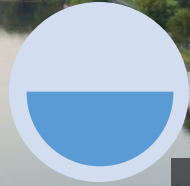
An aerial photograph of a university campus, likely the University of Minnesota, showing various academic buildings, green spaces, and a river (the Mississippi River) flowing through the area. A bridge is visible in the foreground. The image is partially obscured by a large, semi-transparent white circle on the right side, which contains the event information.

Leveraging Emerging Technologies and the Path to Net Zero

December 4, 2024
Minnesota Renewable Energy Roundtable 2024

**Tracy Hodel &
Elizabeth Kramer**

ENERGY INNOVATIONS TODAY and into the FUTURE



TODAY

Global Leader
Energy Efficiency
Energy Management
Solar
Combined Heat & Power
Waste to Energy
Hydroelectric Generation
Facility
EV Infrastructure



FUTURE

Green Hydrogen
Renewable
Natural Gas
Landfill Organics
Diversion
Food Waste to
Energy
Carbon Capture

2022

City Services
Carbon Neutral
Energy Use

+

100%

Renewable Electricity for City Services

2028

St. Cloud Community
Carbon Neutral
Electricity

2038

St. Cloud Community
Carbon Neutral
Energy Use & Transportation

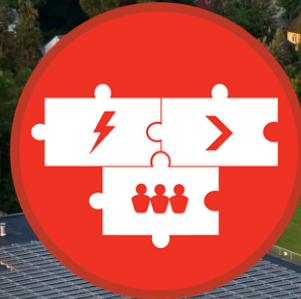
Pathways to Energy Goals



SOLAR ENERGY PRODUCTION



COMMUNITY ENERGY PLAN



NUTRIENT RECOVERY



2014



2015



2016



2017



2018



2019



2020

2024 & Into Future



ENERGY EFFICIENCY PROJECTS



COMMUNITY SOLAR GARDENS



BIOFUEL PRODUCTION



PUBLIC/PRIVATE PARTENRSHIPS

- Green Hydrogen
- Renewable Natural Gas
- Food Waste to Energy

- Energy Storage
- Carbon Capture
- Microgrid
- EV Charging
- Fleet Electrification
- Decarbonize Transportation & Heating Sector
- Community Goals
- Hydroturbine

TRANSFORMATION TO RESOURCE RECOVERY

- 2015**
 - Energy Efficiency
- 2016**
 - 2 Solar Arrays (240kW)
- 2017**
 - Biogas Conditioning
 - Generator #1
- 2018**
 - Nutrient Recovery
 - Class A Biosolids
- 2019**
 - Gas Membrane
 - Primary Digester Conversion
- 2020**
 - Generator #2
 - 2 More Solar Arrays

Solar 40 kW

Backup Diesel Gen 2,000 kW

Solar 245 kW

Solar 220 kW

Solar 20 kW

HSW Receiving

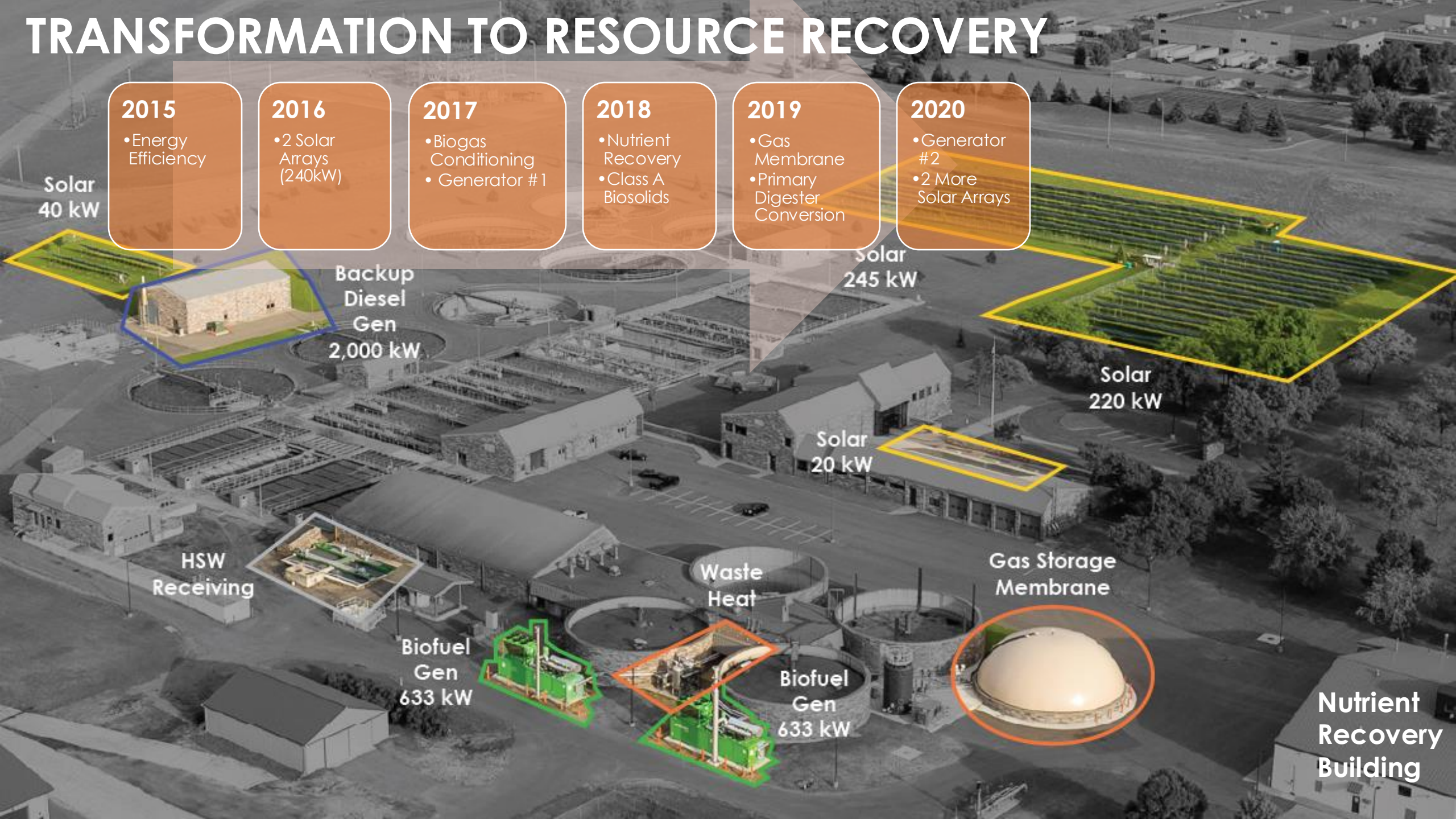
Waste Heat

Gas Storage Membrane

Biofuel Gen 633 kW

Biofuel Gen 633 kW

Nutrient Recovery Building





Waste to Energy



WASTED FOOD TO ENERGY

LANDFILL ORGANICS DIVERSION



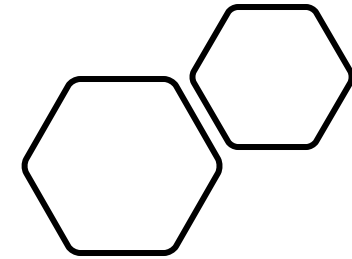


Wasted food causes
58%
of methane emissions from
municipal solid waste landfills.



In landfills, wasted food breaks down relatively quickly, generating methane – a powerful greenhouse gas – before landfill gas collection systems are in place.

Keeping food out of landfills helps tackle climate change.



According to the Minnesota Pollution Control Agency (MPCA), wasted food makes up 18% of landfill contents in Minnesota.

UPCOMING - RESIDENTIAL FOOD WASTE PROGRAM



WE TRANSFORM

St. Cloud will process cooking oils into fuel for generators at the NEW Recovery Facility

ST.CLOUD  **GREATER**

 INNOVATION  IMPROVEMENT  EXCELLENCE

- Residential Food Waste Pilot Program

2025



Residential Fats, Oils, and Grease



+



=



YOU FILL

Let grease or oil cool and pour it into a **sealable** container

YOU BRING

Fill up your container, seal it, and bring it to a St. Cloud drop off site

WE TRANSFORM

St. Cloud will process cooking oils into fuel for generators at the NEW Recovery Facility



LIQUID & CRYSTAL FERTILIZER PRODUCTION

FACILITY GENERATES OVER 1,700 DRY TONS of CLASS A BIOSOLIDS/BIOFERTILIZER PRODUCT ANNUALLY that is RECYCLED on AREA FARMLAND



Partnerships are Key to Success



Increase in City's
Customer Base and
Revenue Source

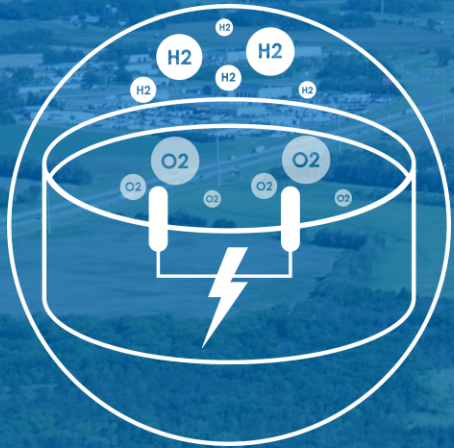
Economic Growth
for Region

**Public/Private
Partnerships**

Reliable, Cost
Savings for Local
Companies

Environmentally
Responsible Practice

GREEN HYDROGEN PROJECT



Hydrogen



Oxygen

Waste Heat



First in the World



GREEN HYDROGEN

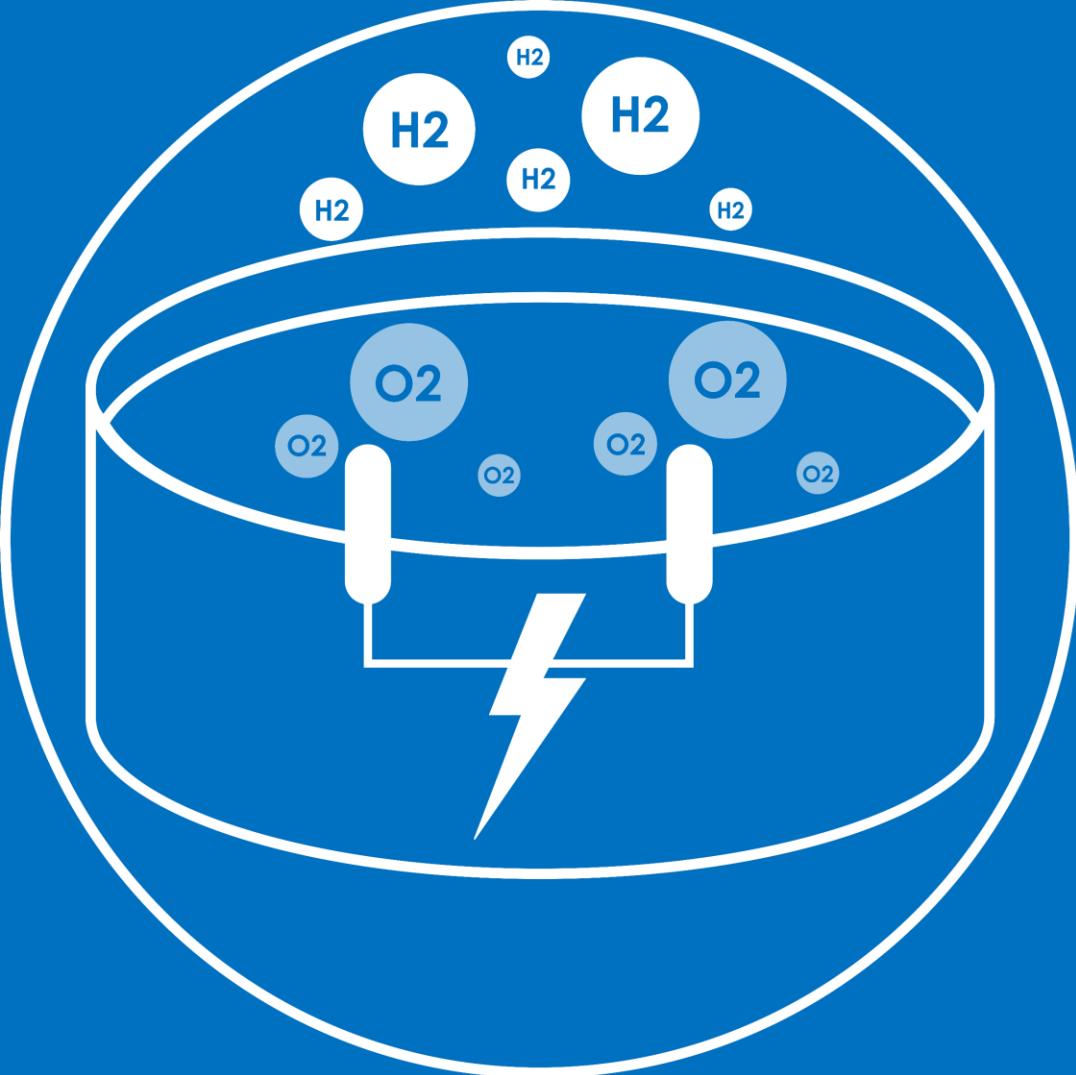
Renewable Energy



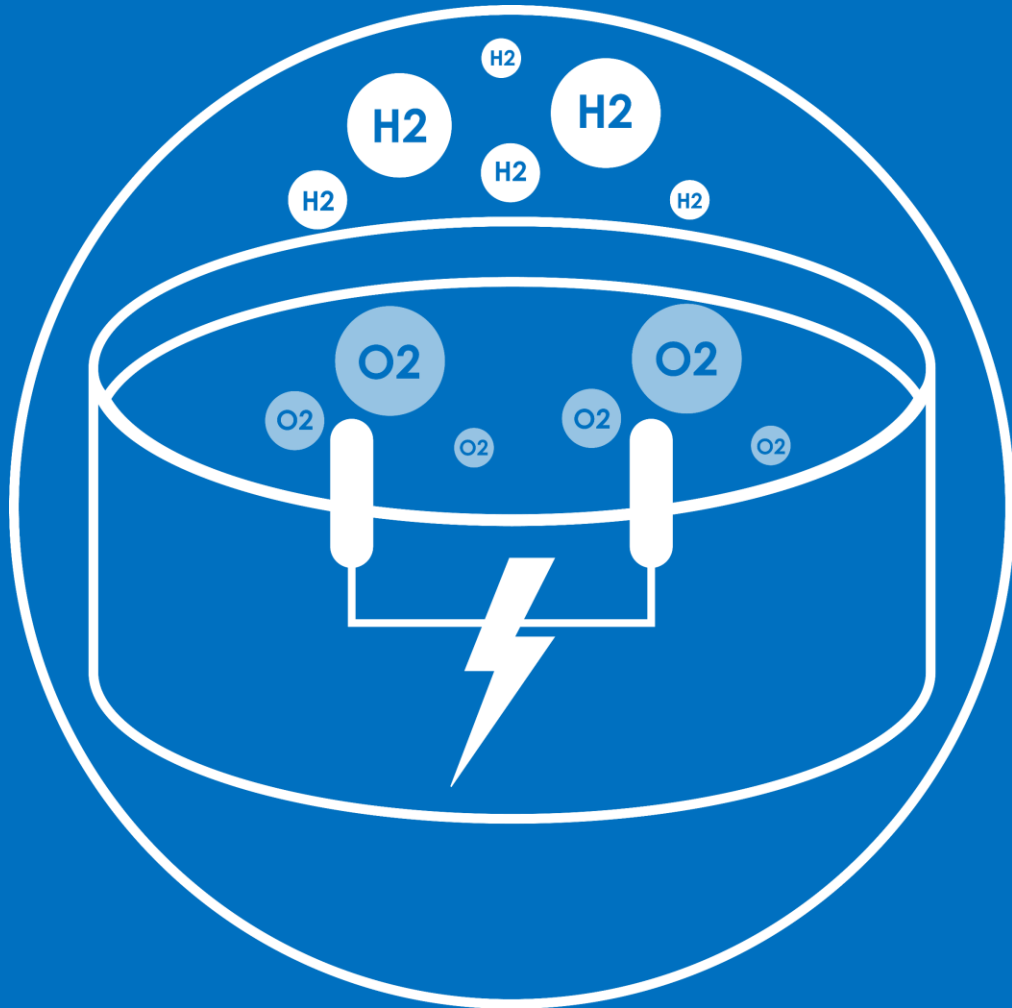
Solar



Biofuel



END PRODUCTS



Electrolyzer



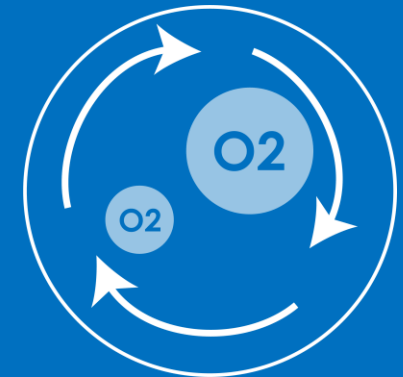
Power Generation



Fuel - Transportation



Fuel - Heating



Oxygen

Keys to Success

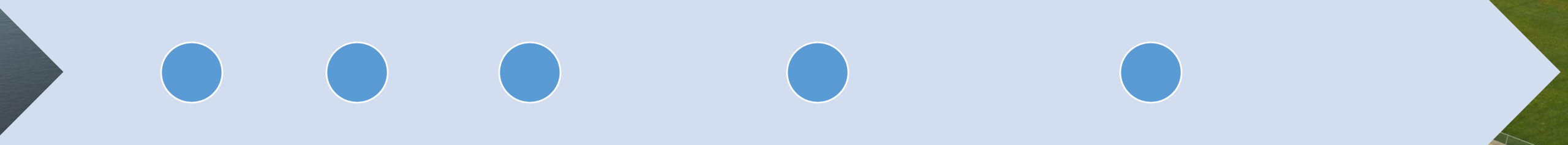


Energy
Efficiency &
Management

City
Administration,
Council,
Community
Support

Think Long-
Term

Energy
Team &
Passion

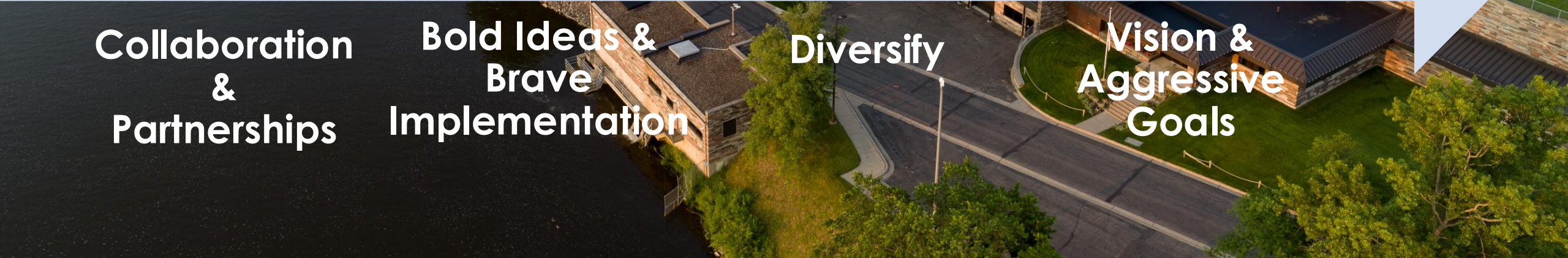


Collaboration
&
Partnerships

Bold Ideas &
Brave
Implementation

Diversify

Vision &
Aggressive
Goals



WHY GO GREEN?



For Our
Future





QUESTIONS & THANK YOU



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ST.CLOUD  **GREATER**

> INNOVATION > IMPROVEMENT > EXCELLENCE