Minnesota In-State Water Energy Nexus Retreat

August 3, 2018

National Governors Association
Center for Best Practices

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About NGA

Office of Government Relations	Center for Best Practices	Office of Management Consulting & Training
• Collective voice of governors in Washington D.C. • Builds consensus on Federal issues • National policy focus	• Comparative policy shop for state level efforts • Provides governors and staff technical assistance and policy guidance	• Internal management consultants • Training and advice for governors, chiefs of staff, legal counsels, policy directors schedulers, spouses

NGA

2018 Technical Assistance

Energy Assurance
Grid Ex Workshop
Executive Order Roadmap
State Resiliency Assessment & Planning Tool
State Resiliency Retreats
Energy Assurance Webinars

Chair's Initiative: Ahead of the Curve: Innovation Governors
Energy Summit & Transportation Summit
Story Maps and Policy Roadmaps
Podcasts

Smarter States, Smarter Communities
Learning Lab
State Specific Support

Power Sector Modernization
Policy Academy
State Specific Support

Technical Assistance on Demand
Research
Policy Memos
Consultation

Transportation Modernization
Traffic Safety Learning Labs
Traffic Safety Roadmap
Electric Vehicle (EV) Regional Workshops

Energy Efficiency
Lead By Example Workshop
Experts Roundtable
Water- Energy Nexus Retreats

Nuclear Weapons Waste
Federal Facilities Task Force Summer Meeting
Intergovernmental Fall Meeting
Webinar Series

Water Policy Learning Network
Water Policy Institute
Webinar Series
Water- Energy Nexus Retreats

Water Energy Nexus Retreat Core Team

State of Minnesota

Jessica Burdette, State Energy Office Manager, Minn. Dept. of Commerce

Lindsay Anderson, Energy Project Manager, Minn. Dept of Commerce

Aaron Luckstein, Manager, Municipal Wastewater, Minnesota Pollution Control Agency

Will Seuffert, Director, Environmental Quality Board

Randy Thorson, Principal Engineer, Minnesota Pollution Control Agency

Anna Henderson, Water Advisor, Governors' Office

National Governors Association

Bevin Buchheister, Senior Policy Analyst

Patricio Portillo, Policy Analyst

Brielle Stander, Program Assistant

Introductions

- In 15 seconds or less, please briefly state your:
  - Name
  - Affiliation
  - Role/Title

Agenda

- Welcome & Introductions
- Background & Determining State objectives
- Local Perspective and Opportunities for Progress
  - Policy
  - Funding & Finance
  - Technical Assistance
  - Workforce Development
- Lunch & Keynote
- Best Practices Presentation & Discussion
  - Technical Assistance
  - Policy
  - Funding & financing
  - Workforce Development
- Roundtable Discussion
- Develop Action Plan & Wrap Up

Background & Determining State Objectives

Shannon Lotthammer, Assistant Commissioner, Water Policy/Agriculture Liaison, Minnesota Pollution Control Agency

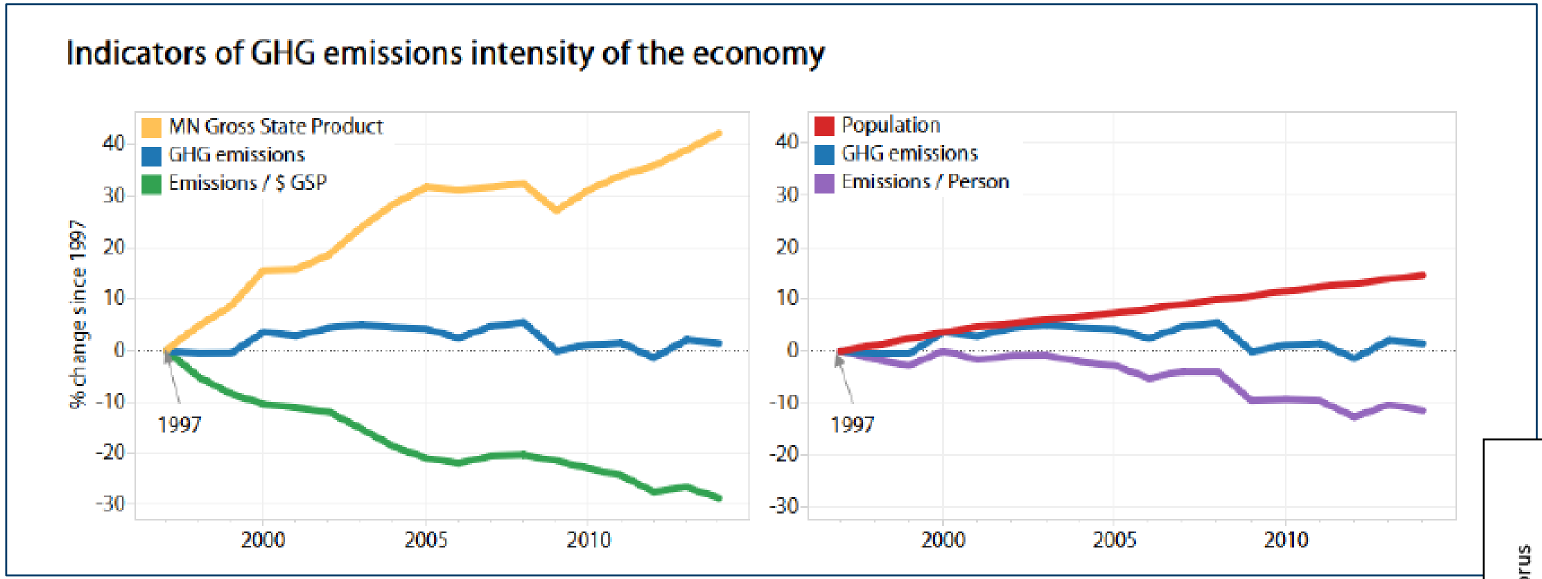
Advancing Efficiencies in the Water-Energy Nexus

MINNESOTA POLLUTION CONTROL AGENCY

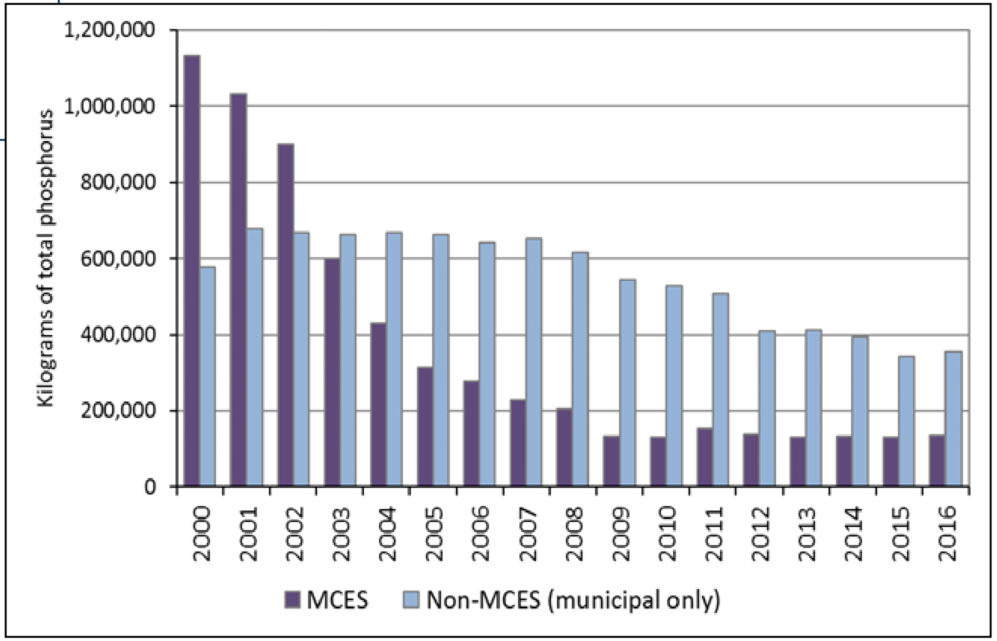
Shannon Lotthammer | Assistant Commissioner

March 6, 2018

MN: Innovation, Leadership and Action



Reducing phosphorus in WW

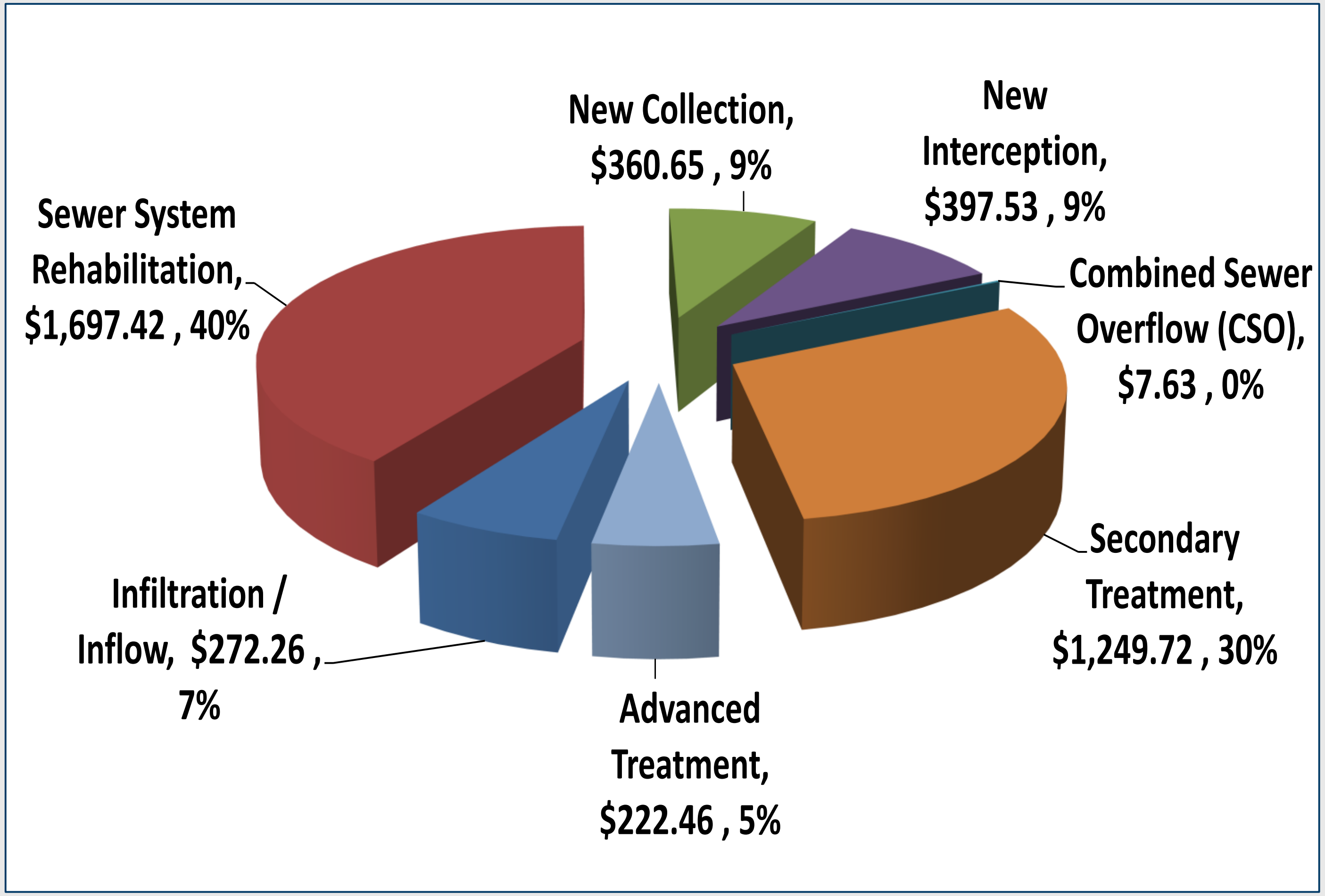


Existing Programs/Actions (Examples)

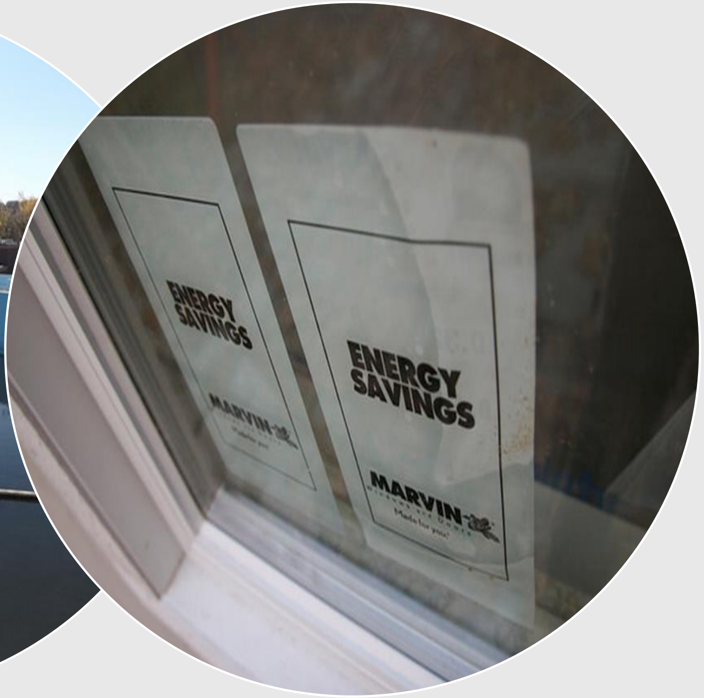
- Next Generation Energy Act goals
- Grant to increase energy efficiency in small and mid-sized WWTPs
- Buildings, Benchmarks and Beyond
- Individual facility efforts

Challenges – and Opportunities!

- Infrastructure investment needs
- Working across sectors and areas of expertise
- Workforce changes
- Shared goals



Today’s Retreat



- Learn from each other
- Explore opportunities
- Identify next steps and an Action Plan


Thank you (in advance) for a great day!

The Local Perspective and Opportunities for Progress

Policy: Anna Henderson, Water Advisor, Office of Governor Mark Dayton

Funding & Financing: Jeff Freeman, Executive Director, Minnesota Public Facilities Authority

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Technical Assistance: Laura M. Babcock, Director, Minnesota Technical Assistance Program

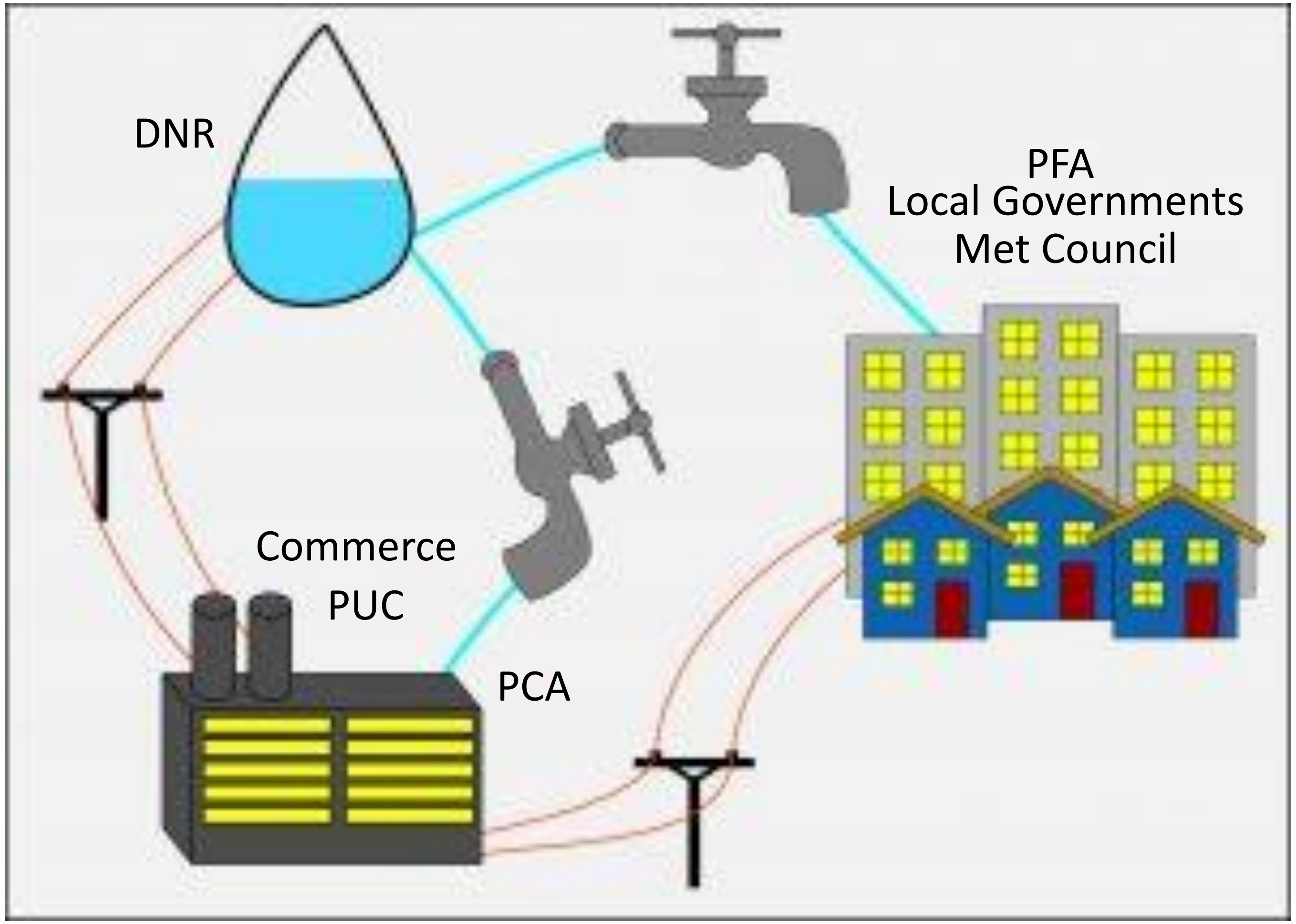
Workforce Development: Wade Klingsporn, President, Minnesota Wastewater Operators Association & Instructure , Vermilion Community College

Minnesota‘s Energy and Water Policy

Anna Henderson, PhD
Senior Policy Advisor
Office of Governor Mark Dayton

EQB

MDA
MDH

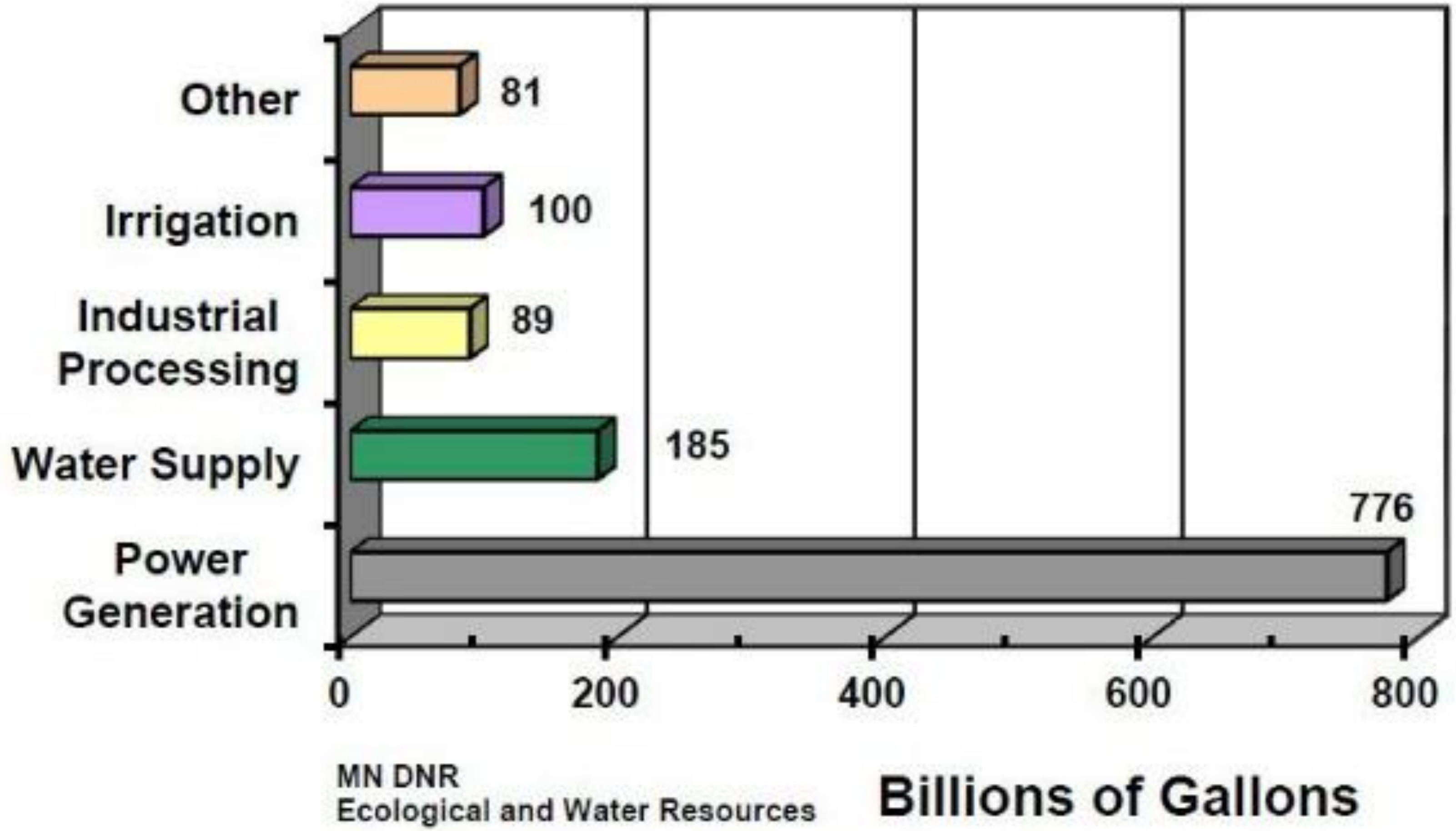


DLI

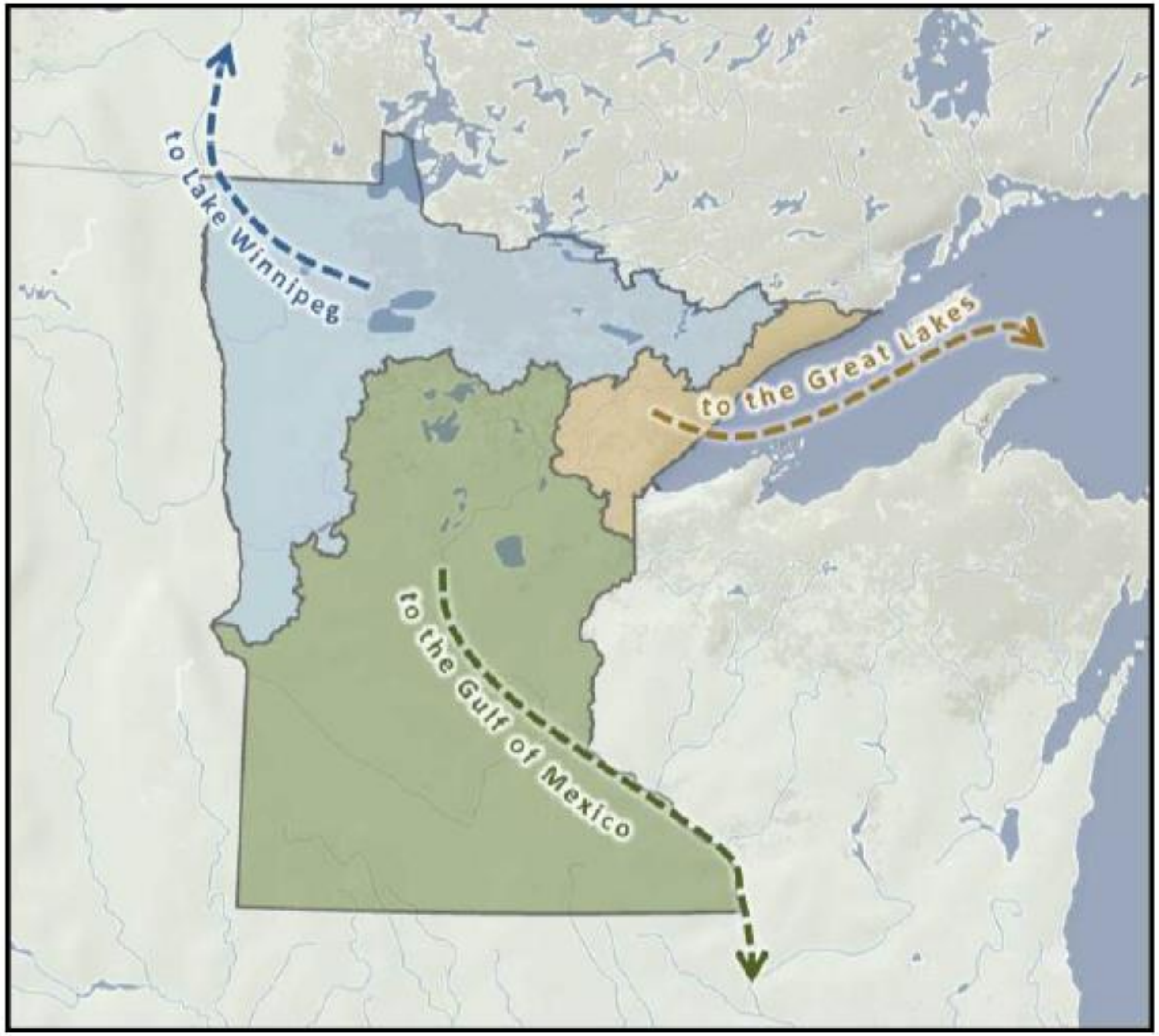
PCA

BWSR

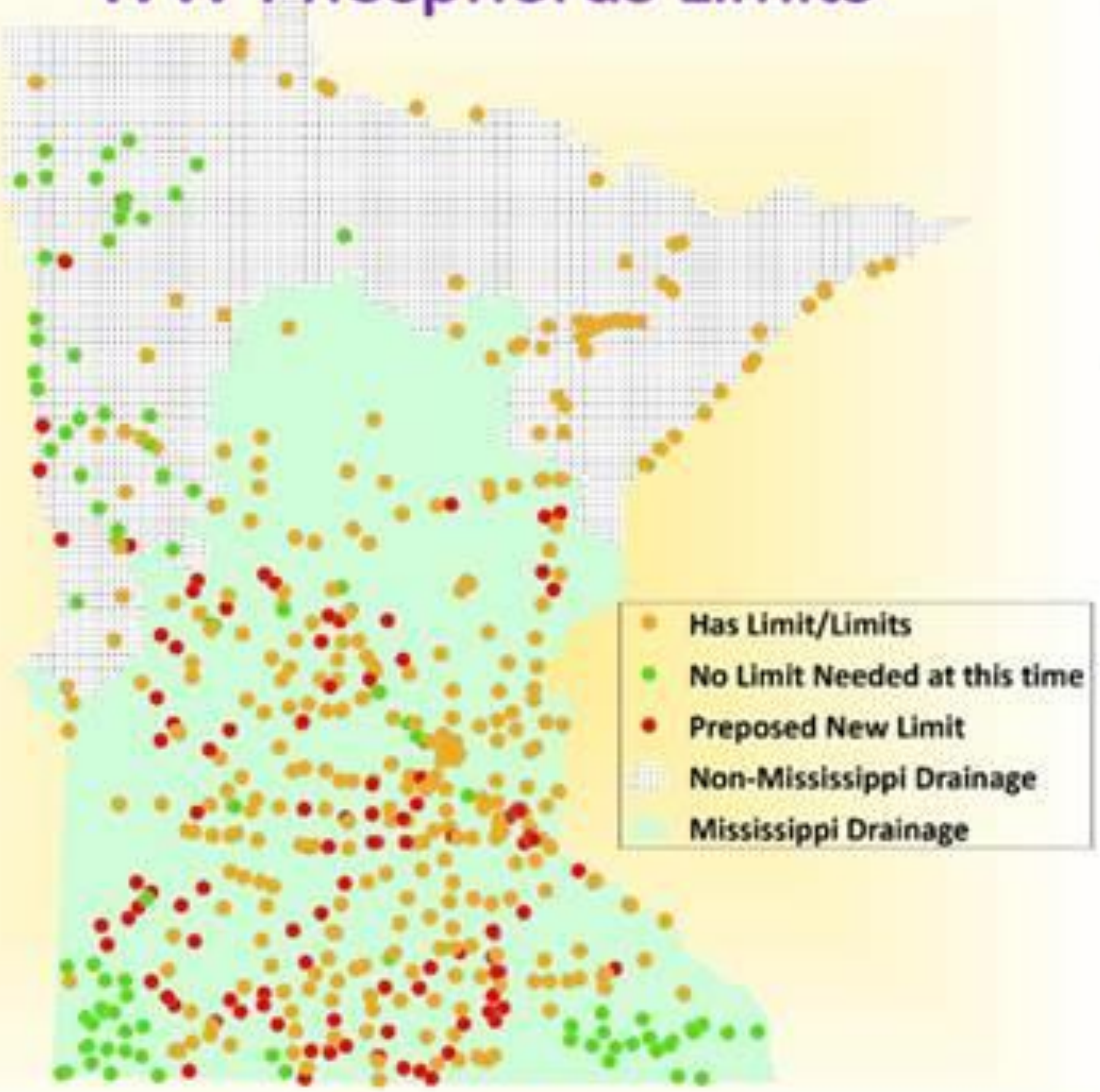
Minnesota Water Use 2016



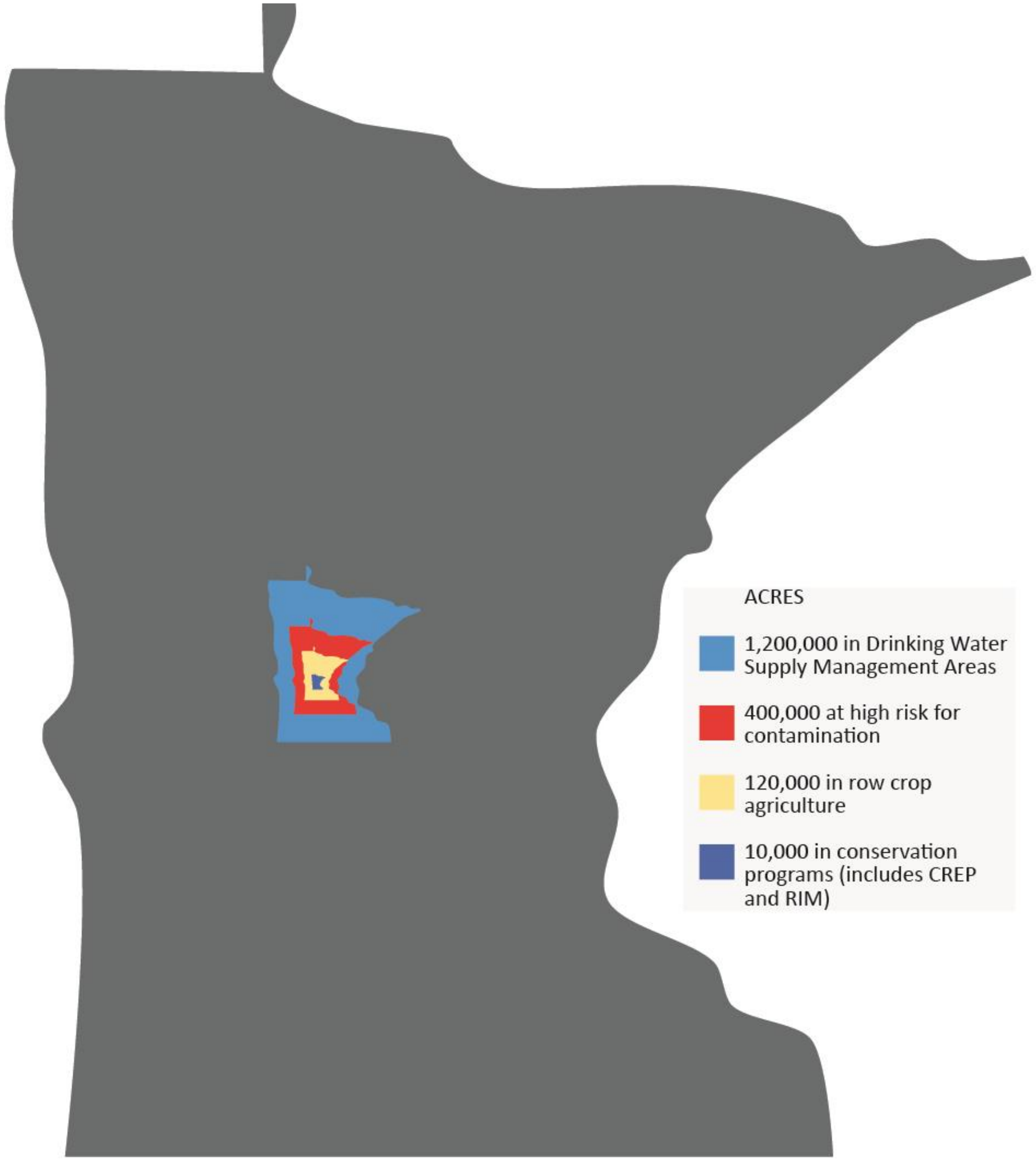
Minnesota is a Headwaters State

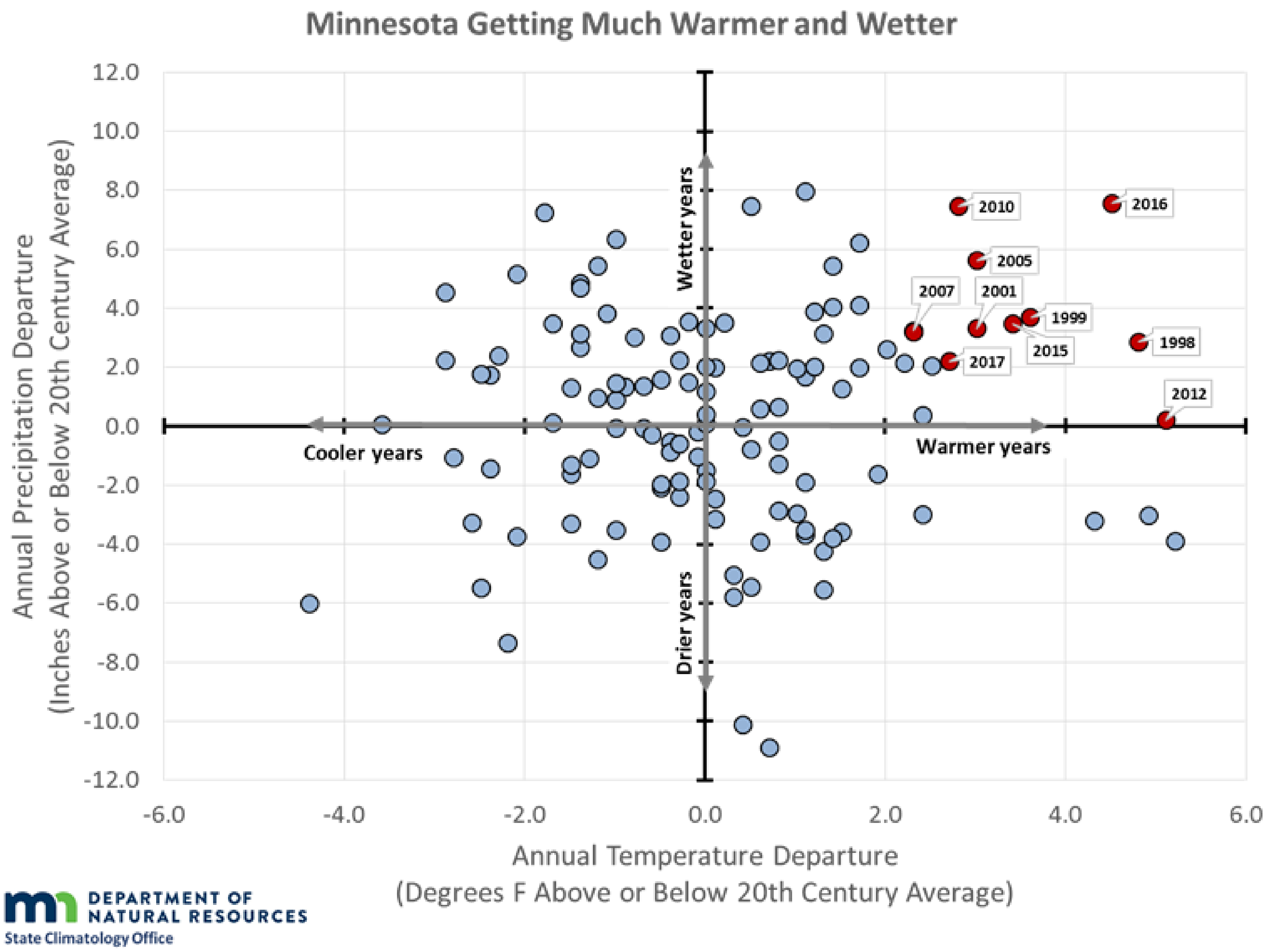


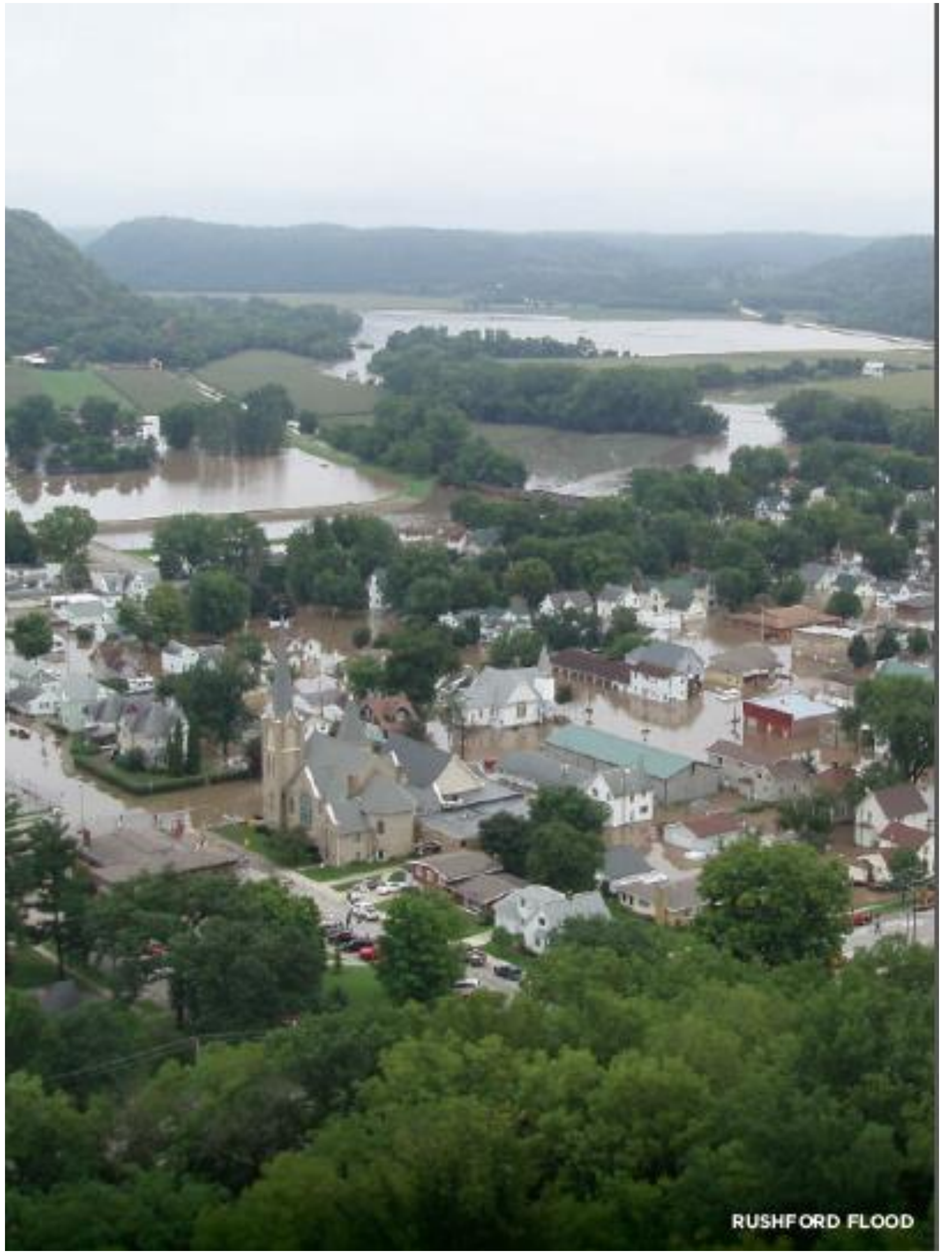
WW Phosphorus Limits



The most efficient strategy is pollution prevention: Targeting protection of key lands is the safest option for public health and the cheapest option.




Minnesota Getting Much Warmer and Wetter
Annual Precipitation Departure (Inches Above or Below 20th Century Average)
Annual Temperature Departure (Degrees F Above or Below 20th Century Average)
Wetter years
Drier years
Cooler years
Warmer years
2010
2016
2005
2007
2001
1999
2015
1998
2017
2012
12.0
10.0
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
-8.0
-10.0
-12.0
-6.0
-4.0
-2.0
0.0
2.0
4.0
6.0
DEPARTMENT OF NATURAL RESOURCES
State Climatology Office


RUSHFORD FLOOD

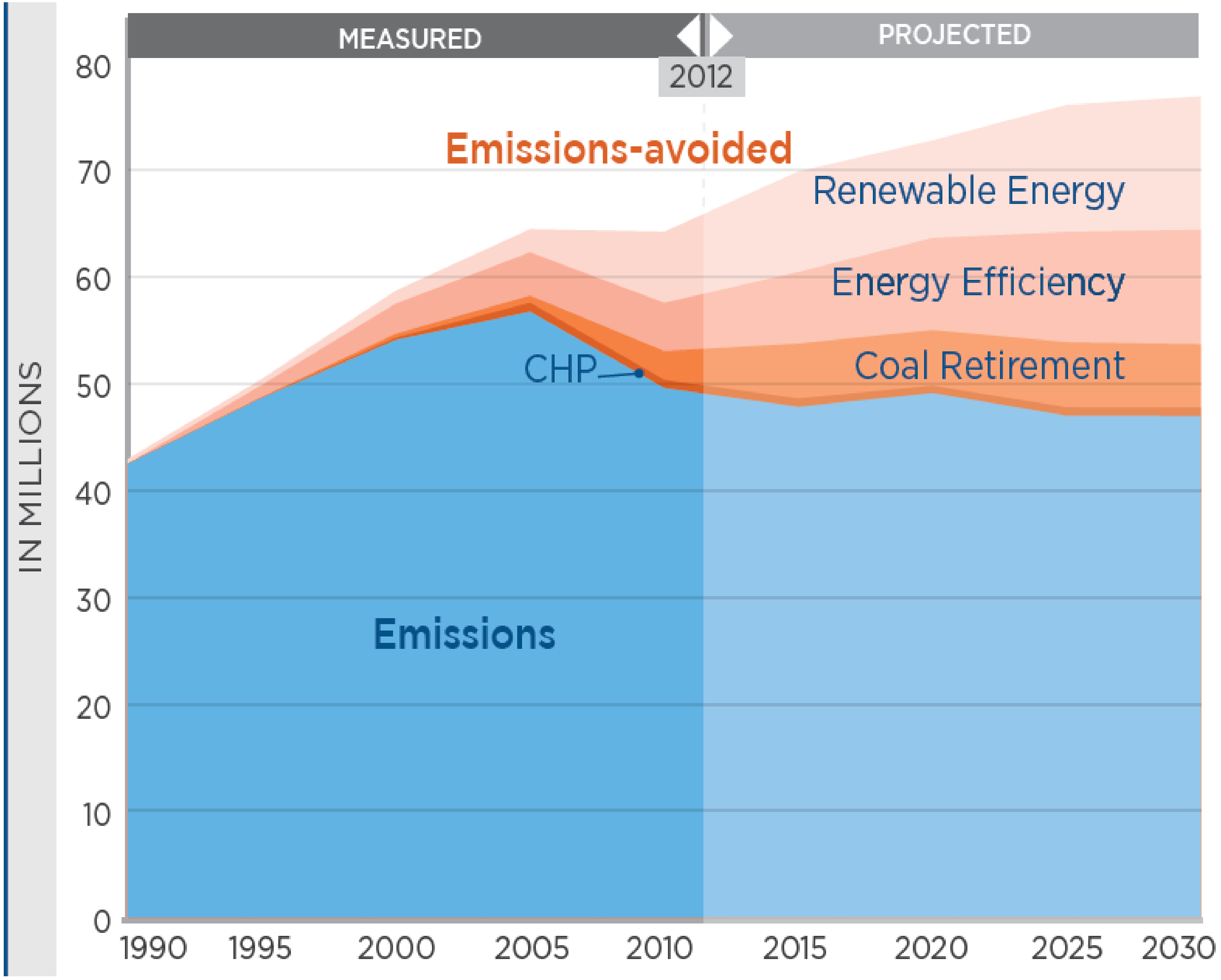

June 20, 2014
Copyright Erdahl Aerial Photos

The Next Generation Energy Act of 2007

(Minn. Stat. § 216H.02)

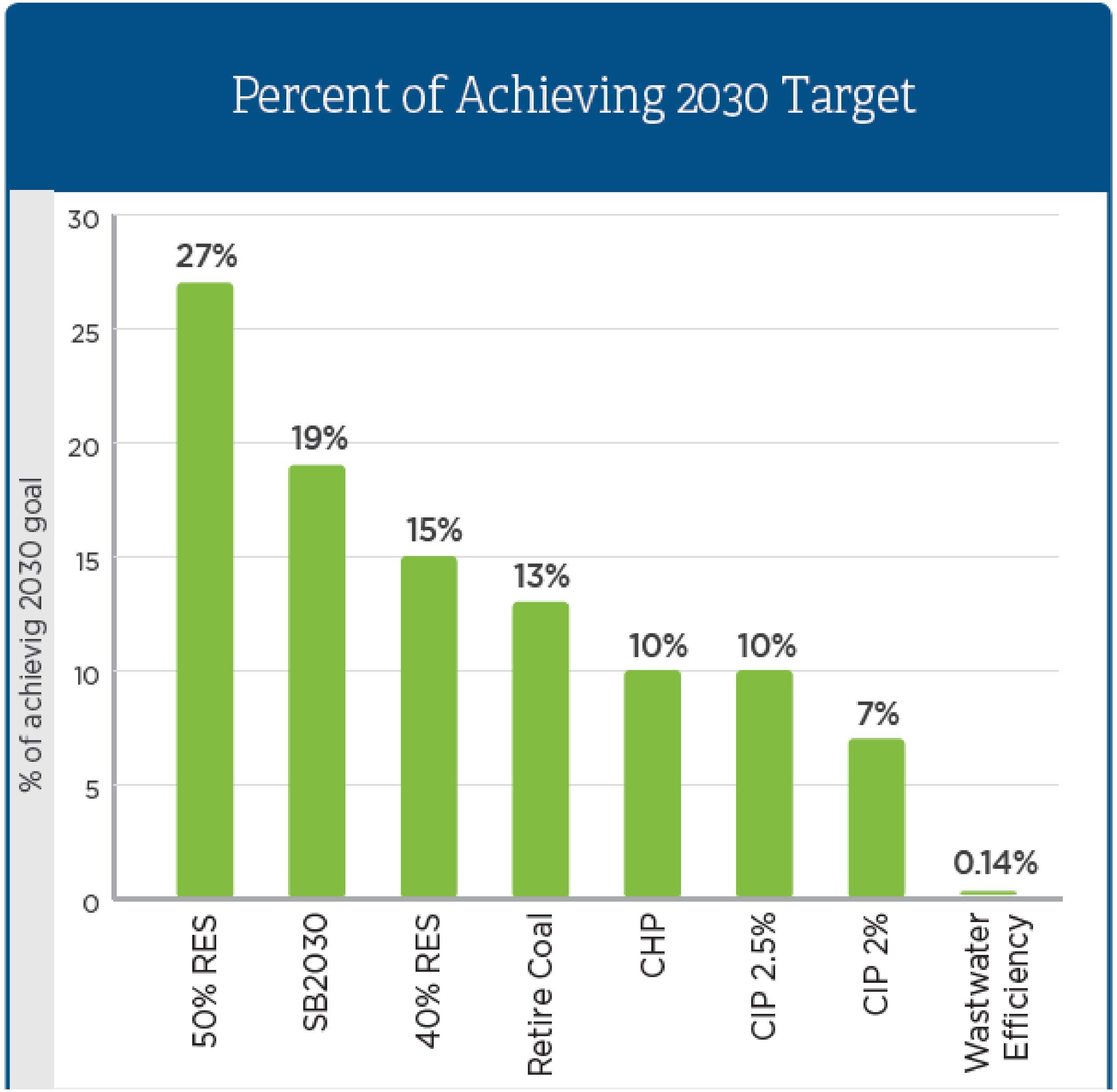
- 2015 reduction goal of 15 percent
- 2025 reduction goal of 30 percent
- 2050 reduction goal of 80 percent

*baseline of 2005



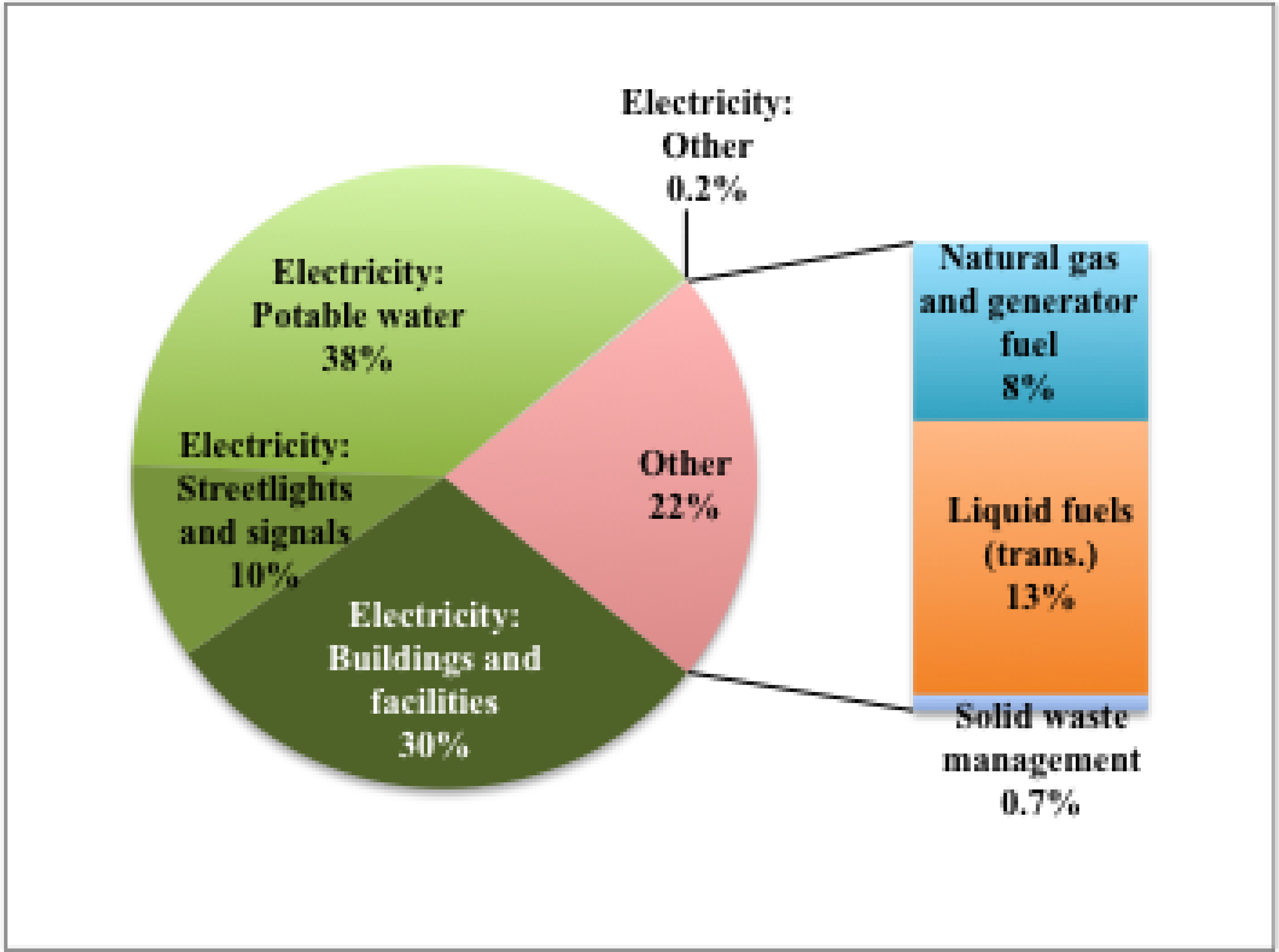
- **Renewable Energy Standard** (RES) of 25% renewable generation by 2025

- **Energy Efficiency Resource Standard** (EERS) requires electric and natural gas utilities to offer costumers cost effective energy conservation and efficiency programs to achieve an annual energy savings equal to 1.5% of their retail energy sales.



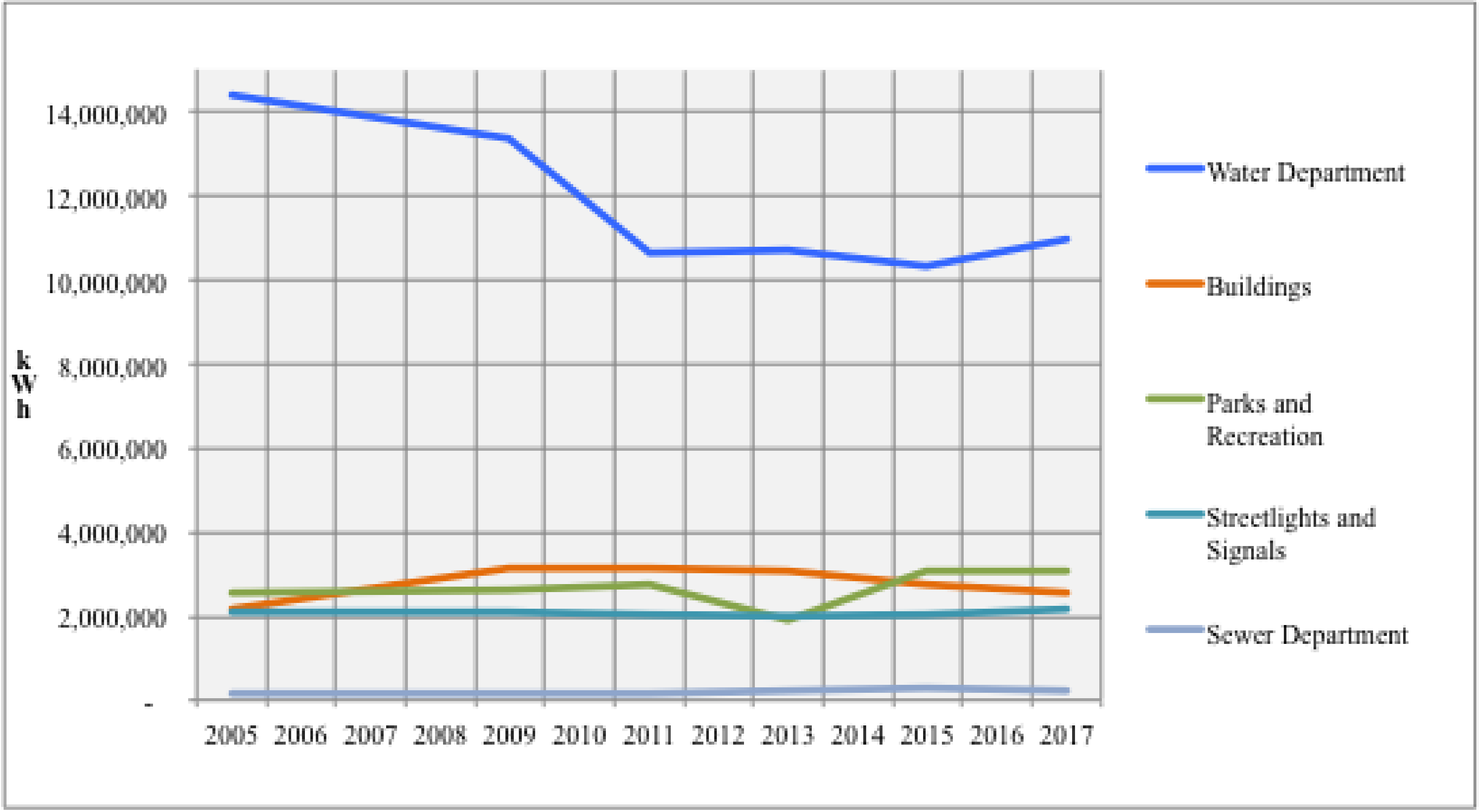
Percent of Achieving 2030 Target
% of achievig 2030 goal
30
25
20
15
10
5
0
27%
19%
15%
13%
10%
10%
7%
0.14%
50% RES
SB2030
40% RES
Retire Coal
CHP
CIP 2.5%
CIP 2%
Wastwater Efficiency

Burnsville greenhouse gas emissions 2017



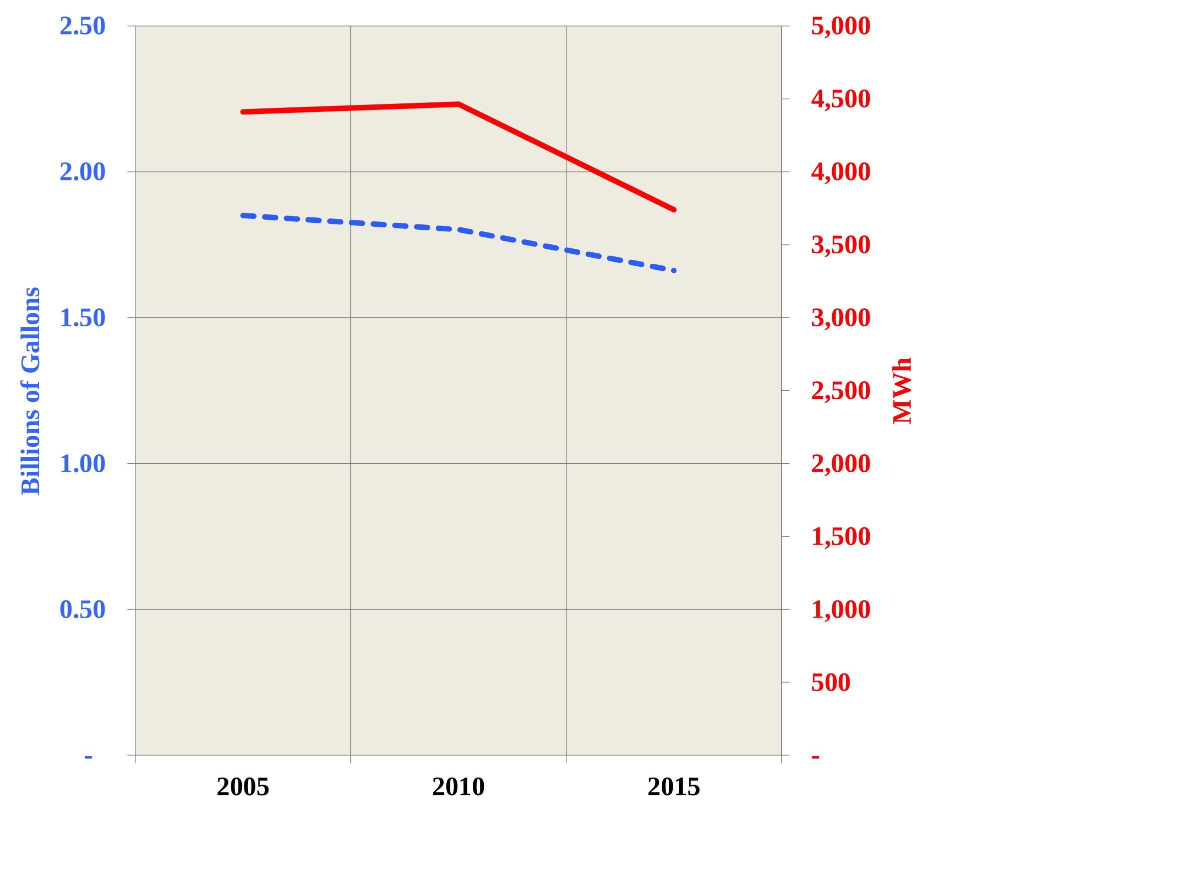
Orange Environmental report, 2018

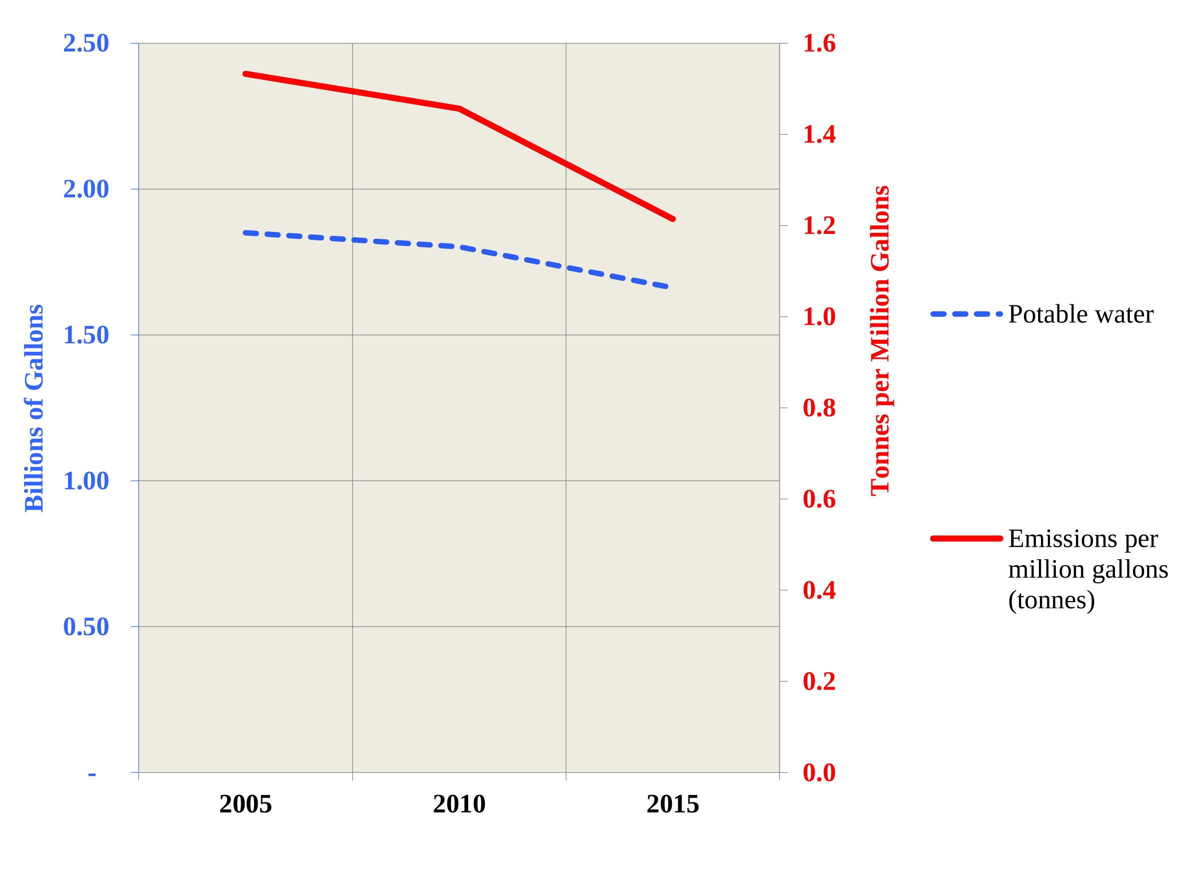
Burnsville Electricity Consumption, 2005-2017



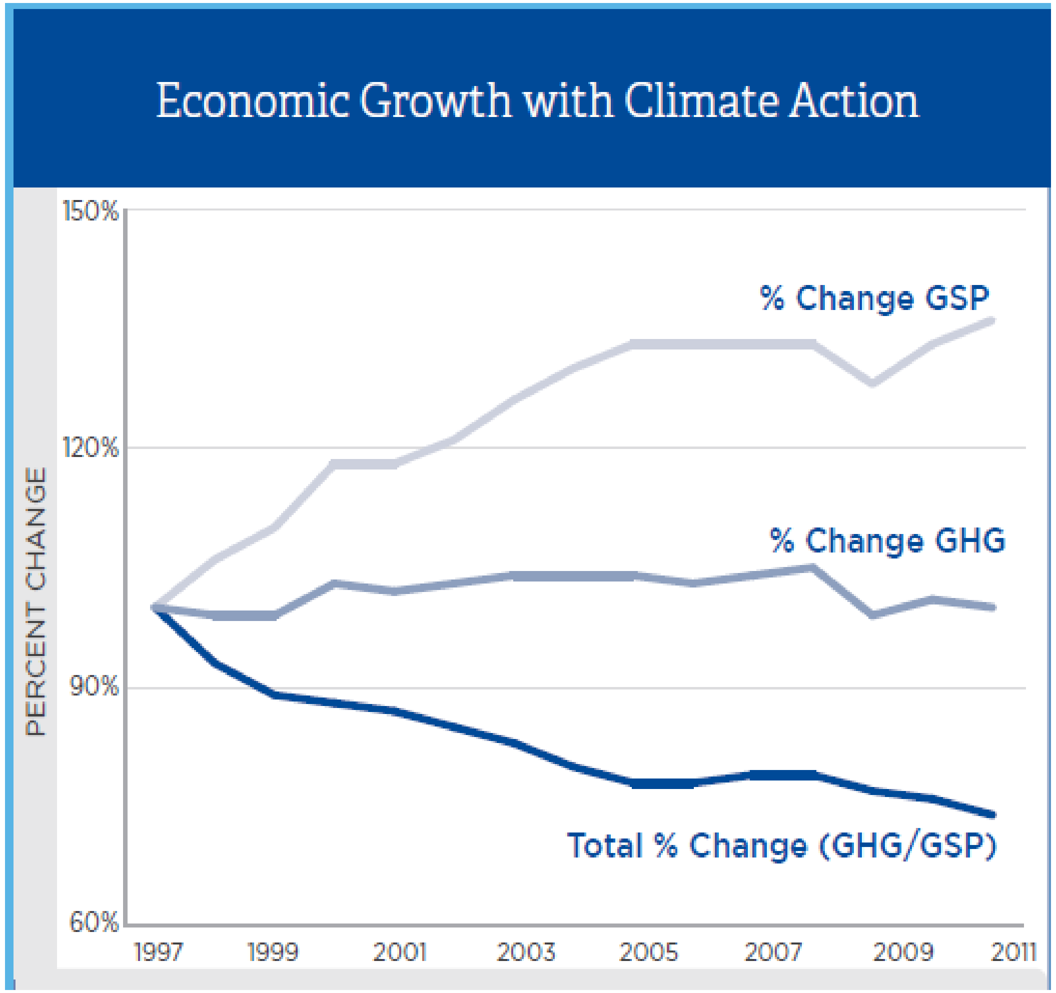
Orange Environmental report, 2018

St. Louis Park, Minnesota

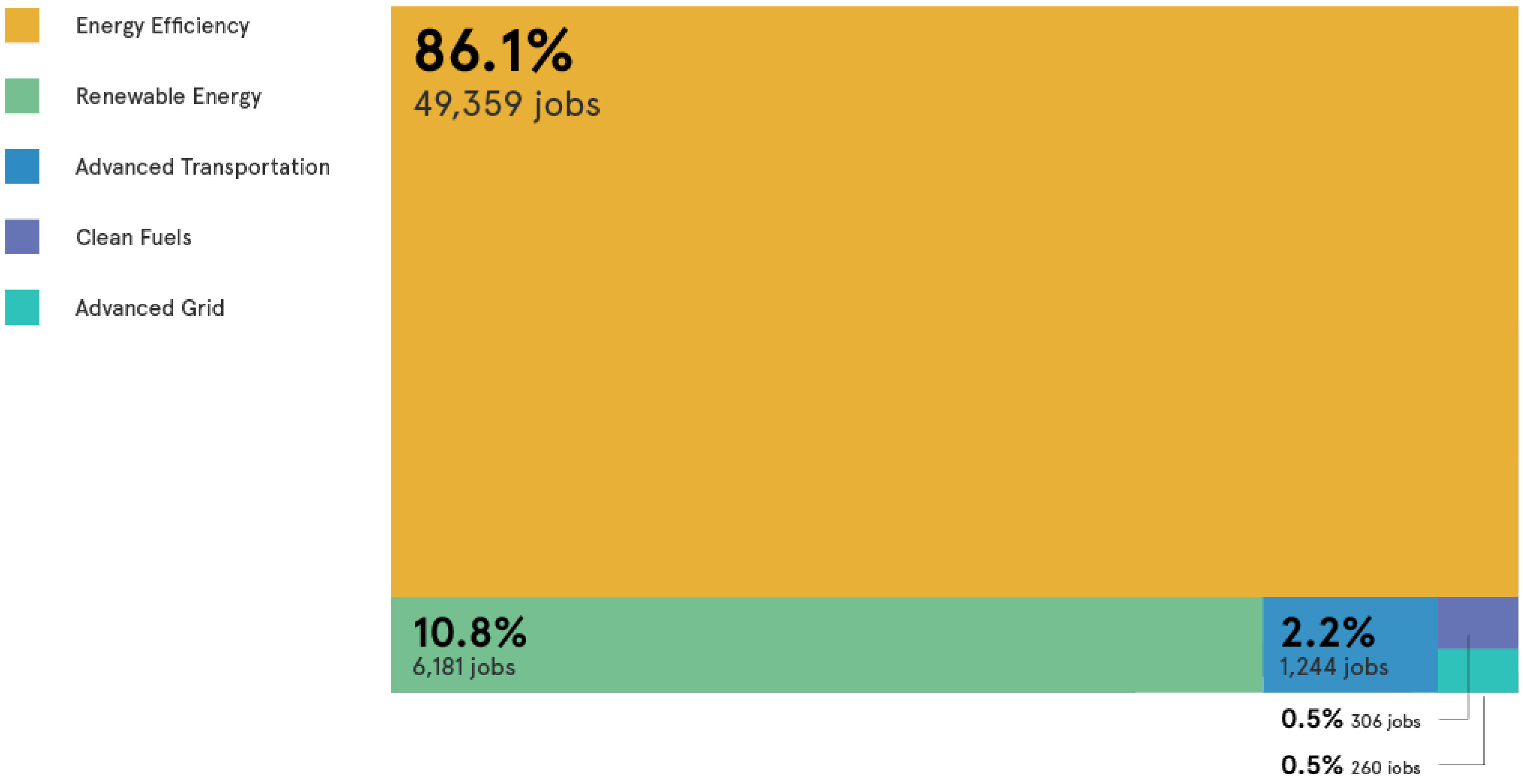




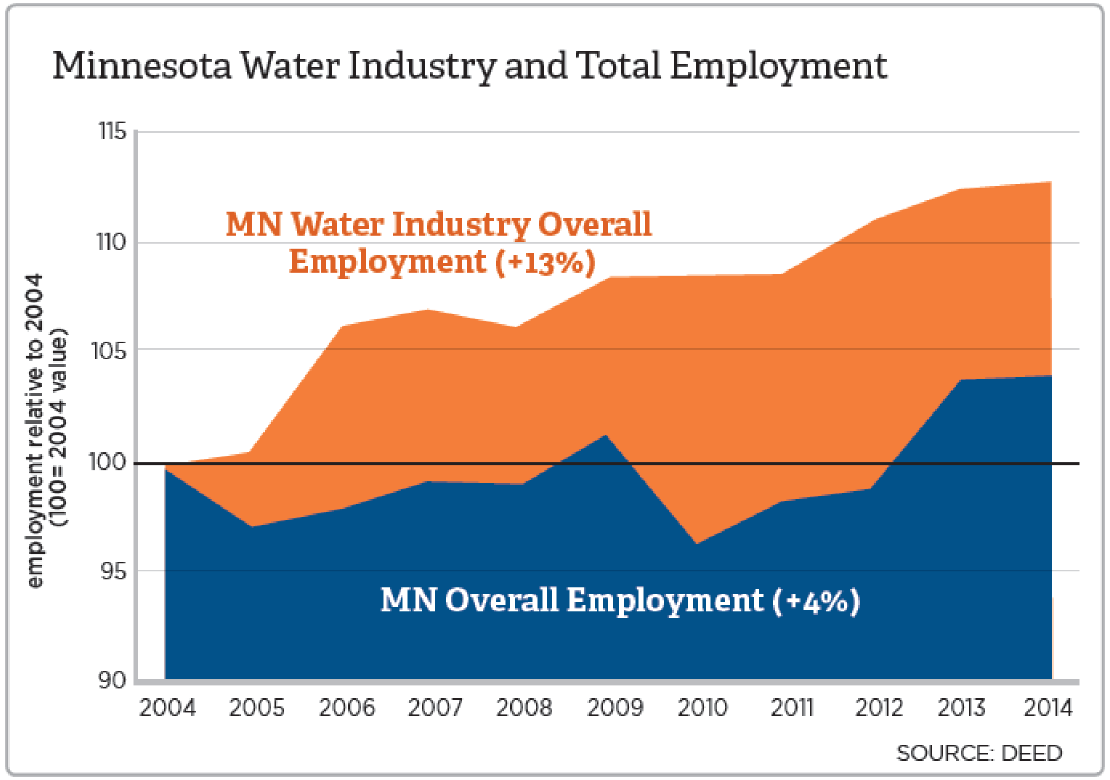
Economic and Environmental Win-Win!



Clean Energy Jobs



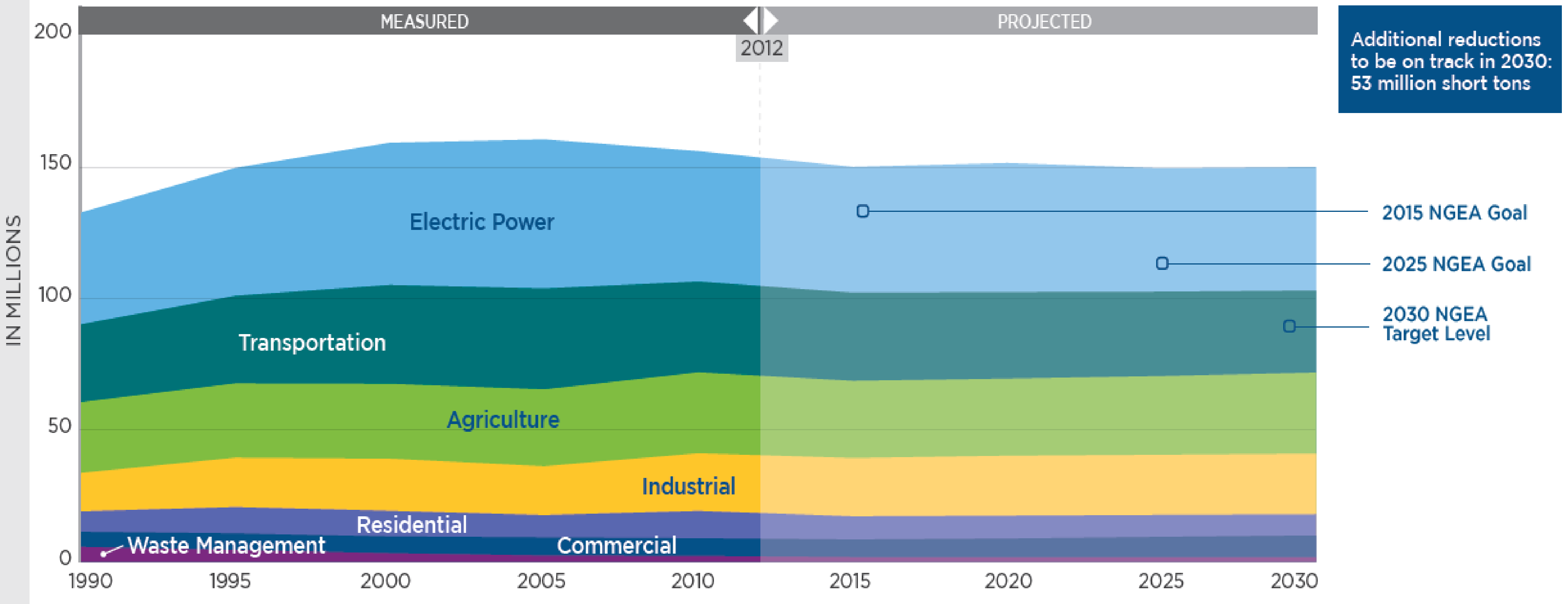
Water Technology Jobs



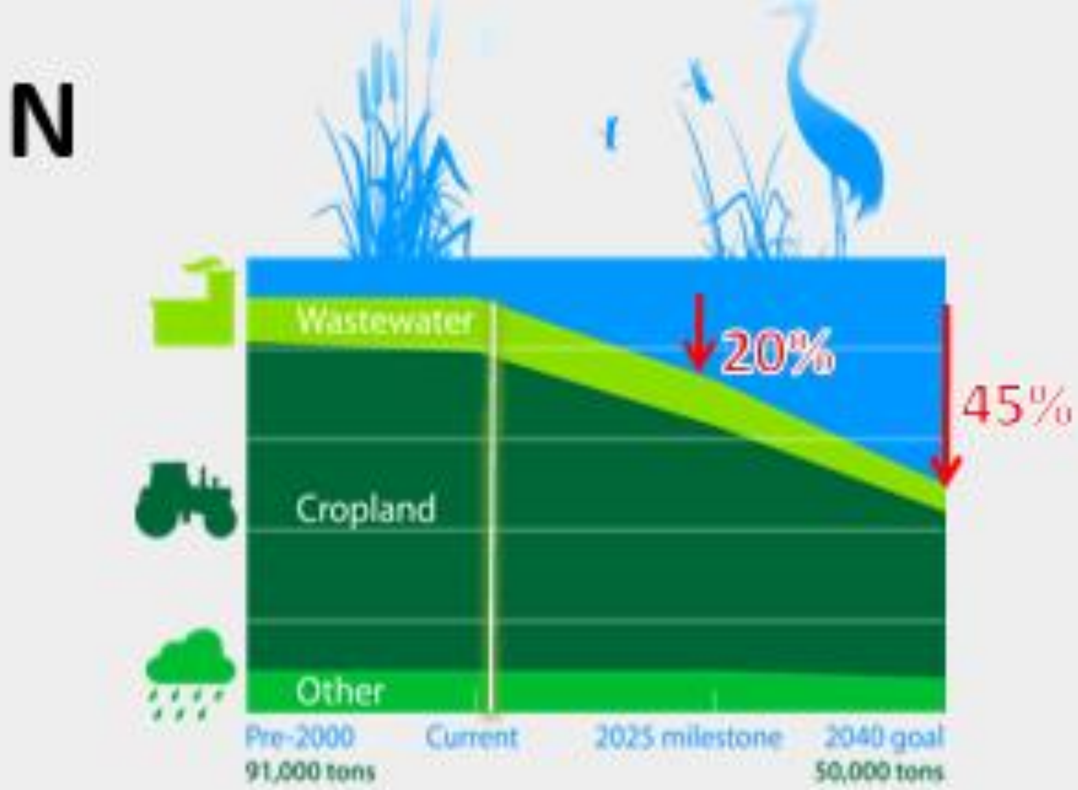
Thanks

Community PWS with source groundwater above 10 mg/L (1/1/2011 to current)	Population (2016)	Past and Potential Future Actions	Estimated Capital Cost per Household (2016 dollars)
Adrian	1211	Wells sealed and treatment plant built.	$3,400
Brookhaven Development, Louisville Township, Scott County	45	Potential future new well.	$3,400
Chandler	270	Potential future hookup to LPRWS*.	Unknown
Clear Lake	525	Treatment plant to be replaced.	$7,900
Cold Spring	4,053	Potential new wells.	$1,100
Edgerton	1,171	Treatment plant built.	$3,500
Ellsworth	456	Well sealed and treatment plant built.	$3,600
Hastings	22,335	Treatment plant built.	$430
Leota	209	Interconnect to LPRWS* installed.	Unknown
Lincoln-Pipestone Rural Water System (LPRWS)	13,010	Potential blending wells and treatment plant improvements.	$180
Park Rapids	3,808	Wells sealed, new well constructed, and treatment plant built.	$3,100
Randall	650	future potential treatment plant	$7,400
Rock County Rural Water System	2,256	Transmission main built to blend wells.	$46
Saint Peter	11,758	Treatment plant built.	$1,700
Sundsruds Court, Todd Township, Wadena County	40	Treatment installed.	$450

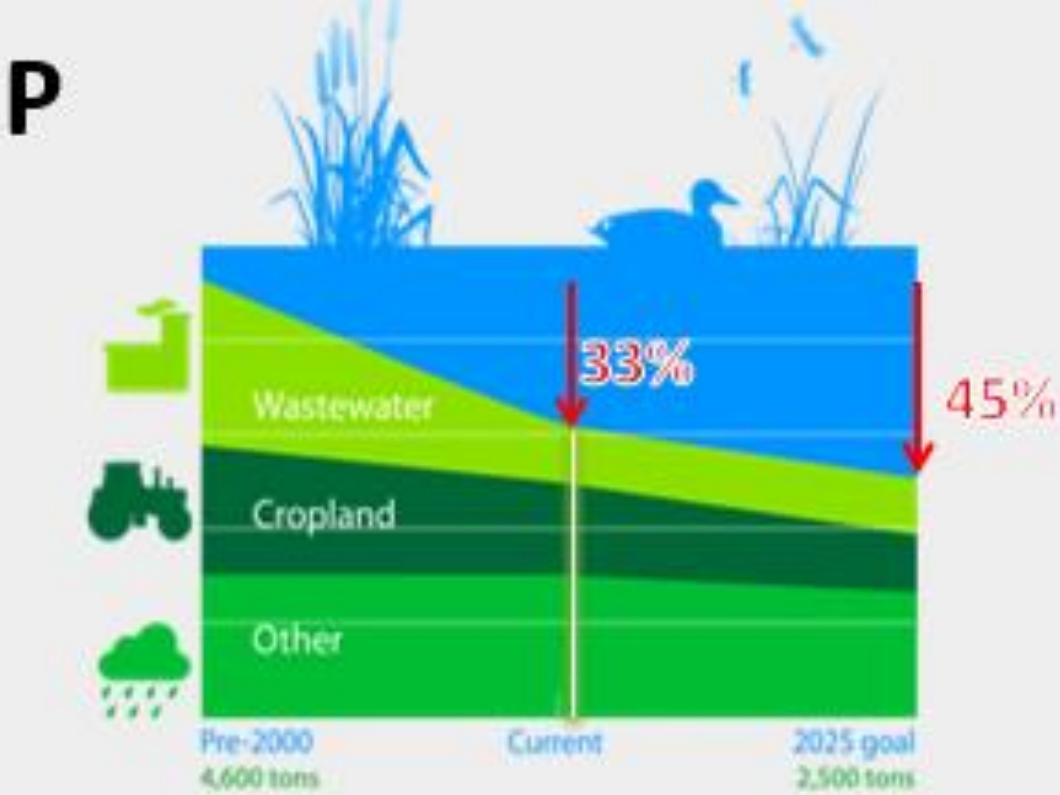
Greenhouse Gas Emissions by Sector (CO2-e short tons)



Historic greenhouse gas emissions (1990-2011) and projected emissions (2012–2030) are shown by economic sector. To be on track in 2030 for meeting Next Generation Energy Act Goals, an additional 53 million CO_2-equivalent short tons (CO_2-e) a year need to be reduced beyond business as usual. (Data source: Minnesota Pollution Control Agency, September 2013).



N
Wastewater
20%
45%
Cropland
Other
Pre-2000
91,000 tons
Current
2025 milestone
2040 goal
50,000 tons



P
33%
45%
Wastewater
Cropland
Other
Pre-2000
4,600 tons
Current
2025 goal
2,500 tons

MINNESOTA
PUBLIC FACILITIES AUTHORITY

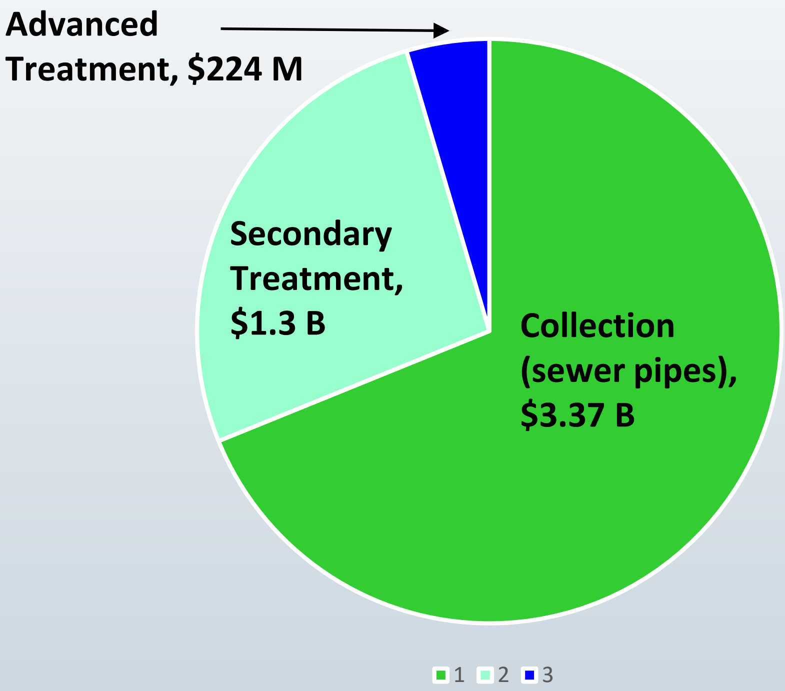
The Water-Energy Nexus

In-State Retreat, August 3, 2018

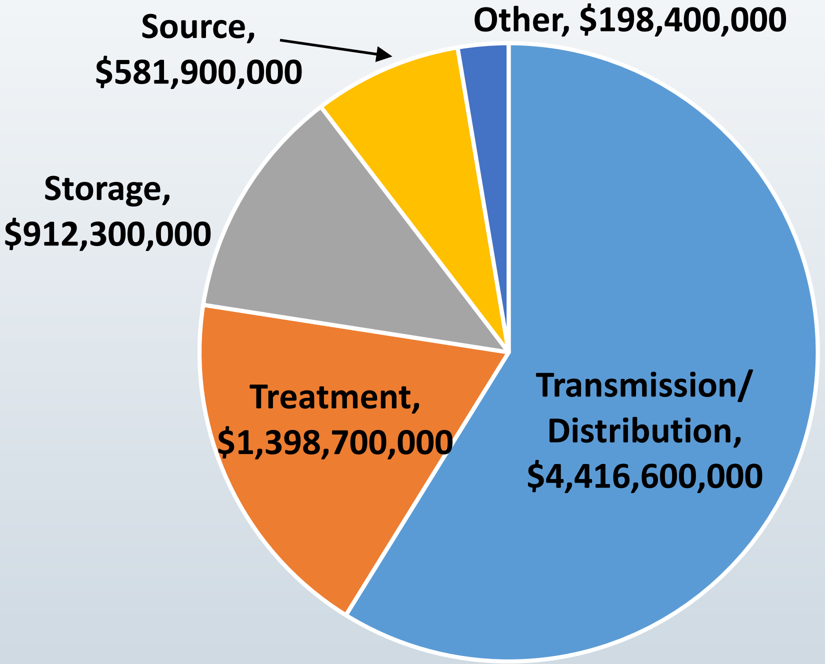
Jeff Freeman, Minnesota Public Facilities Authority

Water Infrastructure Needs

Wastewater - $4.9 billion over 20 years



Drinking Water - $7.4 billion over 20 years



MINNESOTA
PUBLIC FACILITIES AUTHORITY

Funding for Water Infrastructure Projects

- State loan and grant programs (Public Facilities Authority)
  - Clean Water and Drinking Water State Revolving Funds (loans)
  - Water Infrastructure Fund (WIF) grants
  - Point Source Implementation Grants (PSIG)
- USDA Rural Development grants and loans (federal)
- Small Cities Development Program (federal, admin by DEED)
- Local government financing (private bond market)
  - PFA credit enhancement program can help cities get higher bond rating (one notch below state)

MINNESOTA
PUBLIC FACILITIES AUTHORITY

State Funding Framework

- PFA funding is based on low interest SRF loans and targeted grants focused on affordability (WIF) and treatment requirements (PSIG)
- Project priority lists (PPL) rank projects based on age and condition of existing infrastructure and water quality and public health criteria
  - MPCA – wastewater and stormwater projects
  - MDH – drinking water projects
- PFA annual Intended Use Plans (IUPs) identify "fundable range"
  - Cities with projects ranked in the upper 2/3 - 3/4 on the PPL can be assured of at least low interest loans when ready for construction

MINNESOTA
PUBLIC FACILITIES AUTHORITY

Project Review

- Wastewater projects must submit a facilities plan to MPCA that evaluates system needs and alternatives, including a cost-effectiveness analysis
  - MPCA cost and effectiveness guidelines discuss need to include consideration of:
    - Energy conservation opportunities
    - Renewable energy opportunities
      - Solar, wind, biogass, combined heat and power
    - Water reuse options
  - Guidelines also reference Minnesota's B3 tools to identify energy conservation measures for wastewater systems and provide energy performance benchmarks

Conclusion

- PFA funding is available for most large water infrastructure projects
  - Project costs for energy improvements are eligible for PFA funding
  - CWSRF federal funds include a Green Project Reserve and possibility of a 25% principal forgiveness grant up to $1,000,000 for eligible project costs
- Smaller scale capital and operational improvement projects may often be funded by cities themselves
- Cities may be reluctant to try new technology due to cost, regulatory pressures, and the need to provide continuous 24/7/365 service
- Energy related outreach and training for public works directors, operators, consulting engineers is critical

NGA

NATIONAL GOVERNORS ASSOCIATION

Minnesota Water-Energy In-State Retreat Technical Assistance

Laura Babcock

August 3, 2018

University of Minnesota

Driven to Discover[SM]

Minnesota Technical Assistance Program

Strengthening Minnesota businesses by improving efficiency while saving money through energy, water, and waste prevention.

Technical Assistance at the Water-Energy Nexus

- Goals of Technical Assistance
  - Assess current state
  - Develop future state
  - Support transition
  - Optimize resource utilization and impact

Technical Assistance - Wastewater Facilities

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Objective: Improve WWTP energy efficiency

- 2% of ALL electric energy use in U.S.
- 25-40% of WWTP operating budget

COMMERCE DEPARTMENT
ENERGY RESOURCES

MnTAP

MINNESOTA POLLUTION CONTROL AGENCY

Energy Efficiency in Water and Wastewater Facilities , EPA 2013
Statewide Assessment of Energy Use by the Municipal Water and Wastewater Sector, NYSERDA 2008

Show - Comparative Energy Use

- Benchmarking
  - Compare operations internally and externally
  - Identify improvement opportunities
  - Monitor change
  - Track progress

Energy Star® Portfolio Manager

- Supported by Energy Star®
- Compares facilities nationally
- Requires:
    - Flow, influent/effluent BOD
    - Utility information
- Accounts for climate and operations

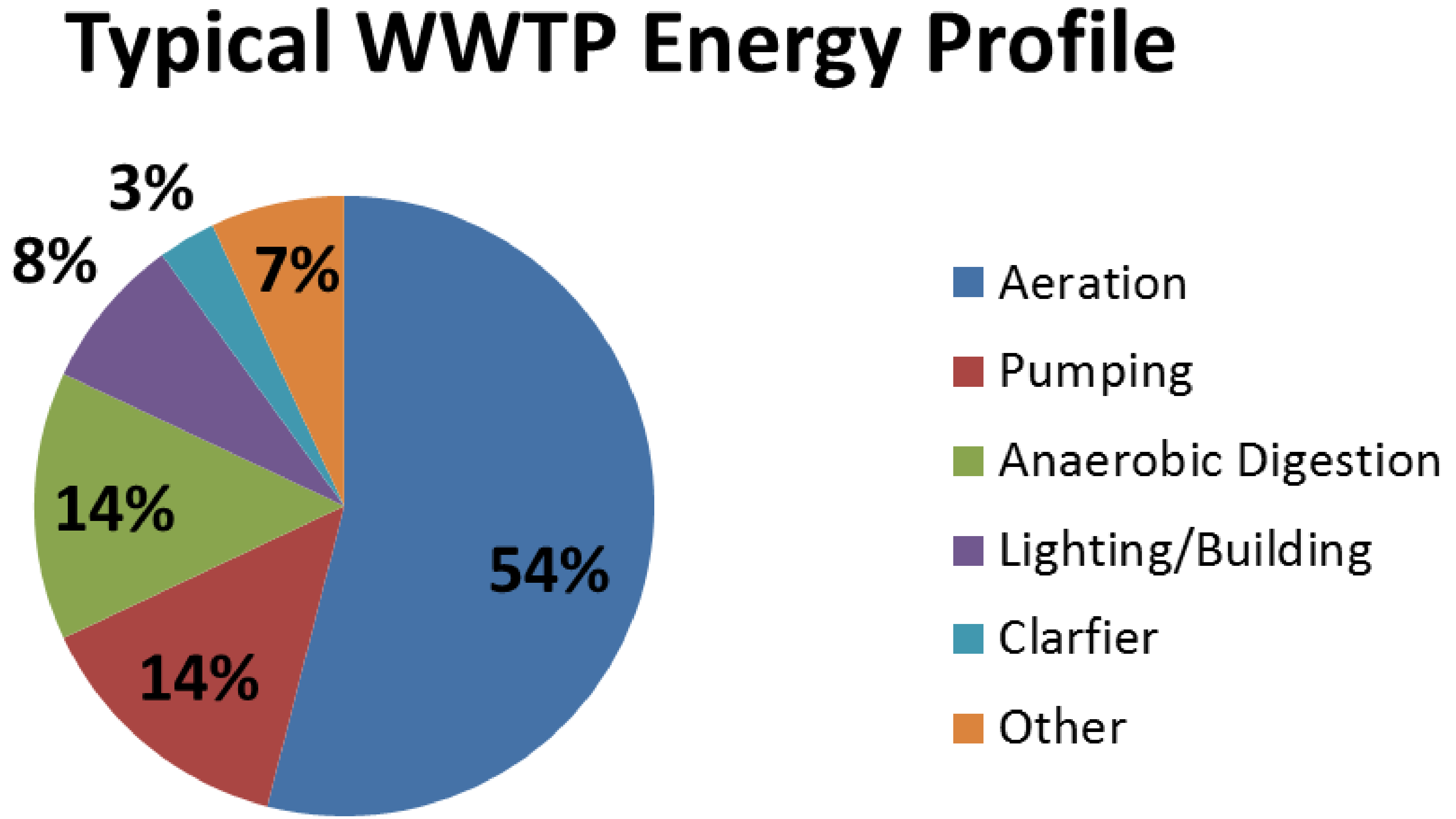
Effluent Flow (million gal/day)	Electricity Cost ($0.10/kWh)	Energy Star® Score*
0.52	$142,000	5
0.57	$45,000	57

*Score estimated using Energy Star® algorithm

B3 Wastewater Tool

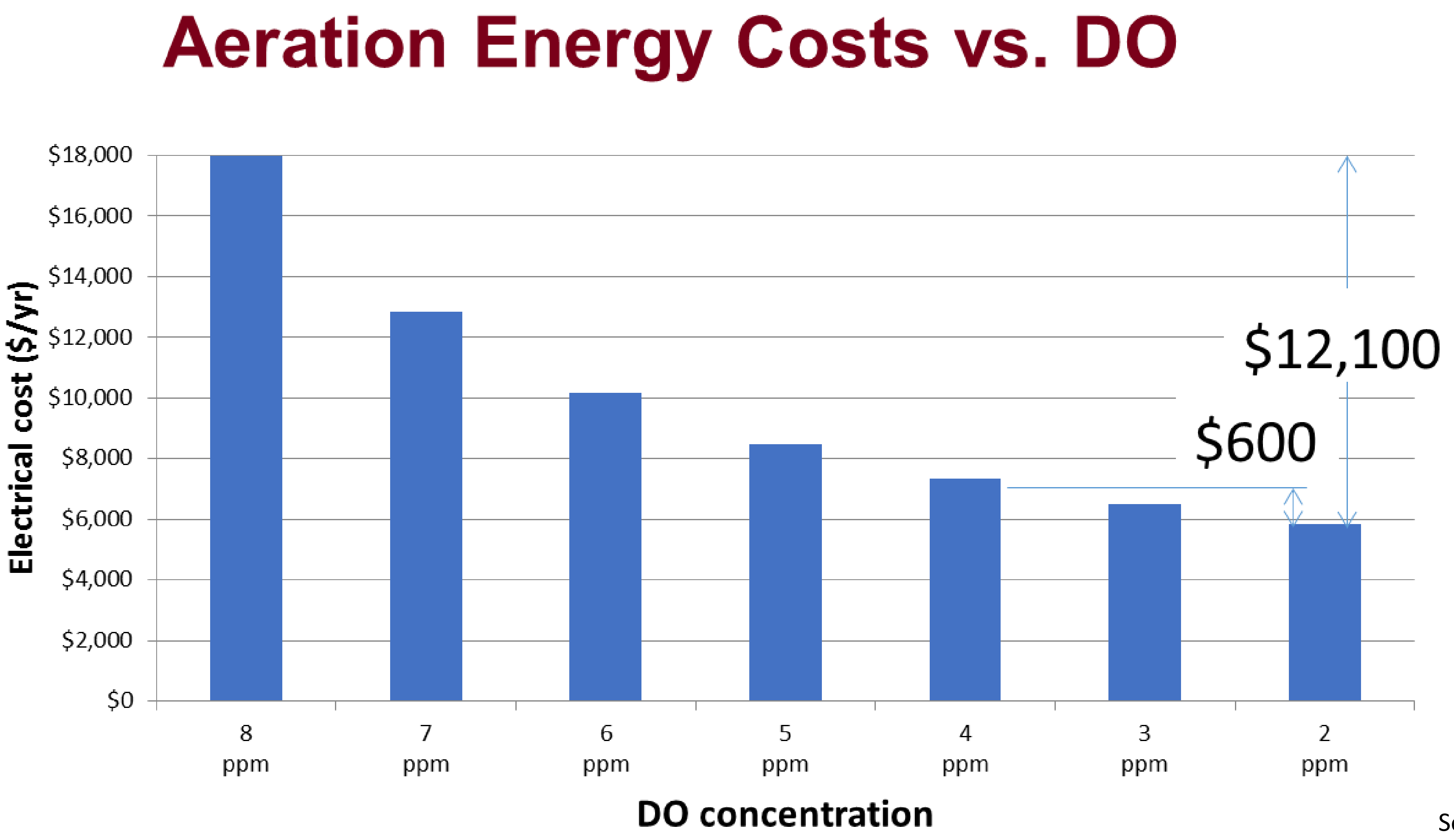
- WWTP module in Minnesota B3 Benchmarking
  - Engage facilities in energy efficiency
  - Align with state benchmarking tool
  - Provide a forum to track energy performance
  - Use best features of ESPM without size limits
- More information
  - Demonstration Video z.umn.edu/WWB3
  - http://mn.b3benchmarking.com/Documents/B3_WWTP_Overview.pdf

Help – Identify and Implement



Water and Wastewater Industry Energy Best Practices Guidebook, Focus on Energy, 2006

Efficiency Opportunities



Source: Tom Jenkins, JenTech Inc.

Energy Assessment

Pop. 2,160, Treating 0.28 MGD

Basin DO was 9.2ppm

- Opportunities
  - Use fewer aeration basins
  - Turn down blower speeds
  - Use smaller blower
- Implemented Savings
  - 220,000kWh electricity per year
  - $20,000 annual operation cost
- Estimated Score 16 to 29

Energy Assessment

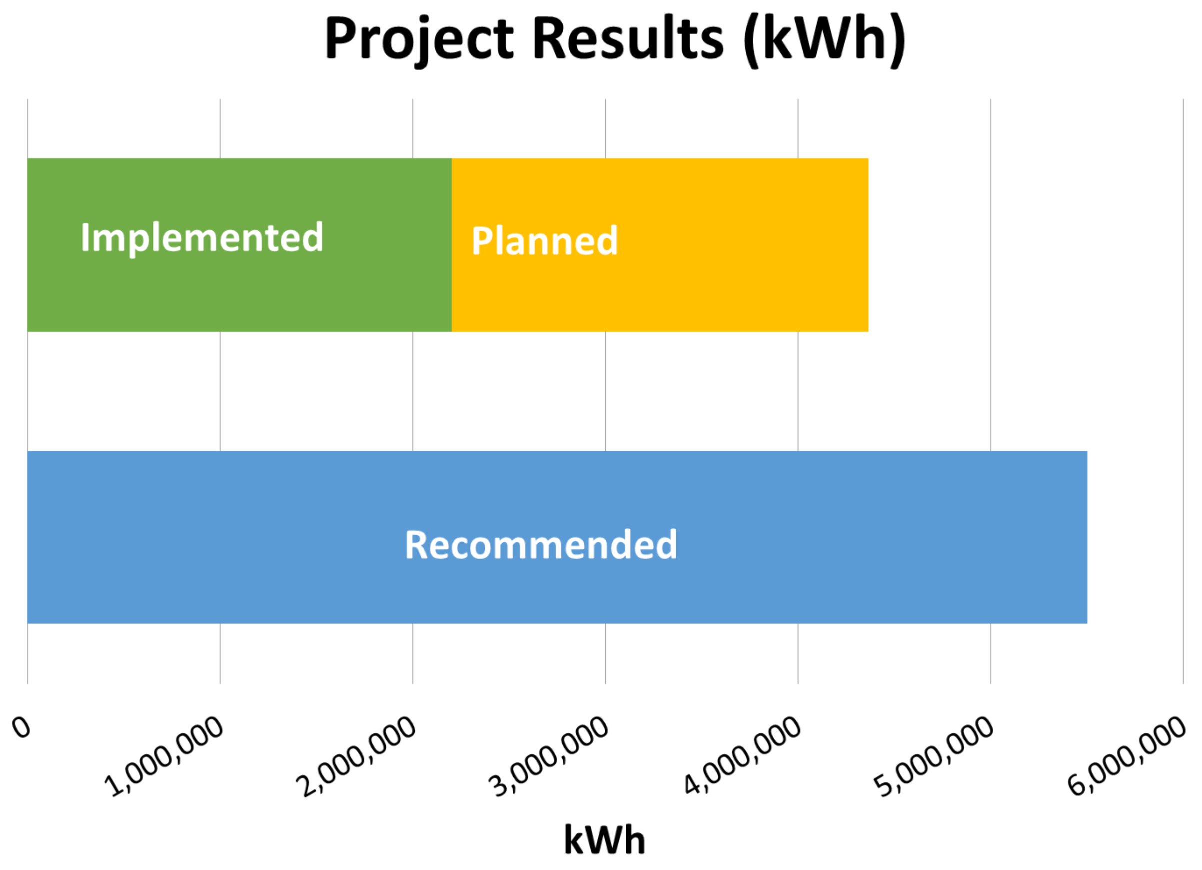
Pop. 2,470, Treating 0.41 MGD

Reduce the annual energy costs

- Opportunities
  - Turn down biosolids airflow
  - Turn off biosolids airflow after emptying
  - Tune biosolids blower cycle time
- Implemented Savings
  - ~180,000kWh electricity per year
  - ~$11,700 annual operation cost
- Estimated Score 18 to 52

Project Results

- 53 Efficiency recommendations
  - 35 Operational changes
  - 18 Capital changes
- Total Energy Potential
  - 5.5 million kWh electricity
  - 600 Minnesota homes
- High implementation potential



Next Steps - Resources for Implementation

- MnTAP Intern Projects
  - Established program
  - Experiential learning opportunities
  - Provide needed site resources for implementation
- Operations Cohort Training
  - Developing program
  - Training WWTP staff on E2
  - Implementation support through peer learning

Next Steps - Biogas Utilization

- Assess WWTP potential for Combined Heat & Power (CHP)
- Indicators for CHP feasibility
  - Energy efficiency complete
  - Generates biogas
  - Feedstocks available
  - Target flow rate >5 MGD

St. Cloud (NEW) Nutrients, Energy & Water Recovery Facility

Distributed Generation Opportunity for MN

- 64 mechanical plants with anaerobic digestion
- <10 facilities with flow >5 MGD
- Explore CHP opportunity for flow >1 MGD and high BOD*
- 26 Minnesota facilities treat >2000 lb BOD/day

*https://www.epa.gov/sites/production/files/2015-07/documents/opportunities_for_combined_heat_and_power_at_wastewater_treatment_facilities_market_analysis_and_lessons_from_the_field.pdf,

CHP Screening Results

- Level 1 assessments to determine site potential for CHP projects
- Reasonable CHP payback potential (4-10 yrs) at smaller facilities
- Potential benefit to scope anaerobic digestion and CHP at smaller facilities with high load

Site	Flow	BOD Removal (lb/day)	CHP Simple Payback
1	3.2 MGD	12,400	3.9 yr
2	1.5 MGD	2,500	9.1 yr
3	3.4 MGD	9,700	4.2 yr
4	1.2 MGD	1,200	4.8 yr

Technical Assistance at the Water-Energy Nexus

Energy Efficiency and Renewable Energy Generation

Minnesota Wastewater Facilities

Strategies that work!

- Show
  - Benchmarking
- Help
  - Assessments
- Next Steps
  - Implement efficiency
  - Biogas utilization

COMMERCE DEPARTMENT ENERGY RESOURCES

Mn TAP

MINNESOTA POLLUTION CONTROL AGENCY

Minnesota & National Governors Association Water-Water-Energy Nexus Retreat

Wade Klingsporn

August 3, 2018

Vermilion
The Boundary Waters College

Background and Current Status of the MN Water/Wastewater Workforce

- Availability of staff: Major limitation?
  - Entry level staff
  - Supervisory level staff
- Availability of jobs: Rarely a shortage
  - League of Minnesota Cities (28)
  - MN Rural Water Association (10)
- Age distribution of workforce: Lack of data in MN

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The Boundary Waters College

The Workforce Need!

- *According to the National Rural Water Association:*

*“It takes more than **380,000 highly skilled** water and wastewater personnel to ensure the public supply of safe drinking water and to protect our lakes, streams and groundwater”.*

*“Over the next decade, the water sector is expected to lose between **30 and 50 percent** of the workforce to retirement. Many of these employees have worked at the same utility for the majority of their careers, and they will depart with decades of valuable institutional knowledge”.*

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Availability of Staff

- Entry level staff:
  - Water/Wastewater Operations degrees (Vermilion Community College, St. Cloud Technical College)
  - Operator in Training programs (WLSSD, MetCouncil)
  - Apprenticeship program (NRWA)
- Supervisory level staff:
  - Replacing retiring upper-level staff
  - Small rural towns
  - Contractors???

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The Boundary Waters College

Demographics

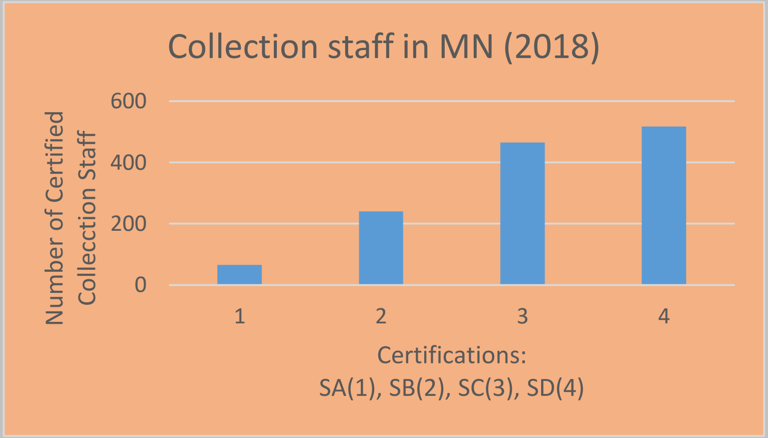
- MPCA Wastewater Operations Specialists and Collections (S) staff:

Wastewater Operators

- A: 285
- B: 390
- C: 534
- D: 1035

Collection

- SA: 65
- SB: 240
- SC: 465
- SD: 517



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Demographics

- MDH – Water Operations Specialists
  - A: 250
  - B: 553
  - C: 1238
  - D: 1236

Vermilion
The Boundary Waters College

Workforce Development Programs
Continued Education

- MANY opportunities!
- MRWA lists 66 separate training sessions (2018/2019):
  - **MRWA**
  - MDH
    - Minnesota Training Coalition
      - Determines need and content and assessment of former training events
  - AWWA
  - MPCA
  - VCC (SWAMP)
  - MWOA
  - CSWEA

  - *Topics: SDWA, Wastewater, Water, Collections, Certification Refreshers, Small Systems, Pumps, Bioslids, etc.*

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Workforce Development Programs
Continued Education

- MPCA Training attendance (2018)

  Years of Experience:

  - **0-5:** 30%
  - **5-10:** 25%
  - **10-15:** 8%
  - **15-20:** 16%
  - **20-25:** 6%
  - **25-30:** 5%
  - **30+:** 10%

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The Boundary Waters College

Trends

- Aging workforce – especially in the Supervisory positions
  - Loss of knowledge
- Less high school students going on into trades education/field
  - Where will the workforce come from?

- Focus is starting to shift to "Optimization"
  - *Doing more with less*
    - *Reduction in pollution discharge*
    - *Reduction in cost (less chemicals, more efficiency)*
  - 2 separate projects (MRWA and MPCA)
    - MRWA and MNTAP: Pond Optimization
    - MPCA: Wastewater Treatment Optimization

Vermilion
The Boundary Waters College

Conclusion

- Need to make career more appealing:
  - Wages/Benefits
  - Job stability
  - Environmental stewardship
  - Diverse workforce
- Shift focus from meeting limits to energy efficiency, reduction in pollution, and reduced operating costs

Vermilion
The Boundary Waters College

Questions?

Wade Klingsporn

Vermilion Community College

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218.341.4168 (Cell)

Vermilion
The Boundary Waters College

Lunch & Keynote

Tracy Hodel, Assistant Utilities Director, City of St. Cloud Minnesota

Patrick Shea, Public Services Director, City of St. Cloud Minnesota

NGA
NATIONAL GOVERNORS ASSOCIATION

AHEAD OF THE CURVE
INNOVATION GOVERNORS

Water & Energy Innovations

at the St. Cloud NEW (Nutrient, Energy & Water) Recovery Facility

HYDRO

- 8.86 MW
- 47M kWh

DRINKING WATER

- Lime Softening
- 24 MGD

STORMWATER

- 190 miles
- 8,000 catch basins
- 212 outfalls

RESOURCE RECOVERY

- Renewable Energy Production
- 18 MGD

ST.CLOUD GREATER PUBLIC UTILITIES

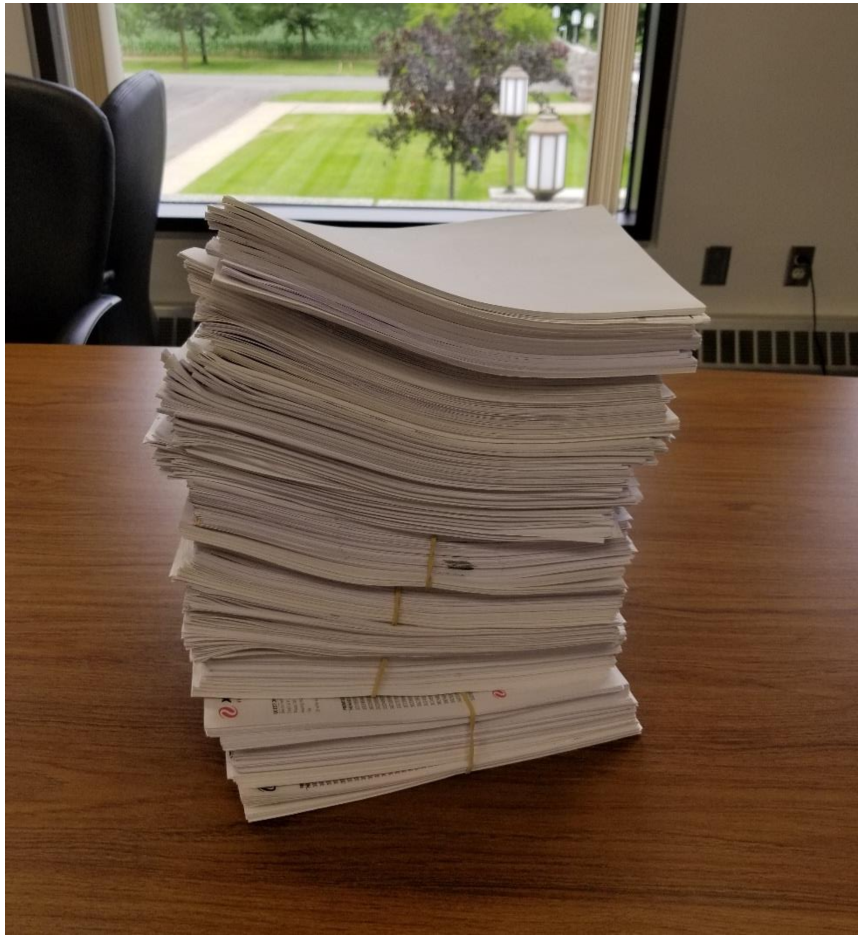
St. Cloud NEW (Nutrient, Energy & Water) Recovery Facility

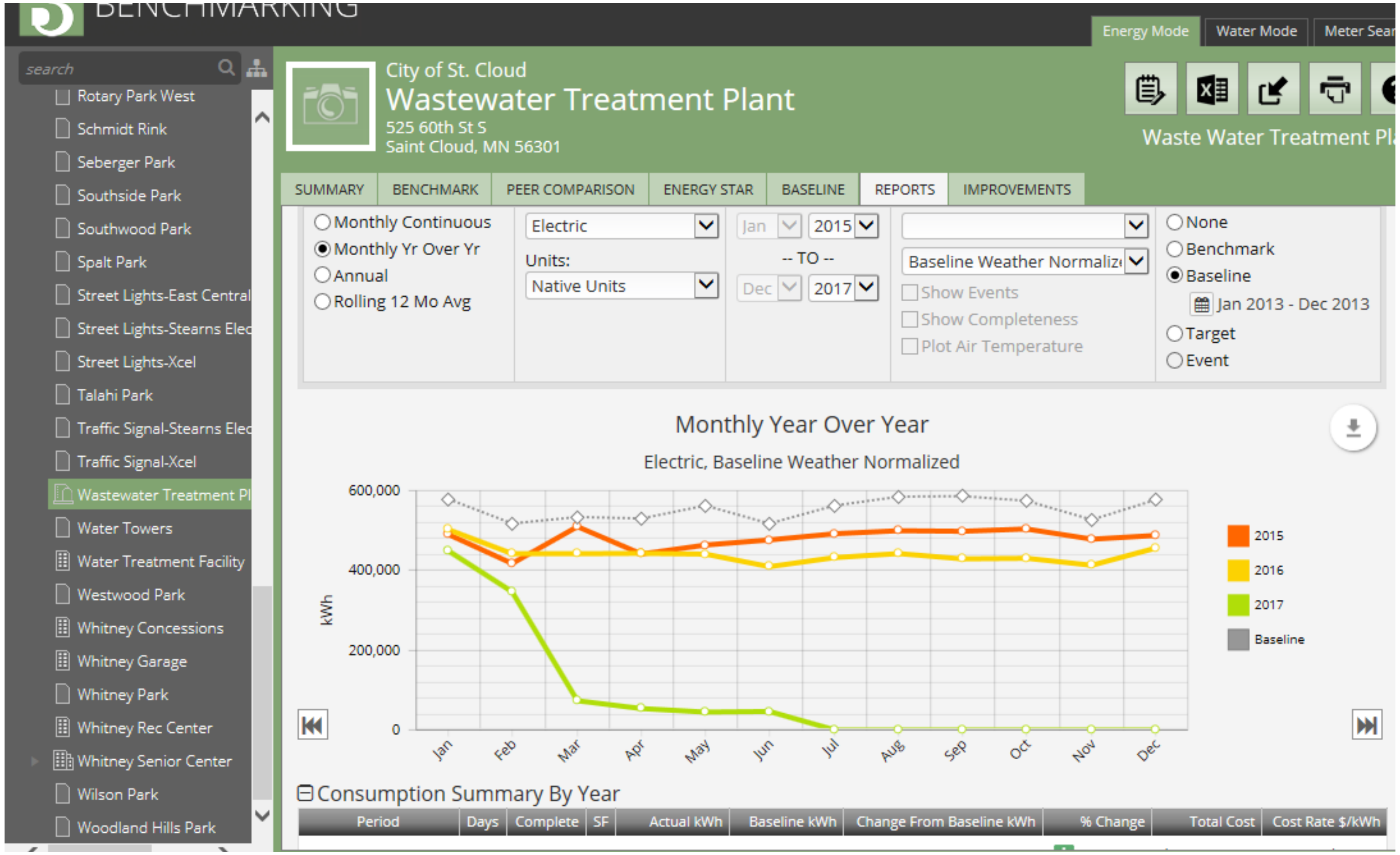
OVERVIEW

- Energy Data
- R2E2 Master Plan
- Energy Efficiency
- Biofuel Recovery
- Solar
- Nutrient Recovery & Reuse

You Can't Manage What You Don't Measure

B3 Benchmarking

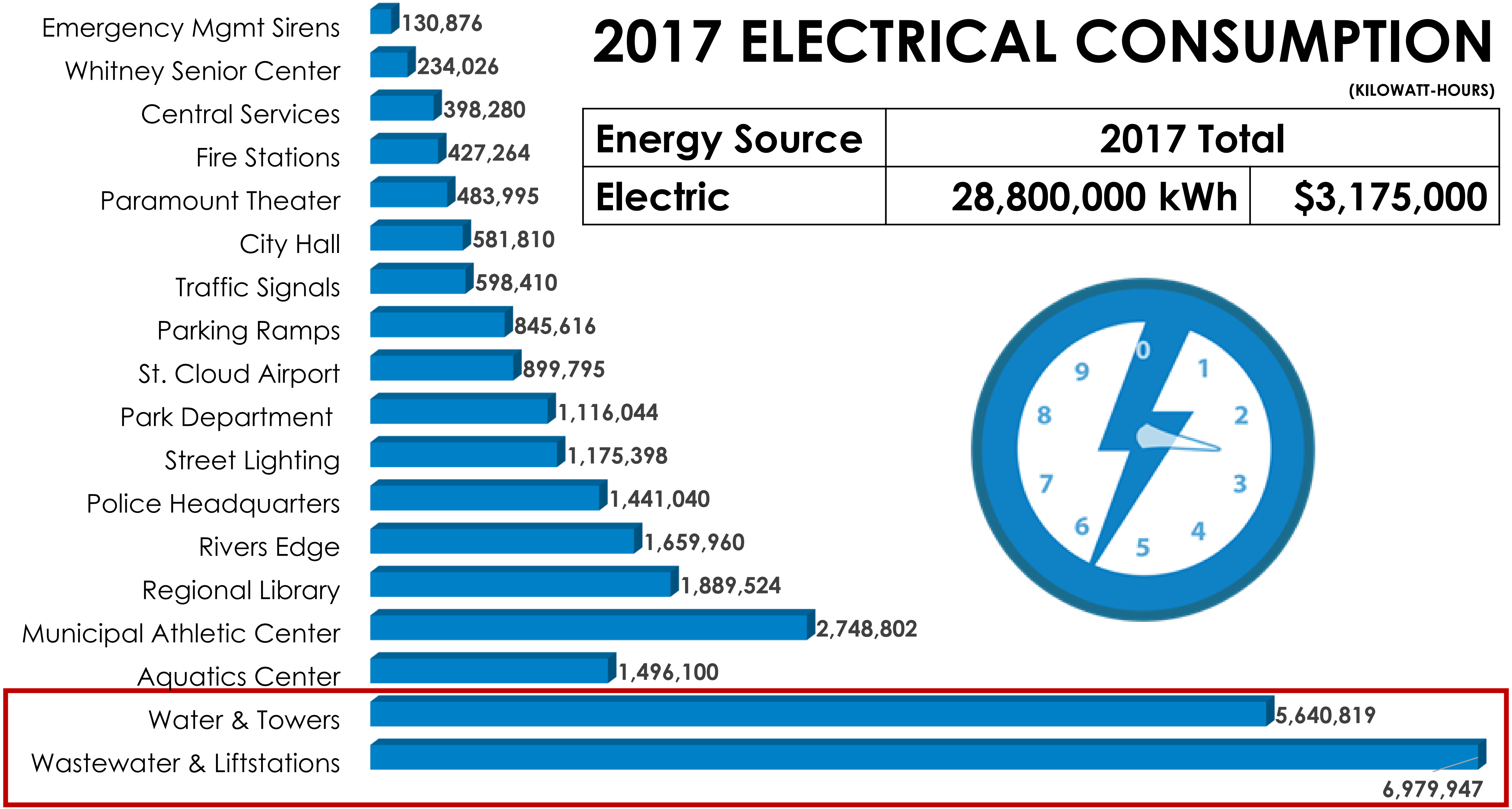




2017 ELECTRICAL CONSUMPTION

(KILOWATT-HOURS)

Energy Source	2017 Total	
Electric	28,800,000 kWh	$3,175,000



R2E2 MASTER PLAN

RESOURCE RECOVERY & ENERGY EFFICIENCY MASTER PLAN

Energy Efficiency

Biofuel Recovery

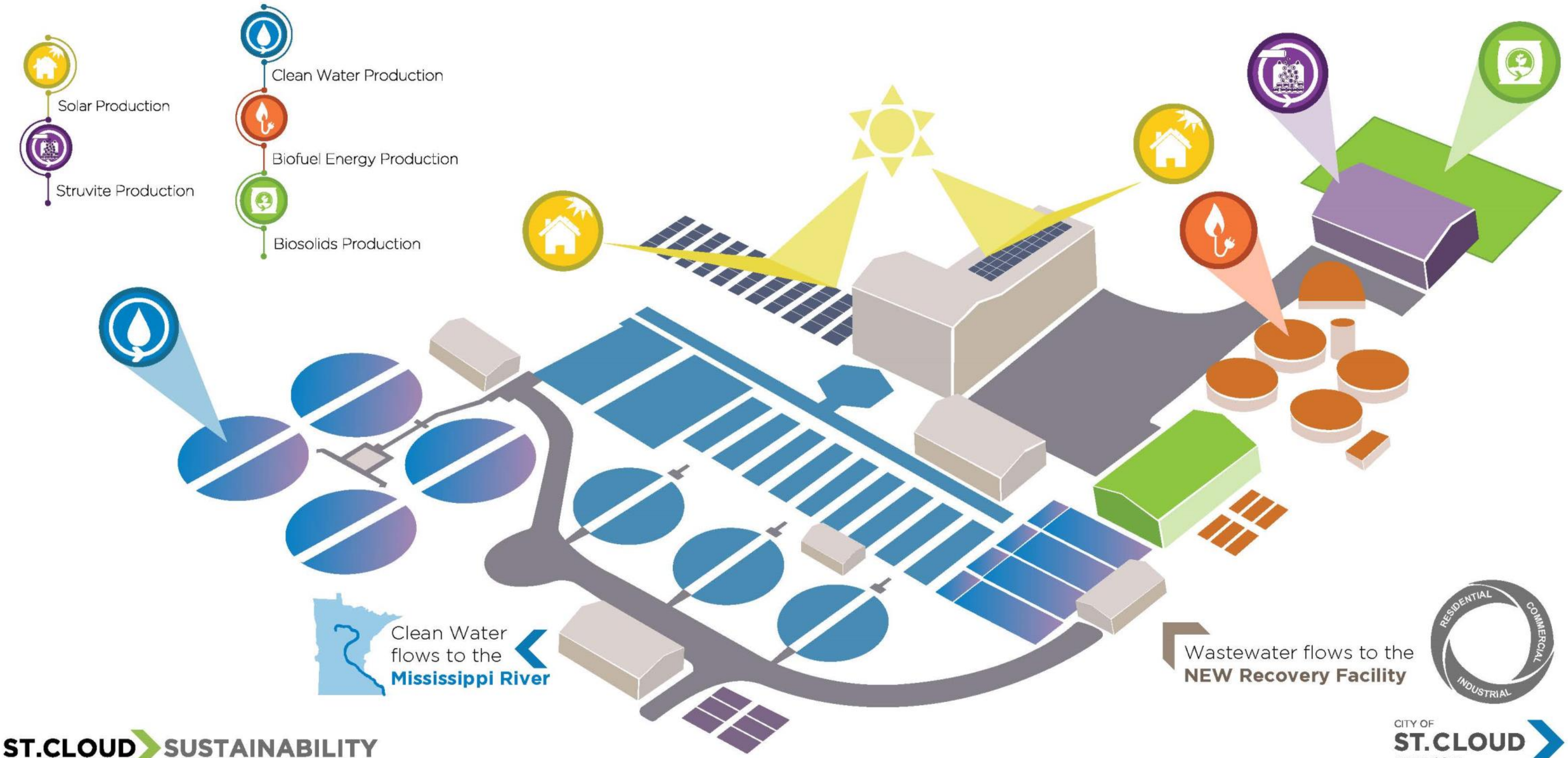
Solar

Resource Recovery & Reuse

St. Cloud Nutrient, Energy & Water Recovery Facility

Producing Clean Water, Renewable Energy, and Recovering Nutrients

The St. Cloud NEW Recovery Facility is a leader in innovative, cost-effective, and sustainable practices, producing renewable energy, recovering nutrients, and sending clean water back to the environment. The NEW Recovery Facility makes the City of St. Cloud GREATER, converting waste products to renewable resources.



ST.CLOUD SUSTAINABILITY

CITY OF ST.CLOUD MINNESOTA

ENERGY EFFICIENCY

RESOURCES

MN TAP - Internship Program

Xcel Energy – Process Efficiency Program

ENERGY EFFICIENCY

Lighting

HVAC

Pneumatic System Upgrades

Blower Optimization

Energy Efficiency Improvements & Upgrades

1,600,000
Kilowatt-Hours

=

164
Homes' Electricity
(Use for one year)

1,200,000
Pounds of Coal

2,700,000
Miles Driven
(By a passenger vehicle)

ENERGY & COST SAVINGS

40,000,000

Kilowatt-hours
in 25 years

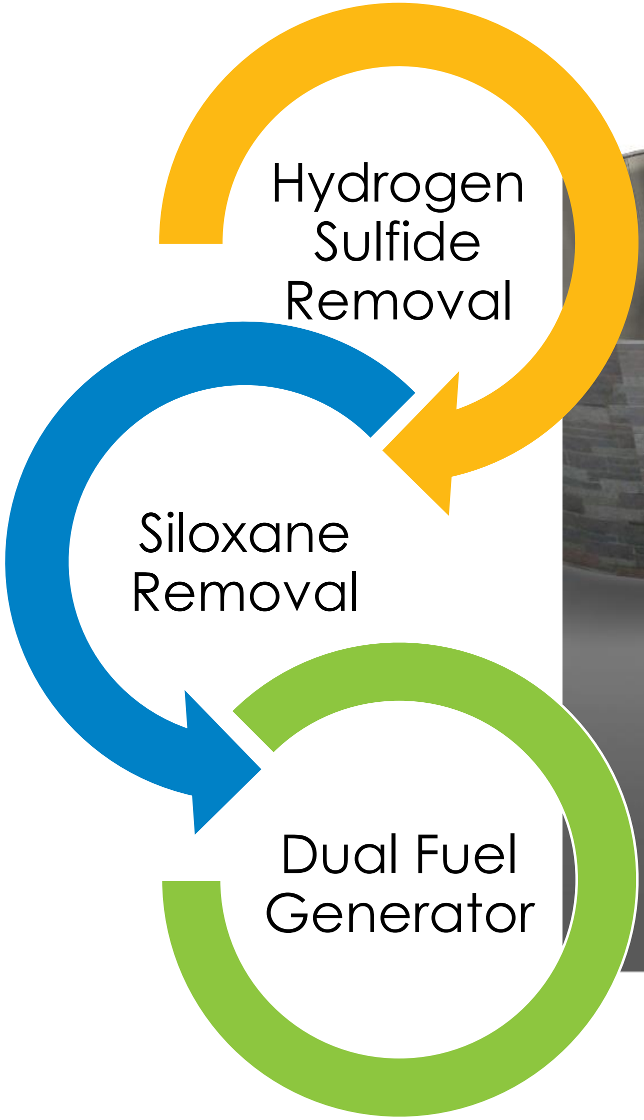
$3,500,000

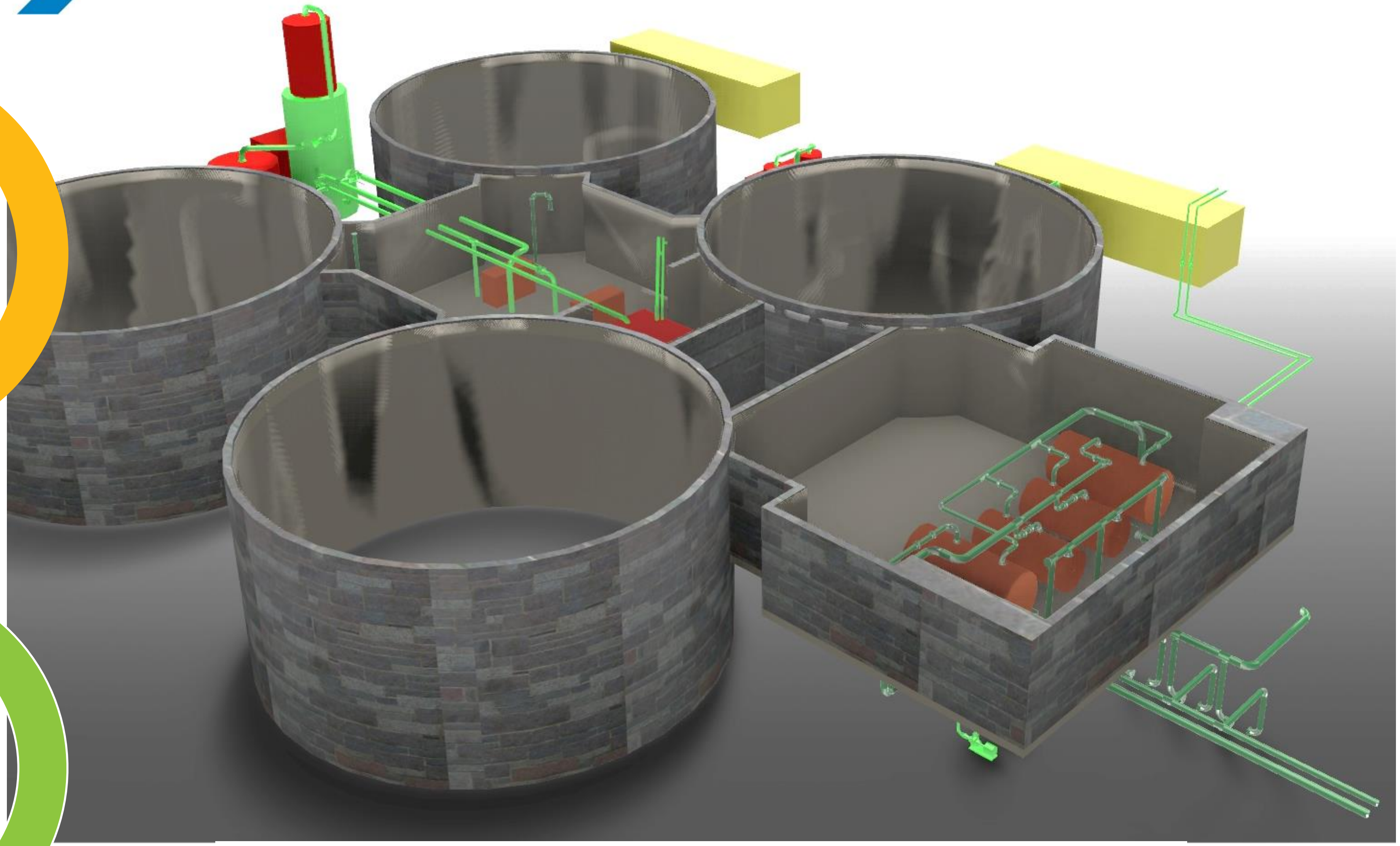
Savings in 25
years

BIOFUEL RECOVERY

CITY OF
ST.CLOUD
MINNESOTA

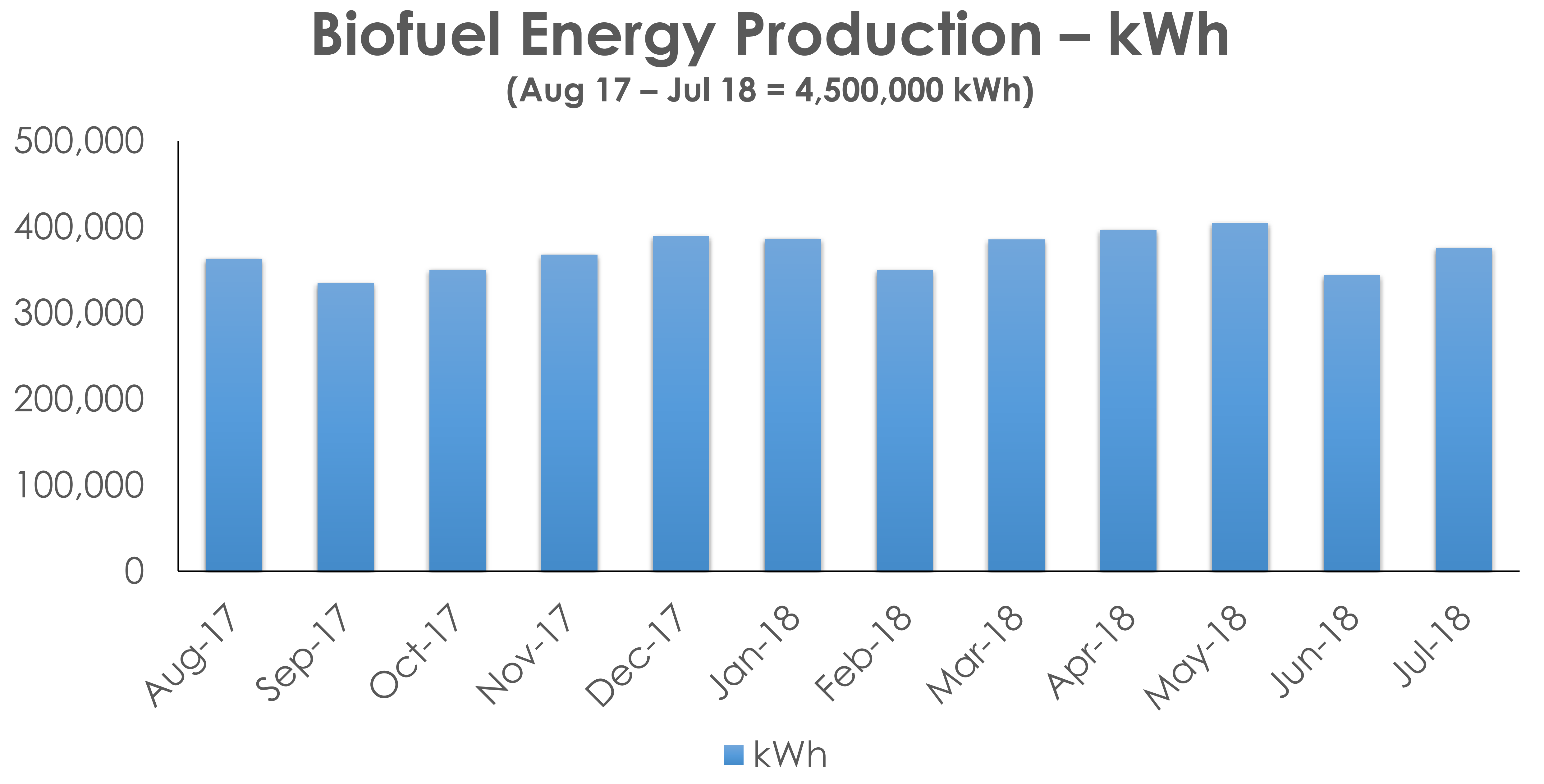
BIOFUEL RECOVERY





ST.CLOUD SUSTAINABILITY

BIOFUEL RECOVERY


Biofuel Energy Production – kWh
(Aug 17 – Jul 18 = 4,500,000 kWh)
500,000
400,000
300,000
200,000
100,000
0
Aug-17
Sep-17
Oct-17
Nov-17
Dec-17
Jan-18
Feb-18
Mar-18
Apr-18
May-18
Jun-18
Jul-18
kWh

ENERGY & COST SAVINGS (EFFICIENCY + PRODUCTION)

40,000,000 +
122,000,000 =
162,000,000 kWh's

$3,500,000 +
$10,000,000 =
$13,500,000

GREENHOUSE GAS EQUIVALENCY

162,000,000 kilowatt-hours

266,000,000 pounds of carbon dioxide emissions

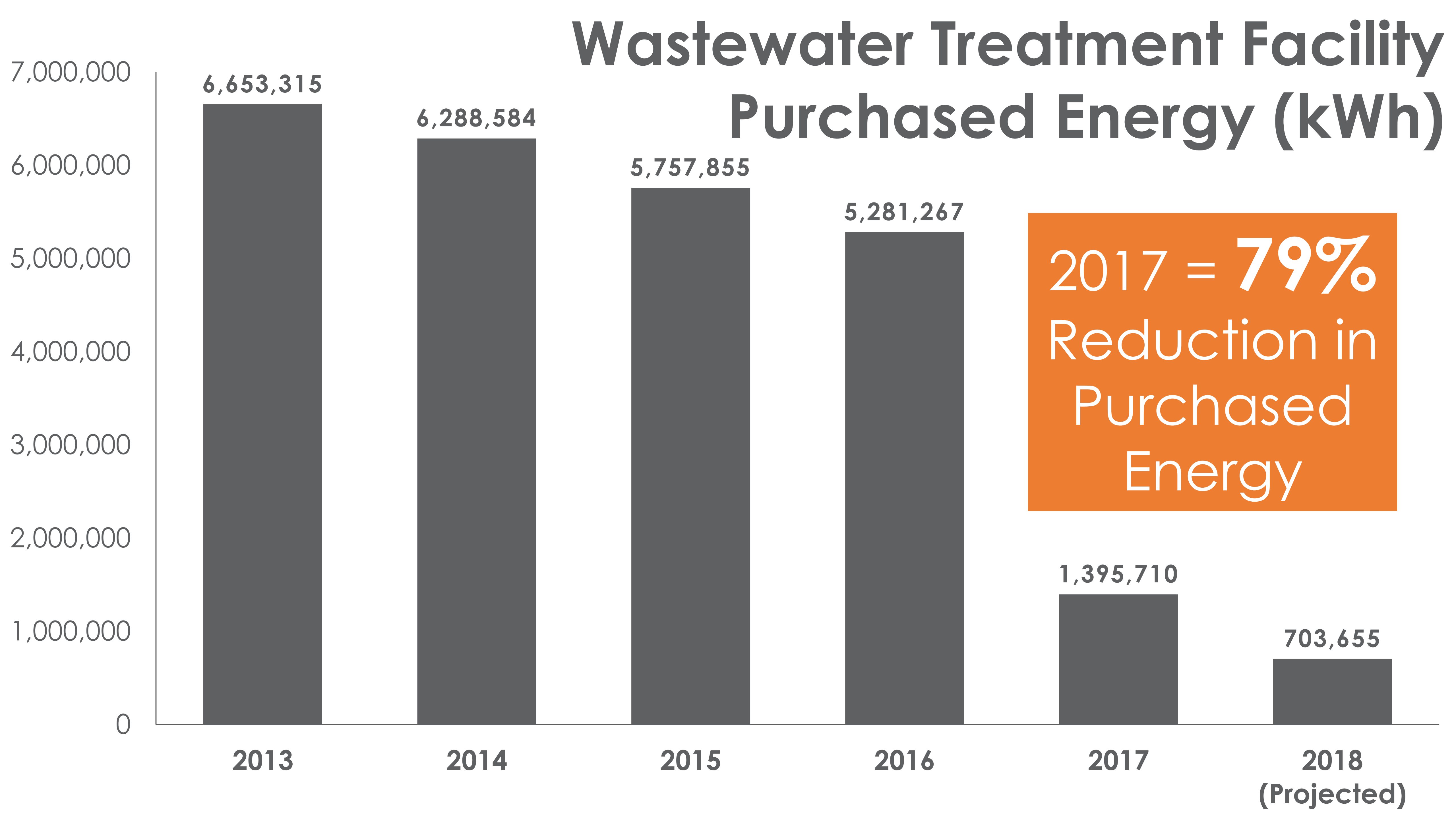
SOLAR

SOLAR

Annual Production – 340,000 kWh's

CITY'S FIRST SOLAR INSTALL – 20KW ROOFTOP

CITY'S FIRST BEHIND THE METER INSTALL – 220KW


Wastewater Treatment Facility
Purchased Energy (kWh)
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
6,653,315
6,288,584
5,757,855
5,281,267
1,395,710
703,655
2013
2014
2015
2016
2017
2018
(Projected)
2017 = 79%
Reduction in
Purchased
Energy

% RENEWABLE

Jun 2017	94%
	84%
Aug 2017	81%
	81%
Oct 2017	75%
Nov 2017	80%
Dec 2017	79%
Jan 2018	75%
Feb 2018	77%
Mar 2018	81%
Apr 2018	86%
May 2018	90%
June 2018	85%

NUTRIENT RECOVERY & REUSE PROJECT

NR2 PROJECT TIMELINE

2010-13 | 01 | 2014 | 02 | 2015 | 03 | 2016 | 04 | 2017 | 05 | 2018 | 06 | 2019

RUE

RUE Project
Construction of the $48M Rehabilitation, Upgrade & Expansion Project

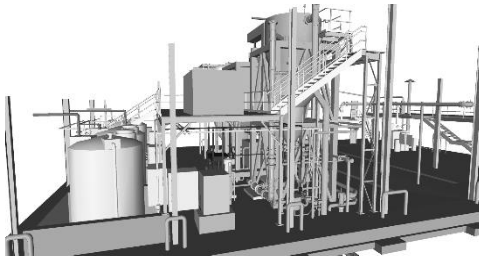
R2E2 Master Plan
Development of a Resource Recovery & Energy Efficiency Master Plan

Pilots
- Bioset
- Screw Press (2)
- Ostara

NR2 Funding & Regulatory
- PFA IUP
- PSIG
- Facilities Plan
- NPDES Permit

Finalize Design & Bidding
- April – Advertise
- May – Open Bids
- June – Award Bid

Construction Schedule
- July 2017 – Start Construction
- November 2018 – Substantial Completion
- April 2019 – Final Completion



CORE AREAS

POLICY	FUNDING & FINANCING	TECHNICAL ASSISTANCE	WORKFORCE DEVELOPMENT
• BIDDING LAWS	• GRANTS • PERFORMANCE CONTRACTING • PFA LOAN APPLICATION PROCESS • TIMING; SOLAR RELATED TAX CREDITS • EQUIPMENT SITE VISITS	• "ENERGY" EDUCATION • UTILITY BILL • ENERGY DATA MANAGEMENT • B3 BENCHMARKING IMPROVEMENTS • UTILITY ASSISTANCE - PROVIDE AUTOMATIC DATA ENTRY	• DIVERSITY IN EDUCATION & EXPERIENCE • TECHNOLOGY & COMPLEXITY

CENTRAL STATES WATER ENVIRONMENT ASSOCIATION

CSWEA Member WEF Central States Water Environment Association

LIFT Leaders Innovation Forum for Technology

MN SECTION RESOURCE RECOVERY & ENERGY (R2E) COMMITTEE

- Resource for WWTF's & Collection Systems
- Minnesota Network
- Focus on Sustainable Technology
- Planning for the Future
- For Operators, Supervisors, and Others
- Large and Small Utilities
- http://cswea.org/minnesota/
- Recognition Opportunities

Technology Scans

LIFT Link

Info Sharing & Collaboration

SEE IT

University-Utility Partnership

Test Bed Network

MA Toolbox

OPPORTUNITY & IMPACT

Energy Potential contained in wastewater, biosolids, biogases **exceeds by 10 times** the energy used to treat

Resource Recovery Facilities collectively could potentially meet **10 percent** of the national electricity demand

OPPORTUNITY & IMPACT

- $13.5M

Saves Money

Rates

- Low
- Stable

FOR OUR FUTURE GENERATIONS

THANK YOU & QUESTIONS

Patrick Shea
Public Services Director
320.255.7225

Tracy Hodel
Assistant Public Utilities Director
320.255.7226

Best Practices Presentations & Discusssion

Technical Assistance: Clifford P. Haefke, Director, Energy Resources Center, University of Illinois at Chicago

Policy: Megan Levy, Local Energy Programs Manager, Wisconsin Office of Energy Innovation

Funding: Alice Dasek, Energy Efficiency & Renewable Energy, U.S. Department of Energy

Workforce Development: Dave Kuzminski, Coordinator, Water & People Program/Water Boot Camp, Hartford Connecticut

CHP and Energy Efficiency Technical Assistance Resources for the Wastewater Market Sector

National Governors Association

Minnesota Water-Energy Nexus In-State Retreat

Saint Paul, Minnesota

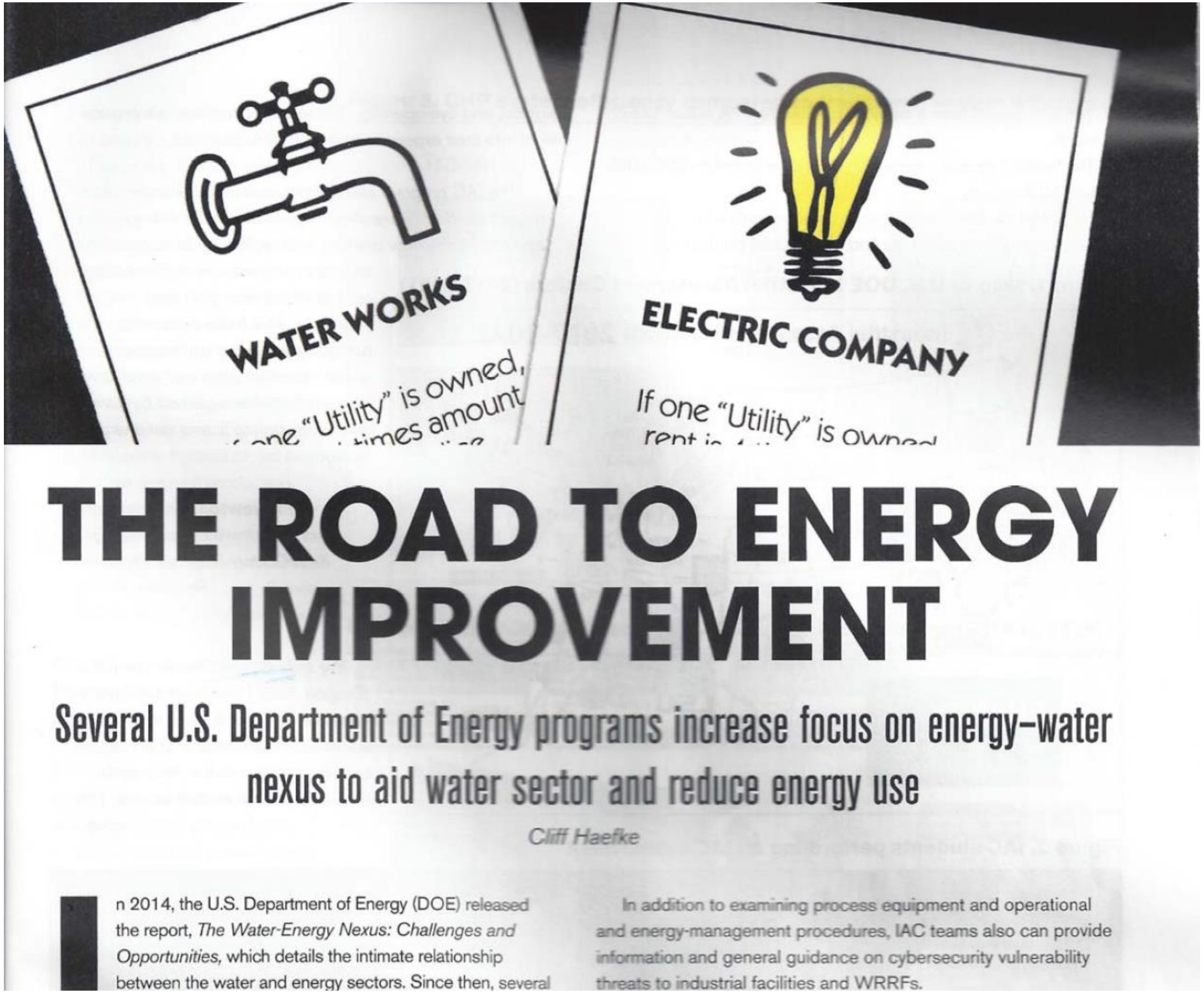
August 3, 2018

CHP Technical Assistance Partnerships

MIDWEST

Agenda

- US DOE CHP Technical Assistance Partnerships
- US DOE Industrial Assessment Centers
- US DOE Better Buildings Sustainable Wastewater Infrastructure of the Future (SWIFt) Accelerator
- Example Illinois Programs (past and present)



THE ROAD TO ENERGY IMPROVEMENT

Several U.S. Department of Energy programs increase focus on energy–water nexus to aid water sector and reduce energy use

Cliff Haefke

In 2014, the U.S. Department of Energy (DOE) released the report, *The Water-Energy Nexus: Challenges and Opportunities,* which details the intimate relationship between the water and energy sectors. Since then, several

In addition to examining process equipment and operational and energy-management procedures, IAC teams also can provide information and general guidance on cybersecurity vulnerability threats to industrial facilities and WRRFs.

Source: Water & Environment Technology Magazine, April 2018, Volume 30, Number 4.

CHP Technical Assistance Partnerships
MIDWEST

DOE CHP Technical Assistance Partnerships (CHP TAPs)

- **End User Engagement**
  Partner with strategic End Users to advance technical solutions using CHP as a cost effective and resilient way to ensure American competitiveness, utilize local fuels and enhance energy security. CHP TAPs offer fact-based, non-biased engineering support to manufacturing, commercial, institutional and federal facilities and campuses.
- **Stakeholder Engagement**
  Engage with strategic Stakeholders, including regulators, utilities, and policy makers, to identify and reduce the barriers to using CHP to advance regional efficiency, promote energy independence and enhance the nation's resilient grid. CHP TAPs provide fact-based, non-biased education to advance sound CHP programs and policies.
- **Technical Services**
  As leading experts in CHP (as well as microgrids, heat to power, and district energy) the CHP TAPs work with sites to screen for CHP opportunities as well as provide advanced services to maximize the economic impact and reduce the risk of CHP from initial CHP screening to installation.

www.energy.gov/chp

DOE CHP Technical Assistance Partnerships (CHP TAPs)

Northwest WA, OR, ID, AK
www.northwestCHPTAP.org
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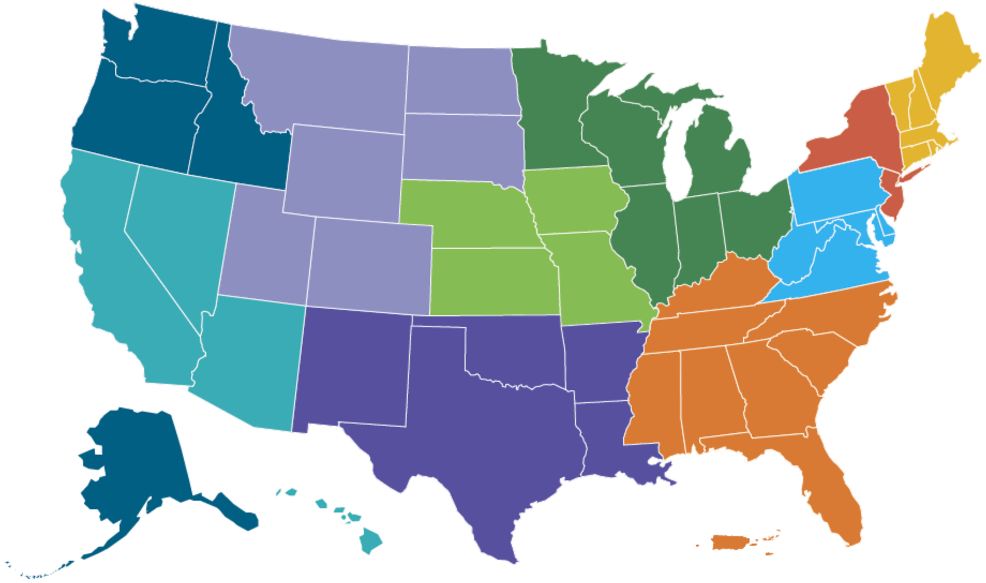

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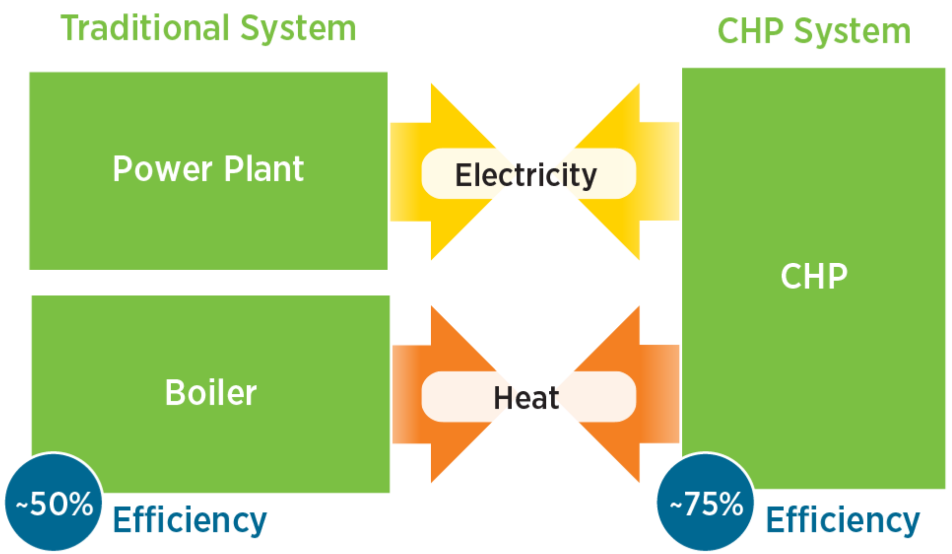
CHP: A Key Part of Our Energy Future

- Form of Distributed Generation (DG)
- An integrated system
- Located at or near a building / facility
- Provides at least a portion of the electrical load and
- Uses thermal energy for:
  - Space Heating / Cooling
  - Process Heating / Cooling
  - Dehumidification



CHP provides efficient, clean, reliable, affordable energy – today and for the future.

Source: www.energy.gov/chp

What Are the Benefits of CHP?

- CHP is **more efficient** than separate generation of electricity and heating/cooling
- Higher efficiency translates to **lower operating costs** (but requires capital investment)
- Higher efficiency **reduces emissions** of pollutants
- CHP can also increase **energy reliability** and enhance power quality
- On-site electric generation can **reduce grid congestion** and avoid distribution costs.

Critical Infrastructure and Resiliency Benefits of CHP

"Critical infrastructure" refers to those assets, systems, and networks that, if incapacitated, would have a substantial negative impact on national security, national economic security, or national public health and safety."

Patriot Act of 2001 Section 1016 (e)

Applications:

- Hospitals and healthcare centers
- Water / wastewater treatment plants
- Police, fire, and public safety
- Centers of refuge (often schools or universities)
- Military/National Security
- Food distribution facilities
- Telecom and data centers

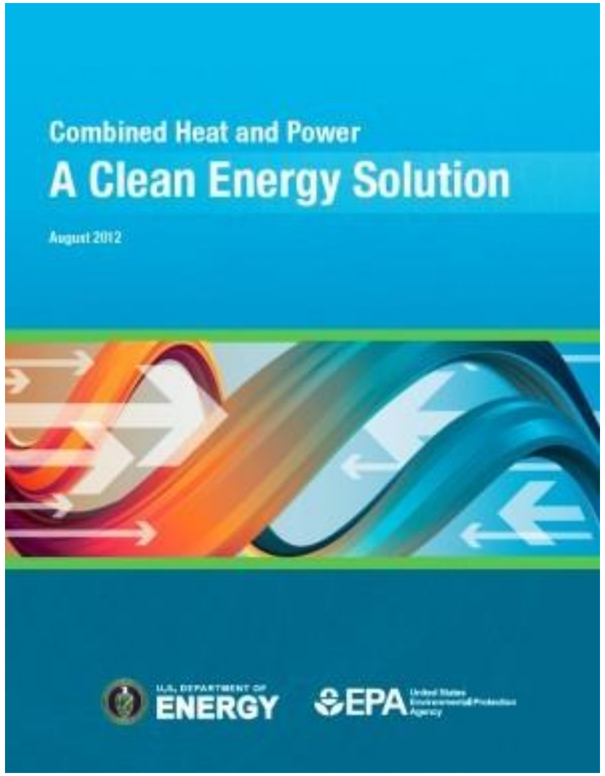
CHP (<u>if properly configured</u>):

- Offers the opportunity to improve Critical Infrastructure (CI) resiliency
- Can continue to operate, providing uninterrupted supply of electricity and heating/cooling to the host facility

Emerging National Drivers for CHP

- Benefits of CHP recognized by policymakers
  - State Portfolio Standards (RPS, EEPS), Tax Incentives, Grants, standby rates, etc.
- Favorable outlook for natural gas supply and price in North America
- Opportunities created by environmental drivers
- Utilities finding economic value
- Energy resiliency and critical infrastructure

DOE / EPA CHP Report (8/2012)



http://www1.eere.energy.gov/manufacturing/distributedenergy/pdfs/chp_clean_energy_solution.pdf

CHP Today in the United States

U.S. CHP Installation Data

- **81.3 GW** of installed CHP at more than 4,400 industrial and commercial facilities
- 8% of U.S. Electric Generating Capacity; 14% of Manufacturing
- Avoids more than **1.8 quadrillion Btus** of fuel consumption annually
- Avoids **241 million metric tons of CO_2** compared to separate production

CHP in U.S. WWTPs (CHP Capacity)

CHP Capacity	# of Systems
<50 kW	5
50-99 kW	15
100-249 kW	31
250-499 kW	33
500-1000 kW	39
>1000 kW	99
Total	222

CHP in U.S. WWTPs (Prime Mover)

Prime Mover	# of Systems
Reciprocating Engine	155
Microturbine	36
Combustion Turbine	15
Fuel Cell	10
Boiler/Steam Turbine	4
Combined Cycle	1
Organic Rankine Cycle	1
Total	222

Source: DOE CHP Installation Database (U.S. installations as of December 31, 2017)

CHP TAP Role: Technical Assistance

Screening and Preliminary Analysis

Quick screening questions with spreadsheet payback calculator; Advanced technical assistance to explore equipment or operational scenarios.

Feasibility Analysis

Perform 3rd Party reviews of site feasibility assessments: Estimates on savings, installation costs, simple paybacks, equipment sizing, and type.

Investment Grade Analysis

Perform 3rd Party reviews of Engineering Analysis. Review equipment sizing and choices.

Procurement, Operations, Maintenance, Commissioning

Review specifications and bids.

DOE TAP CHP Screening Analysis

- High level assessment to determine if site shows potential for a CHP project
  - Qualitative Analysis
    - Energy Consumption & Costs
    - Estimated Energy Savings & Payback
    - CHP System Sizing
  - Quantitative Analysis
    - Understanding project drivers
    - Understanding site peculiarities

Annual Energy Consumption	Base Case	CHP Case
Purchased Electricty, kWh	88,250,160	5,534,150
Generated Electricity, kWh	0	82,716,010
On-site Thermal, MMBtu	426,000	18,872
CHP Thermal, MMBtu	0	407,128
Boiler Fuel, MMBtu	532,500	23,590
CHP Fuel, MMBtu	0	969,845
Total Fuel, MMBtu	532,500	993,435
Annual Operating Costs		
Purchased Electricity, $	$7,060,013	$1,104,460
Standby Power, $	$0	$0
On-site Thermal Fuel, $	$3,195,000	$141,539
CHP Fuel, $	$0	$5,819,071
Incremental O&M, $	$0	$744,444
Total Operating Costs, $	$10,255,013	$7,809,514
Simple Payback		
Annual Operating Savings, $		$2,445,499
Total Installed Costs, $/kW		$1,400
Total Installed Costs, $/k		$12,990,000
Simple Payback, Years		**5.3**
Operating Costs to Generate		
Fuel Costs, $/kWh		$0.070
Thermal Credit, $/kWh		($0.037)
Incremental O&M, $/kWh		$0.009
Total Operating Costs to Generate, $/kWh		**$0.042**

Example Screening Questions

- Do you pay more than $.06/kWh on average for electricity (including generation, transmission and distribution)?
- Are you concerned about the impact of current or future energy costs on your operations?
- Are you concerned about power reliability? What if the power goes out for 5 minutes… for 1 hour?
- Does your facility operate for more than 3,000 hours per year?
- Do you have thermal loads throughout the year? (including steam, hot water, chilled water, hot air, etc.)
- Does your facility have an existing central plant?
- Do you expect to replace, upgrade, or retrofit central plant equipment within the next 3-5 years?
- Do you anticipate a facility expansion or new construction project within the next 3-5 years?
- Have you already implemented energy efficiency measures and still have high energy costs?
- Are you interested in reducing your facility's impact on the environment?
- Do you have access to on-site or nearby biomass resources? (i.e., landfill gas, farm manure, food processing waste, etc.)

Project Snapshot:
Partnering with Local Utility

Albert Lea Wastewater Treatment Facility
Albert Lea, MN

Application/Industry: Wastewater Treatment

Capacity: 120 kW (4 x 30 kW)

Prime Mover: Microturbines

Fuel Type: Biogas

Thermal Use: Heat for the digestion process, building heat

Installation Year: 2004

30 kW Capstone microturbines

Testimonials: *" It gives us the ability to use the methane gas already generated at the plant. We are able to take a waste product and use if for something beneficial."* – Steve Jahnke, City Engineer

"We are impressed with the effectiveness of the technology, and hope to encourage other Minnesota cities to consider capturing methane biogas to not only protect Minnesota's environment, but to save energy. The possibilities of the turbines don't end with energy production; they could also bring new businesses, and businesses are looking for cities that have vision." - Lois Mack, Minnesota Department of Commerce

Source: http://www.midwestchptap.org/profiles/ProjectProfiles/Albert_Lea_WWT_Facility_Profile.pdf

Project Snapshot:

Opportunity Fuels

Lima Wastewater Treatment Plant

Lima, OH

Application/Industry: Wastewater Treatment

Capacity (MW): 130 kW

Prime Mover: Microturbines

Fuel Type: Biomass

Thermal Use: Heat for the Digestion Process

Installation Year: 2012

Highlights: The CHP project was determined to provide:

- Best avenue for reductions of V.O.C.'s
- Best return of electrical energy
- Best capture of the heat for use in the WWTP

Source: http://www.puco.ohio.gov/puco/index.cfm/industry-information/industry-topics/combined-heat-and-power-in-ohio/chp-case-studies-voices-of-experience-workshop-june-20-2012/#sthash.MRLZAQNR.dpbs
http://gemenergycapstone.com/wp-content/uploads/chp-ohio-casestudies-120913.pdf

Project Snapshot:

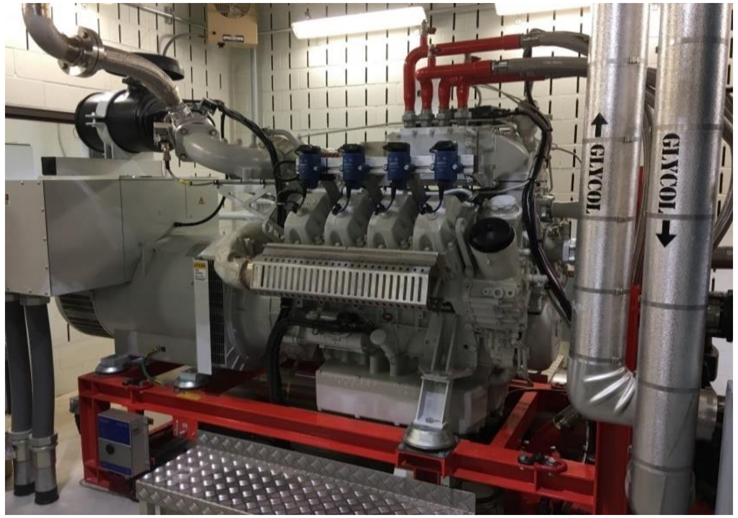
Targeting Energy Neutrality

Glenbard Wastewater Authority

Glen Ellyn, Illinois

Application/Industry: Wastewater Treatment
Capacity (MW): 750 kW (2 x 375 kW)
Prime Mover: Reciprocating Engines
Fuel Type: Biogas & Natural Gas
Thermal Use: Heating Digesters
Installation Years: 2016

Testimony: "The CHP project provides our wastewater facility a significant increase in operational reliability and resiliency. The CHP system is capable of operating on either biogas from our digesters or natural gas supplied by our local utility. Electricity for the facility is provided by the CHP system with backup provided by the local electric utility, and the heat required by the digesters is supplied by the free recovered thermal energy from the CHP system with backup, if required from the 2 existing dual fueled boilers" – Matt Streicher – Executive Director, Glenbard Wastewater Authority



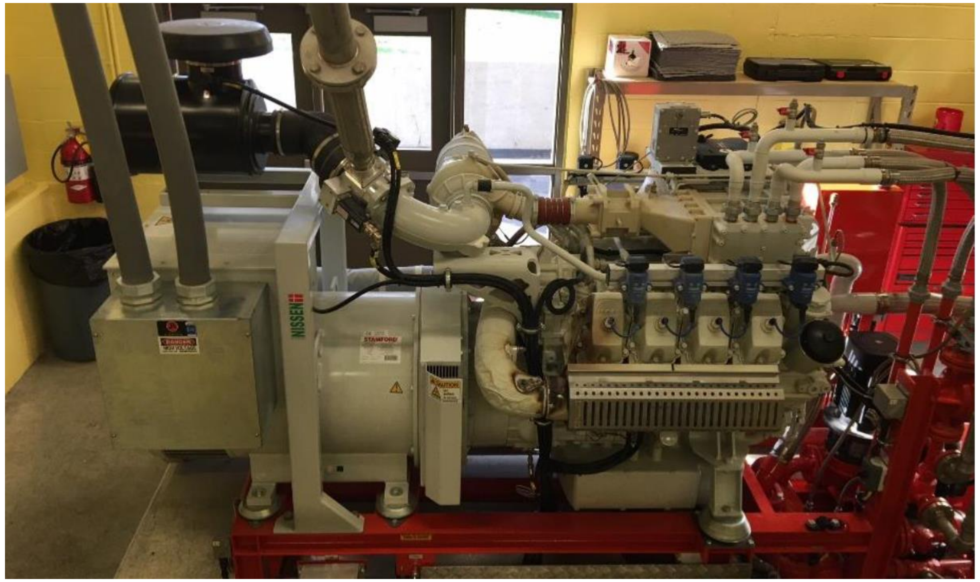
Project Snapshot:

Targeting Net-Zero

Downers Grove Sanitary District
Downers Grove, IL

Downers Grove
Sanitary District

Application/Industry:
Wastewater Treatment
Capacity (MW): 655 kW
Prime Mover: Reciprocating Engines
Fuel Type: Biomass
Thermal Use: Heat for Digestion Process
Installation Year: 2014, 2017

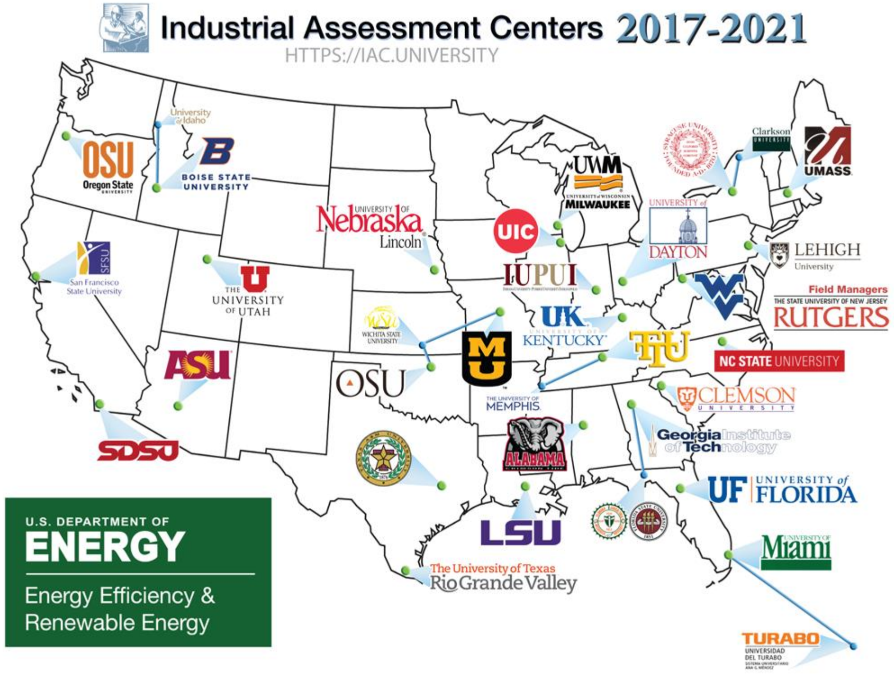


Highlights: In 2014, DGSG installed a 280 kW engine-driven generator with heat recovery, along with a gas conditioning system. The plant began processing waste grease from nearby restaurants within the digester system to increase gas production. To fully utilize this resource, it installed an additional 375 kW engine and generator in 2017 with incentives from utility ratepayer Energy Efficiency Portfolio Funds.

Source: http://www.midwestchptap.org/profiles/ProjectProfiles/DownersGrove.pdf

US DOE Industrial Assessment Centers

- Established by the U.S. Department of Energy in 1976
- Teams of university-based faculty and student engineers (trained 3,300+ students)
- Provide no-cost energy, productivity, and waste assessments
- Serve small and medium sized US manufacturers and wastewater treatment plants nationwide



The IAC program has already conducted over 18,362 assessments with more than 139,105 associated recommendations.
Average recommended yearly savings is $136,531.

DOE IAC Assessment Eligibility and Recent UIC IAC Assessments for WWTPs

- Located < 150 miles of a participating university
- Industrial facilities…
  - Within SIC Codes 2000-3999
  - Gross annual sales < $100 million
  - < 500 employees at the plant site
  - Annual energy bills between $100K and $2.5M
- Water and wastewater treatment facilities…
  - Water treatment plant >5 MGD
  - Wastewater treatment plant >2 MGD
  - Annual energy bills between $250K and $2.5M

Assessment Outcomes of UIC's Recent WWTP Energy Assessments in Illinois and Michigan

	Annual Energy Costs	Recommen-dations	Identified Savings	Implemented Savings	Implemented Savings % of Energy Costs
WWTP 1	$464,279	3	$52,498	$52,498	11.3%
WWTP 2	$364,435	4	$113,916	$105,484	28.9%
WWTP 3	$345,255	6	$226,157	$216,698	62.8%
WWTP 4	$1,545,472	5	$139,874	$84,038	5.4%

US DOE Better Buildings Sustainable Wastewater Infrastructure of the Future (SWIFt) Accelerator

- Established to catalyze the adoption of innovative and best-practice approaches in data management, technologies, and financing for infrastructure improvement within WWTPs
- 27 state, regional, and local organizations, representing 90+ WTTPs have joined the accelerator program
- Program partners seek to improve the energy efficiency at WWTPs by at least 30% and integrate at least one (1) resource recovery measure
- Program partners participate in peer exchanges and technical assistance forums about tools, approaches, technologies, and options
- DOE published the "Energy Data Management Manual for the Wastewater Treatment Sector" December 2017
  https://www.energy.gov/sites/prod/files/2018/01/f46/WastewaterTreatmentDataGuide_Final_0118.pdf

Source: Water & Environment Technology Magazine, April 2018, Volume 30, Number 4.

Pre-2015 Illinois Biogas-to-Energy Programs

- Illinois Biomass and Biogas-to-Energy Grant Program (2005-2015)
  - Funding was available through a renewable energy resources fund
  - Target projects were biogas or biomass fueled systems that produce electricity with CHP through gasification, co-firing, or anaerobic digestion
  - Technical assistance was available to assist grant applicants
  - Funding Structure (up to 50% of cost):
    - Biogas and Biomass Feasibility Study- $2,500
    - Biogas to Energy Systems- $225,000
    - Biomass to Energy Systems- $500,000
  - CHP Projects Installed in WWTPs: Danville Sanitary District, Downers Grove Sanitary District, Northwest Regional Water Reclamation Facility

- Illinois Clean Energy Community Foundation Biogas Conditioning Grant
  - Funding was available to offset the costs of the equipment/technologies used to treat biogas conditioning
  - Up to $250,000 per project

Source: Illinois Department of Commerce and Economic Opportunity

DCEO Energy Efficiency Programs Available for Wastewater Treatment Plants (2012-2017)

- Illinois Energy Now Energy Efficiency Program (2012-2017)
  - Wastewater Treatment Plants were identified as a target sector in 2012
  - Collaboration with individual treatment plants and trade associations was important
  - Technical assistance was available to assist applicants
  - Increased incentives were available for aeration specific equipment (20% min. savings, $0.36/kWh)
    - Initial technology promoted was turboblowers for small-to-medium sized WWTPs
    - Other technologies later included: ultrafine diffusers, advance DO controls, controls related to aeration, ultra-violet for disinfection, twin screw compressors, etc.

- Illinois Public Sector CHP Pilot Program (2014-2017)
  - CHP became an eligible energy efficiency technology in State of Illinois in 2013
  - CHP was listed in the Illinois Technical Reference Manual (TRM) in 2014
  - 3 Level CHP Incentive for Design, Construction, and Production
  - Technical assistance was available to assist applicants
  - 17 applications submitted, including 7 CHP projects in WWTPs
  - 3 WWTPs received funding: Danville Sanitary District, Downers Grove Sanitary District, Glenbard Wastewater Authority

Source: Illinois Department of Commerce and Economic Opportunity

ComEd Energy Efficiency Programs Targeting Wastewater Treatment Plants (2017-TBD)

- ComEd identified the wastewater treatment sector as a key public sector target market
- Technical assistance is available for feasibility assessments and more detailed analyses
- Standard energy efficiency incentives are available ($0.07/kWh)
- Increased energy efficiency incentives are available towards *aeration upgrades* ($0.21/kWh)
  - e.g. turboblowers, high efficient blowers, fine bubble diffusers, dissolved oxygen controls, VFDs on blowers, etc.

Source: ComEd

Resources Available for Illinois Wastewater Treatment Plants through Illinois EPA

- Free Energy Assessments
  - Illinois EPA is offering free energy assessments to help local municipalities reduce the cost of wastewater treatment
  - Implemented through the Illinois Sustainable Technology Center (ISTC) and Smart Energy Design Assistance Center (SEDAC)

- Illinois EPA Revolving Load Fund
  - July 1, 2018 through June 30, 2019
  - Wastewater Loan Interest Rate = 1.84%
  - Drinking Water Loan Interest Rate = 1.84%

Source: Illinois EPA

Summary and Next Steps

- CHP is a proven concept in WWTPs providing energy savings, reduced emissions, and opportunities for resiliency
- Emerging drivers are creating new opportunities to evaluate CHP today
- Resources are available regionally and at state levels to assist in developing CHP projects and assessing energy efficiency opportunities
- Contact the US DOE Midwest CHP TAP to perform a CHP Qualification Screening and/or receive other Technical Assistance

Thank You

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U.S. Department of Energy
CHP Technical Assistance Partnerships
MIDWEST

www.MidwestCHPTAP.org

Best Practices in Improving the Efficiency and Resiliency of Water Treatment and Conveyance Systems

Examining Data From 583 Resource Recovery Facilities Across Wisconsin

Megan Levy

NGA Minnesota Water-Energy Nexus In-State Retreat

August 3, 2018

Wisconsin Office of Energy Innovation

Presentation Overview

- Why Address Energy Use Through The CMAR
- Training Initiative
- Best Practice Guide Forecasted Energy Use
- What Does The Collected Data Look Like
- Process Questions
- Facility Distribution
- What is The Data Telling Us
- Summary – Actions – Q & A

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Why Address Energy Use Through the CMAR?

One of the primary purposes of the CMAR is to foster **communication**.

Communication of Wastewater Resource Recovery Facilities needs among **operators, governing bodies**, and the **DNR**.

This project allows the CMAR to become an educational tool that increases awareness of the importance and **value** of wastewater treatment **energy efficiency.**

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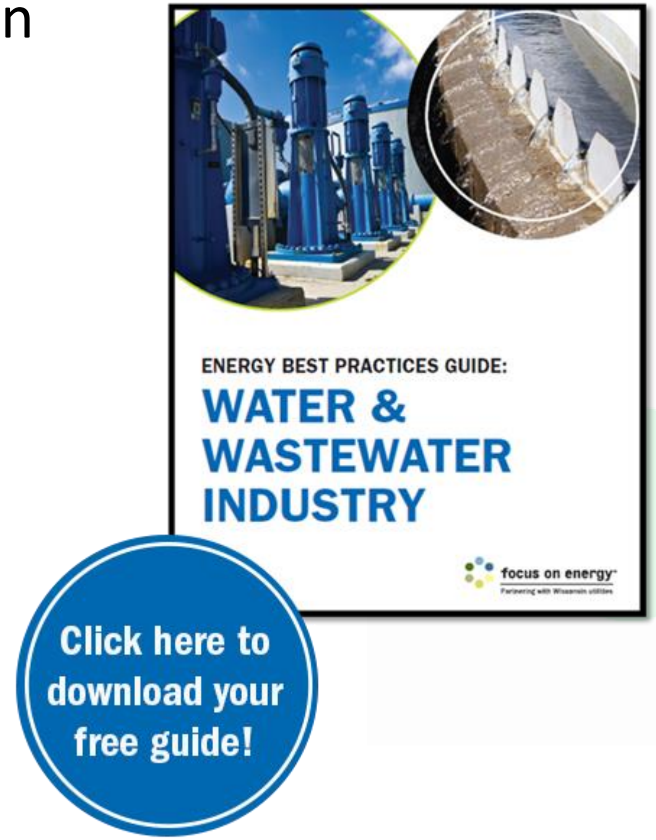
Why Address Energy Use Through the CMAR?

The Clean Water Loan Fund requires an Energy Audit, first step of energy audit is to create an energy use baseline.

In 2017 Focus on Energy provided energy efficiency incentives to over 50 Wisconsin Wastewater Treatment Facilities.



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Collaborative Process to Develop Questions

<u>Design Phase (2015)</u>

CMAR Energy External Workgroup with in-person meetings to develop the new questions and data table with the charge of keeping it short, simple and easy to complete.

Jack Saltes – DNR Madison
Joe Cantwell, Focus On Energy
Jeremy Cramer, Fond du Lac WWTP
Kevin Freber, Watertown WWTP
Sharon Thieszen, Sheboygan WWTP
Gary Hanson, Short Elliot Hendricksen
Steve Ohm, DNR-Rhinelander
David Argall, DNR-Madison
Megan Levy, OEI
Kevin Splain, OEI

WWOA Wisconsin Wastewater Operators' Association

focus on energy[sm]
Partnering with Wisconsin utilities

Wisconsin Dept. of Natural Resources

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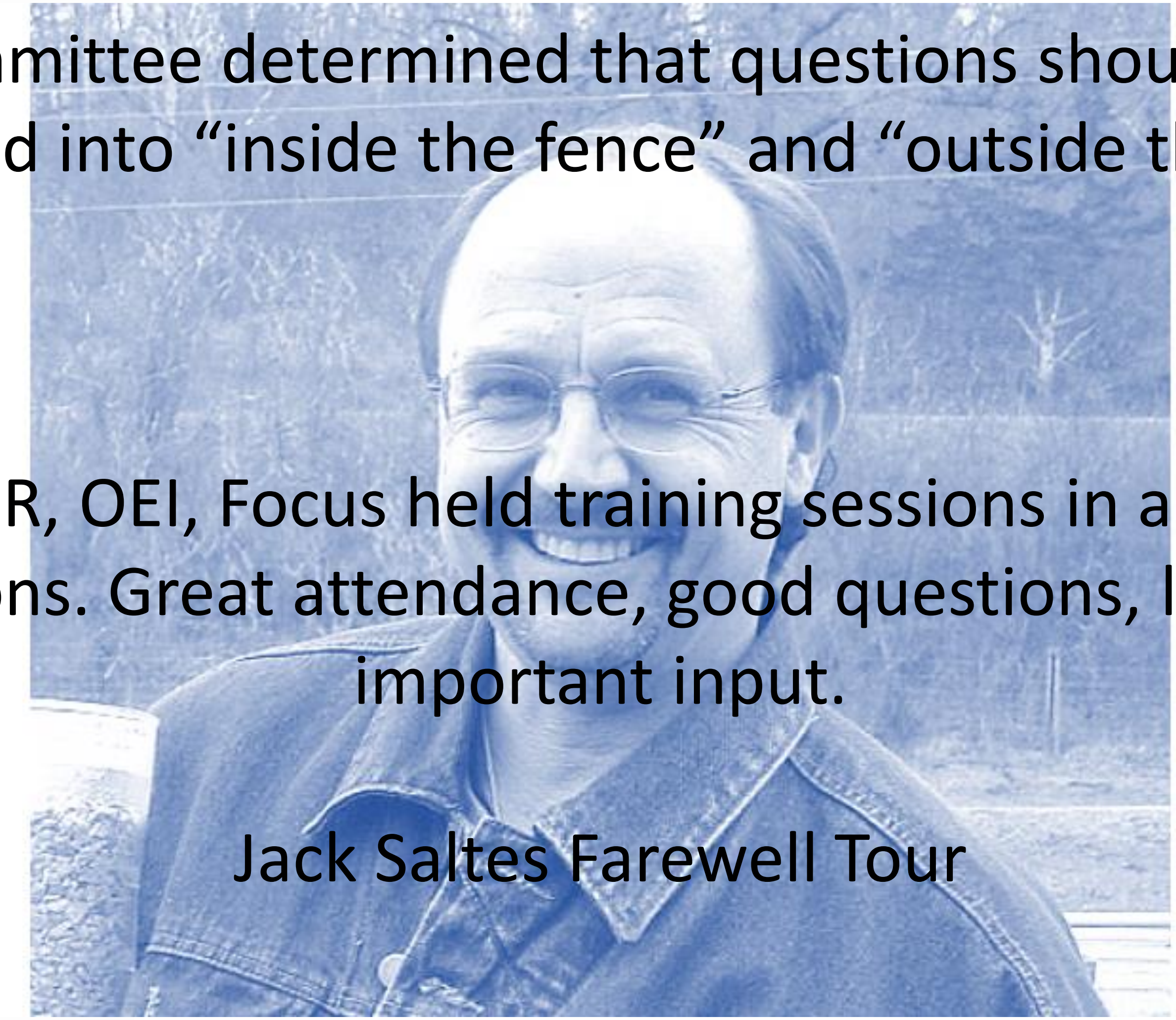
Initial Questions on Energy Use/ Training Initiative



Committee determined that questions should be separated into “inside the fence” and “outside the fence”

WDNR, OEI, Focus held training sessions in all DNR regions. Great attendance, good questions, lots of important input.

Jack Saltes Farewell Tour

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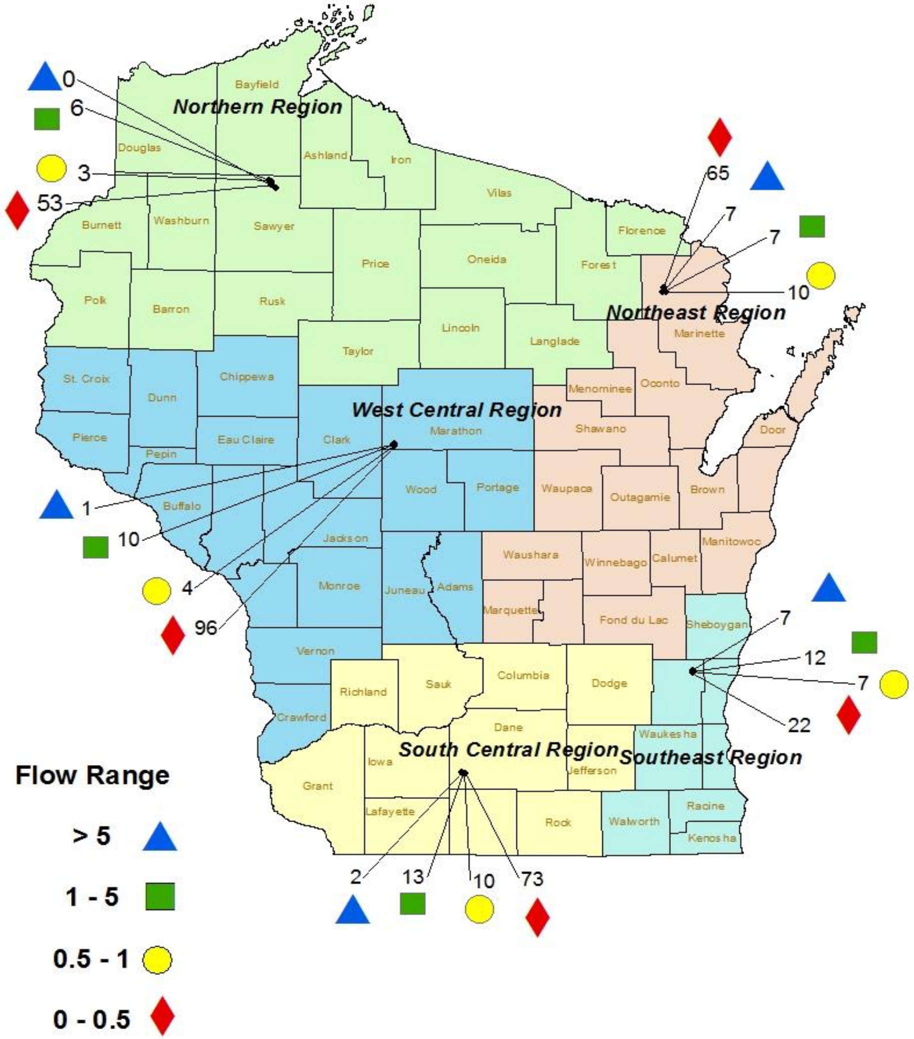
Facility Distribution Across the State



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What the Data Looks Like and What it Tells Us-2016

Flow Range (MGD)	Number of Facilities	Median Flow (MGD)	Best Quad (kWh/MG)	Median (kWh/MG)	Lowest Quad (kWh/MG)
0 - 0.05	163	0.023	123.33	3,825.65	9,089.09
0.05 - 0.125	117	0.072	1,542.22	4,253.15	6,357.29
0.125 - 0.25	79	0.184	2,677.83	3,894.32	5,523.13
0.25 - 0.5	70	0.352	2,290.91	3,607.38	4,564.06
0.5 - 1	39	0.644	1,921.98	2,781.67	3,207.98
1 - 5	58	1.630	1,702.18	2,058.50	2,906.92
>5	19	10.986	1,351.18	1,965.30	2,487.36
0-100	545	0.118	1,575.52	3,237.91	5,663.82

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What the Data Looks Like and What it Tells Us-2017

Flow Range (MGD)	Number of Facilities	Median Flow (MGD)	Best Quad (kWh/MG)	Median (kWh/MG)	Lowest Quad (kWh/MG)
0 - 0.05	186	0.022	11.83	3,855.82	8,941.33
0.05 - 0.125	125	0.074	1,279.16	4,607.23	6,525.83
0.125 - 0.25	81	0.187	2,516.79	3,690.82	5,563.75
0.25 - 0.5	73	0.340	2,403.38	3,271.55	4,228.38
0.5 - 1	41	0.652	2,175.83	2,609.37	3,502.66
1 - 5	58	1.694	1,660.88	2,172.53	2,884.26
>5	19	10.981	1,453.91	1,894.51	2,523.28
0-100	583	0.100	1,538.74	3,072.32	5,392.48

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What the Data Looks Like and What it Tells Us

2016 kWh/BOD

Flow Range (MGD)	Number of Facilities	Median Electricity Consumed (kWh)	Best Quad (kWh/BOD)	Median (kWh/BOD)	Lowest Quad (kWh/BOD)
0 - 0.05	163	33,004	95.54	2,761.99	5,723.26
0.05 - 0.125	117	118,680	1,253.23	2,701.51	4,230.17
0.125 - 0.25	79	263,920	2,056.31	2,838.25	3,925.73
0.25 - 0.5	70	425,140	1,489.41	1,904.17	2,715.07
0.5 - 1	39	639,606	995.86	1,422.73	2,063.95
1 - 5	58	1,495,596	826.82	1,057.86	1,400.75
>5	19	6,524,275	675.56	1,101.78	1,278.79
0-100	545	168,200	987.59	2,062.65	3,859.35

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What the Data Looks Like and What it Tells Us

2017 kWh/BOD

Flow Range (MGD)	Number of Facilities	Median Electricity Consumed (kWh)	Best Quad (kWh/BOD)	Median (kWh/BOD)	Lowest Quad (kWh/BOD)
0 - 0.05	186	29,420	8.40	2,370.80	5,463.86
0.05 - 0.125	125	112,600	1,365.37	2,958.71	4,349.39
0.125 - 0.25	81	224,830	2,010.55	2,737.36	3,628.20
0.25 - 0.5	73	415,680	1,508.91	1,863.72	2,571.02
0.5 - 1	41	736,825	992.27	1,697.89	2,178.98
1 - 5	58	1,527,130	810.50	1,096.39	1,537.67
>5	19	6,734,757	683.79	1,032.74	1,504.45
0-100	583	163,700	920.54	2,035.78	3,617.16

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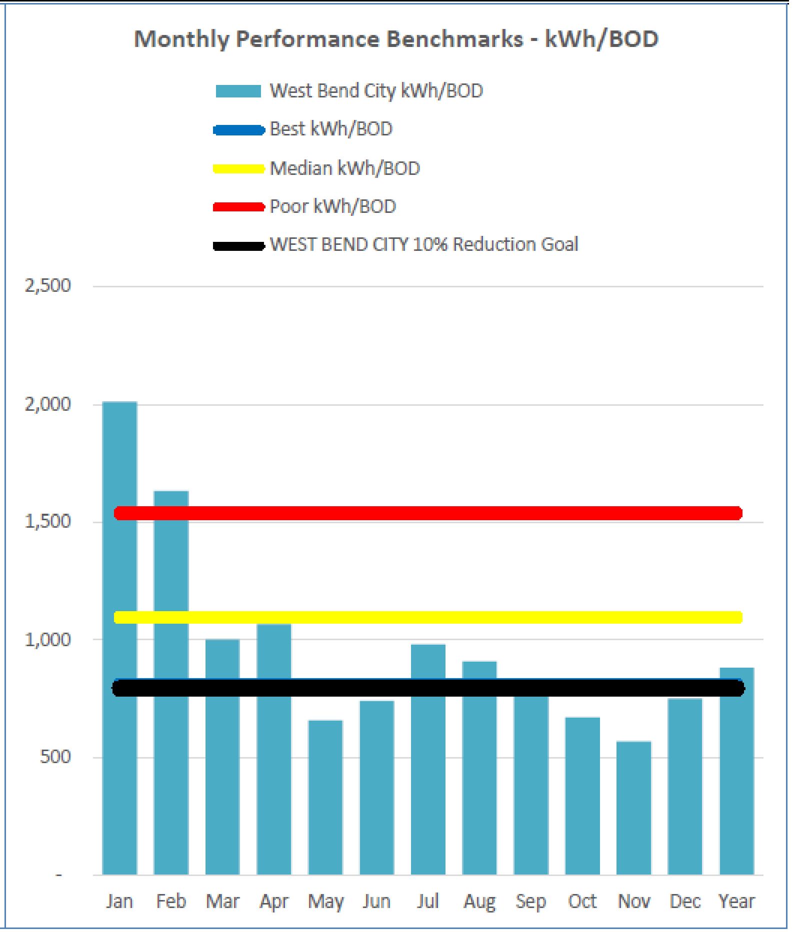
Process Questions

7.2 Energy Related Processes and Equipment

7.2.1 Indicate equipment and practices utilized at your treatment facility (Check all that apply):

- ☐ Aerobic Digestion
- ☐ Anaerobic Digestion
- ☐ Biological Phosphorus Removal
- ☐ Coarse Bubble Diffusers
- ☐ Dissolved O2 Monitoring and Aeration Control
- ☐ Effluent Pumping
- ☐ Fine Bubble Diffusers
- ☐ Mechanical Sludge Processing
- ☐ Nitrification
- ☐ SCADA System
- ☐ UV Disinfection
- ☐ Variable Speed Drives
- ☐ Other:

Facility Performance and Benchmarking Analysis



Water and/or wastewater utility managers index their facility's energy usage through a production or demand index, such as kWh/MGD or kWh per 1,000lb of Biological Oxygen Demand (BOD). This index is called a Key Performance Index (KPI) or Energy Performance Index (EPI). Establishing an energy baseline helps facility managers understand the relative efficiency or change in efficiency relative to the core purpose of the operation, i.e., water production or wastewater treatment. It is recommended utilities set a goal to save five to ten percent of its energy after it has implemented energy efficiency measures, a new annual average line is set as the targeted KPI level with monthly Monitoring & Verification (M&V).

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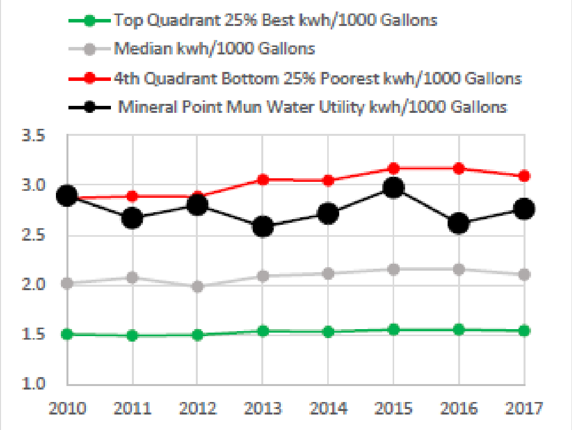
Water Utility Analysis

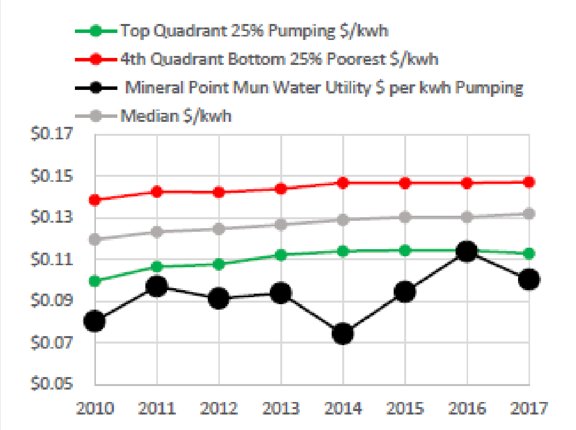
Quartile Statistical Benchmarks where 1 = Top Quadrant 25% Best, 2 = 2nd Quadrant Good, 3 = 3rd Quartile below Median & 4 = 4th Quadrant Bottom 25% Poorest

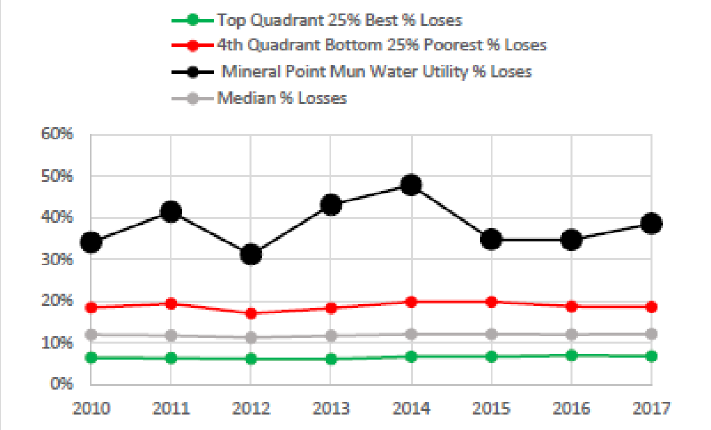
Utility ID	Utility	Performance Benchmark	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017 Average
3740	Mineral Point Mun Water Utility	kwh/1000 Gal Quad	4	3	3	3	3	3	3	3	3
3740	Mineral Point Mun Water Utility	% Water Losses Quad	4	4	4	4	4	4	4	4	4
3740	Mineral Point Mun Water Utility	$ per kwh Pumping Quad	1	1	1	1	1	1	1	1	1
3740	Mineral Point Mun Water Utility	$ per 1000 Gallons Quad	2	3	3	2	2	2	3	2	2

Water utilities with benchmarks of 3 (Yellow) and 4 (Red) can request that MEETAP prepare a system analysis of wells, towers and pumps to estimate demand, energy and cost savings (capacity and average operating characteristics – on-peak, capacity factor, constant flow high pressure control vs variable flow constant pressure, etc.).

Utility ID	Utility	Performance Benchmark	2010	2011	2012	2013	2014	2015	2016	2017	2010-2017 Average
3740	Mineral Point Mun Water Utility	kwh/1000 Gallons	2.89	2.67	2.80	2.58	2.72	2.97	2.62	2.76	2.75
3740	Mineral Point Mun Water Utility	% Water Losses	34.07%	41.39%	31.15%	43.07%	47.78%	34.77%	34.66%	38.55%	38.18%
3740	Mineral Point Mun Water Utility	$ per kwh Pumping	$ 0.08	$ 0.10	$ 0.09	$ 0.09	$ 0.07	$ 0.09	$ 0.11	$ 0.10	$ 0.09
3740	Mineral Point Mun Water Utility	$ per 1000 Gallons	$ 0.23	$ 0.26	$ 0.26	$ 0.24	$ 0.20	$ 0.28	$ 0.30	$ 0.28	$ 0.26







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Top 25 Low Cost No Cost Measures to Implement

https://focusonenergy.com/business/WWbridge

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2017 Energy Advisor Territory Map

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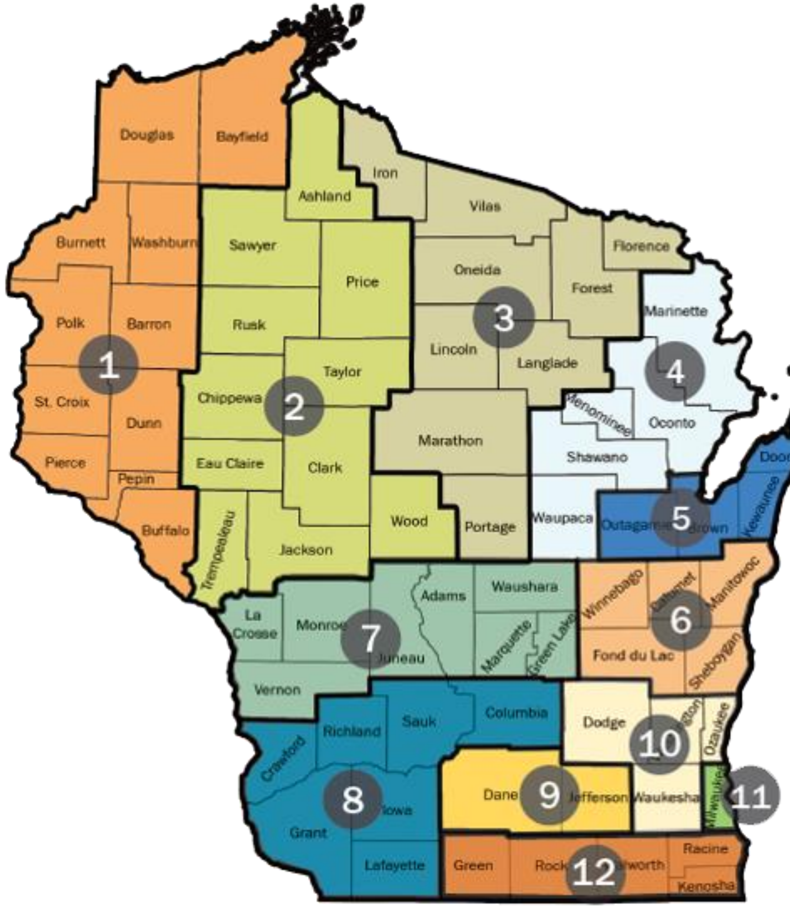

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Talk to an AgSG Rep today!
Call 888.947.7828

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Partnerships Create More Resources

- **Focus on Energy - 800.762.7077**
  - **https://focusonenergy.com/business/water-wastewater**
  - Energy Advisor Map, **focusonenergy.com/ea-map**
  - Ag, Schools, and Government Program
  - Large Energy User Program

- **Office of Energy Innovation**
- **Wisconsin Municipal Energy Efficiency Technical Assistance Program (MEETAP)**

- **Request Wastewater Treatment Facility Energy Tracking Tool:** Vanessa.Durant@Wisconsin.gov
- DNR Clean Water Loan Fund- eliminate PF caps, and determine list of priorities for PF Incentive program:
  - Regionalization
  - P reduction
  - ENERGY EFFICIENCY!!!!!!!!

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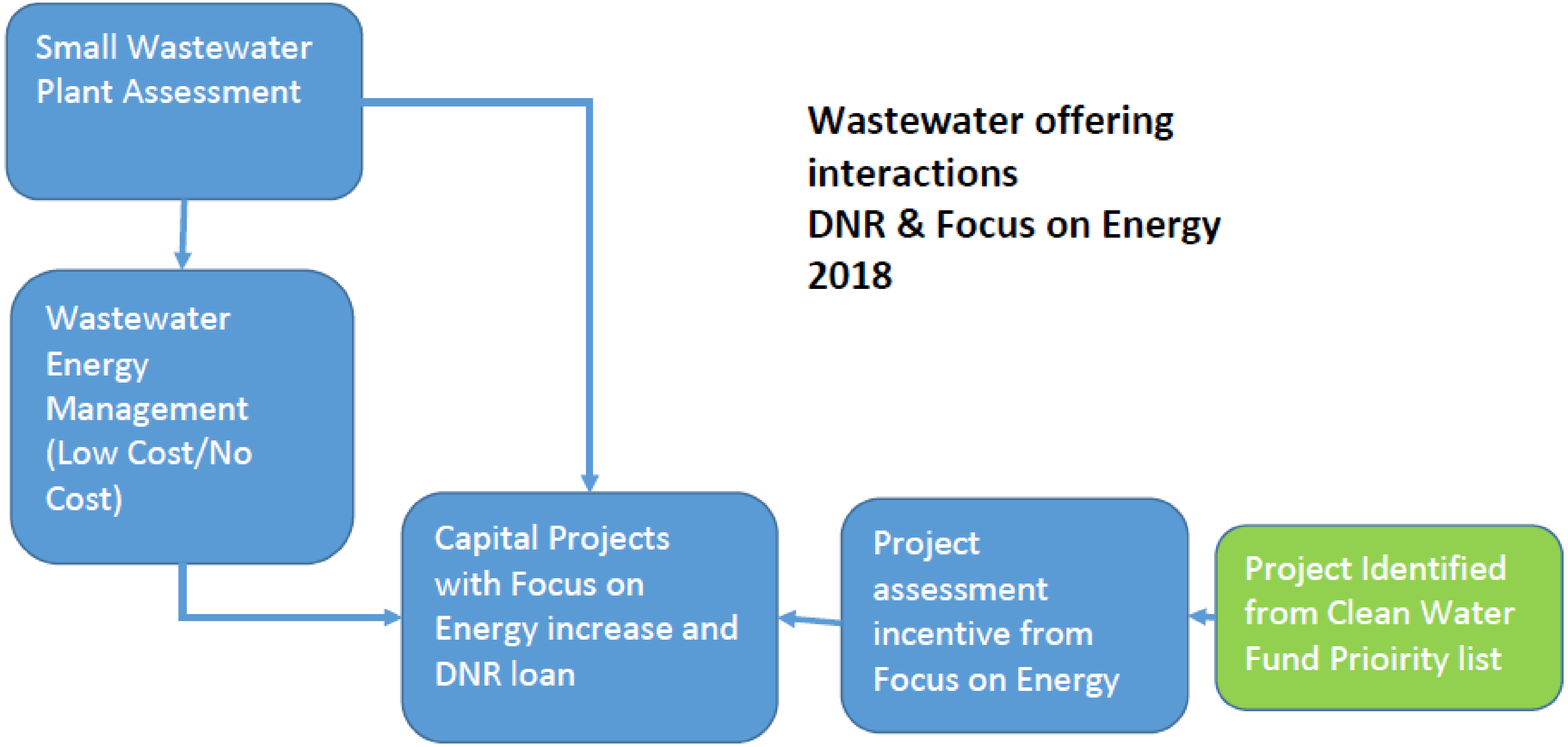
Summary

- Range of reported energy use: **690 to 26,926 kWh/MG**
- Per Cent of Energy Reduction Available (From Average to 75 %'ile Data): **24 to 50 %**
- Amount of forecasted energy savings available from wastewater facilities: **256 MWh/year**
- Forecasted value of energy savings at $0.10 /kWh 256,000,000 kWh X 0.10 $/kWh = **$25,600,000 / year**
- DNR CWLF will provide matching funds in the form of principal Forgiveness to municipalities working with Focus on Energy
- More data sharing = better incentives for Municipalities

Take Away & Actions



Wastewater offering interactions
DNR & Focus on Energy
2018

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Take Away & Actions

- **TAKE AWAY**
  - Wastewater System energy use can be significantly reduced
  - Focus on Energy assistance is available
  - If a facility has completed one energy project now look for the second, third, fourth

- **ACTIONS**
  - Continue data analysis
  - Reach out to facilities with high energy use
  - Develop and provide additional education and training materials and/or sessions
  - Encourage facilities to contact Focus on Energy for assistance

Provide individual reports to WWTFs that show blind comparisons

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Questions – Comments - Contact

Megan Levy

Local Energy Programs Manager

Energy Assurance Coordinator

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NGA

NATIONAL GOVERNORS ASSOCIATION

U.S. DEPARTMENT OF ENERGY | Energy Efficiency & Renewable Energy

Energy Savings Performance Contracting

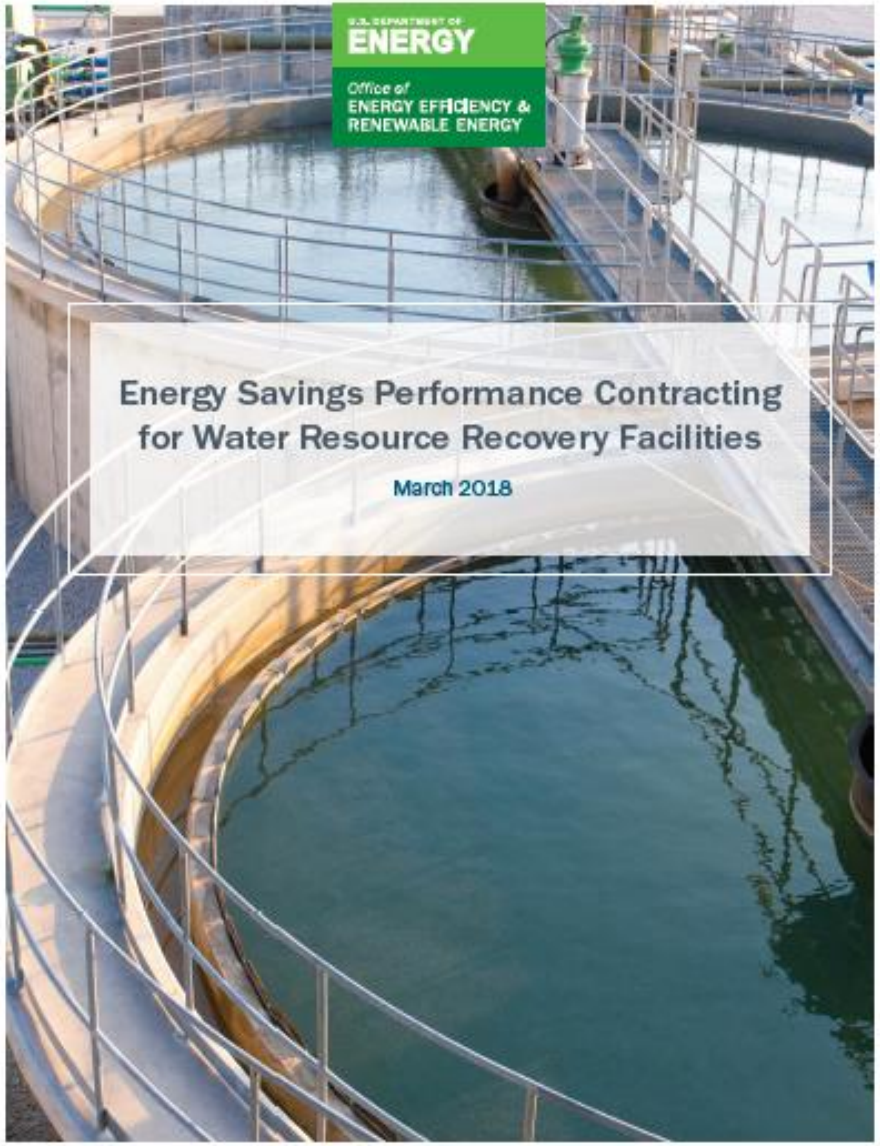
For the Wastewater Sector

Alice G. Dasek

Office of Weatherization & Intergovernmental Programs
U.S. Department of Energy
August 3, 2018

Introduction

- Released in March 2018
- Explores how ESPC can help facilities achieve priorities for the wastewater market
- One of a series of guides for markets underserved by ESPC



Overview

- What is Energy Savings Performance Contracting (ESPC)?
- Why ESPC?
- A Look at the ESPC Market
- ESPC Wastewater Case Studies
- DOE Resources for the Wastewater Sector

What is ESPC?

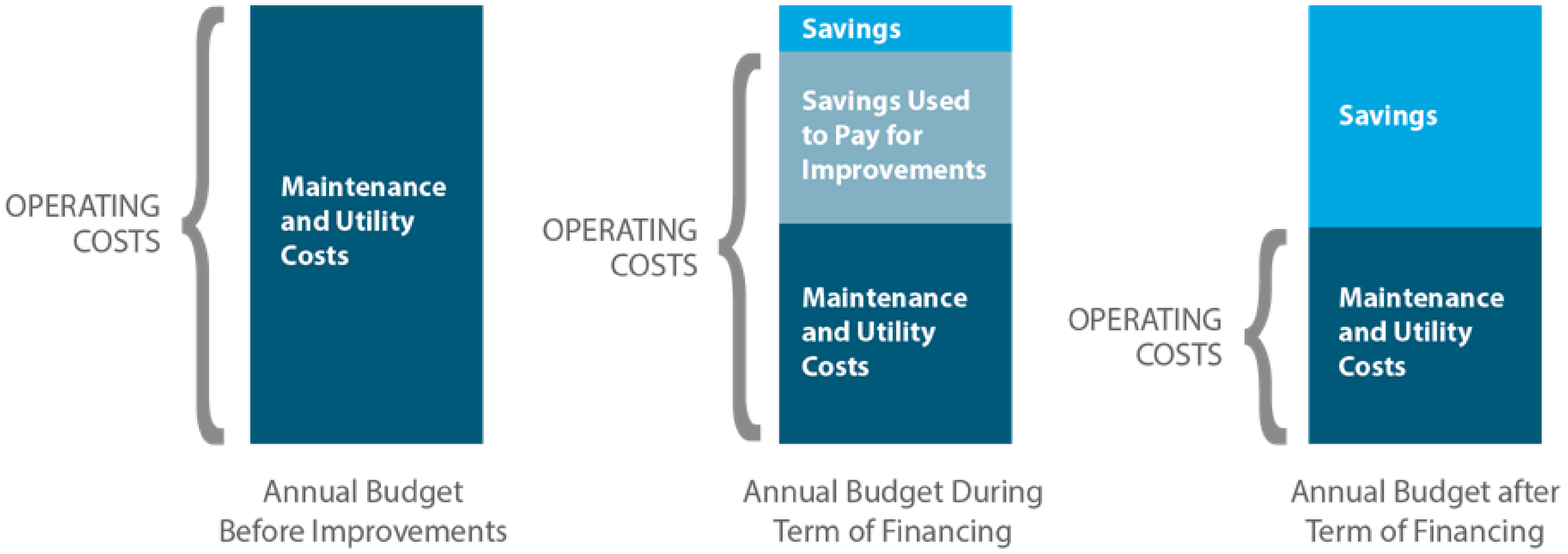
U.S. DEPARTMENT OF ENERGY

Definition

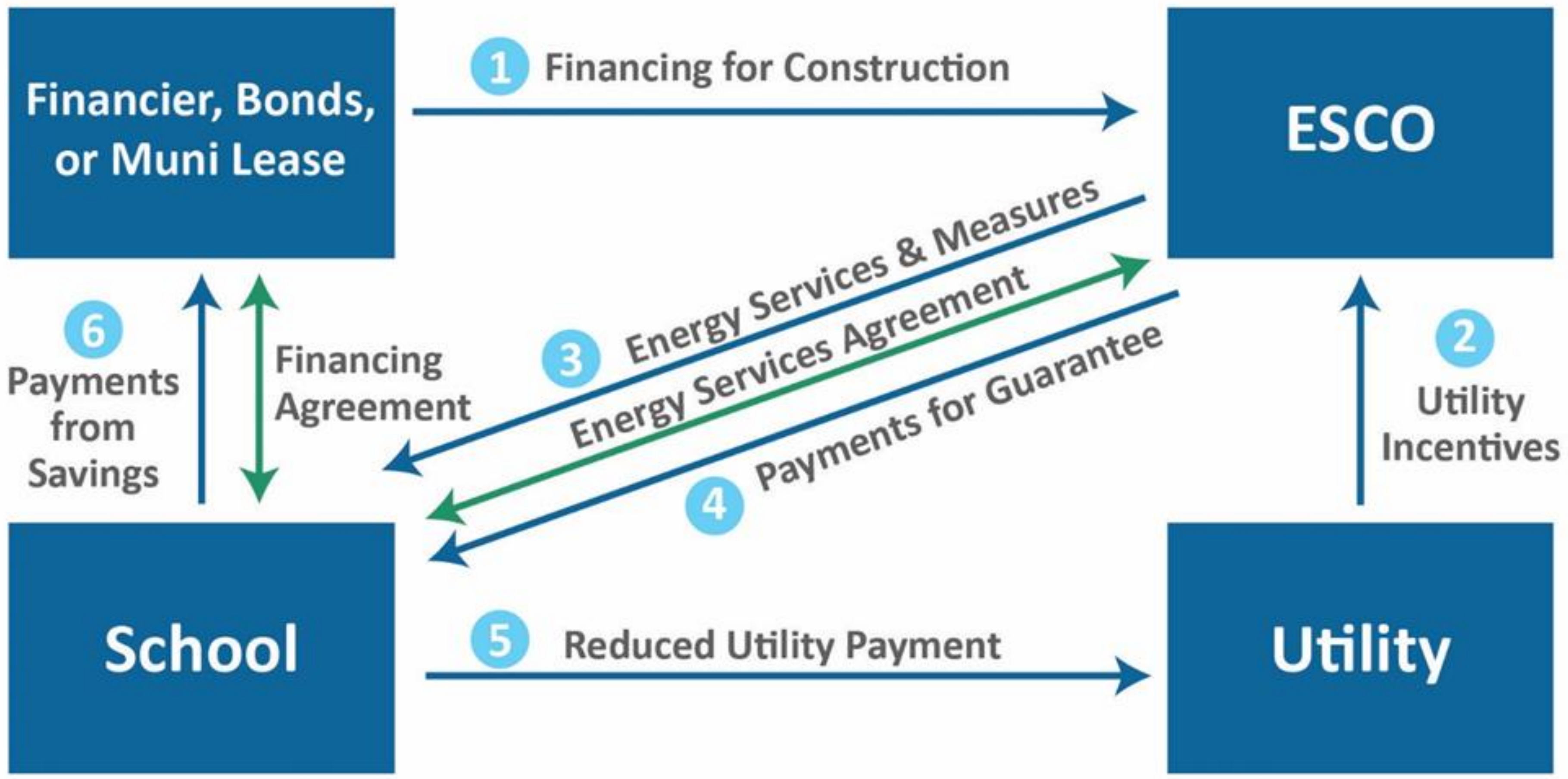
ESPC is

A contracting and financing method that provides upfront financing for energy efficiency projects and repaid by the savings on utility bills resulting from the upgrades

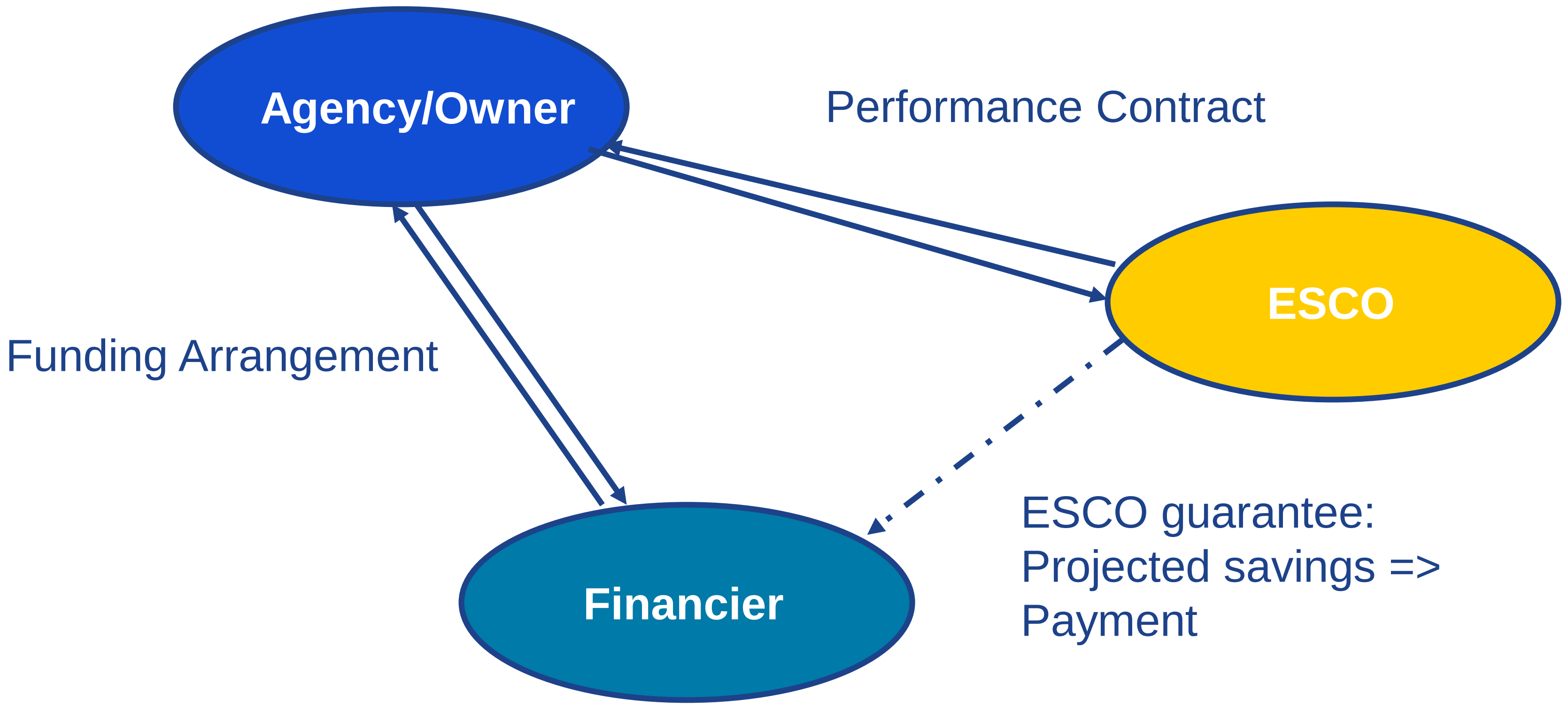
How Does it Work in Practice?



ESPC Relationships



Financing Options



The Performance Guarantee

- Unique feature of ESPC

The ESCO:

- Assumes financial, operating, and performance risk
- Guarantees project savings
- Measures and verifies savings
- Provides reimbursement if guaranteed savings not met and/or fixes the problem at no additional cost

Why ESPC?

General ESPC Benefits

- No upfront costs needed
- ESCO accountable for project design, construction, and post-installation monitoring
- ESCO serves as single point of contact for project
- ESCO takes on project risks
- Guaranteed cost and energy savings
- Savings measured and verified as “real”

Opportunities for Wastewater Facilities

- Achieve Wastewater Sector Mission
- Upgrade Infrastructure
- Manage Energy Costs

Achieve Wastewater Sector Mission

Issue

- Increasingly stringent regulatory requirements
- Demand on facilities expected to grow 23% by 2032[1]
- Need for reliable service for customers through outages

Opportunity

- ESPC project upgrades can help plants meet NPDES discharge permit requirements
- Streamlined operations help meet the demand for clean water at reasonable user rates
- Generating energy onsite can support operations resiliency

[1] https://www.infrastructurereportcard.org/the-impact/explore-infographics/americas-infrastructure-grade/

Upgrade Infrastructure

Issue

- WRRFs built to meet supply, not efficiency
- Aging equipment costs more to operate & maintain
- Infrastructure rated a D+ and capital investment needs estimated at $271B[1] ($2.4B over next 20 years in MN[2])

Opportunity

- Comprehensive nature of ESPC projects allows upgrades that improve overall project operations
- Upgrades can ensure operational stability
- ESPC projects can provide upfront investment not readily available

[1] https://www.infrastructurereportcard.org/cat-item/wastewater/
[2] https://www.infrastructurereportcard.org/state-item/minnesota/

Manage Energy Costs

Issue

- 2000-2010 energy costs rose by ~80%[3] and are estimated to continue rising through 2040[4]
- Energy often second highest operating cost in WRRF
- WRRFs represent 30-40% of energy use in community

Opportunity

- Individual ESPC projects have demonstrated up to 50% energy savings
- ESPC project can reduce utility bills
- Equipment improvements can also reduce other operating & maintenance costs

[3] "Annual Energy Review 2011." (2012). US Energy Information Administration. DOE/EIA-0384(2011). September 2012. Page 72. http://www.eia.gov/totalenergy/data/annual/pdf/aer.pdf
[4] "Annual Energy Outlook 2013." (2013). US Energy Information Administration. DOE/EIA-0383(2013). April 2013. Page 97-98. http://www.eia.gov/outlooks/archive/aeo13/

A Look at the ESPC Market

U.S. DEPARTMENT OF ENERGY

A Perfect Storm for ESPC

- Tight budgets for energy efficiency retrofits
- Good energy savings track record
  - ESPC projects active in 2012 saved 34 million TWh and 224 million MMBtu or approximately 1% of total US commercial building energy consumption[6]
  - A typical ESPC project in the MUSH market saves approximately 13% to 31% annually compared to its baseline consumption[7]
- High market growth potential for ESPC
  - Anticipated 2017 revenues of $7.6 billion, representing an average annual growth of 13% over the period 2015-2017[8]
  - Estimated ESPC project investment opportunity in MUSH market: ~$51.8-$86.8 billion[9]

[6] LBNL, 2015. "Estimating Customer Electricity and Fuel Savings From Projects Installed by the US ESCO Industry."
[7] LBNL/NAESCO database of ESCO projects

The Potential for ESPC in WRRFs

Market	2008 (n=29)	2011 (n=35)	2014 (n=43)
Federal Govt.	15.4%	21.4%	20.7%
State/Local Govt.	23.0%	24.0%	25.4%
K–12 Schools	22.4%	19.4%	23.5%
Univ./College	16.2%	13.7%	10.0%
Healthcare	6.3%	5.9%	5.9%
Housing/Other	9.4%	7.5%	6.6%
Commercial/Industrial	7.3%	8.1%	7.9%
TOTAL	100.0%	100.0%	100.0%

Source: "U.S. Energy Service Company Industry: Recent Market Trends." by Elizabeth Stuart, Peter H. Larsen, Juan Pablo Carvallo, Charles A. Goldman, and Donald Gilligan. October 2016. Appendix A. Page 48.

- State/local governments incur approximately 95% of the capital investments annually to maintain & improve the infrastructure
- ESPC can provide upfront project financing in the face of limited budgets
- Upgrades in WRRFs can achieve up to 50% energy savings

[8] "U.S. Energy Service Company Industry: Recent Market Trends." by Elizabeth Stuart, Peter H. Larsen, Juan Pablo Carvallo, Charles A. Goldman, and Donald Gilligan. October 2016. Page 18.

Note Regarding ESPC Legislation

- Most states have legislation enabling ESPC
- Individual states might have language addressing ESPC specifically for school districts
- Legislation may set requirements for procurement, allowable energy conservation measures, financing terms, structure of the guarantee, M&V, and budget streams
- Good practice to consult your General Counsel, the State Energy Office, and/or project facilitator

[9] "Current Size and Remaining Market Potential of the U.S. Energy Service Company Industry" by Elizabeth Stuart, Peter H. Larsen, Charles A. Goldman, and Donald Gilligan. September 2013. Page 37.
[10] Ibid, Page A-4.

What's Holding Back the ESPC Market

Frequent barriers to broad use of ESPC expressed by MUSH market:

- Complicated and time-consuming procurement process
- Hard-to-access data on existing projects
- Inadequate data to make business case for ESPC
- Insufficient knowledge about mechanism details
- Inexperience in using ESPC in certain market sectors

[11] Ibid, Page A-6, A-5.

ESPC Case Studies for Wastewater Facilities

U.S. DEPARTMENT OF ENERGY

City of Rome, NY

- Small city - population 35,000
- Faced state and local budget cuts, shrinking tax base
- Goals of stable infrastructure, financial viability, water production quality, and economic development
- $6.6 million in energy improvements
  - Fine-bubble aeration system
  - Low-Lift Pumps with Variable Frequency Drives (VFDs)
  - Dissolved Oxygen (DO) controls
  - New cleaning schedules allowed for total summer shutdown
- Post-project can process greater volumes and more easily meet NPDES requirements
- $100,000+ annual savings

City of Riverbank, CA

- Small city – population 23,000
- Focus on infrastructure stability and product quality
- $3.9 million in energy improvements
  - Upgraded to fine-bubble aeration system
  - Variable Frequency Drives (VFDs)
  - Filters, valves, gauges, control panels
- $200,000 annual savings

Hutchinson Wastewater Facility, MN

- Small city – population 14,000
- Capacity 3.5 MGD/day
- Focus on infrastructure stability
- $375,000 in energy improvements
  - Variable Frequency Drives (VFDs)
  - Lighting
  - Reduced maintenance needs
- Post-project motors can run at 30-35% capacity
- $60,000 annual savings (almost twice the guarantee)

DOE Resources for Wastewater Facilities

U.S. DEPARTMENT OF ENERGY

ESPC Accelerator Toolkit

https://betterbuildingssolutioncenter.energy.gov/energy-savings-performance-contracting-espc-toolkit

- The ESPC project process
  - Model contract documents, ESPC project database, financing decision tree, online guide to implementing ESPC, best practices for selecting energy service company
- The ESPC institutional infrastructure
  - Resources for developing ESPC project champions and for building support network for ESPC across jurisdiction, fact sheet on economic impact analysis tools, ESPC vs. Design-Bid-Build, guide for establishing ESPC technical assistance program
- Application of ESPC to new markets
  - Guide to ESPC in the wastewater sector

DOE Resources for Wastewater

- Better Plants
- Superior Energy Performance (SEP) Program
- ISO 50 001 Ready
- Industrial Assessment Centers (IACs)
- CHP Deployment Program
- CHP Technical Assistance Partnerships (CHP TAPs)
- CHP for Resiliency Accelerator
- **Sustainable Wastewater Infrastructure of the Future (SWIFt) Accelerator**

SWIFt Goals & Structure

Goals

- Document model plans for transitioning to a sustainable infrastructure that will help drive more solutions in the industry
- Develop assessment and decision tools for selecting best-practice approaches and tools on the pathway toward a sustainable infrastructure

Structure

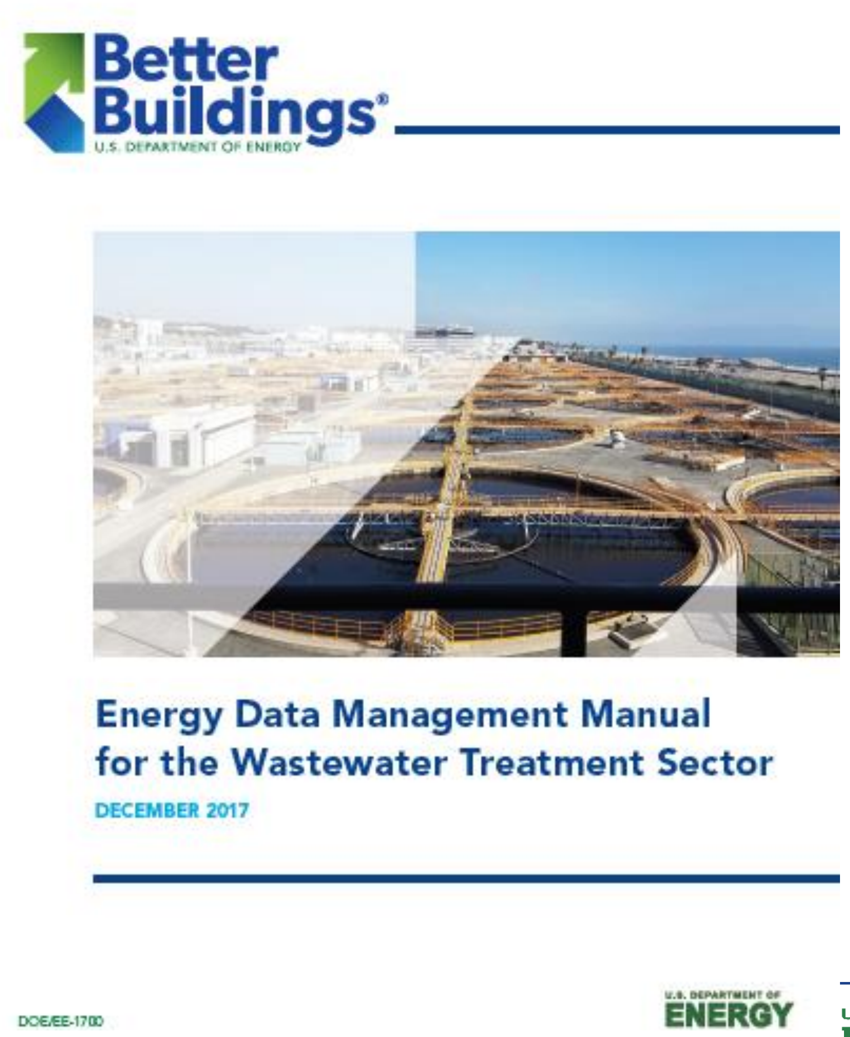
- **Phase 1:** Energy Data Management
- **Phase 2:** Measure Planning & Implementation
- **Phase 3:** Project Financing
- **Phase 4:** Plan Drafting

Energy Data Management Resources

- Published 2017
- Explains the energy data management process, provides step-by-step approach, and provides data tool comparison matrix

SWIFt: Data Tool Comparison Matrix

Better Buildings U.S. Department of Energy	Tool interface and entering data	# of Months of data needed	Data needed to use the tool	What metrics does the tool calculate?	Internet needed?	Facility size/type requirements	Other features of the tool	Technical assistance available for the tool	Compatibility with other data tracking tool(s)?
Portfolio Manager - EPA https://portfoliomanager.energystar.gov/pm/signup	Online tool to measure and track energy and water consumption and greenhouse gas emissions. Upload from Excel or enter data manually	24 months	1) Property information (sq. ft.) 2) Monthly energy data (kWh, therms) 3) Monthly flow data (gpd, MGD) 4) Plant annual average of influent and effluent BOD (mg/l) 5) Plant design flow rate (MGD) 6) Plant features- trickle filter, nutrient removal, onsite generation	• Energy use intensity per flow (kBtu/MGD) • Greenhouse gas emission intensity (kg CO2e/ gpd) • Avoided GHG emissions	Yes	All types/sizes, but ENERGY STAR score only for facilities > 0.6 mgd	• Can be used to manage different property types (e.g., buildings) within the same portfolio. • Data request templates can be used to request data from multiple facilities • Weather- normalized values based on 30-year average temperature • Nutrient removal indicated as Y/N in profile factored into ENERGY STAR score	Online Resources	Compatible with most tools
Energy Assessment Tool (EAT) - EPA Region 4 https://www3.epa.gov/region9/waterinfrastructure/audit.html	Downloadable Excel-based tool to assess individual baseline energy use and costs through utility bill and equipment analysis	24 months	1) Date & monthly flow (DMR data) 2) kWh monthly usage and monthly costs (kW demand optional) 3) Monthly gas usage and bill ccf or therms/ $	• kWH/MG • Cost/MG • kWh/ MG treated	No	All types/ Small-medium sizes (up to 5 electric meters per facility)	• Accommodates biogas and solar • Designed for 5 years; needs tweaking to accommodate longer timeframes	Region 4 experts	PM and EnPI tool
New Hampshire spreadsheet tool (not publicly available)	Customized by State of NH, this Excel spreadsheet- based tool requires manual entry of energy data.	24 months	1) Design flow (MGD) 2) Annual average daily flow (MGD) 3) Annual average energy usage (kWh) 4) Nutrient limit types 5) Annual average daily BOD removed	• kWh/ lb BOD removed • kWh/ MG treated	No	All types/sizes	Suitable for both portfolio and individual facility use	N/A	Compatible with most tools
Energy Performance Indicator (EnPI) - DOE https://ecenter.ee.doe.gov/EM/tools/Pages/EnPI.aspx	Downloadable add-in for Excel. Upload data from external spreadsheet or enter data manually through step-by-step wizard	24 months	1) Monthly or weekly energy consumption data 2) Monthly or weekly production data (metric tons, million gallons of flow, BOD, COD etc.) 3) Weather data - Heating Degree Days (HDDs), Cooling Degree Days (CDDs), humidity, monthly rain, average temperature, etc.	• kWh/ lb BOD removed • kWh/ MG treated • COD mg/L • Avoided GHG emissions	No	All types/sizes	• Regression analysis (forecast, backcast, and chaining) for improved accuracy • Can be used by both individual facilities and portfolios (corporate roll-up functionality) • Tool updated bi-annually (optional download)	Online Resources	Compatible with most tools
Qualified Energy Savings Tool (QEST) Tool- DOE (Expected to be available Feb-March 2017)	An online tool you can use to track and analyze energy use and greenhouse gas emissions. Internet needed. Standard regression analysis vs. customized as in EnPI.								



https://www.energy.gov/sites/prod/files/2018/01/f46/WastewaterTreatmentDataGuide_Final_0118.pdf

Low- and No-Cost Measures List

Sustainable Wastewater Infrastructure of the Future (SWIFt)

LOW- AND NO-COST MEASURES LIST

These measures were recommended by U.S. DOE Industrial Assessment Centers and implemented at various water resource recovery facilities, averaging ≤ 2 year payback periods.

Operation

- ☐ Test, calibrate, and maintain dissolved oxygen level/sensors in aeration tank(s).[1]
- ☐ Shift to smaller HP pumps/blowers during nightly low-flow periods or seasonal low-flow periods, if applicable.[2]
- ☐ Reduce blower pressure to the minimum required through proper maintenance of aeration diffusers and distribution system to minimize head loss. Control the set point in the aeration blower control strategy. Also, identify, assess and repair aeration system air main leaks - (replace gasket, repair corrosion, underground maintenance) and lower aeration tank levels to reduce air header static pressure, if applicable. (May need sensing O2 level).
- ☐ Turn off equipment when not in use (e.g., turn off aerobic digester blower periodically or operate intermittently).
- ☐ Adjust system operations when there is a change in wastewater load.
- ☐ Raise wet well levels to reduce static head in the pump system. Coordinate all control points (low-level alarm, pump start/stop, high-level alarm) to adjust the wet well level upward. Consider hydraulic profile of the facility when doing so.
- ☐ Eliminate leaks in inert gas and compressed air lines/valves.
- ☐ Operate select aeration tanks as needed while also establishing operating protocols to enable the plant to bring tanks back on line efficiently.
- ☐ Routinely clean UV lamp sleeves to enhance transfer efficiency and decrease the number of UV lamps where/when possible while still meeting disinfection needs.
- ☐ Idle aeration basins/zones, if not needed (periodic maintenance may still be needed).
- ☐ Reschedule plant operations or reduce load to avoid on-peak hours (e.g., operate dewatering equipment during off-peak, load digesters during off-peak, repair equipment, and shift recycling of supernatant to off-peak).

Assessment

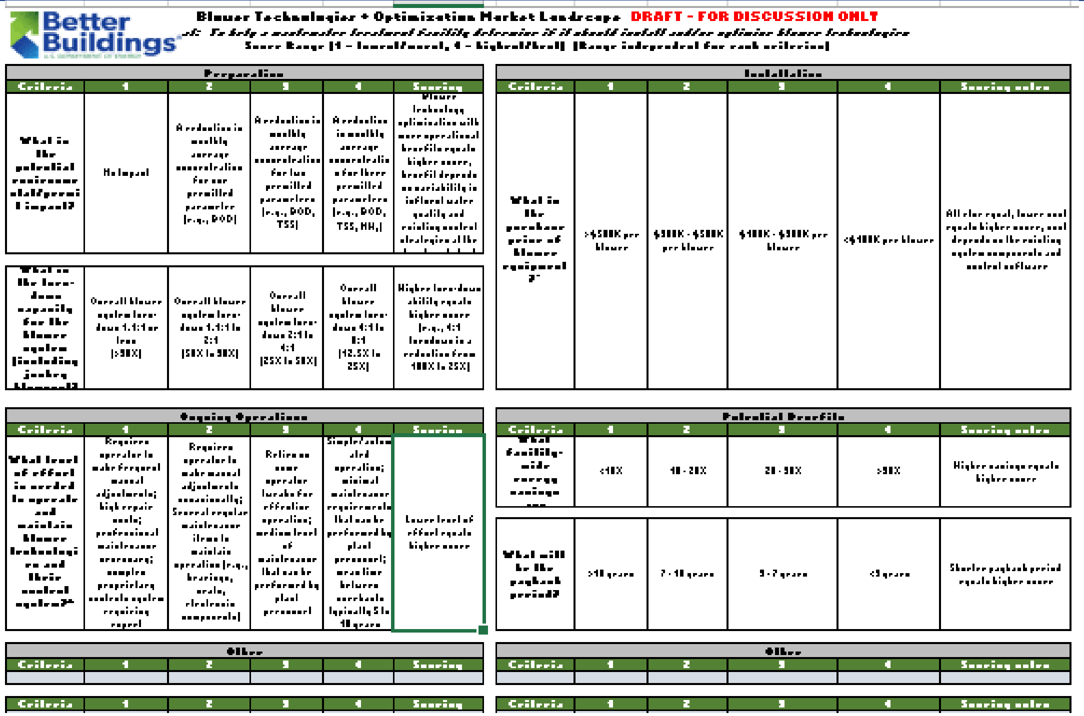
- ☐ Review and assess ventilation requirements to optimize efficiency, reduce space conditioning during non-working hours, and manage space conditioning energy use during non-occupancy times.
- ☐ Assess the potential to remove organics prior to entering the secondary treatment system. Assess the capability for high strength organic dischargers to feed directly to an anaerobic digester.
- ☐ Review operations to identify any pumps or blowers that are being throttled and assess them to determine if they can be adjusted to operate more efficiently.
- ☐ Assess air and water piping systems in need of insulation (exposed piping).
- ☐ Identify equipment speeds and resheave blowers where needed.
- ☐ Consult your energy utility account manager to evaluate rate schedules and determine the most efficient rate for your facility.

Installation

- ☐ Install timers on light switches and occupancy sensors in little-used areas and adjust for scheduled operations as needed.
- ☐ Install programmable thermostats and use night set-back/setup settings.
- ☐ Turn off unnecessary lighting and install occupancy sensors.
- ☐ Identify and use energy-efficient belts compatible with your facility's equipment.
- ☐ Change aeration blower intake filters regularly to minimize air intake resistance.[3]
- ☐ Use automatic controls when available to optimize equipment, process monitoring, and operations.

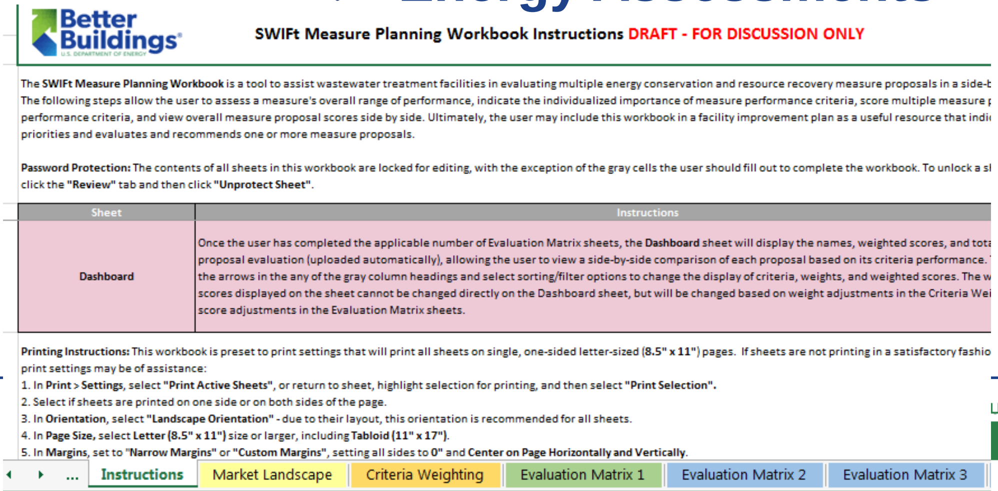
[1] Requires emptying tanks. Otherwise, payback can be much shorter.
[2] Must have more than sporadic (significantly frequent) nightly low-flow periods.
[3] Use static pressure to check if filters need replacement.

Measure Planning Workbooks



- Dissolved Oxygen (DO) Control
- Blower Technologies + Optimization
- Emerging Diffuser Technologies
- Pumping System Technologies + Optimization
- Energy Assessments

- Real-Time Monitoring & Control
- Energy Management Systems
- Infiltration/Inflow Studies
- Ammonia-based Aeration Control (ABAC)



Measure Planning Workbooks contd.

Better Buildings
U.S. DEPARTMENT OF ENERGY

Technologies + Optimization Criteria Weighting DRAFT - FOR DISCUSSION ONLY

stewater treatment facility determine priorities with regard to blower technologies + optimization

Range (1 = lowest/worst, 4 = highest/best) (Range independent for each criterion)

Criteria	2	3	4	Scoring notes	Weight
What is the purchase price of blower equipment?*	\$300K - \$500K per blower	\$100K - \$300K per blower	<\$100K per blower	All else equal, lower cost equals higher score, cost depends on the existing system components and control software	*17%*
Ongoing Operations					
What level of effort is needed to operate and maintain blower technologies and their control system?^	Requires operator to make manual adjustments occasionally; Several regular maintenance items to maintain operation (e.g., bearings, seals, electronic components)	Relies on some operator tweaks for effective operation; medium level of maintenance that can be performed by plant personnel	Simple/automated operation; minimal maintenance requirements that can be performed by plant personnel; mean time between overhauls typically 5 to 10 years	Lower level of effort equals higher score	*17%*
Potential Benefits					
What facility-wide energy savings are expected?	10 - 20%	20 - 30%	>30%	Higher savings equals higher score	*17%*
What will be the payback period?	7 - 10 years	3 - 7 years	<3 years	Shorter payback period equals higher score	*17%*
Other					
				Total Weight:	**100%**

Better Buildings
U.S. DEPARTMENT OF ENERGY

Blower Technologies + Optimization Evaluation Matrix 1 DRAFT - FOR DISCUSSION ONLY

Goal: To help a wastewater treatment facility determine if it should install and/or optimize blower technologies

Score Range (1 = lowest/worst, 4 = highest/best) (Range independent for each criterion)

Criteria	1	2	3	4	Scoring notes	Weight	Score	Weighted Score
What level of effort is needed to operate and maintain blower technologies and their control system?^	Requires operator to make frequent manual adjustments; high repair costs; professional maintenance necessary; complex proprietary controls system requiring expert contractor support	Requires operator to make manual adjustments occasionally; Several regular maintenance items to maintain operation (e.g., bearings, seals, electronic components)	Relies on some operator tweaks for effective operation; medium level of maintenance that can be performed by plant personnel	Simple/automated operation; minimal maintenance requirements that can be performed by plant personnel; mean time between overhauls typically 5 to 10 years	Lower level of effort equals higher score	17%		
Potential Benefits								
What facility-wide energy savings are expected?	<10%	10 - 20%	20 - 30%	>30%	Higher savings equals higher score	17%		
What will be the payback period?	>10 years	7 - 10 years	3 - 7 years	<3 years	Shorter payback period equals higher score	17%		
Other								
Name:					**Total Weight:**	100%	**Total Score:**	

- **Anaerobic Digestion**
- **Combined Heat & Power (CHP)**
- **Heat Recovery**
- **Biosolids Energy Recovery**

Thank You!

Questions?

For additional information, contact

Alice Dasek

alice.dasek@ee.doe.gov

WORKFORCE DEVELOPMENT

Minnesota Water-Energy Nexus
In-State Retreat

David Kuzminski, Coordinator

Water and People Program/Water Boot Camp

BACKGROUND

- Experts predict that water industry in general will be experiencing a 40% “brain drain” within the next five years.

- State of Connecticut has 1,020 certified distribution & treatment operators, 40% or 432 will be eligible to retire in 5 years.

CTAWWA'S RESPONSE

- Process began 9 years ago
- Initial Meeting - CTAWWA & Superintendent of Portland, CT schools
- Previous CTAWWA working relationship with Town Tech Education Partnership Program - program developed in early 1990s that gives high school students real life projects in partnership with town government.

THE PROCESS BEGINS

- Presentation then made to the Portland Board of Education proposing a new course focusing on careers in the water industry. Board feedback positive; requested more information

- CTAWWA education committee partners with the Town of Portland Town Tech Educational Partnership Program, Portland High School, Gateway Community College and State of CT DPH to develop a high school curriculum that brings awareness to careers with the water industry.

GOAL AND INNOVATION

- Goal - offer the class to juniors & seniors with end result being students eligible to sit for the State of Connecticut operator in training exam or continue on the Gateway curriculum with advanced credits. At the very least we will bring exposure to careers the water industry to our high school student population.

- Concept innovation – first of its kind offered at public high school level

“WATER AND PEOPLE” CLASS IS BORN!

- Curriculum designed to satisfy requirements to meet the Small Systems Operator in Training exam as well has meet State Board of Education new course requirements. At the completion of the course, senior students will be eligible to sit for the Operator in Training exam.

- Course consists of class training and labs. Lab schedule includes topics such as Total Coliform, Filtration, Chlorination, Pressure, Flow Rate, Cross Connections, Water Quality, Meter Testing and Operator Safety and field trips.

"WATER AND PEOPLE" CLASS IS BORN!

- Advanced placement credits toward the Water Management Program offered at Gateway Community College in North Haven, CT
- Partnering between all state agencies along with all the educational institutions has been critical

FUNDING FOR "WATER AND PEOPLE"

- Town of Portland notified section that $7,500 would be required to start program.

- CTAWWA will fund the first year of the program, continue to play major continuing role in success and sustainability of the program, and develop outside funding on the State and Federal levels for sustainability of this important course beyond the immediate school year.

MOU – PORTLAND AND CTAWWA

- **<u>Terms of Funding</u>**
- CTAWWA wants this course to be a model for similar courses in Connecticut and around the country. The curriculum will need to be shared with other public school systems to help the water industry deal with looming workforce issues.

- **<u>Memorandum of Understanding</u>**

  Agreement signed that the Portland High School "Water and People" curriculum will be shared with other school systems, at no charge, upon written request.

THE GOOD NEWS!

- 67 students have gone through the course to start January 2009 at Portland High School
- Co-teachers including CTAWWA's Dave Kuzminski, have taken DPH course in Water Treatment for Operators and are "tweaking curriculum". Eighteen labs arranged.
- CTAWWA will give each graduate a one year student membership in AWWA.

WATER AND PEOPLE GOES TO BLOOMFIELD HIGH SCHOOL

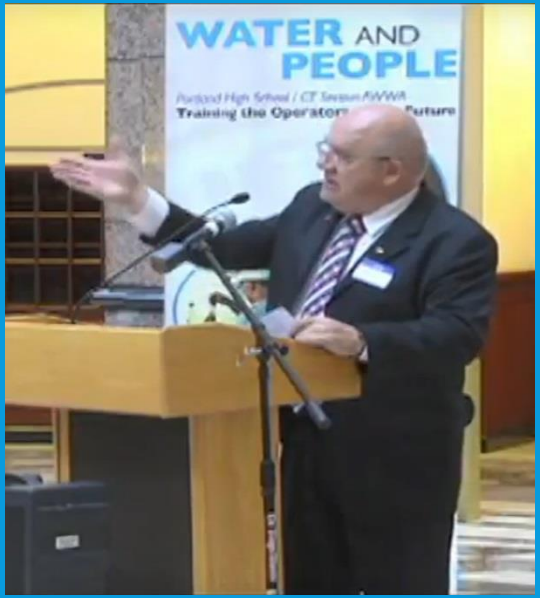
AWARDS

2010

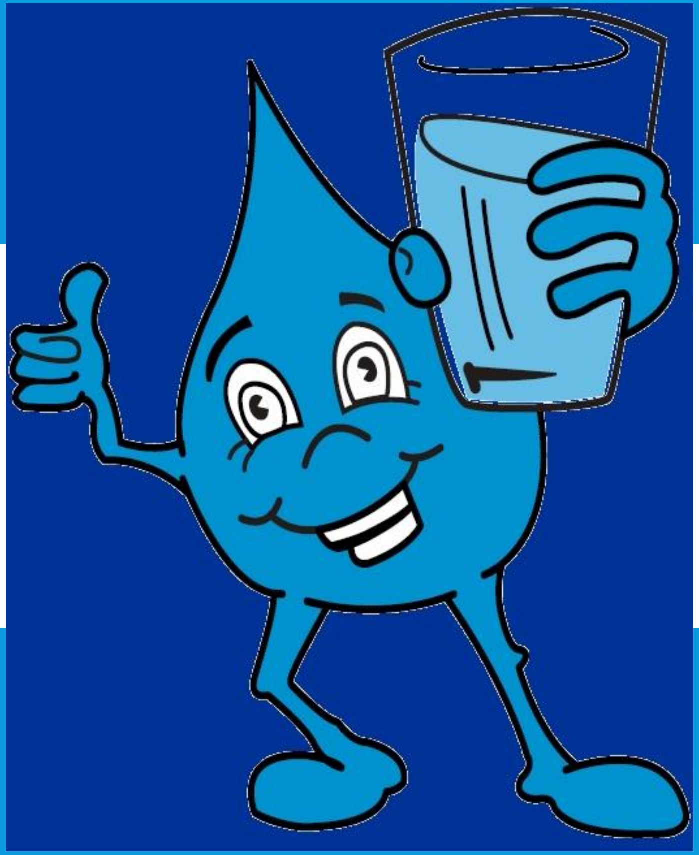
EPA Environmental
Merit Award

2014

Joint Educational
Public Health Drinking Water
Merit Award



QUESTIONS?



Thank You!

NGA

NATIONAL GOVERNORS ASSOCIATION

Roundtable Discussion

Facilitator: Bevin Buchheister, Senior Policy Analyst, NGA

NGA

NATIONAL GOVERNORS ASSOCIATION

Develop Action Plan & Wrap Up

Facilitator: Patricio Portillo, Policy Analyst, NGA

NGA

NATIONAL GOVERNORS ASSOCIATION