

**STAFF SUMMARY**

**TO:** Board of Directors  
**FROM:** Frederick A. Laskey, Executive Director   
**DATE:** January 18, 2012  
**SUBJECT:** MWRA Energy Efforts & Savings – FY02 to FY11 Ten Year Summary Report

COMMITTEE: Administration, Finance & Audit Committee

INFORMATION  
 VOTE

Kristen A. Patneau, Program Manager, Energy  
Richard P. Trubiano, Deputy Chief Operating Officer  
Preparer/Title

  
Michael J. Hornbrook  
Chief Operating Officer

**RECOMMENDATION:** For information only. This staff summary provides a review of the savings and revenue impacts of MWRA’s successful and award-winning energy program during the past decade and includes an overview of currently ongoing and planned initiatives.

- Energy savings and revenue total approximately \$177 million during the FY02 to FY11 period with annual savings and revenue of about \$24 million in FY11.
- Annual energy savings and revenues have increased steadily from about \$6 million in FY02 to nearly \$24 million in FY11 (which reflects the addition of new energy generating equipment and facilities, additional revenues, and reduced energy use).
- Almost half of MWRA’s total energy cost profile is derived from renewable sources (demand response, STG/methane, wind, hydro, solar, RPS credits).
- MWRA has completed energy audits at 28 of its 36 major facilities. Implementation of audit recommendations and other process optimization efforts is estimated to save almost \$2 million annually.
- As a result of aggressively pursuing opportunities for grants and rebates, MWRA was awarded over \$12 million for funding of renewable energy and energy efficiency related projects (wind, solar, hydro).
- From 2005 to 2011, MWRA has received eight regional and national awards (most recently a 2011 Massachusetts State Leading by Example Award) for energy program leadership and project completion (see Attachment 4).
- MWRA energy efficiency program efforts are continuing in the areas of renewable energy and demand management related to wind, solar and hydro projects as well as implementation of facility audit recommendations.

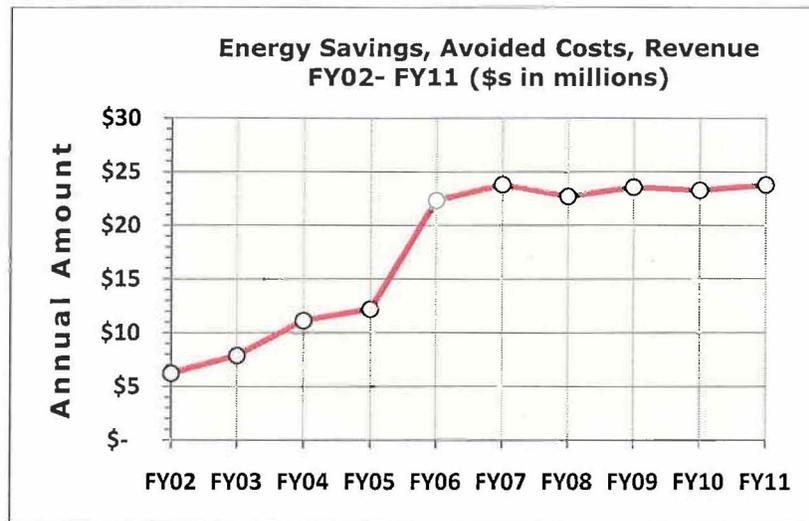
**DISCUSSION:**

Over the past decade, MWRA has implemented a system-wide program to reduce energy costs, increase energy revenue, and improve our carbon footprint. These initiatives have been launched and completed without compromising MWRA’s core mission of providing reliable and high

quality water and sewer services. MWRA's broad energy savings and revenue initiatives have primarily focused on:

- Optimization of self-generation/renewable energy assets such as the Deer Island Steam Turbine Generator and introducing new energy sources based on wind, hydroelectric and solar power. Consistent with Executive Order 484 issued by Governor Patrick, MWRA has made a priority of siting new renewable energy projects at as many facilities as economically feasible and continues to aggressively seek out any available grant and loan funds to improve project paybacks.
- Demand-side management including conservation, facility energy audits, energy-focused new facility design, participation in demand response programs and receiving Renewable Portfolio Standard credits;
- Supply-side management (used competitive bidding for power supply); and
- Use of green technologies (power purchases, vehicles, computing).

The graph below indicates the savings over the past 10 years. These continuing increases in savings/revenues are the result of expanded energy program efforts related to renewable energy (wind, solar, hydro), improved use of methane at Deer Island, implementation of energy audit recommendations, peak shaving and competitive energy procurements.



As summarized in the table below, the total cumulative CEB impact of energy initiatives is about \$177 million over the past decade. Of the total savings, approximately \$55 million is the result of new and/or expanded initiatives within the past decade to competitively purchase power, avoid capacity charges, reduce energy use at facilities, participate in energy revenue programs, and increase generation capacity by adding wind turbines, solar panels, and hydroelectric generators at key facilities. Additionally, MWRA increased the CEB impact of baseline energy assets through modification of the Oakdale and Cosgrove hydro facilities and Deer Island's steam turbine generator and digester gas recovery system. Attachment 1 provides additional detail on energy savings and revenues for these initiatives.

### MWRA's Energy Initiatives – 10 Year CEB Impact

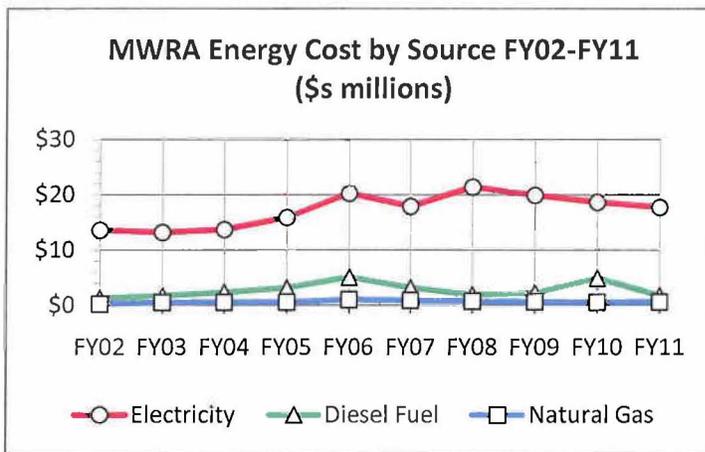
Source (\$'s in Millions)	FY02-FY11
<b>Savings and Avoided Costs:</b>	
Avoided Fuel (DI Digas)	\$ 82 million
Competitive Bidding vs Basic Service	\$ 34
DI Steam Turbine Generator	\$ 24
Audits/Efficiency	\$ 6.5
Hydropower	\$ 4.4
Avoided Capacity Charges	\$ 2.5
Wind	\$ 0.4
Solar	\$ 0.1
<b>Total Savings/Avoided Costs</b>	<b>\$ 154 million</b>
 <b>Revenue:</b>	
RPS Credits	\$ 8.0 million
Load Reduction	\$ 6.8
Generation Sales to Grid	\$ 7.8
Utility Rebates/Other	\$ 0.7
<b>Total Revenue</b>	<b>\$ 23 million</b>
<b>TOTAL CEB IMPACT</b>	<b>\$ 177 million</b>

MWRA inherited renewable energy generation at Oakdale and Cosgrove (which have been generating hydropower for more than fifty years) and methane generation from the old Deer Island primary plant. MWRA's early energy management efforts concentrated on the Deer Island Treatment Plant as that facility typically accounts for 55-65% of MWRA's annual energy costs. The new Deer Island had self-generation facilities incorporated into the design of the Plant and work has continued to optimize methane gas generation and use (now up to 98%), both of which provided opportunities to both reduce costs and increase revenue. MWRA then focused on considering energy efficiency and/or self-generation capacity in major new and rehabilitated facilities, including the Carroll Water Treatment Plant, the Five Water Pump Station Rehabilitation Project and the Braintree-Weymouth Intermediate Pump Station. At the Carroll Plant the emergency generators were designed and permitted for non emergency use allowing for participation in energy revenue and capacity charge avoidance programs. Many new MWRA facilities like the Union Park CSO, South Boston CSO and Blue Hills Covered Storage Facilities are inherently low energy use facilities since they operate only intermittently (as in wet weather) and/or are infrequently occupied thanks in part to remote operation by SCADA.

MWRA has also taken advantage of various state and federal energy related grants and rebates offered by utilities for demand management and renewable energy projects. Almost \$2.3 million has been awarded to MWRA for energy projects and the utilities have provided about \$680,000 in energy efficiency project rebates. In addition, the American Recovery and Reinvestment Act of 2009 (ARRA) funding provided \$9.2 million in principal forgiveness loans for the following renewable energy related projects: Carroll and Deer Island photovoltaic, Loring Road Hydroelectric, and Charlestown Wind.

## Energy Costs and Budget

MWRA's costs for electricity, diesel fuel and natural gas are a significant portion of direct expenses. Energy costs ranged from \$15 million (8.4% of total direct expenses) in FY02 to \$20 million (9.9% of budget) in FY11 (due in part to the addition of major new facilities like the Carroll Plant and to the varying price of energy). Spending temporarily escalated to \$26 million (13.8% of directs) in FY06 from the spike in energy costs subsequent to Hurricane Katrina. This event highlighted the volatility of energy prices and reinforced MWRA's efforts to manage energy usage and costs.



Notes:

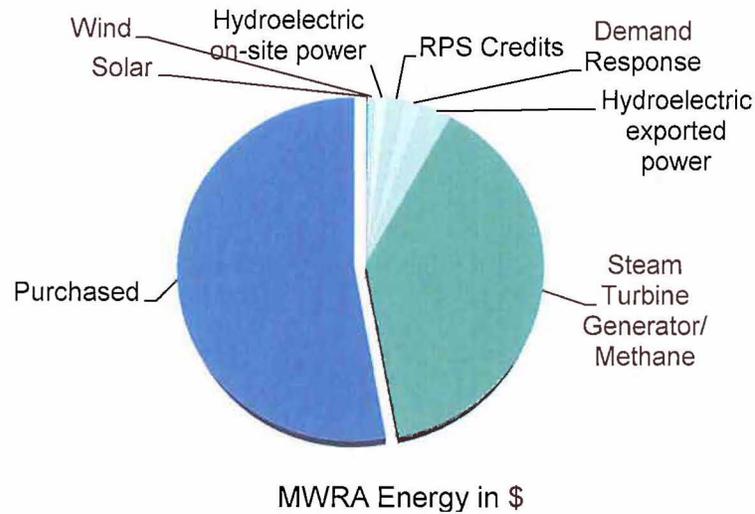
- Significant increases in diesel fuel and electricity prices in FY06 due to Hurricane Katrina.
- Significant increases in electricity prices again in FY08-FY10 due to market. Offset by declining purchases due to self-generation and energy-efficiency projects.
- Diesel fuel purchases increased in FY10 due to extensive CTG use during spring storms.

MWRA's energy initiatives have focused on all energy utilities but the major emphasis has been on reducing costs for electricity since it accounts for the majority of the energy spending.

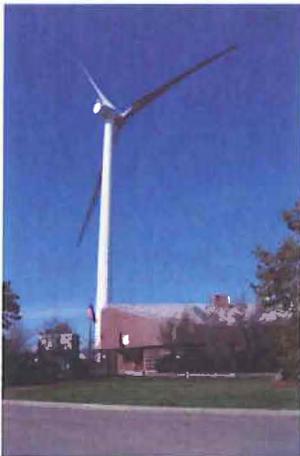
## Areas of Energy Savings and Revenues

A summary of renewable energy, demand side management, supply side management and green power programs, savings and revenues is provided below.

**Renewable Energy** - Consistent with Executive Order 484 issued by Governor Patrick in 2007, MWRA has made a priority of siting new renewable energy projects at as many facilities as economically feasible and continues to aggressively seek out any available grant and loan funds to improve project paybacks. Each renewable project is reviewed on a case by case basis to evaluate the reasonableness of payback periods (including the impact of grants and rebates). As shown below, almost half of MWRA's total energy cost profile is derived from renewable sources.



Wind - The four currently operating MWRA wind turbines (two 600kW turbines and the 100kW capacity engineering prototype FloDesign Wind turbine at Deer Island and the 1.5 MW capacity Charlestown Pump Station turbine) will generate over 5 million kWh per year and provide a projected annual savings in electrical costs and revenue of about \$580,000. Active future wind project considerations include a fourth wind turbine at Deer Island, adjacent to the pier.



1.5 MW Turbine in Charlestown



476 kW photovoltaic system at Carroll

Solar – Solar photovoltaic systems are currently installed at Deer Island on the roofs of the Residuals/Odor Control, Maintenance/Warehouse and Grit Buildings and on the ground in the south parking lot. A system is also located on the grounds at the Carroll Water Treatment Plant. The systems represent over 1.2 MW of capacity and will produce over 1.4 million kWh per year of electricity and provide projected annual electrical cost savings and revenue of approximately \$240,000.

Hydroelectric - MWRA has a long history of using hydroelectric energy and continues to look for opportunities to capture the potential energy of water as it moves from higher to lower elevations. Hydroelectric facilities are currently located at Deer Island, Oakdale, Cosgrove and the recently activated turbine at Loring Road. These facilities represent over 8 MW of capacity and will produce about 23 million kWh of electricity per year with projected annual savings and revenues of over \$1,800,000.

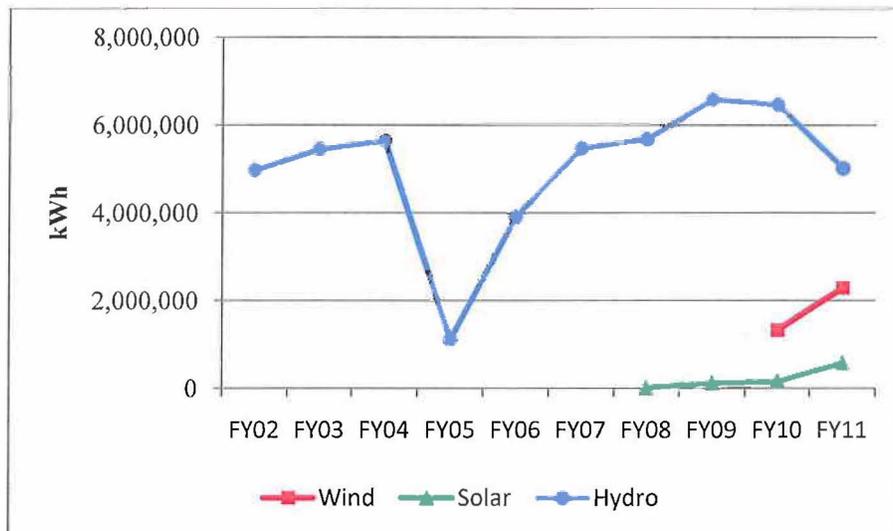


Hydro Turbine at Loring Road



Hydro Turbine at Oakdale

The graph below indicates the increasing production of wind and solar power at MWRA beginning in FY08. This will continue to increase as new solar and wind facilities are added (such as the Charlestown turbine and Carroll solar which started in FY12). The hydropower generation fluctuates year to year based on water transfer needs (and was particularly low in FY05 and 06 during start-up of the CWTP as the Cosgrove generator was offline and due to major maintenance of the Deer Island hydro turbine).



Methane - The capture of methane from the digesters was included in the original design contract of the Deer Island Treatment Plant. Co-generation at the Deer Island Thermal Power Plant (capacity of over 6 MW) using the methane saves MWRA approximately 5 million gallons per year in annual fuel oil purchases (to heat the digesters and Deer Island buildings). Use of the Power Plant Steam Turbine Generator at Deer Island allows MWRA to use steam from the methane powered boilers to produce electricity (valued at about \$2.3 million in FY11). Ongoing optimization upgrades at the thermal power plant/steam turbine generator are expected to result in a total additional annual electrical savings and revenue of about \$700,000. In addition, methane is a potent green house gas and so its capture and use significantly reduces MWRA's carbon footprint.

Massachusetts Renewable Energy Portfolio Standard (RPS) – Retail electricity suppliers are required by Massachusetts regulation to provide a portion of their power from renewable energy sources. Renewable energy generators (like MWRA) can sell credits to electricity suppliers to help them meet the regulatory requirements. Since December 2002, MWRA has been selling its renewable energy credits through a competitive bid process. MWRA RPS eligible facilities have increased in recent years due to both new facilities being brought on line, as well as the Green Communities Act regulations that made hydropower eligible in 2009. MWRA has received about \$8 million in RPS revenue to date.

Regional Greenhouse Gas Initiative (RGGI) - Ten Northeast and Mid-Atlantic States participating in the Regional Greenhouse Gas Initiative have designed and initiated the first market-based, mandatory cap and trade program in the United States to reduce greenhouse gas emissions. The states sell emission allowances through auctions and invest proceeds in consumer benefits: energy efficiency, renewable energy, and other clean energy technologies. The Deer Island combustion turbine generators (CTGs) are subject to the Massachusetts CO<sub>2</sub> Budget Trading Program, which implements the RGGI program in Massachusetts. MWRA must hold CO<sub>2</sub> allowances equal to CTG CO<sub>2</sub> emissions as of the end of each three year control period, the first of which ended December 31, 2011. To date, MWRA has purchased 23,000 CO<sub>2</sub> allowances (tons) at a cost of \$51,900.

## **Demand Side Management**

MWRA demand side management efforts include:

- Improving equipment energy efficiencies at operating facilities (lighting, variable frequency drives, HVAC system updates, treatment process modifications);
- Establishing operating protocols to reduce monthly and annual peak energy demand charges; and
- Enrolling in demand response programs offered by regional grid operators.

## ***Facility Energy Audits***

Water and wastewater utilities are large energy users. The Governor's EO 484 and MA DEP and EPA efforts have focused on demand-side management in wastewater and water facilities. MWRA has put significant effort into energy conservation through implementation of energy

audits at 28 of its 36 major facilities, process optimization, and installation of energy efficient lighting and equipment, saving about 8 million kWh and \$1,700,000 in FY 11. Attachment 2 indicates facility audit locations and Attachment 3 provides additional details on audit implementation and savings. Engineering design reviews are undertaken by staff on all in-house projects for facility energy optimization (such as the proper selection of pumps, motors, lighting, etc.) to ensure that they are premium efficiency and eligible for utility rebates.

### ***Demand Response Programs***

The Carroll Water Treatment Plant and Deer Island participate in a demand, price, load response program run by ISO-New England that pays these facilities a monthly “capacity fee” for being available to go on back-up generation during periods of extremely high electricity demands. Deer Island began participating in 2001 and Carroll in 2008. The total revenue received under this program through FY11 was \$6.8 million.

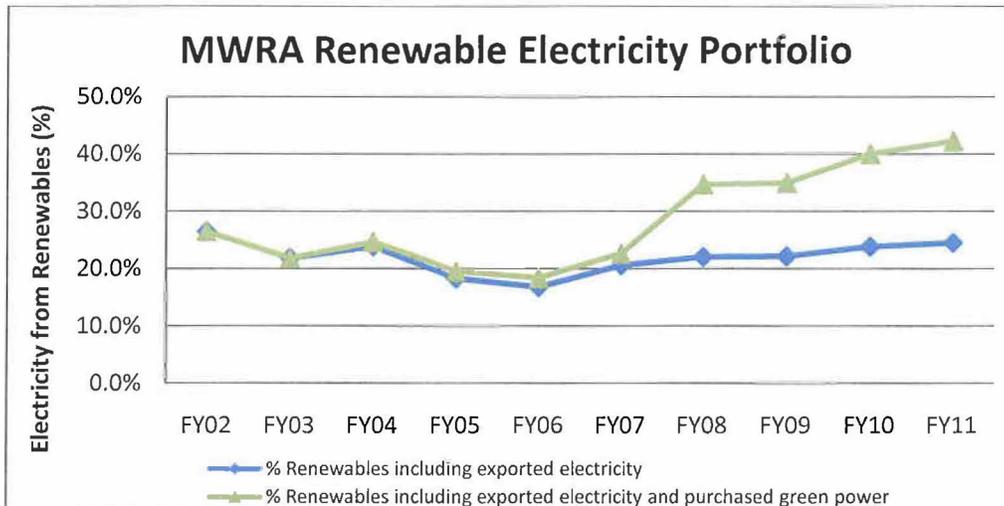
Deer Island and Carroll have also avoided “peak capacity” charges by going off the grid during the ISO-NE peak operating hour. Monthly facility demand charges for the calendar year are set based on this peak hourly load. The total annual FY10 and FY11 savings by these two facilities by avoiding this charge ranges from about \$800,000 to \$1,000,000. Staff also modify facility operating practices to reduce energy use and/or costs such as tariff sensitive (off peak) timing of Chestnut Hill Underground Pump testing and shifting from pumping to gravity operation at the Fells tank in winter (low demand) months.

On a smaller scale, all new PCs and laptops are Energy Star-compliant and computer monitors have been replaced with energy-efficient flat panels.

**Supply Side Management** - Due to its large power purchasing, MWRA was an early entrant to the competitive electricity marketplace in 2001. The process has evolved into the creation of three distinct electricity supply contracts:

- Deer Island;
- The larger operations facilities including the Carroll Water Treatment Plant, Nut Island Headworks, Clinton Treatment Plant, and 22 other facilities); and
- The smaller accounts (e.g. CSO facilities, some pump stations).

MWRA maintains a balanced electricity portfolio by contracting for a base block of power at a fixed-price and purchasing the balance of the load on the open market at real-time clearing prices. Currently over 60% of MWRA power is purchased on the fixed market. Estimated savings over the last 10 years from MWRA purchasing power competitively versus buying directly from the utilities are over \$30 million.



**Green Power and Other Sustainable Efforts** - In addition to all the efforts discussed above in support of MWRA and Commonwealth shared goals to increase renewable energy purchases and reduce greenhouse gas emissions at state facilities, MWRA has undertaken additional efforts to directly use more green power by maximizing the use of alternative fuel vehicles (biodiesel, CNG, hybrid, propane, and flex-fuel) representing about 70% of the fleet, and procuring green power (“National Green-e power”) as a portion of our total electrical purchases. The figure above shows how the percentage of our total electrical power use that is produced or purchased from green sources has increased over time.

### Currently Ongoing and Planned Initiatives

**Hydropower** - Future hydropower efforts include the proposed development of a small hydroelectric facility associated with the CVA-Hatchery pipeline project. Staff also plan to explore alternative locations in the water transmission system which may provide hydropower development potential.

**Solar** - Staff are working with a solar energy consultant to conduct a comprehensive solar feasibility study will be conducted for all MWRA sites, to assess the solar capability, and technical and economical feasibility.

**Wind** - Staff are currently reviewing the technical and economic feasibility of a fourth wind turbine at Deer Island, adjacent to the pier. FAA approval for this turbine is expected at the beginning of 2012. Grant funding will be sought to help off-set design and construction costs.

**Demand Side Management:**

- Enroll the three headworks facilities in the demand response program.
- Install an energy management system (EMS) at the Chelsea and Southborough facilities to automatically control all HVAC equipment optimizing heating and cooling energy use.

- Complete and implement audits of the eight remaining major water and wastewater facilities.
- Add ventilation setbacks at four additional facilities.
- Consider expanding the use of SCADA from process control to include more energy management functions.

**ATTACHMENTS:**

1. MWRA Energy Savings and Revenue by Category for FY02 - FY11
2. Energy Conservation Projects Completed or Underway at MWRA Facilities
3. Summary of Facility Audit Implementation Activities
4. MWRA's Energy Awards 2005 to 2011

**ATTACHMENT 1**

**MWRA ENERGY SAVINGS AND REVENUE BY CATEGORY FOR FY02 - FY11 (\$ in Thousands)**

Notes	Source	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual	Actual
		FY02	FY03	FY04	FY05	FY06	FY07	FY08	FY09	FY10	FY11	10 Yr Total
<b>TOTAL CEB IMPACT</b>		<b>\$ 6,220</b>	<b>\$ 7,871</b>	<b>\$ 11,126</b>	<b>\$ 12,193</b>	<b>\$ 22,334</b>	<b>\$ 23,801</b>	<b>\$ 22,718</b>	<b>\$ 23,572</b>	<b>\$ 23,281</b>	<b>\$ 23,761</b>	<b>\$ 176,877</b>
<b>PART A - SAVINGS AND AVOIDED COSTS</b>												
1	Avoided Fuel (DI Digas)	\$ 2,950	\$ 4,450	\$ 5,187	\$ 5,589	\$ 10,089	\$ 10,035	\$ 10,000	\$ 8,787	\$ 11,731	\$ 13,300	\$ 82,119
2	Avoided Capacity Charges	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 650	\$ -	\$ 856	\$ 1,000	\$ 2,506
3	DI Steam Turbine Generator	\$ 2,125	\$ 1,875	\$ 1,996	\$ 2,110	\$ 2,687	\$ 2,438	\$ 2,940	\$ 2,787	\$ 2,704	\$ 2,329	\$ 23,991
4	Hydropower	\$ 348	\$ 365	\$ 406	\$ 96	\$ 379	\$ 476	\$ 600	\$ 651	\$ 640	\$ 466	\$ 4,427
5	Wind	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 150	\$ 243	\$ 393
6	Solar	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ 2	\$ 12	\$ 15	\$ 60	\$ 88
7	Audits/Efficiency	\$ -	\$ 217	\$ 321	\$ 328	\$ 356	\$ 385	\$ 711	\$ 1,100	\$ 1,308	\$ 1,733	\$ 6,459
8	Competitive Power Purchases	\$ -	\$ -	\$ 1,500	\$ 1,700	\$ 5,400	\$ 7,900	\$ 4,000	\$ 7,500	\$ 3,300	\$ 2,300	\$ 33,600
	<b>Total Savings &amp; Avoided Costs</b>	<b>\$ 5,424</b>	<b>\$ 6,908</b>	<b>\$ 9,410</b>	<b>\$ 9,823</b>	<b>\$ 18,911</b>	<b>\$ 21,234</b>	<b>\$ 18,903</b>	<b>\$ 20,836</b>	<b>\$ 20,704</b>	<b>\$ 21,431</b>	<b>\$ 153,583</b>
<b>PART B - REVENUE</b>												
9	Renewable Portfolio Standard Certificates (RPS Credits)	\$ -	\$ 458	\$ 871	\$ 814	\$ 1,422	\$ 1,030	\$ 1,577	\$ 709	\$ 524	\$ 581	\$ 7,986
10	Load Reduction	\$ 163	\$ -	\$ 367	\$ 826	\$ 1,592	\$ 639	\$ 787	\$ 717	\$ 1,020	\$ 684	\$ 6,794
11	Generation Sales to Grid	\$ 634	\$ 506	\$ 478	\$ 594	\$ 408	\$ 898	\$ 1,242	\$ 1,011	\$ 1,025	\$ 1,039	\$ 7,835
12	Hydropower	\$ 634	\$ 506	\$ 478	\$ 594	\$ 408	\$ 898	\$ 1,242	\$ 1,011	\$ 1,025	\$ 1,039	\$ 7,835
13	Wind	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
14	Solar	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -	\$ -
15	Utility Rebates & Other	\$ -	\$ -	\$ -	\$ 136	\$ -	\$ -	\$ 209	\$ 298	\$ 9	\$ 26	\$ 678
	<b>Total Revenue</b>	<b>\$ 797</b>	<b>\$ 964</b>	<b>\$ 1,715</b>	<b>\$ 2,370</b>	<b>\$ 3,423</b>	<b>\$ 2,567</b>	<b>\$ 3,815</b>	<b>\$ 2,736</b>	<b>\$ 2,577</b>	<b>\$ 2,330</b>	<b>\$ 23,294</b>

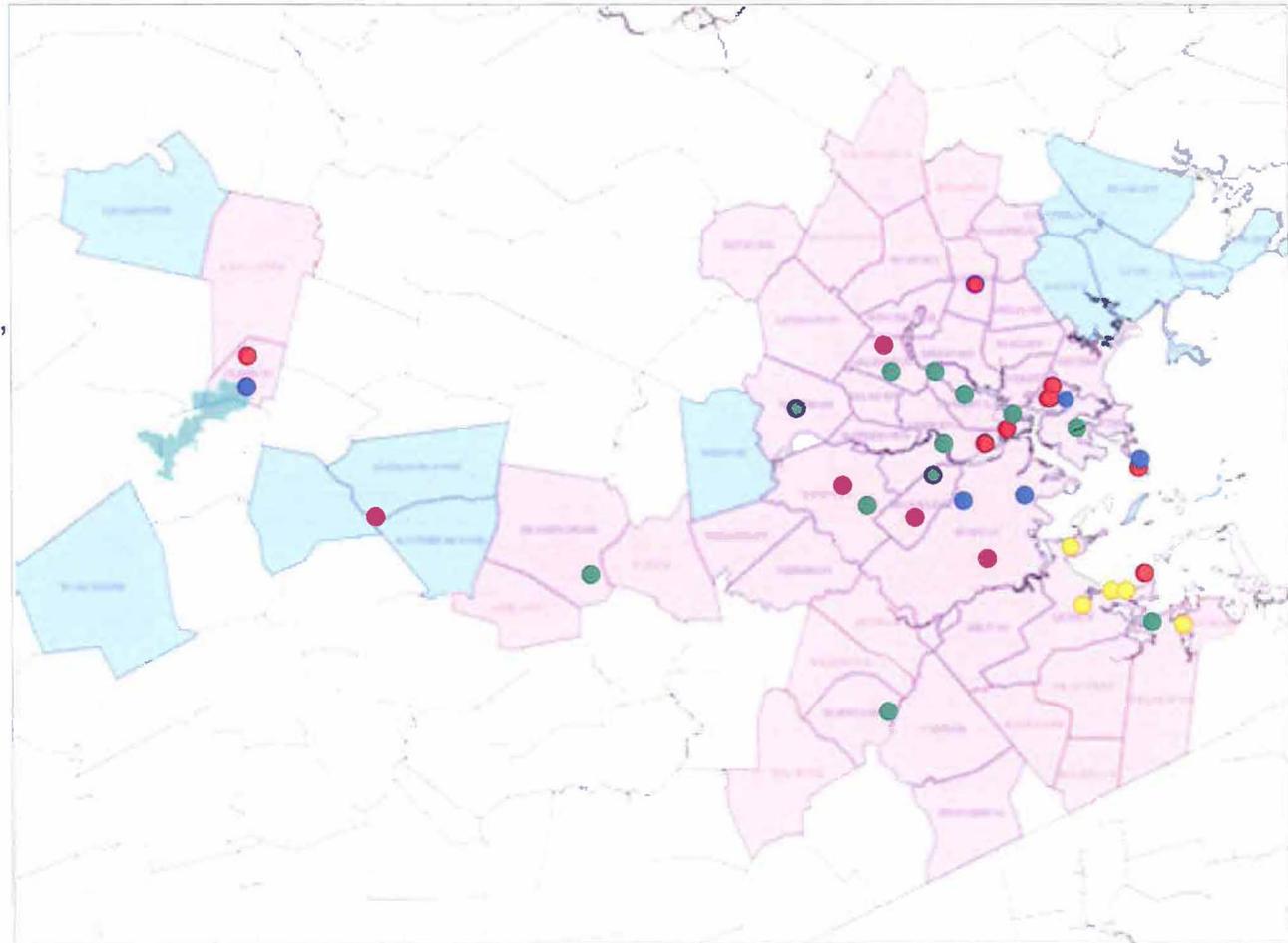
Notes:

1	DITP converts methane from the digesters into energy (co-generation) for use in plant and process heating.														
2	MWRA self-generates at DITP and CWTP on grid peak days to avoid annual electricity capacity charges of ~\$800k to \$1m per year.							9				Revenue from sales of Renewable Energy Certificates (RECs) per the MA Renewable Portfolio Standard Trading Program. MWRA earns credits for sale from numerous assets including hydropower, STG, solar panels, wind turbines.			
3	Steam from DITP's boilers is sent through a steam turbine generator (STG), which produces an average of approximately 3 megawatts of electricity. DITP uses the electricity on-site to avoid purchasing power.								10			MWRA receives revenue for participation in ISO-NE's demand response programs. MWRA self-generates with its back-up generators on peak demand or pricing days at DITP and CWTP. Revenue varies due to market pricing.			
4	Hydro includes DITP outfall (100% of generated power used on-site), Cosgrove water intake facility (5%-10% usage on-site) and the Loring Road water pump station (20% usage on-site).									11		MWRA sells power to utility grid and receives revenue per kWh for sale.			
5	DITP has three wind turbines (including one prototype) with more planned for the future. The energy generated by the turbines supplies DITP with power.										12	Includes Cosgrove, Loring Road, and Oakdale hydropower revenue. Oakdale revenue is an offset to DCR Watershed Division's budget.			
6	DITP has solar panels installed on several buildings and the ground and uses the power generated on-site.											13	The Charlestown Wind Turbine generates 3 million kWh/yr of electricity which is sold to the grid (with an estimated annual value of \$310,000). The turbine began operation in FY12.		
7	Major projects include lighting retrofits, DITP shaft height adjustments, cessation of CWTP soda ash mixers.												14	The panels began revenue operation in FY12. Revenue will be for electricity generated and sold to the grid (estimated annually as 620,000 kWh and \$100,000) for CWTP ground-mounted solar array.	
8	MWRA has been competitively purchasing power since FY02 (Nov 2001) for DITP and FY05 for other facilities. Amount is estimate of annual savings from competitive purchase vs buying directly from utilities (FY02 & 03 data unavailable).													15	MWRA receives rebates from utilities for selected energy-efficiency projects.



## Attachment 2 – Energy Conservation Projects Completed or Underway at MWRA Facilities

- Completed Projects
- Project Currently Underway
- Facilities Audited, Project Being Evaluated
- Facilities Scheduled to be Audited in FY12



**ATTACHMENT 3 - SUMMARY OF FACILITY AUDIT IMPLEMENTATION ACTIVITIES**

PROJECT NAME	TYPE OF ENERGY CONSERVATION MEASURE	EXPECTED ANNUAL COST SAVINGS	PROJECT COSTS (\$)			PROJECT STATUS
			TOTAL PROJECT COST	UTILITY INCENTIVE	TOTAL COST TO MWRA	
Gillis P.S. Lighting Upgrade	Lighting	\$14,700	\$27,100	\$25,100	\$2,000	Completed
Commonwealth Ave. P.S. Upgrade	Lighting	\$7,700	\$14,800	\$14,500	\$300	Completed
Newton Street P.S. Upgrade	Lighting	\$2,500	\$5,000	\$4,500	\$500	Completed
Chelsea Facility Lighting Upgrade	Lighting	\$26,000	\$134,600	\$50,000	\$84,600	Completed
Chelsea Energy Efficient Outdoor Lighting	Lighting	\$25,000	\$99,800	\$47,000	\$52,800.00	Completed
Carroll EE Lighting Upgrade	Lighting	\$57,000	\$107,200	\$30,000	\$77,200	Completed
Charlestown Navy Yard Lighting Upgrade	Lighting	\$13,600	\$77,300	\$24,500	\$52,800	Completed
Deer Island Multi-Phase Lighting Upgrade	Lighting	\$284,000	\$1,465,000	\$269,000	\$1,196,000	Completed
Carroll VFDs on Hot Water Pumps	Process	\$2,600	\$20,300	\$4,600	\$15,700	Completed
Carroll - Discontinued Use of Soda Ash Mixers	Process	\$200,000	\$0	\$0	\$0	Completed
HVAC Improvements & Ventilation Set-Backs at Chelsea Creek HW *	HVAC	\$138,600		\$31,000		Completed
DITP Operations - Adjusted Shaft Heights at Headworks and Tunnels	Process	\$447,000	\$0	\$0	\$0	Completed
DITP Operations - Shut Off Equivalent of 3 Mixers	Process	\$175,000	\$0	\$0	\$0	Completed
Install VFDs on Pumps at Water Pump Stations *	Process	\$197,500		\$190,000		Completed
Discontinued use of Service Water Pumps	Process	\$14,000	\$0	\$0	\$0	Completed
Southborough Energy Management System	EMS/HVAC	\$17,500	\$84,000	\$31,200	\$52,800	Pending
Prison Point VFDs on Chemical bldg. Ventilation Fan	HVAC	\$3,500	\$10,800	\$400	\$10,400	Pending
DITP Operations - Install VFDs at Both the North and South Main Pump Stations*	Process	\$44,000				SMPS Completed; NMPS Scheduled for FY12
Southborough Lighting Upgrades	Lighting	\$4,200	\$27,300	\$27,300	\$0	Underway
Prison Point Upgrade	Lighting	\$29,300	\$65,400	\$35,700	\$29,700	Underway
Cosgrove Lighting Upgrade	Lighting	\$4,200	\$7,600	\$5,300	\$1,900	Underway
Chelsea Energy Management System	EMS/HVAC	\$100,000	\$435,000	\$168,100	\$266,900	Underway
Chelsea Screen House VFDs on Exhaust & Supply Fans	HVAC	\$26,200	\$63,600	\$63,600	\$0	Underway
Ventilation Set-Backs at New Neponset P.S.	HVAC	\$48,000	\$0	\$0	\$0	Underway
DITP Operations - Installed DO Probes to Optimize Ops.	Process	\$144,000	\$105,000	\$0	\$105,000	Underway
Clinton WWTP - Enhanced Digester for More Efficient Mixing, Adjusted Lift Station Float Controller, Upgraded Secondary Reactors Aeration Efficiency and Power Factor**	Process					

\* These projects were done as part of larger capital projects, so there is no cost breakdown pertaining specifically to the energy upgrade equipment.

\*\* These projects at Clinton were completed, however, there is no final information at this time on total costs or savings.

**ATTACHMENT 4 - MWRA's Energy Awards 2005 to 2011**

Sponsor	Award	Date
Commonwealth of MA	State Agency Leading by Example Award	2011
US EPA	EPA New England Environmental Merit Award	2011
MA DEP/US EPA	Clean Water State Revolving Fund Pisces Award	2011
MA DEP/US EPA	Drinking Water State Revolving Fund Sustainable Public Health Protection Award	2011
MA Energy Consumers Alliance	Public Sector Leadership Award	2010
Commonwealth of MA	State Agency Leading by Example Award	2007
MA Clean Cities Coalition	AltWheels - MA Clean Cities Award for Renewable Fuel Use	2006
Association of Metropolitan Sewer Agencies (AMSA)	National Environmental Achievement Award for DITP Comprehensive Energy Cost Recovery Program	2005