

# **Racking Up the Savings:** *Planning and Evaluating Cost-Beneficial Water Conservation Programs*

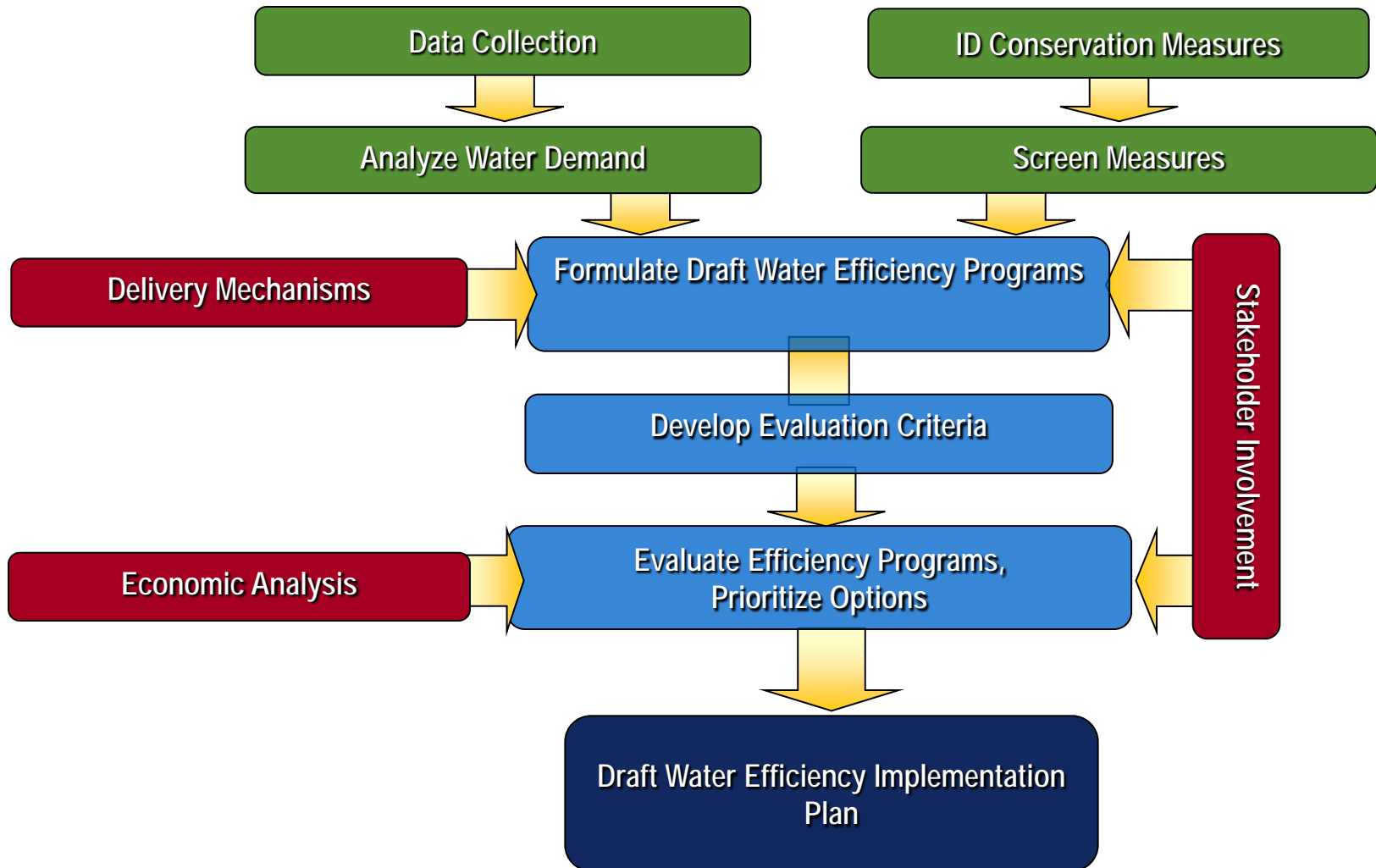
Mary Ann Dickinson  
President and CEO

A VOICE AND  
A PLATFORM  
PROMOTING THE  
EFFICIENT AND  
SUSTAINABLE  
USE OF WATER



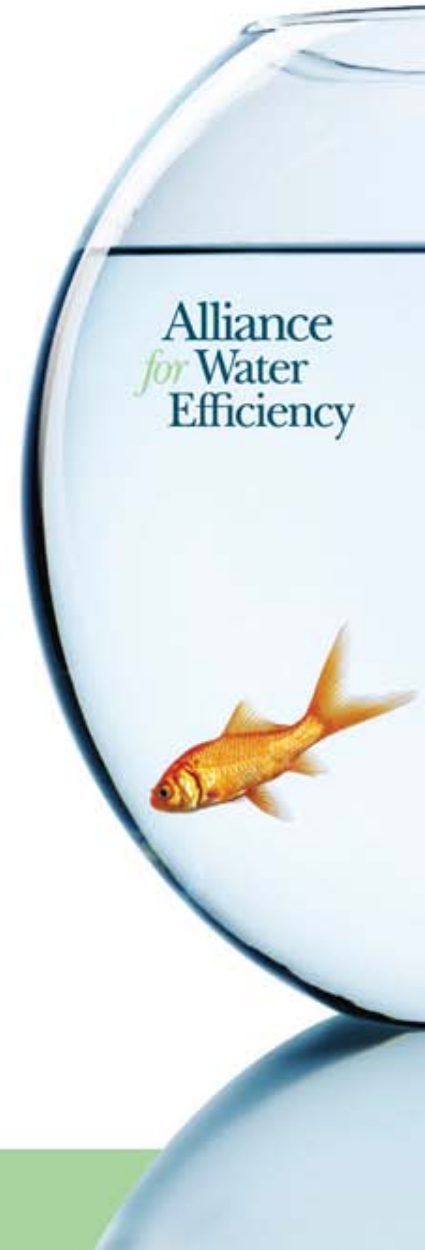
Alliance *for* Water Efficiency

# Constructing a Water Efficiency Plan

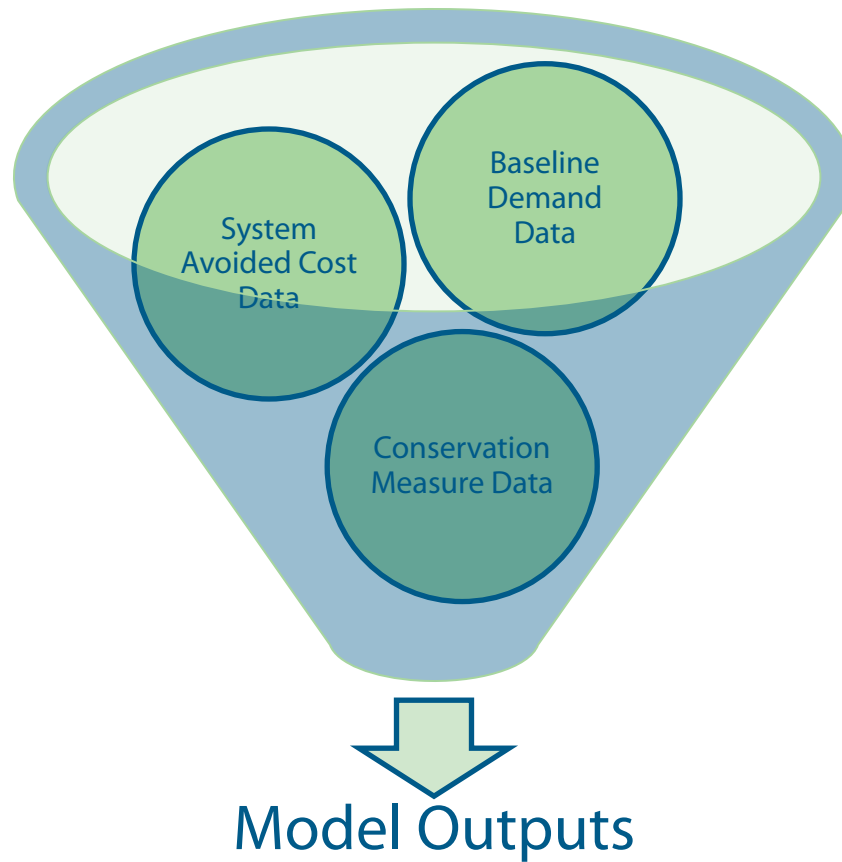


# So Why Another Model?

- Need for consistent and thorough analysis of cost-effective water conservation options
- Tools exist in various forms
- Most are proprietary
- AWE wanted robust but easy to use model with transparent code
- The Home Depot Foundation funded partial development
- “Tracking Tool” for savings as well as analytical tool for planning



# Tracking Tool Inputs and Outputs



Savings Analysis    Benefit-Cost Analysis    Revenue/Rate Impacts

## Getting Started:

1. The model uses a simple worksheet tab color code:

- Blue Tabs = User Data Entry
- Green Tabs = Model Outputs/Results
- Grey Tabs = Data Storage and Library

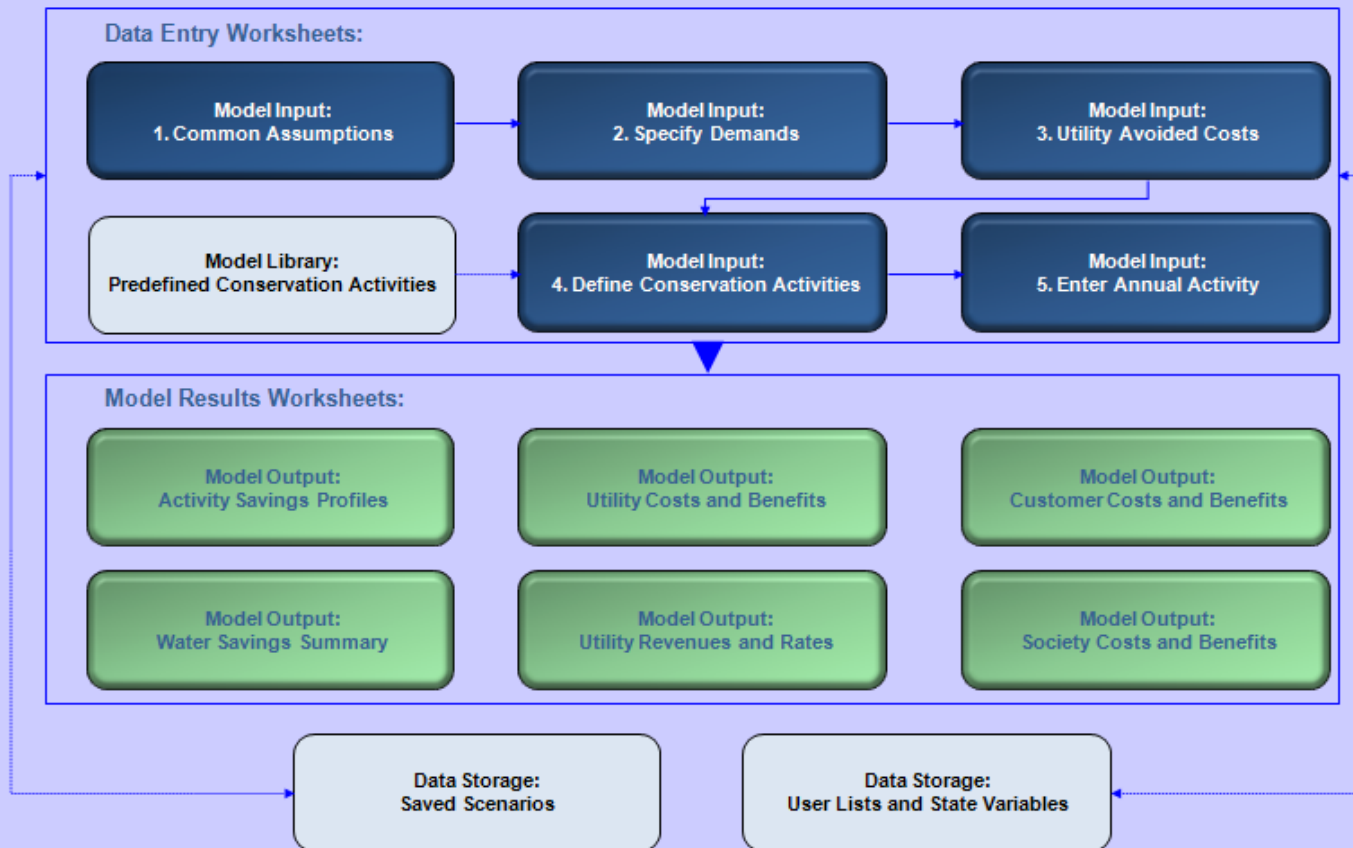
2. First provide informaton about your system, customers, and water demands. This is done on data entry worksheets 1 thru 3.

3. Next define or import conservation activities and set their annual activity levels. This is done on data entry worksheets 4 and 5.

4. You can save conservation activity scenarios at any time. You access the scenario manager on the Common Assumptions worksheet.

6. You can navigate to model worksheets by clicking on the model schematic below or by clicking on the worksheet tabs at the bottom of the screen.

7. Data entry cells on input worksheets look like this: xx,xxxx Only enter data in cells with this color coding.



# Common Assumptions

**AWE CONSERVATION TRACKING TOOL: COMMON ASSUMPTIONS WORKSHEET**

ENTER COMMON ASSUMPTIONS: Manage Scenarios [Return to Navigation Sheet](#) [Report Error](#)

Analysis Start Year	2008	2010	2020	2030	2040
Service Area Population	350,000	353,000	365,000	380,000	395,000
Service Area Population in 1990	300,000				
Peak-Season Start Date (month/day)	31-May				
Peak-Season End Date (month/day)	31-Oct				
Nominal Interest Rate	6.00%				
Inflation Rate	3.00%				
Persons Per Household - SF	2.25				
Persons Per Household - MF	1.50				
Full Bathrooms Per Household - SF	1.75				
Half Bathrooms Per Household - SF	0.75				
Full Bathrooms Per Household - MF	1.00				
Half Bathrooms Per Household - MF	0.25				
SF Housing Units Built <i>before 1994</i>	100,000				
MF Housing Units Built <i>before 1994</i>	50,000				
Reference ET (inches/yr)	57.33				
Avg. Annual Rainfall (inches/yr)	7.67				

CHOOSE VOLUME UNITS:

Water Volume Units

Million Gallons (MG)

Acre-Feet (AF)

Million Cubic Meters (MCM)

MODEL UNITS:

Flow: MGD

Volume: AF

SELECT RATES: US-Southwest

SELECT CUSTOMER CLASSES:

Select Water User Classes

Water User Classes in Model	Current Customer Utility Rates		
	Water Rates (\$/Thou Gal)	Sewer Rates (\$/Thou Gal)	Electric Rates (\$/KWh)
Single Family	\$2.50	\$0.70	\$0
Multi Family	\$2.30	\$0.70	\$0
CII	\$2.00	\$0.70	\$0
Irrigation	\$2.30	\$0.70	\$0

Navigation: **1. Common Assumptions** | 2. Specify Demands | 3. Enter Utility Avoided Costs

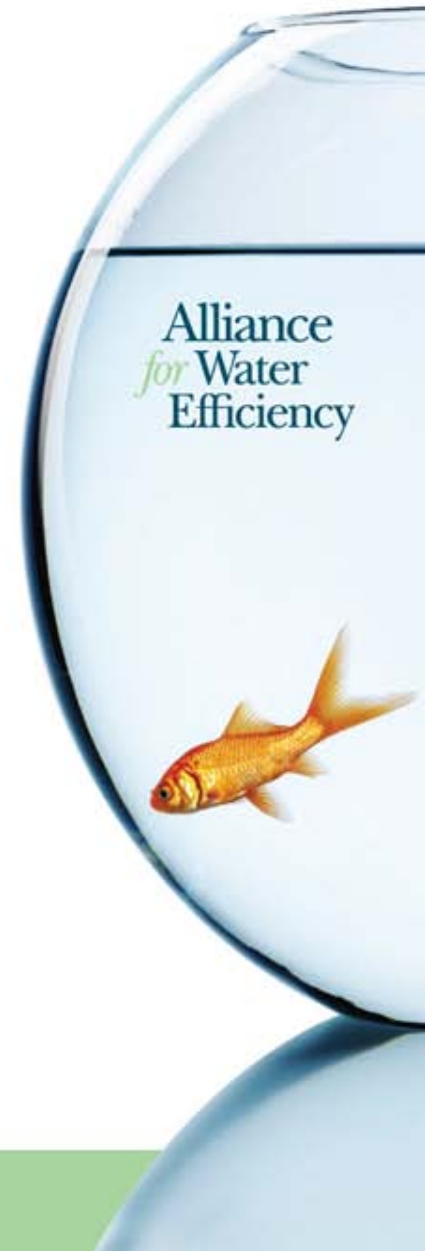
**Select Customer Classes**

Class Names	Selected Classes
Single Family	
Multi Family	
Residential	
CII	
Commercial	
Industrial	
Institutional	
Irrigation	
All Customers	
Miscellaneous	
Utility/Unaccounted	

Buttons: Move Up, Move Down, Delete, Add >, OK, Cancel

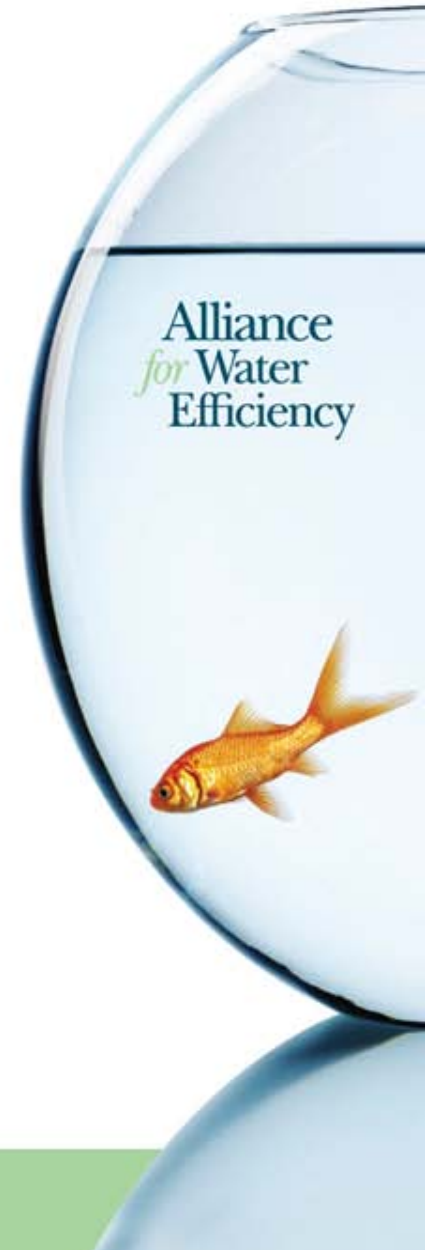
# Baseline Demands

- Two Data Entry Options
  - *Enter or link to an existing demand forecast*
  - *Use model to grow current demand by population*
- Plumbing/Energy Code Adjustment
  - *Model can adjust for impact of existing plumbing/energy codes as necessary*
- Demand Disaggregation
  - *Peak/Off Peak Seasonal Demands*
  - *Customer Class Disaggregation*



# Avoided Costs

- Two Data Entry Options
  - *Enter or link to an existing avoided cost forecast*
  - *Use model's avoided cost calculator*
- Model's Avoided Cost Calculator
  - Short-run avoided O&M
    - *Water Supply*
    - *Wastewater Treatment*
  - Long-run avoided or deferred capacity
    - *Calculates present value of delaying and/or downsizing peak season capacity expansion*



# Capacity Deferral Analysis

## AWE CONSERVATION TRACKING TOOL: WATER SAVINGS SUMMARY WORKSHEET

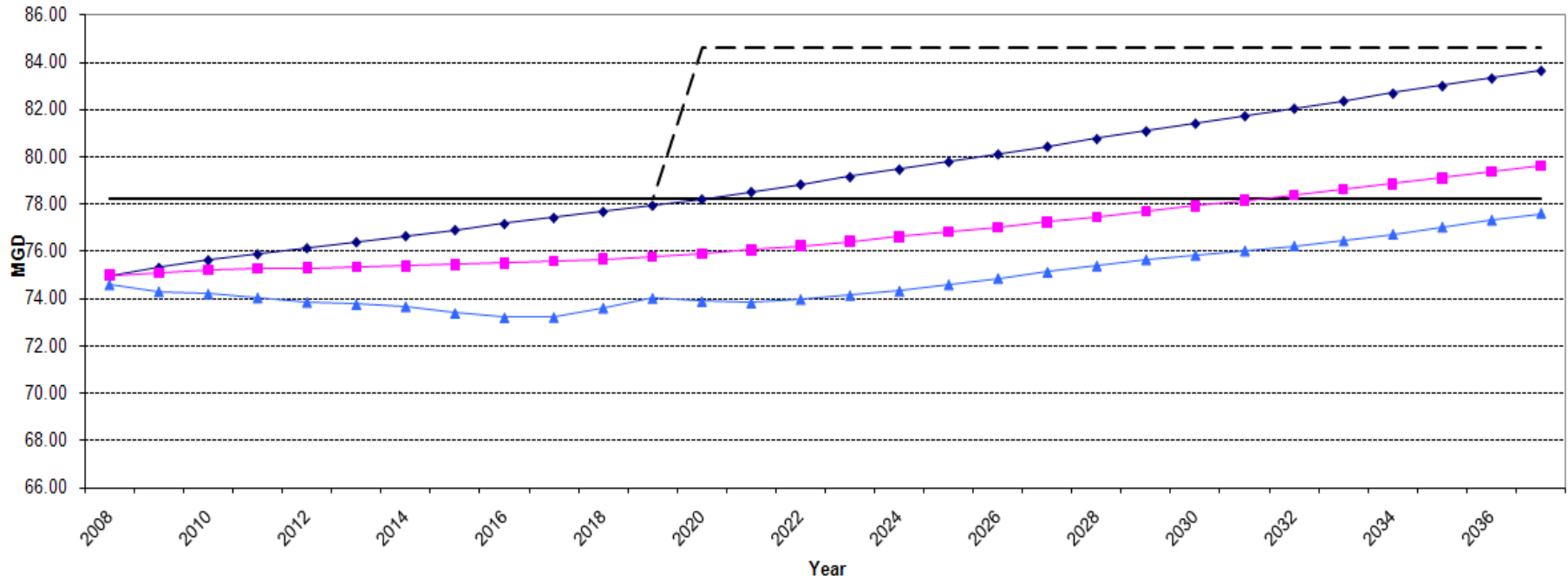
Year forecasted peak season demand equals existing peak season delivery capacity		Expansion (Years)	Deferred Capacity (MGD)	Benefit of Deferred Expansion (\$)	Avoided Capacity (MGD)	Benefit of Avoided Expansion (\$)
Baseline Demands	2020	N/A	N/A	N/A	N/A	N/A
Baseline - Code Savings	2031	11	6.4	\$9,144,908	0.0	\$0
Baseline - Code Savings - Program Savings	2039	19	6.4	\$14,198,213	0.0	\$0

Select Chart to View

Peak Season Capacity

Chart Explanations

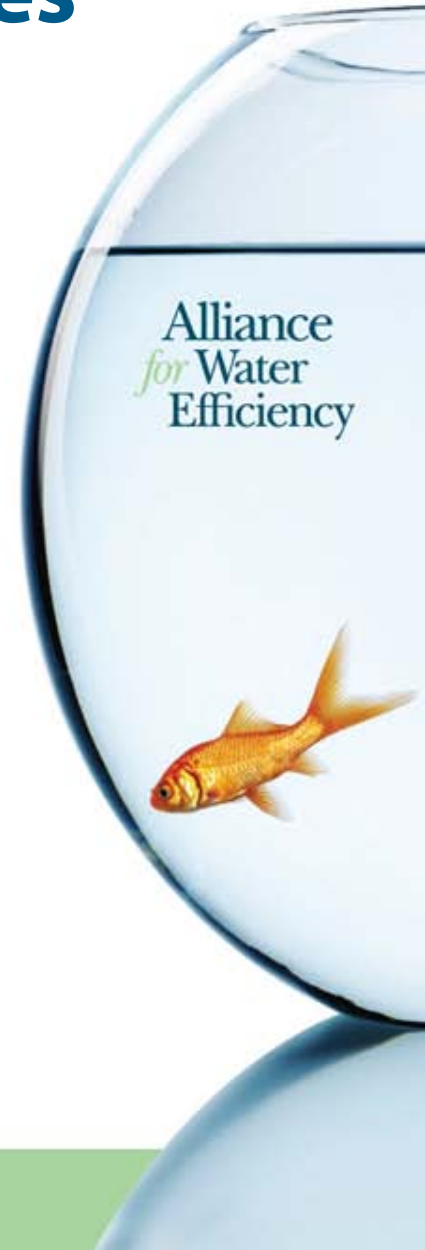
Peak Season System Capacity



— Current System Capacity  
 - - - Planned System Capacity  
 ◆ Gross Peak Season Demand  
 ■ Less Passive Savings  
 ▲ Less Active Savings

# Setting Up Conservation Measures

- Two Specification Options
  - *Build from scratch*
  - *Import pre-defined measures from library*
  - *Pre-defined measures can be customized*
- Library currently includes 25 measures
  - *13 residential measures*
  - *8 CII measures*
  - *4 large landscape measures*



# Defining a New Conservation Measure

## AWE CONSERVATION TRACKING TOOL: DEFINE CONSERVATION ACTIVITIES WORKSHEET

### Define Conservation Program Activities

[Return to Navigation Sheet](#)

[Report Error](#)

Click to Import Library Activities or Define/Edit/Delete Custom Activities

Hide Table of Activities in Model

Warning: Only use the form to edit or delete activities. Editing/de

Activity ID	Activity Name	Class	Savings, Per Unit (gpy)	Savings, Annual Rate of Decay (%)	Savings, Peak Period (% of Annual Savings)	Savings, Useful Life (yrs)	Savings, Participant Free Riders (% of Participants)	Utility Costs, Year Denominated	Utility Costs, Initial Fixed (\$)	Utility Costs, Variable (\$/unit)	Utility Costs, Years of Follow-up (yrs)
1	Residential Surveys, SF	Single Family	12373	20%	65%	5	0%	2008	\$10,000.00	\$95.00	0
2	Residential HE Toilets, SF										0
3	CII HE Toilet										0
4	Residential Irrigation Controller, SF										0
5	Large Land Irrigation Controller										0
6	CII Spray Rinse Valve										0
7	CII Cooling Tower										0
8											0
9											0
10											0
11											0
12											0
13											0
14											0
15											0
16											0
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27											0
28											0
29											0
30											0
31											0

**Define Conservation Activities** ✖

Activity Name:

Affected Customer Class:

Unit Water Savings |
  Utility Costs |
  Participant Costs |
  Participant Non Water Benefits |
  Plumbing Code

Unit Water Savings (Gal/Yr):

Annual Rate of Savings Decay (%/Year):

Peak Period Savings (% of Annual):  Peak days = 42% of days in a year.

Useful Life (Years):

Participant Freeriders (% of Participants):

1 of 7

# Importing a Library Measure

## Define Conservation Activities

Activity Name: Residential Surveys, SF

Affected Customer Class: Single Family

Unit Water Savings | Utility Costs | Participant Costs | Participant Non-Water Benefits | Plumbing Code

Unit Water Savings (Gal/Yr):

Annual Rate of Savings Deca

Peak Period Savings (% of A

Useful Life (Years): 5

Participant Freeriders (% of Participants): 0.00%

**Import from Library**

- Residential Surveys, SF
- Residential Surveys, MF
- Residential ULF Toilets, SF
- Residential ULF Toilets, MF
- Residential HE Toilets, SF**
- Residential HE Toilets, MF

OK

Cancel

**Import an Activity from the Library**

Close Form

Previous Record

Next Record

New Record

Delete Record

# Entering Annual Activity Levels

## AWE CONSERVATION TRACKING TOOL: ENTER ANNUAL CONSERVATION ACTIVITY WORKSHEET

### Enter Annual Conservation Activity

[Return to Navigation Sheet](#)

[Report Error](#)

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	1000	1000	1000	1000	1000						
Single Family	Residential HE Toilets, SF	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
CII	CII HE Toilet	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	
Single Family	Residential Irrigation Controller, SF	1000	1000	1000	1000	1000	1000	1000	1000			
Irrigation	Large Land. Irrigation Controller	100	100						100	100		
CII	CII Spray Rinse Valve	100	100	100	100	100						
CII	CII Cooling Tower			25	25	25	25	25	25	25	25	

### Effective Conservation Activity

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	1,000	1,800	2,440	2,952	3,362	2,362	1,562	922	410	0	
Single Family	Residential HE Toilets, SF	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	10,000
CII	CII HE Toilet	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000	10,000
Single Family	Residential Irrigation Controller, SF	1,000	2,000	3,000	4,000	5,000	6,000	7,000	8,000	8,000	8,000	7,000
Irrigation	Large Land. Irrigation Controller	100	200	200	200	200	200	200	300	400	400	300
CII	CII Spray Rinse Valve	100	200	300	400	500	500	500	500	500	500	500
CII	CII Cooling Tower	0	0	25	50	75	100	125	150	175	200	200

### Gross Water Savings (AF)

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	37.971343	68.3	92.7	112.1	127.6	89.7	59.3	35.0	15.6	0.0	0.0
Single Family	Residential HE Toilets, SF	27.8	55.7	83.5	111.4	139.2	167.0	194.9	222.7	250.6	278.4	278.4
CII	CII HE Toilet	35.5	71.0	106.5	142.1	177.6	213.1	248.6	284.1	319.6	355.1	355.1
Single Family	Residential Irrigation Controller, SF	61.6	123.1	184.7	246.3	307.8	369.4	431.0	492.5	492.5	492.5	431.0
Irrigation	Large Land. Irrigation Controller	134.1	268.2	268.2	268.2	268.2	268.2	268.2	402.3	536.4	536.4	402.3
CII	CII Spray Rinse Valve	8.7	17.4	26.0	34.7	43.4	43.4	43.4	43.4	43.4	43.4	43.4
CII	CII Cooling Tower	0.0	0.0	28.5	57.0	85.5	114.0	142.5	171.0	199.5	228.0	228.0
<b>Total Gross Water Savings</b>		<b>305.7</b>	<b>603.7</b>	<b>790.1</b>	<b>971.7</b>	<b>1,149.3</b>	<b>1,264.8</b>	<b>1,387.8</b>	<b>1,651.0</b>	<b>1,857.5</b>	<b>1,933.8</b>	<b>1,738.0</b>

### Peak Gross Water Savings (AF)

Class	Activity Name	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Single Family	Residential Surveys, SF	24.7	44.4	60.2	72.9	83.0	58.3	38.5	22.7	10.1	0.0	0.0
Single Family	Residential HE Toilets, SF	11.7	23.5	35.2	47.0	58.7	70.5	82.2	94.0	105.7	117.5	117.5
CII	CII HE Toilet	15.0	30.0	45.0	59.9	74.9	89.9	104.9	119.9	134.9	149.9	149.9

# Activity Savings Profile Worksheet

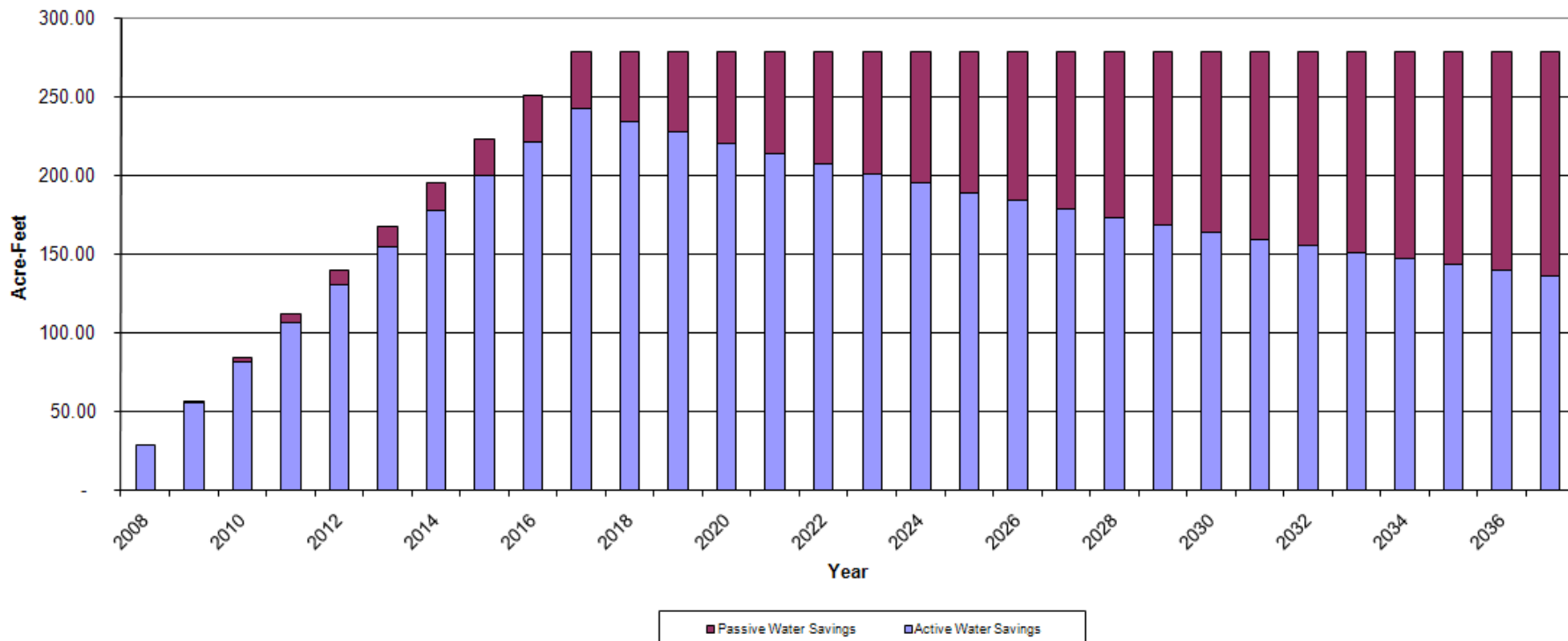
## AWE CONSERVATION TRACKING TOOL: ACTIVITY SAVINGS PROFILES WORKSHEET

Activity Name Residential HE Toilets, SF

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Residential HE Toilets, SF Annual Water Savings



Residential HE Toilets, SF	Gross	Active	Passive
Lifetime Water Savings (AF)	15,452	7,957	7,495
Average Annual Water Savings (AF)	258	133	125

# AWE CONSERVATION TRACKING TOOL: WATER SAVINGS SUMMARY WORKSHEET

## Water Demand Summary

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Service Area Demands	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Baseline Demands	AF	67,822	68,112	68,404	68,633	68,863	69,093	69,325	69,557	69,790	70,023
Baseline - Code Savings	AF	67,822	67,876	67,942	67,955	67,921	67,902	67,897	67,906	67,927	67,961
Baseline - Code Savings - Program Savings	AF	67,517	67,275	67,160	67,000	66,799	66,677	66,564	66,326	66,158	66,133

Per Capita Demands	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Baseline Demands	GPD	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0	173.0
Baseline - Code Savings	GPD	173.0	172.4	171.8	171.3	170.6	170.0	169.4	168.9	168.4	167.9
Baseline - Code Savings - Program Savings	GPD	172.2	170.9	169.8	168.9	167.8	166.9	166.1	165.0	164.0	163.4

Service Area Water Savings	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Code Water Savings	AF	0.0	236.9	461.7	677.6	942.1	1,191.7	1,427.5	1,650.4	1,862.2	2,062.6
Program Water Savings	AF	305.7	600.8	781.5	954.8	1,121.7	1,224.1	1,332.7	1,580.3	1,769.8	1,827.9
<b>Total Water Savings</b>	<b>AF</b>	<b>305.7</b>	<b>837.7</b>	<b>1,243.2</b>	<b>1,632.4</b>	<b>2,063.7</b>	<b>2,415.8</b>	<b>2,760.2</b>	<b>3,230.7</b>	<b>3,632.0</b>	<b>3,890.6</b>
<b>% of Baseline Demands</b>	<b>%</b>	<b>0.5%</b>	<b>1.2%</b>	<b>1.8%</b>	<b>2.4%</b>	<b>3.0%</b>	<b>3.5%</b>	<b>4.0%</b>	<b>4.6%</b>	<b>5.2%</b>	<b>5.6%</b>

Class Water Savings	Units	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Single Family	AF	127.4	405.0	667.3	917.8	1,205.6	1,428.1	1,647.4	1,862.6	2,012.3	2,157.1
Multi Family	AF	-	54.4	106.0	155.7	212.9	267.1	318.3	366.9	413.1	457.0
CII	AF	44.2	110.2	201.8	290.7	377.1	452.4	526.4	598.9	670.2	740.2
Irrigation	AF	134.1	268.2	268.2	268.2	268.2	268.2	268.2	402.3	536.4	536.4
Water Losses	AF	-	-	-	-	-	-	-	-	-	-
<b>Total</b>	<b>AF</b>	<b>305.7</b>	<b>837.7</b>	<b>1,243.2</b>	<b>1,632.4</b>	<b>2,063.7</b>	<b>2,415.8</b>	<b>2,760.2</b>	<b>3,230.7</b>	<b>3,632.0</b>	<b>3,890.6</b>

Year forecasted peak season demand equals existing peak season delivery capacity		Deferred Expansion (Years)	Deferred Capacity (MGD)	Benefit of Deferred Expansion (\$)	Avoided Capacity (MGD)	Benefit of Avoided Expansion (\$)
Baseline Demands	2020	N/A	N/A	N/A	N/A	N/A
Baseline - Code Savings	2031	11	6.4	\$9,144,908	0.0	\$0
Baseline - Code Savings - Program Savings	2039	19	6.4	\$14,198,213	0.0	\$0

### Select Chart to View

Per Capita Demands

[Chart Explanations](#)

### Per Capita Demands

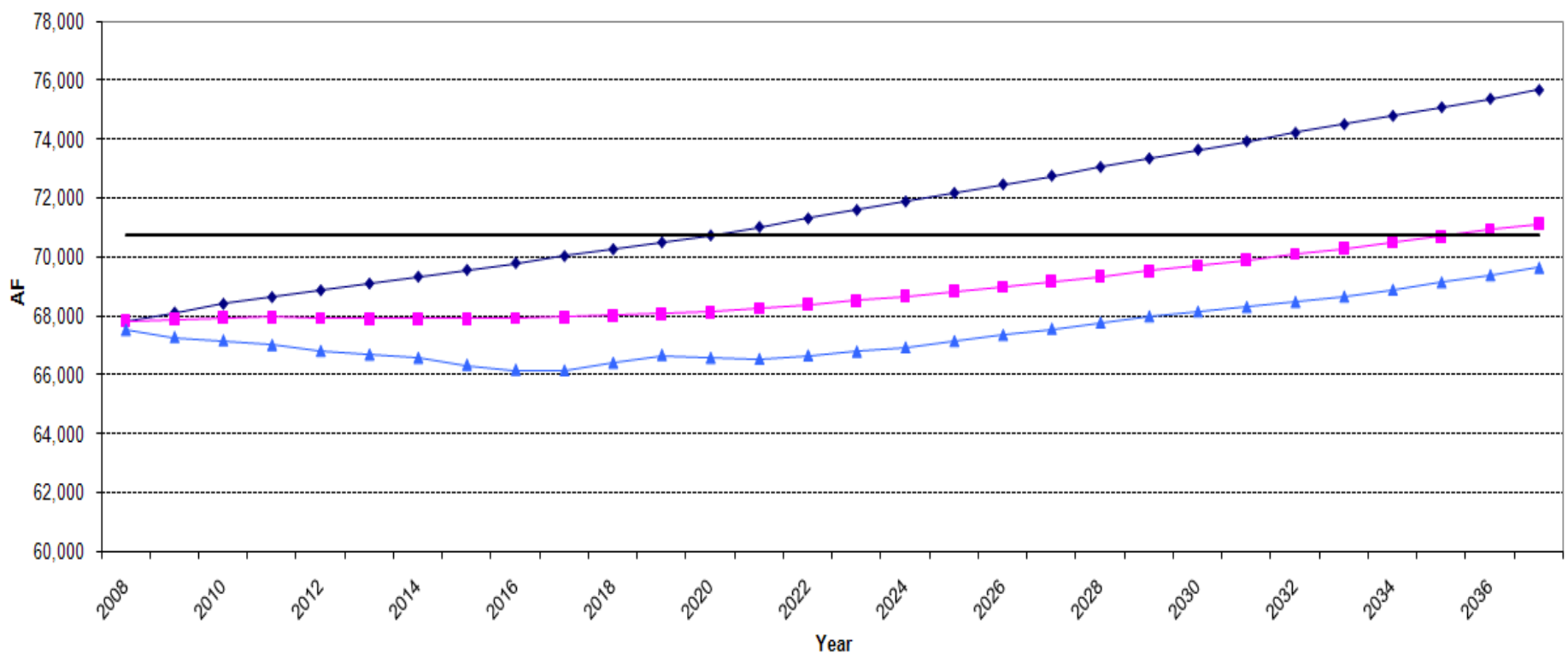
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Select Chart to View

Service Area Demands

Chart Explanations

Service Area Demands



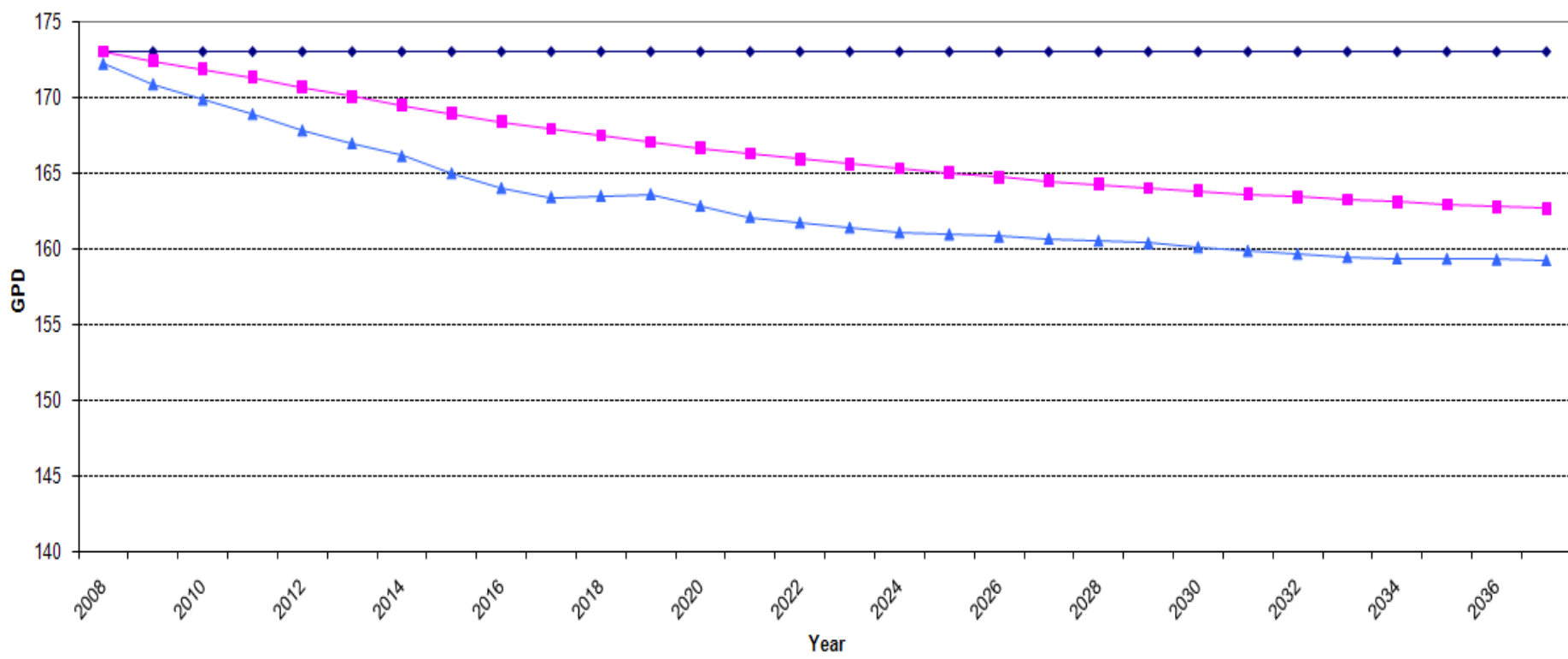
◆ Baseline Demands    ■ Baseline - Code Savings    ▲ Baseline - Code Savings - Program Savings    — Current Annual Delivery Capacity

Select Chart to View

Chart Explanations

Per Capita Demands

Per Capita Demands



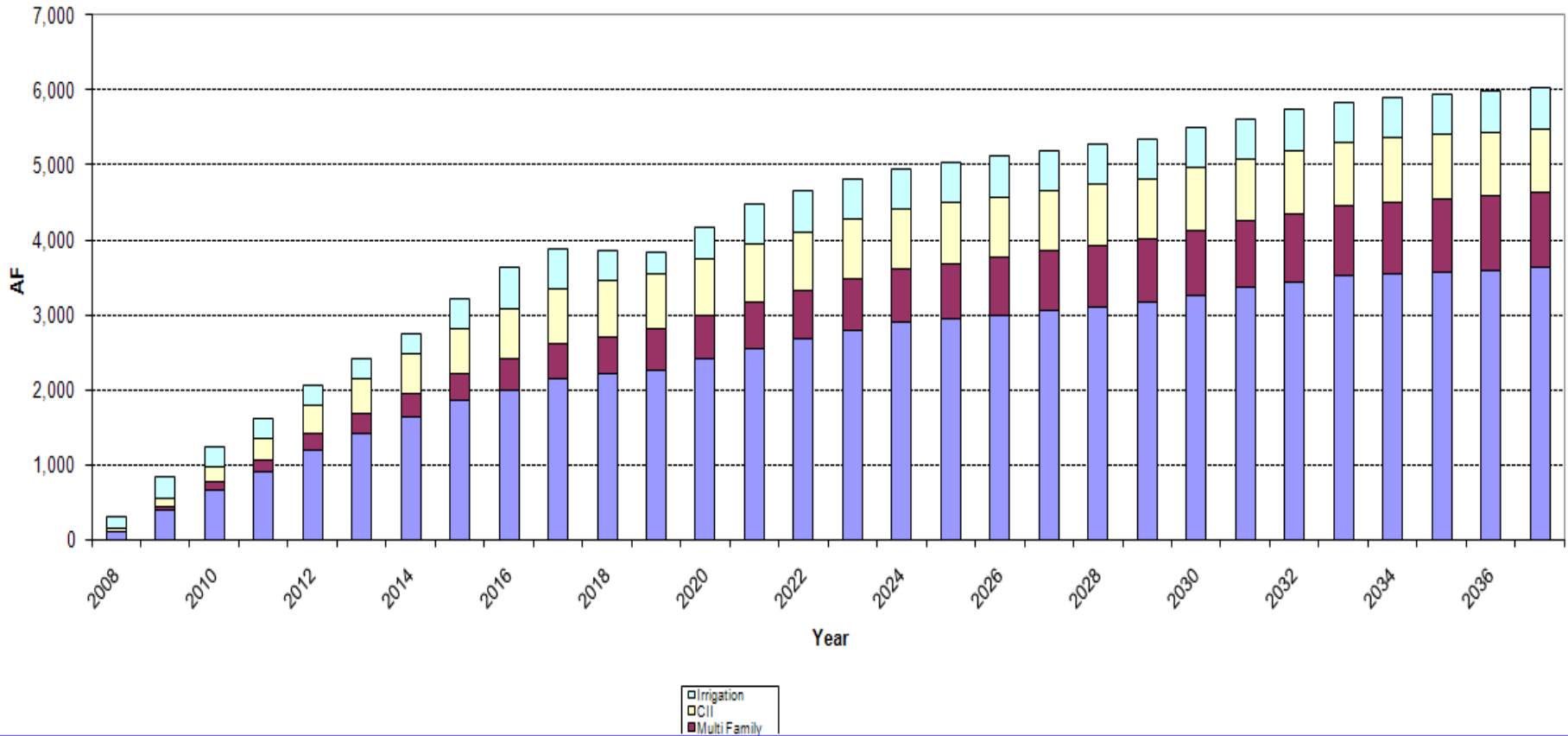
◆ Baseline Demands    ■ Baseline - Code Savings    ▲ Baseline - Code Savings - Program Savings

Select Chart to View

Total Class Savings

Chart Explanations

### Customer Class Water Savings (Program + Code-Driven)



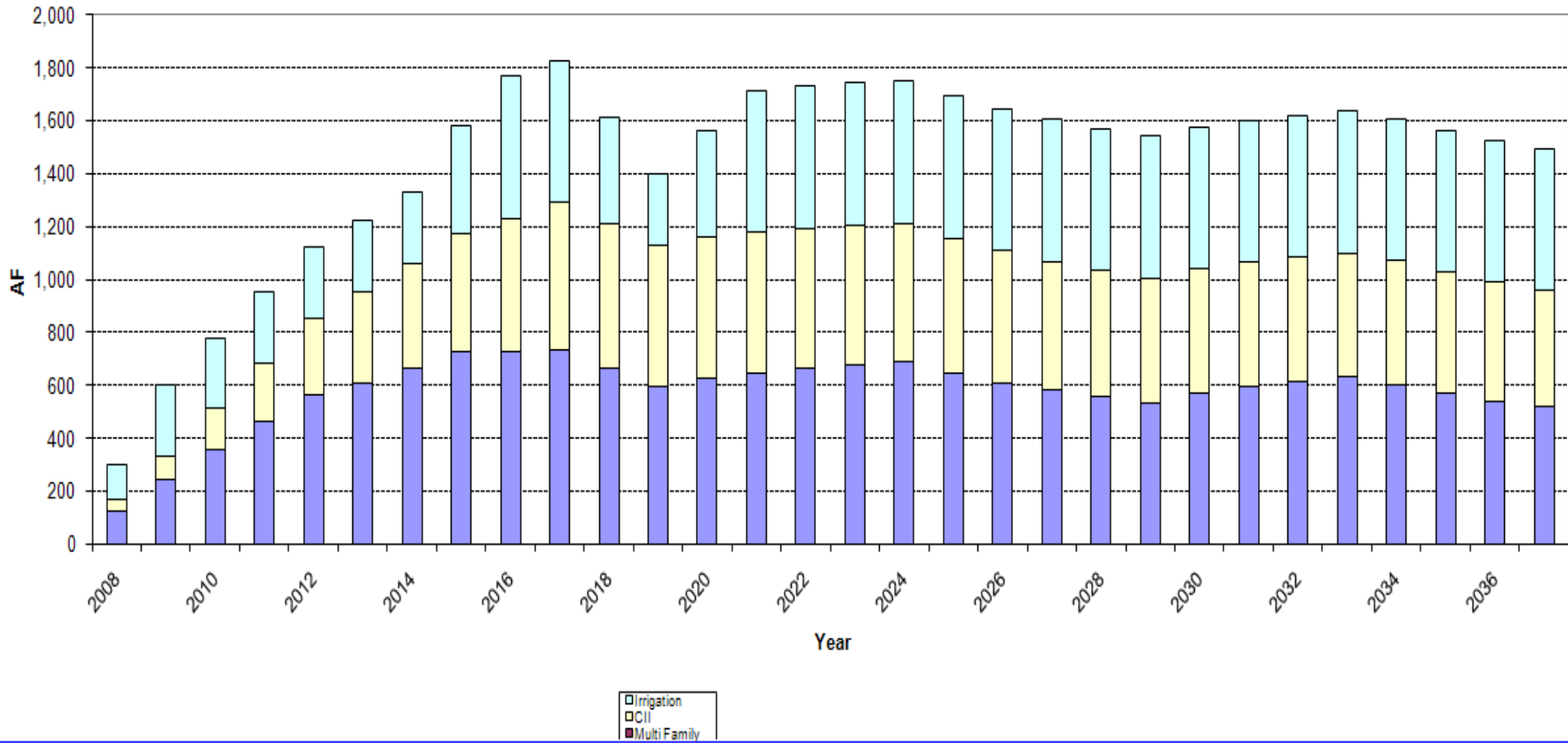
Irrigation  
CII  
Multi Family

Select Chart to View

Chart Explanations

Program Class Savings

### Customer Class Water Savings (Program Only)



# AWE CONSERVATION TRACKING TOOL: UTILITY COSTS & BENEFITS WORKSHEET

Show Budget Table

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## Conservation Program Cost Analysis (2010 Dollars) Amort. Years: 20

Class	Activity Name	Unit Cost (\$/AF)	PV Cost	Amortized Cost
Single Family	Residential Surveys, SF	\$ 832	\$ 1,469,277	\$ 97,962
Single Family	Residential HE Toilets, SF	\$ 403	\$ 1,694,499	\$ 112,979
CII	CII HE Toilet	\$ 787	\$ 4,220,334	\$ 281,386
Single Family	Residential Irrigation Controller, SF	\$ 783	\$ 7,687,606	\$ 512,563
Irrigation	Large Land. Irrigation Controller	\$ 193	\$ 2,520,977	\$ 168,083
CII	CII Spray Rinse Valve	\$ 324	\$ 318,207	\$ 21,216
CII	CII Cooling Tower	\$ 201	\$ 1,055,409	\$ 70,368
<b>Subtotal Conservation Activities</b>		<b>\$ 469</b>	<b>\$18,966,309</b>	<b>\$ 1,264,557</b>
<b>Total With Overhead &amp; Public Information</b>		<b>\$ 469</b>	<b>\$18,966,309</b>	<b>\$ 1,264,557</b>

## Conservation Benefit Analysis (2010 Dollars)

Class	Activity Name	Unit Benefit (\$/AF)	PV Benefit	Avoided Supply	Avoided Wastewater	Capacity Benefit
Single Family	Residential Surveys, SF	\$ 662	\$ 1,167,828	\$ 898,505	\$ 40,596	\$ 228,728
Single Family	Residential HE Toilets, SF	\$ 676	\$ 2,841,271	\$ 2,280,326	\$ 240,463	\$ 320,482
CII	CII HE Toilet	\$ 676	\$ 3,624,397	\$ 2,908,842	\$ 306,741	\$ 408,815
Single Family	Residential Irrigation Controller, SF	\$ 620	\$ 6,089,920	\$ 4,773,421	\$ -	\$ 1,316,499
Irrigation	Large Land. Irrigation Controller	\$ 634	\$ 8,295,971	\$ 6,369,481	\$ -	\$ 1,926,490
CII	CII Spray Rinse Valve	\$ 695	\$ 683,579	\$ 536,074	\$ 57,006	\$ 90,499
CII	CII Cooling Tower	\$ 748	\$ 3,927,857	\$ 2,862,134	\$ 303,931	\$ 761,792
<b>Total</b>		<b>\$ 658</b>	<b>\$26,630,822</b>	<b>\$20,628,782</b>	<b>\$ 948,736</b>	<b>\$ 5,053,304</b>

## Utility Conservation Program NPV and B/C Ratio (2010 Dollars)

Class	Activity Name	NPV (\$)	B/C Ratio
Single Family	Residential Surveys, SF	\$ (301,449)	0.79
Single Family	Residential HE Toilets, SF	\$ 1,146,772	1.68
CII	CII HE Toilet	\$ (595,937)	0.86
Single Family	Residential Irrigation Controller, SF	\$ (1,597,686)	0.79
Irrigation	Large Land. Irrigation Controller	\$ 5,774,994	3.29
CII	CII Spray Rinse Valve	\$ 365,371	2.15
CII	CII Cooling Tower	\$ 2,872,448	3.72
<b>Subtotal Conservation Activities</b>		<b>\$ 7,664,513</b>	<b>1.40</b>
<b>Total With Overhead &amp; Public Information</b>		<b>\$ 7,664,513</b>	<b>1.40</b>

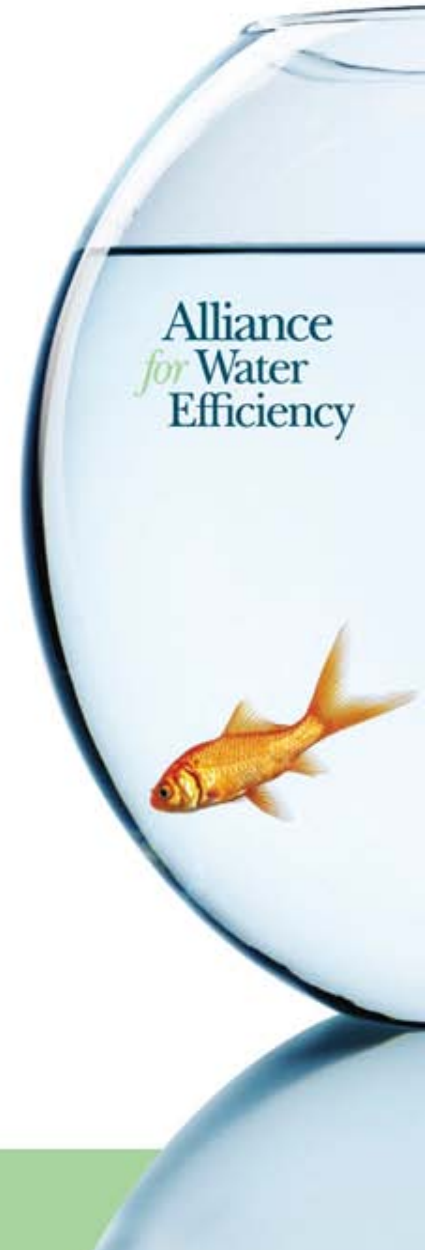
### Select Chart to View

Unit Costs Sorted

Chart Explanations

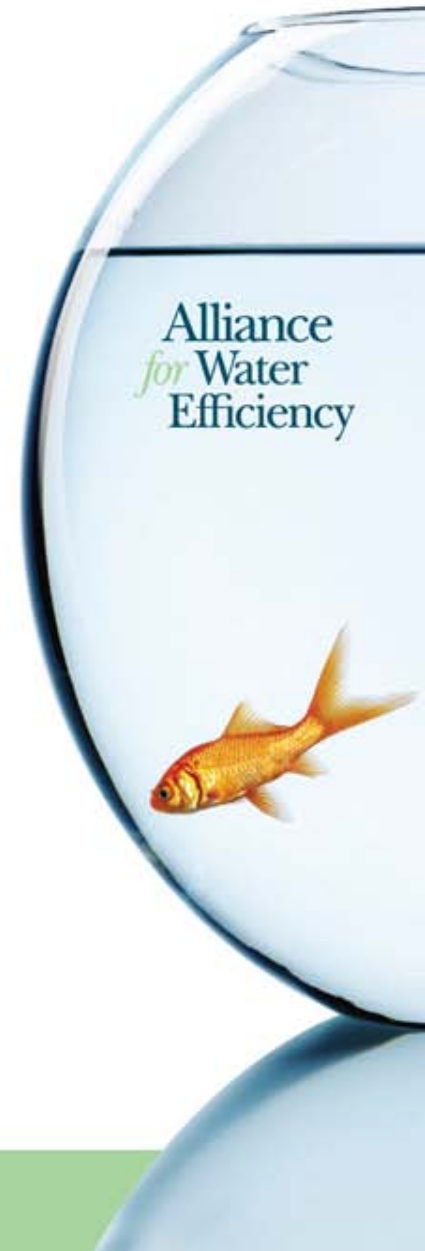
# Assessing Water Loss Control

- Important to include water loss control methods in model analysis
- Detailed modeling necessary to incorporate individual water loss control strategies for a specific utility
- Insufficient funding available for first version of model to do this
- Wanted to benchmark water loss control strategies against demand side management strategies



# Model Assumptions

- Default assumption that 65% of total water losses are real losses and 35% are apparent losses. This default assumption can be modified by the user
- Default assumption that an aggressive water loss reduction program would, for a typical utility, reduce real losses by 20 - 40%
- Model compares this savings potential to program water savings from demand side conservation activities defined in the model

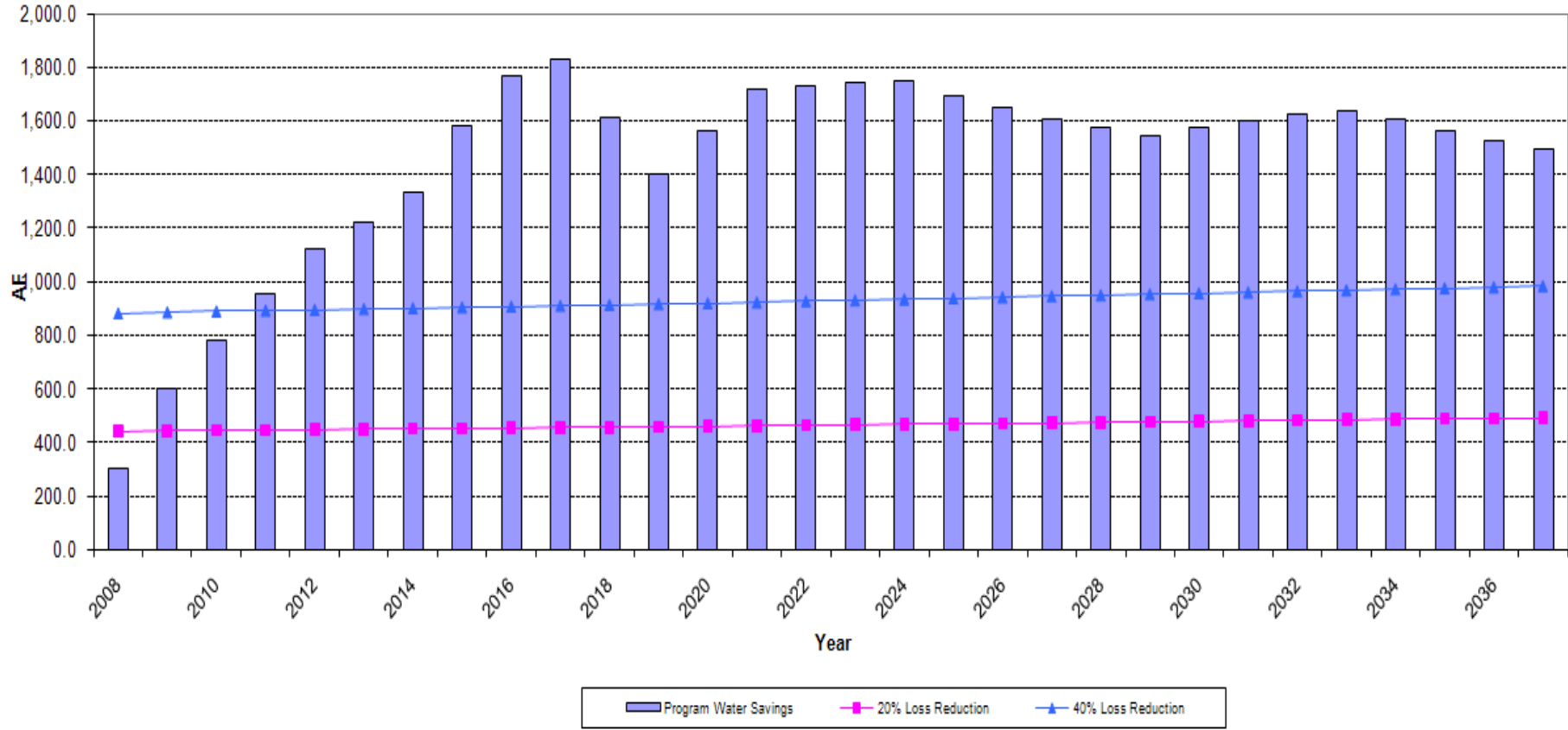


Select Chart to View

Phy. Loss Reduction Comparison

Chart Explanations

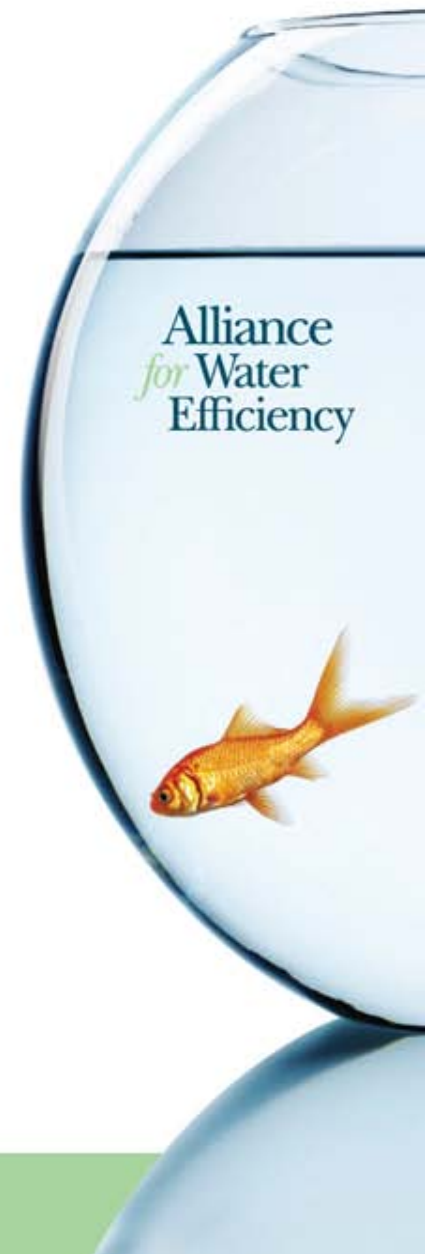
Physical Loss Reduction Comparison



# Benchmark Examples (in AF)

San Francisco PUC	\$439
Nashville Water Works	\$318
Los Angeles Dept. of Water and Power	\$347
California Grant Program	\$658
Las Vegas WD	\$464
Large Western US Utility	\$318
Orange County Utilities, FL	\$463
Average	\$430
Maximum	\$658
Minimum	\$318

Source: Julian Thornton and Reinhard Sturm



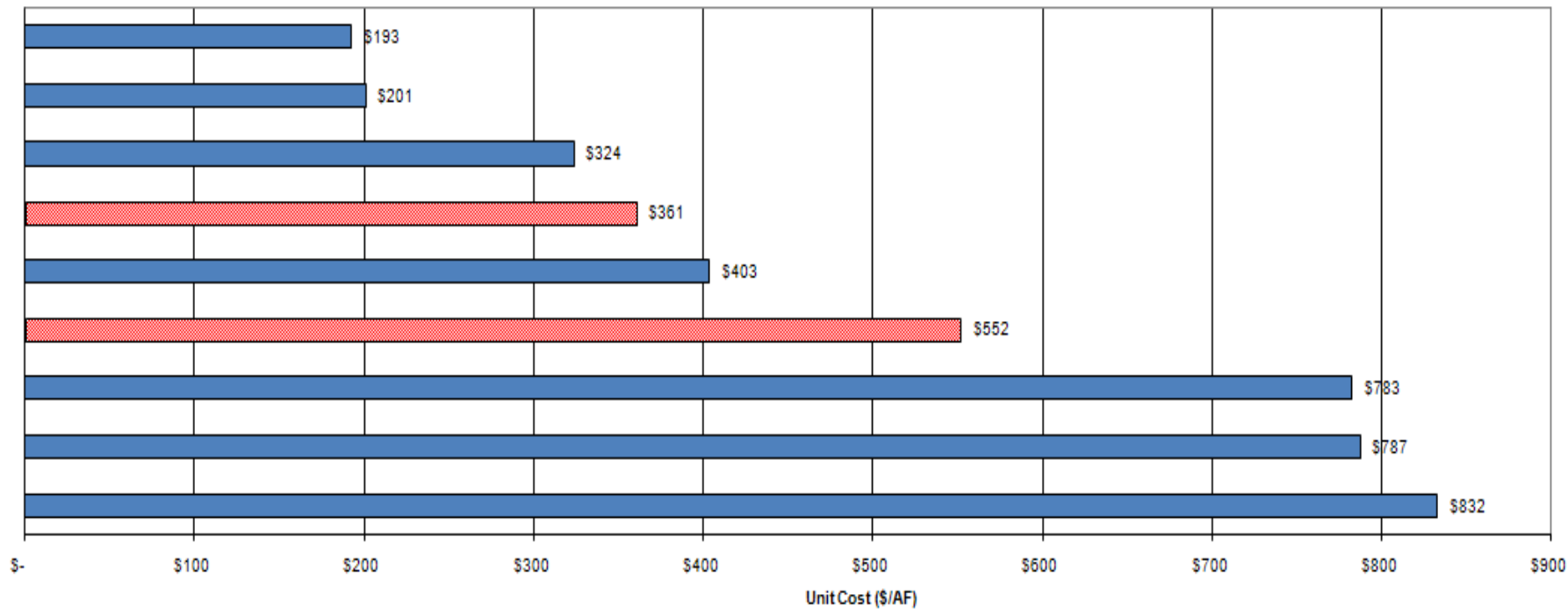
145 Utility Conservation Program NPV and B/C Ratio (2010 Dollars)

Select Chart to View

Unit Costs Sorted

Class	Activity Name	NPV (\$)	B/C Ratio
Single Family	Residential Surveys, SF	\$ (301,449)	0.79
Single Family	Residential HE Toilets, SF	\$ 1,146,772	1.68
CII	CII HE Toilet	\$ (595,937)	0.86
Single Family	Residential Irrigation Controller, SF	\$ (1,597,686)	0.79
Irrigation	Large Land. Irrigation Controller	\$ 5,774,994	3.29
CII	CII Spray Rinse Valve	\$ 365,371	2.15
CII	CII Cooling Tower	\$ 2,872,448	3.72
<b>Subtotal Conservation Activities</b>		<b>\$ 7,664,513</b>	<b>1.40</b>
<b>Total With Overhead &amp; Public Information</b>		<b>\$ 7,664,513</b>	<b>1.40</b>

Conservation Activities Sorted by Utility Unit Cost



\*Low and high unit cost represent the 90% confidence interval for average unit cost of 7 U.S. water loss control programs, as reported in Thornton and Sturm (2007).

# AWE CONSERVATION TRACKING TOOL: GHG MODULE INPUTS WORK SHEET

Last Loaded Scenario: "GHG Scenario" loaded on 4/19/2011 6:11:20 PM

[Return to Navigation](#)

## Select eGRID Region:

In which eGRID Region are you located? (See map) **RFCE**

Average Generation Emission Rates	lb/MWhr
CO <sub>2</sub>	1,139
CH <sub>4</sub>	0.03027
SO <sub>2</sub>	7.7918
NO <sub>x</sub>	1.6307
N <sub>2</sub> O	0.01871
Hg	0.0000387

## Energy Used for Water Supply and Wastewater Treatment:

Average Energy Intensity For:	KWh/AF
Water Supply Withdrawal, Treatment, and Distribution	2,200
Wastewater Pumping and Treatment	850

## Tables for Estimating Water and Wastewater Embedded Energy

### Water Supply, Treatment, and Distribution Energy Intensity Default Values

Local Water Supply Sources	KWh/AF	% of Local Supply
Local Surface Water	222	40%
Groundwater	624	40%
Brackish Desalination	528	0%
Recycled Water	730	10%
Seawater Desalination	4,497	10%
<b>Total:</b>		<b>100%</b>

Average Energy Intensity of Local Water Supply **861** KWh/AF

Imported Water Supply Sources	KWh/AF	Default Value
Select the imported water energy intensity level	High	
Average Energy Intensity of Imported Water Supply		2,473 KWh/AF
Imported Water Supply as % of Total Supply	40%	
Local Water Supply as % of Total Supply	60%	

Average Energy Intensity per AF of Total Supply **1,506** KWh/AF

	% of Total Supply

## eGRID Subregion Representational Map



### Imported Water Energy Intensity Key

Low - Transmission mostly via gravity with limited pumping. More likely raw than treated.

Moderate - Some transmission pumping required. Source may be groundwater. Default value.

High - Transmission involves significant pumping. Source may be groundwater. Default value.

# Tables for Estimating Water and Wastewater Embedded Energy



## Water Supply, Treatment, and Distribution Energy Intensity Default Values

Local Water Supply Sources	KWh/AF	% of Local Supply
Local Surface Water	222	40%
Groundwater	624	40%
Brackish Desalination	528	0%
Recycled Water	730	10%
Seawater Desalination	4,497	10%
<b>Total:</b>		<b>100%</b>

**Average Energy Intensity of Local Water Supply** 861 KWh/AF

Imported Water Supply Sources	KWh/AF	Default Value
Select the imported water energy intensity level	High	
<b>Average Energy Intensity of Imported Water Supply</b>		2,473 KWh/AF
Imported Water Supply as % of Total Supply	40%	
Local Water Supply as % of Total Supply	60%	

### Imported Water Energy Intensity Key

Low - Transmission mostly via gravity with limited pumping required.  
Moderate - Some transmission pumping required.  
High - Transmission involves significant pumping.

**Average Energy Intensity per AF of Total Supply** 1,506 KWh/AF

Local Water Treatment	KWh/AF	% of Total Supply Receiving This Treatment
Coagulation, Flocculation, Filtration	82	80%
Microfiltration	153	60%
Disinfection (Ozone)	72	50%

**Average Treatment Energy Intensity per AF of Delivered Water** 193 KWh/AF

Water Distribution	KWh/AF
Choose a terrain that best describes your service area	Flat
Average Booster Pump Energy Intensity per AF of Delivered Water	18
Average Pressure System Pumps per AF of Delivered Water	477

**Average Distribution Energy Intensity per AF of Delivered Water** 495 KWh/AF

**Average Energy Intensity of Delivered Water** KWh/AF

# AWE CONSERVATION TRACKING TOOL: GHG REDUCTION BENEFITS WORKSHEET

Last Loaded Scenario: "GHG Scenario" loaded on 4/19/2011 6:11:20 PM

## Summary of Calculated Energy Savings

Utility-Side Energy Savings From	Units	2015	2020	2025	2030	2035	2040	2045	2050
Plumbing Codes	MWh/Yr	3,605	6,484	8,720	10,462	11,855	12,968	13,864	14,593
Utility Conservation Programs	MWh/Yr	3,019	3,242	1,663	1,202	1,046	920	817	733
<i>Subtotal</i>	<i>MWh/Yr</i>	<i>6,624</i>	<i>9,726</i>	<i>10,383</i>	<i>11,664</i>	<i>12,901</i>	<i>13,888</i>	<i>14,680</i>	<i>15,325</i>

Customer-Side Energy Savings From	Units	2015	2020	2025	2030	2035	2040	2045	2050
Plumbing Codes									
Electricity	MWh/Yr	238	442	581	676	746	798	838	869
Natural Gas	10 <sup>3</sup> Therms/Yr	364,894	633,301	805,984	917,329	996,240	1,052,188	1,093,313	1,125,685
Utility Conservation Programs									
Electricity	MWh/Yr	121	101	0	0	0	0	0	0
Natural Gas	10 <sup>3</sup> Therms/Yr	144,858	98,602	0	0	0	0	0	0

Total Annual Energy Savings	Units	2015	2020	2025	2030	2035	2040	2045	2050
Electricity	MWh/Yr	6,983	10,269	10,964	12,340	13,648	14,686	15,518	16,195
Natural Gas	10 <sup>3</sup> Therms/Yr	509,753	731,903	805,984	917,329	996,240	1,052,188	1,093,313	1,125,685

Cumulative Energy Savings Since 2010	Units	2015	2020	2025	2030	2035	2040	2045	2050
Electricity	GWh	25	72	125	183	249	321	397	476
Natural Gas	10 <sup>6</sup> Therms	1,840	5,053	9,015	13,398	18,233	23,389	28,778	34,344

## Summary of Calculated Emission Reductions

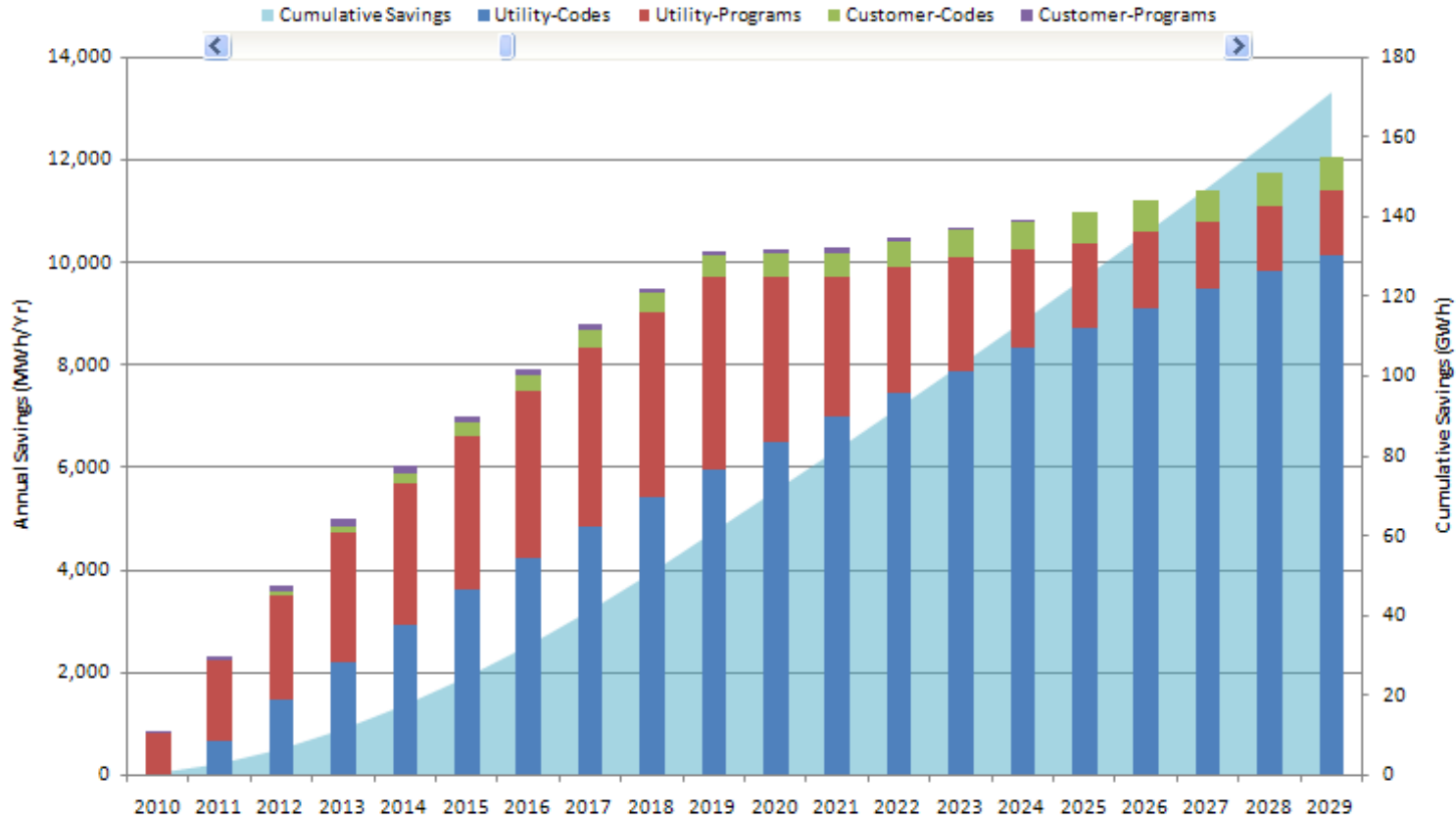
### Carbon Dioxide

Utility-Side CO <sub>2</sub> Reductions From	Units	2015	2020	2025	2030	2035	2040	2045	2050
Plumbing Codes	Tons/Yr	2,053	3,693	4,967	5,959	6,752	7,386	7,896	8,311
Utility Conservation Programs	Tons/Yr	1,719	1,846	947	684	596	524	465	417
<i>Subtotal</i>	<i>Tons/Yr</i>	<i>3,772</i>	<i>5,539</i>	<i>5,913</i>	<i>6,643</i>	<i>7,348</i>	<i>7,910</i>	<i>8,361</i>	<i>8,728</i>

### Customer-Side CO<sub>2</sub> Reductions From

Plumbing Codes	Tons/Yr	0	0	0	0	0	0	0	0
Utility Conservation Programs	Tons/Yr	2,282	3,977	5,072	5,781	6,285	6,644	6,908	7,117
<i>Subtotal</i>	<i>Tons/Yr</i>	<i>2,282</i>	<i>3,977</i>	<i>5,072</i>	<i>5,781</i>	<i>6,285</i>	<i>6,644</i>	<i>6,908</i>	<i>7,117</i>

## Annual and Cumulative Electricity Savings



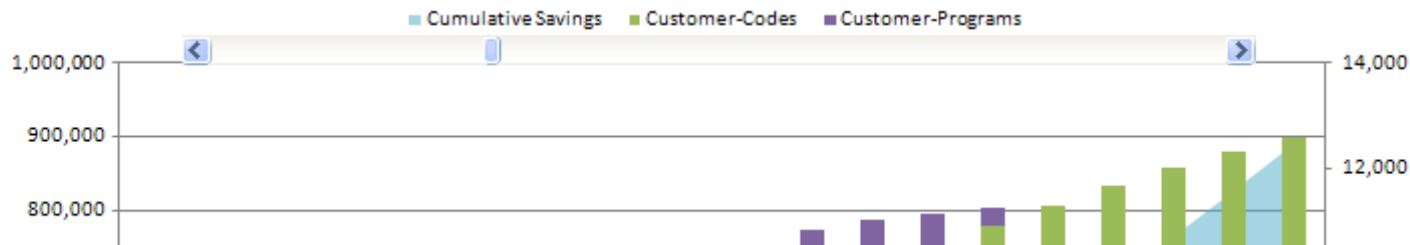
### Show Series

- Utility-Codes
- Utility-Programs
- Customer-Codes
- Customer-Program
- Cumulative Savings-All

Years to Display:

Use the slider in the chart to set the number of years to display. Or enter a whole number between 5 and 60 in the box above.

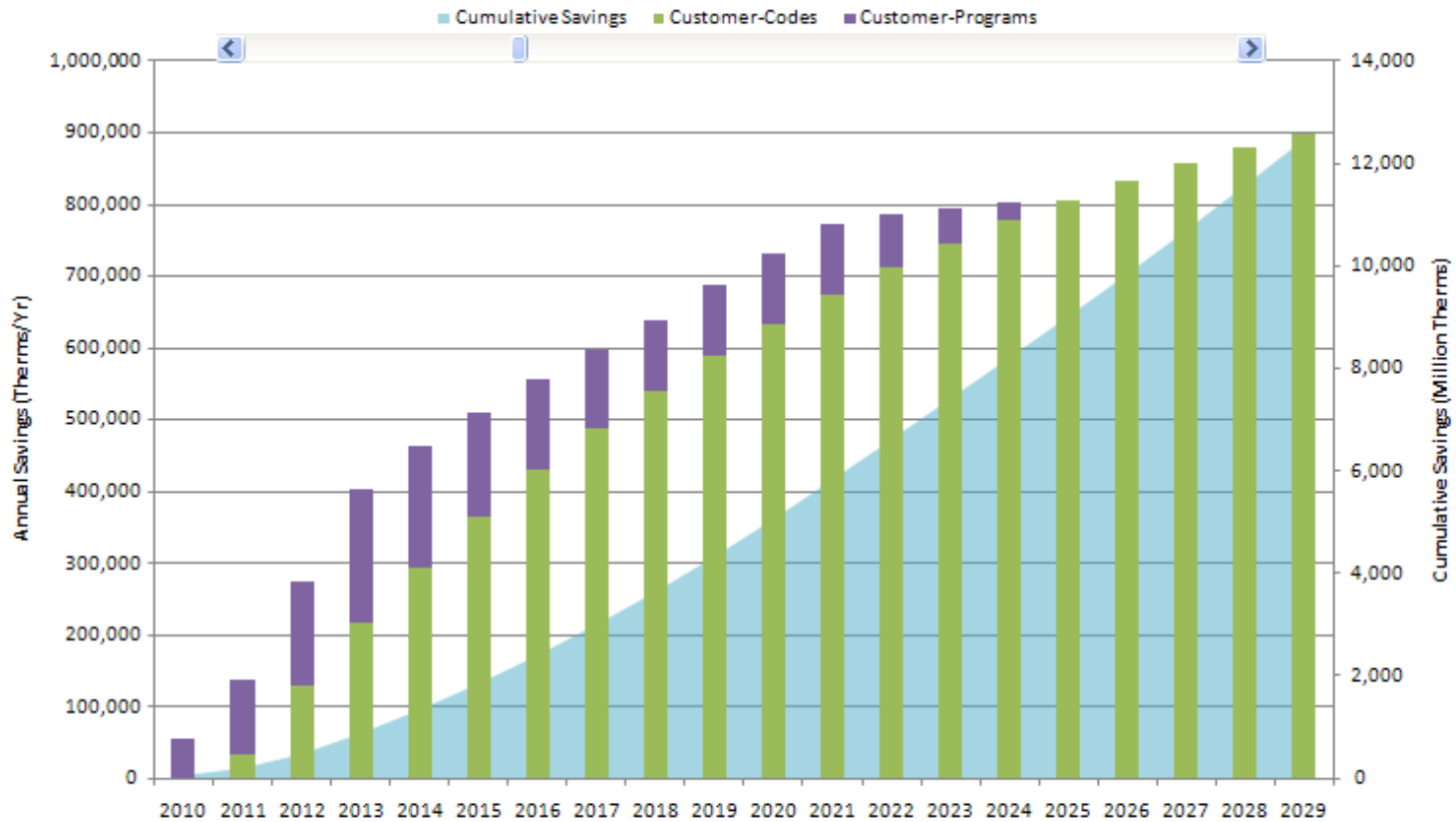
## Annual and Cumulative Gas Savings



### Show Series

- Customer-Codes
- Customer-Program
- Cumulative Savings-All

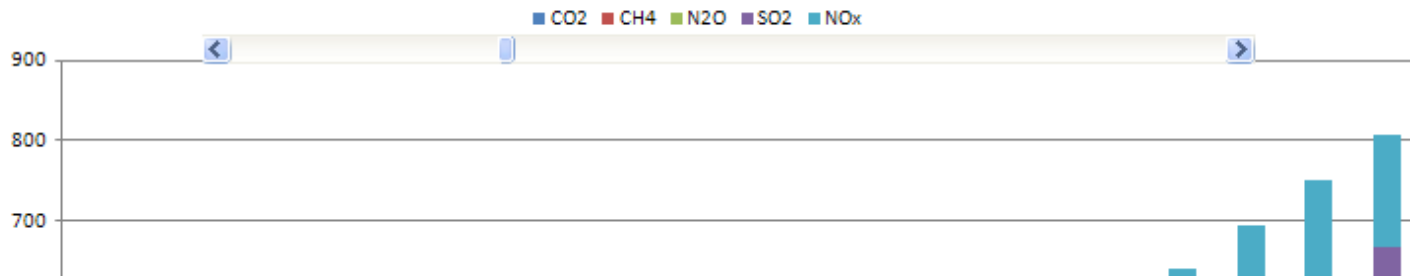
## Annual and Cumulative Gas Savings



Show Series

- Customer-Codes
- Customer-Program
- Cumulative Savings-All

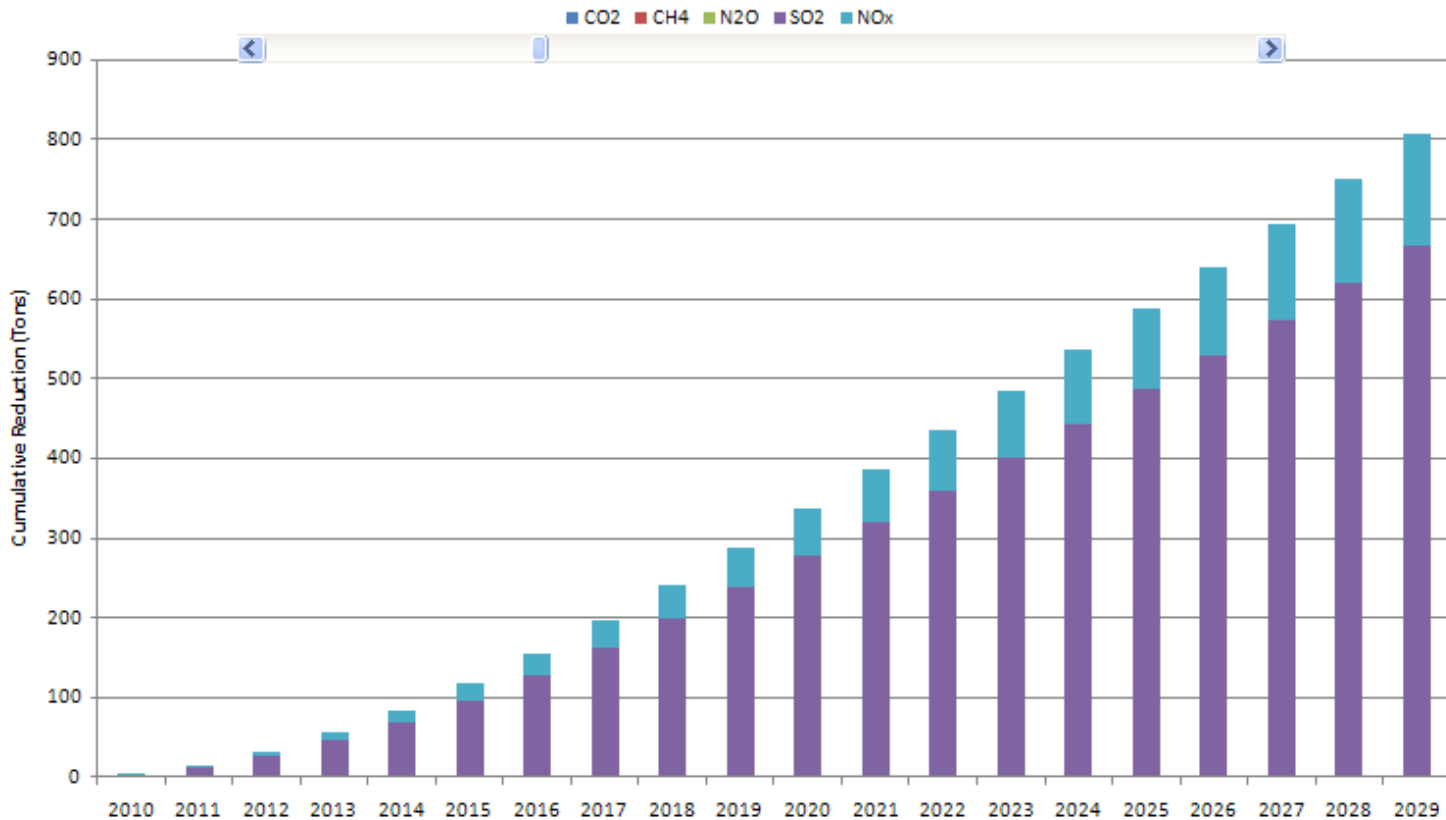
## Cumulative Emission Reductions



Show Series

- Carbon Dioxide
- Methane
- Nitrous Oxide
- Sulfur Dioxide
- Nitrogen Oxides

### Cumulative Emission Reductions



Show Series

- Carbon Dioxide
- Methane
- Nitrous Oxide
- Sulfur Dioxide
- Nitrogen Oxides



2 Utility Revenue Requirement and Rate Impacts

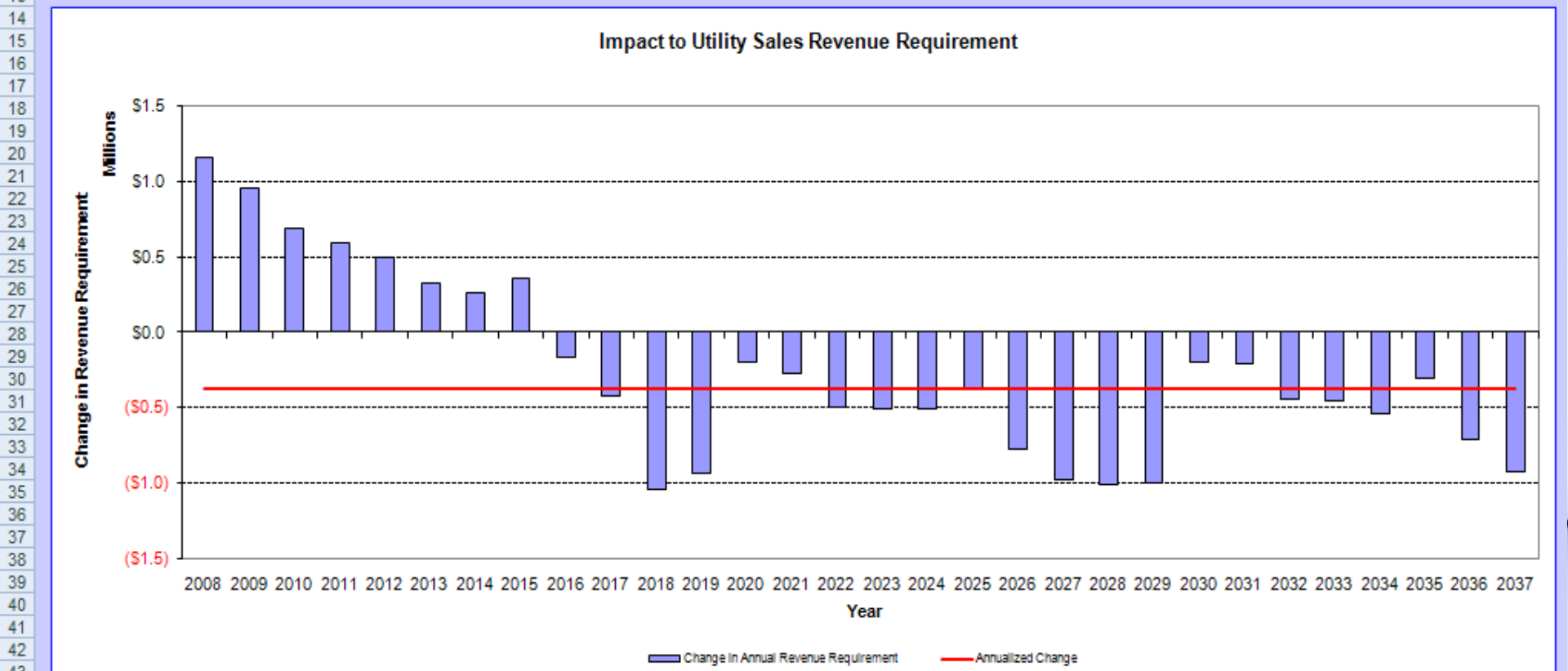
[Return to Navigation Sheet](#) [Report Error](#)

Program Impact on...	Baseline	With Conserv.	Change to Baseline
Water Utility Annual Sales Revenue Requirement	49,750,031	\$49,378,362	(\$371,668)
% change from baseline			-0.75%
Avg. Water Rate (\$/Thou Gal)	\$2.17	\$2.31	\$0.14
% change from baseline			6.60%
Annualized Bill Impact (\$/Mo.)	46.91	\$46.58	(\$0.32)
% change from baseline			-0.69%

10 Select Impact Chart to View

Chart Explanations

12 Revenue Requirement



3 Utility Revenue Requirement and Rate Impacts

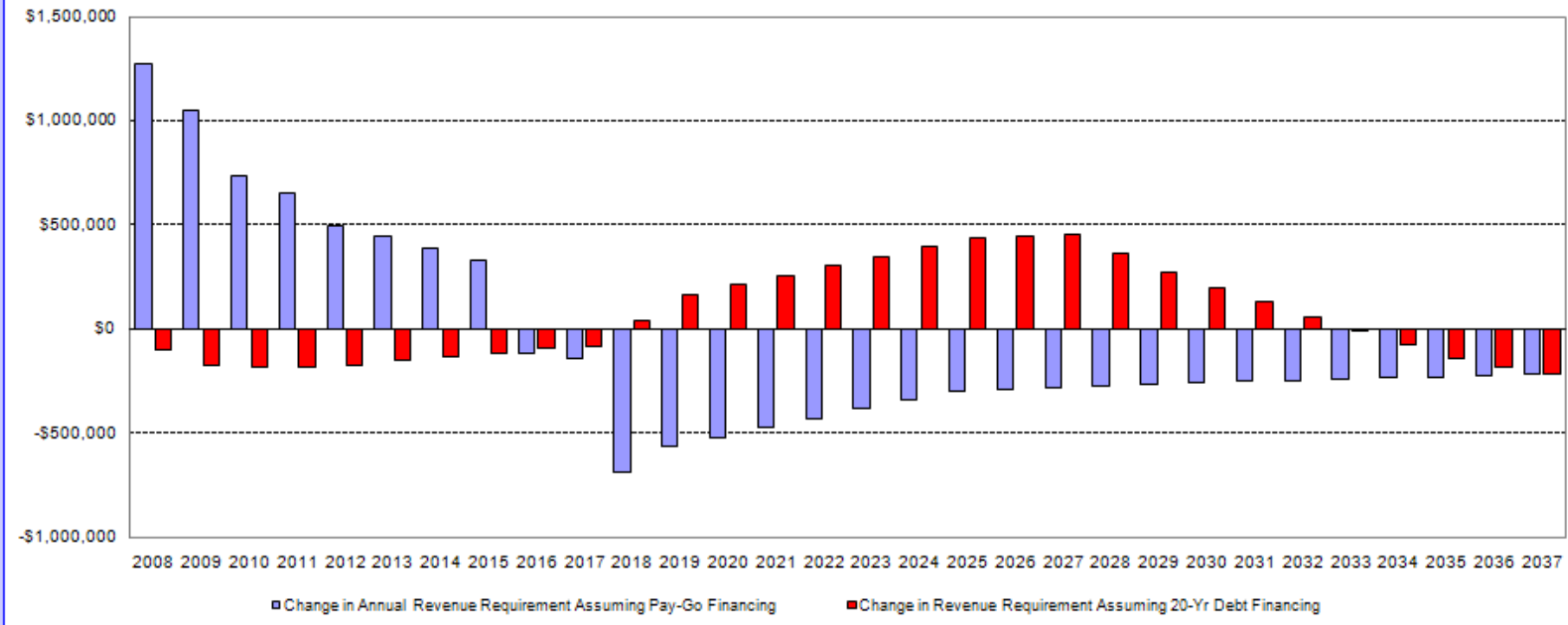
Program Impact on...	Baseline	With Conserv.	Change to Baseline
Water Utility Annual Sales Revenue Requirement	49,742,591	\$49,714,663	(\$27,927)
% change from baseline			-0.06%
Avg. Water Rate (\$/Thou Gal)	\$2.17	\$2.30	\$0.13
% change from baseline			6.05%
Annualized Bill Impact (\$/Mo.)	46.86	\$46.84	(\$0.01)
% change from baseline			-0.03%

11 Select Impact Chart to View

13 Revenue Requirement

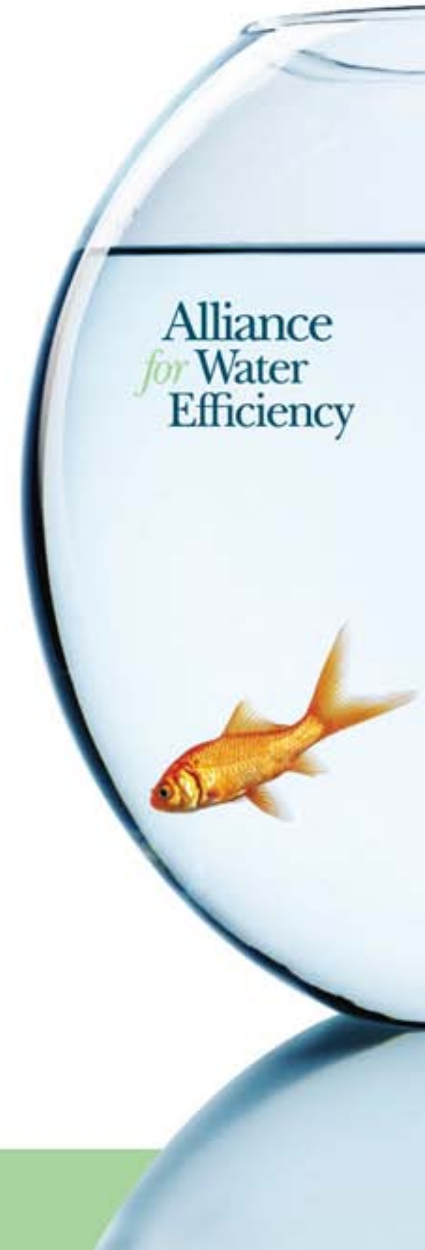
12 Chart Explanations

16 Impact to Utility Sales Revenue Requirement Under Two Financing Approaches



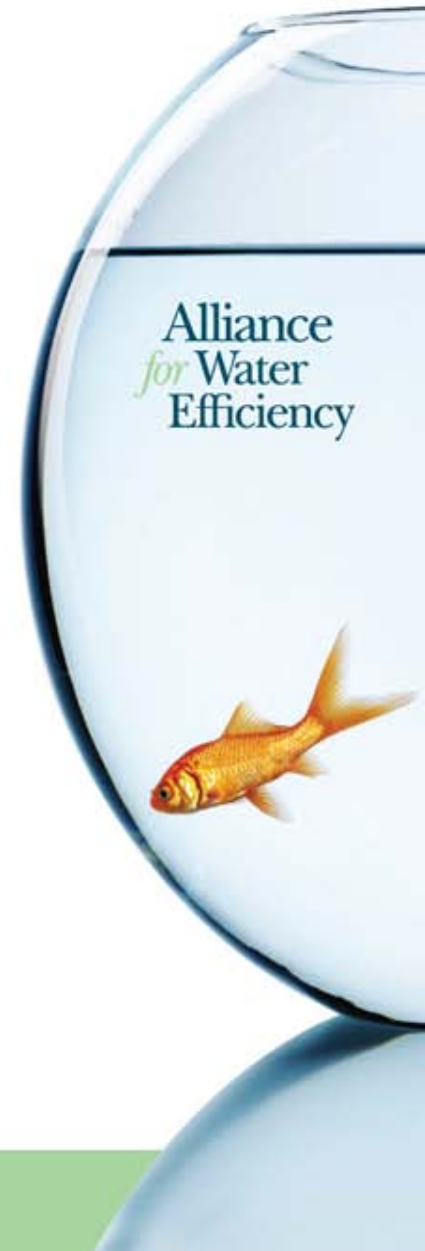
# Beta Testing the Model

- Four US utilities tested the model: Seattle, San Antonio, Tampa Bay, Marin Municipal Water District
- Model now finalized with results from beta testing
- Version 1.2 now available in Excel
- Version 2 to be released in a month
- Future versions will add to library of conservation measures
- Detailed water loss evaluation component will be added



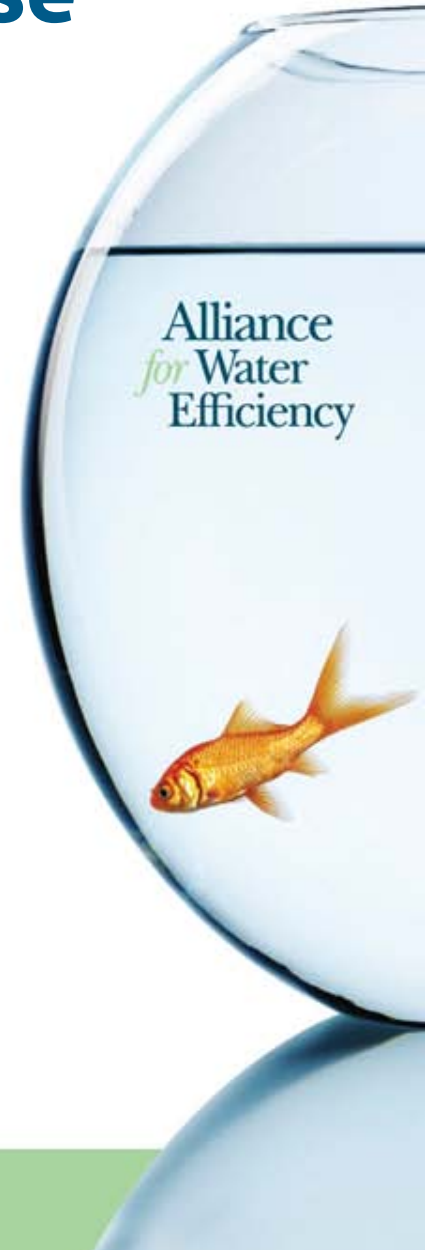
# Availability of Model

- Available free to members
- AWE agrees to provide free all future updates and one free hour of technical assistance
- Version 1.2 released last month with new features and corrections
- International applications (Jordan, Australia, Italy)
- Collecting case studies of user experiences from the nearly 100 users



# Observations Since Model Release

- Data inputs must be correct on avoided costs and system expansion needs
- Utility conservation costs must be correctly estimated
- Utility overhead not double-counted
- Savings of 15-30% reasonably likely depending upon avoided costs
- Users are able to create and customize
- California highest activity to date (due to state planning requirements)





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