

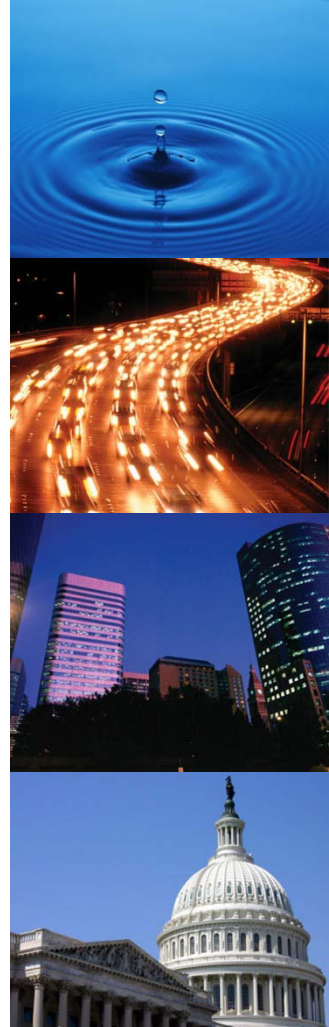
# This presentation premiered at WaterSmart Innovations

[watersmartinnovations.com](http://watersmartinnovations.com)



# PROMOTING WATER AND ENERGY EFFICIENCY SIMULTANEOUSLY

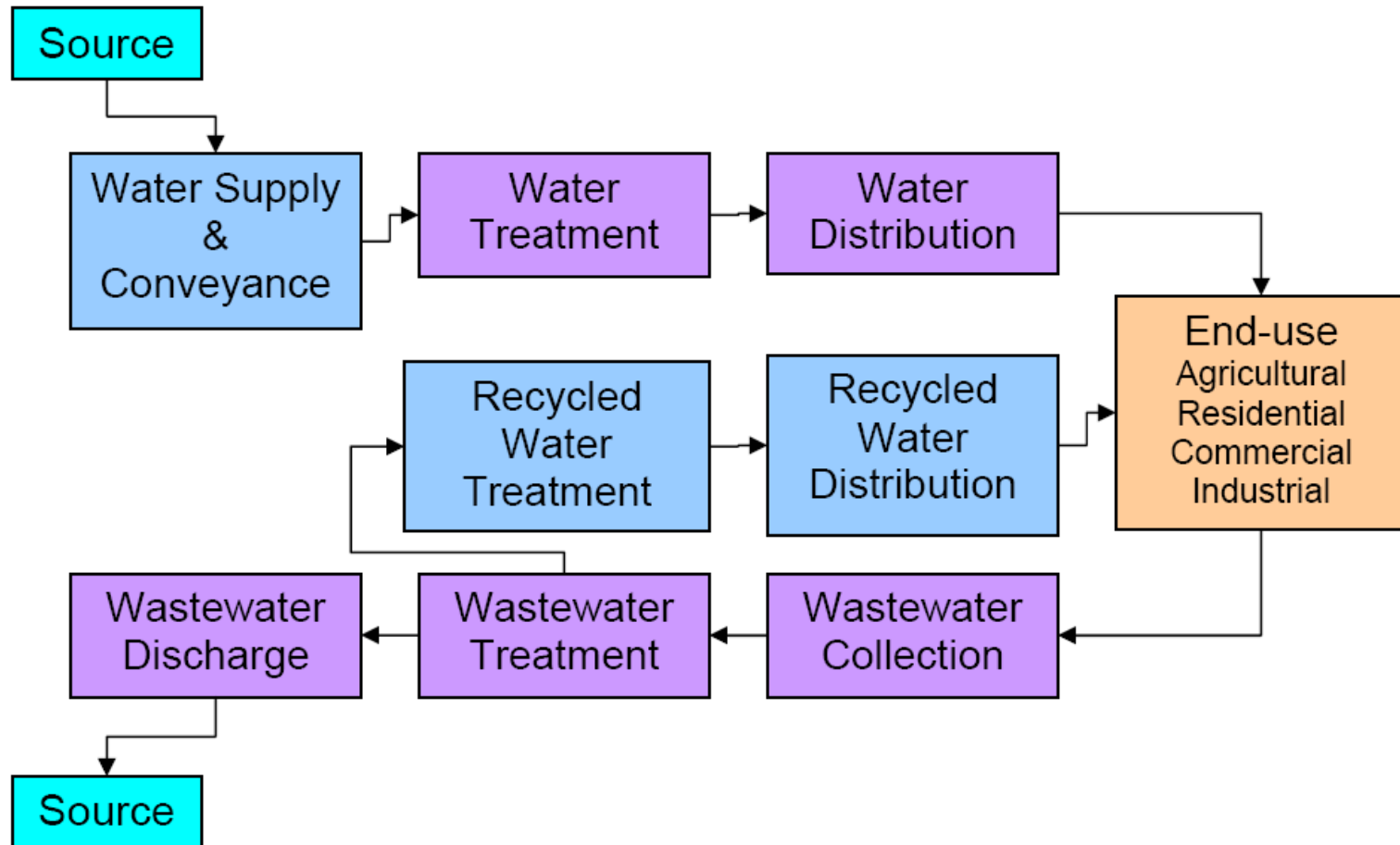
DIANA PAPE, ICF INTERNATIONAL  
OCTOBER 8, 2009



# Overview

- **Linkage Between Water and Energy**
- **Energy Intensity of Water Supply and Wastewater Treatment**
- **Residential and Commercial Water and Energy Saving Strategies**
- **Illustrative Example of Energy Savings by Replacing Appliances**
- **Growing Interest in Water/Energy Nexus Initiatives**
- **Conclusions**
- **References**

# Water Supply and Treatment Requires Energy



Source: CEC, 2005

# Energy Use at Water Utilities

## Typical Energy Use for Urban Drinking Water Supply

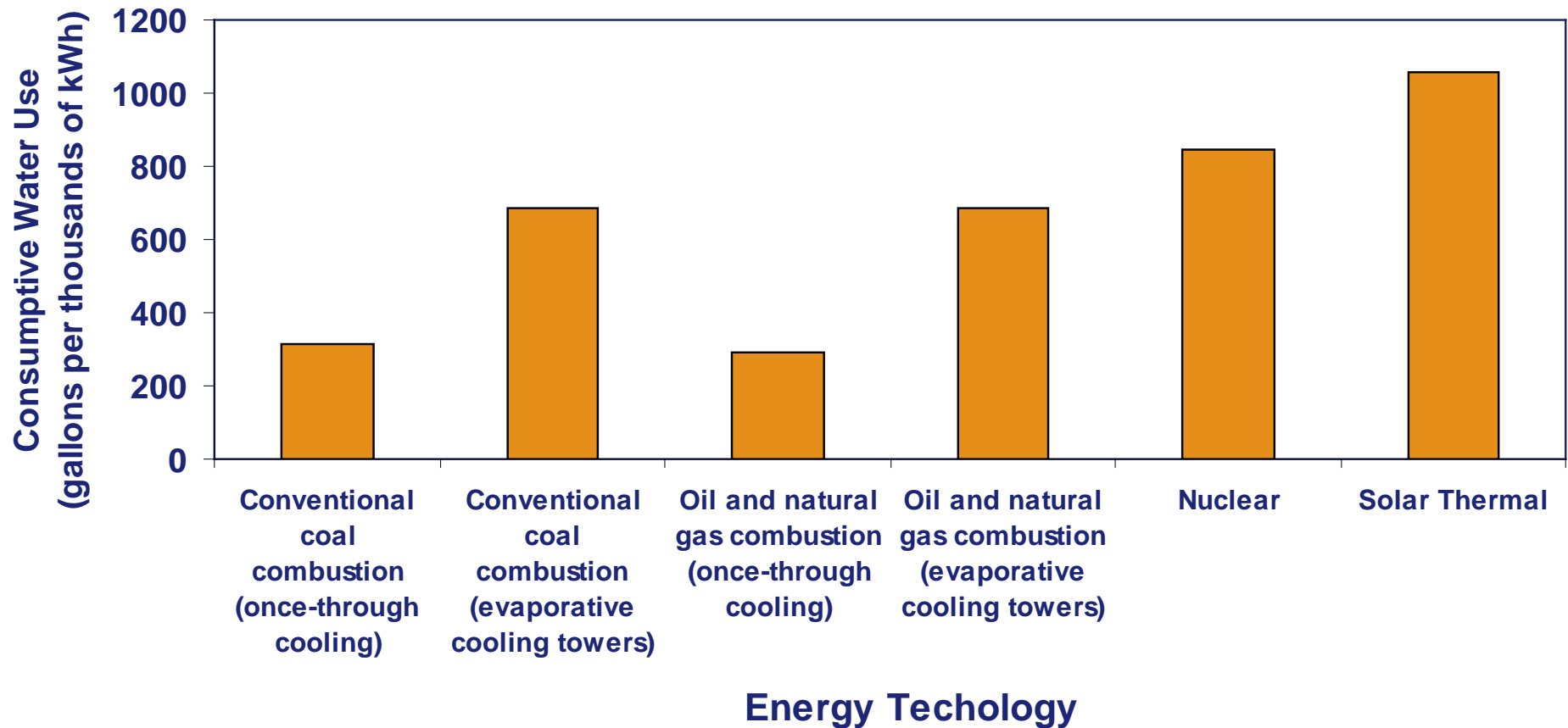
Use	Average Energy Use	Range of Energy Use
Conveyance	100 kWh/MG	0-10,000 kWh/MG
Treatment	250 kWh/MG	100-5,000 kWh/MG
Distribution	1,150 kWh/MG	0-1,200 kWh/MG

Source: AwwaRF, 2008

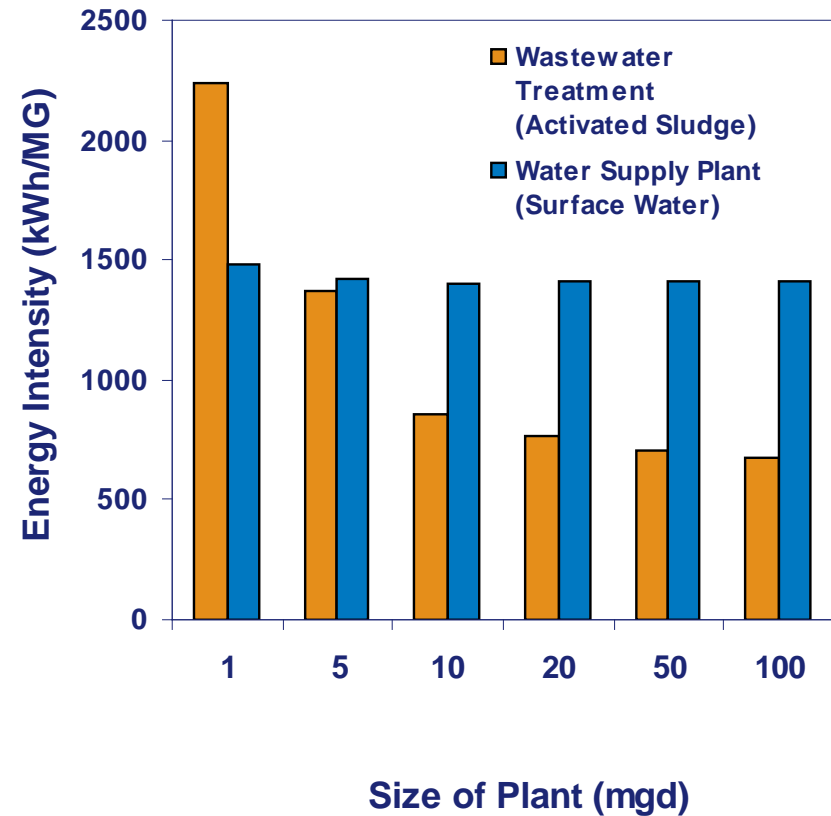
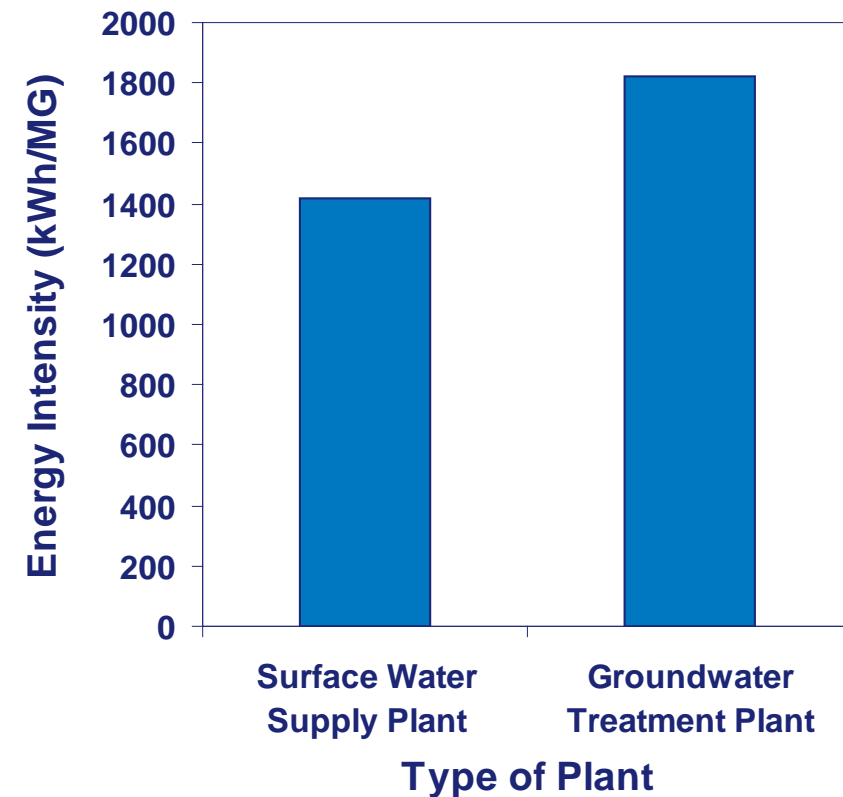
# Energy Use For Wastewater Treatment

Treatment Process	Energy Used (kWh/million gallons)
Activated Sludge	3,250-4,400
Trickling Filter	750-1,400
Activated Sludge + Trickling Filter	1,250-3,100
Rotating Biological Contactor	3,200
Non-aerated Facultative Lagoon	300 to 1,400
Aerated Facultative Lagoon	1,550-1,800

# Energy Supply Requires Water



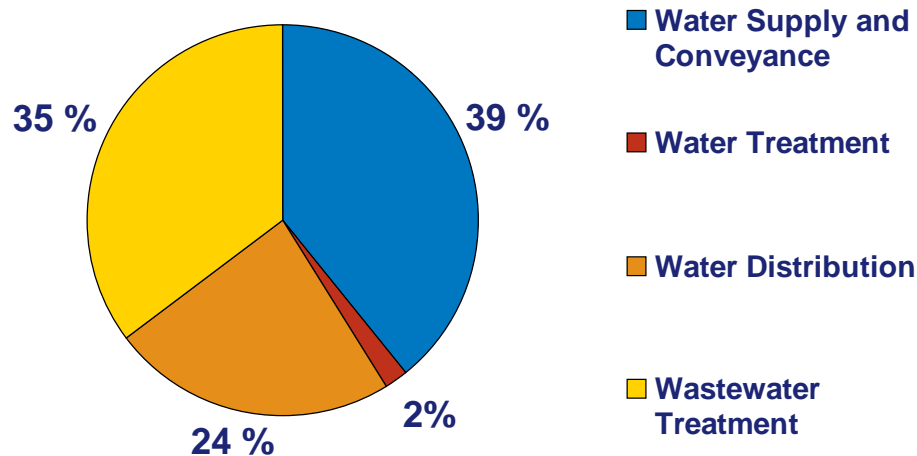
# Energy Intensity Varies by System Type and Size





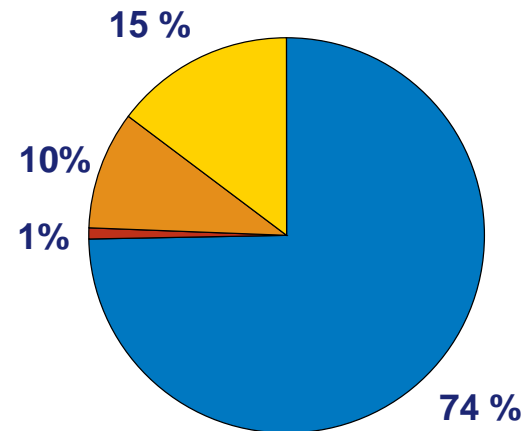
# Energy Intensity Varies by Region

## Northern California Energy Intensity



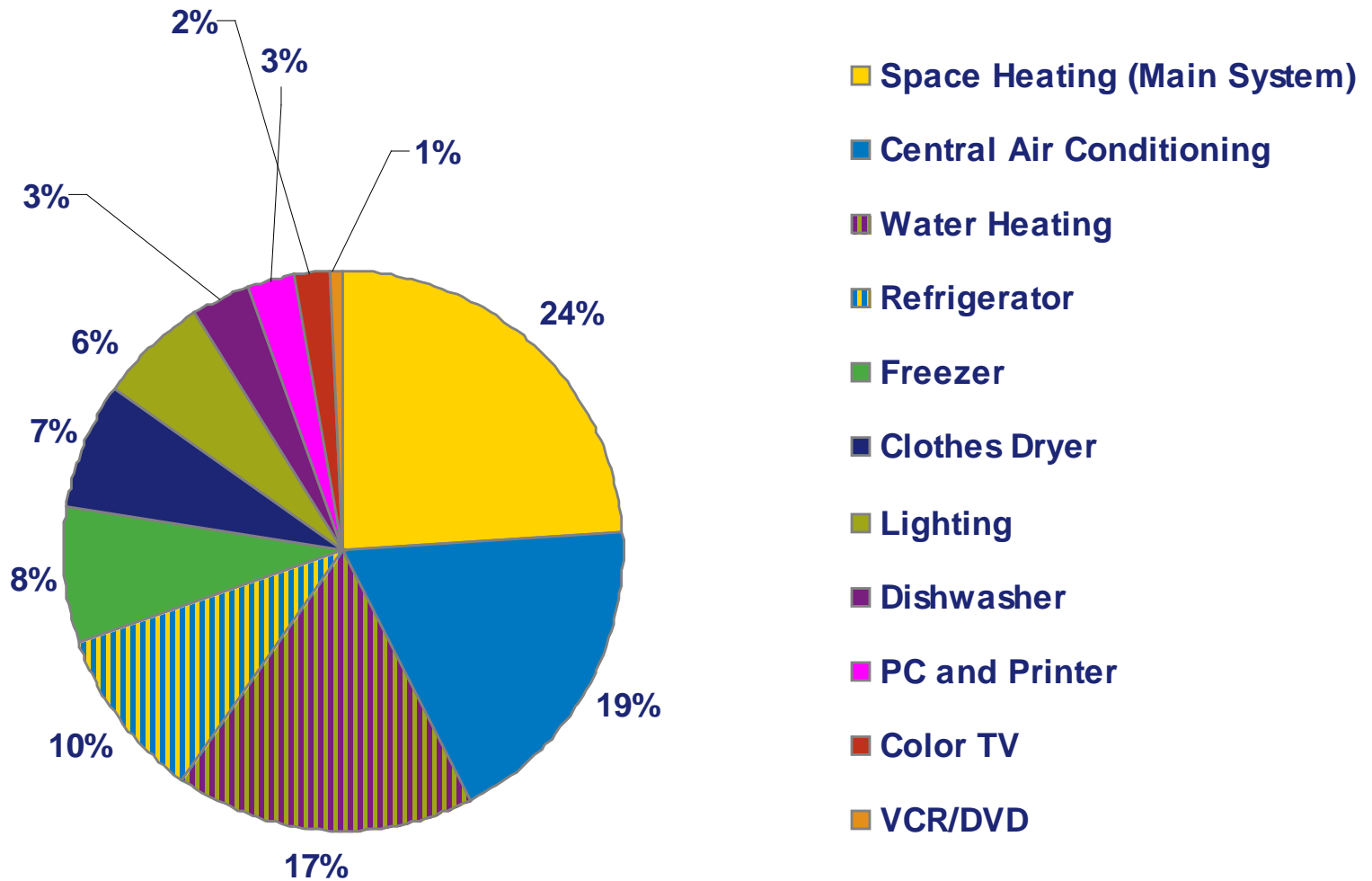
Total Energy Intensity = 5,411 kWh/MG

## Southern California Energy Intensity

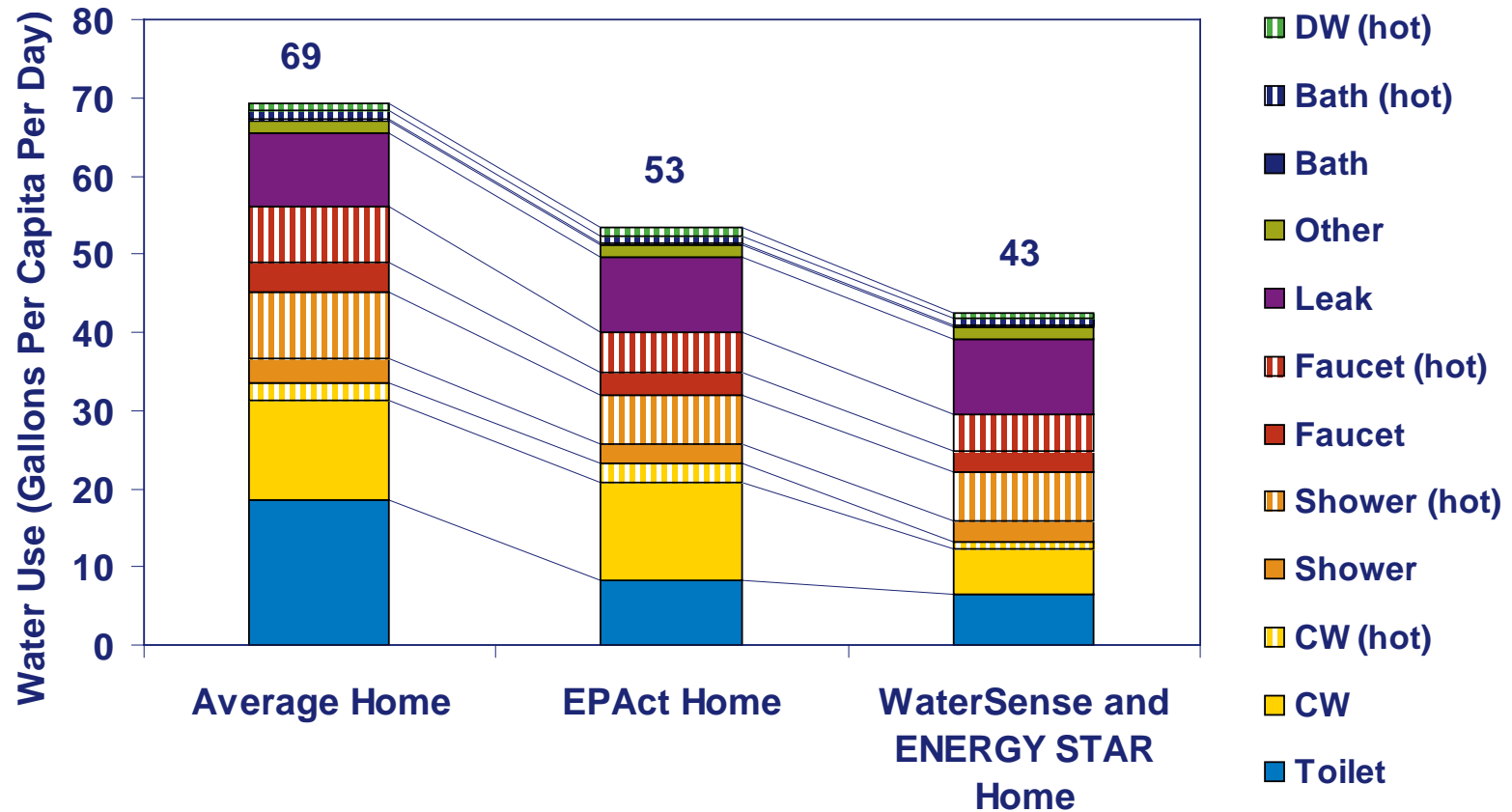


Total Energy Intensity = 13,021 kWh/MG

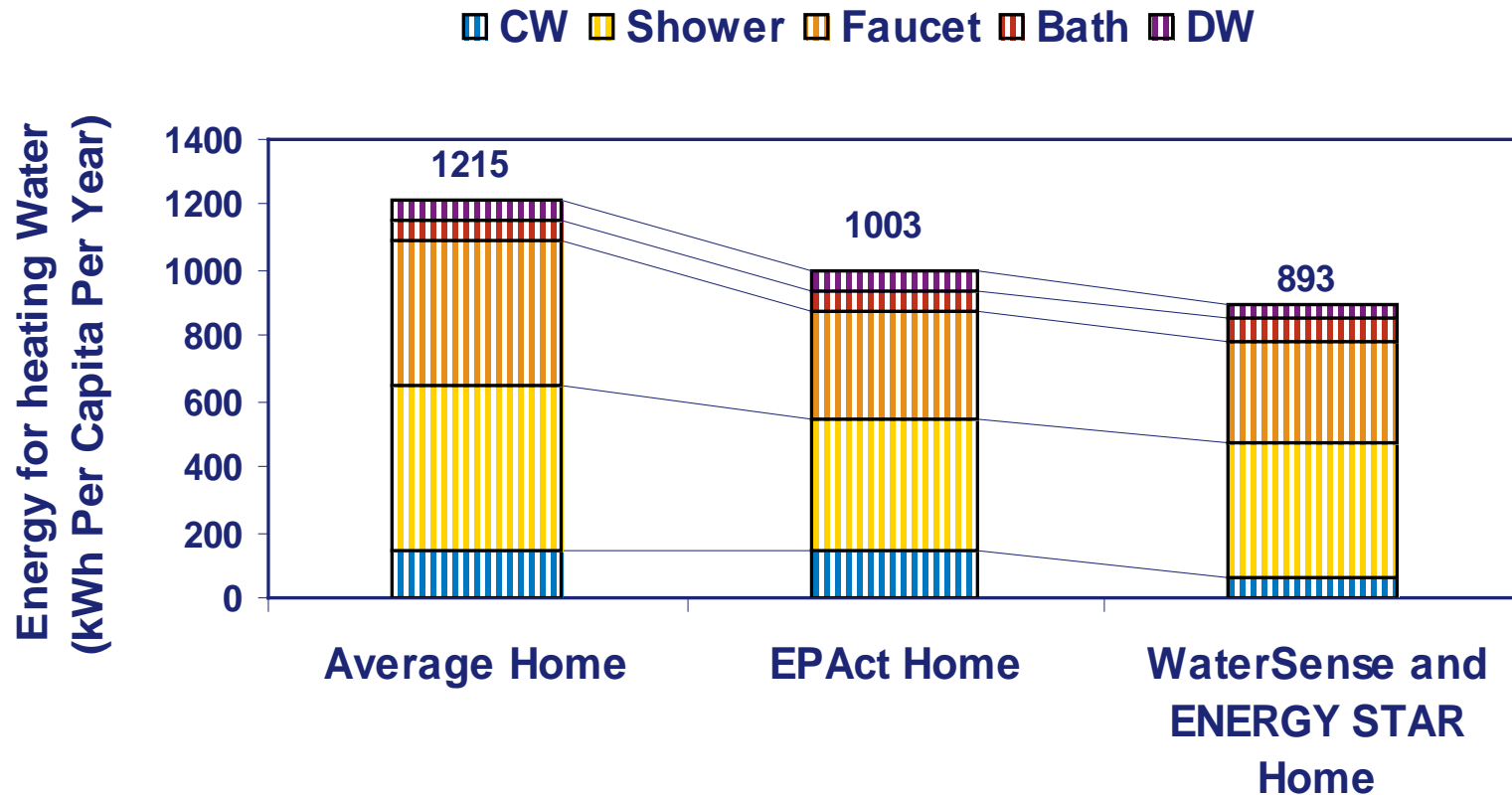
# Household Energy Consumption



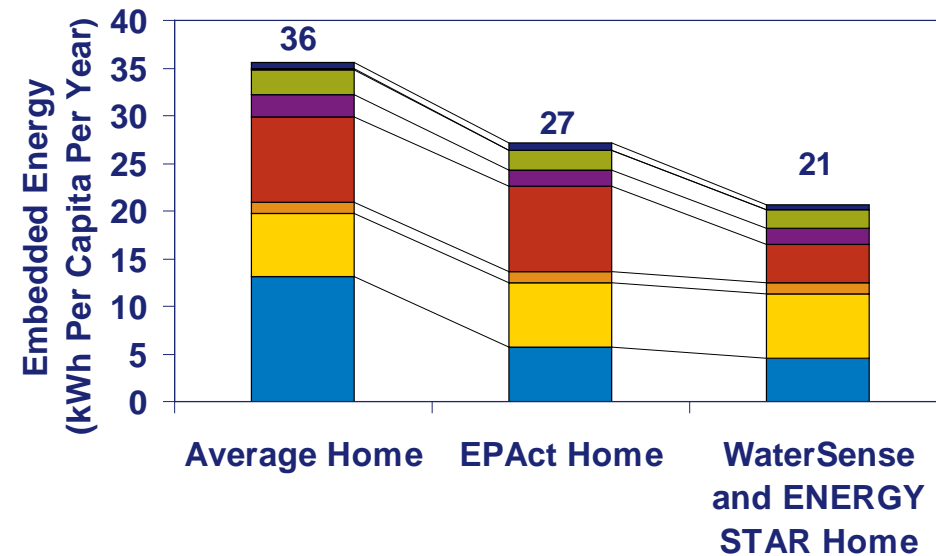
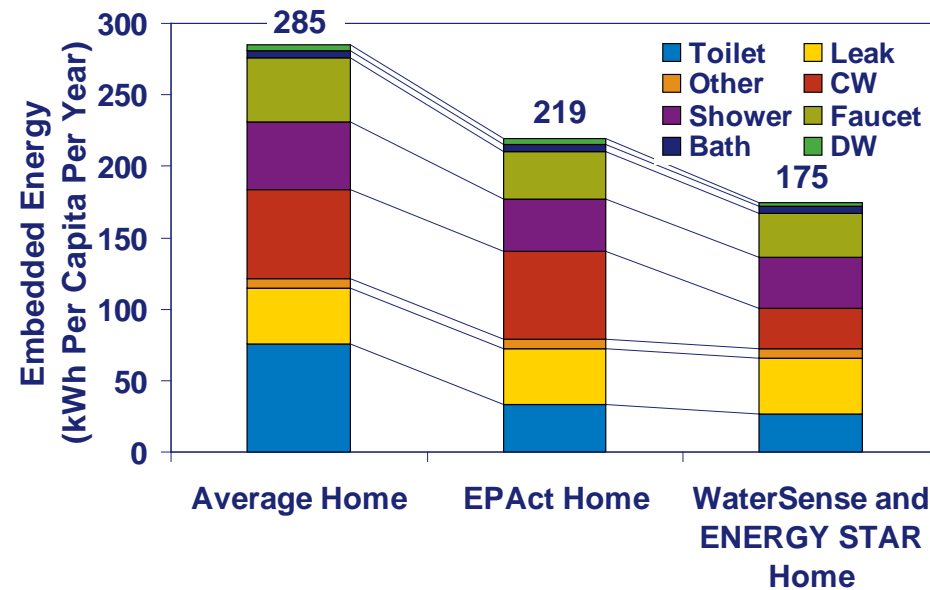
# Residential Water Saving Strategies



# Residential Hot Water Energy Consumption

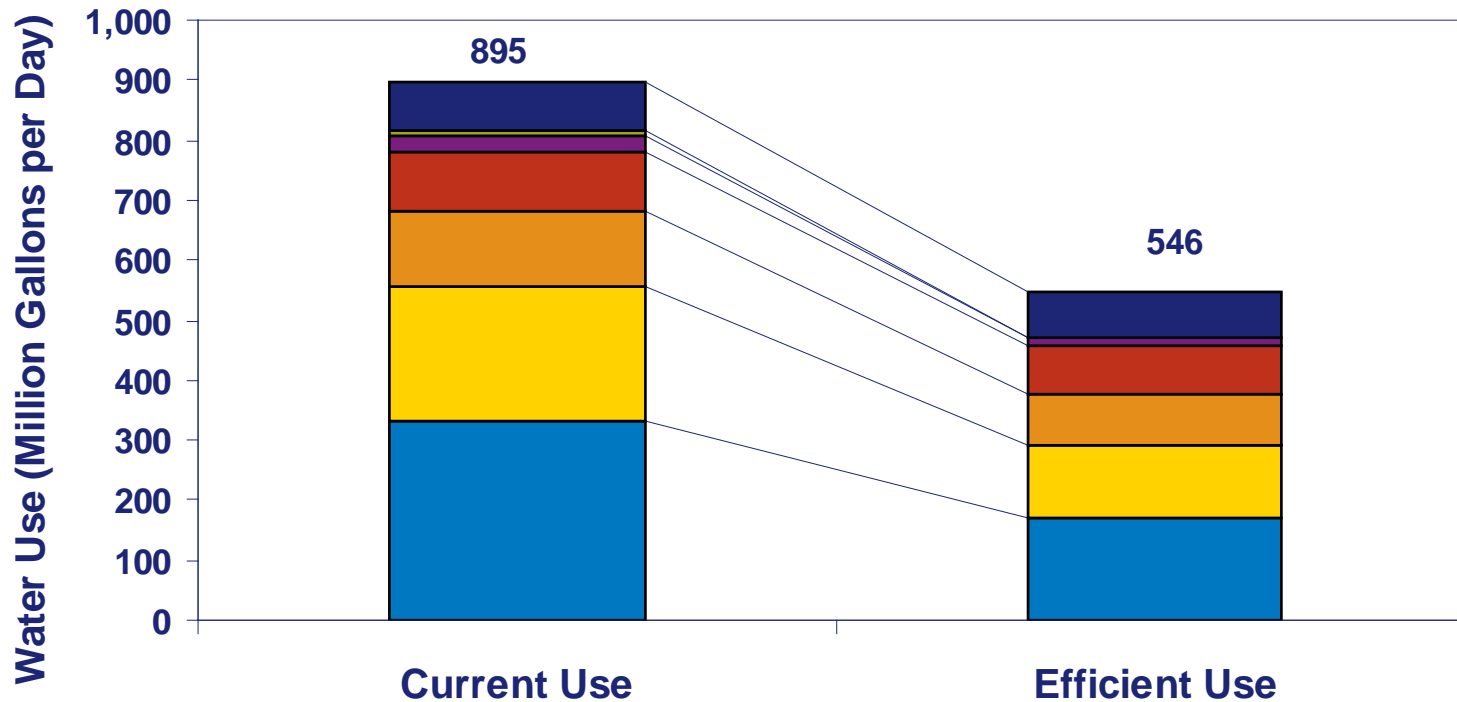


# Residential Embedded Energy for Water Supply and Wastewater Treatment

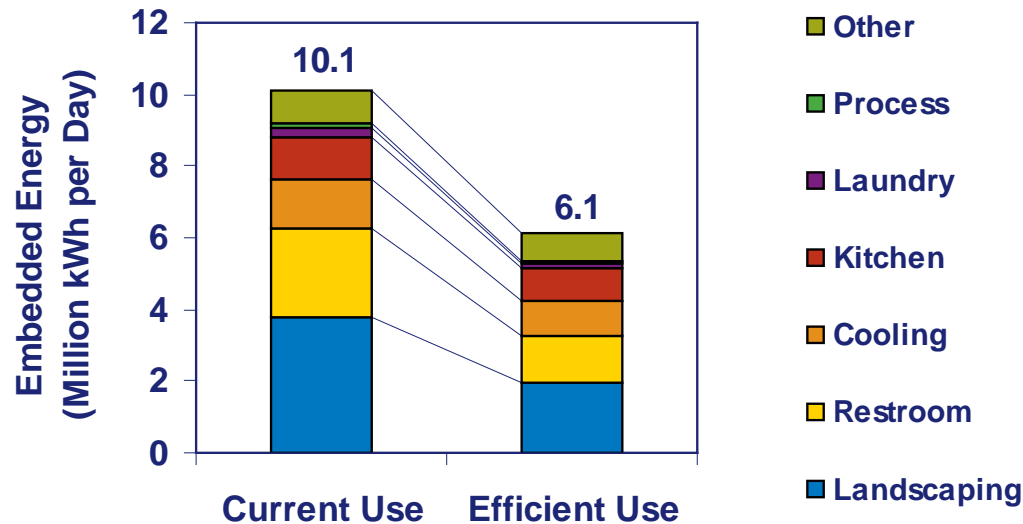


# Potential Water Savings in Nine C&I Sectors in California

■ Landscaping ■ Restroom ■ Cooling ■ Kitchen ■ Laundry ■ Process ■ Other

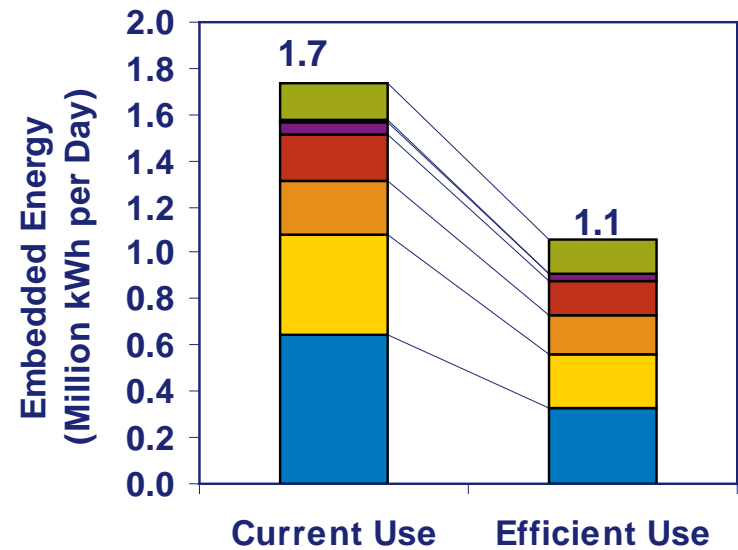


# Potential Embedded Energy Savings in Nine C&I Sectors in California



## Southern California

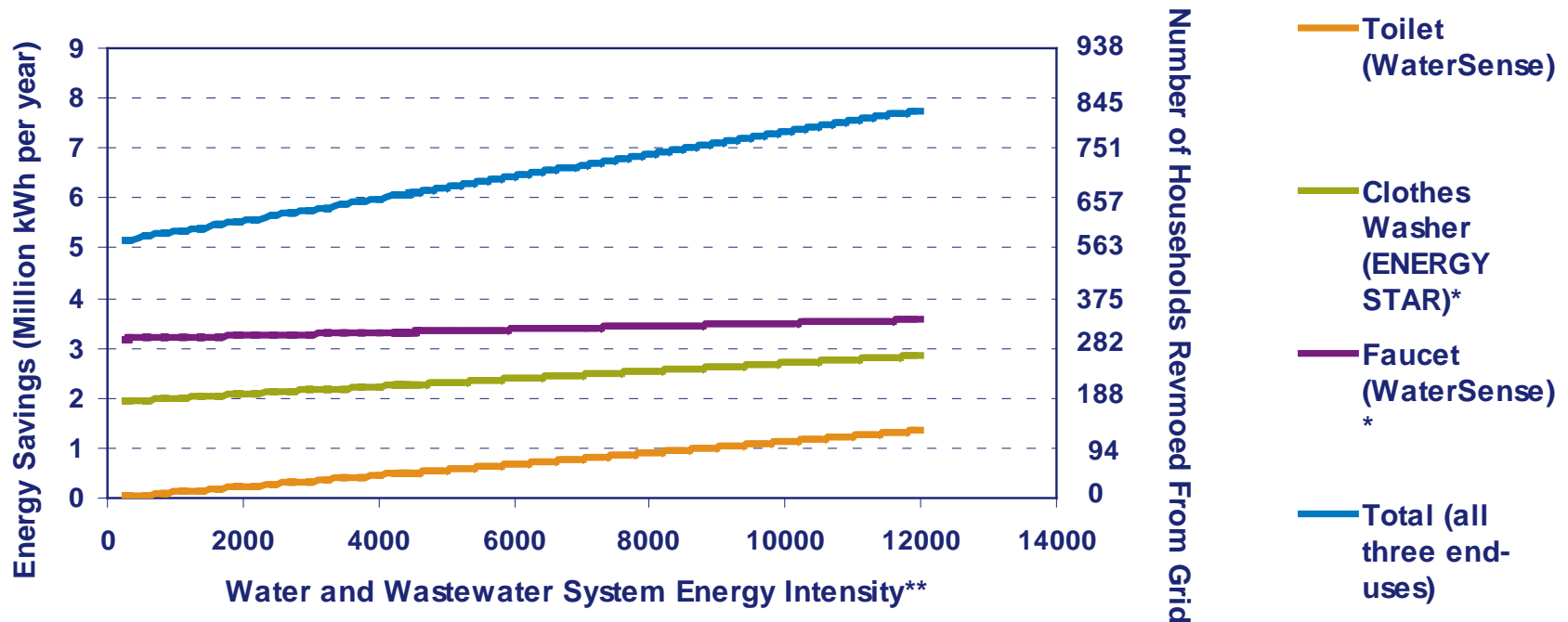
Water Supply = 11110 kWh/MG



## U.S. Average

Water Supply = 1785 kWh/MG

# Potential Energy Savings By Replacing Appliances In 10,000 Residential Households



\* Energy savings include hot water savings for clothes washers and faucets

\*\* Only pumping energy for wastewater included in energy intensity values



# WaterSense

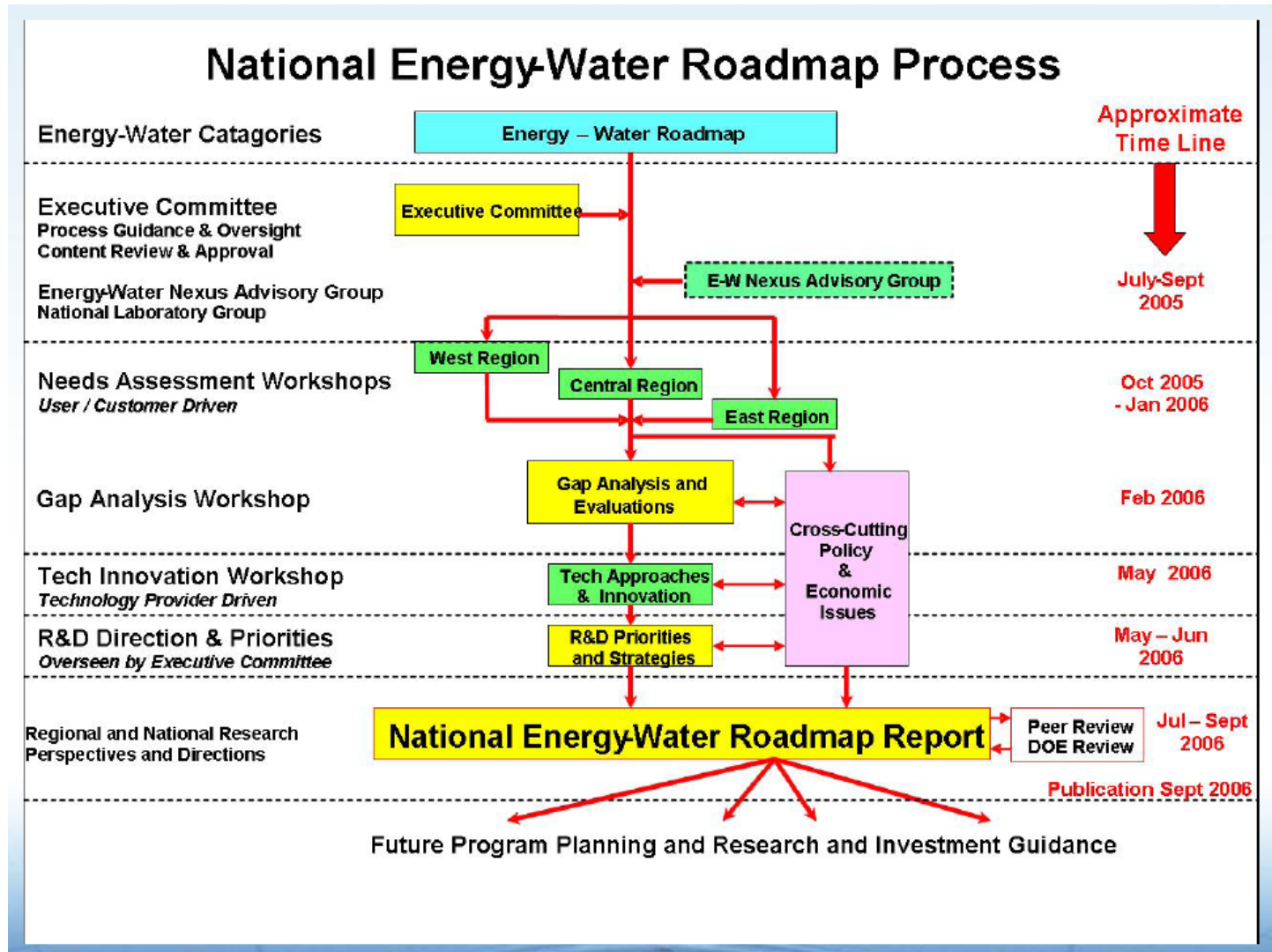


## Savings from WaterSense Labeled Products in 2008

	Water Saved	Electricity Saved	Equivalent to...	GHG Emissions Avoided	Equivalent to...
Toilets	2.19 billion gallons	7 million kWh	Electricity use of <b>683</b> homes for one year	5,000 metric tons	Annual GHG emissions from <b>916</b> passenger vehicles
Faucets and Faucet Accessories	7.19 billion gallons	1 billion kWh	Electricity use of <b>97,087</b> homes for one year	700,000 metric tons	Annual GHG emissions from <b>128,205</b> Passenger vehicles

Source: EPA, 2009.  
<http://epa.gov/watersense/pubs/accomplish2008.htm>

# DOE Water/Energy Nexus 2005



# California Public Utility Commission 2007

- The CPUC directed that the pilot programs be designed to explore the potential for a water embedded energy savings program.
- The objectives of the pilot programs are:
  - Reduce energy consumption related to water use in a manner that should prove to be cost-effective for all of the customers of the sponsoring energy utilities;
  - Create a methodology for calculating cost-effectiveness and evaluating water-derived energy efficiency programs;
  - Determine if, in fact, it is cost-effective to save energy through programs that focus on cold water;
  - Better understand how energy is used in the California water system;
  - Test a diverse set of water energy programs and measures, with particular emphasis on new technologies and low-income customers;
  - Better understand what programs and measures are likely to save water and energy;
  - Provide the basis for meaningful *ex-post* project assessment;
  - Stimulate new partnerships; and
  - Better understand the potential benefits of pursuing the following strategies: conserving water; switching to less energy-intensive water sources; and increasing the energy efficiency of current water delivery.
- Source: <http://docs.cpuc.ca.gov/published/Report/81928.htm>

# Water Legislation 2009

Over 10 bills in House and Senate relating to water conservation and efficiency (Source: Alliance for Water Efficiency)

Bill	Summary
S 531. The Energy and Water Integration Act of 2009	To conduct an in-depth analysis of impact of energy development and production on water resources of the U.S.
H.R. 1778. The Retrofit for Energy and Environment Performance (REEP) Program Act of 2009	To provide for the establishment of national energy and environmental building retrofit policies for residential and commercial buildings
H.R. 2368. The Water Advanced Technologies for Efficient Resource Use Act of 2009	To encourage water efficiency—provides money for state and local rebate and incentive programs that encourage the early adoption of water efficient products.

# EO 13514: Federal Leadership in Environmental, Energy, and Economic Performance Oct 2009

Purpose: To establish an integrated strategy towards sustainability in the Federal Government and to make reduction of greenhouse gas emissions a priority for Federal Agencies.

- Conserve and protect water resources through water efficiency and reuse
- Reduce potable water consumption intensity by 2 % annually through 2020
- Reduce industrial, landscaping, and agricultural water consumption by 2 % annually by 2020
- Advance sustainable acquisition to ensure that 95 % of new contract actions are energy efficient, water efficient, etc.

# Conclusions

- Energy and Water are Linked
- Energy Intensity is Site Specific
- Opportunities Exist to Leverage Water and Energy Efficiency Programs to Save Both Resources
- Energy Savings are a Significant Co-benefit of Water Conservation Programs
- Increased Awareness of Co-benefits of Water Efficiency and Energy Efficiency Programs

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# Questions

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