

MASSACHUSETTS WATER RESOURCES AUTHORITY

Presentation to
WAC and WSCAC

“Going Green, Staying Green”
MWRA’s Energy Initiatives

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MASSACHUSETTS WATER RESOURCES AUTHORITY

- Energy Usage Overview
- Examples of Energy Conservation Projects Implemented by MWRA
- Renewable Energy Projects at MWRA Facilities

Water And Sewer Is An Energy Intensive Business

- MWRA's total annual energy use (as of FY13) – 205.5 MWh and 450,725 therms (electricity and natural gas only). Equivalent to 18,500 homes.
 - MWRA's total electricity cost accounts for nearly 81% of all utilities (not including water)
- MWRA's costs for natural gas, electricity and diesel fuel
 - \$15 M (8.4% of total direct expenses) in FY02
 - \$21.0 million (10.1% of direct budget) in FY13
- Deer Island Treatment Plant accounts for 60 % of MWRA's energy budget

MWRA Approach to Energy Conservation

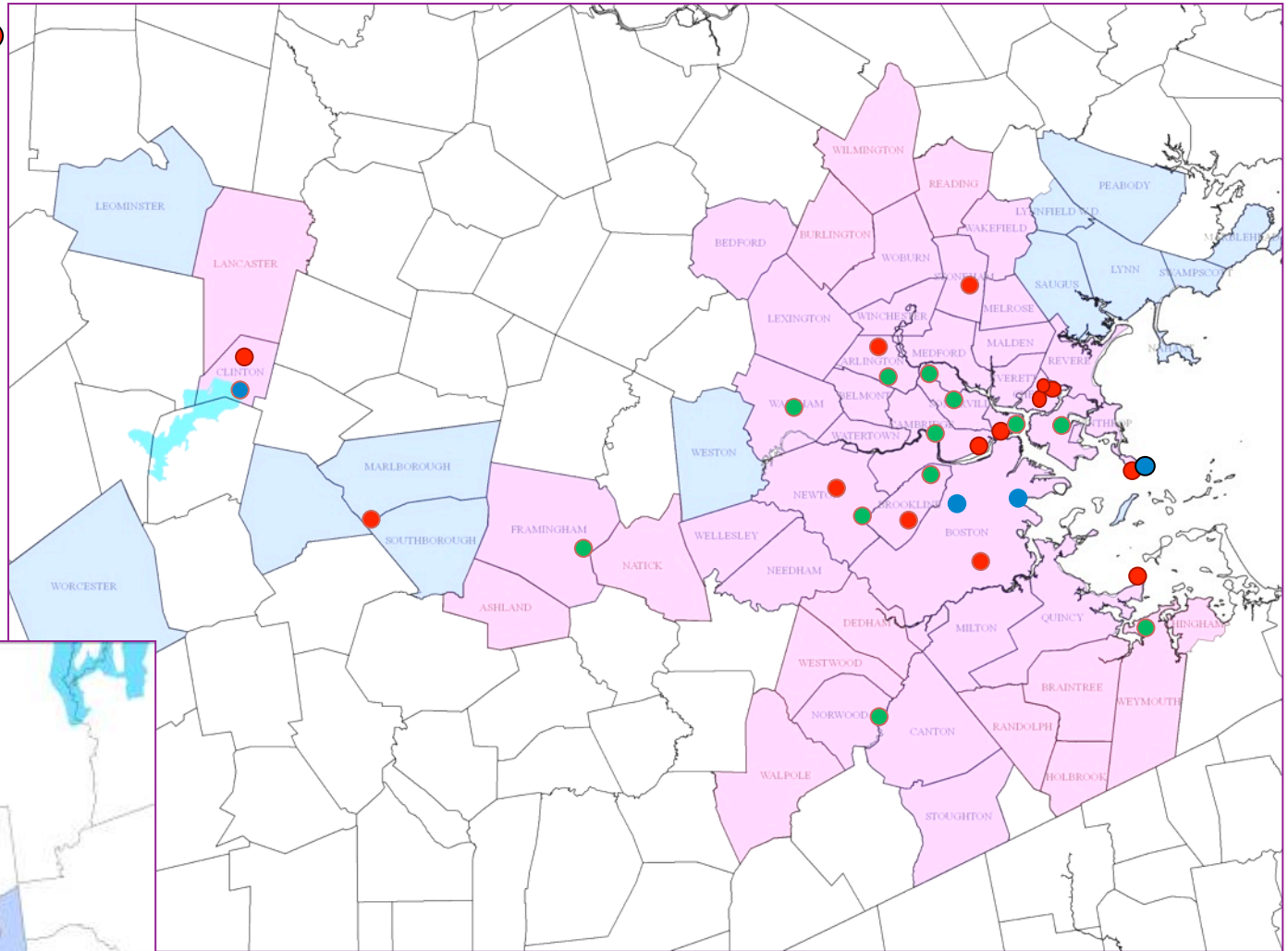
- Conduct energy audits through utility sponsored programs
- Identify “low-hanging fruit” first
- Specify Standard Premium Efficiency Motors
- Modifications to HVAC Systems, where possible
- Use VFDs where applicable
- Use Standard Specifications in RFPs
- Coordinate with Capital Improvements Program
- Optimize Utility Rebate Program

Facility Energy Efficiency Audits

Completed Projects ●

Project Currently Underway ●

Facilities Audited, Project Being Evaluated ●



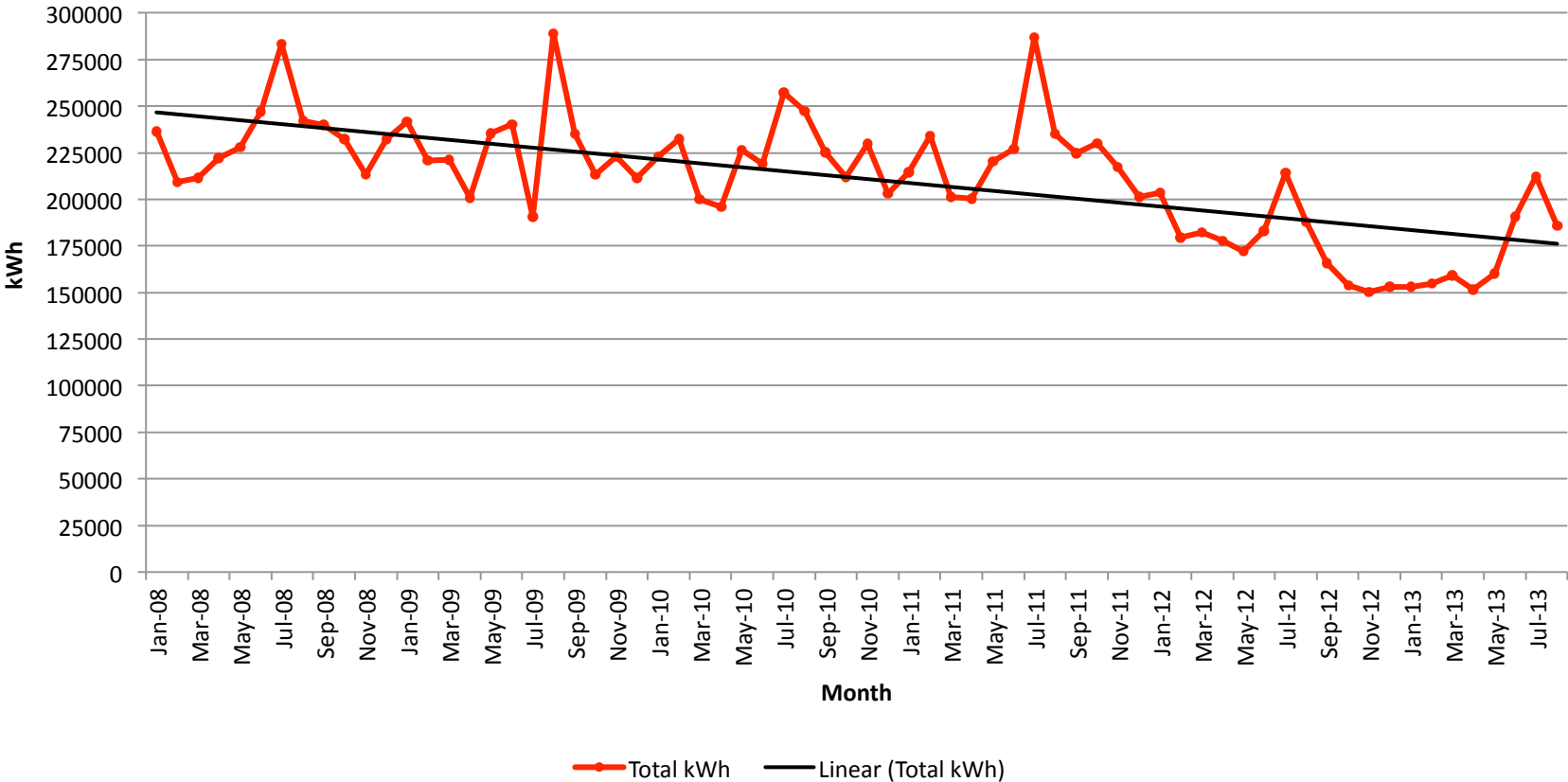
Examples of Operational/Energy Conservation Measures Taken

- Turned off soda ash mixers at the Carroll Water Treatment Plant - resulting in 1.8 million kWh/yr savings
- Adjusted main pump station shaft height resulting in 4.4 million kWh/yr savings
- Set-back ventilation at one headworks resulting in 43,000 gal. fuel savings and 66,000 kWh savings, annually.
- Installed exterior LED lights at Chelsea HQ facility, reducing kWh by 60% over previous metal halide lights.
- Installed an EMS in Chelsea Headquarter buildings resulting in a 33% reduction in natural gas usage during the winter.
- Installed VFDs on pumps at a water pump station, reducing kWh per million gallons pumped by 55%.



Energy Efficiency Projects Add Up at Chelsea Admin. Bldg.

Total Monthly kWh Usage at the Chelsea Admin. Facility Over 6 Year Period



Lighting at Deer Island

- DITP Interior Lighting
 - Phases 1, 2, 4 - complete
 - Total savings ~ 3M kWh/yr
 - MWRA Paybacks approx 2-3 yrs
 - Phase 5 - ongoing
 - Savings ~ 100,000 kWh/yr
 - MWRA Payback approx 7 yrs
 - Phase 3 Lighting controls - future
 - Savings ~ 300,00 kWh/yr
- DITP Exterior Lighting
 - Phases 1,2 – complete
 - Total savings ~ 174,000 kWh/yr
 - Paybacks approx 3-6 yrs



Capital Projects

- VFDs are being installed on the pumps at Gillis Pump Station in 2014, as part of larger rehabilitation.
 - 927,000 kWh/year savings
 - \$178,000 incentive payment



Capital Projects

- Secondary Optimization - Installation VFD's Stages 5 & 6
 - \$2.24M total cost
 - 3.1 million kWh/yr savings
 - \$930,000 incentive payment
 - Payback 5 yrs
- DITP NMPS VFD/motor (project for asset protection)
 - 730,000 kWh/yr savings
 - \$219,000 incentive payment



Capital Projects

- Sludge Pump Replacement
 - Replace positive displacement pumps with centrifugal pumps
 - 200 hp overall reduction
 - 790,000 kWh/yr savings

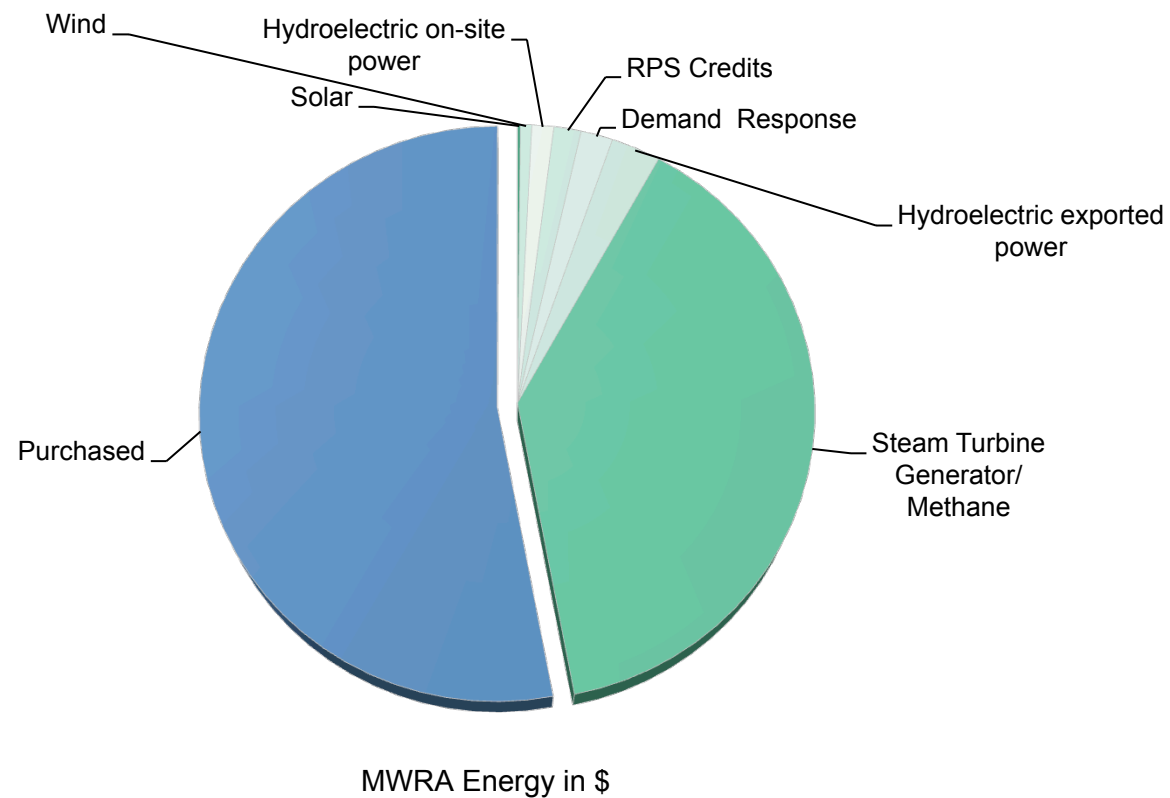


MOU Highlights

- Includes preliminary list of energy efficiency projects for implementation CY14-16. List will be updated periodically.
- Goal is to reduce electrical demand from NSTAR by 15 % - almost 18,000,000 kWh.
- NSTAR/NU to pay MWRA a minimum of \$0.30 per kWh saved.
- Predominantly, stand-alone energy efficiency projects include:
 - Lighting improvements
 - Pump/Motor efficiency improvements
 - HVAC
- Helps fund projects that MWRA would implement anyway (e.g. asset protection and replacement needs, other incentives and directives).

Energy From Renewables

- Of MWRA's total energy profile (in \$), over 45% is derived from renewable sources





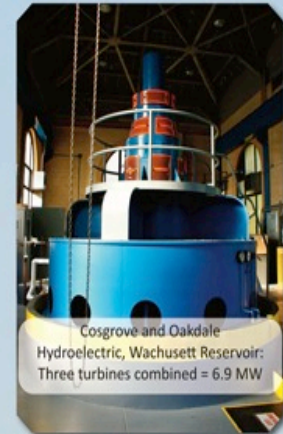
Deer Island Methane: Provides all heat and hot water for plant; used to generate electricity



Deer Island Solar 2: 180 kW roof-mounted solar array - November 2009



Carroll Water Treatment Plant, Marlborough: 496 kW solar array - February 2011



Cosgrove and Oakdale Hydroelectric, Wachusett Reservoir: Three turbines combined = 6.9 MW



Deer Island Wind: Two 600 kW turbines - November 2009



Deer Island Wind: 100 kW FloDesign experimental turbine - May 2011



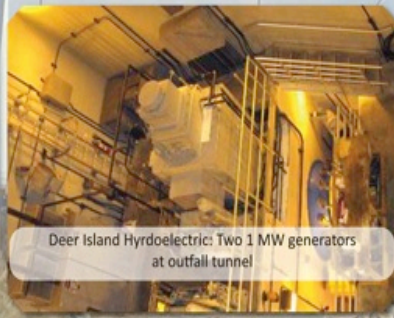
Charlestown Wind: 1.5 MW turbine - September 2011



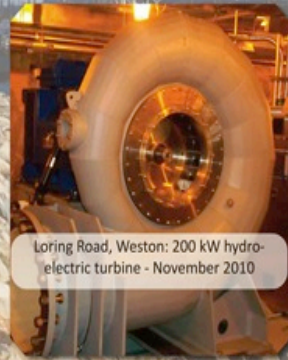
Deer Island Solar 1: 100 kW roof-mounted solar array - April 2008



Deer Island Solar 3: 450 kW roof-mounted and ground solar array - April 2011



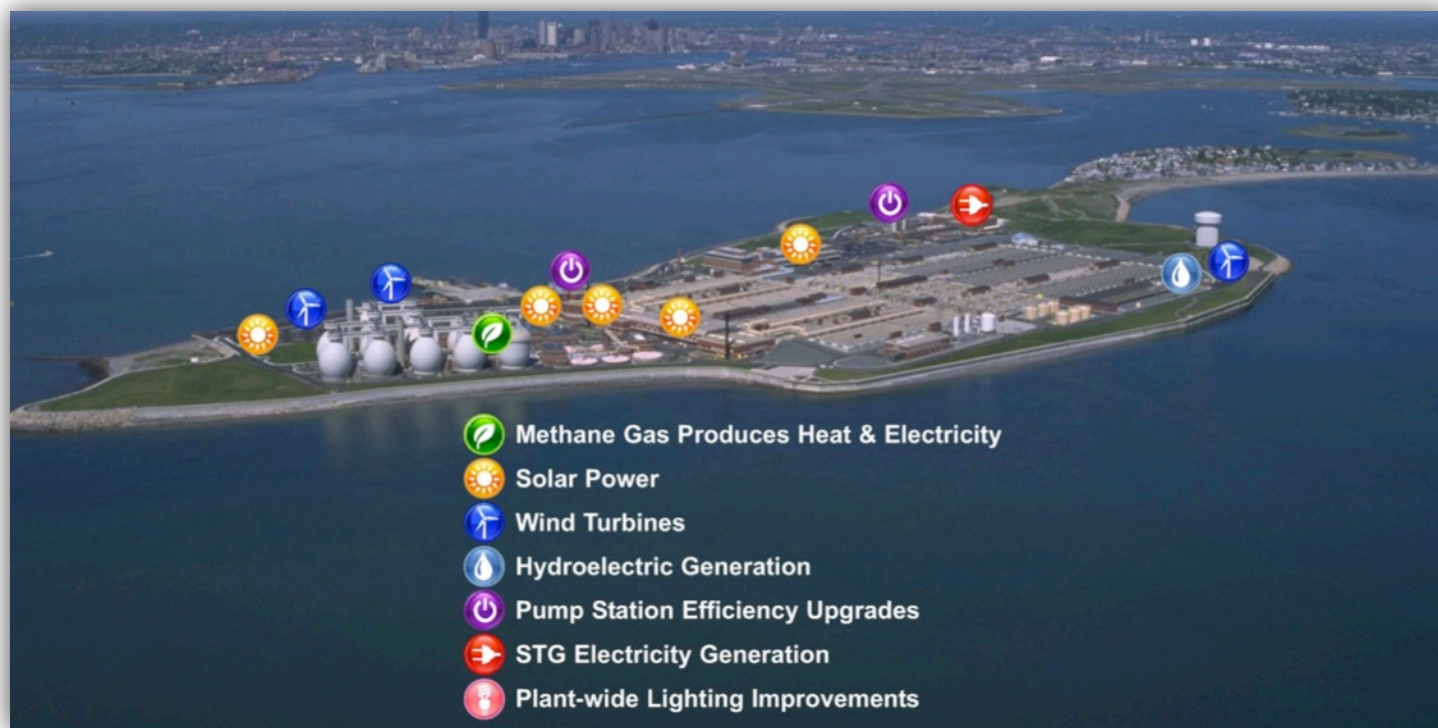
Deer Island Hydroelectric: Two 1 MW generators at outfall tunnel



Loring Road, Weston: 200 kW hydroelectric turbine - November 2010

Deer Island Treatment Plant

- Deer Island is one of the largest electricity users in the Northeast
- Deer Island currently self-generates 26% of its electricity needs
- More than half of the plant's energy demand is provided by on-site, renewable generation



Hydroelectric Power

- Cosgrove, Oakdale, Loring Rd, Deer Island
- Over 8MW Capacity
- Approximately 23 MWh/yr electricity production
- Over \$1.8M/yr savings and revenue



Wind Power

- Deer Island, Charlestown (Delauri Pump Station)
- 2.8 MW Capacity
- Over 5 MWh/yr electricity production
- Approximately \$575,000/yr savings and revenue



Solar Power

- Deer Island, CWTP
- Over 1.2 MW Capacity
- Over 1.4 MWh/yr electricity production
- Approximately \$242,000/yr savings and revenue



Maximizing Grants and Rebates

- When the American Reinvestment and Recovery Act was announced, MWRA had a number projects “shovel ready”
- MWRA received \$33M in ARRA funds for water and sewer projects of which nearly \$10M for renewable energy projects
- Over \$2.5M various state grants
- Approximately \$680,000 energy efficiency project rebates to date

MWRA Energy Program Summary of Accomplishments

- Energy Savings and revenue total approximately \$177M during FY02 – FY11
- Increase annual energy savings and revenue from \$6M in FY02 to \$24M in FY11
- Aggressive pursuit of rebates and grants
- About 45% of MWRA's total energy cost profile derived from renewable sources
- Process optimization and implementation of energy audit recommendations projected to save almost \$2M annually

MWRA Future Energy Initiatives

- DI Co-Digestion pilot program
- Hydro – Continue to explore hydropower development potential
- Solar – Comprehensive solar assessment ongoing
- Demand Side Management – Continue energy audits, process control optimization, demand response, EMS installation
- Grants/Rebates – Seek funding assistance opportunities
- Other Sustainable Efforts – alternative fuel vehicles, green power purchase, energy efficient computing, recycling.
- Metrics

Co-digestion Pilot – starting in CY14

- Receive Pre-processed Source Separated Organics via sealed tanker trucks to “co-digest” with sludge
- Operate as a pilot program for up to 3 years*
- Expected benefits in CY14 based upon bench-scale testing:
 - 4.2% - 8.5% increase in gas production
 - 480,000 kWh increase in energy production
- Expected benefits for years 2-3 will be re-projected based upon actual experience



*October Board approved project for Year 1 only, Years 2-3 pending future board approval.