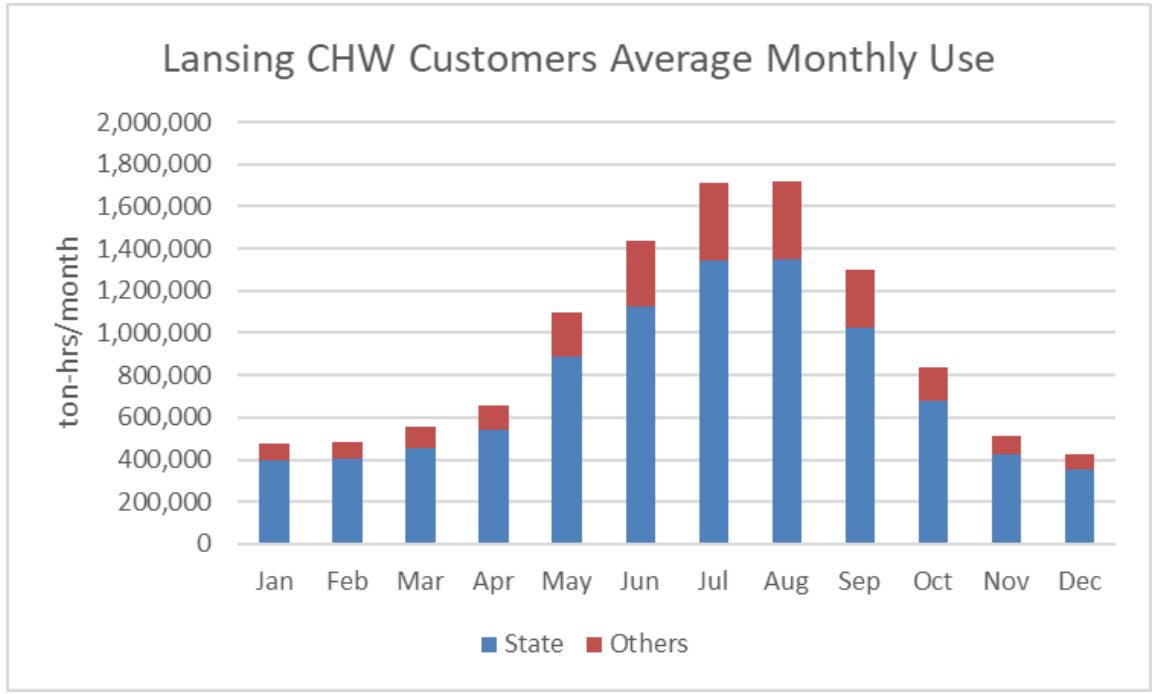
- Three pressure zones with approximately 9.7 miles of pipe
- High pressure distribution to largest customer
- Low and medium pressure distribution to downtown core
- $3M annual investments in distribution piping systems, vaults, and manhole repair and replacements
- No condensate recovery

Existing Systems: Steam Production

- REO Plant
  - Combined Heat & Power
  - 100 MW electrical capacity
  - 300 kpph steam capacity
- Produces ~40% of BWL electricity annually
- Steam system ~60% efficient

Existing Systems: Chilled Water Customers

- Customers
  - 8,350 ton coincidental peak load
  - 12.6 MM ton-hours
  - 13 of 17 customers are State of Michigan-owned buildings
  - Insufficient flow during peak cooling days



Existing Systems: Chilled Water

- Customer Efficiency Issues
  - Building Circulation Pumping
  - Poor Customer Delta Ts
  - Customer Connections

Existing Systems: Chilled Water Production

- Plant Capacity
  - 10,000 ton rated chiller capacity
  - 8,000 ton rated cooling tower capacity
  - 2,500 ton rated free cooling not used
- Plant Efficiency
  - 1.0 kWh/ton-hr
  - 1.9 gal/ton-hr

System Advancement Programs

- Program 1 - Largest Customer Service Advancement
- Program 2 - Chilled Water System Advancement
- Program 3 - Northeast Quadrant Advancement
- Program 4 - REO Efficiency Improvements
- Program 5 - Future Downtown Hot Water Conversion

Program 1 – Largest Customer Service Advancement

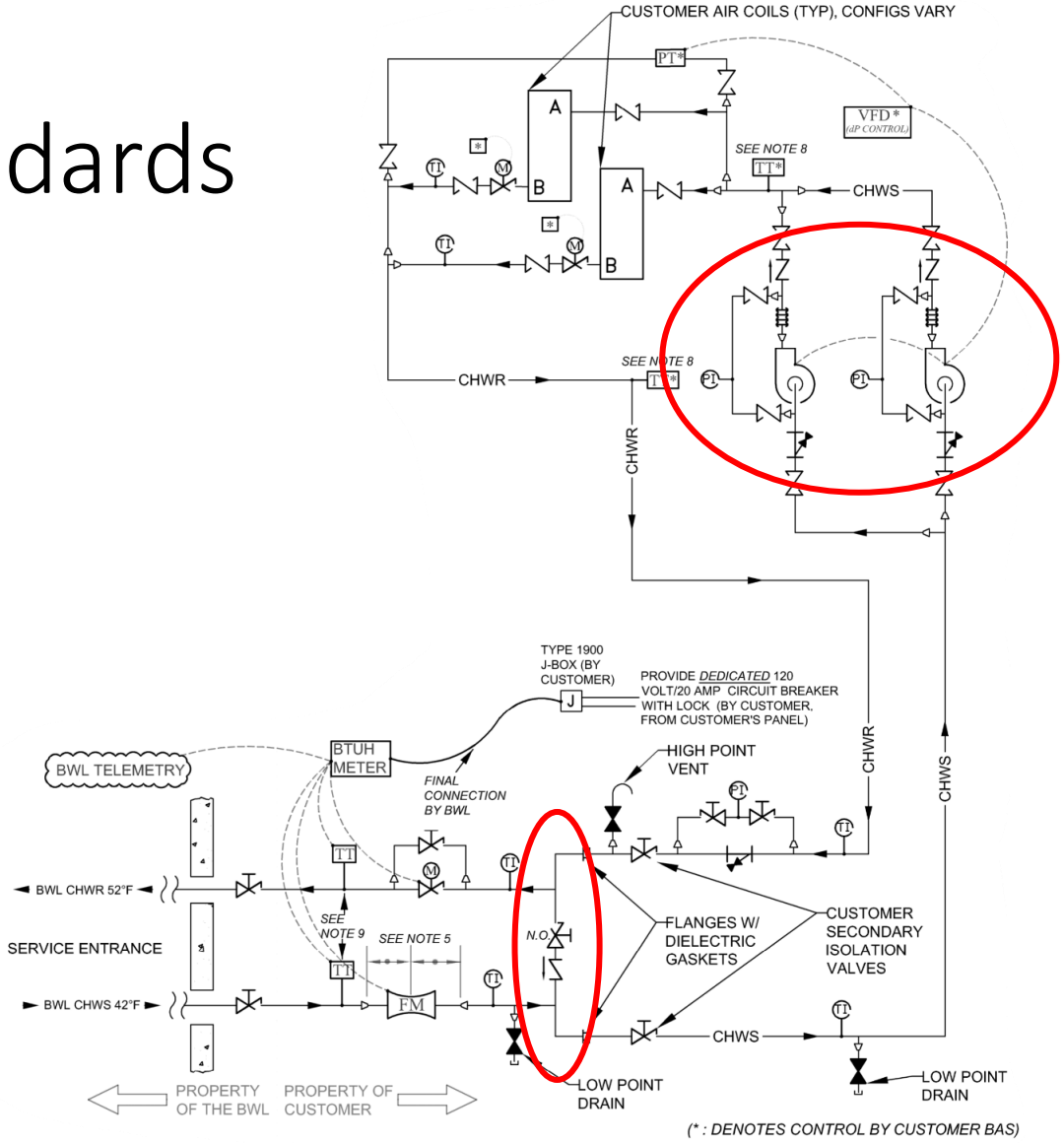
- Alternative A – Business as Usual
- Alternative B – Hot Water Service
  - 92% lower CO_2/year
  - 95% lower H_2O/year
- Alternative C – Steam Service with Condensate Return
  - 73% lower CO2/yr
  - 73% lower H2O/yr

Program 2 – Chilled Water System Advancement

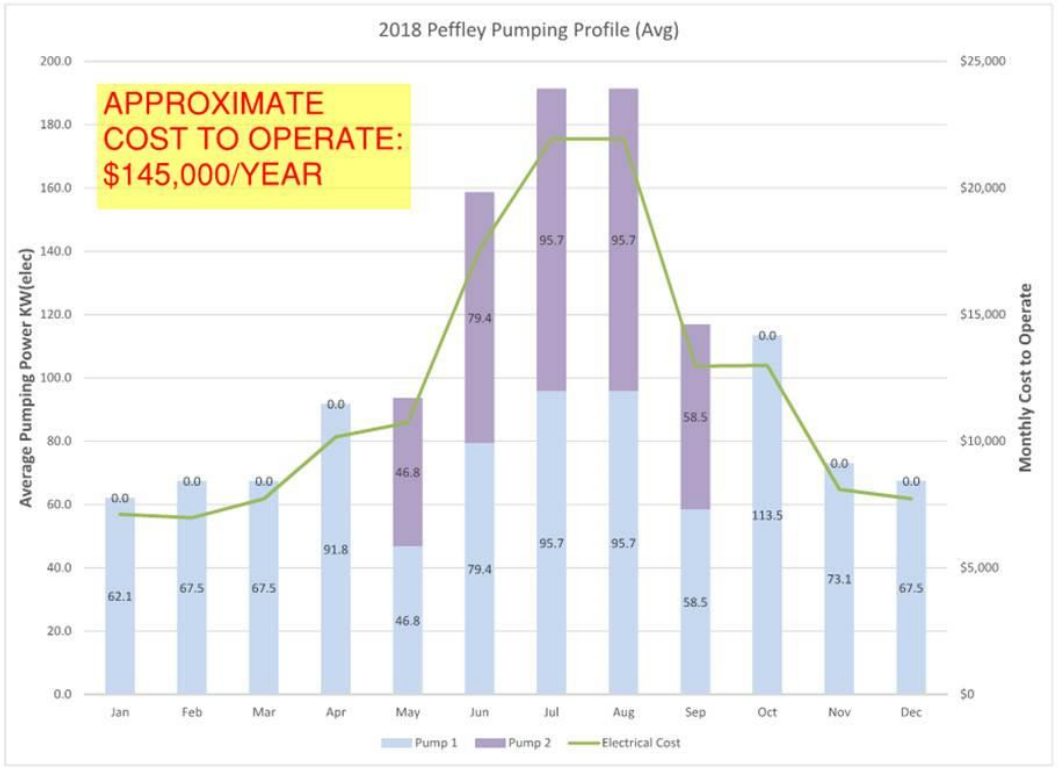
- Customer Connection Standards & Delta T Improvements
- Chilled Water System Expansion
- Chilled Water Storage or Increased Chilled Water Generation Capacity

Program 2 – Chilled Water Customer Connection Standards

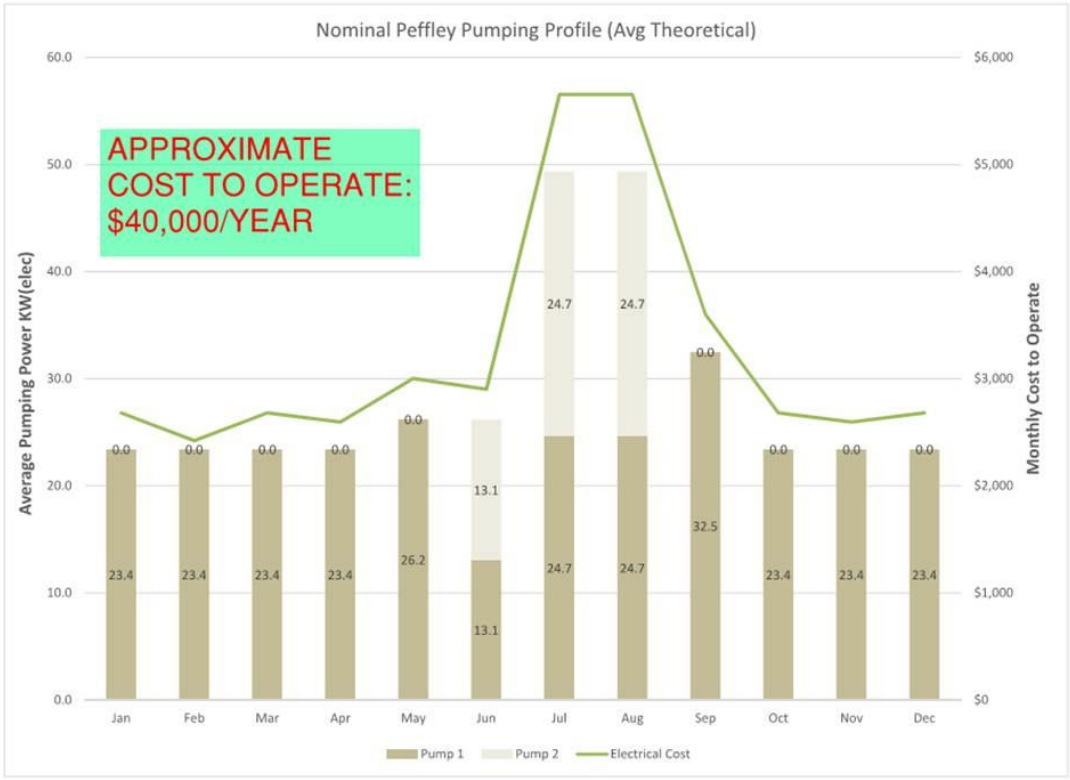
- Force building side pump use
- Delta T improvements
- Standardize connection specifications



Program 2 – CHW Customer Connection Standards



Current



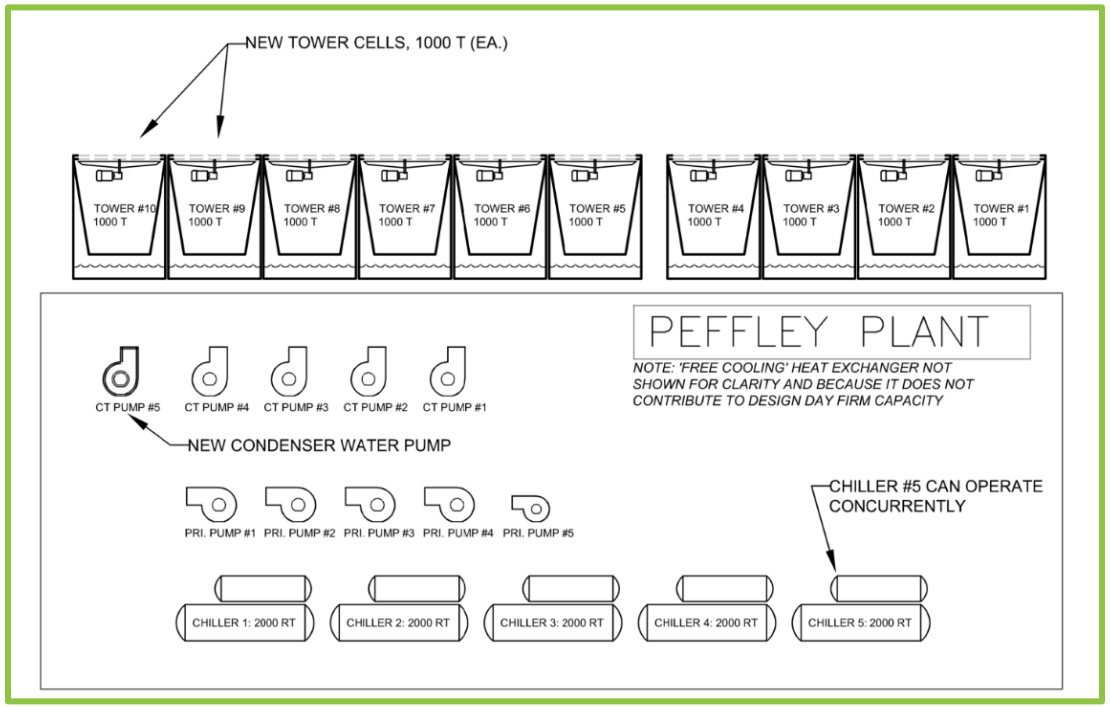
With Customer Pumping & More Efficient Pump Staging

Program 2 - Chilled Water Expansion

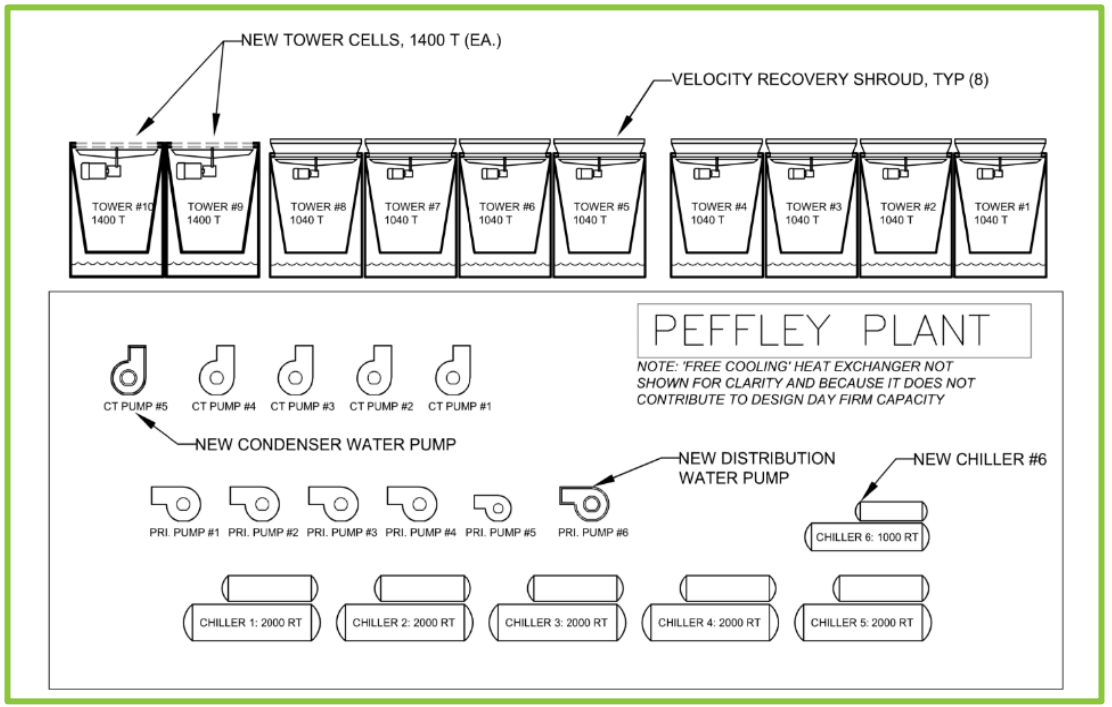
Program 2 - Thermal Storage

- Chilled Water Only
  - In Lieu of Chiller Installation
  - 3.6M Gallons
  - $7.2M Estimated Cost
  - Approximately Equal Annual Cost
- Chilled Water/Hot Water
  - Low Cost Enhancement
  - Reduce Peak Steam Sen-out/Increase Peak Power Production
  - $130k Annual Savings
  - Opportunity for Off-Peak, Low-Cost Renewables

Program 2 - Chilled Water Capacity



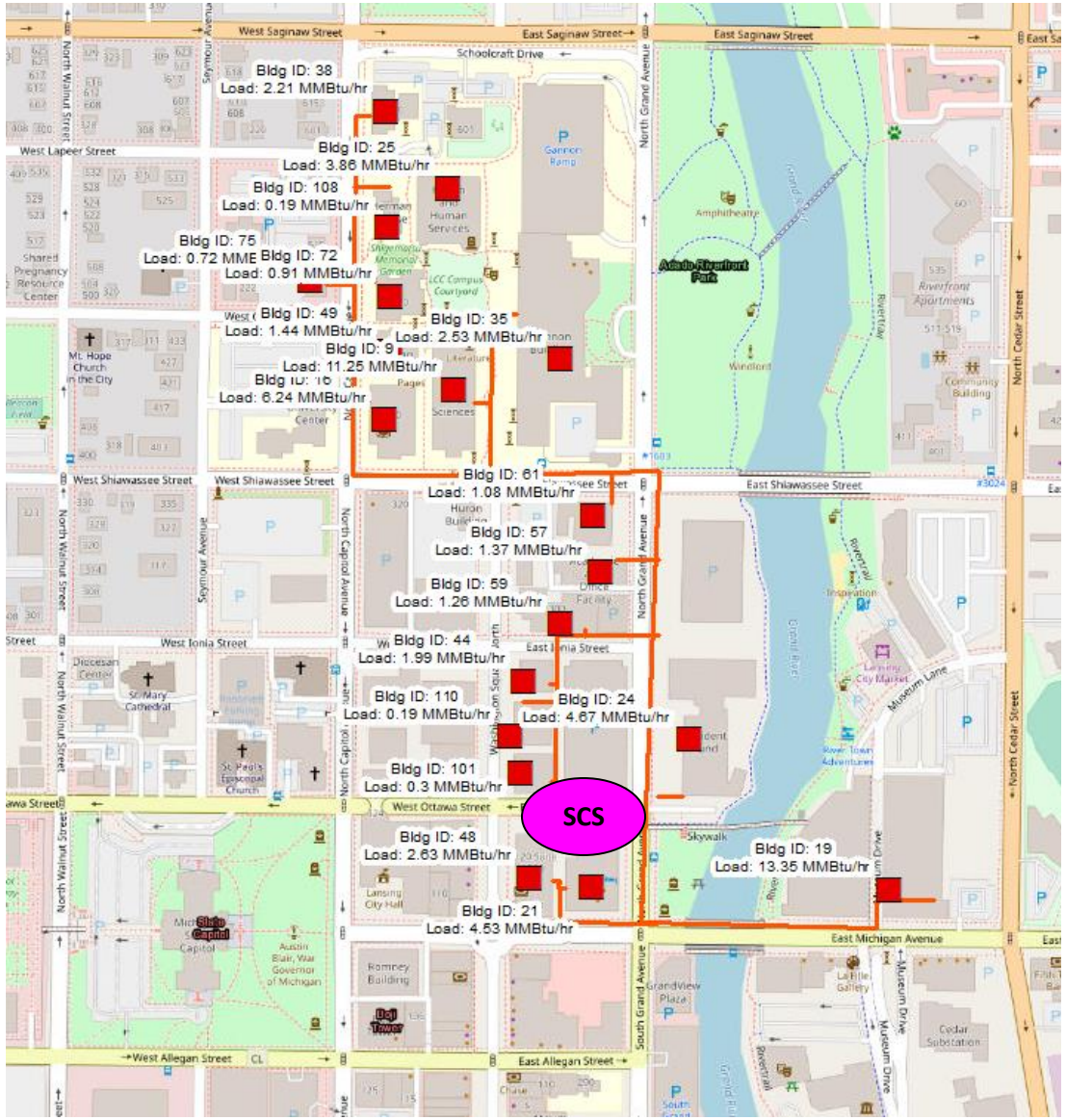
With Current Customer Loads



With Additional Customer Loads

Program 3 – Northeast Quadrant Advancement

- 61 MMBtu/hr
- 23% of Downtown Load
- $16.5M Estimated Costs
- Zero Additional Rate Impact



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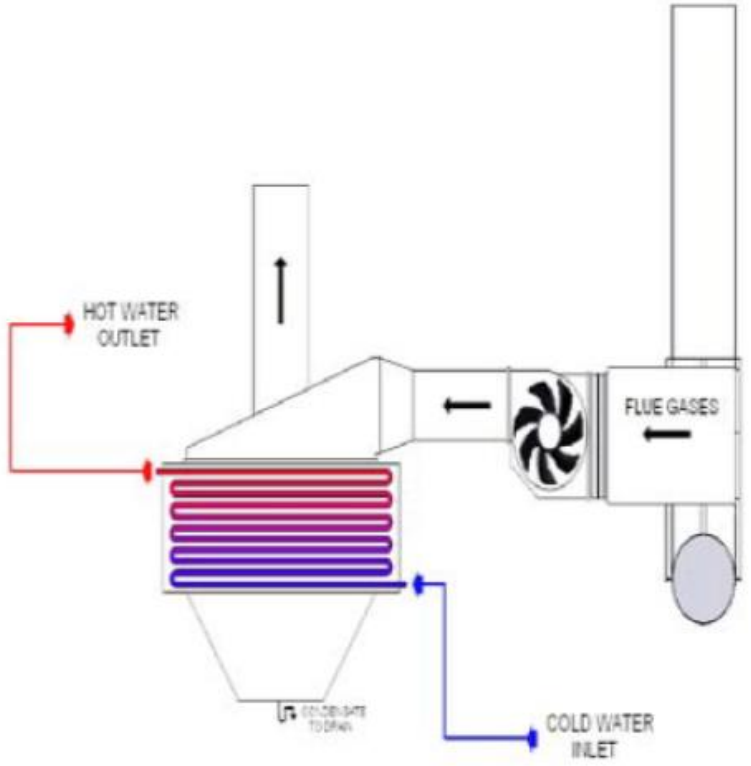
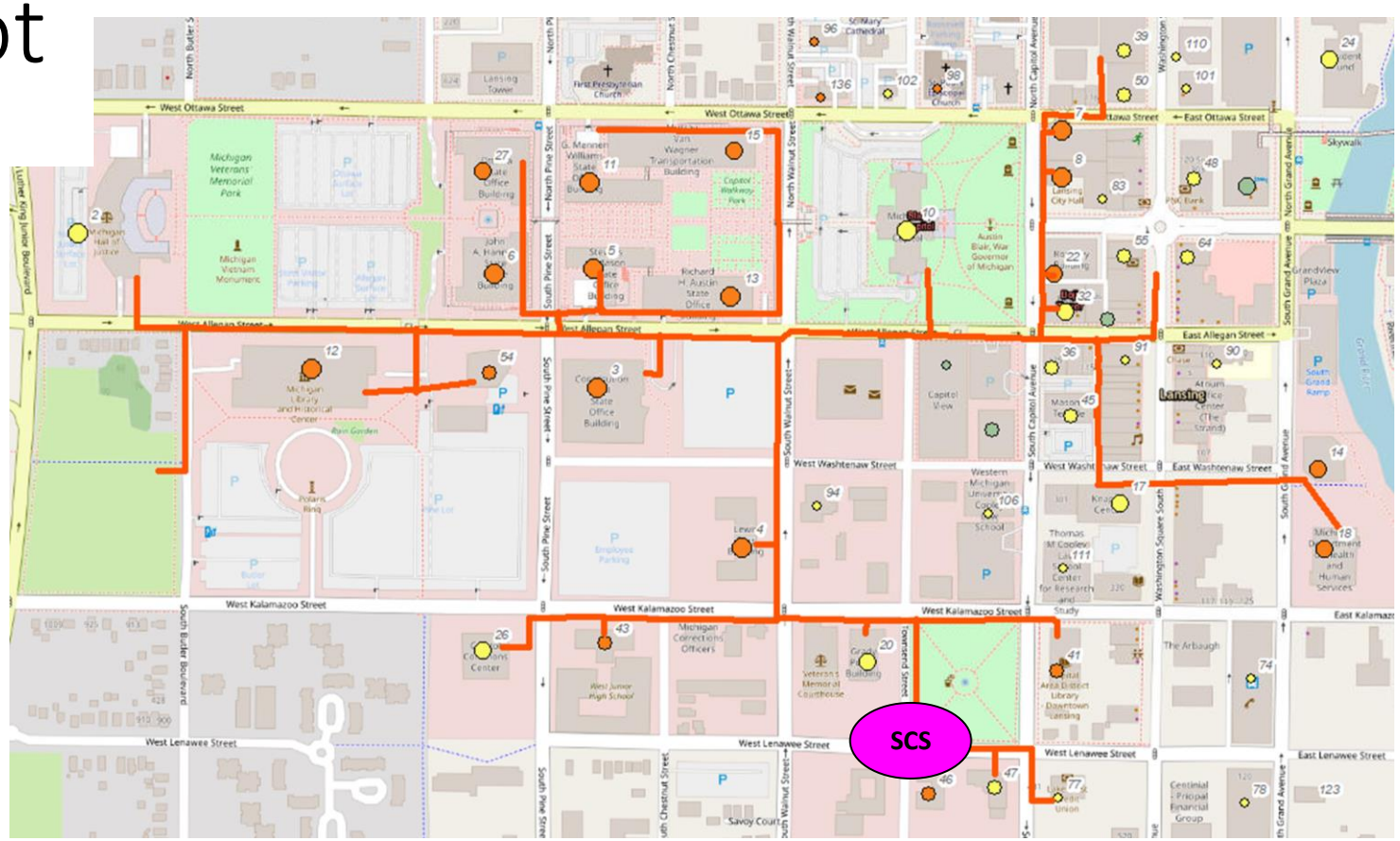
Program 4 – REO Efficiency Improvements

- Flue Gas Heat Recovery
- $2.8M Estimated Install Cost
- $754,000 Estimated Annual Energy Savings
- 230,000 MMBtu/year Estimated Annual Energy Recovery Potential



Program 5 – Future Downtown Hot Water Conversion

- ~87% of downtown load on HW
- ~60 buildings likely need to develop alternative strategies
- ~$20M - $25M for conversion of the remainder of downtown to hot water
- ~$20M for a downtown hot water plant if REO goes away



Next Steps

- Program 1 - Largest Customer Service Advancement
- Program 2 - Chilled Water System Advancement
- Program 3 - Northeast Quadrant Advancement
- Program 4 - REO Efficiency Improvements
- Program 5 - Future Downtown Hot Water Conversion

Thank You!

Sean McFarling, PE

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