



# Integrated Capital and Energy (ICE) Planning

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# Intro



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- New York Headquartered Professional Services Company
- 77 Year Old Firm with a Staff over 270 people
- 1 of 17 companies accredited as an ESCO by the National Association of Energy Service Companies
- US DOE Qualified
- Long-Term Relationships
- Professional Credentials



A large iceberg floating in the ocean. The tip of the iceberg is visible above the water surface, while the much larger, jagged base is submerged below. The sky is blue with some clouds, and the water is a deep blue. The overall image serves as a metaphor for the concept of 'iceberg' in the text, representing visible vs. hidden aspects of a problem or solution.

# ICE

## Integrated Capital & Energy Planning

A program that helps create a world where capital improvements can pay for themselves... freeing municipalities from having to impose more burdens on ratepayers or rely on grant funding.

# Why is Energy Management and Operational Savings a Focus?

## CHALLENGES

1. Tight Budgets/Property Tax Cap
2. Energy Costs – Increasing and Volatile
3. Infrastructure – Aging and Maintenance Intensive
4. Tax Payers Expect to do More with Less
5. Public Relations Cost/Benefit/Environmental Justification



# Why is Energy Management and Operational Savings a Focus?

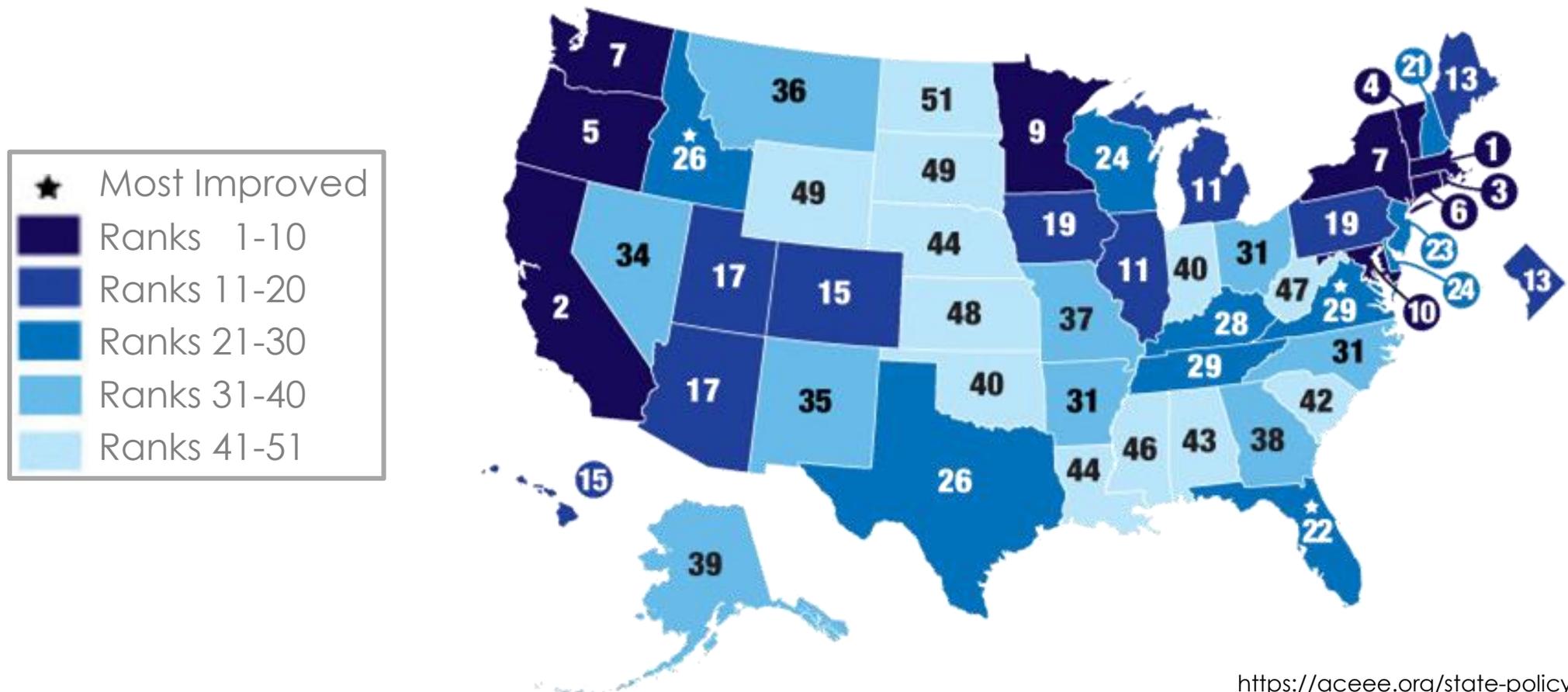
## OBJECTIVES

1. Save Money, Reduce Energy, Operational, Maintenance Costs
2. Increase Revenue
3. Meet More Stringent Water Quality Limits
4. Integrate Energy Efficiency into Capital Improvement Programs



# Why is Energy Efficiency a Focus?

## 2017 State Energy Efficiency Scorecard Rankings

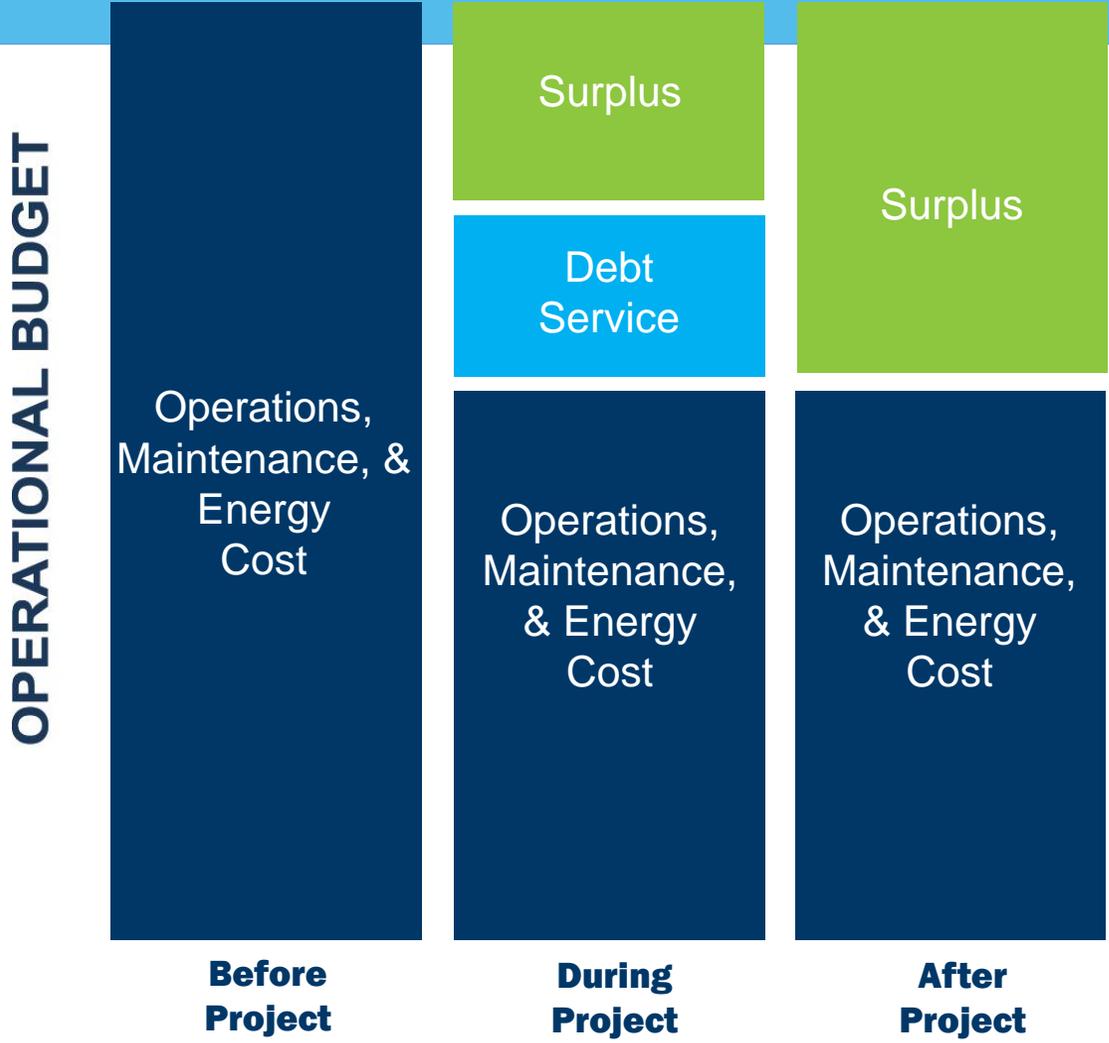


# ICE

## Integrated Capital & Energy Improvements

A program that helps create a world where capital improvements can pay for themselves... freeing municipalities from having to impose more burdens on ratepayers or rely on grant funding.

# Energy Savings Project



# ICE Master Plan



## Integrating Energy & Operational Savings into CIP plans

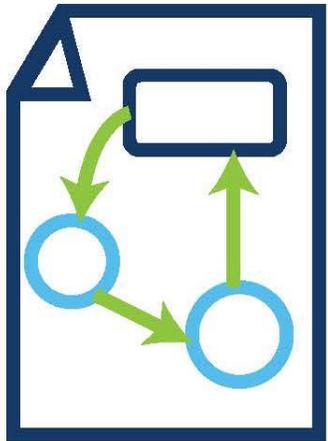
- Many improvements planned as part of CIP plans reduce operating costs
- Asset renewal value of replaced items incorporated
- Short payback items are combined with longer payback items to bring total project payback within goals

## Implementing an ICE Master Plan

- Investment Grade Assessment
- NYSERDA FlexTech Program (50% Grant for Plan)
- Key to incorporate Pro Forma based financial analysis as overlay and presentation of results developed



# ICE Approach



PLANNING PHASE

DESIGN PROJECT  
IMPROVEMENTS

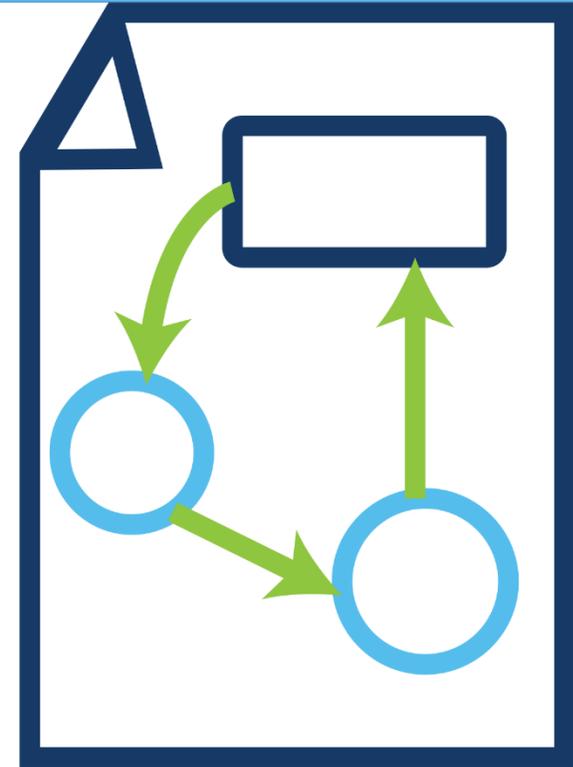
IMPLEMENTATION

RESULTS



# Planning Phase

**Make an Informed  
Decision!**



# Investment Grade Assessment

Mix of longer payback with shorter payback energy conservation improvements.

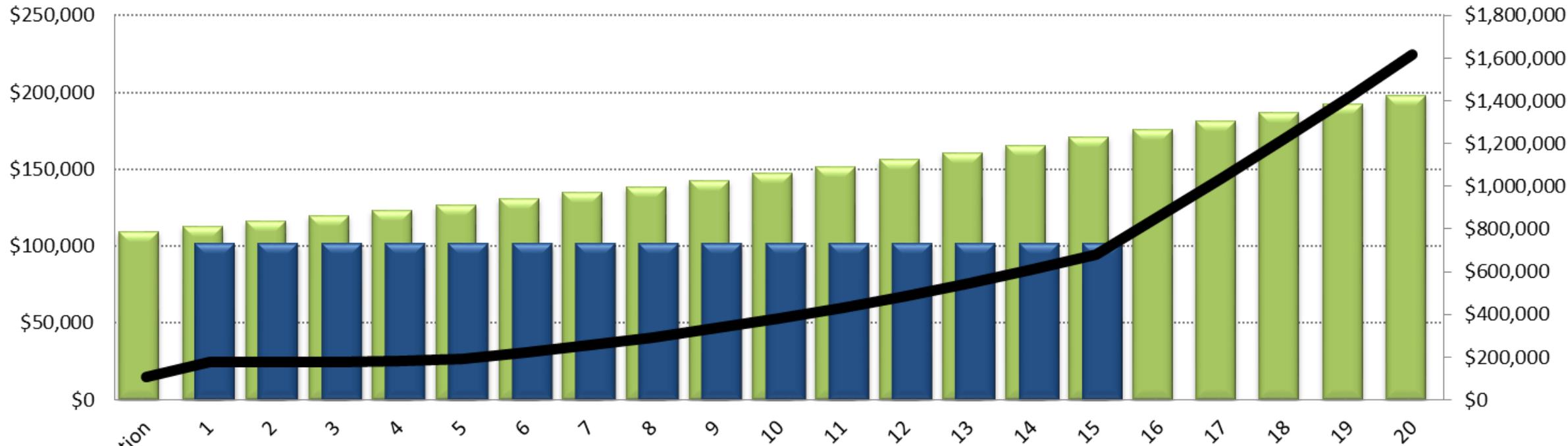
ENERGY CONSERVATION MEASURE NO.	FACILITY IMPROVEMENT MEASURE	TOTAL MEASURE COST	TOTAL ANNUAL SAVINGS	SIMPLE PAYBACK
1	Control System and Blower Upgrades	\$309,120	\$31,543	9.8
2	Pump Controls and Optimization	\$124,657	\$10,840	11.5
3	Motor Improvements	\$ 43,217	\$ 3,425	12.6
4	Boiler Replacement & Controls	\$175,772	\$ 6,392	27.5
5	Lighting Improvements	\$261,622	\$33,780	7.7
6	Building Envelope Improvements	\$ 20,987	\$ 5,672	3.7
7	Photovoltaic System	\$275,819	\$18,146	15.2
	<b>PROGRAM TOTALS - Recommended Measures</b>	<b>\$1,211,194</b>	<b>\$109,798</b>	<b>11.0</b>



# Sample Cashflow

Savings & Debt Service

Cash Flow



Installation

Savings Debt Service (\$) Cash Flow

# Investment Grade Assessment

## Wastewater Treatment Plant ECM – 3: Solids Dewatering Upgrades and Polymer System

Measure Summary		
Energy Savings		
Total Demand Savings	18	kW/Year
Electrical Energy Savings	71,912	kWh/Year
Fossil Fuel Savings	-	mmBtu/Year
Total Equivalent CO <sub>2</sub> Gas Savings <sup>(1)</sup>	35,806	lbs/Year
Cost Savings		
Electrical Dollar Savings	\$7,368	Per Year
Fossil Fuel Dollar Savings	\$0	Per Year
Operational & Maintenance Savings	\$106,183	Per Year
Total Dollar Savings	\$113,550	Per Year
Direct Project Costs		
<b>Total Measure Cost</b>	<b>\$1,357,200</b>	
Payback		
Simple Payback	12.0	Year(s)

(1) Environmental CO<sub>2</sub> Gas Savings Estimated Using Conversions By: EPA

### Environmental Savings from Energy Use Reduction (1 year)



35,806 lbs of CO<sub>2</sub> (Carbon Dioxide)  
 71 lbs of SO<sub>2</sub> (Sulfur Dioxide)  
 0 lbs of N<sub>2</sub>O (Nitrous Oxide)

### Equivalent Savings for Comparison (1 year)

cars removed  
from the road

3



barrels of oil  
saved

38



houses energy  
use

1



number of trees  
planted

421



# Design Project Improvements



**Water**

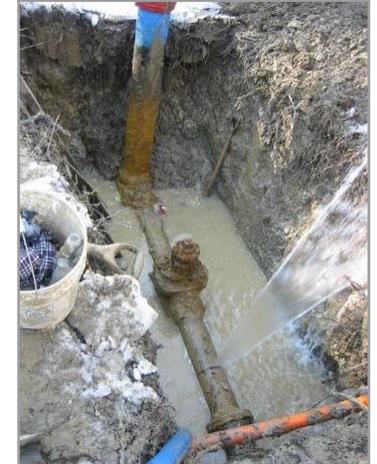
**Wastewater**

**Buildings/Facilities**



# Project Improvements – Water Treatment Facilities

- Pumping and Pump Station Upgrades
- Filtration System Upgrades
- Variable Speed Drives and Motor Replacements
- Automated Control Systems
- Low Headloss Valves
- Tube Settlers
- Chemical Optimization
- Residual Managements Upgrades
- Energy Management Systems/SCADA
- Water Meters and AMR



# Project Improvements – Wastewater Treatment Facilities

- Aeration Diffuser Upgrades
- Pump and Headworks Upgrades
- Automated Control Systems
- Blower Upgrades
- Chemical Optimization
- Solids Handling Upgrades
- Digestion Upgrades
- Energy Management Systems/SCADA





# Project Improvements





# Project Improvements



The image shows a large industrial facility, likely a water treatment plant, with several tall, light blue cylindrical tanks. Each tank has a yellow 'CAUTION' label with an upward-pointing arrow. The tanks are connected to a network of pipes and valves, some of which are red. In the background, there are metal walkways and railings. The overall scene is brightly lit, suggesting an indoor or well-lit outdoor environment.

Oswego, NY

Raw Water and High  
Service Pumping,  
Sedimentation, Filtration  
and Controls Upgrades

Annual energy Savings: \$95,892

Revenue Increases and  
O&M Savings: \$370,528

Energy Incentives: \$270,000

# Town of Grand Island, NY



## Water & Sewer

Water Revenue Increase: \$343,868

Energy Savings: \$66,345

O&M Savings: \$15,639

Energy Incentives: \$278,251

Simple Payback: 9 Years

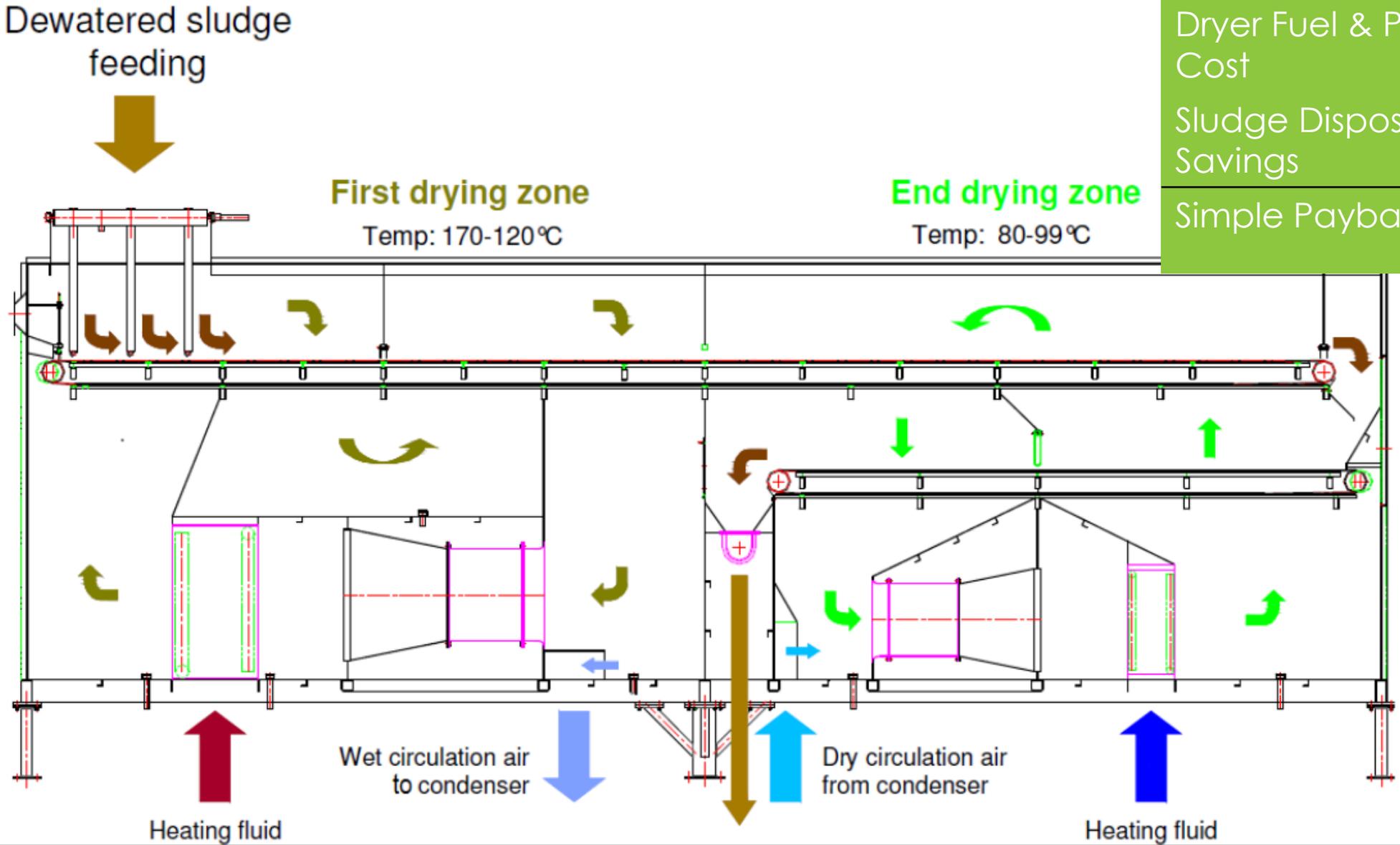
# Onondaga County, NY WWTP



- A comprehensive ICE evaluation was performed on the six WWTPs making up the County System
- Over \$45 million of integrated energy and capital improvements
- Over 13 million KWHrs of electrical savings and \$1.25 of O&M savings annually
- \$2.3 million in energy incentives
- 15 year payback when including asset renewal for replacement of aged equipment

# Onondaga County, NY WWTP

Sludge Disposal Cost	\$2.8M Annually
Sludge Dryer Cost	\$13M (installed)
Dryer Fuel & Power Cost	\$500,000
Sludge Disposal Savings	<b>-\$1.9M</b>
Simple Payback	9.5 years



# Onondaga County, NY WWTP

ECM #	Description	% Energy Save
3a	Influent Pump Station - Modify Existing Check Valves	48%
8	Post Aeration Blower Upgrades	85%
10	Boiler Burner Controls	10%
11	Retro-commissioning	14%
14b	Oxygen Basin Mixer Upgrades w/VFDs (Lightnin Mixers)	64%
15 / 17	Aeration Blower Upgrades (Turbo Blowers)	59%
18d	Replace RAS Pumps Only	81%
19	Sludge Transfer Pump Upgrades	74%
25	Variable Flow Pumping	69%
26	Retro-commissioning	13%
27	Steam Boiler Plant Optimization	10%
28a	Fleet Maintenance Garage IR Heaters	57%
28b	Plant Maintenance Garage IR Heaters	58%
28c	Large Vehicle Garage IR Heaters	44%
35	Laboratory Controls	53%
37	Computer Power Management Software	19%



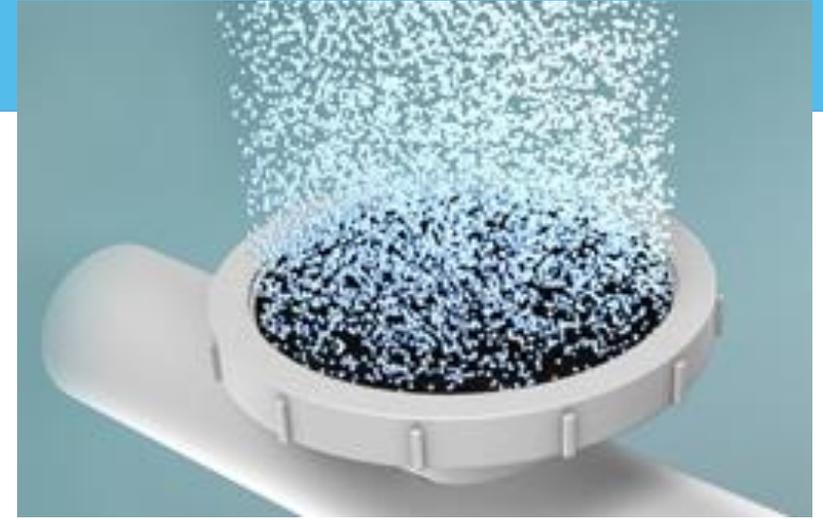
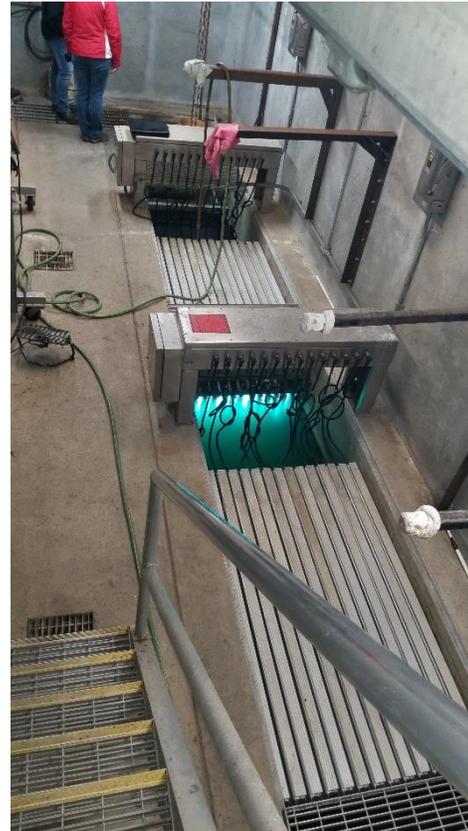
## Village of Westfield, NY – WWTP Improvements

### Existing Conditions & Deficiencies

- Majority of equipment is original and beyond operating life
- Maintenance costs are rising
- Existing surface aerators are energy inefficient and limited to treat high organic loading
- Icing issues in winter months
- No grit removal system
- Existing liner failure in basins

# Village of Westfield, NY – WWTP Improvements

- Existing basins consist of: First and Second Stage Aeration Basins with Mechanical Surface Aerators
- Fine bubble and ultra fine bubble diffused aeration systems were evaluated
- Samples of influent were collected and analyzed



# Village of Westfield, NY – WWTP Improvements

- Convert Both Second Stage Aeration Basins to Diffused Air Consisting of:
  - Ultra Fine Bubble Diffusers
  - (3) Turbo Blowers
  - Automated Dissolved Oxygen System for Controls
  - Upgrade of Stage 1 to equalization basins
- Benefits include:
  - Increase Energy Efficiency and Savings, while doubling the amount of air to the basins
  - Increase Standard Oxygen Transfer Rate (SOTR) and Oxygen Transfer Efficiency (OTE)
  - Better control of basins to accommodate fluctuating plant flows and organic loading



# City of Dunkirk, NY

- New York State Water Grant
  - \$10,175,000 that includes a 0% loan and a \$2,543,750 grant
- NYSERDA Flex Tech Program Grant
  - Economically sustainable capital improvement program
  - Replaced a combination of failing and inefficient assets to reduce financial burden
- Triple Bottom Line Approach
  - Develop a project scope that saves money, replaces failing or outdated equipment and is environmentally sustainable utilizing green infrastructure improvements



Approach allows City to replace failing equipment with utility bill savings and stay ahead of regulatory requirements and enforcement



City of Dunkirk, NY

- Bar Screen and Grit System upgrades
- Aeration Turbo Blower improvements
- LED Site and Interior Lighting Improvements
- Solids Dewatering Improvements
- Emergency Generator for WWTP
- Treatment plant heating and ventilation improvements
- Energy management and process automation (SCADA) improvements
- Boiler and natural gas well upgrades
- Pumping upgrades



# Project Improvements – Building Opportunities

- LED Interior & Site Lighting
- Lighting Controls
- Energy Management Systems
- HVAC Equipment Upgrades/Replacements
- Motors & Variable Speed Drives
- Computer Power Management System
- Occupancy Controlled Ventilation
- Infrared Heating Technology
- Retro-commissioning
- Water Conservation
- Building Envelope
- Street Lighting and “Smart” Technologies



# CASE STUDY | ORLEANS COUNTY



Annual Energy  
Savings:  
\$63,853

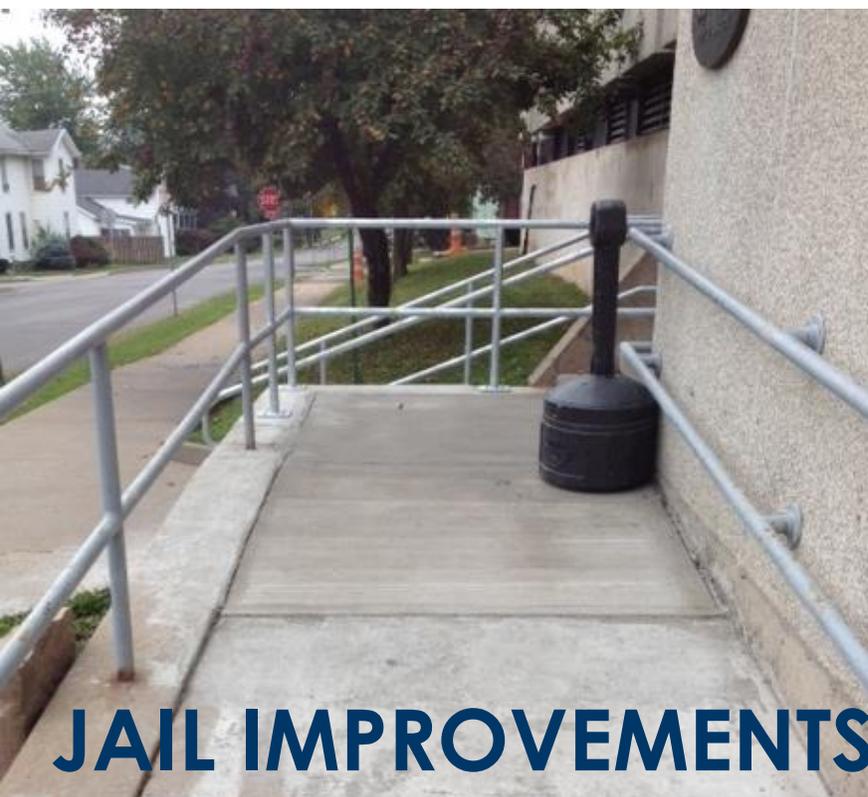
Energy Incentives:  
\$111,200



# UPGRADES

- Lighting
- HVAC Controls
- Boiler/Burner Replacements
- Domestic Hot Water Upgrades
- Roof Replacement
- New Windows
- Ozone Laundry
- Water Conservation
- Building Envelope





## JAIL IMPROVEMENTS



- Utilized In-house County Labor
- Increased Life of Jail by 20 yrs
- Improved Equipment Reliability
- Improved Employee & Visitor Environment

# PROJECT SUMMARY

- Total Project Cost: \$1,474,371
- Total Energy Savings: \$1,757,788 over equipment life
- Energy Program Funding : \$111,200

## Annual Equivalent Savings

Cars Removed  
From the Road

43



Barrels of  
Oil Saved

511



Houses  
Energy Use

19



Number of  
Trees Planted

5,686



**nationalgrid**  
THE POWER OF ACTION





# CASE STUDY HORSEHEADS, NY

Water & Sewer  
Revenue Increase: \$114,621

Energy Savings: \$86,459

# CASE STUDY | CITY OF POUGHKEEPSIE

Annual Savings  
\$461,759

Simple Payback  
8.35 Years

Included wiring,  
pole and mast arm  
improvements  
where needed.

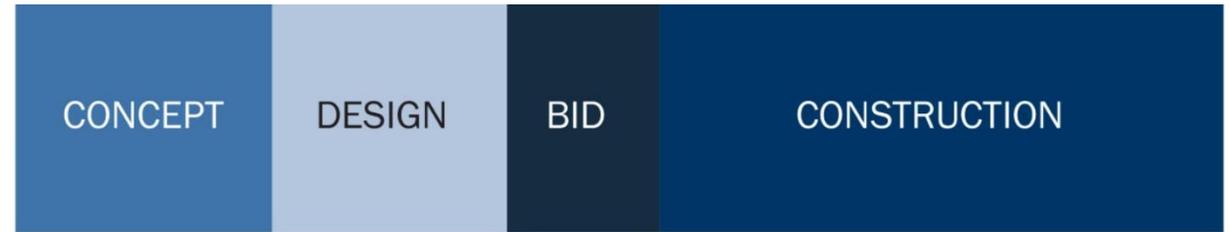


**Before**

**After**

# Implementation - Methods

## 1. Studies



## 2. Design Bid Build

## 3. Design Build



## 4. Professionally Led Design Build

## 5. Energy Performance Contracting



# Energy and Utility Incentives

## Prescriptive Programs

- Rebate per unit
- Simple and low effort
- Limited energy efficiency measures

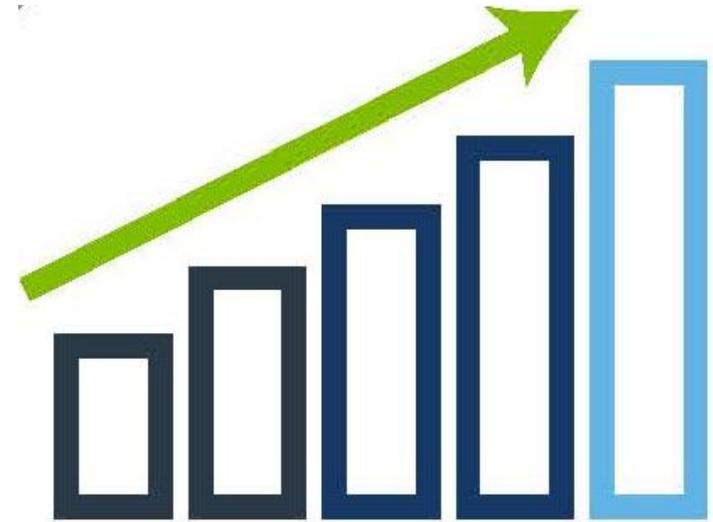
## Custom Programs

- Incentive on total savings & costs
- Broader scope of eligible measures
- Pre-approval required
- Requires calculation of energy savings and costs



# Conclusion - ICE Benefits

1. Save Money, Reduce Energy, Operational, & Maintenance Costs
2. Increase Revenue
3. Integrate Energy Efficiency into Capital Improvement Programs
4. Additionally - Meet More Stringent Regulations.



# Questions? and Thank you!

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