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Water-Embedded Energy:
Pilot Projects in California

for the
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Outline

- California Context
- Background of Water-Energy Pilot
- Proposed Pilot Projects
- Water-Energy Policy Issues
- Next Steps

California Context: Energy

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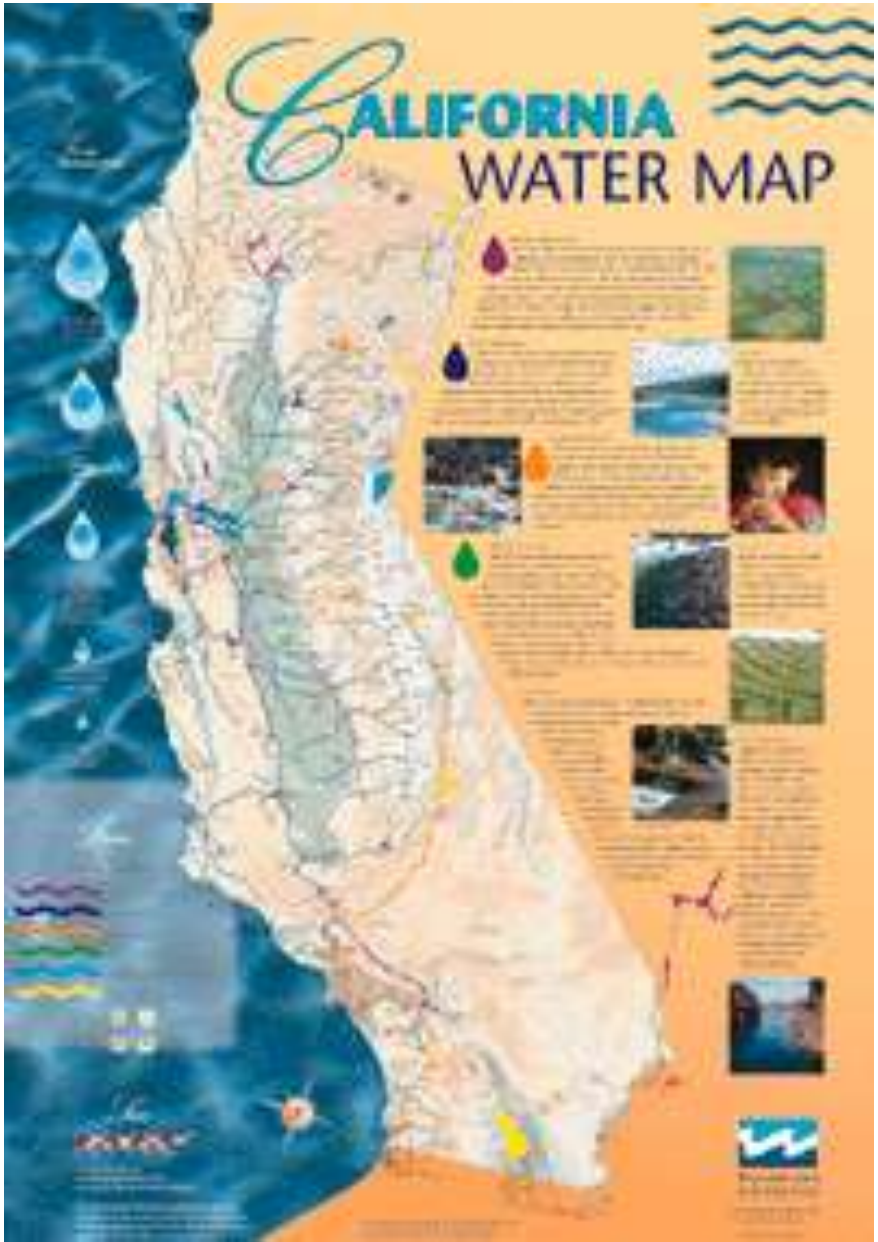
- Robust ratepayer funded Energy Efficiency Programs
- California Public Utilities Commission sets goals, oversees programs
- Investor Owned Utilities (IOUs) administer programs
- Rigorous evaluation, especially cost-effectiveness

California Context: Water

- Hydrology
- Engineering
- Agency diversity



Water-Energy Background

- California Energy Commission (CEC) identified importance of linking water and energy (June 2005)
  - Building on the work of non profits and academics
  - "**The Perfect Non-Storm**"
  - Population growth and climate change make links more critical

- California Public Utilities Commission (CPUC) ordered pilot projects in 2006
  - IOUs to partner with one water agency
  - One year duration
  - Up to $10 Million statewide

Timeline

	2006				2007		
	Apr - Jun	Jul - Sep	Oct - Dec	Jan - Mar	Apr - Jun	Jul - Sep	Oct - Dec
IOU Activities				Pilot Application and Testimony	Supplemental Testimony	Additional Supplemental	Pilot Launch
CPUC Activities	Workshops and Written Comments		Ruling Requesting Application and Testimony	Workshops	Ruling Requesting Supplemental Testimony Workshops	Approve Request for Additional Supplemental	Final Commission Decision (est. Oct, if protests, Dec or later)

Commission's Intent for Pilot Project

- Overarching Goals
  - Build relationships
  - Test program strategies
  - Add water-embedded energy savings and measures to the 2009-2011 Customer Energy Efficiency portfolio
- Objectives
  - Understand energy and water, diverse strategies, and potential
  - Stimulate partnerships
  - Explore benefits of different energy-water strategies
  - Determine cost-effectiveness
- Specifically called for saving energy by:
  - Conserving Water
  - Using less energy-intensive water
  - Making current delivery & treatment systems more efficient

Overview

- IOUs submitted proposals to:
  - Deliver energy savings associated with water
  - Prove those savings can be measured and verified reliably
  - Study potential of water-related energy savings

- Commission narrowed focus of pilots
  - Increased emphasis on cost effectiveness
  - Less emphasis on relationship building, testing concepts, and environmental benefits

PG&Es Pilot Program

- $2.1M over one year
- Commercial Institutional and Industrial Focus
- Rebates
  - Food process improvement (6 projects)
  - Winery improvement (2 projects)
  - Ozone Laundry Treatment (25 projects)
- Low Income Direct Install High Efficiency Toilets (3000 homes)
- Emerging Technologies in water system efficiency

Other IOU Pilot Proposals

	Southern California Edison	San Diego Gas and Electric	Southern California Gas
Water Agency Partner	• Metropolitan Water District	• San Diego County Water Authority	• San Diego County Water Authority
Budget	$2.7 million	$1.3 million	$858,000
Strategies	• Low Income Direct Install HE Toilets • Industrial Water Efficiency Program • Advanced PH and Irrigation controllers • Targeted residential in/outdoor retrofit • Green Schools	• Managed Landscape Program • Convert some potable to recycled water • Joint Marketing and Outreach Program	• Targeted residential in/outdoor retrofit •Gas pump testing and evaluation •Joint Marketing and Outreach

Joint EMV Plan

- Water Studies
  - Engineering estimates
  - End use studies (metering, bill analysis)
  - Statistical impact analysis (irrigation controllers, system-wide intervention)
- Embedded energy studies
  - Cost-benefit
  - Load profiles
  - Emerging technology
  - Leak detection
  - Lost opportunities in direct efficiency
  - Flappers
  - Low income
  - Calculator
- Process Evaluation
  - Program delivery effectiveness
  - How to improve

Policy Issues

- How should “non-energy” benefits be considered (planning, relationship building, GHG reduction)?
- Should non-IOU energy be considered? What about other cross-jurisdictional issues?
- How should the “energy intensity” (kwh/mgal) of water be measured or estimated or both?
- How should cost-effectiveness be calculated?
- Should water-energy be included in EE portfolio?

PG&E Pilot Estimates from CPUC Water-Energy Calculator

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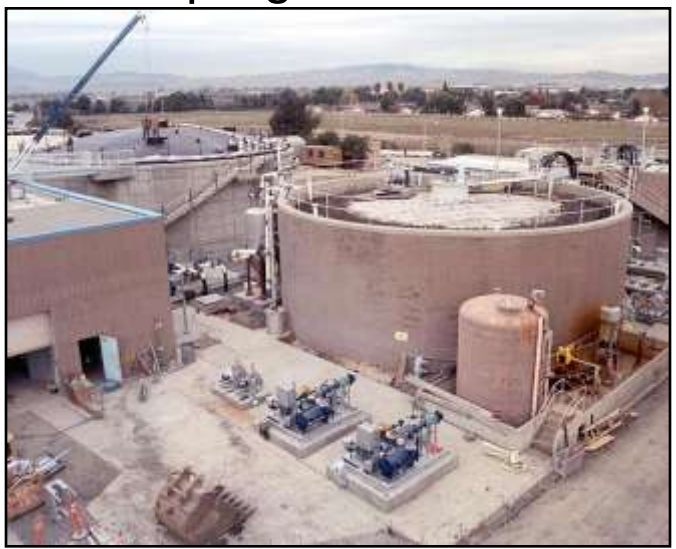
	Per Measure (annual)	Total Program (lifetime)
Cost-effectiveness (Total Resource Cost, TRC)	Range: .21 - .52	0.28
Water saved (1000 gallons)	Range: 8.67 – 13.61	1,910,000
Energy saved (kWh per unit)	Range: 31 – 48,508	6,404,837
GHG reduction (lbs CO2 equivalent)	Range: 1,562,725 – 2,986,451	10,722,069

Next Steps

- Obtain Commission approval for pilots
  - Begin Water-Energy Studies
  - Implement Pilot Activities
    - Conduct EMV on activities
- Continue policy discussions
- Continue to pursue Water-Energy connections outside Pilot
  - Joint residential clothes washer rebate program
  - Joint industrial audits
  - Etc.



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Thank you!

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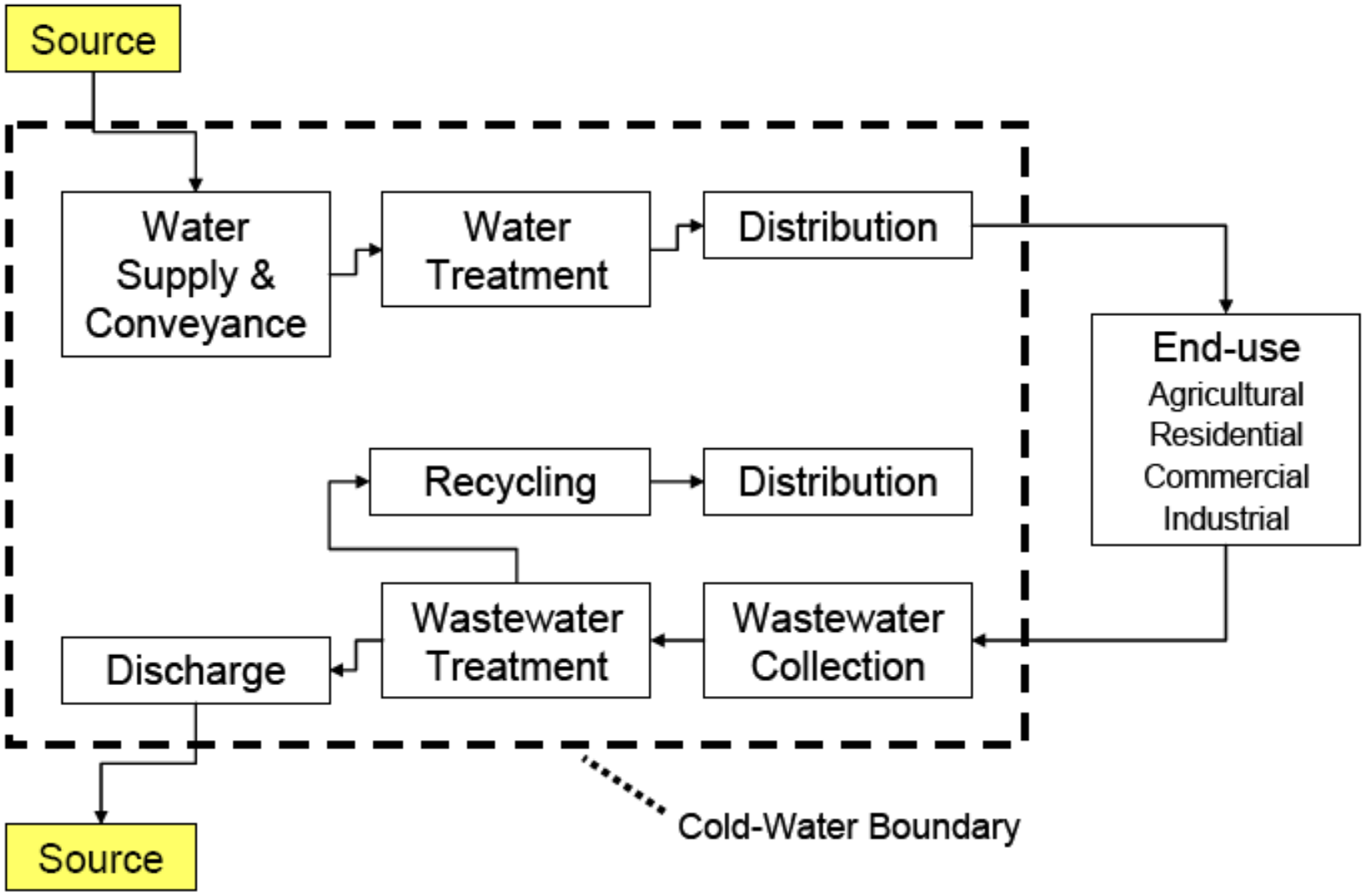
The water-energy cycle



Findings of study:

Agency Name	1 Supply Conveyance kWh/AF	2 Treatment kWh/AF	3 Distribution kWh/AF	4 Wastewater kWh/AF
California American Water, Monterey	430	127	448	2,028
City of Fresno	412			562
City of Santa Cruz	337	106	128	519
City of Santa Rosa	777	2	167	1,480
City of Watsonville	524			694
EBMUD	53	34	239	472
North Marin Water District	793			N/A
San Jose Water Company	623	42	193	676
Santa Clara Valley Water District	751	100	320	676
Sonoma County Water Agency	943			1,155
Sonoma Valley Area	606	2	626	1,401
Northern California (CEC Report)	690	36	414	623
Pacific Institute's Water to Air Urban model assumptions	260	55	395	440

Findings of study:

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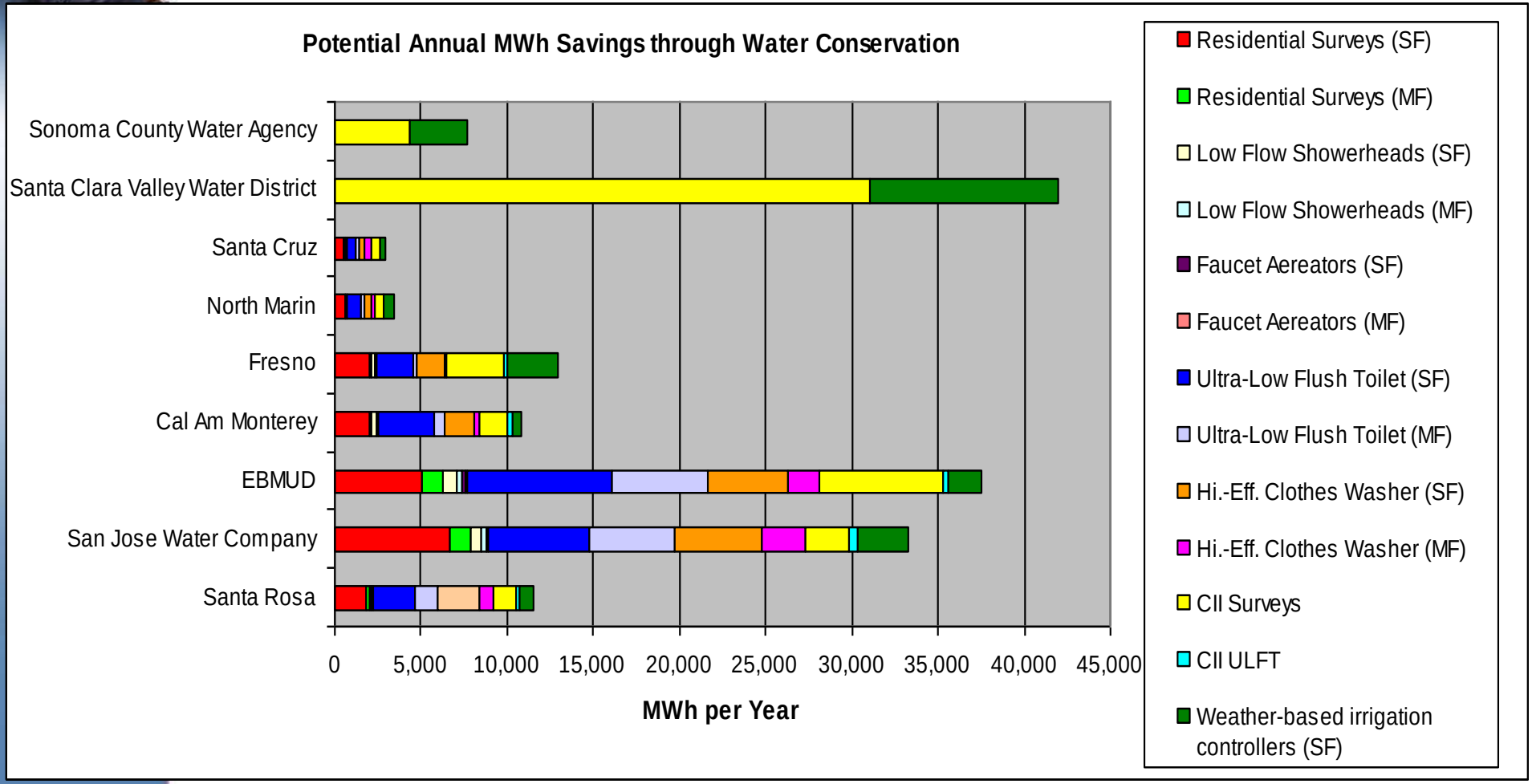

Water Energy Relationship

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	Electricity (GWh)	Natural Gas (MM Therms)
Water Supply & Treatment		
Urban	7,554	19
Agricultural	3,188	
End Uses		
Agricultural	7,372	18
Residential	27,887	4,220
Commercial		
Industrial		
Wastewater Treatment	2,012	27
Water Related TOTAL	48,013	4,284
2001 Calif. Consumption Total	250,494	13,571
Percent of Statewide Energy Use	**19%**	**32%**

Source: CEC http://energy.ca.gov/process/water/2006-03-28_symposium/WHITE_CEC.PDF

Food Process Improvement

- Partners: EBMUD and SCWA
- Separate calculated rebates ($0.75 water agency, $0.08 PG&E)
- Joint outreach to targeted customers
- Measures could include cleaning and sanitation, cooling tower improvements, water recycling and re-use.

Winery Improvement

- Partner: SCWA
- Separate calculated rebates ($0.75 water agency, $0.08 PG&E)
- Joint outreach to targeted customers in expansion
- Measures could include hot water closed loop, barrel washer efficiency, and tank washing cascaded rinsing.

Ozone Laundry Treatment

- Partner: SCWA
- Separate calculated rebates ($0.75 water agency, $0.08 PG&E)
- Joint outreach to targeted customers

Low Income Direct Install HET

- Partners: SCWA, SCVWD

- PG&E leverages existing Low Income Energy Efficiency program
  - Identify target customers
  - Manage contractor
  - Deliver installation

- PG&E invoices water agency for equivalent of their rebate ($150)

Emerging Technologies in Water System Efficiency

- Explore with SCWA, SCVWD, EBMUD
- PG&E offers incentives to agencies based on energy savings
- Test monitoring and telecommunications technologies
  - Integrate with SCADA to improve efficiency