Better than the Sum of their Parts: Taking Advantage of the Water-Energy Nexus to Create Dual-Funded Partnership Programs

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ABSTRACT

As part of the effort towards reduction of community-wide resource consumption, partnerships will become an increasingly valuable tool to enhance funding of resource conservation programs and ensure that the most valuable programs are being implemented. Partnerships in the water-energy field can lead to additional funding for existing, multi-beneficial programs currently funded by one water or energy utility, but which have benefits to more than one. In 2006, the California Public Utilities Commission (CPUC) ordered the four largest energy investor owned utilities (IOUs) to partner with water agencies in developing one-year pilot proposals to investigate how best to take advantage of the water energy nexus. This process of developing the pilots led to questions about program funding, avoided costs, impact measurement, and agency behavior.

This paper suggests a series of steps partner agencies can use to determine what level of program co-funding is appropriate, how benefits should be calculated for each agency, and the nature of partnerships most likely to succeed. Using the CPUC Embedded Energy in Water Pilots as a case study, this paper also makes suggestions about the cost-effectiveness calculations currently being used. Entrenched in the cost-effectiveness issues is the fundamental concept of water savings vs. water efficiency, how and where possible savings may occur, and the avoided costs associated with each of these possibilities.

Introduction

Many problems in the world remain unsolved not because the solution is unknown, but because benefits accrue to multiple entities and no single organization is willing or able to pay to solve them.

This paper takes as a given that programs exist that are likely to be cost-effective where the benefits accrue to more than one agency, but are not cost-effective from any one agency's perspective. The proposal in this paper is to create partnerships in which the costs can be allocated in the same proportion as the benefits are received. Using the example of the California Public Utilities Commission's (CPUC) Embedded Energy in Water Pilots, this paper takes the reader through four steps to create such a partnership. This is done by:

1. Identifying programs or actions likely to be cost-effective but that are not cost-effective for any one agency to implement alone.
2. Creating funding partnerships between agencies likely to receive benefits

[1] The views expressed herein are the ideas of the author independently and do not necessarily represent the CPUC or its staff.

3. Identifying a method for determining the costs and benefits. If funds are required to do this, a means of sharing these initial costs must also be developed. Benefits must then be compared with the costs to determine whether the program or action is indeed likely to be cost-beneficial.
4. If the program or action is likely to be cost-effective, determine the allocation of costs across benefitting entities. This is done by creating a methodology for allocating costs once the benefits become known.

Background

In December 2007, the CPUC approved $6.4 million in funding for a one-year pilot to study the potential for energy efficiency savings achieved through water conservation and the substitution of high-energy intensity water with less energy-intensive water[2] (CPUC 2007). Starting in July 2008, this pilot will undertake a variety of water-related energy efficiency programs administered by Pacific Gas and Electric (PG&E), Southern California Edison (SCE), San Diego Gas and Electric (SDG&E) and Southern California Gas (SCG) in partnership with one or more water agencies in their service territory. These programs range from low-income residential high-efficiency toilets to industrial sector winery process improvements to recycled water and managed landscaping in the commercial and residential sectors.[3] Funding for these programs comes from both the energy utility and the partner water agency and will be described in further detail below.

Identifying Programs Made Cost-Effective by Partnerships

If a program is cost-effective for an agency to do alone, a funding partnership is not required. This paper focuses on programs which are *not* cost-effective for an agency to fund exclusively, but that may be cost-effective if funded by other entities who would also receive benefits. Before a partnership can be formed, however, a program or program area needs to be identified where savings are likely to occur.

Recognizing the potential for water efficiency programs that could save both water and energy, the CPUC held a series of workshops that culminated in an Assigned Commission Ruling (ACR) in October of 2006 directing the four largest California investor-owned energy utilities (the utilities) to partner with at least one water agency and submit applications for a one-year pilot (CPUC 2006). In the process that followed, the CPUC developed the Embedded Energy in Water Calculator[4] to aid the utilities in selecting water efficiency programs likely to be cost-effective from an energy perspective. In developing only the energy side of the calculator

[2] High-energy intensive water is water that has to move long distances, be pumped up significant elevation changes, be treated extensively before use, or otherwise has large amounts of energy embedded in it. Less energy-intensive water is that which has less energy than the water it would be used to replace.

[3] The 12 programs are: SCE Low-Income Direct install HETs for Multi Family; SCE Express Water efficiency; SCE Lake Arrowhead Water Conservation; SCE Water Leakage; PG&E Large Commercial Customer; PG&E Low-Income Single Family HET Replacement; PG&E Emerging Technologies in Water Utility Efficiency: SDG&E Managed Landscape; SDG&E Large Industrial Customer Audits; SDG&E Recycled Water; SCG CLAWA/EMWD Gas Pump Testing; and LACSD/SCE/SCG Gas water Conservation. For a full description of the programs see Decision 07-12-050.

[4] The Embedded Energy in Water Calculator is available online in zip form at http://www.doe2.com/download/Water-Energy/WaterMeasures-AvoidedCostCalcs-v4B.zip.

the CPUC made the assumption that the partner water agency would determine a cost-effective contribution for that agency. For example, if a water agency planned to contribute \$50 to the cost of a high efficiency toilet (HET), the CPUC assumed that the water use-reduction benefits to the agency must be greater than \$50.

Creating Funding Partnerships Between Benefiting Agencies

Once a program likely to be cost-effective has been identified, funding partnerships should be formed among agencies expected to receive benefits. Partner criteria will be unique to each agency and program, but in general, criteria should be developed by the lead agency (or agencies) so that suitable partners can be selected. In the Embedded Energy in Water Pilots the energy utilities are the lead agencies.

When the CPUC directed the investor owned energy utilities to partner with at least one water agency in the October 2006 ACR, it identified municipal water agencies as those likely to have the most potential to save water (CPUC 2006). In addition to high potential for energy savings, other criteria used were: willingness of the partner to provide co-funding; water agency interest; water agency location; ability to quickly develop and implement a water use-reduction program; availability of staff resources; etc. Once partners were selected, the energy utilities worked with the water agencies to develop pilot programs that would save significant amounts of water (therefore using less energy for conveyance, distribution and treatment), or use less energy-intensive water.

The four energy utilities approached sharing of program costs with their partners in different ways. Some initially allocated the costs based on the advice of their partner water agencies and the availability of pilot funding, while others examined the potential energy benefits of water saved and developed a rough estimate of how much they would be able to pay for a given amount of energy saved. PG&E chose to pay a price per kilowatt-hour (kWh) saved, and commissioned a study (Green Building Studio 2007) to determine the embedded energy in the water provided by specific municipalities in their service territory. Alternately, SCE approached the pilot partnerships as exploratory and initially established a 50/50 relationship for co-funding.

Development of the Embedded Energy in Water Calculator allowed the utilities to adjust levels of co-funding to more accurately reflect the preliminary calculations of benefits. These benefits were developed using assumptions about the energy use of the partner water agencies, and estimations of measure level water savings.[5]

Creating a Method for Determining Costs and Benefits

In producing the Embedded Energy in Water Calculator the CPUC sought to develop a methodology to quantify the likely energy benefits and costs of the proposed pilot programs. Specifically, it was developed to be used as a tool in the selection of pilot programs for specific

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[5] Example measure inputs were drawn from "BMP Costs & Savings Study" California Urban Water Conservation Counsel, March 2005. Default embedded energy values and load shapes were drawn from "Water Supply Related Electricity Demand in California" Demand Response Research Center, Lawrence Berkeley National Laboratory, LBNL-62041, December 2006 (Hirsch 2007).

water agencies to determine which measures could pass a measure-level cost-effectiveness test. The main drawback of this approach is that the calculator, in its current form, only calculates the energy benefits without attempting to determine water system benefits to the partner water agency.

For the purposes of the Embedded Energy in Water Calculator, a Total Resource Cost (TRC) test was used to determine the cost effectiveness of a proposed pilot program. The TRC test is the standard cost-effectiveness test used for energy efficiency programs, and therefore is the test that will be applied to the pilot programs at their conclusion to determine if water use-reduction measures should be implemented as mainstream energy efficiency programs.

The TRC test measures the net benefits of a program as a resource option, and includes both the participants' and the utilities costs. The benefits calculated in the TRC test are defined as the reduction in transmission, distribution, generation, and capacity costs valued at marginal cost for the periods when there is a load reduction. The costs for this test are all costs paid by the utility and the participants (related to measure installation and program administration) plus the increase in supply costs for the periods in which load is increased. The benefit-cost ratio is the ratio of discounted total benefits of the program to the discounted total costs over the life of the measures installed. A benefit cost-ratio above one indicates that the program is beneficial to the utility and its ratepayers from a total resource cost perspective (CPUC 2001, 18-19). This test is limited by the reliability of the inputs, and the extent to which costs and benefits can be known and quantified.

In the Embedded Energy in Water Calculator the individual measure level TRC values are calculated according to the following equations.

TRC=Benefit / Cost
*Benefit = Total Avoided Cost * NTG*
where NTG = Net-to-Gross[6]

Costs

*For a rebate program: Cost = (Measure Cost-Partner Paid Cost) * NTG + (1-NTG) * Rebate Amount + Admin Cost*

*For a direct install program: Cost = Measure Cost – Partner Paid Cost – (1-NTG) * Participant Paid Cost + Admin Cost*

- **Measure cost** = For a rebate program, the purchase price of a device or piece of equipment as seen by the participant. For a direct install program, the total price paid to a contractor to have the device or equipment installed (includes the costs paid by the energy utility and any participant costs).

[6] Net-to-Gross, although indicated in the equation above is not anticipated to be a major component of the pilot evaluation as it is already known that many of the programs are likely to have high numbers of free riders. A low NTG value does not have significance in the context of the pilots since the aim is to gather information. Additionally, the energy utilities may not claim credit for energy savings achieved through the pilot since: (1) a method for determining embedded energy savings is still being developed, and (2) savings potential from this source did not go into the development of the energy efficiency goals for 2006-2008. (CPUC D.07-12-050., FOF 12-13)

- **NTG** = The calculation of net savings to gross savings (one minus the fraction of free riders for the program).
- **Measure Rebate** = Amount paid to the participant of a rebate program in $ per unit.
- **Participant Paid Cost** = The amount of the measure cost that is paid by the participant in $ per unit.
- **Administrative Cost** = The utility's cost per unit measure that is associated with the administration of the rebate or direct install program (typical values are 0.2 - 0.5 of the measure cost).
- **Partner Paid Cost** = The amount paid by a third party (water agency) per measure unit (either to the energy utility or to the participant).

The program costs are calculated according to the formulae and definitions above.

Benefits

*Benefit = Total Avoided Cost * NTG*

*Total avoided cost = annual summation of (electricity savings * avoided electricity costs + gas savings * avoided gas costs)*

The Total Avoided Cost is the present value of annual avoided electric and gas costs over the lifetime of the measure.

Energy benefits are calculated based upon the annual water use-reduction attributed to each measure installation and converted to annual electricity and gas use-reduction. The conversion of water use-reduction to energy use-reduction is calculated based on the water savings and the supplying water agency energy-use related to water treatment and distribution. The annual energy savings are then converted to IOU annual avoided energy supply costs[7] as well as lifetime avoided costs[8].

Measure level water savings are categorized as using "fresh water," "waste water," and "total" (freshwater and waste water combined). Freshwater is water that is delivered to the customer site where it is consumed, and like outdoor water use, does not enter the waste water treatment system. Wastewater is water that is created or obtained at the customer site, was not delivered there, and only enters the wastewater system. Since "total" encompasses both freshwater and wastewater, most residential indoor water conservation measures were assigned to this category.

Annual electricity and gas saved is calculated using water agency specific marginal energy use-reduction profiles to translate water savings into hourly electric demand reductions (at the water agency). The water agency marginal energy use-reduction profiles describe the water agency hourly energy use-reduction profile per unit of daily water use-reduction over the course of the year. The avoided cost per unit of water use-reduction is highly sensitive to the assumed electricity use-reduction profile for the water agency since the calculation uses hourly avoided costs times hourly electricity use-reductions to determine savings. Three default water agency energy use-reduction profiles are provided in the calculator as well as the ability to create

[7] This is calculated via a macro using avoided cost values *f*(fuel, IOU, climate zone, years), and the hourly profile of energy savings (Hirsch for CPUC 2007).

[8] Present value of annual avoided costs over the lifetime of the measure calculated using IOU specific discount rates (PG&E = 8.79%; SCE = 8.77%; SDG&E = 8.23%; SCG = 8.84%) (Ibid).

custom profiles. The default load shapes are Off-Peak, On-Peak, and 24-Hour. The Off-peak profile assumes that the water agency is highly efficient and all marginal water volume reductions only occur to off-peak pumping. The On-Peak profile is representative of a water agency that is not as efficient as it could be, and thus responds to a decrease in water-use by decreasing peak period pumping. The 24-Hour profile indicates that a decrease in water use may lead to a decrease in pumping energy evenly throughout the day, and is in between Off-Peak and On-Peak for efficiency.

Annual avoided costs are calculated as the sum of all direct and indirect costs that can be avoided or deferred by a decision that would result in delaying or avoiding supply-side investments or energy purchases in the market. This value also includes avoided or deferred transmission or distribution related costs (CPUC 2006). Under the CPUC adopted avoided cost methodology, long-run costs are used to provide a basis for comparing different demand side management options. Long-run marginal costs (LRMC) use the all-in costs of a combined cycle gas turbine (CCGT) based on evidence that the majority of new energy resources being added are gas-fired combined cycle generators (CPUC 2006).

Total avoided cost is the present value of annual avoided cost over the lifetime of the measure being installed. In the embedded energy in water calculator this is determined by the Expected Useful Life (EUL) or Remaining Useful Life (RUL) of a water conservation measure. The RUL and EUL are functions of the measure and the type of program under which the measure is being implemented. For an early retirement program that replaces existing, higher water-use equipment, the savings lifetime of the measure is the remaining useful life. For a replace on failure program that installs water conservation equipment above that required by code, the effective savings life is the number of years after which one half of the population of devices would be expected to remain installed and operating (Hirsch for CPUC 2007).

For the purposes of the pilot cost-effectiveness calculation, "embedded" energy benefits are defined as those occurring on the water agency side of the water meter. Many hot water use-reduction measures such as washing machines, dishwashers, faucet aerators, and hot water heaters have been found to be cost-effective based on energy used at the customer site, and have therefore been included in the energy efficiency programs for some time. As extensive data exists on the majority of these measures, and as the proposed programs for this pilot focused on cold water use-reduction, the commission thought it prudent to focus this effort on measures that may offer added potential for energy efficiency in an area where insufficient data exist. In its current version, the Embedded Energy in Water Calculator does not include energy use by other entities such as the California Department of Water Resources (DWR) or the Western Area Power Administration (WAPA).[9]

Determining the Water Benefits

Although it has the capability to do so, this calculator is not being used to determine the benefits to the water agency co-funding the programs. Determination of water benefits requires the development of water agency specific avoided water costs based on the agency's extra-marginal, or likely next source of water.

Although critical for translating water benefits into dollars, identifying an agency's likely

[9] Non-IOU energy use-reductions were excluded from being counted in this pilot since such energy use is not a component of the IOU avoided costs used to value energy savings since the benefits of such savings would not accrue to IOU ratepayers.

next water source is not always easy. In D.07-12-050 the commission writes that not enough is known yet to be able to confidently say what the avoided water source is for a given agency (CPUC 2007, 93). Significant discussion leading up to the approval of the pilot programs focused on the concept of intra- vs. extra-marginal water supplies. Intra-marginal source is the last unit supplied to meet demand, while extra-marginal source is the next supply needed to meet growth in demand (CEC 2006). Avoided water costs vary greatly depending on which marginal water source conservation programs will avoid or defer using. The December 2007 Decision approving the pilots finds that it would be logical to rely on extra-marginal supply assumptions for long-term planning (more than one or two years in the future), and intra-marginal assumptions for the short term (one to two years ahead). Information in a recent study by the California Energy Alliance, however, identifies extra-marginal supplies as being more appropriate for estimating both the short-run and long-run marginal sources. This is due to growing water demand, diminishing conventional water supplies, and the fact that new water supplies are being proactively sought (CSA 2008, 14).

As identified in the recent California Sustainability Alliance (Draft) study, the long-run marginal water sources from a statewide perspective are likely to be seawater desalination and inter-basin transfers. Desalination is still expensive, and a relatively high energy intensity resource. As plants are not typically operated only to meet peak demand, desalination would likely be treated as a baseload resource that would raise the average energy intensity of the state's water supply portfolio. Inter-basin transfers have been and are currently being used to make up shortfalls in historical imported water supplies. Water transferred (often from northern to southern California) comes from the California State Water Project and the Colorado River aqueducts, so the energy used to convey this water may not "change significantly in the foreseeable future" (CSA 2008, 3).

While energy avoided costs focus on the long-run marginal sources, it may be prudent to examine short-run marginal sources like inter-basin transfer as well as long-run sources when determining avoided costs for energy. Unlike electricity, water can be stored for long periods of time, and for this reason, short-run resources can also meet long-term needs (CSA 2008, 19).

Once the intra- or extra- marginal water source is identified, the water agency can then calculate short-term and long-term avoided costs based on the values for these water supplies.

Evaluating Program Cost-Effectiveness

Once the costs and benefits are in dollars a simple comparison is possible. If the benefits are larger than the costs then the program or action is cost-effective. The table below appeared in the December 20 2007 Decision approving the pilots and shows the initial TRCs of the proposed pilot programs.

Table 1. TRCs for Proposed Embedded Energy in Water Pilot Programs

Utility	Program	TRC
PGE	**Total Program (budget including EM&V)**	**.28**[10]
	Industrial Process Improvement in the Food Processing Sector	.31& .52
	Industrial Process Improvement in the Winery Sector	.41
	Ozone Laundry Treatment in the Hospitality Sector	.33
	Low-Income Direct Install High Efficiency Toilet Replacement	.20
	Emerging technologies to Improve Water System Efficiency	--
SCE	**Total Program**	**.10**[11]
	Low-income direct install high efficiency toilet replacement	.07
	Express water efficiency (PH controllers and ET controllers)	.06
	Industrial Water Efficiency (audits)	.10
	Lake Arrowhead Water Conservation	.19
	Green Schools Water Efficiency	.07
SDG&E	**Total Program (budget including EM&V)**	**.31**[12]
	Managed landscape	.20
	Large customer audits	.50
	Recycled water retrofit	.28
	Join marketing and outreach	n/a
SCG	**Total Program (budget including EM&V)**	**.36**[13]
	Lake Arrowhead/SCE/SoCalGas Water Conservation Partnership	1.33
	Pump/engine testing/evaluation program for Crestline-Lake Arrowhead Water Agency and Eastern Municipal Water District	---
	Joint Marketing and Outreach	---

Source: CPUC Decision 07-12-050 (2007)

As presented in the table above, initial estimates of program TRC values indicated that the programs would not be cost-effective from a Total Resource Cost energy efficiency perspective. Several parties argued in favor of approving the programs on the grounds that the new information obtained by the measurement and study of such programs would provide sufficient benefit to justify the expenditure (CPUC D. 07-12-050 2007, 45). Acknowledging that the current body of knowledge on embedded energy in water is inadequate to make meaningful decisions about whether water use-reduction programs should be included in the IOU's energy efficiency portfolios, the Commission approved the pilot programs despite ex-ante cost-effectiveness ratios of less than one (CPUC D. 07-12-050 2007, 93).

[10] PG&E's July 11, 2007 Additional Supplemental Testimony, p. 4.
[11] SCE's July 11, 2007 Additional Supplemental Testimony, Attachment E.
[12] SDG&E's July 11, 2007 Additional Supplemental Testimony, p. 3.
[13] SoCalGas' July 11, 2007 Additional Supplemental Testimony, p. 3.

Determining Cost Allocations

The CPUC has not yet given direction on the appropriate allocation of program costs among partners. The table and explanation that follows is a suggestion for how the CPUC might go about doing this in a way that would produce cost-effective savings for both water and energy partners from a Program Administrator Cost (PAC) perspective. The example below uses the PAC cost test in recognition that both agencies may want to calculate cost-effectiveness independently of any benefits received by their partner when evaluating whether to participate in a program.

Table 2: Simplistic Example of Program Cost Allocation (using the PAC test)

Scenario 1--The program is not cost-effective for a single agency to implement alone

Cost $1,000,000

	Benefits	% of Total Benefits	Cost Allocation	Net Benefit
Agency 1	$720,000	100%	$1,000,000	-$280,000

Scenario 2--The program is not cost-effective with 2 agencies sharing costs

Cost $1,000,000

	Benefits	% of Benefits	Cost Allocation	Net Benefit
Agency 1	$720,000	75%	$750,000	-$30,000
Agency 2	$240,000	25%	$250,000	-$10,000
total	$960,000		$1,000,000	-$40,000

Scenario 3--The program becomes cost-effective with 3 agencies sharing costs

Cost $1,000,000

	Benefits	% of Benefits	Cost Allocation	Net Benefit
Agency 1	$720,000	67%	$666,667	$53,333
Agency 2	$240,000	22%	$222,222	$17,778
Agency 3	$120,000	11%	$111,111	$8,889
total	$1,080,000		$1,000,000	$80,000

Scenario 4--The program is most cost-effective with all benefitting agencies sharing costs

Cost $1,000,000

	Benefits	% of Total Benefits	Cost Allocation (	Net Benefit
Agency 1	$720,000	60%	$600,000	$120,000
Agency 2	$240,000	20%	$200,000	$40,000
Agency 3	$120,000	10%	$100,000	$20,000
Agency 4	$84,000	7%	$70,000	$14,000
Agency 5	$36,000	3%	$30,000	$6,000
total	$1,200,000	100%	$1,000,000	$200,000

In the table above, the Program Administrator Cost (PAC) test is used to create a simplistic model illustrating allocation of program costs. It assumes that program costs and benefits are fixed and that adding partners does not increase costs. In reality, each successive partner would likely add additional administrative costs, as well as changes to the program. The PAC test differs from the TRC test by excluding costs incurred by the program participant[14].

Scenario 1 illustrates a program that a single agency is attempting to fund. The program is not cost-effective to the agency because the benefits to the individual agency are smaller than the program costs. Scenarios 2, 3, and 4 show the addition of beneficiary agencies. In the table above, cost-effectiveness becomes a factor of the number of contributing partners that receive benefits.

Allocating the costs according to the proportion of total benefits ensures that a cost-effective program or action will be shown to be cost-effective as long as significant benefits occur to entities within the partnership. In the embedded energy in water pilots potential benefits will accrue to DWR and WAPA if their pump load is decreased. These entities are not part of the partnership and would not be contributing funds so a PAC cost-effectiveness calculation would have to exclude them. The calculation will therefore need to exclude benefits to non-partner entities in the cost-effectiveness calculation. However, such cases could result in an incorrectly low cost-effectiveness number (based on TRC).

If a program cannot be shown to be cost-effective under this approach it is for one of three reasons: (1) the program is not cost-effective to begin with due to measure and administration costs that are larger than the measure benefits; (2) the program is cost-effective but large beneficiaries have been left out of the partnership as in Scenario 2; and (3) the program is cost-effective, but partners are not contributing the correct amounts of funding in relation to their accrual of benefits.

It should be noted, however, that scenario 3 is the one most likely to succeed as it includes the minimum number of agencies needed to make the program cost-effective. If Agencies 1, 2, and 3 decide to implement the program there is a disincentive for Agencies 4 and 5 to contribute funds since they will receive benefits regardless of participation. If agencies with smaller benefits do not join a partnership, the cost-benefit values for the participating agencies will always be lower than what they could be if all costs and benefits were part of the calculation. This brings into question the competitiveness of the programs requiring partnerships to be cost-effective as compared with programs that can be cost-effective for a single sponsoring agency. For the embedded energy in water pilots to become mainstream, the associated energy efficiency programs must be competitive (on an energy savings basis) with energy efficiency programs in the CPUC's current portfolio because funds are limited.

Conclusion

If the goal of a partnership is to fund a lasting, cost-effective program, allocations of program costs should be determined when (and as) benefits are known. For programs with unknown benefits, the allocation of program costs should be determined by best estimates at the time and modified when benefits are better known. Furthermore, assumptions should not be made about the cost-effectiveness of a program to a partner based on the amount of a partner's

[14] While benefits are similar to the TRC benefits it is the PAC costs that are defined more narrowly. As defined in the Standard Practice Manual, PAC costs are those that are incurred by the administrator; the incentives paid to customers; and the increased supply costs for the periods in which the load is increased (CPUC 2001, 23).

funding contribution. It is important to accurately calculate the benefits of a program to all partner agencies so costs can be shared correctly and using the same methodology.

A successful partnership is probably one that includes the major beneficiaries of a program. The partner contributions of agencies with smaller benefits are less likely to make a program costs-effective since, by definition, their contributions would be small. Additionally, it may be in the best interest of smaller beneficiaries not to contribute funds if larger beneficiaries are already planning to implement a program. Doing so would increase the overall cost-benefit of the program to other partners, but would decrease the cost-benefits for the smaller agencies that would have received benefits regardless of their decision to contribute funds. While these agencies may not make a significant difference to the program cost-effectiveness they may be worthwhile partners for other reasons.

If partnerships are created to take advantage of the dual energy and water benefits of water use-reduction programs, the CPUC Embedded Energy in Water Calculator should calculate the total benefits of such programs. If only the energy perspective is included the resulting cost-effectiveness numbers may be artificially low due to benefits accruing to non-partner agencies, insufficient water partner contributions, or total program benefits that are smaller than the costs.

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