

Demand-Side Management (DSM) – Water

Summary:

This initiative supports water conservation and yields energy savings. To achieve 25 percent potable water conservation, enact new utility incentives, conservation credits, smart metering, and education programs. The energy impact of water use is estimated at 4 percent of all electricity consumption nationwide.

Background Discussion:

Most homeowners in PA have ~~water bills that exceed electric bills, with~~ little awareness of the contributing factors to their water bill where those costs are generated. Landscaping, toilet flushing, showers and sinks and washing machines are the most significant contributors to building water loads. These water costs have measurable GHG implications (4 percent of all energy use) because of the processing energy costs and the pumping energy costs. Faucets and washing machines also have hot water loads, gas or electric, with GHG implications.

As a result, water-conserving alternatives benefit building owners both in water cost savings and in domestic hot water heating cost savings.

Conservation can be achieved through State efforts to promote rain capture for landscaping, dual-flush toilets, low-flow faucets and shower heads, and ~~water efficient/ front loading~~ high efficiency washing machines. This can be achieved by: point of sale education and U.S. EPA WaterSense product performance standards; elimination of code barriers; and utility-managed programs that combine certified installers with equitable utility rate financing.

Goals and Implementation Steps:

Recommend education and legislation to promote:

- Reduction of e-per-capita water use by 20 percent statewide by 2020.
- Achieving a 5 percent overall water savings by 2020.
- Installing WaterSense or similarly efficient fixtures for all new construction.

Foci for ImplementationPossible Vehieles:

- Low-water landscaping:
 - Irrigation (low-water landscaping, soil moisture detection systems, rain capture).
 - Encourage drought-tolerant species selection.
- Low-water plumbing:
 - Toilets (WaterSense uses 1.28–1.6 gallons per flush).
 - Faucets
 - Washing machines.
- More efficient hot water delivery:
 - On Demand/Tankless Hot Water Heaters
 - High Efficiency Gas Hot Water Heaters
 - Plumbing configuration and insulation

Calculations and Assumptions:

Population, and baseline water consumption data, and the percentage goals were used to establish the numeric (million gallon) goals. The baseline data and numeric goals were then multiplied by the costs and avoided costs to estimate the costs and cost-effectiveness results shown in Table 1. Assumptions and values used in these calculations are contained below.

Assumptions:

Other Data, Assumptions, Calculations	2013	2020	Units
Population	12,829,967	13,127,198	persons
Population (2010)		12,702,379	persons
Baseline (2010) per capita water use <i>Assumes no change in per capita use</i>		29,729	gal/person/yr
Baseline (2010) total water use <i>Assumes no change in per capita use</i>		377,627	million gal/yr
Energy Intensity (excluding heating) <i>Griffiths-Satenspiel and Wilson (2009.04) The Carbon Footprint of Water Savings from water heating will be captured by the Act 129 and DSM-Natural Gas Work Plans included under RC 8 Appliances</i>		4	MWh/million gal

Goals

Water use avoided (per capita)	2.5	20.0	percent
Water use avoided (per capita)	9,477	74,732	million gal
Water use avoided (absolute)	0.6	5.0	percent
Water use avoided (absolute)	2,360	18,881	million gal
Water use avoided (greater of per capita and absolute)	9,477	74,732	million gal

Costs

Levelized cost of measure - landscaping		\$4.84	\$/thousand gal
Levelized cost of measure - fixtures		\$2.62	\$/thousand gal
Levelized cost of measure - washing machine		\$0.01	\$/thousand gal
Levelized cost of measure - toilet		\$4.98	\$/thousand gal
Avoided cost of water <i>Pittsburgh water and sewer authority http://www.pgh2o.com/fees.htm</i>	<i>Residential</i>	\$8.08	\$/thousand gal
	<i>Commercial</i>	\$7.74	\$/thousand gal
	<i>Weighted average</i>	\$8.00	\$/thousand gal

Buildings/Appliances/Fixtures

Buildings undergoing irrigation retrofits annually		10,000	buildings
Washing machines replaced annually		50,000	machines
Homes retrofitting fixtures annually		250,000	housing units
Toilets replaced annually		250,000	toilets

Additional Results	2013	2020	Units
Overall avoided water use	9,618	26,448	million gal
Overall avoided electricity use	37,268	102,487	MWh

Note: additional measures and/or higher rates of implementation of the measures analyzed are necessary to meet the overall goals of this work plan.

Potential GHG Reduction:

Table 1. Estimated GHG Reductions and Cost-effectiveness

Annual Results (2020)			Cumulative Results (2013-2020)		
GHG Reductions (MMtCO ₂ e)	Costs (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	GHG Reductions (MMtCO ₂ e)	Costs (NPV, Million \$)	Cost-Effectiveness (\$/tCO ₂ e)
0.1	-\$13 57	-\$1, 646 912	0. 45	-\$5 76 85	-\$1, 264 492

Economic Cost: See Table 1

Potential Overlap: None

Subcommittee Recommendations:

Water use contributes 4 percent of all electric demand, for processing and pumping energy. Water conservation in the areas of greatest use - landscape irrigation, toilets, faucets and washing machines, offers measurable GHG benefits at low costs especially given the natural cycles of replacement.

Between 1950 and 2000, the U.S. population nearly doubled. However, in that same period, public demand for water more than tripled. American public water supply and treatment consume approximately 56 billion kilowatt-hours per year. If one out of every 100 American homes retrofitted with water-efficient fixtures, 100 million kilowatt-hours of electricity would be saved each year. (Source: EPA WaterSense Program)

The technologies to achieve these goals are available now. Water conservation and water reuse technologies have infiltrated the market, public perspective, and government policy. While the products marketed to the public are recognizable, technologies are strongly supported by policy across all levels of government.

The major barrier to water conservation is the upfront cost of replacing fixtures. While low-flow faucets have very low costs, low water consumption toilets and washers, as well as rain barrels, have first costs and installation costs that are often prohibitive for building owners and renters. Utility-based programs are needed to ensure certified installers, carefully specified fixtures, and financing, with water cost savings to pay for the program. Dry states such as California offer excellent precedent.

According to the EPA WaterSense program, the average household in the U.S. spends about \$700 per year on its water and sewer bill. According the website whitefence.com, which compares costs and rates for various services in Pennsylvania, the average yearly cost for water and sewer is \$960. If all U.S. households installed water-efficient appliances, the U. S. could save more than 3 trillion gallons of water and more than \$18 billion per year. (Source: EPA WaterSense Program) While a significant portion of water conservation and reuse technologies are affordable to most, legislation could provide financial assistance and incentives.

While water is not scarce in PA, there are periods of drought and significant processing costs to providing potable water. Water conservation will ensure that water is available for the highest and best use. Water conservation and water reuse encourages economic development and benefits the environment. Water conservation reduces water costs for building owners and renters - benefits that can pay for the retrofit actions. The cost savings borne out of water conservation and reuse frees up opportunity costs and may provide a higher quality of life for some individuals. In addition, reusing water where potable is not needed reduces demand and the associated energy needs.