

**Information Item:**  
**Towerside Sewage Thermal Energy  
Recovery Potential Project**

Jeannine Clancy, Assistant General Manager, Technical Services

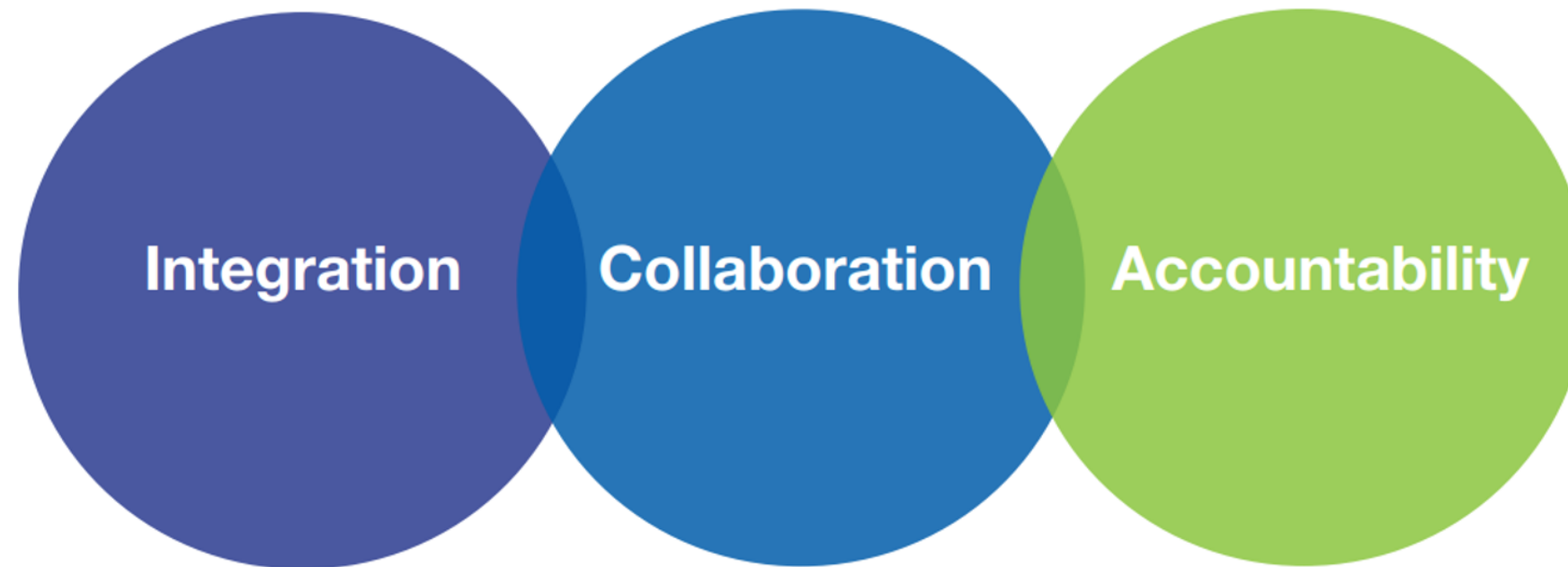
Deborah Manning, Assistant Manager, Plant Engineering, Technical Services

Environment Committee: November 13, 2018



# Thrive Lens

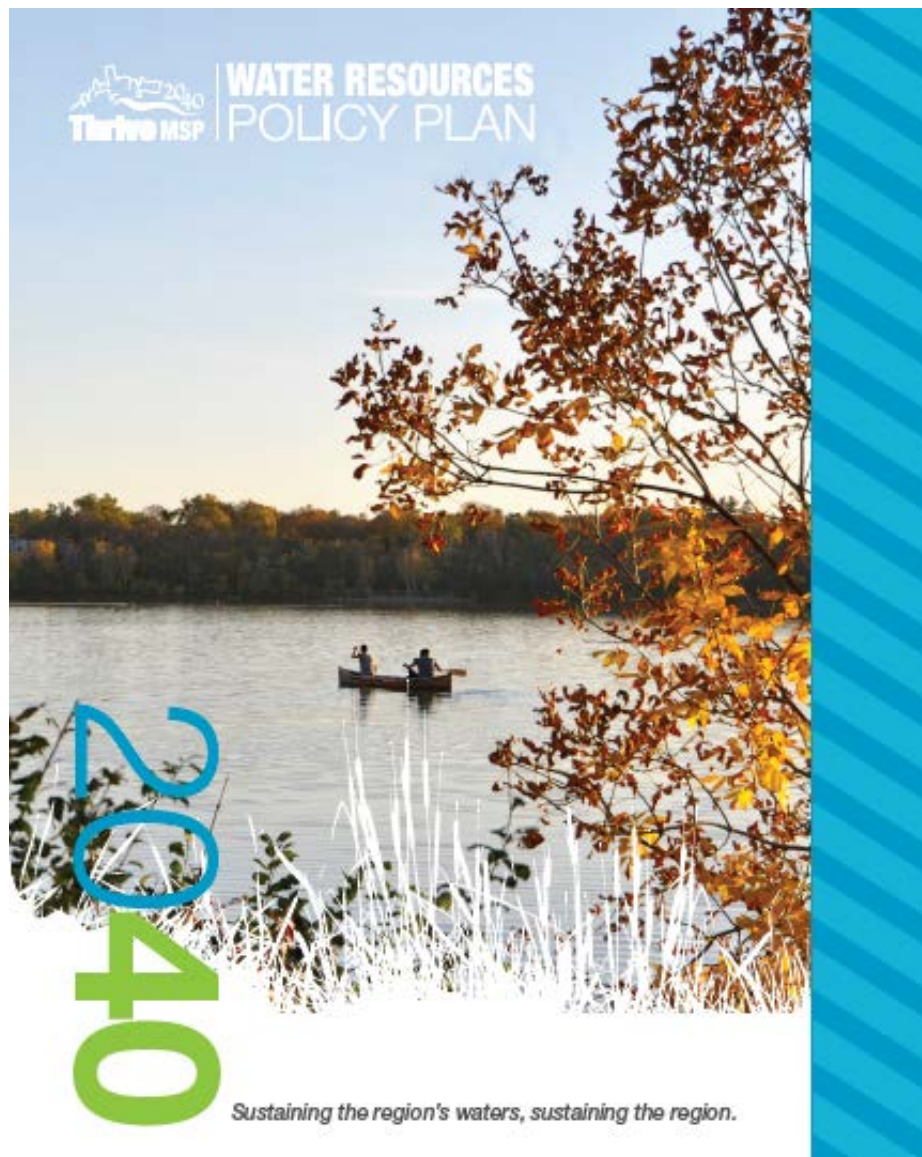
THRIVE PRINCIPLES TO CARRY OUT THE COUNCIL'S WORK:



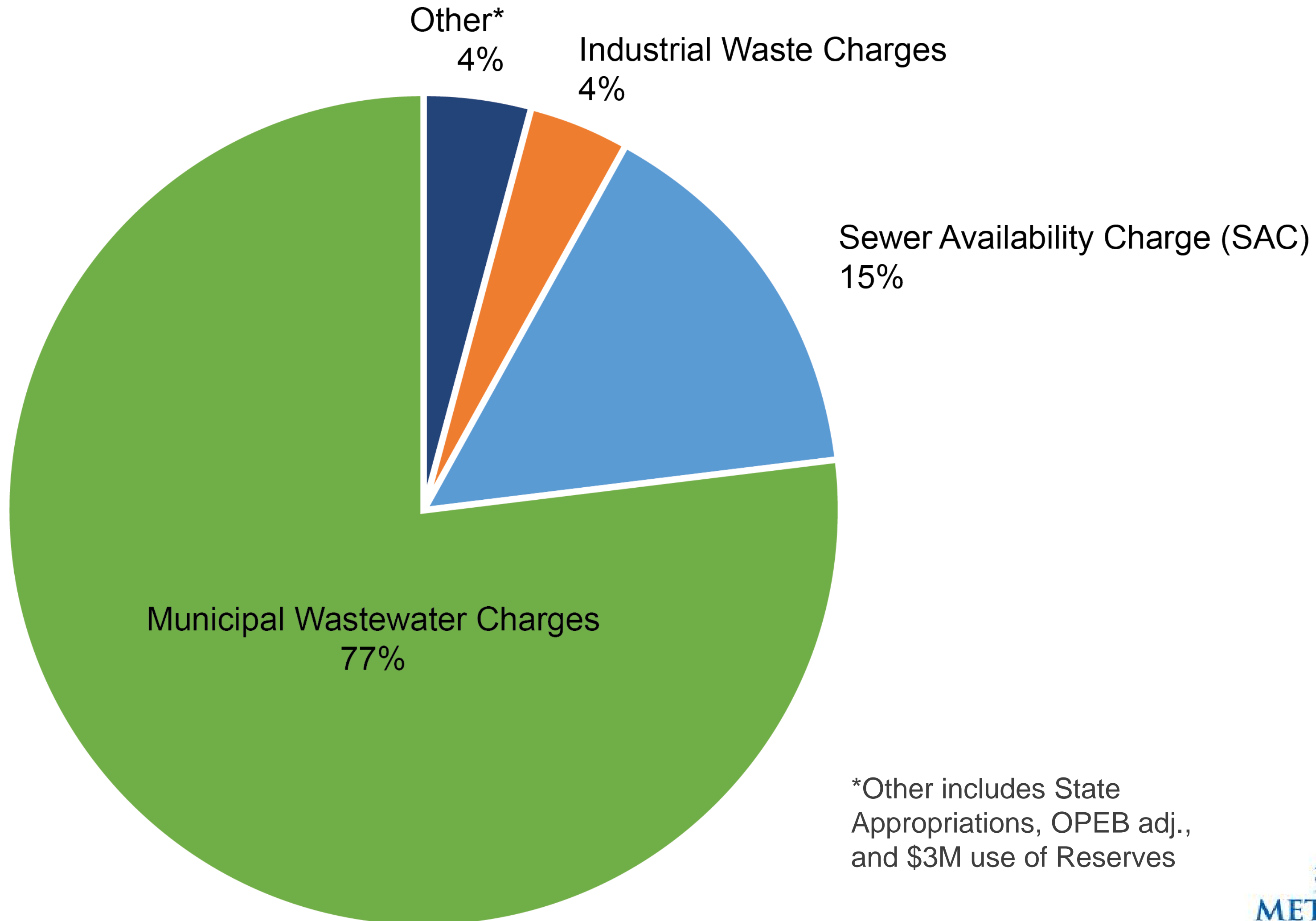
## 2040 Water Resources Policy Plan (p. 92)

**Wastewater Sustainability of regional wastewater system includes energy conservation & generation**

- ✓ Generating energy from processing biosolids
- ✓ Recovering heat from plant effluent
- ✓ Solar power generation facilities
- ✓ Pursue additional technologies, such as fuel cells, as capabilities and economics are proven
- ✓ Improve operational sustainability, when economically feasible

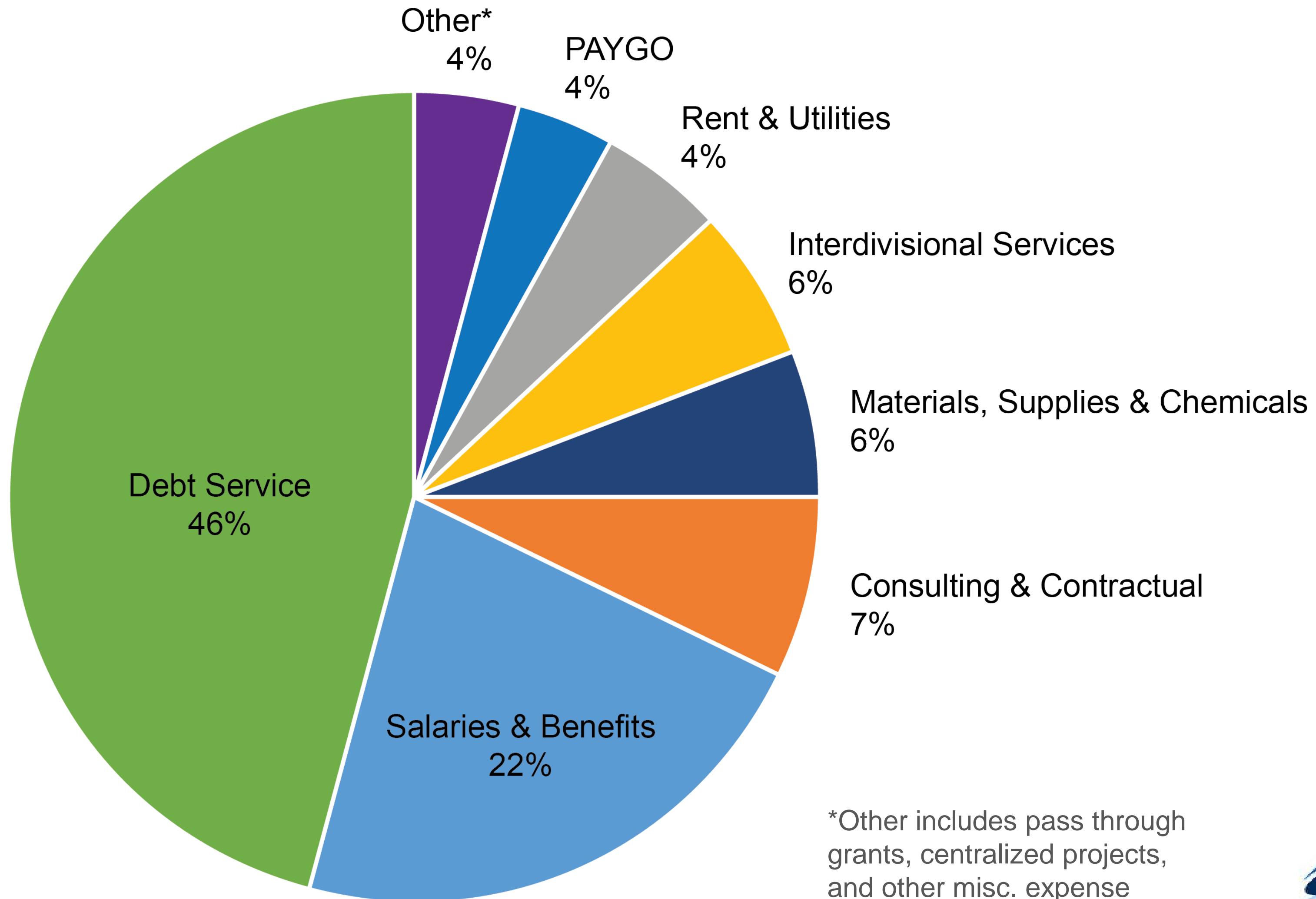


# Proposed 2019 Revenue Sources: \$300M



\*Other includes State Appropriations, OPEB adj., and \$3M use of Reserves

# Proposed 2019 Uses by Category: \$300M



# Progress Toward MCES' Energy Goals

1990s - 2011

Reduce high-energy uses in known areas

2012 - 2014

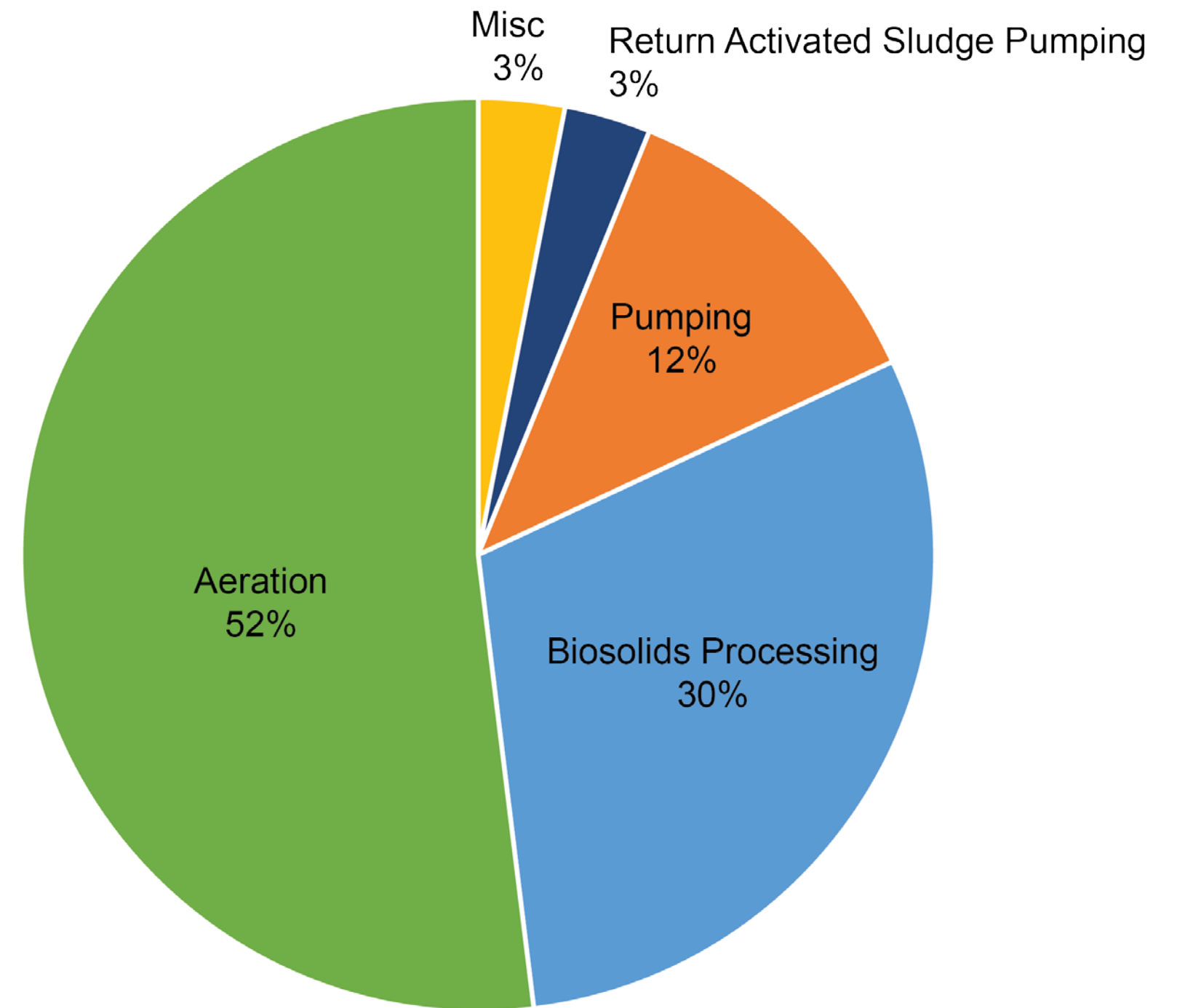
Creating sustainable policies and programs

2014-present

Capital improvements and partnerships

Future →

New opportunities in WWTP and WRF



Typical Energy End-Uses in Municipal Wastewater Treatment, Hazen & Sawyer (Electricity Use in the Municipal Water Supply and Wastewater Industries, EPRI and WRF 2013)

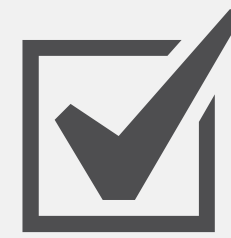
# Progress Toward MCES' Energy Goals

## Partnerships/Collaborations & Awards

- Climate Registry (founding member)
- Metropolitan Energy Policy Coalition
- Regional Community Solar Garden Collaboration
- Sustainable Growth Coalition
- Green Partnership with Xcel
- Xcel Process Efficiency Partnership Award
- Gov. Dayton's Continuous Improvement Award
- Xcel Energy Highest Electric Savings
- Environmental Initiative's Community in Action Award
- MN State Government Innovation Award
- Utility of the Future Today
- Xcel Gold Award



# Progress Toward MCES' Energy Goal:



## Generating Energy from Processing Biosolids: Existing

### Empire WWTP

- Since 1979: Biogas used for process and building heat

### Metro WWTP Fluidized Bed Incinerators

- 2004: Initial construction
- Recover enough energy to power 2,400 homes/year
- Energy used in the plant and saves ratepayers \$2.5 million/year
- 2021 – 2017: 4<sup>th</sup> incinerator construction



# Progress Toward MCES' Energy Goal:



**Generating Energy from Processing Biosolids: Current/Future**

## Empire WWTP Biogas Combined Heat and Power Project

- Use biogas from solids processing to
  - Provide 30% of Empire's heat and power needs
  - Save \$350,000/year
- Boiler system upgrades:
  - Demolish 5 existing boilers
  - Replace with 3 new, high-efficiency boilers
- 2019 – 2021 Construction





# Progress Toward MCES' Energy Goal:



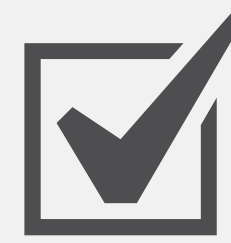
Recovering Heat from Plant Effluent: Existing

## Eagles Point WWTP Effluent Heat Recovery System

- 2004: System installed
- Effluent heat recovery system, supplemented with electricity, heats & cools Administration Building year-round
- Heat recovery equipment relatively issue-free & low maintenance
- 2019: Monitoring equipment to be installed to determine energy savings



# Progress Toward MCES' Energy Goal:



## Recovering Heat from Plant Effluent: Current/Future

### Heat Recovery from Plant Effluent

- Findings from review of potential installations
  - If retrofitting, not cost effective
  - If new construction, higher chance of cost effectiveness
  - Greater opportunities with planned new WWTPs



# Progress Toward MCES' Energy Goal:



## Solar Power Generation Facilities: Existing

### Blue Lake WWTP

- Completed: 2017
- Behind the meter & Council-sited community solar garden

### Empire WWTP

- Completed 2017
- Council-sited community solar garden

### Seneca WWTP Ash Landfill

- Completed: 2018
- Council-sited community solar garden



# Progress Toward MCES' Energy Goal:



Pursue Additional Technologies As Capabilities and Economics are Proven: Existing

## Metro WWTP Aeration Basins

- Dissolved oxygen control
- Enhanced diffuser cleaning
- Header pressure reduction

## Metro WWTP High Efficiency Lighting Improvement



# Progress Toward MCES' Energy Goal:



Pursue Additional Technologies As Capabilities and Economics are Proven: Current/Future

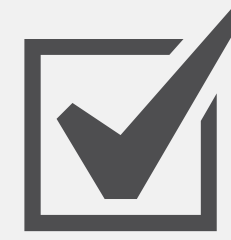
## Industrial Pretreatment Incentive Program

Empire WWTP Kemps High Strength Waste Receiving

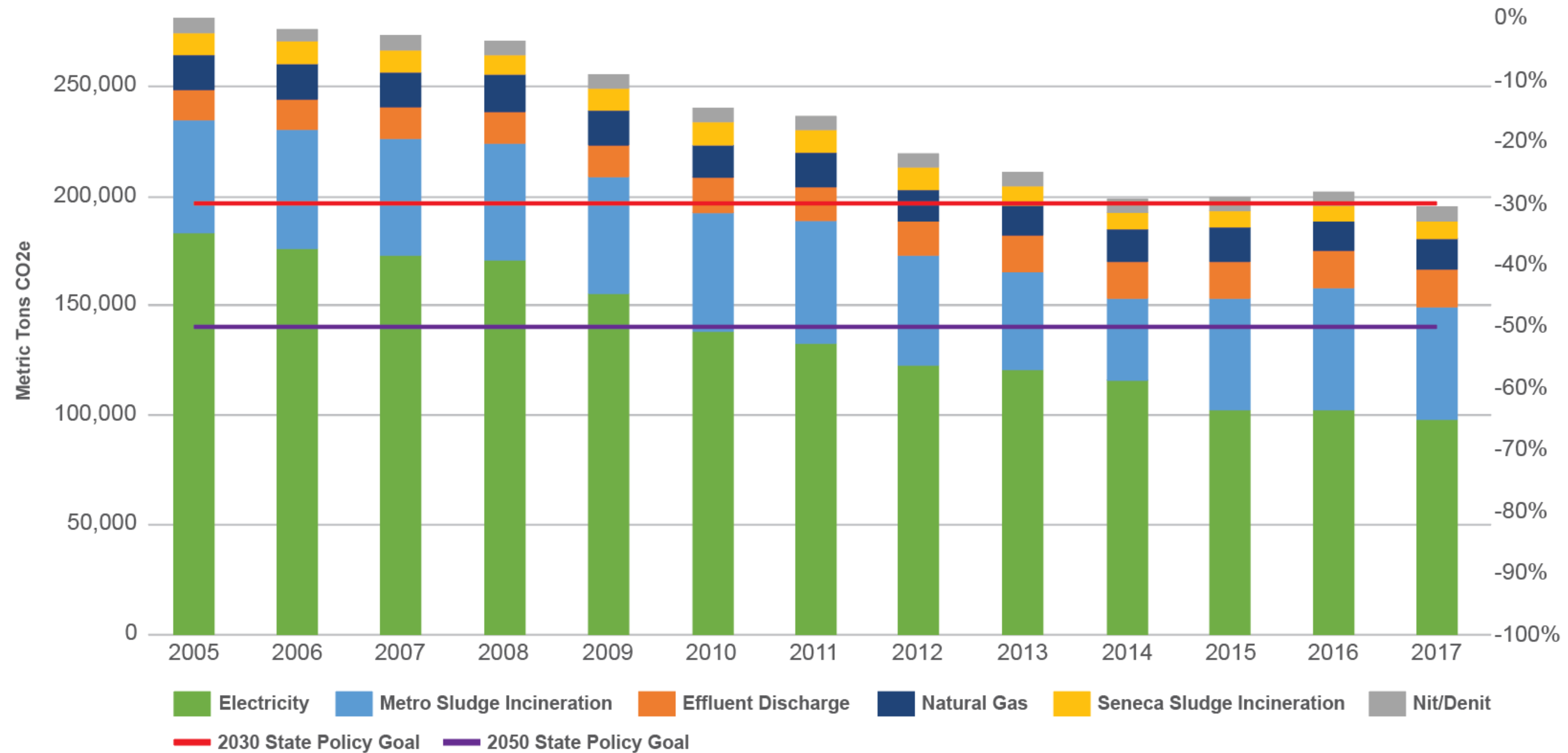
- 23% increase in biogas production will decrease energy use by 3,690 MMBTU/yr (equals 172 cars/yr)
- Improved solids dewaterability will decrease energy use by 32 MMBTU/yr from truck traffic (equals ½ car/yr)



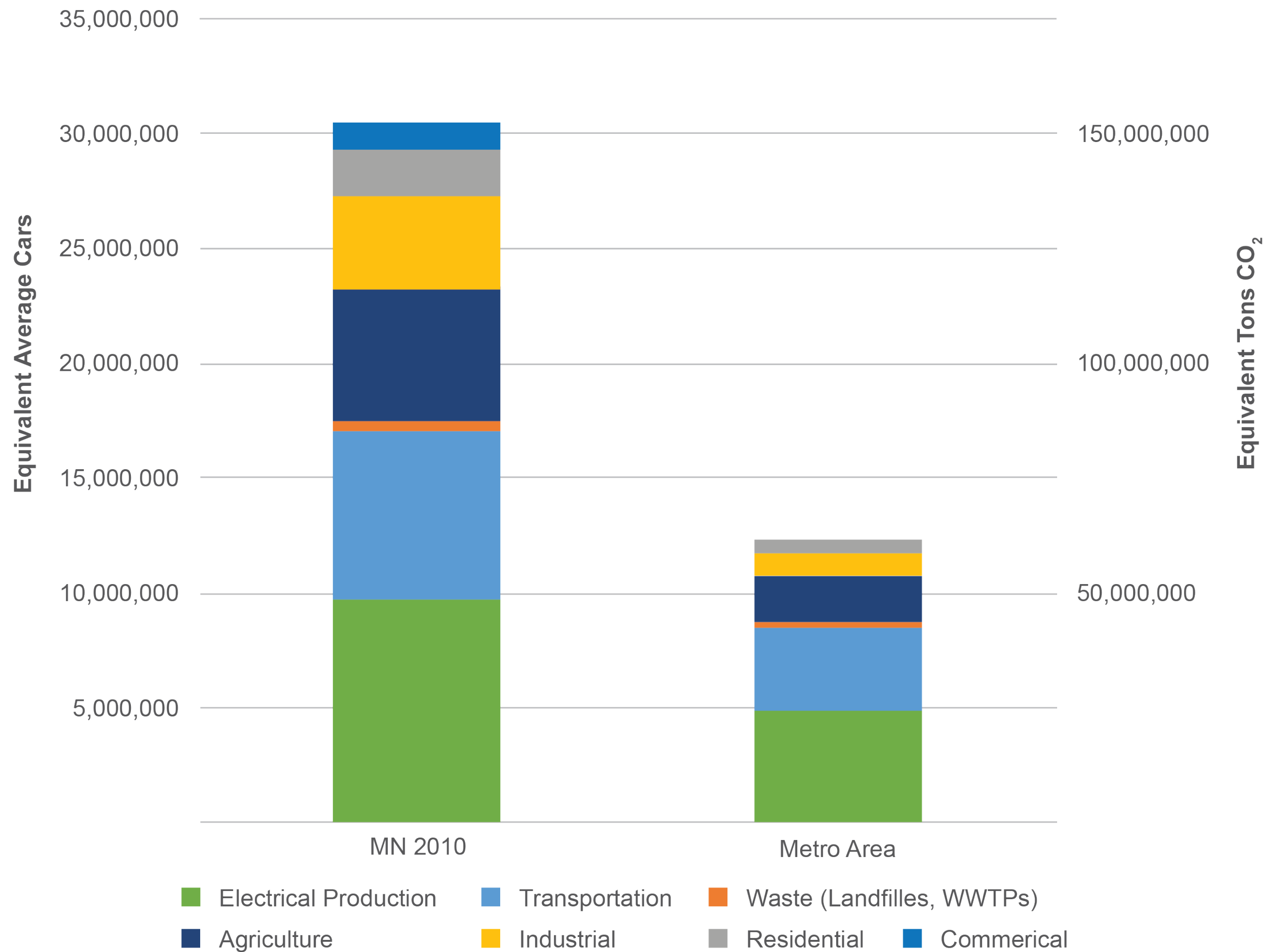
# Progress Toward MCES' Energy Goal:



## GHG Emission Reduction Tracking



# WWTP GHGs Compared to Other Sources



Source: Greenhouse Gas Emissions Reduction, MPCA and MN Dept of Commerce

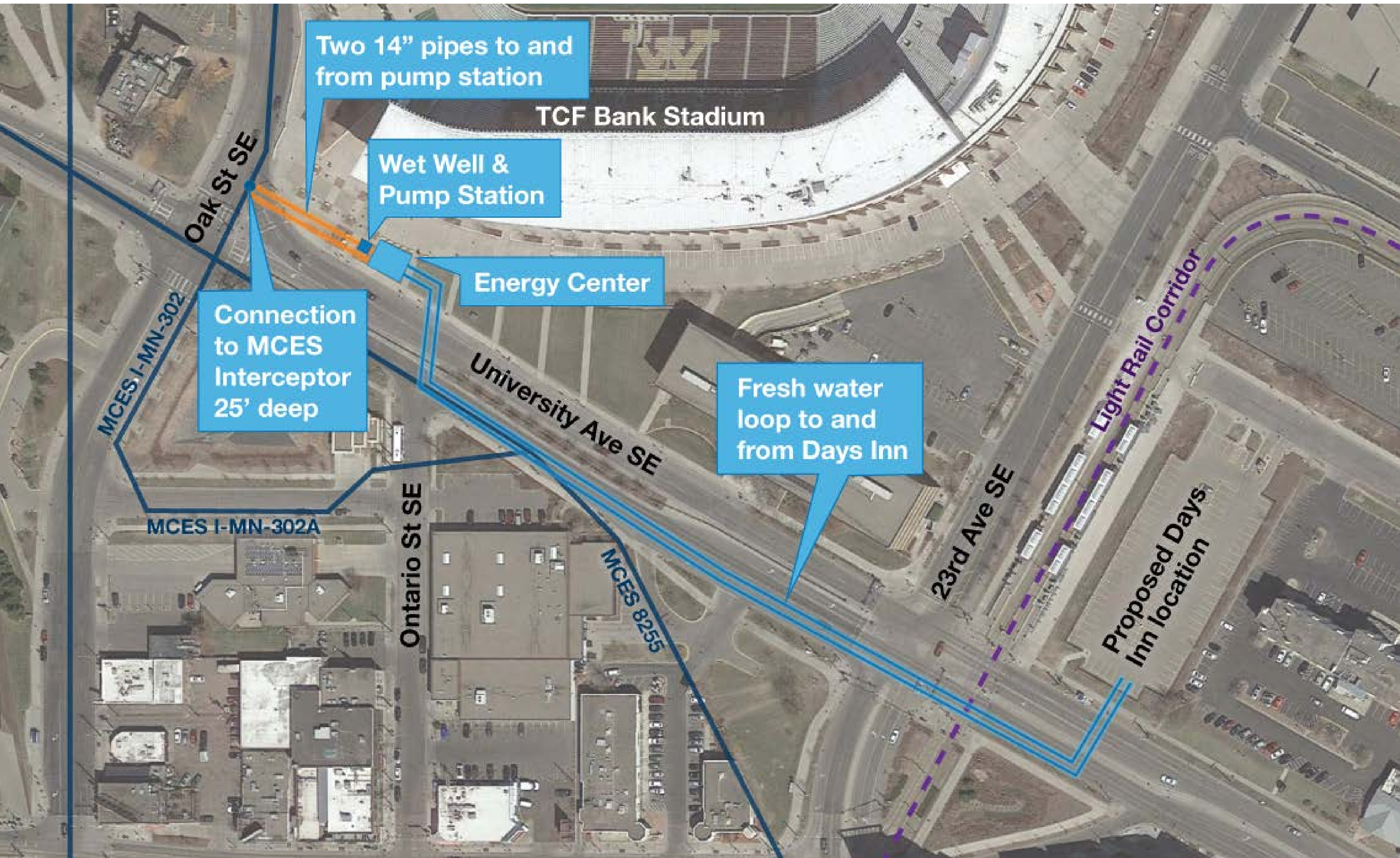


# Towerside Sewage Thermal Energy Recovery Proposed Project – Key Dates

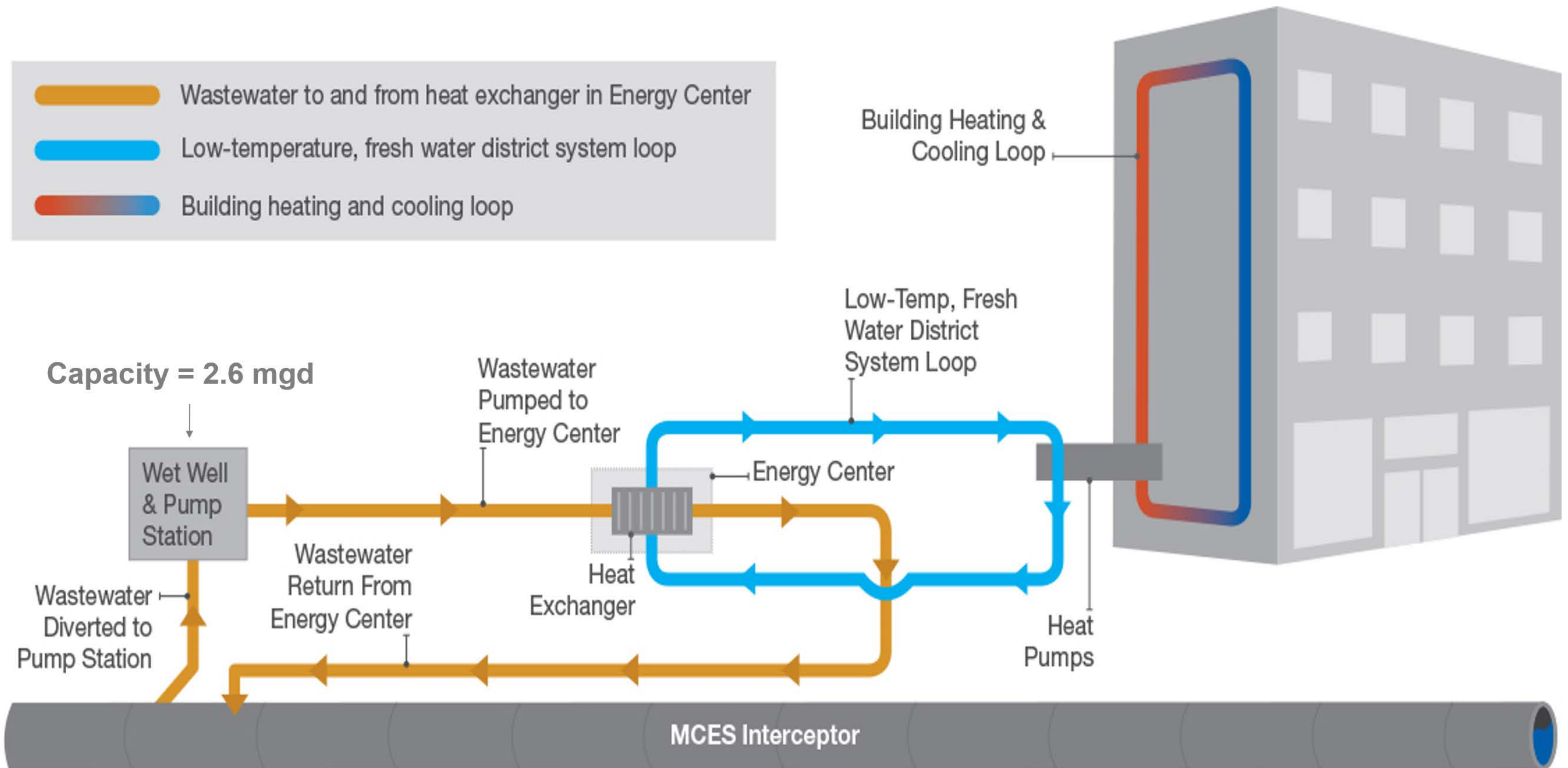
Timeframe	Activity
~3 years ago	Inquiry by Ever-Green Energy about STER application on MCES interceptor.
2015-2017	Project feasibility discussions between Ever-Green Energy and MCES.
December 2017	Environment Committee considers STER issues. Decision: continue exploring feasibility.
June-August 2018	MCES technical review of Ever-Green Energy's STER model.
October 2018	Provide MCES' final comments to Ever-Green Energy.
November 2018	Report to Environment Committee.



# Ever-Green Energy's Proposed Concept



# Ever-Green Energy's Proposed Concept - Schematic



# Issue: Regulatory Compliance



## MPCA feedback:

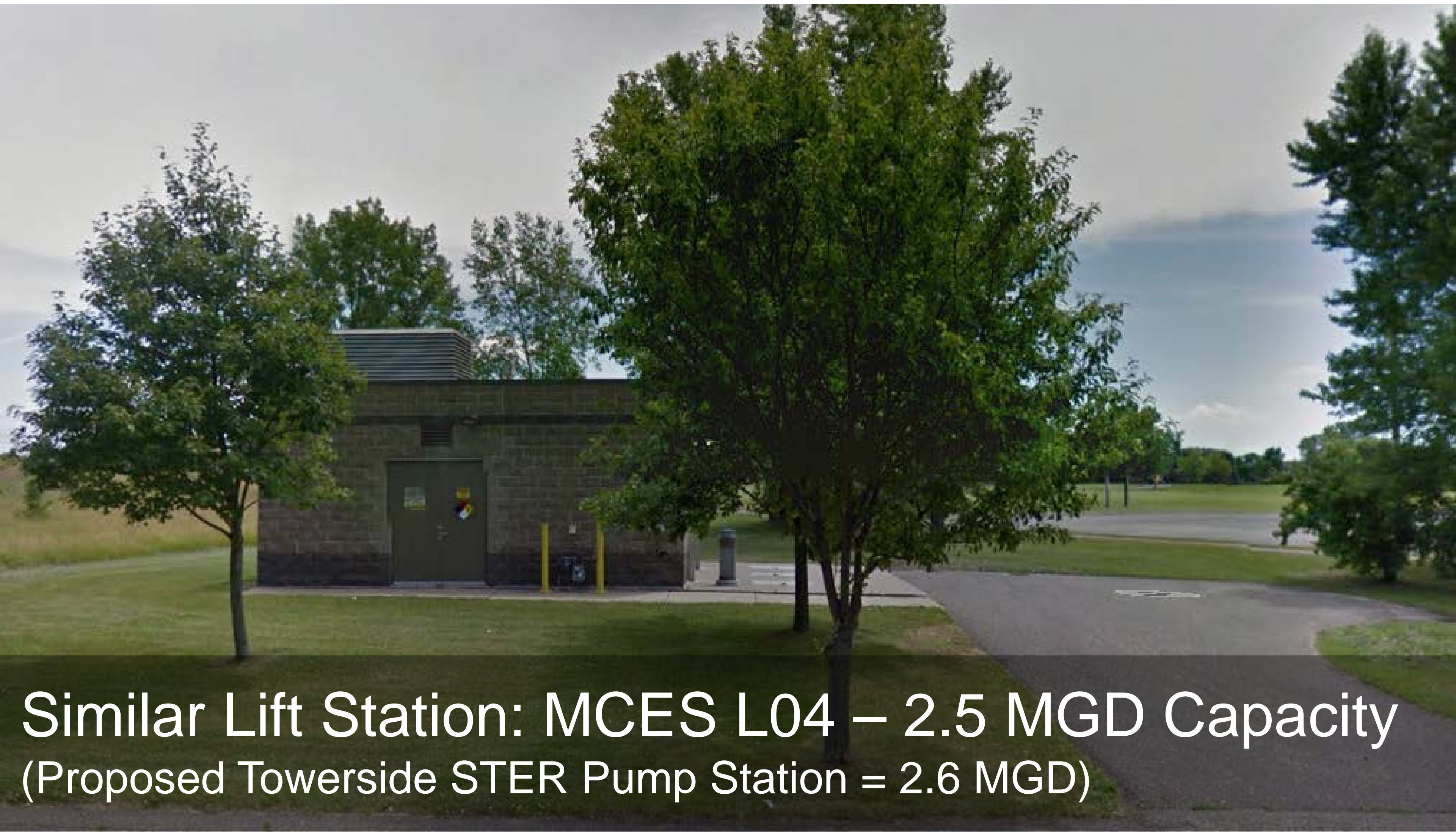
- STER-type application in interceptor system is new to MPCA
- Permit would be required for thermal recovery use
- MCES must retain control & responsibility for wastewater in interceptor system at all times
- Responsibility for wastewater and permit compliance cannot be transferred



## Conclusion:

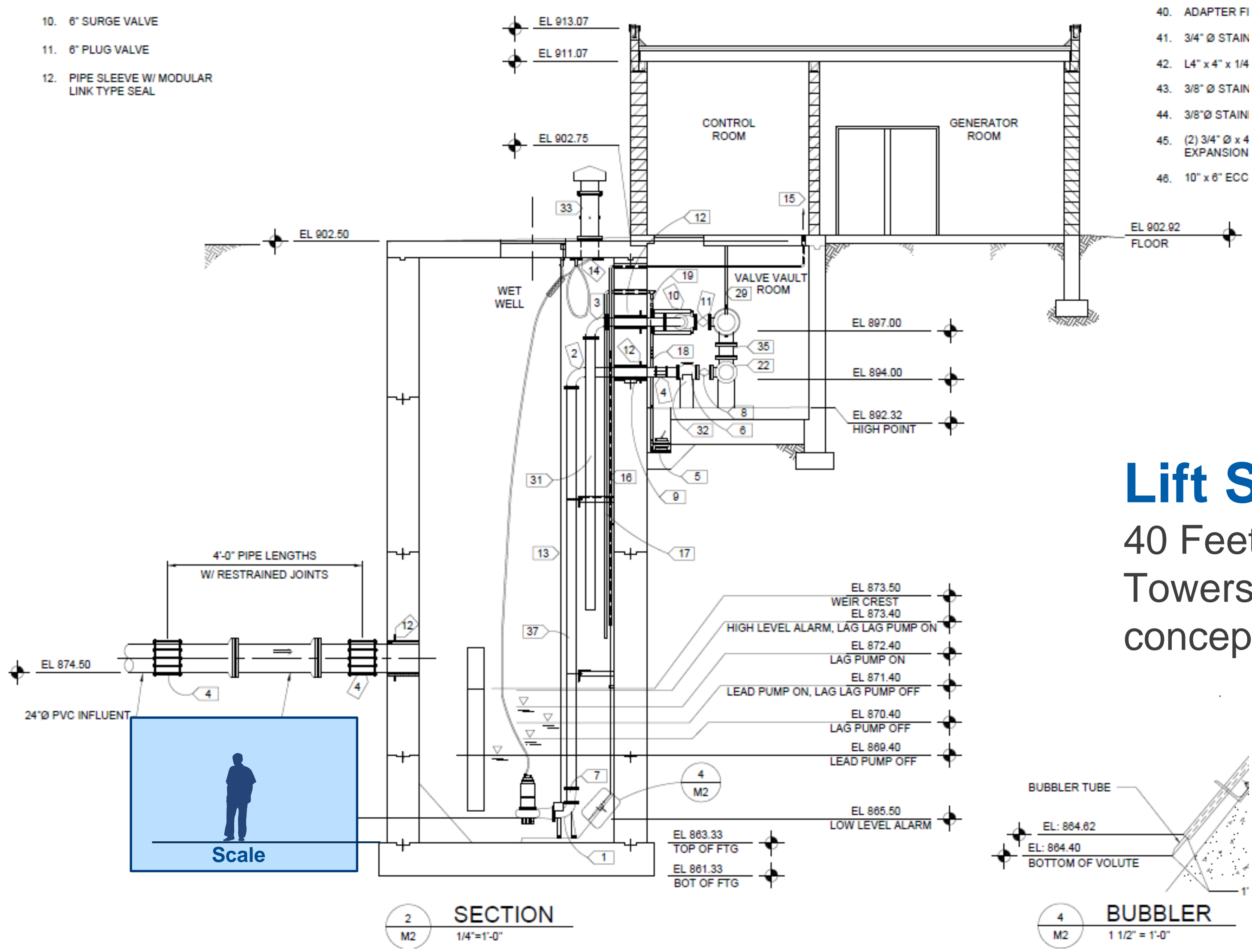
- MCES must retain ownership and operation of STER's wastewater-related facilities

# Issues: Financial, Construction, Operations



Similar Lift Station: MCES L04 – 2.5 MGD Capacity  
(Proposed Towerside STER Pump Station = 2.6 MGD)

# Issues: Financial, Construction, Operations



**Lift Station L04**  
 40 Feet Deep, similar to  
 Towerside STER  
 concept's lift station

# Issues: Financial, Construction, Operations



Open cut west of MH5



MH5

## **MCES' Experience in Proposed Towerside Project Area:**

Project 1-MN-302 Realignment on Oak Street, 2007

# Issues: Financial, Construction, Operations

## Wastewater diversion, piping, pumping station:

- Ever-Green Energy construction cost estimate: approx. \$1M
- MCES construction cost estimate based on experience with facilities & construction in project area: \$7 – 13M

### Some major differences:

- Odor control equipment
- Corrosion control equipment
- Utility relocation/conflicts
- Lift station access during operation (e.g., driveway, parking pad)
- Temporary diversion of wastewater
- Excavation (e.g., sheeting & shoring, excavation support, contaminated soil, etc.)
- Pavement demolition & restoration
- Erosion control
- Traffic control
- Site dewatering
- Coordination (event coordination, parking, etc.)
- Contingency

# Issue: Performance Information- Lack of Proven, Successful STER Performance on Untreated Wastewater



## RAW WASTEWATER HEAT RECOVERY

Vancouver, BC Southeast False Creek Neighborhood Energy Utility

- Drivers: Federal-level goal to reduce GHGs and local commitment to be carbon neutral
- Owned/operated by the City of Vancouver, as a utility distributor
- \$35M construction cost (2010); 4.5 mgd average flow
- 5.2 million sq ft facility total heated floor space
- Current rate is 23% more than natural gas systems

✓ Federal & local drivers    ✓ New development    ✓ Fee recovery structure



## RAW WASTEWATER HEAT RECOVERY

Camden, NJ Pilot Test at WWTP

- Driver: Demonstrate heat recovery technology
- Pilot test during winter 2017/2018
- Test unsuccessful due to repeated plugging of screens on heat recovery equipment
- Estimated ROI: 35+ years

✓ Pilot test    ✓ Raw wastewater    ✓ Test unsuccessful due to equipment plugging



# Issue: Operational - Impact on Regional Wastewater System

## Treatment Process Impacts

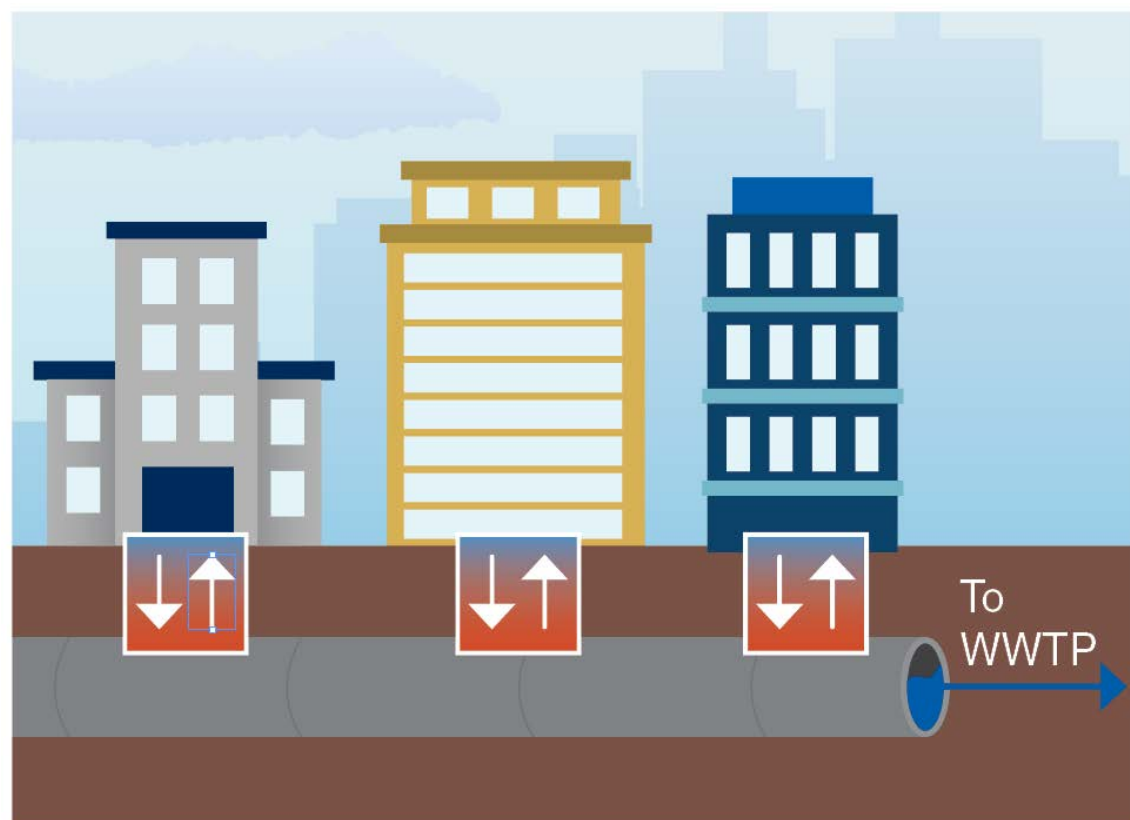
- Assumed condition: minimum month wastewater temperature influent to Metro WWTP reduced from 12 to 11 degrees C
- Impact on Metro WWTP under existing permit and process configuration:
  - 3 additional aeration tanks needed
  - Capital cost = \$50 M
- Impact on Metro WWTP under anticipated permit and process configuration:
  - 5 additional aeration tanks needed
  - Capital cost = \$100 M

## MCES' Energy Goals Impact

- Reduction in influent wastewater temperature would hamper MCES' ability to reach energy reduction goal

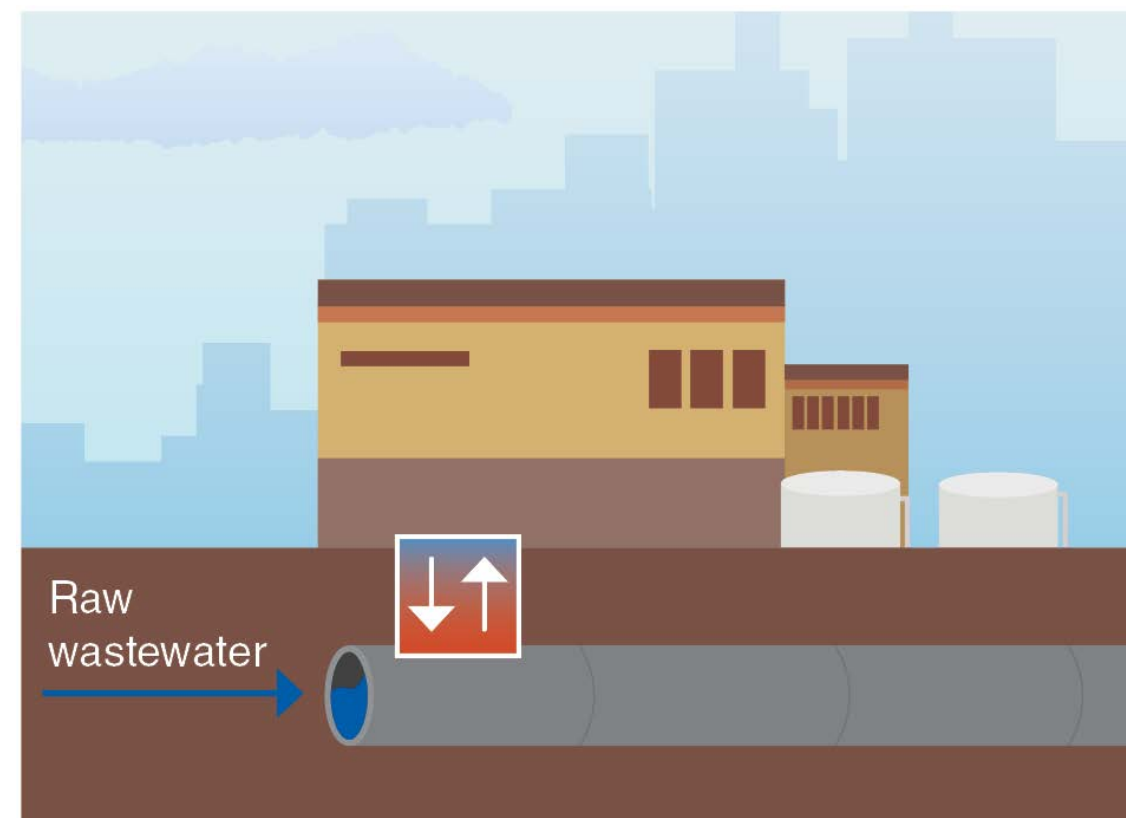
# Issue: Operational - Impact on Regional Wastewater System Energy Goals

## Multiple heat recovery installations on raw wastewater



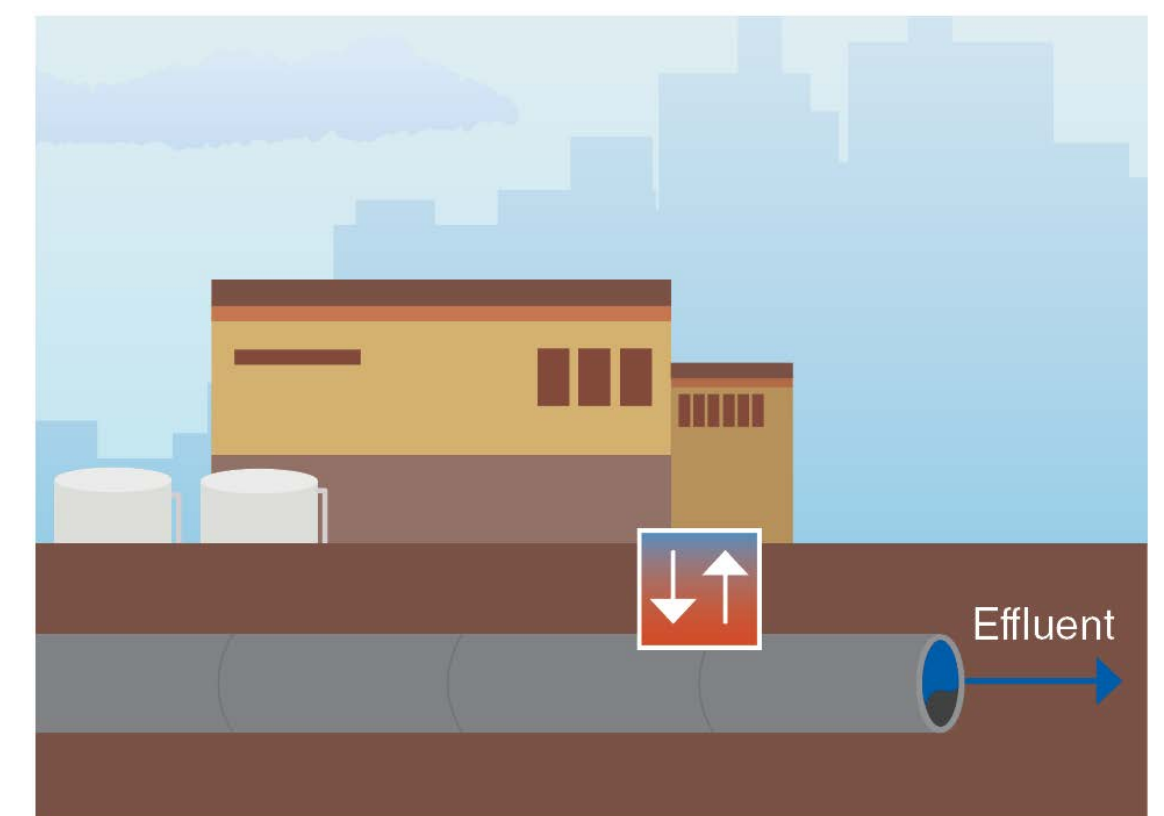
- Not cost-effective
- Not scalable
- Highest risk
  - Public health & safety
  - Process
  - Odor
  - Technology
- No regional wastewater system benefit

## Heat recovery at WWTP on raw wastewater



- Not cost-effective (yet)
- Scalable
- Medium risk
  - Process
  - Technology
- Regional wastewater system benefit

## Heat recovery at WWTP on effluent



- More cost-effective with new construction; less cost effective with retrofit
- Scalable
- Lowest risk
- Regional wastewater system benefit

# Summary of Review Comments



## AUTHORITY

Unless it has express legislative authority, a government cannot compete with private business. The recommendation is the Council not proceed with STER without express legislative authority.



## POLICY

Council has no policy about wastewater heat value transfer or sale.



## RISK MANAGEMENT

Council would face an increased risk, both directly and indirectly, associated with wastewater-related STER facilities. There is no guarantee that the Council could be satisfactorily insured and indemnified by STER operator. Council ownership of those facilities required.



## REGULATORY COMPLIANCE

Concept is new to MPCA. Regulatory framework under consideration. A permit would be required. MCES must retain control and responsibility for wastewater in collection system at all times. Responsibility cannot be transferred to a third party.



## POINT OF HANDOFF

Point of wastewater handoff complicated and unclear; facility ownership unclear.



## CONSTRUCTION

High construction risks: construction adjacent to existing interceptor; in high-profile, highly urbanized area with extensive utilities, and significant pedestrian and transportation corridors.



## FINANCIAL

Wastewater-related facilities construction costs likely 10 times higher than Ever-Green Energy's (E-G E's) estimate.

Design, O&M, heat value-cost recovery not in E-G E's model; recovery mechanism unknown.



## OPERATIONAL

Not in E-G E's model: corrosion & odor control; inspection & maintenance costs; access to facilities. Unknown impact of decreased wastewater temperature on MCES wastewater treatment.

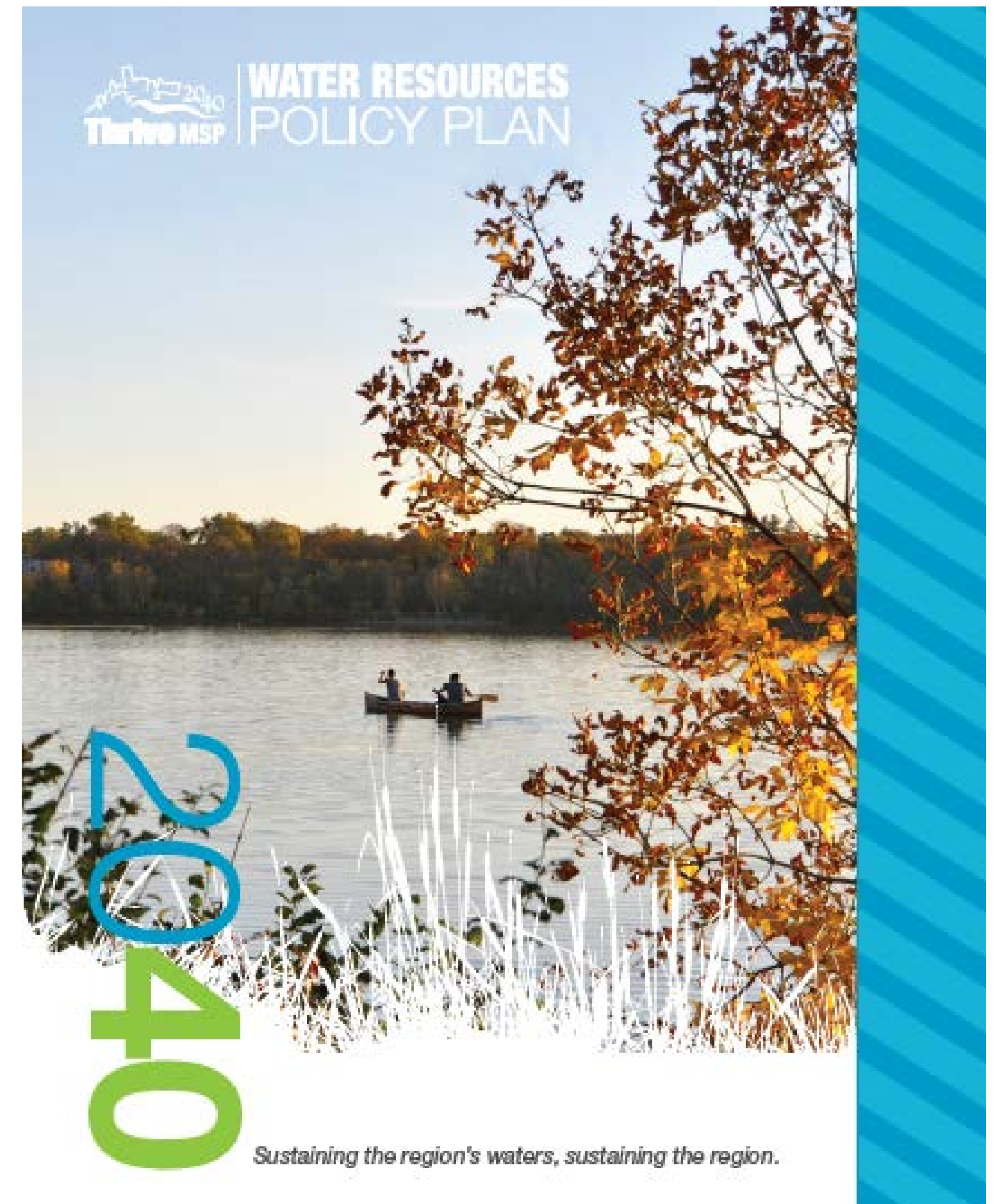


## PERFORMANCE INFORMATION

Demonstrated, successful performance-based information about heat exchange technology using untreated wastewater needed.

# MCES' Mission

- To provide wastewater services and integrated planning to ensure sustainable water quality and water supply for the region
  - Consistent customer support for efforts focused on this mission
  - Ongoing, new initiatives that support the mission and benefit the regional wastewater system require Council staff and leadership resources
  - Policy supports MCES in pursuing additional energy-recovery technologies as capabilities and economics are proven and for the benefit of the regional wastewater system
- MCES' review of Towerside STER proposal performed with mission and policy in mind
- Finding: Ever-Green Energy proposed project is inconsistent with MCES' mission and policy



# Next Steps



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Conclude review and further discussions regarding participation in Ever-Green Energy's potential project



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Continue to investigate and implement potential energy recovery from wastewater for the benefit of Council's wastewater facilities

# Questions