

# This presentation premiered at WaterSmart Innovations

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# Water and Embedded Energy Savings from California's Water Pilot Programs



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# Water Pilot Objectives

## Previous study findings:

- 19% of state electricity production is for water-related uses
- Significant energy used to acquire, pump, treat and distribute water (= “embedded energy”)

## Response:

- California Public Utilities Commission (CPUC) requests 4 largest investor owned energy utilities (IOUs) to develop Pilot programs to count potential embedded energy savings

# Water Pilot Objectives

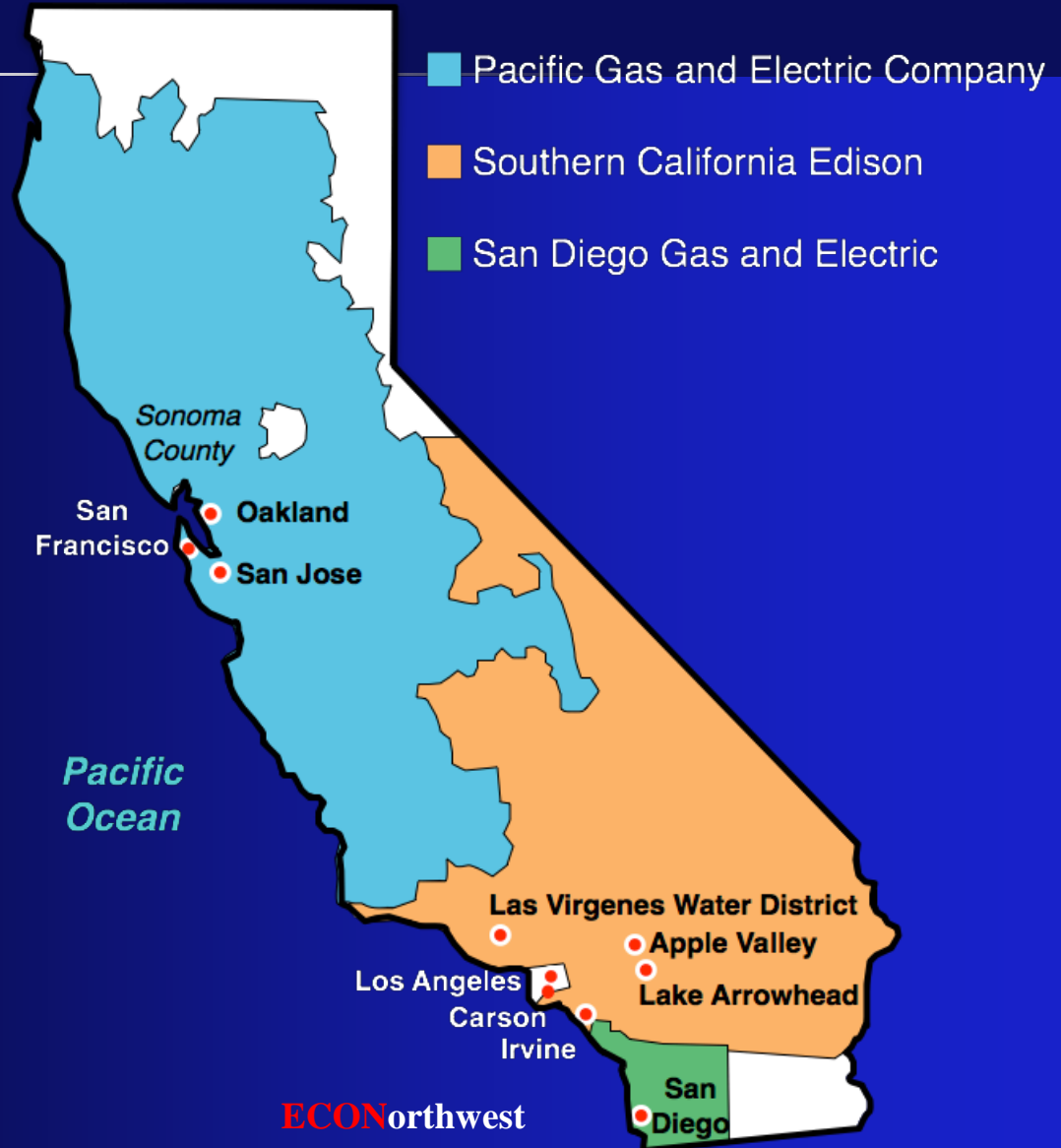
Specifically:

- IOUs must partner with at least one large water provider
- Programs should be jointly funded
- Programs should:
  - Conserve water;
  - Use less energy-intensive water (e.g., gravity-fed, recycled versus groundwater or desalination);
  - Make delivery and treatment systems more efficient

# Water Pilots

1. PG&E Large Commercial Customers
2. PG&E High Efficiency Toilets (HETs)
3. PG&E Emerging Technologies (SCADA upgrades)
4. SCE Leak Detection
5. SCE HETs
6. SCE pH Controllers, Weather Based Irrigation Controllers (WBICs)
7. SDG&E Recycled Water Retrofits
8. SDG&E Managed Landscapes
9. SDG&E Large Commercial Customer Water/Energy Audits

# Water Pilots Project Locations



# Timeline

December 2007: CPUC approves Pilots designs

June 2008: Evaluation Plan completed (“M&V”)

July 2008: Pilots implementation begins

January 2009: Implementation still not started for  
some Pilots

June 30, 2009: Pilots scheduled to end

December 31, 2009: Revised Pilots end date

# Water Pilot Evaluation Overview

## Primary Elements of Evaluation:

1. Water savings measured for each Pilot program
2. Embedded energy impacts for each program, based on water impacts



# Water Pilot Evaluation Overview

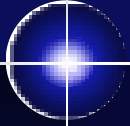
## Evaluation firms:

- ECONorthwest (prime contractor)
- SBW Consulting
- Aquacraft, Inc.
- Pacific Institute
- Eskinder Berhanu & Associates

# Water Agency Data Collection

- Survey to collect 2008 water, wastewater “flows” and energy data, systems information
- Asked for hourly flows data - got mostly monthly
- Data processed with Access dbase tool
  - Calculates energy intensity (kWh/million gallons) by function (e.g., treatment, distribution)
- Average system-wide energy intensities calculated for this evaluation

# Individual Pilot Activities



# PG&E Large Commercial Customers Description and M&V

- PG&E partnered with EBMUD, SCWA and SCVWD retailers
- Water audits and incentives offered to:
  - Hospitality
  - Food processors
  - Others (wineries, schools, jails, etc.)
- Wide range of measures possible
- Multiple incentives cover portion of retrofit cost
- M&V: Pre-post metering of water use at measure level

# PG&E Large Commercial Customers Findings

- Evaluated sites (census)
  - 7 hotels (ozone laundry)
  - 4 others (efficient dishwasher, recycled water, toilet retrofits/timers)
- Water savings = 34 million gallons/yr
- Wastewater savings = 16 million gallons/yr
- IOU energy savings = 55,000 kWh/yr
  - Does not include energy savings from 2 recycled water projects, some water agencies

# PG&E Single Family HETs Description and M&V

- PG&E partnered with Santa Clara Valley Water District (SCVWD)
- Direct install program for low-income customers
- Multiple incentives cover entire cost of single-flush HETs
- Retrofit opportunities identified during home energy audits
- M&V: Direct pre-post metering of existing and new toilets

# PG&E Single Family HETs Findings

- 478 total HETs installed
- 27 homes evaluated with 40 HETs
- Water/wastewater savings = 5 million gallons/yr
- IOU energy savings = 14,000 kWh/yr
  - Does not include wastewater energy savings

# PG&E Emerging Technologies Description and M&V

- PG&E partnered with EBMUD, San Jose Water Co.
- Contractors integrate real-time energy data into SCADA systems to improve operational decisions, pumping efficiency
  - EBMUD: new screen displays for operators
  - San Jose: New algorithm for automatic pumping
- Water agencies contributed staff time, data
- M&V: Pre-post analysis of energy controlling for flows/pressures, operator interviews



# PG&E Emerging Technologies Findings

- Goal = save energy directly, not water
- Both projects did integrate real-time energy
- No measured IOU energy savings
  - EBMUD - Operators had little time, flexibility to react to energy data on SCADA screen
  - San Jose - pumping algorithm not adopted and programmed by agency by December 2009, is potential for energy savings based on modeling

# SCE Multifamily HETs Description and M&V

- Partnership between SCE, MWD and Irvine Ranch Water District
- Only for low-income apartment tenants
- Multiple incentives cover entire cost of dual-flush HETs
- M&V: Pre-post analysis of household water use with flow trace method
  - No direct toilet metering
  - Flushes distinguished from other water uses at household indoor meter

# SCE Multifamily HETs Findings

- 276 total HETs installed in 176 apartments
- 41 apartment units evaluated
- Water/wastewater savings = 1.3 million gallons/yr
- IOU energy savings = 5,800 kWh/yr

# SCE pH and WBIC Controllers Description and M&V

- SCE partnership with MWD
- Rebates available through Water Express Efficiency Program
  - pH controllers for cooling towers
  - WBICs for landscape irrigation
- No WBICs installed through Pilot program

# SCE pH and WBIC Controllers Findings

- 1 customer installed 3 pH controllers
- M&V: Pre-post analysis of inflow makeup water, chemical mix, conductivity readings
- Water/wastewater savings = 1.6 million gallons/yr
- IOU energy savings = 2,500 kWh/yr
  - Wastewater energy only (retailer energy not provided)

# SCE Leak Detection Description and M&V

- SCE partnered with three water agencies
- Agencies received free, comprehensive audits:
  - Authorized usage
  - *apparent* water losses (metering/data problems, theft)
  - *real* losses (leaks)
- Leaks identified and repaired in selected areas
- Economically justified (future) leak detection and pressure management also determined
- M&V: Field observation of some leakage measurements

# SCE Leak Detection Findings

- 170 miles of distribution systems got leak detection and repairs
- Short-term water savings = 83 million gallons/yr
- Short-term energy savings = 178,000 kWh/yr
- Potential long-term energy savings = 580,000 kWh/yr
  - If agencies implement recommended leak detection campaigns

# SDG&E Recycled Water Description and M&V

- SDG&E partnered with SDCWA
- Cost sharing for public agency retrofits switching from potable water to recycled water
  - Roadsides, community parks
- Recycled water requires additional treatment beyond standard wastewater; reduces energy savings
- M&V: Analysis of pre-project potable water usage from utility metering, normalized for ETo



# SDG&E Recycled Water Findings

- 6 total participant projects
- 4 sites evaluated
- Potable water savings = 31 million gallons/yr
- Energy savings = 75,000 kWh/yr
  - For 3 evaluated sites
  - Is energy from all sources, not just IOU

# SDG&E Managed Landscapes Description and M&V

- SDG&E partnered with SDCWA
- Installed “smart” weather-based controllers for aesthetic landscape irrigation
- Participants could be:
  - Apartments, condominiums, estates, offices
- Must have 4+ irrigated acres, 5 or less irrigation timers, separate indoor/outdoor meters
- M&V: Pre-post analysis of utility outdoor water bills, adjusting for plantings changes

# SDG&E Managed Landscapes Findings

- 13 total participant sites
- 4 sites evaluated
- Water savings = 51 million gallons/yr
- IOU energy savings = 21,000 kWh/yr
  - No savings from two retail water agencies (two projects) that mostly provide imported water

# SDG&E Large Customer Audits - Description and M&V

- SDG&E partnered with SDCWA
- Combined water/energy audits and (some) incentives offered to:
  - Commercial, Industrial, Institutional large water users
- 9 sites got audits
- M&V: Pre-post metering of all installed measures

# SDG&E Large Customer Audits - Findings

- 4 sites installed measures and evaluated
  - Detention facility, biotech/R&D
  - Flush timers, autoclave upgrades, reverse osmosis upgrades, boiler water reuse
- Water/wastewater savings = 82 million gallons/yr
- IOU energy savings = 155,000 kWh/yr
  - No savings from one water agency/project

# Observations

1. Programs can create large water/energy savings
2. Poor economy reduced participation for some Pilots
3. Water and electric utilities don't always have same funding cycles, complicates coordination
4. Projects targeting public agencies can take longer to complete
5. Partnerships have led to more integrated customer service, more partnering

# For More Information

Detailed reports will be available at:

*Calmac.org*

*Thank You!*

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