

Massachusetts Energy Management Pilot for Water & Wastewater Plants

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Summary

- MassDEP's role
- Background & project development
- Project components
- Preliminary results
- Q & A

MassDEP's role



Public water / wastewater treatment in MA

- Approx. 662 billion gallons of water treated per year
- Approx. 2-3 % of total electricity consumed in MA

Consumption of electricity

- \$150,000,000 / year
- 1,000,000 tons (CO₂)
- 2,000 tons of (SO₂)
- 750 tons of (NO_x)



Project development

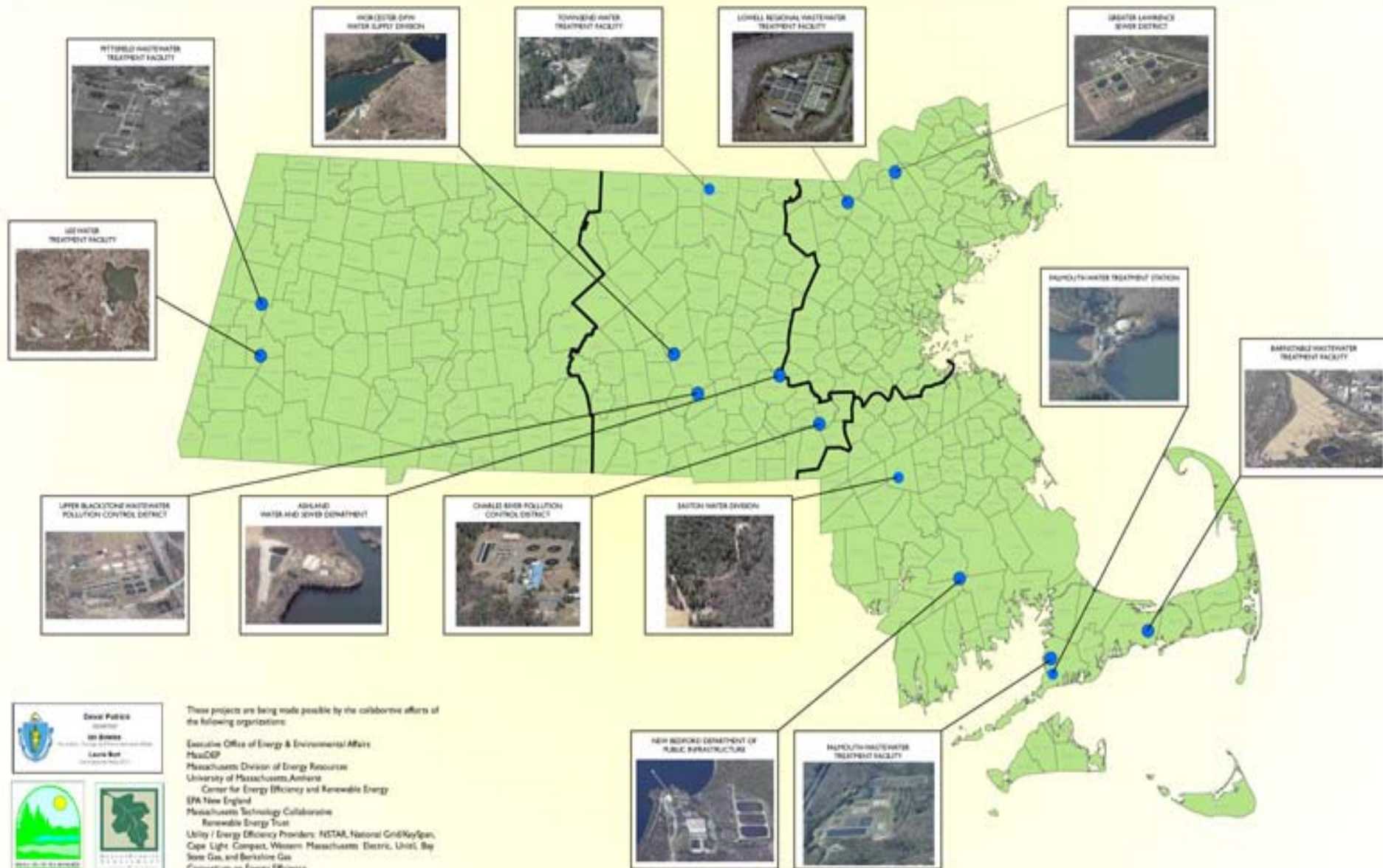
- **Lead:** MassDEP
- **Partners:**
 - MA Dept. of Energy Resources
 - EPA New England
 - Consortium for Energy Efficiency
 - Investor-owned electric and gas utilities: NGrid, NSTAR, Western MA Electric, Unitil, Bay State Gas
 - Cape Light Compact
 - Executive Office of Energy & Environmental Affairs
 - MA Technology Collaborative – Renewable Energy Trust
 - UMass Amherst – Center for Energy Efficiency & Renewable Energy (CHP)

14 Municipal water / wastewater facilities

Massachusetts Energy Management Pilot for Wastewater and Drinking Water Facilities

A Targeted Approach to Advance Municipal Energy Savings and Greenhouse Gas Reductions

Pilot Facilities



These projects are being made possible by the collaborative efforts of the following organizations:

- Executive Office of Energy & Environmental Affairs
- MassDEP
- Massachusetts Division of Energy Resources
- University of Massachusetts Amherst
- Center for Energy Efficiency and Renewable Energy
- EPA New England
- Massachusetts Technology Collaborative
- Renewable Energy Trust
- Utility / Energy Efficiency Providers: NSTAR, National Grid/KeySpan, Cape Light Compact, Western Massachusetts Electric, United Bay State Gas, and Berkshire Gas
- Conservation on Energy Efficiency



Project components

Goals:

- 20% reduction in electric consumption and costs
 - Reduce greenhouse gas emissions / climate change
 - Develop a model for strategic use of utility and public funding
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- EPA: Energy STAR benchmarking (“no cost”)
 - Utilities / MA DOER: “no cost” energy audits
 - MA Technology Collaborative: “no cost” renewable energy assessments
 - UMass: “no cost” combined heat & power analysis (2 plants)
 - Financial assistance for implementation (Utilities, Renewable Energy Trust, SRF, MA DOER, MA EOEEA)

Project schedule

Phase

Task

Target Timelines

Phase	Task	Target Timelines
Coalition Building	<ul style="list-style-type: none">• Partnership development (internal & external)• Invitation to participate• Public announcement	June - December 2007
Assessment	<ul style="list-style-type: none">• Energy Star Benchmarking (7 sites)• CHP feasibility analysis (2 sites)• Energy audits (14 sites)• Renewable screening (14 sites)	January – August 2008
Financial Assistance	<ul style="list-style-type: none">• Develop creative financial support model (government & private utilities)	September – December 2008
Implementation	<ul style="list-style-type: none">• Implement energy saving recommendations	2008 - 2009

Auditing Recommendations

Facility	Motors / VFDs	Process / Optimization	Operations	Lighting	HVAC
Pittsfield Wastewater		X – Aeration	X	X	X
Greater Lawrence Sanitary District	X	X - Sludge			
Barnstable Wastewater	X		X		
Charles River Pollution Control	X		X		X
Lowell Regional Wastewater		X - Aeration			
Upper Blackstone Wastewater	X	X - Aeration	X	X	X
Falmouth Wastewater			X		
New Bedford - Quittacas	X		X		X
Worcester Water Filtration	Prescriptive		X -DR	Prescriptive	X
Lee Water	X	X – Batch Mgt.	X	X	
Falmouth Long Pond	X				
Townsend Water	X			X	X
Ashland Water	X		X		
Easton Water	Prescriptive			Prescriptive	

City of Pittsfield Wastewater Treatment Plant

Recommended Improvements:

(moving forward 2008 -2009)

Fine Bubble Aeration

- Investment needed: \$1.7M
- Estimated annual electricity savings: \$141,000 (20%)

Anaerobic Digestion Upgrade

- Investment needed: \$1.6M
- Estimated annual savings of electricity: \$206,000 (29%)

Annual CO₂ Emission Reductions:

- 1,750 tons

Additional Benefits

- Using SRF 2% loan to bundle energy-saving projects with plant headwork's project (\$5.5 M)
- Higher effluent quality & more process control



Falmouth Wastewater & Long Pond Water Facilities

Recommended Improvements: (moving forward / done)

Install 1.5 MW wind turbine

- Investment needed: \$ 3,500,000
- Estimated revenues: \$174,000 (100%) at plant; plus sell \$300,000 back to Grid

Install VSDs on 3-250 hp high lift pumps & (1) pump station

- Investment needed: \$ 150,000*
- Estimated annual savings of gas: \$20,000 (13%)

(* Cape Light funded the entire project in 2006 – 2007)

Annual CO2 Emission Reductions:

- 3,300 tons

Other Opportunities

- Solar: 510 kW (Wastewater); 15kW (Water)



Greater Lawrence Sanitary District Wastewater Treatment Plant

Recommended Improvements: (Preliminary)

Install VFDs at Riverside Pump Station

- Investment needed: \$ 900,000*
- Estimated annual savings of electricity: \$200,000 (21% at pump station; (6.6% overall))

Sludge drying & ventilation improvements

- Investment needed: \$ ~290,000*
- Estimated annual savings of gas: \$150,000 (31%)

(* NGrid currently evaluating incentives – Energy Efficiency program)

Annual CO₂ Emission Reductions:

- 4,700 tons

Other Opportunities

- Hydro: 110kW turbine
- Solar: 90kW (roof); 220kW (ground)



City of Worcester Water Filtration Plant

Recommended Improvements:

Install Energy Management System & HVAC improvements

- Investment needed: \$ 34,000
- Estimated annual savings of electricity & gas: \$28,000 (8%)

NGrid Demand Response

Annual CO2 Emission Reductions:

62 tons

Other Opportunities

- Hydro: 25 kW turbine (10 -15%)
- Solar: 25kW (roof); 135kW (ground)



Energy Efficiency Opportunities - Wastewater

Facility	Upgrade	Est. Costs	Annual Savings	CO2 Reduction (tons)
Pittsfield Wastewater	Fine bubble aeration, microturbines, heating & lighting	\$3,641,000	\$384,000 (49%)	1,849
Lowell Regional Wastewater	(2) Turbo aeration blowers	\$463,000	\$50,000 (4%)	318
Barnstable Wastewater	VSDs, premium motors	\$150,000	\$35,000 (13%)	160
Greater Lawrence Sanitary District	Variable speed drives (VSDs), sludge drying facility	\$1,190,000 (Preliminary)	\$350,000 (21% P.S., 31% gas)	4,783
Charles River Pollution Control	Demand and operational controls, premium motor	\$53,000	\$52,000 (11%)	308
Upper Blackstone Wastewater	VSDs, new boilers, optimize aeration, EMS	\$133,000 (Preliminary)	\$60,000 (2%)	215
	Totals	\$5,630,000	\$931,000	7,613

Energy Efficiency Opportunities – Drinking Water

Facility	Upgrade	Est. Costs	Annual Savings	CO2 Reduction (tons)
New Bedford - Quittacas	Installed VSDs on (2) 700 hp and (2) 200 hp pumps	\$717,000	\$270,000 (52%)	1,600
Falmouth Long Pond Treatment	Installed VSDs to low-lift pumps	\$150,000	\$49,000 (30%)	200
Lee Water	(VSDs), premium motor & lighting, optimize batching	\$21,000	\$7,900 (24%)	22
Townsend Drinking Water	VSDs, premium motors, heating & lighting	\$45,000	\$5,000 (14%)	20
Ashland Drinking Water	VSDs to low-lift pumps	\$150,000 (Preliminary)	\$14,000 (11%)	115
Worcester Water Filtration	EMS, HVAC improvements	\$34,000	\$28,000 (8%)	62
	Totals	\$1,097,000	\$317,000	2,019

Summary: Energy Saving Opportunities

	Est. Costs	Est. Annual kWh Reductions	Est. Annual Savings	Est. Annual CO2 Reductions (tons)
Wastewater Facilities	\$28,905,037	14,932,261	\$2,253,493	12,262
Drinking Water Facilities	\$5,030,100	3,757,381	\$548,198	2,871
Totals	\$33,935,137	18,689,642	\$2,801,691	15,133

Energy upgrade projects in progress

\$9.0 M Investment

\$1.2 M annual cost savings (9.4 M kWh / year)

7,000 tons CO₂ reduced / year

14% annual savings / CO₂ reductions

Building a financial assistance model - the hole in the donut!



$$\underline{\text{Energy Savings \$} + \text{Utility \$} + \text{Government \$}} = \text{Project Financing}$$



Massachusetts Energy Management Pilot Phase II Planning

- Still have another approximately 200 Drinking Water facilities and 120 Wastewater facilities to assess

Next Round of Facility Selection

- Work with MA DOER's Green Communities Program to identify municipalities that would likely benefit from energy upgrades of their water and wastewater treatment facilities
- Use SRF Program to identify funding options

MA DOER's Energy Audit Program (2009 – 2nd Round)

- Open solicitation April 15th, 2009

Questions?



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