Implementing a Public Goods Charge for Water

by
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On behalf of the
California Public Utilities Commission
And the
Water Energy Team of the Climate Action Team
(WetCat)

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Executive Summary

Our client asked for recommendations on how to implement a public goods charge (PGC) on water, as per the "Water Energy" section of the Assembly Bill 32 (AB 32) Scoping Plan.

Before considering "how," we considered whether a public goods charge for water is the right tool. The problem we wanted to address is the negative externalities of high water consumption, including greenhouse gas emissions from the energy used to pump, transport, treat, and heat water. We gave serious consideration to two alternate strategies but ultimately decided the public goods charge for water is the best tool.

We recommend a public goods charge for water because:

- A public goods charge for water creates a price signal for water conservation.
- A public goods charge for water would provide a stable, sustainable funding mechanism to support the full list of conservation and efficiency activities specified in Assembly Bill 32.
- The dual energy and water conservation programs specified in AB 32, which could not be fully funded through the other mechanisms we considered, will be effective to both mitigate and adapt to climate change.
- Our proposed implementation strategy will help institutionalize regional water agencies, which are necessary for the state's long-term water-planning effectiveness.

We then make specific recommendations about the design of the public goods charge:

- We recommend passing state legislation requiring all water providers to assess volumetric surcharges on each water bill where metered, or by alternate means in the short-term for areas not metered.
- We recommend that the funds be managed by regional joint power authorities to implement Integrated Regional Water Management Plans (IRWMPs), which must institutionalize their operating structure before this can be put in place. This will provide the necessary regional organization for effective project choices, **and** will reduce the number of water agencies that need oversight from thousands to 50.
- We recommend that the Department of Water Resources (DWR), which already has jurisdiction over the IRWMPS, provide direction and oversight to ensure that specified state goals are met and that funds are well-managed, with assistance from the WETCAT members.
- We recommend that the fees initially be set to raise $680 Million per year. That level of funding can be used to meet the water supply targets of Senate Bill X7-7, and to exceed the greenhouse gas emissions goals of Assembly Bill 32. We recommend that the legislation be structured with maximum flexibility to allow for future rate changes.

Introduction

Public Goods Charges and Assembly Bill 32

A public goods charge is a fee applied to a utility bill to fund public-interest programs related to that utility service. A public goods charge for electricity was passed in California in 1996 as part of the energy sector deregulation, and has been very effective at funding conservation and efficiency programs for energy. State agencies in the field of water have been interested in the possibility of a similar charge on water bills for years. The current directive to look into it comes from the Scoping Plan of Assembly Bill 32 (AB 32), also known as "The Global Warming Solutions Act of 2006."

The overarching goal of AB 32 is to reduce greenhouse gas emissions in California to 1990 levels by the year 2020, which represents an approximately 25% reduction from "business as usual." For the purposes of this investigation, we assumed AB 32 will go into full effect on schedule, though in fact it is under continual threat of delay or repeal.

Assembly Bill 32 itself does not provide specific details about how the greenhouse gas emissions targets will be met. The AB 32 scoping plan, released by the California Air Resources Board in December of 2008, provides more direction, while still remaining quite vague. The items included in the scoping plan are **not** *law,* but rather administrative recommendations of how to achieve the law's goals. On the subject of water, the scoping plan recommends six specific measures, which are voluntary. The final one, the public goods charge, is intended as a financing mechanism for the others.

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

Our direct clients are in the Policy Planning Division of the California Public Utilities Commission. Our indirect client is the Water Action Team of the Climate Action Team (WETCAT) that has been tasked with addressing this list of water issues included in the AB 32 scoping plan.

Our client asked us to make recommendations about how to implement a public goods charge for water.

Water, Energy, and the Environment

Water use and energy use are highly correlated in California, both in volume and in geography. Approximately 20% of all electricity consumed in the state is related to water delivery, treatment, and use. (CARB, 2008: p. 65) Shortages of water supply have a two-pronged impact on energy: they decrease the large amounts of water needed for hydroelectric generation while requiring higher-energy-intensity alternate sources of water. The focus of this report will be on the latter.

The underlying problem, as we defined it, is that water consumption has negative externalities on the environment.

The primary negative externalities are:

I. Greenhouse gas emissions from pumping, treating, and heating water.
II. Environmental externalities from removing water from its natural place in the ecosystem: decreased flows available for flora and fauna, concentrations of pollutants in remaining flows, and other ecosystem damage.

There are also two major economic externalities of water consumption:

I. Decreased supply, due to overdraft of groundwater, for future generations.
II. Increased costs of procuring less accessible new supply, through the consumption of "cheap" water.

Water Utilities and Regulation

According to consultations with professionals in the industry, there are 3,000 to 6,000 water providers in the state of California. Those provider agencies are regulated by several state agencies, including the Department of Water Resources (DWR), State Water Resources Control Board (SWRCB), California Public Utilities Commission (CPUC), and Department of Public Health (DPH). Several federal agencies are also involved. The division of roles in regulating water supply and water quality is not always clear.

The majority of water providers are publicly owned utilities with locally elected boards of directors, and there is no additional oversight of their rates. Because they are publicly owned, they are presumed to act in the best interests of their member/owners.

However, investor-owned water utilities (IOUs) *are* regulated and carefully counted. There are fewer than 150 such providers in California, and most of them are small. Only a handful serves significant numbers of customers, but that handful supplies water to approximately 20% of California's residential users. The investor-owned water providers, like investor-owned electricity providers, are regulated by the California Public Utilities Commission in matters of rate-setting and customer protection.

Three Alternatives, Two Recommendations

After gathering information about the state of the water industry (thousands of providers, limited regulation), we considered three alternatives for how to address the negative externalities:

1. No new funding mechanism: Create/expand programs to educate water providers about laws that require water and/or energy conservation, and about funding sources or pricing mechanisms already available to them. This alternative does **not** include a new regulatory component; only outreach tools (brochure, website,

contact to utilities) and staff to develop them. Ongoing staff to do personal outreach would make this alternative more effective.

2. Revise the current energy PGC to fund more projects at the nexus of water and energy conservation. An energy-sector-funded PGC would necessarily focus on energy savings, not water savings, but that would meet the explicit goals of AB 32, and would have associated water conservation co-benefits.

3. Create new water PGC, and create the structure to oversee and implement it.

The research into the current energy PGC, reported below in Appendix 2, revealed much information about the opportunities for alternative 2 or for modeling a similar program for water as in alternative 3.

We analyzed the anticipated water and energy conservation outcomes of alternatives 2 and 3, and they are presented below. Our ultimate recommendation is to pursue option 3, and *also* to do option 1. The public goods charge should be created to generate a sustainable, stable funding source for water conservation and efficiency programs.

Water sector managers in state agencies should also coordinate efforts to provide a single, simple source of information to individual utilities about laws they must obey and funding mechanisms they have available to them.

Explanation of Recommendation

The primary reasons for our decision in favor of the public goods charge for water, as listed above, are that it provides appropriate price signals and stable funding, funds projects that are appropriate for climate change mitigation *or* adaptation, and promotes institutionalization of regional water management agencies that would provide other benefits to California's water management. Our analysis also included consideration of the impacts of other legislation and programs, and the incentives of various players.

Price Signal Impact of a Charge on Water

A key concept from economics is that increases in price cause decreases in demand. A public goods charge can serve the dual purpose of raising funds for AB 32 measures while also creating a price signal reducing water demand.

Based on this logic, the most appropriate basis for a fee intended to incentivize water conservation and efficiency is a volumetric fee on water itself. We anticipate that this effect of increased price on water demand will be quite small, given that the size of the proposed public goods charge will be negligible on individual bills. However, we do recommend in favor of a Public Goods Charge on water partly for this reason.

Stable Funding for Five Measures

Basic operations of most local water utilities are funded through rates.

Larger local water projects, like new supply development in the form of new pumps or recycled water treatment plants, do not have a clear and adequate long-term funding source. In recent years, statewide water projects have been funded through bonds. The $5.388 Billion dollar "Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006," (Prop 84) is the latest in a $23.7 Billion dollar series of water bonds since 1970. That water bond is supplemented by the smaller Proposition 50, "The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002."

In November of 2010, California voters will have the opportunity to vote on the "Safe, Clean, and Reliable Drinking Water Supply Act of 2010," which at $11.1 billion is the largest bond proposed in the history of California. The likelihood of that bond passing in November is generally perceived as low (The Record, 2010), which will leave California without any dedicated funding source for water capital projects once Proposition 50 and 84 funds are completely allocated.

Using bond financing for water capital improvements is costly and unreliable, particularly if/when temporary economic circumstances or voter attitudes prevent passage, as is anticipated in November. Historically, California has had a debt-service ratio around 4 percent, but there was a sharp increase between 2002 and 2006. In 2007 the ratio was projected higher than 7 percent, which is higher than the California Legislative Analyst's Office (LAO) recommendation of 6 percent (Alth and Rueben, 2005: p. 9). As the state relies more heavily on bond-financing, the cost of borrowing increases and the capacity to raise funds for other purposes diminishes.

For water infrastructure planning, Californians would be better-served by a stable, consistent funding source due to the long lifetimes and capital recovery periods. Funding water capital projects through a public goods charge would also reduce total costs by eliminating interest payments, and it would free up bond financing capacity for other state needs. A public goods charge would also be paid more directly by the beneficiaries of specific projects, rather than through serviced debt by each taxpayer.[1]

Mitigation and Adaptation

AB 32 and the Scoping Plan were both written with the goal of reducing greenhouse gas emissions in order to *prevent* climate change. Although the scientific evidence points overwhelmingly to the conclusion that climate change is already underway, the measures specified in the scoping plan are still timely because they are also good strategic choices for *adapting* to climate change.

Specifically, reducing water demand and securing/creating additional reliable supplies will be critical as weather patterns deviate further from our historic norms and as the Sierra Nevada snowpack generates less and less reliable surface runoff.

[1] This occurs when general obligation bonds are passed as opposed to revenue bonds, which are generally serviced through user fees.

"For California water managers, the future is now. Climate change is already having a profound impact on water resources as evidenced by changes in snowpack, river flows and sea levels," (DWR, 2008: p. 1).

Institutionalize IRWMPS

One critical component of effective long-term planning for water is integrated planning and project development within hydrologic regions. California has two massive water systems (the Central Valley Project and the State Water Project) which involve coordinated planning, but many water providers operate largely independently. Decisions about groundwater extraction are not coordinated amongst the various communities that share an aquifer, and decisions about capital investments are usually made by individual utilities.

In an effort to move toward a more efficient regional water management system, voters passed Proposition 50, the Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002. This bond includes $380 million for grants to support and incentivize "Integrated Regional Water Management (IRWM)." The state is divided into IRWM regions, which are directed to work together to develop plans (IRWMPs) and apply for funding for coordinated projects. So far, approximately 25 of the 48 IRWM regions have developed draft or final plans, and have applied for Proposition 50 and 84 funds.

One benefit to a public goods charge on water, as proposed below, is that it would help further institutionalize IRWM regions by providing a long-term funding source for their coordinated efforts, which is important to addressing complex and politically-sensitive water issues.

Energy PGC Has Been Very Effective

California has been a leader in conserving energy, maintaining constant per-capita consumption while electricity demand for the rest of the US grew by 150 percent. Figure 1 shows California per capita consumption for each year relative to national consumption in 1965. California's ability to conserve energy relative to the US is due in part to the public goods charge on electricity, which has funded conservation and efficiency programs.

Figure 1 also shows per capita water consumption in California and nationally. The per-capita water consumption in California has declined more rapidly than the US as a whole. However, because California has used more water on a per-capita basis historically, current consumption is near the US average. Much like for energy conservation, California has the opportunity to continue its water conservation efforts and become a leader for the country.

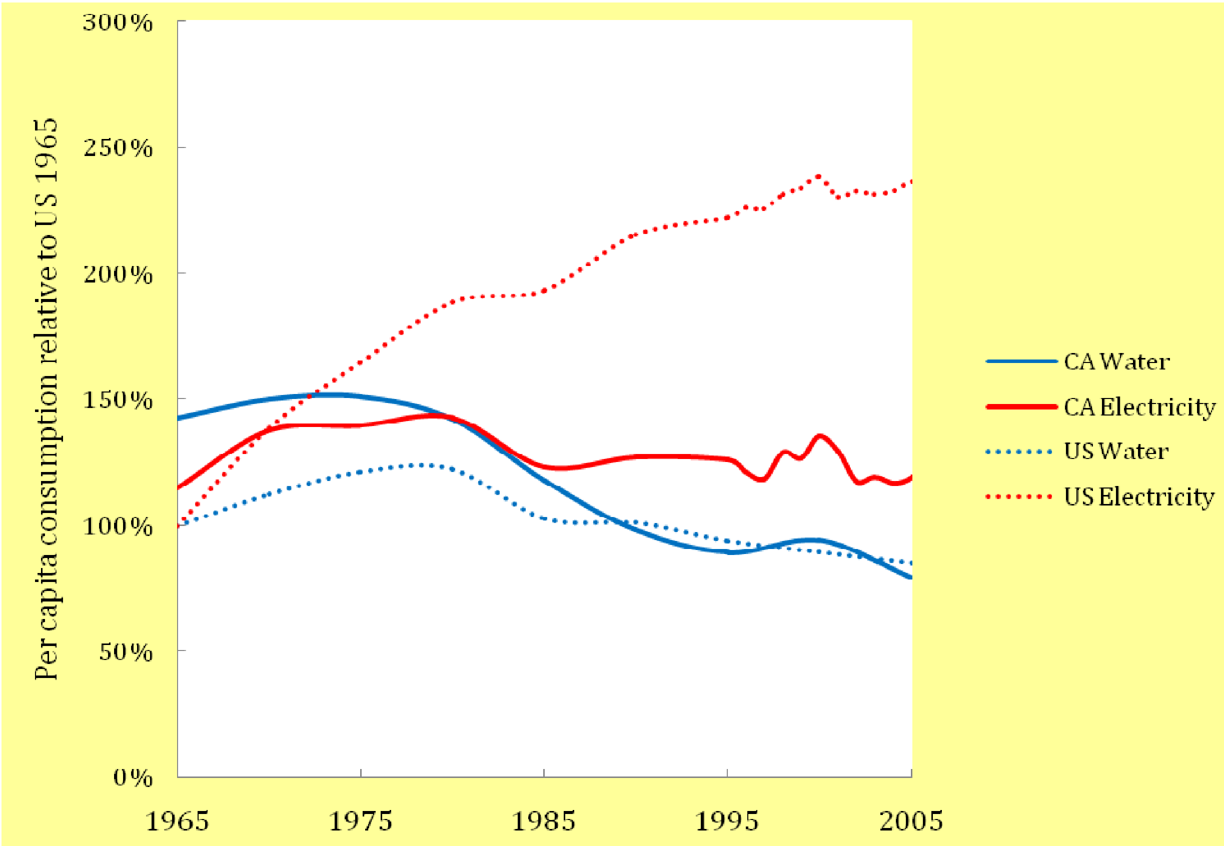

Figure 1. Comparison of California and US per capita water consumption from 1965 to 2005, indexed to US per capita water consumption in 1965.
Source: EIA Annual Energy Review (2009), EIA State Energy Data System (2009), and USGS (1968-2009).

POU Incentives

Publicly owned water utilities (POUs) set water rates through votes by their Boards of Directors. Board members in general prefer not to raise rates, and are often elected for that reason. Though California water rates have actually increased by around 17 percent on average between 2003 and 2006 (Black and Veatch, 2006: p. 3), they are not raised regularly. The Government Accountability Office found "about half of the utilities raised their user rates infrequently—once, twice, or not at all—from 1992 to 2001," (2002: p. 21). The survey also found that over a quarter of water and 40 percent of wastewater utilities did not recover full costs for operations and maintenance, capital, and debt service (2002: p. 4). Hence, although utilities have the power to raise rates to fund conservation and efficiency programs without the PGC, they are often reluctant to do so.

Implementation Strategy

Volumetric Fee on Individual Bills

As described above, the fee should be a volumetric charge on individual water utility bills, in order to provide rational economic incentives (albeit small). Some communities do not have individual volumetric meters, but all are required to install them by 2025, per 2004's AB 2572. A flat fee equal to the average estimated volumetric fee can be used in the short term in any service areas that lack individual meters.

Because the fee is based on a person's water use, it creates a closer nexus between the user and the fee, which is important for legislative purposes. Furthermore, a volumetric fee is more equitable than a flat fee, which disproportionately impacts the poor, or a percentage fee, which results in people from expensive water areas paying proportionally more for conservation measures. Different rates may be needed for agriculture versus urban users.

Legislate: Non-Bypassable Surcharge

Legislative approval is necessary, to implement a public goods charge. Although Assembly Bill 32 gave broad implementation authority to the California Air Resources Board, new taxes and charges cannot be imposed without specific legislative approval, and no such approval of water fees was included in AB 32.

Pending legislative approval, the state **does** have the authority to require Municipal Utility Districts (MUDs) to implement a fee, because the state ultimately owns the water flowing in and under the state. Utilities – public and private – only use it with the permission of the state.

Surcharges on bills can be considered "taxes" or "fees," depending on their specifics. The distinction is whether the revenue is clearly earmarked for a purpose closely tied to the point of incurrence, and whether the payer receives relevant "benefits" in proportion to the amount paid. Taxes require a 2/3 majority to pass through the legislature, whereas "fees" require only a simple majority vote.

The decisions to have the funds managed regionally (rather than statewide) and to have the fee be volumetric (rather than flat) both increase the likelihood that the PGC will be considered a fee. In the interest of political feasibility, other decisions about program design should be made with close attention to this distinction, and should attempt to meet all criteria for consideration as a "fee."

Even at the 50 percent threshold, we realize this proposal will face significant challenges in gaining legislative approval. The dearth of support for the current water bond demonstrates the public's current attitude with regard to supporting water projects and voting for new taxes.

The 1996 Energy PGC passed through as part of the larger energy deregulation bill. We recommend waiting for a good opportunity to bundle this along with a relevant and popular bill, for best chance of political survival.

There are several possible policy windows, which may open up in the next few years, which would make passage much easier. First, an economic recovery may begin which would increase tax revenues and ease public concern about individual incomes. Second, if the water bond fails, it will make the need for a sustainable, stable source of funding for water starkly clear. Third, 2010 is an election year. If the water community can convince the incoming governor to put water financing at the top of her or his agenda, she or he would be a powerful ally.

Currently, the best legislator to approach as an author for this legislation is State Senator Fran Pavley (see Appendix 5).

The plan to create IRWMP joint power authorities, described below, is proposed in part to reduce utility opposition to this proposal and to decrease the likelihood that they will lobby to defeat it in the legislature. Utilities would certainly oppose a proposal that involved primary fund management by a centralized state agency.

Although passing a fee bill through the legislature presents a formidable political challenge, it is less onerous than the challenge of relying on 6,000 jurisdictions to pass individual fee increases. Proposition 218, passed by voters in 1996, gives local voters the right to contest local tax or fee increases. Fear of Proposition 218 challenges adds to the reluctance of municipal utility districts to raise their fees to increased higher funding for conservation and efficiency programs.

Create IRWMP JPAs to Manage Funds

We propose that PGC funds be managed by Joint Power Authorities (JPAs) created through Integrated Regional Water Management Plans (IRWMPs). Individual utilities would collect the fees through bills, but would then pass the total revenue directly to the JPAs.

As mentioned briefly above, Proposition 50 in 2002 created an Integrated Regional Water Management structure, which is organized under the Department of Water Resources. The state is divided, based on hydrologic boundaries, into 48 IRWM regions. Proposition 50 called for the creation of Integrated Regional Water Management Plans (IRWMPs), by the water providers within each boundary, in coordination with other interested parties such as environmental organizations and other government jurisdictions. Forming JPAs would formalize the institutions that would have to be created for management of these PGC funds. Unfortunately Investor-Owned Utilities are unable to participate in JPAs currently. Remedying this legal block will be critical in ensuring that all major stakeholders are involved in the institutionalization of IRWMPs.

Currently, grant funds are available to water providers in regions with IRWMPs through both Proposition 50 and Proposition 84, but individual agencies are not eligible to apply for the same funds. Out of 48 IRWM regions, about 25 have drafted or finalized IRWM Plans

(IRWMPs). Only a few have taken the next step and created JPAs. For the others, a single member agency acts as the lead agency/fiscal sponsor of any grant applications. However, this "lead agency" model has an administrative shortcoming, which is that the lead agency has no enforcement power over non-compliant partner agencies.

The formation of JPAs for IRWMPs will be an important component of planning for a sustainable water future for California. Integrating the proposed public goods charge for water into the IRWM framework will provide mutual benefits: The need to manage PGC funds will give regions more incentive to organize, and the opportunity to manage PGC funds at the regional level will improve efficiency over having thousands of member agencies each manage their own programs.

DWR Provides Regulatory Oversight

The IRWMP program is officially organized under the Department of Water Resources (DWR), who approves plans and disburses Proposition 84 IRWMP funds. It is logical to have DWR oversee implementation of this PGC. It will be DWR's responsibility to provide guidance on appropriate programs, and to audit for compliance and performance. Because the PGC will be implemented at the IRWMP level rather than by individual utilities, oversight will not be unduly onerous.

Administrative guidelines should also give DWR the authority to take over direct management of the PGC funds for any region that does not create a JPA, *or* in the event that a region's management of the funds does not meet DWR's performance criteria.

Although DWR will provide primary oversight, the WETCAT team will also have several important roles in the development of this public goods charge:

I. Contribute significantly to the development of the administrative guidelines for this PGC.
II. Track and report the greenhouse gas emissions of the water industry.
III. Use enforcement powers of WETCAT member agencies where appropriate (e.g. CPUC for IOUs) and when necessary.
IV. Modify performance criteria over time with best available knowledge.

Fee Calculations

The AB 32 Scoping Plan specifies GHG reduction targets for each of the five water-energy measures, see Table 1. Our calculations show that GHG reductions can be achieved for a lower cost by a different distribution of reductions than was specified in the Scoping Plan.

Up to 9 million metric tons of CO_2 can be avoided and 3.6 million acre-feet of water added by 2020. See Figures 2 and 3 and Appendix 4 for documentation. Urban water use efficiency (WUE), especially on heated water, and renewable energy production from combined heat and power (CHP), or biogas, at wastewater facilities , are the most cost-effective means of reducing greenhouse gas emissions. Water recycling is relatively expensive per ton of CO_2, but can be a cost-effective supply of water. For systems efficiency, using pump replacement as a proxy, the cost is nearly three times that of water conservation and 15 times greater than combined heat and power at wastewater treatment

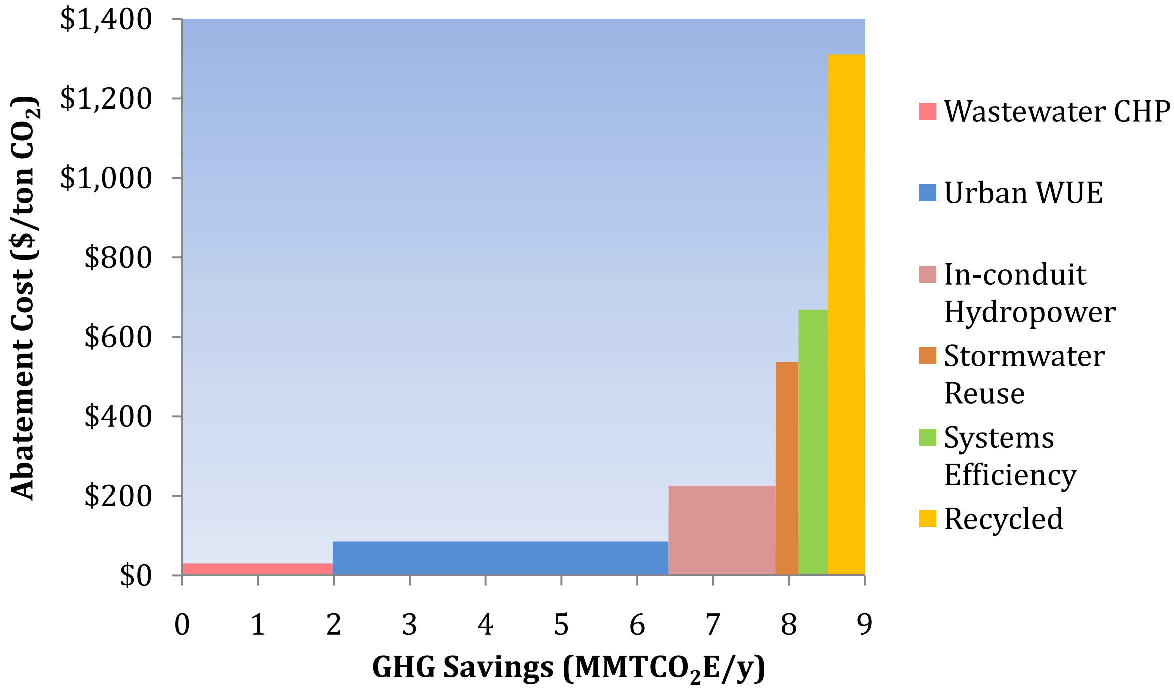

Figure 2. 2020 GHG abatement cost curve.

a. Agricultural water use efficiency is not included in this figure because data is inconclusive and preliminary estimates show greenhouse gas savings to be minimal.
b. Urban water use efficiency corresponds to the 20x2020 target.

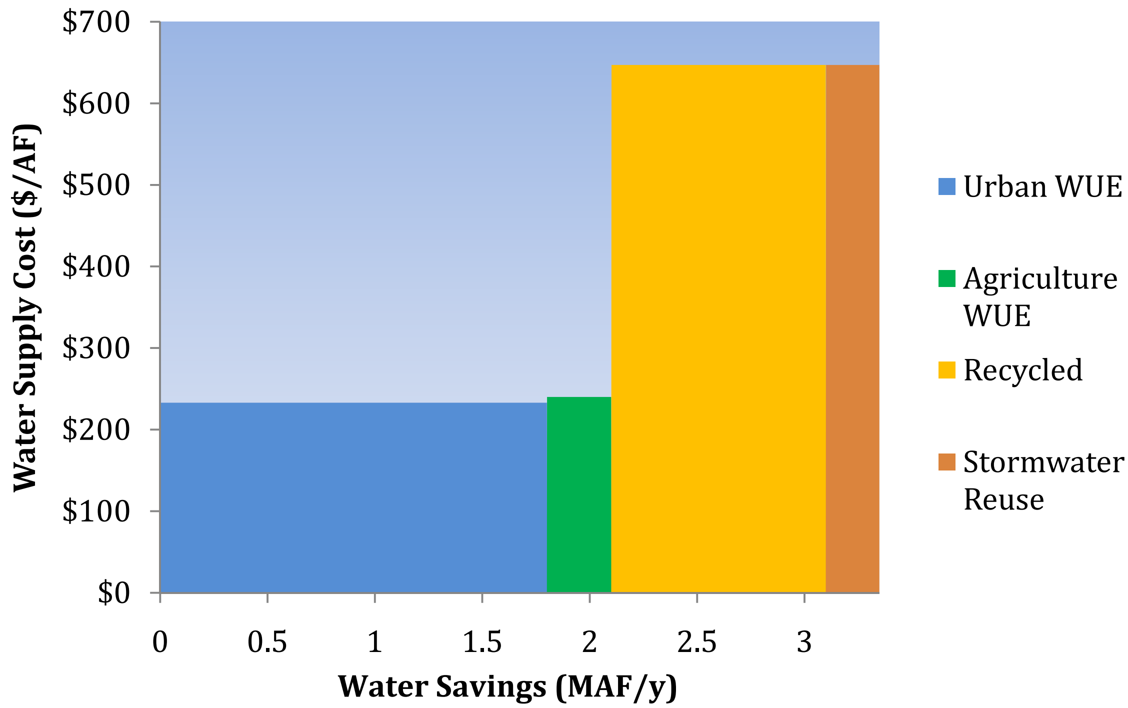

Figure 3. 2020 water savings cost curve.

a. Because of a lack of cost information on stormwater reuse, unit costs assumed the same as recycled water.

plants. The AB 32 scoping plan likely places too much emphasis on this measure. In terms of water benefits, water use efficiency is the cheapest.

The tables below (and in Appendix 4) calculate only capital costs. We believe that the public goods charge should only fund a portion of the capital expenses, and that ongoing operations and maintenance expenses should be borne by users. The estimates below should not be mistaken for a cost-benefit analysis, as regional conditions may make a more costly measure desirable because the benefits are large. Also, as a caveat, the Air Resources Board should take care to avoid double-counting the carbon reductions of water-related measures such as wastewater combined heat and power (CHP) that could be included under other sections of AB 32. In Table 1 is the estimated cost of the original targets for each water measure in the AB 32 Scoping Plan. Left unchanged, an estimated $850 million in capital costs are needed annually to meet these 2020 targets. Appendix 4 contains dollars the supporting calculations and assumptions for the estimates of Tables 1 to 3.

Table 2 is the minimum cost to achieve the overall AB 32 water sector target of 4.8 MMTCO$_2$E. By redistributing the targets to more cost-effective mitigation measures, the cost of achieving the overall AB 32 water sector target of, can be nearly 7 times less than previously estimated. This can be done by implementing only wastewater CHP and urban water use efficiency. It should be noted that the implementation of the 20x2020 plan can almost single-handedly meet the overall goals of AB 32. However, pursuing the minimum cost path ignores other strategic goals of the state, specifically the goal of developing a more reliable water supply.

Table 1. Costs as proposed in AB 32 Scoping Plan

AB 32 Measures	2020 GHG Targets (MMTCO$_2$e)	GHG Unit Cost ($2004/ton)	Annual Cost[a] ($2004 M/y)	2020 Water Savings (MAF/y)
Water Use Efficiency[b]	1.4	$85	$50	0.5
Water Recycling	0.3	$1300	$170	0.6
Stormwater Reuse	0.2	$540	$50	0.2
System Efficiency	2	$670	$580	
Renewable (only CHP)	0.9	$30	$10	
Total	**4.8**		**$850[c]**	**1.3**

a. First the present value of the costs to meet the 2020 abatement and water savings targets for all years, beginning in 2010, was calculated. The present value was then converted to an annuity using an interest rate of 5%.

b. Only urban water use efficiency considered for achieving GHG reductions, see Appendix 4 for detailed calculations and assumptions.

c. Rounding errors result in the total not being completely additive.

Table 2. Minimum cost to meet AB 32 Scoping Plan targets.

AB 32 Measures	2020 GHG Targets ($MMTCO_2E$)	GHG Unit Cost ($2004/ton)	Annual Cost[a] ($2004 M/y)	2020 Water Savings (MAF/y)
Water Use Efficiency[b]	2.8	$85	$100	1.1
Water Recycling	0	$1300	$0	
Stormwater Reuse	0	$540	$0	
System Efficiency	0	$670	$0	
Renewable (only CHP)[c]	2.0	$30	$30	
Total	**4.8**		**$130**	**1.1**

a. First the present value of the costs to meet the 2020 abatement and water savings targets for all years, beginning in 2010, was calculated. The present value was then converted to an annuity using an interest rate of 5%.

b. Only urban water use efficiency.

c. The full penetration of wastewater was calculated first since it is the cheapest GHG mitigation measure and the rest of the target is fulfilled by urban WUE.

Our recommended distribution appears in Table 3, which shows higher GHG emissions reductions and increased 2020 water supply, at a lower total cost than Table 1. The cost estimate of $680 million includes the full implementation of SBX7-7 and the new water recycling policy of the State Water Resources Control Board adopted in 2009. We also recommend that Systems Efficiency be de-emphasized in favor of renewable energy production, in particular wastewater CHP. This is slightly in excess of the $100 - $500 million estimate of the water public goods charge in the AB 32 scoping plan, but significantly less than our calculation of the true costs of the measures as shown in Table 1. If additional water goals are to be met, then the full amount of $680 million per year must be raised through a combination of a PGC and local rates. However, to only meet the emissions reduction goals of AB 32 would require a lower investment (Table 2). We leave it to water and energy managers to determine which targets to use in setting the water PGC rate.

Table 3. Costs of recommended targets.

AB 32 Measures	2020 GHG Targets ($MMTCO_2E$)	GHG Unit Cost ($2004/ton)	Annual Cost[a] ($2004 M/y)	2020 Water Savings (MAF/y)
Water Use Efficiency[b]	4.4	$85	$180	1.8[c]
Water Recycling	0.5	$1300	$280	1.0 [d]
Stormwater Reuse	0.6	$540	$140	0.5[d]
System Efficiency	0.2	$670	$60	
Renewable (only CHP)	2.0	$30	$30	
Total	**7.7**		**$680[e]**	**3.3**

a. First the present value of the costs to meet the 2020 abatement and water savings targets for all years, beginning in 2010, was calculated. The present value was then converted to an annuity using an interest rate of 5%.
b. Only urban water use efficiency.
c. 1.8 MAF/y is the estimated reduction that will be needed to meet 20x2020 (CARB, 2008: p. C-132).
d. Targets set by SWRCB in newly adopted water recycling policy in 2009.
e. Rounding errors result in the total not being completely additive.

Appendix 1: Acronyms

AF / MAF – Acre Feet / Million Acre Feet
CALFED – CALFED Bay-Delta program (California-Federal project)
ARB / CARB – California Air Resources Board
CEC – California Energy Commission
CHP – Combined heat and power
CPUC – California Public Utilities Commission
DPH – Department of Public Health
DWR – Department of Water Resources
EIA – Energy Information Administration
EM&V – Evaluation, Measurement and Verification
GAO – Government Accountability Office
GHG – Greenhouse Gas (emissions)
GSP – Gross State Product
GWh – Gigawatt hours
High GWP – High Global Warming Potential (gases)
IOU – Investor Owned Utility
IRWMP – Integrated Regional Water Management Plan
JPA – Joint Power Authority
kWh – kilowatt hour
Mgal – Million gallons
$MMTCO_2E$ – Million Metric Tons of Carbon Dioxide Equivalent
MUD – Municipal Utility District
ORNL – Oak Ridge National Laboratory
PG&E – Pacific Gas & Electric
PGC – Public Goods Charge
POU – Publicly Owned Utility
PPP – Public Purpose Programs
RPS – Renewable Portfolio Standard
SCE – Southern California Edison
SDG&E – San Diego Gas & Electric
SWRCB – State Water Resources Control Board
USGS – United States Geological Survey
WETCAT – Water Energy Team of the Climate Action Team
WUE – Water Use Efficiency
WWTP – Waste Water Treatment Plant

Appendix 2: Energy Public Goods Charge: Current Program Summary

Summary

We examined the energy sector's public purpose programs for two reasons: They could be a model for a PGC on water, or they could be a direct funding source for the AB 32 Scoping Plan measures.

We reviewed the current Public Purpose Programs and the mechanism for funding those programs. Below are a quick history and a brief summary of how the energy public goods charge works. We focused on the model used for the three largest Investor-Owned Utilities (IOUs): Pacific Gas & Electric (PG&E), Southern California Edison (SCE) and San Diego Gas & Electric (SDG&E). These three IOUs supply approximately 68% of California's retail electricity sales – approximately 24% is supplied by Publicly Owned Utilities (POUs).[2] We also describe the differences between the system for IOUs and for POUs.

History

In 1996, the California legislature adopted *The Electric Utility Industry Restructuring Act* (Assembly Bill 1890), which allowed for deregulation of the electricity industry. The bill passed unanimously. The legislation included a public goods charge on electricity to fund public purpose programs (PPPs), including ones focused on conservation and efficiency. Legislators were concerned that conservation and efficiency efforts of the IOUs might disappear under a deregulation regime without some regulatory inducement.

The public goods charge was originally set to expire in 2001. In 2000, AB 995 extended the collection of a non-bypassable surcharge to fund these programs until January 1, 2012. Also in 2000, AB 1002 created a public goods charge on natural gas.

In March of 2010, the Natural Resources Defense Council published a report entitled "California Restores its Energy Efficiency Leadership: Smart Policies Provide Enormous Economic and Environmental Benefits," which found the energy efficiency programs to be a major success (Marinez et al, 2010). The report credited these programs with the following:

I. Californians use 33% fewer kWh per capita than the national average.
II. Gross State Product (GSP) per kWh consumed in California is double the average of other states.
III. The Energy Efficiency programs have produced about $5 billion in benefits for Californians.

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[2] California Energy Commission, "California Electric Utility Service Areas", accessed May 13, 2010. http://www.energy.ca.gov/maps/maps-pdf/UTILITY_SERVICE_AREAS_DETAIL.PDF

Program Structure

Investor Owned Utilities

Because rates on privately owned, electric Investor Owned Utilities (IOUs) are regulated, the California Public Utilities Commission has much more flexibility in directing the collection of funds and the administration of their programs.

Public Purpose Programs

There are four Public Purpose Programs (PPPs) funded by the non-bypassable surcharge on electricity. The four Public Purpose Programs are:

1) **California Alternate Rates for Energy (CARE) –** Gives a 20% discount to eligible low income customers.

2) **Renewable Energy Program (REP) –** Provides incentives to promote increased supply and use of renewable energy sources. The REP is arranged into three areas: 1) Existing Renewable Resources - Support market competition among in-state existing renewable electricity facilities through varying incentives, 2) Emerging Renewable Resources - Stimulate renewable technology market growth by providing rebates to purchasers of on-site renewable energy generation while effecting market expansion and 3) Consumer Education - Inform the public about the benefits of renewable energy and available choices of emerging renewable energy technologies through information dissemination and project demonstrations.

3) **Energy Efficiency Programs (EE) –** Offers rebates and incentives to adopt efficient technologies, promulgates information, reduces barriers to investment in efficient products and promotes energy efficiency services markets. The programs are designed to reduce energy use in three areas: 1) Lighting and Appliances, 2) Heating, Ventilation and Air Conditioning Systems and 3) Motors. The program also promotes energy efficiency in Retrofits, Renovations and New Construction.

4) **Public Interest Energy Research Program (PIER) –** Funds research demonstration and development (RD&D) in seven energy program areas. Examples of projects falling into the PIER program are: Buildings end-use energy efficiency research, Energy-related environmental research and Industrial/Agricultural/Water End-Use Energy Efficiency Research[3]

Current allocation levels for each of the IOUs to finance the PPPs (Energy Efficiency, PIER and Renewable Energy Production, CARE was not included in the resolution) are as follows:

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[3] California Energy Commission website: http://www.energy.ca.gov/contracts/pier.html. Accessed May 13, 2010.

Table A2-1. Allocation to PPP Programs by utility from 2002 to 2011 ($ Million).

Utility	EE	Renewables[a]	PIER	Total
PG&E	$106.0	$32.9	$31.4	$170.3
SDG&E	$32.0	$5.8	$5.5	$43.3
SCE	$90.0	$26.8	$25.6	$142.4
Total	$228.0	$65.5	$62.5	$356

Source: Public Utilities Commission of California, Energy Division Resolution E-4160.
a. The Renewables number reflects a 51.1% reduction amendment by SB 1026 effective January1, 2008.

Oversight and Administration

The California Energy Commission performs Evaluation, Measurement and Verification (EM&V) for the PIER and Renewable Energy Programs. The California Public Utilities Commission carries out the EM&V for the CARE and Energy Efficiency programs.

"The CPUC solicits project proposals from third parties for about 20% of the energy efficiency PGC funds, with the IOUs proposing programs for the remainder," (Local Government Commission, 2004). Initially, the IOUs proposed all projects in the Energy Efficiency program. The CPUC oversees the administration of these funds.

For the Renewable Energy Program and the PIER program, IOUs send money collected from the non-bypassable surcharge on customer bills directly to the State Treasurer who then transfers it to the California Energy Commission. The CEC decides how to distribute funds for those two programs.

Funding

To raise the money that funds the Public Purpose Programs, utilities must charge a non-bypassable surcharge per AB 1890 (extended by subsequent legislation). The surcharge is volumetric, charged per kilowatt hour (kWh). The design is equitable: the more electricity a customer uses, the larger the customer's contribution to the Public Purpose Programs. From 1998-2005, approximately $6.4 billion for these programs were distributed as follows (Anders and Adi Kuduk, 2006: p. 1):

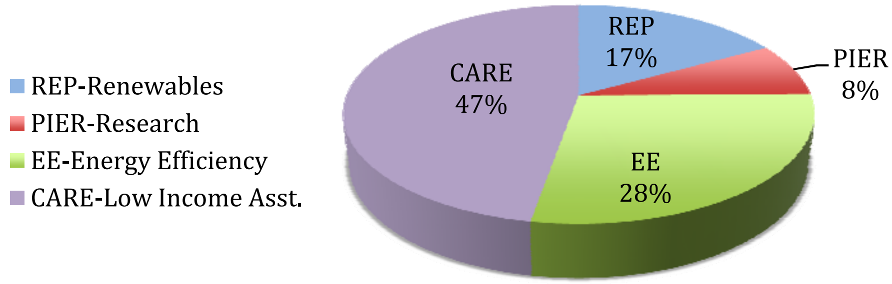

Figure A2-1. Distribution of PGC funds by program of the largest IOUs

Publicly Owned Energy Utilities

The 1996 legislation that established the public goods charge for private investor owned utilities, AB 1890, also required Publicly Owned Utilities (POUs) to support the same four programs. They are required to collect and spend "not less than the lowest expenditure level [on public programs] of the three largest electrical corporations [PG&E, SCE and SDG&E]," (Anders and Adi Kuduk, 2006: p. 15).

However, POUs differ from the IOUs in that:

- They can raise the funds for the programs either through a rate increase or by setting aside the money in their operational budgets
- POU Boards of Directors have discretion over how to allocate the monies across the program areas

These distinctions were particularly important as we considered adapting this model for the water sector, where Publicly Owned Utilities make up the vast majority of providers.

Appendix 3: Expanded Detail About Other Alternatives

Before looking into the design of a public goods charge on water, we considered two alternatives for funding the water/energy measures described in the AB 32 Scoping Plan. The first was to support and expand education about existing and pending laws and programs, forgoing the implementation of any new funding mechanism. The second was to finance the Scoping Plan measures through the electricity side's public goods charge. This section describes those two alternatives, although we ultimately found them both insufficient.

Alternative 1. No New Funding Mechanism: Support and Expand Education About Existing Laws, Programs, etc.

Publicly Owned Utilities have complete rate-setting authority. They can set rates to account for lost revenues from water conservation and capital expansion.

Recent legislation mandates conservation and may change how POU Boards of Directors think about conservation. Two existing programs are available to fund such conservation: the *California Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002* (Proposition 50) and the *Safe Drinking Water, Water Quality and Supply, Flood Control, River and Coastal Protection Bond Act of 2006* (Proposition 84).

Other recent legislation, specifically AB 32 and SBX7-7 (known as "the 20X2020 water bill") provides incentives to address the problems the Scoping Plan measures seek to mitigate. AB 32 will place a price on carbon and therefore increase the price of carbon-intensive energy. A higher price on carbon-intensive energy creates an additional incentive for energy efficiency. With the Cap and Trade system in place, water purveyors will experience higher operating costs and should choose to decrease energy consumption, releasing fewer greenhouse gases.

At the same time, SBX7-7, which sets targets for water conservation culminating in a 20% reduction in use by 2020, will induce water purveyors to conserve water. If the targets for water conservation elaborated in the bill are not met, grant funds awarded under Prop 50 and Prop 84 can be withheld.

Education and Outreach

A recent Government Accountability Office (GAO) study found that an "estimated one-third of the utilities [surveyed] deferred maintenance," (2002: p. 32). Further, of the utilities that deferred maintenance, most reported having done so due to insufficient funding. As mentioned in the previous section on POU incentives, other bad practices include not properly accounting for future capital needs and raising rates infrequently. There is a clear need for education about available funding opportunities and about best practices for finance and operations. Materials that catalog existing funding prospects and educate managers about cost effective conservation policies would be particularly valuable for smaller water purveyors.

These materials could be used to direct purveyors toward sustainable state goals. Best practices literature could be created that would address each of the measures in the Scoping Plan. Two Part Tariffs and Tiered Water Rates could be promoted through this outreach and education, for example.

The CPUC, for instance, could provide best practices information on determining revenue requirements. Accurately determining these requirements is crucial to generating sufficient revenue through user rates. In addition, IOUs have also decoupled water rates from volumetric sales, incentivizing water conservation. The CPUC could promulgate to POUs techniques for determining revenue requirements that fully account for future capital needs, and account for demand-side management.

Weaknesses

Unfortunately, there are several weaknesses with using education and outreach exclusively, in place of a Public Goods Charge. POU Boards of Directors have little will or incentive to raise water rates. The main source of pressure that they experience comes from their constituents, who generally elect them to keep water rates low. For years, POUs have been able to rely on state bond funds to finance needed capital projects, allowing Boards to leave rates artificially low.

However, the balance of Prop 50 funds is below 2% (CA Natural Resources Agency, 2010) and only about 23% of the money from Prop 84 remains uncommitted (State of California, 2010). These bonds will not provide financial long-term incentives. Relying on bond funding and the political will of the electorate needed to approve large bonds is neither a stable nor sustainable approach to funding the state's water needs.

Alternative 2: Using the Energy Public Goods Charge

The second alternative we examined was to fund the Scoping Plan measures through the existing electric public goods charge structure. We believed that water projects supporting the Scoping Plan measures could fit into the guidelines of the Public Purpose Programs and could, therefore, be financed through those programs. We also considered having the CPUC increase the amount of money raised for these programs or having a new charge added to electricity bills specifically for projects aimed at conserving the energy expended in water use.

Advantages and Disadvantages

This alternative offers several advantages:

I. It is a logical way to fund measures that have the goal of reducing greenhouse gas emissions (i.e. from the energy side).
II. No new administrative infrastructure would be required.
III. This approach does not require legislative approval if the energy public goods charge remains the same (a new or increased charge could require a two-thirds vote in the legislature).

IV. Projects could be implemented quickly, as compared to the time it takes to develop a complete new funding mechanism and program.

However, there are disadvantages that outweigh these advantages:

I. Two Scoping Plan measures, water recycling and stormwater reuse, which have significant water benefits in addition to energy benefits, would not be covered by any of the Public Purpose Programs.
II. Opportunities for climate change adaptation in the water sector could be missed.
III. Individual electric IOUs, which decide the allocation for 80% of the Energy Efficiency program funds, will be resistant to funding projects that benefit outside firms, i.e. water providers, with no direct benefit to the IOU itself.
IV. Unless funding of the Public Purpose Programs was adequately expanded, water and energy projects would be competing with each other.
V. By excluding two of the Scoping Plan measures, this course of action would not reduce greenhouse gases as much as a water PGC plan would.

Implementation

Below is a list of the Public Purpose Programs largely funded by the public goods charge on electricity and the AB 32 Scoping Plan measures.

Table A3-1. Public Purpose Programs and AB 32 Scoping Plan measures.

Energy Side Public Purpose Programs		AB 32 Scoping Plan Measures
Energy Efficiency		Water Use Efficiency (W-1)
Renewable Energy Promotion		Water Recycling (W-2)
Public Interest Energy Research		Water System Energy Efficiency (W-3)
CARE		Reuse Urban Runoff (W-4)
		Increase Renewable Energy Production (W-5)

Projects supporting the Scoping Plan measures should fit into the guidelines of the Public Purpose Programs in the following ways:

Table A3-2. Incorporation of AB 32 measures in existing Public Purpose Programs.

Energy Side Public Purpose Programs		AB 32 Scoping Plan Measures
Energy Efficiency →		Water Use Efficiency (W-1)
Energy Efficiency →		Water System Energy Efficiency (W-3)
Renewable Energy Promotion →		Increase Renewable Energy Production (W-5)

Adding water projects to the Renewable Energy Promotion program would be the easiest because the California Energy Commission has direct, centralized control over which projects receive funding. The Energy Efficiency program would be more difficult. Although the CPUC chooses some of the projects for this program, the IOUs that collect the surcharge choose the vast majority of projects to be funded. It will be difficult to convince these IOUs to fund projects that they may not see as directly beneficial to their interests.

In addition to simply adding water projects to existing programs, which could put water and energy projects in direct competition for funds, the funding could be expanded to allow for additional water projects. This could be done two ways:

I. The CPUC could increase the Required Yearly Program Funding.
II. A new line item charge could be added to electricity bills.

Course 1 would require a decision by the CPUC to adjust current funding levels. We are not sure what CPUC's motivations would be when considering such an adjustment. Course 2 may require legislative action to implement a new surcharge. If that were the case, there would be a chance that the new charge would be considered a tax, therefore requiring a 2/3 majority vote for passage.

The estimated annual cost to meet the AB 32 reduction of 4.8 million metric tons of carbon dioxide for the water sector could be as low as $130 million, see Table 2. To include the full implementation of the AB 32 measures, not including water recycling and runoff reuse, would require $270 million per year, see Table A3-3. Though some of these costs should be borne by the consumer, in particular those that are not related to fixed costs, the energy public goods charge would have to be increased to attain significant change in the water sector.

Finally, we noted that, because of their capital intensive nature, two Scoping Plan measures would not fit into the guidelines of any of the existing energy Public Purpose Programs: Reuse of Urban Runoff and Water Recycling. Though most of the GHG savings can be achieved by omitting these two measures, a significant amount of water supply is foregone, see Table A3-4.

Overall, compared to the public goods charge on water, greenhouse gas abatement and water savings under an energy-side Public Purpose Programs regime would be less effective at saving water and avoiding greenhouse gas emissions.

Table A3-3. Estimated cost of meeting AB 32 reduction targets.[a]

Measure	GHG Savings[c] ($MMTCO_2E/y$)	Annual Cost[c] ($2004 M/y)
Urban WUE[b]	4.4	$180
Renewables (only CHP)	2.0	$30
Systems	0.2	$60
Total	6.6	$270

a. The GHG targets are based on our recommendations in Table 3.
b. Urban water use efficiency 20x2020 targets would by itself achieve the AB 32 reduction targets of water at 4.8 $MMTCO_2E$. Other relevant AB 32 measures are included in this estimate.
c. See Appendix 4 for detailed calculations on GHG savings and annual cost.

Table A3-4. The potential to reduce GHG emissions and create new water supply by 2020 through an expanded energy versus water public goods charge.[a]

Measure	GHG Savings[b] ($MMTCO_2E/y$)	Water Supply[b] (MAF/y)
Urban WUE	4.4	1.8
Recycled	0.5	1.0
Stormwater Reuse	0.6	0.5
Renewables (only CHP)	2.0	
Systems	0.2	
Energy PGC	6.6	1.8
Water PGC	7.7	3.3

a. The GHG targets are based on our recommendations in Table 3.

b. See Appendix 4 for detailed calculations on GHG savings and annual cost.

Appendix 4: Cost Analysis on AB 32 Water-Energy Measures

Calculations of Potential for Energy and Water Savings from AB 32 Measures

Assembly Bill 32 specifies five measures, plus the public goods charge, for achieving greenhouse gas emissions reductions through the water sector. The costs, GHG reductions, and new water supply are estimated below for each measure.

Table A4-1. Summary of GHG abatement potential, water savings, and annual payments by water measure.

Measure	2020 Savings		Unit cost	
	$MMTCO_2E/y$	MAF/y	$/ton CO_2	$/AF
Urban WUE	**1.5 – 4.4**	**0.6 – 1.8**	**$85**	**$230**
Indoor (heated)				
Northern	0.4 – 1.3	0.05 – 0.14	$25	$230
Southern	0.7 – 2.1	0.07 – 0.2	$23	$230
Indoor (non-heated)				
Northern	0.03 – 0.1	0.07 – 0.2	$520	$230
Southern	0.1 – 0.4	0.1 – 0.3	$220	$230
Outdoor				
Northern	0.04 – 0.1	0.1 – 0.4	$810	$230
Southern	0.2 – 0.5	0.2 – 0.6	$250	$230
Agriculture WUE	**0 - 0.05**	**0 – 0.5**	**$2300**	**$240**
Recycled	**0.5**	**1.0**	**$1300**	**$650**
Northern	0.05	0.4	$5600	$650
Southern	0.45	0.6	$870	$650
Systems	**0 – 0.8**		**$670**	
Stormwater Reuse	**0.6**	**0.5**	**$540**	**$650**
Renewables	**1.7 – 5.1**		**$110**	
In-conduit hydropower	1.4		$220	
Wastewater CHP	0.3 – 3.7		$30	
Total	**4.2 - 11**	**2.1 – 3.8**		

a. First the present value of the costs to meet the 2020 abatement and water savings targets for all years, beginning in 2010, was calculated. The present value was then converted to an annuity.
b. A 5% interest rate was assumed.

Table A4-1 can aid decision-makers in choosing the right balance between expanding water supply and avoiding emissions at the least cost. The cheapest measures for abating a ton of carbon dioxide are urban water use efficiency (specifically for heated water) and wastewater combined heat and power. Recycled water and stormwater reuse are relatively costly in abating GHG emissions, but are important measures in expanding California water supply. Also, implementing water use efficiency (non-heated) and water recycling in Southern California is significantly more cost-effective at abating carbon dioxide than in Northern California.

External Trends in Energy and Greenhouse Gas Savings Related to Water

Two major trends could affect the greenhouse gas emissions related to water use in California. One trend is that the greenhouse gas emissions associated with a given level of energy output are decreasing with time. This is because the California Renewable Portfolio Standard (RPS, passed as SB-1078, 2002 and accelerated per SB-107, 2006) specifies that renewable sources should contribute 33 percent of the total supply by 2020. The current mix is around 20 percent. By 2020 the emissions intensity of electricity will decline by around 16 percent, see Table A4-2. As electricity becomes cleaner, the marginal cost of abating GHG emissions through the water energy measures increases. This effect was taken into consideration to avoid double counting of water-energy measures with RPS.

Table A4-2. Projected GHG emissions intensity of California electricity sector.

Year	GHG emissions intensity ($MMTCO_2E/GWh$)[a]
2010	$3.03*10^{-4}$
2020	$2.54*10^{-4}$

Sources: CARB GHG Emissions Inventory, EIA State Electric Profiles.

a. Calculated by dividing total electric generation GHG emissions by electricity consumption (retail sales + direct use).

Another trend is that new water supply – to meet the demands of an increasing population – will have to come from water that is increasingly difficult to extract, requiring more energy in delivery and treatment. Table A4-3 shows the current mix of water sources and the projected additional supply by 2030 according to the State Water Plan. By 2030, the mix will still largely rely on surface water and groundwater, with the difference being made up by recycled water and some desalination. Given that recycled water can potentially save energy in some regions of the state, the energy intensity of water could decline. However energy used to treat and pump existing water sources could increase due to increasingly strict water quality standards and less accessible water. Therefore, it is unclear whether the energy intensity of supply, treatment, and distribution will increase by 2030 as according the California Water Plan Update.

Table A4-3. Current and future California water mix.

Source	2005 Supply MAF/y (%)	2030 Supply MAF/y (%)
Groundwater[a]	12 (34%)	14 (34%)
Desalination	Negl. (0%)	0.4 (1%)
Surface	23 (65%)	24 (58%)
Recycled	0.5 (1%)	3 (7%)
Total	35.5 (100%)	41 (100%)

Source: California Water Plan Update 2009 (DWR, 2010: p. 18).
a. Includes conjunctive use management.

Measure W-1a: Water Use Efficiency (Urban)

Methodology

1. Determine the cost of urban water conservation ($/AF).
2. Divide urban water consumption by end use (indoor heated, indoor unheated, and outdoor) and region (Northern and Southern California).
3. Determine the 2020 GHG emissions intensity of urban water consumption (ton CO_2/AF), accounting for Renewable Portfolio Standard.
4. Determine the 2020 abatement cost ($/ton CO_2).
5. Determine the 2020 water efficiency potential (MAF/y).
6. Determine the 2020 GHG abatement potential (MMTCO2E/y).

Step 1: Determine the cost of urban water conservation ($/AF).

Table A4-4. Urban water use efficiency unit cost and savings potential.

Projection Level	Assumed Local Agency Investment	Unit Cost ($2004/AF)	2030 Savings (MAF/y)
1	Historic rate	$522	1.15
2	Locally cost-effective	$223	1.86
3	Historic rate	$395	1.40
4	Locally cost-effective	$227	2.11
5[a]	Locally cost-effective	$233	2.08
6			3.10

Sources: California Water Plan Update 2009 (DWR, 2010: p. 3-23 to 3-25), Water Use Efficiency Comprehensive Evaluation (CALFED, 2006).
a. Projection level 5 was chosen as the average unit cost and total savings potential for this analysis.

The unit cost estimates in the state water plan were based upon CALFED analysis on urban water conservation, see Table A4-4. Six projection levels based on different assumptions of local agency implementation and funding and investment levels were employed. Funding levels increase with each successive level. Projection level 6 represents the maximum technical potential for urban water use efficiency, and does not have a cost estimate due to the costliness of reaching this target. Costs are highly variable between regions and the least-cost implementation may be best determined through integrated regional planning. The study found that water conservation projects qualifying for state and federal funding were on average double the cost of those that were locally cost-effective. These projects were selected because they had additional statewide benefits on water quality, supply, and ecosystem restoration. In this analysis, level 5 was assumed the average unit cost and savings potential.

Step 2: Divide urban water consumption by end use (indoor heated, indoor unheated, and outdoor) and region (Northern and Southern California).

The categories were divided by region because the energy intensity of supply, treatment, and distribution in Southern California is 2.5 times greater than Northern California. This is because Southern California relies upon water sources that are more energy-intensive (i.e. water transported long-distances). End use was divided into indoor heated, indoor unheated, and outdoor use due to differences in their embedded energy. Indoor heated includes energy consumed in supply and distribution, water heating, and wastewater treatment. Indoor unheated includes energy consumed in supply and distribution and wastewater treatment. Outdoor only consists of supply and distribution. Each category was estimated in Table A4-5 based on the urban distribution of water consumption estimated by the Pacific Institute (2003).

Table A4-5. Distribution of urban water savings by end use and region.

Region[a]	Indoor Heated[b] (%)	Indoor Unheated[c] (%)	Outdoor[d] (%)	Total (%)
Northern	8	12	20	40
Southern	11	18	30	60
Total	**19**	**30**	**50**	**100**

Source: Waste Not Want Not: The Potential for Urban Water Conservation in California (Gleick, 2003: p. 2-5).

a. Assumed Northern California consumed 40% of the state's water, and Southern California 60% (CEC, 2005: p. 110). "Other" hydrologic regions included with Southern California because most of these regions are in the South.
b. Only consists of residential indoor heated. Heated water is estimated to account for 56% of residential indoor use. Commercial water has some heating, but excluded because it is much smaller than residential. Industrial water heating is ignored in this analysis due to limited data.
c. Indoor unheated is the sum of residential indoor unheated and commercial indoor. Commercial water is assumed to have the same distribution between outdoors and indoors as residential.
d. Outdoor is the sum of residential outdoor, commercial outdoor, and industrial. All industrial water is assumed to not enter the municipal sewer system and is therefore equivalent to outdoor water use.

Step 3: Determine the 2020 GHG emissions intensity of urban water consumption (ton CO_2/AF), accounting for Renewable Portfolio Standard.

Energy intensities per acre-foot of water were calculated for the different urban categories, see Table A4-6. Using average GHG emissions per unit of energy (electricity, natural gas, or diesel), the GHG emissions intensity per unit of water could be calculated. Only residential water heating was included as an end use energy category in addition to supply, treatment, and distribution energy. This is because commercial water heating is relatively small compared to residential. Industrial water heating was ignored due to limited data. The emission intensity of heated water is nearly ten times higher than that of unheated water.

Table A4-6. 2020 GHG emissions per acre-foot of urban water in California.

Stage	Indoor – heated (ton CO_2/AF)		Indoor – unheated (ton CO_2/AF)		Outdoor (ton CO_2/AF)		Average[c] (ton CO_2/AF)
	Northern	Southern	Northern	Southern	Northern	Southern	State
Supply[a]	0.2	0.8	0.2	0.8	0.2	0.8	0.6
Treatment[a]	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Distribution[a]	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Wastewater[a]	0.2	0.2	0.2	0.2			0.1
End use[b]	9.0	9.0					1.7
Total	**9.5**	**10.1**	**0.5**	**1.1**	**0.3**	**0.9**	**2.5**

Source: Refining estimates of water-related energy use in California (CEC, 2006: p. 2), California's Water-Energy Relationship (CEC, 2005: p. 105-106).

a. Calculated by multiplying the energy intensity of water (CEC, 2006: p. 2), by the 2020 average emissions per kWh of electricity and therm of natural gas (CARB, EIA, and ORNL).

b. Calculated based on appendix of California's Water-Energy Relationship (2005: p. 105-106). Only heated water is included as opposed to indirect energy by appliances (e.g. energy for washing machine and clothes dryer).

c. Weighted average by water savings potential for each category.

Step 4: Determine the 2020 abatement cost ($/ton CO_2).

The abatement cost per ton of CO_2 is calculated by multiplying the water use efficiency unit costs ($/AF) in Table A4-4 by the inverse of the emissions intensity of current water supply (AF/ton CO_2) in Table A4-6. The less energy-intensive an end use category, the more expensive it is to abate one ton of CO_2 or its equivalent. Emissions avoided by conserving heated water are at least ten times more cost-effective than emissions avoided by conserving unheated water. Additionally, for unheated and outdoor uses, the overall cost effectiveness of abating emissions in Southern California is more than twice that in Northern California.

Table A4-7. 2002 GHG abatement cost.

Year	Indoor – heated ($/ton CO_2)		Indoor – unheated ($/ton CO_2)		Outdoor ($/ton CO_2)		Average[a] ($/ton CO_2)
	Northern	Southern	Northern	Southern	Northern	Southern	State
2020	$25	$23	$520	$220	$810	$250	$85

a. Weighted average by the GHG savings potential for each category, see Table A4-9.

Step 5: Determine the 2020 water efficiency potential (MAF/y).

The California Water Plan Update estimates the 2030 potential water savings from urban water use efficiency. These savings were divided in half to attain 2020 targets and then distributed among the categories in Table A4-5. The high water savings category corresponds to meeting 20x2020 goals, which is equivalent to approximately 1.8 million acre-feet of water (CARB, 2008). The largest water savings can be gained from outdoor and indoor-unheated end uses, which are not the most energy-intensive water.

Table A4-8. 2020 water savings potential.

Savings	Indoor – heated (MAF/y)		Indoor – unheated (MAF/y)		Outdoor (MAF/y)		Average (MAF/y)
	Northern	Southern	Northern	Southern	Northern	Southern	State
Low	0.05	0.07	0.07	0.1	0.1	0.2	0.6
Average	0.08	0.1	0.1	0.2	0.2	0.3	1.1
High	0.14	0.2	0.2	0.3	0.4	0.6	1.8[a]

Source: California Water Plan Update 2009 (DWR, 2010: p. 18-19).
a. High savings correspond to 20x2020 goals.

Step 6: Determine the 2020 GHG abatement potential (MMTCO2E/y).

The total greenhouse gas savings ($MMTCO_2E$) can be calculated by multiplying the water savings potential (MAF/y) in Table A4-8 by the avoided emissions per acre-foot of water (ton CO_2/AF) in Table A4-6. Nearly 75 percent of the reductions of emissions through water use efficiency can be saved by conserving heated water.

Table A4-9. Total GHG savings potential by 2020.

Savings	Indoor – heated ($MMTCO_2E$/y)		Indoor – unheated ($MMTCO_2E$/y)		Outdoor ($MMTCO_2E$/y)		Total ($MMTCO_2E$/y)
	Northern	Southern	Northern	Southern	Northern	Southern	State
Low	0.4	0.7	0.03	0.1	0.04	0.2	1.5
Average	0.8	1.2	0.06	0.2	0.06	0.3	2.6
High	1.3	2.1	0.1	0.4	0.1	0.5	4.4[a]

a. High savings correspond to 20x2020 goals.

Measure W-1b: Water Use Efficiency (Agriculture)

Methodology

1. Determine the cost of agricultural water conservation ($/AF).
2. Determine the 2020 GHG emissions intensity of agricultural water consumption (ton CO_2/AF), accounting for Renewable Portfolio Standard.
3. Determine the 2020 abatement cost ($/ton CO_2).
4. Determine the 2020 water efficiency potential (MAF/y).
5. Determine the 2020 GHG abatement potential ($MMTCO_2E$/y).

There are many unknowns in the relationship between energy and water in agriculture. Underestimating the amount of agricultural groundwater would result in an overestimation of the abatement costs. However, agricultural energy intensity may be less than urban water consumption because the water does not have to be treated, delivered under high pressure, or heated. Further, some water efficiency devices that save water may actually increase the amount of energy used on the farm (DWR, 2010: p. 2-22). These estimates on cost-effectiveness for greenhouse gas abatement can be updated when better information is available.

Step 1: Determine cost of agricultural water conservation ($/AF).

Table A4-10. Agricultural water use efficiency unit cost and savings potential.

Projection Level	Assumed Local Agency Investment	Unit Cost ($2004/AF)[a]	Total Savings (MAF/y)
1	Historic rate	$85	0.03
2	Locally cost-effective	$85	0.03
3	Historic rate	$180	0.1
4	Locally cost-effective	$180	0.1
5	Locally cost-effective	$180	0.2
150[b]	Locally cost-effective	$240	0.6
500	Locally cost-effective	$675	0.9

Sources: California Water Plan Update 2009 (DWR, 2010: p. 2-17), Water Use Efficiency Comprehensive Evaluation (CALFED, 2006).

a. Water savings defined as irrecoverable flow, or water that normally is not able to be reused downstream.

b. Projection level 150 chosen as the average unit cost and total savings potential for this analysis.

In contrast to urban water use efficiency, the historic implementation rate and locally cost-effective rate for water efficiency programs were estimated to be the same. What did vary was the average unit cost of water savings by projection level. Projection level 150, which corresponded with the use of funding by Proposition 50 plus $150 million/year, is estimated to recover 0.6 million acre-feet at a cost of $240 per acre-foot of irrecoverable flow. Projection level 500 is the maximum technical potential for efficiency but is practically infeasible. Therefore, projection 150 was used in this analysis because it was the most aggressive practical scenario.

Step 2: Determine the 2020 GHG emissions intensity of agricultural water consumption (ton CO_2/AF), accounting for Renewable Portfolio Standard.

The energy used in agriculture is derived from significant amounts of electricity, natural gas, and diesel fuel. The combined greenhouse gas emissions of these energy sources were calculated based on the emissions intensity of the electricity portfolio and the physical properties of natural gas and diesel fuel. There is likely an underestimation of the amount of energy consumed in agriculture since the amount of diesel used in supply and distribution is unknown. Also, there may be undocumented groundwater extraction. A per acre-foot emissions intensity was calculated by assuming agriculture consumed around 34 million acre-feet of water per year (DWR, 2010: p. 4). Like urban water consumption, the largest energy use by agriculture is for end use including additional pumping and transport.

Table A4-11. Current agricultural energy consumption and emissions intensity.

Life Cycle	Electricity[a] (GWh)	Natural Gas[b] (Mtherm)	Diesel[c,d] (Mgal)	Emissions ($MMTCO_2E$)	Emissions intensity (ton CO_2/AF)[e]
Supply and Distribution	2,788			0.85	0.02
End uses	7,372	18	88	3.23	0.09
Total	10,160	18	88	4.08	0.11

Source: Refining estimates of water-related energy use in California (CEC, 2006: p.16), California's Water-Energy Relationship (CEC, 2005: p. 8).

a. Used factor $3.03*10^{-4}$ $MMTCO_2E$/GWh to convert electricity to emissions, see Table A4-2.
b. Used factor $5.57*10^{-3}$ $MMTCO_2E$/Mtherm to convert natural gas to emissions, which is based on the energy and carbon density of methane.
c. Used factor 0.0102 $MMTCO_2E$/Mgal to convert diesel to emissions, which is based on the energy and carbon density of diesel fuel.
d. Data was lacking for diesel fuel consumption for supply and distribution of agricultural water, thus the energy consumption could be underestimated.
e. Divided emissions by current agricultural consumption of 34 MAF per year (DWR, 2010: p. 4).

Step 3: Determine the 2020 abatement cost ($/ton CO_2).

The abatement cost per ton of CO_2 is calculated by multiplying the water use efficiency unit costs ($/AF) in Table A4-10 by the inverse of the emissions intensity of current water supply (AF/ton CO_2) in Table A4-11. Preliminary estimates show that, on a per unit basis, water used for agricultural is responsible for roughly 20 times less emissions than urban water. This is partly due to the lower energy requirements on average to deliver water (e.g. no treatment), and for end-use (e.g. no heating). Improved data on the energy-intensiveness of groundwater and its consumption by agriculture could cause this difference to narrow.

Table A4-12. 2020 avoided GHG emissions per acre-foot and abatement cost.

Year	Emissions intensity (ton CO_2/AF)	Abatement cost ($2004/ton CO_2)
2020	0.11	$2,300

Step 4: Determine the 2020 water efficiency potential (MAF/y).

The California Water Plan Update estimates the 2030 potential water savings from agriculture water use efficiency. These savings were divided in half to attain 2020 targets. Savings from agriculture are expected to be a factor of 3 to 6 less than the savings from urban water use efficiency, see Table A4-13.

Step 5: Determine the 2020 GHG abatement potential ($MMTCO_2e/y$).

The total greenhouse gas savings ($MMTCO_2E$) can be calculated by multiplying the water savings potential (MAF/y) in Table A4-13 by the avoided emissions intensity (ton CO_2/AF) in Table A4-12. The avoided greenhouse gas emissions as compared to other AB 32 measures are relatively insignificant.

Table A4-13. Agricultural water savings and abatement by 2020.

Range	Savings (MAF/y)	Abatement ($MMTCO_2E/y$)
Low	0.015	0.00
Average	0.3	0.03
High	0.45	0.05

Source: California Water Plan Update 2009 (DWR, 2010: p. 18).

Measure W-2: Water Recycling

Methodology

1. Determine the cost of recycled water ($/AF).
2. Determine the 2020 GHG emissions intensity of recycled water (ton CO_2/AF), accounting for Renewable Portfolio Standard.
3. Determine the 2020 abatement cost ($/ton CO_2).
4. Determine the 2020 recycled water savings (MAF/y).
5. Determine the 2020 GHG abatement potential ($MMTCO_2E/y$).

Step 1: Determine the cost of recycled water ($/AF).

The unit cost for water recycling varies depending on region, surrounding infrastructure, and level of treatment necessary for the designated end-use. Recycled water currently accounts for around 0.5 million acre-feet of supply. The Recycled Water Task Force estimates that an additional 1.4 to 1.7 million acre-feet of supply can be added at a capital cost of $9 to $11 billion by 2030 (DWR, 2010: p. 11-10).

Table A4-14. Water recycling unit cost.

Range	Unit Cost ($2004/MAF)
Low	300
Average[a]	650
High	1300

Source: California Water Plan Update 2009 (DWR, 2010: p. 11-10).

a. The average cost was calculated by dividing $11 billion by the cumulative recycled water savings. The cumulative savings were calculated by assuming a linear increase in recycled water to 2030, and taking the area under the curve, i.e. ½ * 20 y * 1.7 MAF/y, or 17 MAF.

Step 2: Determine the 2020 GHG emissions intensity of recycled water (ton CO_2/AF), accounting for Renewable Portfolio Standard.

The energy intensity of water in Southern California is roughly 2 to 3 times greater than Northern California. Therefore, larger energy savings can be gained from employing water recycling in Southern California, see Table A4-15. On average, estimated energy savings from water recycling in Southern California are more than six times greater than in Northern California. The greenhouse gas emissions avoided per acre-foot of recycled water is calculated by assuming all displaced energy is electric and multiplying by an emissions factor (ton/kWh) for the year 2020, see Table A4-16.

Table A4-15. Net energy savings of recycled water per million gallon.

Stage	Northern (kWh/Mgal)	Southern (kWh/Mgal)	Average[a] (kWh/Mgal)
Supply	2,117	9,727	6,683
Water treatment	111	111	111
Distribution	1,272	1,272	1,272
Existing Total[b]	3,500	11,110	8,066
Recycled[c]	2,100	2,100	2,100
Net Savings[d]	1,400	9,010	5,966

Source: Refining estimates of water-related energy use in California (CEC, 2006: p. 2).

d. Assumed Northern California consumed 40% of the state's water, and Southern California 60% (CEC, 2005: p. 110). "Other" hydrologic regions included with Southern California because most of these regions are in the South.

b. Wastewater treatment is excluded because recycled water is assumed for non-potable use.

c. The energy intensity of recycled water ranges from 1,200 to 3,000 kWh/Mgal, or 2,100 kWh/Mgal on average (CEC, 2006: p. 24).

d. Calculated by subtracting energy intensity of recycled water from existing supply excluding wastewater treatment.

Step 3: Determine the 2020 abatement cost ($/ton CO_2).

Given that the energy savings are smaller in Northern California, water recycling is six times more costly than in Southern California, see Table A4-16. In comparison to urban water use efficiency, water recycling is nearly 15 times more expensive per ton of CO_2.

Table A4-16. 2020 avoided GHG emissions and cost per acre-foot of recycled water.

Region	Emissions Intensity (ton/AF)[a]	Abatement cost ($2004/ton)
Northern	0.12	5600
Southern	0.75	870
Average	0.49	1300

a. Calculated by assuming all displaced water is delivered by electricity. Multiply energy intensity (kWh/Mgal) by the emissions factor for electricity (ton/kWh) to get emissions intensity (converted to ton/AF).

Step 4: Determine the 2020 recycled water savings (MAF/y) by region.

In 2009, the State Water Resources Control Board approved new water recycling policy adopting the goals of an additional supply of 2 MAF/y by 2030 and 1 MAF/y by 2020. Table A4-17 projects the recycling potential for Northern and Southern California assuming 40 percent of water is consumed in Northern California. Water recycling figures to be a significant source of future water in the state, see Table A4-3.

Table A4-17. 2020 potential recycled water savings by region.[a]

Range	Northern (MAF/y)	Southern (MAF/y)	Total (MAF/y)
Average	0.4	0.6	1.0

Source: State Water Resources Control Board (2009: p. 1).
a. Only includes additional supply. Existing 0.4 MAF of recycled water excluded.

Step 5: Determine the 2020 GHG abatement potential ($MMTCO_2E$/y).

The total greenhouse gas savings ($MMTCO_2E$) can be calculated by multiplying the water savings potential (MAF/y) in Table A4-17 by the emissions savings (ton CO_2/AF) in Table A4-16. The avoided greenhouse gas emissions as compared to other AB 32 measures are relatively small and costly, see Figure A4-1.

Table A4-18. Total potential GHG savings for recycled water by 2030.

Range	Northern ($MMTCO_2E$/y)	Southern ($MMTCO_2E$/y)	Total ($MMTCO_2E$/y)
Average	0.05	0.45	0.50

Measure W-3: Water System Energy Efficiency

AB 32 specified that water systems reduce their emissions in supply, distribution, and treatment by 20 percent from 2006 levels by 2020. The scoping plan acknowledges that these targets may not be realistic. For this analysis a conservative 10 percent reduction target is used. The installation of variable feed pumps, which reduce the amount of energy consumed for pumping operations, was used as a proxy for the costs of system improvements. The costs of pump replacement, \$670 per ton of CO_2 avoided, are relatively high as compared to urban water use efficiency and renewable energy, see Figure A4-1.

Table A4-19. GHG savings and unit cost for water system energy efficiency.

Year	Levelized Cost (\$ 2004/kwh)[a]	GHG Savings ($MMTCO_2E/y$)[b]	Abatement Cost (\$2004/ton CO_2)[c]
2020	0.17	0.4	670

Source: Appendix of operation efficiency program (CPUC, 2008).

a. Only capital costs are included.

b. Assumed a 10% GHG reduction by 2020 for water systems improvements as opposed to 20% specified in the AB 32 scoping plan.

c. Abatement cost was calculated by multiplying the levelized cost (\$/kWh) by the inverse of the 2020 electricity GHG emissions intensity (kWh/ton), see Table A4-2.

Measure W-4: Reuse Urban Runoff

In 2009, the State Water Resources Control Board included in its new water recycling policy, goals for additional supply of 1 MAF/y by 2030 and 0.5 MAF/y by 2020 from stormwater reuse. Some of these water savings do not result from direct water use but by allowing runoff to infiltrate in the ground thereby replenishing the groundwater table. This has the co-benefit of preventing non-point source pollution from reaching nearby streams and estuaries. To calculate the GHG savings, the emissions intensity was taken from Garrison et al, who estimated the potential GHG savings and water savings from urban reuse in only San Francisco and Los Angeles (2009). Unlike water recycling, relatively few runoff reuse projects have been proposed in the IRWMPs, and hence costing information is scarce. The state water plan also does not provide an average unit cost for this measure. Average unit costs per acre-foot of water were assumed the same as water recycling, though costs could be higher in urban areas where available land is scarce and highly valued. With a unit cost of water, a GHG abatement cost could be calculated. As compared to recycled water, the GHG abatement cost is lower, see Figure A4-1. This is due to the high energy intensity of urban water supply, which urban runoff will replace, especially in the Los Angeles area. Also, the captured water is used more locally (e.g. rain barrels) and does not have to be transported long distances.

Table A4-20. GHG and water savings potential by 2020 for urban runoff reuse.

Range	GHG Savings ($MMTCO_2E/y$)	Water Savings (MAF)	Emissions Intensity ($MMTCO_2E/MAF$)	Unit Cost[a] ($2004/ton CO_2)
Average	0.60	0.50	1.2	540

Source: State Water Resources Control Board (2009: p. 1), Clear Blue Future (Garrison et al, 2009: p. 31).

a. Calculated by multiplying the unit cost of $640/AF (same as recycled water) by the inverse of the emissions intensity of current supply (AF/ton CO_2), see Table A4-2.

Measure W-5a: Renewable Energy Production (In-conduit hydropower)

In-conduit hydropower refers to the use of small turbines to recover energy in water distribution. The California Energy Commission estimated the capital costs to range from $0.02 to $0.20 per kilowatt hour of electricity generated, see Table A4-21. Assuming all the categories are equally weighted, average capital costs are $0.06/kwh. Though the distribution is not equal across categories, this may be a passable assumption since only one category (very low head range, low power) has a unit cost that is significantly different than the rest.

Table A4-21. Levelized capital cost for in-conduit hydropower.[a]

Head Range	Low Power ($2004/kwh)	Medium Power ($2004/kwh)	High Power ($2004/kwh)	Average ($2004/kwh)
Very Low	0.20	0.06	0.05	0.10
Low	0.08	0.03	0.03	0.04
Medium	0.09	0.03	0.02	0.05
High	0.05	0.03	0.02	0.04
Average				0.06

Source: Statewide Small Hydropower Resource Assessment (CEC, 2006: p. 26).

a. Operations and maintenance costs are excluded from the table.

The abatement cost per ton of CO_2 is calculated by multiplying the levelized capital costs ($/kWh) in Table A4-21 by the inverse of the 2020 emissions intensity of electricity (kwh/ton CO_2) in Table A4-2.

Table A4-22. 2020 GHG savings and abatement cost.

Year	Abatement Cost ($2004/ton)[a]	GHG Savings ($MMTCO_2E/y$)[b]
2020	230	1.4

Source: Statewide Small Hydropower Resource Assessment (CEC, 2006).

a. Calculated by multiplying average levelized cost ($/kWh) by the inverse of the emissions intensity of 2020 electricity generation (kWh/ton), see Table A4-2.

b. Based on a potential power generation of 2,467 MW by 2030 (CEC, 2006: p.15). With a capacity factor of 51%, this corresponds to 11,100 GWh/y. To calculate the abatement potential for 2020 this is divided in half and multiplied by the electricity emissions intensity ($MMTCO_2E$/GWh), see Table A4-2.

Measure W-5b: Renewable Energy Production (Wastewater CHP)

Combined heat and power at wastewater treatment plants provides an opportunity for many co-benefits. Wastewater treatment plants are large emitters of methane, which is around 25 times more powerful than carbon dioxide. Instead of emitting methane, a plant could capture and burn the methane and generate heat and power. This could substitute for energy needed elsewhere in the plant or be sold to the electrical grid. Co-digestion refers to food wastes and dairy manure being transported to a plant and digested with sludge. This improves the efficiency of energy generation and also removes another large source of methane emissions, dairy manure. At a unit cost of $30 per ton of CO2, combined heat and power is one of the cheapest means to reduce greenhouse gas emissions, see Figure A4-1.

Table A4-23. 2030 Power generation potential for CHP at wastewater plants.

Scenario	Potential Generation (MW)[c]	Potential Generation (GWh/y)[d]	Avoided methane emissions ($MMTCO_2E/y$)
Wastewater[a]	60	500	0.4
Co-digestion[b]	415	3450	6.5

Sources: Combined heat and power at California wastewater treatment plants (CEC, 2009: p. 10), CARB GHG Emissions Inventory 2006.

a. Some wastewater CHP already exists and is not included in these numbers.
b. Co-digestion is assumed mostly manure. Avoided methane emissions are the sum of manure (6.1 $MMTCO_2E$) and sludge emissions from wastewater plants (0.4 $MMTCO_2E$).
c. This is the market potential as opposed to the technical resource potential. Excludes existing CHP (35 MW).
d. Used capacity factor of 95% in calculating potential generation (EPA, 2007: p. 11).

Table A4-24. Avoided emissions per unit of energy generated with CHP.

Scenario	Avoided methane emissions ($MMTCO_2E/GWh$)[a]	Avoided electricity consumption ($MMTCO_2E/GWh$)[b]	Total avoided emissions ($MMTCO_2E/GWh$)
Wastewater	0.0008	0.00025	0.0010
Co-digestion	0.0019	0.00025	0.0022

a. Calculated by dividing avoided methane emissions ($MMTCO_2E$) by energy generation (GWh).
b. Assumed all of energy generated replaces electricity consumed by the plant, see Table A4-2 for 2020 emissions factor.

Table A4-25. 2020 GHG savings and unit cost for CHP at wastewater plants.

Range	GHG Savings[a] ($MMTCO_2E/y$)	Unit Cost[b] ($2004/ton)
Low	0.3	-
Average	2.0	30
High	3.7	-

Source: Opportunities for and benefits of CHP at WWTP (EPA, 2007).

a. Potential GHG savings calculated by multiplying energy generation (GWh/y), see Table A4-23, by total avoided emissions ($MMTCO_2E/GWh$), see Table A4-24.
b. Average levelized cost assumed $0.042, which is the capital recovery cost estimate for CHP replacing energy elsewhere in the plant only (EPA, 2007: p. 11). Abatement cost calculated by multiplying levelized cost by inverse of total avoided emissions (kWh/ton). Note that 1 ton CO_2/kWh is equal to $1MMTCO_2E/GWh$.

Appendix 5: Possible Legislative Sponsors

In considering a sponsor/sponsors for Public Goods Charge on water, we used three criteria: 1) that the member be a general supporter of water industry causes, 2) that the member understand the needs of the water system in California and 3) that the sponsor be in a position to guide a bill through committee. There are three legislators that fit these criteria: Senator Fran Pavley, D-Los Angeles and Ventura, Senator David Cogdill, R-Modesto, and Senator Dennis Hollingsworth, R-San Diego and Riverside. All are supporters of the current water bond and each has pushed through separate legislation on water issues.

Senator Fran Pavley would be the best candidate to take on water PGC legislation. As a Democrat and Chair of the Senate Natural Resources and Water Committee, she would have the flexibility to introduce a tax and the power to shepherd a bill through committee. She is the author of AB 32, SB 790 which promotes using stormwater to augment supply,, and the current Senate Bill 918 for a 'Safe, Environmentally Sound Water Supply.' However, she recently withdrew her support for the water bond preferring to allow the voters to decide on that proposition.

Senator Cogdill would be the next best candidate to introduce or co-author the bill. He is Vice-Chair of the Senate Natural Resources and Water Committee, is the author of SBX7-7 (the 20x2020 bill), was the ACWA Legislator of the Year in 2009 and represents Toulumne County and parts of San Joaquin County, where water issues are of utmost importance.

Senator Hollingsworth was the co-author of SBX7-7, is the Senate Republican Leader and has been active in water issues, specifically speaking out about water infrastructure needs. He is a good possibility to co-author a PGC bill. However, politically, he and Sen. Cogdill may have difficulty supporting a bill that increases taxes or assesses a fee.

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Jennifer, Sewer and Water Billing, City of San Luis Obispo
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Consultations with U.C. Berkeley professors and students

Friedman, Lee, Professor of Economics, GSPP
Hunt, Jim, Professor of Civil and Environmental Engineering, UC Berkeley
Mikulin, John (GSPP 2011), former Project Manager, California Environmental Dialogue
Milbury, Joe (GSPP 2010), former Intern CPUC.
Norgaard, Richard, Professor of Energy and Resources, UC Berkeley