Demand-Side Management (DSM) – Water

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

Background Discussion:
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 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:

- Reduction of 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 Implementation:

- 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	12,751,886	12,569,017	persons
Population (2010)		12,702,379	persons
Baseline (2010) per capita water use *Assumes no change in per capita use*		29,729	gal/person/yr
Baseline (2010) total water use *Assumes no change in per capita use*		377,627	million gal/yr
Energy Intensity (excluding heating) *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*		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	*Residential*	$8.08	$/thousand gal
Pittsburgh water and sewer authority	*Commercial*	$7.74	$/thousand gal
http://www.pgh2o.com/fees.htm	*Weighted average*	$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 ($MMtCO_2e$)	**Costs (Million $)**	**Cost-Effectiveness ($/tCO_2e$)**	**GHG Reductions ($MMtCO_2e$)**	**Costs (NPV, Million $)**	**Cost-Effectiveness ($/tCO_2e$)**
0.1	-$135	-$1,225	0.4	-$576	-$1,306

Economic Cost: See Table 1

Potential Overlap: None

Subcommittee Recommendations:

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.