9. WATER SECTOR

I. Introduction

California water policies can serve a dual role by both helping the state adapt to the effects of climate change and reducing greenhouse gas emissions. It is one of the few sectors where the same policies can serve both preventative and adaptive purposes. This is because making more efficient use of water will reduce our demands on water resources and it will reduce the energy consumption associated with water conveyance, pumping, heating and treatment.

The use of water in California contributes significantly to the state's greenhouse gas emission crisis. In *California's Water-Energy Relationship* (2005), the California Energy Commission (CEC), concluded that the water sector is the largest user of electrical energy in the state, accounting for 19 percent of all electricity consumed in California, 30 percent of non-power plant-related natural gas use, and 88 million gallons of diesel burned every year. In 2005, Governor Schwarzenegger's Climate Action Team estimated that the energy used to move and treat water in California results in the release of approximately 44 million tons of CO2 emissions annually.

The "embedded energy" of water, which includes the energy consumption associated with water conveyance, pumping, heating, and treating, varies significantly by location and use. According to research by the Public Interest Energy Research Program (PIER), the following table reflects the embedded energy, apart from end use, required for water in indoor and outdoor uses in Northern and Southern California.[1] The difference between indoor and outdoor water use in this table is attributable to wastewater treatment.

	Southern California	Northern California
Indoor water use (kWh / AF)	4,340	1,800
Outdoor water use (kWh / AF)	3,700	1,170

The report further noted that energy applied in end uses—typically, pumping, and heating—accounts for more than 50 percent of the water-related energy consumption.

According to NRDC's *Energy Down the Drain*[2] report, end use energy is conservatively estimated at 3,900 kWh/AF, which does not apply to outdoor use. Total energy savings per acre foot, including end use energy, would be as follows:

	Southern California	Northern California
Indoor water use, including end use (kWh / AF)	8,240	5,700
Outdoor water use (kWh / AF)	3,700	1,170

There is some potential for double counting end-use energy savings between these water efficiency programs and the electric and natural gas utility energy efficiency programs (e.g., for showerheads, faucet aerators, clothes washers, etc.). However, accounting for the full societal benefits of these measures, including water and energy savings, and reduced GHG emissions, may justify larger customer incentives or more effective program delivery mechanisms which can increase participation rates and achieve increased adoption of these measures.

There is a growing imperative to accelerate water use efficiency in California. Likely impacts of climate change on California's water supplies, the precipitous collapse of the San Francisco Bay-Delta ecosystem, mounting evidence regarding the fragile state of Delta levees and the recent federal court decision to limit freshwater exports from the Delta all strongly suggest that the state must transform its policies and approaches in order to achieve the vast potential water savings from water efficiency.

Fortunately, many opportunities exist to reduce water usage and avoid the embedded energy consumption and greenhouse gas emissions. The California Department of Water Resources' California Water Plan indicates that urban water efficiency is the single most important tool for meeting California's future water needs. In fact, despite some laudable progress in water use efficiency, most of California's efficiency potential remains untapped. A recent study[3] by Environmental Entrepreneurs estimated that up to 5 million acre-feet of water and up to 7 million tons of CO2 equivalent emissions could be cost-effectively saved by 2020. This study examined existing studies by both public and private entities to derive its estimates within the following categories:

1. Water metering and tiered pricing – move to 100% metered water use and tier pricing to create an incentive to reduce high consumption
2. Indoor – utilize fixtures and appliances that require less water
3. Outdoor – more efficient landscape irrigation
4. Non-revenue water – eliminate water that is lost or consumed but not measured and fix water losses due to leakage, evaporation and storage overflows.
5. Agriculture – increased use of drip or other micro-irrigation technologies and more efficiency conveyance and delivery

The categories of energy efficiency include:

1. Solar pre-heating for hot water
2. Biogas to energy at wastewater facilities
3. Optimization at processing plants

The categories for water recycling include

1. On-site conversion of waste water for irrigation and toilets. Waster water recycling can also save energy where it displaces a more energy-intensive water supply.
2. Capture of storm water for recharging groundwater or conversion into water for irrigation or consumption.

The items listed above represent many cost-effective opportunities to reduce the greenhouse gas impacts from water use in California. In 2006, The Climate Action Team noted that accelerating investment in Water Use Efficiency to meet the Department of Water Resources' most recent California Water Plan Update (CWPU) 2030 water conservation goals by 2010 would result in a cumulative total reduction of 40 million tons of emissions between today and 2030[4].The CEC 2005 Integrated Energy Policy Report to the legislature noted that the state could achieve all of the savings forecast for the 2006-08 energy efficiency portfolio at 58% of the cost by investing in water efficiency.[5] In addition, new policies, such as efficiency and GHG emission guidelines for the use of energy-intense ocean water desalination facilities, would be essentially cost-free.

On January 16, 2008 the CPUC approved $6.4 million for pilot water-energy projects and associated studies. Included in that package is $341,000 for emerging technologies, plus another $100,000 for evaluation of the emerging technologies projects.[6] This program provides some funding as well as expert support, to test out the benefits of technologies that save both water and energy.

Numerous analyses, including those presented in the "Investment Strategy for California Water" (2004), prepared by the Planning and Conservation League, DWR's "California Water Plan Update" (2005), the Pacific Institute's "An Efficient Future" (2006), and the CALFED Bay-Delta Program's "Water Use Efficiency Comprehensive Evaluation" (2006), show that California can accommodate substantial increases in population while reducing our overall water use through cost-effective, environmentally-beneficial water management strategies. Indeed, the State Water Plan indicates that urban water efficiency is the single most important tool for meeting California's future water needs.

By reducing water use, we can also reduce our vulnerability to the effects of climate change. Governor Schwarzenegger's biennial report on climate impacts in California *Our Changing Climate* (2006) projected a 30–60% loss in Sierra snowpack by the end of the century under its lower emission scenario with much more severe loss of snowpack projected at higher emission scenarios. Additional climate impacts include the effects of sea level rise on the fragile Delta levee system, a key component of the state's water supply infrastructure, and an increase in evapo-transpiration under higher temperatures. By reducing our dependence upon our scarce water resources today, California will be better prepared to sustain these projected changes in the future.

However, state is not on target to achieve its identified water savings potential. A recent analysis by the CALFED Bay-Delta program stated that in the urban sector the voluntary process based on the Memorandum of Understanding Regarding Urban Water Conservation in California "is not working as intended and its impact on urban water use remains well below its full potential."[7] The analysis further noted that the agricultural water use efficiency program received only 10% of the federal and state funding expected in the CALFED Record of Decision, and the program is expected to achieve only 3% of the identified ecosystem and water supply reliability benefits.[8] In evaluating the water-energy nexus, the California Energy Commission noted that water efficiency policies, programs, and funding lag far behind those of energy efficiency. As the state faces the emission reduction mandate of AB 32 and the prospect of reduced water supplies due to climate change, these policy shortcomings must be addressed.

II. Recommendations

A. Establish a Loading Order for Water

The Legislature, the State Water Resources Control Board and the California Public Utilities Commission can adopt a "loading order" policy for water which would prioritize cost efficient efficiency measures and recycling over traditional supply options.

Such a phased approach is entirely consistent with the increased emphasis, by water agencies and the state, on integrated regional water management.

- *Timeframe:* In place by 2012.
- *GHG Reduction Potential*: The Climate Action Team estimates that each reduction of one million acre-feet reduces GHG by 1 million MTCO2E. We estimate a reduction of up to 5 million acre-feet.
- *Ease of Implementation:* Moderate. Unlike the energy sector where most of the energy is delivered by utilities that are publicly regulated, most water in the state is sold by public agencies, under a different regulatory structure.
- *Co-benefits / Mitigation Requirements*:
    - Reduced water demand will improve water quality in the Bay Delta
    - Improved irrigation efficiency will reduce polluted runoff into bays, rivers, and streams
    - Reduced water consumption will make it easier to manage through adapt to natural water shortages and the alterations of California's hydrology caused by global warming
    - Disadvantaged communities can be prioritized for access to water use efficiency projects
- *Responsible Parties:* State Water Resources Control Board, CPUC, Legislature, Dept of Health

Problem: California currently does not have a procedure for prioritizing water efficiency and alternative sources over traditional energy-intensive supplies..

Possible Solution: Model water resource planning and implementation after the successful "loading order" used by the electricity section. The loading order would be:

- First, decrease demand through improved water efficiency as the preferred approach to addressing water supply reliability,
- Second, meet additional supply needs with alternative sources, including water recycling, groundwater clean-up and conjunctive use programs,
- Third, use traditional supply options.

As background, the electricity loading order was established in 2003 by California's principal energy agencies—the California Energy Commission (Energy Commission), the California Public Utilities Commission, and the California Consumer Power and Conservation Financing Authority (Power Authority). The loading order requires the utilities to:

1. Pursue all cost-effective energy efficiency savings;
2. Meet new generation needs with renewable and clean distributed generation resources; and
3. Use efficient fossil-fueled generation.

The loading order was re-adopted by the energy agencies in 2005 and endorsed by the Governor. The Legislature codified energy efficiency as the top priority resource in 2005, requiring that all utilities "first acquire all available energy efficiency and demand reduction resources that are cost effective, reliable, and feasible."[9]

A loading order for water would first require agencies to seek cost-effective water efficiency measures over new sources of water. Efficiency measures should also take the GHG embedded in the water usage into consideration. Measures that maximize the reduction of both water and GHG emissions would be prioritized.

If demand cannot met though efficiency, then the next step would be to meet demand through alternative sources such as water recycling (processing used water or storm runoff) to produce water suitable for irrigation, toilets or in some cases consumption. Such alternatives can be compared both on the cost of water delivery and also on the GHG emission comparisons. Agencies that demonstrate that they are on track towards maximizing their efficiency potential could simultaneously pursue these alternatives if necessary to meet demand.

Finally, if demand cannot be met through efficiency or alternative sources, new supplies could be used.

While a Loading Order would take the important first step of establishing the state's policy, by itself it is not enough. The state must take steps to operationalize the policy, including. establishing a process for determining efficiency potential and defining targets, standardizing evaluation, measurement and verification of savings, and adopting regulatory and incentive programs to achieve those targets.

B. Establish a Public Goods Charge for Funding Water Improvements

Establish a program that collects a public goods charge from water users for investments in water efficiency as a cost-effective water supply measure and a GHG reduction measure.

Support

- *Timeframe:* Programs in place by 2012.
- *GHG Reduction Potential:* This financing would accelerate implementation of the water "loading order".
- *Ease of Implementation*: Similar effort to that used by the public goods charge in the electricity section.

- *Co-Benefits / Mitigation Requirements:*
  - *Can benefit disadvantaged communities by funding water efficiency projects*
  - Reduced water demand will improve water quality in the Bay Delta
  - Reduced water consumption will make it easier to manage through natural water shortages
  - Reduced energy usage with reduced air pollution emissions contributing to unhealthy levels of air pollutants such as ozone and fine particulates.

- *Responsible Parties:* State Water Resources Control Board, CPUC, Legislature

Problem: There is a lack of systematic public funds to encourage water efficiency and recycling in a cost-effective manner.

Possible Solution: A Public Goods Charge on consumption of water can be collected through water bills and then used to fund end-use water efficiency improvements, system-wide efficiency and water recycling. The charge can be modeled after the program used for energy efficiency and managed by the California Energy Commission (see http://www.energy.ca.gov/reports/1999-12_400-99-020.html for a general description of the program).

The Public Goods Charge is financed by a surcharge on rate payers. But far from being a cost, the existing CEC energy program has demonstrated an ability to generate a positive return, which ultimately lowers customers' bills. A study by the RAND Corporation on California's energy efficiency program showed the program resulted in an increase in the state's economy of $875 to $1,300 per capita between 1977 and 2000, a 40 percent decrease in air pollution emissions from stationary sources and a reduced energy burden on low-income households.[10]

[1] Navigant Consulting, Refining Estimates of Water Related Energy Use in California, prepared for the California Energy Commission, Public Interest Energy Research Program (December, 2006) CEC 500-2006-118
[2] http://www.nrdc.org/water/conservation/edrain/contents.asp
[3] http://www.e2.org/ext/doc/E2C2WaterReductionsSummary.pdf
[4] *Climate Action Team Report to Governor Schwarzenegger and the Legislature*, California Environmental Protection Agency, March 2006, p. 50.
[5] California Energy Commission, 2005 *Integrated Energy Policy Report*, CEC-100-2005-007CMF, November 2005, p.150.
[6] http://docs.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/76926.htm#P108_3558
[7] CALFED Bay-Delta Program, *Water Use Efficiency Comprehensive Evaluation, (Sacramento, CA: August, 2006) p. 3*
[8] Ibid. p. 2
[9] Senate Bill 1037 (Kehoe, 2005).
[10] http://www.rand.org/pubs/monograph_reports/2005/MR1212.0.pdf