California's Water-Energy Relationship: A Policy Perspective

Sustainable Water Resources Roundtable

April 27, 2010

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Occurs at the intersection of water and energy resources & infrastructure.

Energy sector >> Water

vs.

Water sector >> Energy

Which has priority?

How will we decide?

The answers ultimately lie in policy

The increasing role of seawater desalination in our state's water resource portfolio serves as a reminder of the importance of an integrated approach to optimizing our water & energy decisions

The site of the Carlsbad Desalination Project

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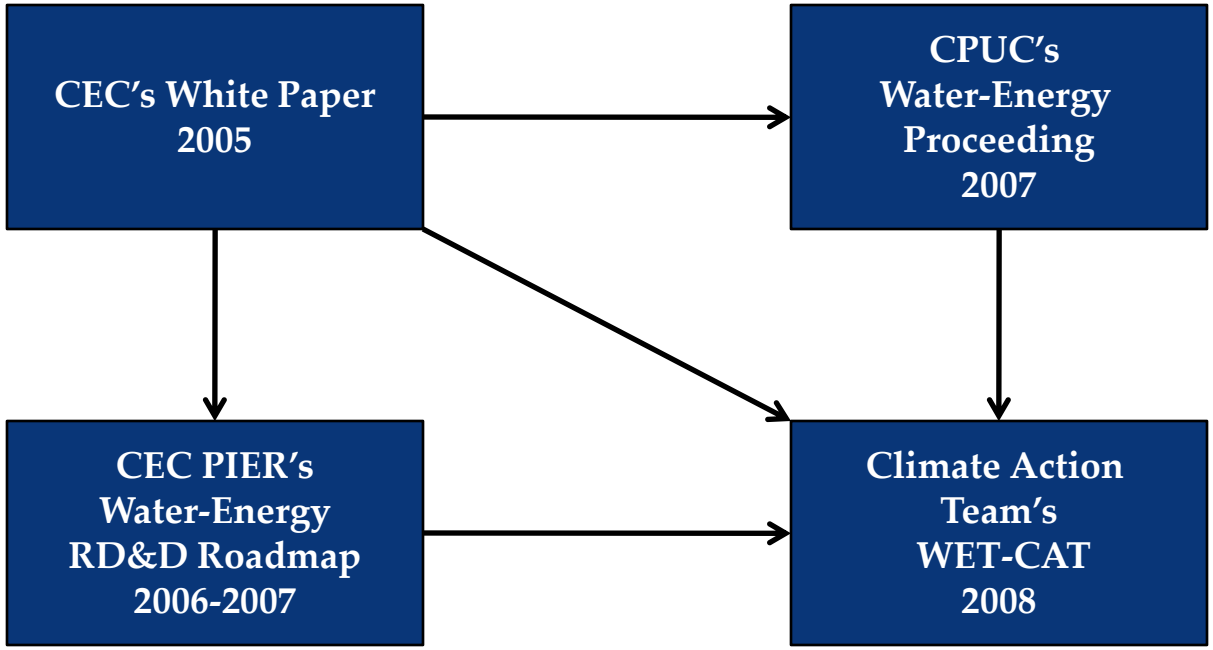
The CEC's white paper launched several activities that precipitated actions by others



In addition, industry associations; energy, water & wastewater agencies; NGOs and others are conducting separate studies

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1 - Reduce water sector impacts on energy resources & infrastructure:

Energy Efficiency	•Save energy by saving water (aka, "embedded energy") •Improve energy efficiency
Demand Response	Build flexibility into water systems (e.g., storage, redundancy)
Renewable Energy	Maximize water-related renewable energy: •By-products of water & wastewater operations (in-conduit hydropower, digester gas cogeneration) •Untapped renewable resource potential on public lands

2 - Reduce energy sector impacts on water resources & infrastructure:

Cooling	•Use non-potable water sources •Use non-water technologies
Hydropower	•Mitigate long-term impacts of climate change that could reduce hydropower production (presently ~20% of California's energy supplies)

On January 19, 2007, the CPUC opened a water-energy proceeding to consider whether/how energy "embedded in water" should be recognized as an energy efficiency resource

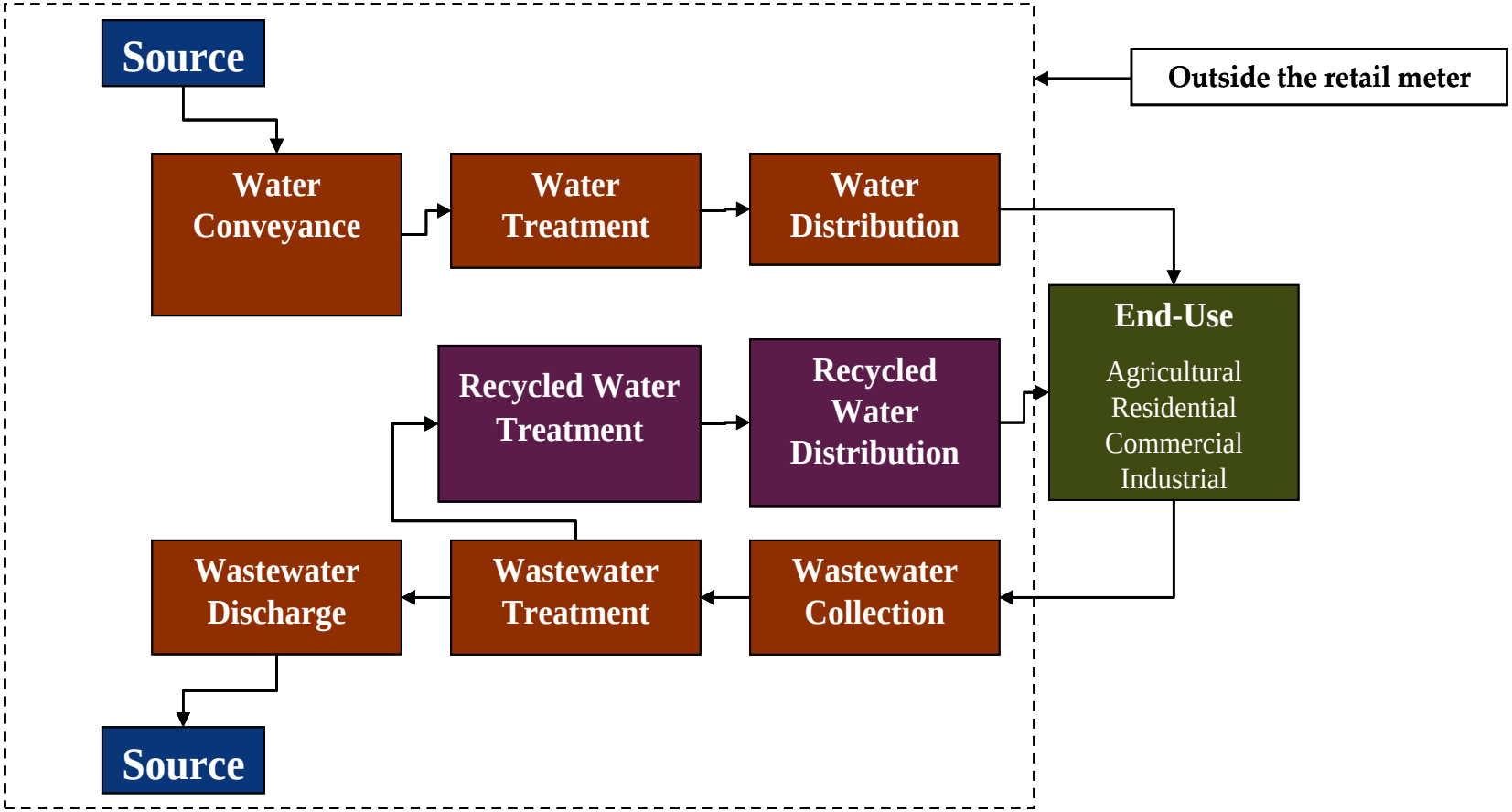
Decision 12-07-050:

- Authorized the IOUs to conduct water-energy pilots
- Directed that three studies be conducted:
  - Study 1 - Statewide and Regional Water Energy Relationship Study
  - Study 2 - Water Agency and Function Component Study and Embedded Energy -Water Load Profiles
  - Study 3 - End-Use Water Demand Profile Study

Current Status & Timeline:

- Water-Energy Pilots
  - Completed December 2009
  - EM&V fieldwork complete March 2010
  - Embedded Energy Profiles complete April 2010
  - EM&V final report July 2010
- Studies 1 & 2:
  - Study Drafts & Models released March 2010
  - Public Workshop tentatively scheduled April 2010
  - Final Report end April or early May 2010
- Study 3
  - Final Report expected October 2010

Assessment of embedded upstream & downstream energy focused on water-energy magnitudes & intensities outside the retail water meter



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PRELIMINARY ESTIMATES: Relative Energy Intensity of Segments of the Water Use Cycle (2006)

	Northern California (kWh/MG)			Southern California (kWh/MG)		
	WER	Adjusted	w/Losses	WER	Adjusted	w/Losses
Water Supply and Conveyance	150	1,811[1]	2,117[2]	8,900	8,324[3]	9,727[2]
Water Treatment	100	n/a[4]	111[2]	100	n/a[4]	111[2]
Water Distribution	1,200	n/a[4]	1,272[2]	1,200	n/a[4]	1,272[2]
Wastewater	2,500	1,911[5]	1,911	2,500	1,911[5]	1,911
Total	3,950	5,022	5,411	12,700	11,535	13,022

Sources: "California's Water-Energy Relationship," California Energy Commission, 2005; updated in 2006 through "Refining Estimates of Water-Related Energy Use in California," Navigant Consulting for the California Energy Commission.

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Drilling down to sub-segments of the water use cycle enables effective targeting of investments

Supply	Conveyance	Treatment	Distribution	Wastewater Collection	Wastewater Treatment	Wastewater Disposal
Surface Water (0)	SWP-L.A. Basin (8,325)	EPRI Avg. (100)	EPRI Avg. (1,200)	Average of 140 is aggregated within treatment	Trickling Filter (955)	Gravity Discharge (0)
Groundwater (4.45/MG/Foot)	SWP-Bay Area (3,150)		Flat Topography (proposed)		Activated Sludge (1,322)	Pump Discharge (400)
Ocean Desalination (13,800)	SWP-Central Coast (3,150)		Moderate Topography (proposed)		Advanced (1,541)	
Brackish Water Desal (1,240-5,220)	SWP-San Joaquin Valley (1,510)		Hilly Topography (proposed)		Advanced w/Nitrification (1,911)	
Recycled Water (0)	CRA-L.A. Basin (6,140)		Recycled Water (2,750-3,000)			
	Hetch Hetchy-Bay Area (0)					
	Mokelumne Aqueduct (160)					
	Local/Intrabasin (120)					

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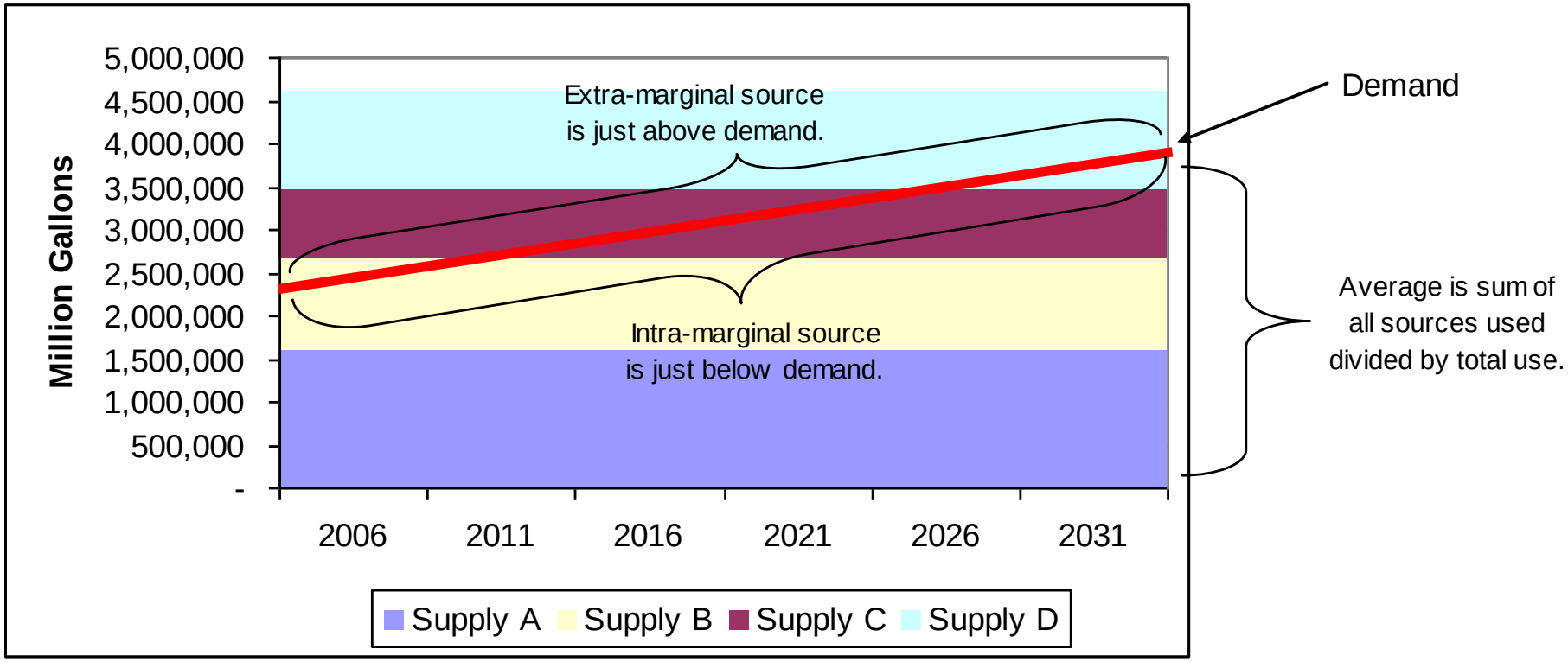
Whether and when to apply "average" vs. "marginal" energy intensities of water supplies depends on the planning objective(s)



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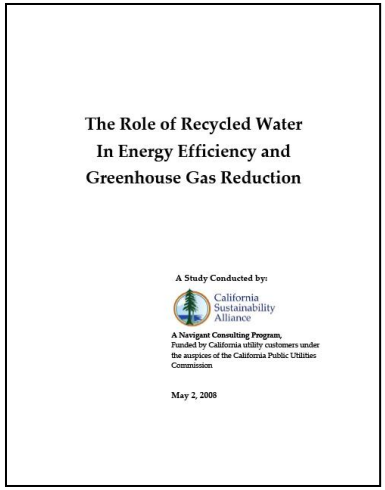
Seawater Desalination as California's Marginal Water Supply?

- On behalf of the California Sustainability Alliance, Navigant Consulting conducted a study on The Role of Recycled Water In Energy Efficiency and Greenhouse Gas Reduction which had significant findings:
  - Low energy intensity resource that is available now in substantial quantities
  - Significant energy and carbon benefits over other options such as seawater desalination

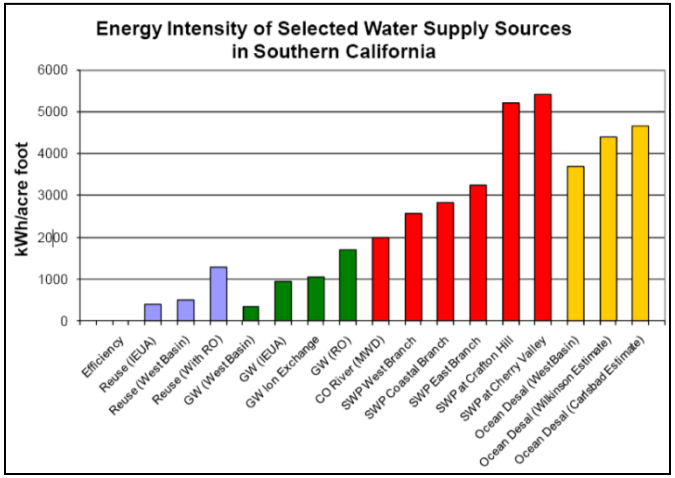

The Role of Recycled Water
In Energy Efficiency and
Greenhouse Gas Reduction

A Study Conducted by:

California Sustainability Alliance

A Navigant Consulting Program,
Funded by California utility customers under the auspices of the California Public Utilities Commission

May 2, 2008



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WET-CAT is the Water-Energy Subgroup of the Climate Action Team

- Tasked with coordinating the study of GHGs on California's water supply system
- Co-chaired by Frances Spivy-Weber (SWRCB) and Mark Cowin (DWR)
- Six measures under the AB 32 Scoping Plan:
  - (W-1) Water Use Efficiency
  - (W-2) Water Recycling
  - (W-3) Water System Energy Efficiency
  - (W-4) Reuse Urban Runoff
  - (W-5) Increase Renewable Energy Production
  - (W-6) Public Goods Charge for Water
- Several efforts are underway by the WETCAT agencies to implement these measures

Measures include mitigation & adaptation

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Current WET-CAT Initiatives in progress

Measures	Agency	Activity	Current Status	Link
W-1	**CEC**	Proceeding setting standards for landscape irrigation equipment	Temporarily deferred due to many competing priorities	www.energy.ca.gov/appliances/irrigation/
W-1	**SWRCB**	Investigating 20% reduction in per capita consumption of water by 2020	Plan is done but implementation wrought with equity issues	http://www.waterboards.ca.gov/water_issues/hot_topics/20x2020/index.shtml
W-2	**SWRCB**	Recycled water development	Adopted policy establishes goals	http://www.waterboards.ca.gov/water_issues/programs/water_recycling_policy/index.shtml
W-3	**CEC**	Water-infrastructure in-system improvements through ARRA	Water projects (EE&RE) eligible for EECBGs + Low Interest Loan programs (1% & 3%)	http://www.energy.ca.gov/recovery/blockgrant.html
W-4	**SWRCB**	Investigating reuse of urban runoff	Ongoing efforts to develop sustainable communities	http://www.waterboards.ca.gov/water_issues/low_impact_development/index.shtml
W-5	**CEC**	Increase renewable energy production & combined heat and power development (CHP) in 2009 IEPR	2009 IEPR completed	http://www.energy.c.agov/2009_energypolicy/
W-6			Significant implementation challenges identified; discussions on-going	

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But as in any emerging area of thought, barriers and hurdles will need to be overcome

- Economic – substantial investments are needed
- Knowledge & experience – new ground is being paved
- Data, methods & metrics – more data & new methods are needed to effectively evaluate tradeoffs and rank options
- Traditional single entity perspectives – decisions made by all agencies and utilities, whether water or energy, currently focus on optimizing their own systems and resources

To truly optimize the state's water and energy resources, a statewide perspective is needed.

This will require new policies, decision making frameworks, tools & techniques.

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