Presentation to the Bay-Delta Advisory Council

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Comments on the Potential for Improving Water-Use Efficiency and Demand Management in California

These comments summarize part of the recent "Review of the CALFED Water-Use Efficiency Component Technical Appendix" Report to the United States Department of the Interior Bureau of Reclamation (Peter H. Gleick, Dana Haasz), Pacific Institute for Studies in Development, Environment, and Security, Oakland, California. June 30, 1998.

Introduction

Thank you for the opportunity to offer some comments on the recent draft CALFED evaluation of the potential for improving water-use efficiency in the urban and agricultural sectors.[1] I am the director of the Pacific Institute for Studies in Development, Environment, and Security, a non-profit independent research institute in Oakland, California. Our work is mostly supported by private foundations in the U.S. These comments summarize a recent assessment prepared at the request of the U.S. Department of the Interior Bureau of Reclamation.[2] The opinions are, of course, our own.

First of all, I urge BDAC to consider holding a separate, much longer meeting to discuss the issues I will raise. They are critical to CALFED decisions and to long-term water policy and planning in the state. My brief presentation can only raise some of the most critical issues and they are worthy of more discussion.

Second, I would like to thank CALFED staff, who worked patiently with us as we went through their assessment, provided data when it was available, and who seem open to criticism. We understand and respect the difficulties facing them. Many of the problems we identify result **not** from intentional error or miscalculation but because water-use efficiency and demand management concepts and programs have long been ignored, misunderstood, and underfunded at the state water-planning level, because many important data are not collected or available, and because individuals experienced in these issues do not receive the support or rewards given more traditional water managers.

While some progress has been made in recent years in developing and applying water-use efficiency policies and technologies, we are nowhere near to the limits of what is technically feasible, economically sustainable, or socially acceptable. Substantial improvements are possible in all sectors – agriculture and urban; and residential, industrial, commercial, and institutional. Furthermore, the potential greatly exceeds that projected in the CALFED WUEC Technical Appendix.

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[1] The CALFED Water Use Efficiency Component Technical Appendix (WUEC).

[2] Gleick, P.H. and D. Haasz. 1998. "Review of the CALFED Water-Use Efficiency Component Technical Appendix" Report to the United States Department of the Interior Bureau of Reclamation, Pacific Institute for Studies in Development, Environment, and Security, Oakland, California. June 30, 1998.

Demand management and water-use efficiency have strong support in California law and policy. The California Constitution prohibits "waste or unreasonable use" of water and excludes from water rights any water that is not reasonably required for beneficial use (Article X, Section 2). Sections 100 and 101 of the California Water Code also prohibit waste and unreasonable use of water. The State Water Resources Control Board (SWRCB) can place water conservation conditions on water rights permits that it approves. The California Water Code requires all urban water suppliers give first consideration to demand management measures that offer lower marginal costs than new supplies (Water Code Section 10610 *et seq*). The Central Valley Project Improvement Act (CVPIA) calls for water conservation criteria to be developed to promote "the highest level of water use efficiency reasonably achievable" by beneficiaries of the water developed by the project. And a June 24, 1998 letter from sixteen members of California's congressional delegation to Secretary of the Interior Babbitt and Governor Wilson said:

> "The potential for maximizing efficient use of existing supplies must be fully and accurately factored into CALFED's analysis... It is critical that the analysis of the potential for conservation, efficiency and management options compare the environmental and economic costs of improving water use efficiencies with the water project construction alternatives..."

The Numbers Matter

Reiterated throughout the CALFED document is the statement that the information and the analysis related to water-use efficiency are not intended to be used as planning recommendations. CALFED staff have noted that CALFED's objective is to reduce the mismatch between future supply and demand and to focus on supply reliability rather than to quantify demand. This argument is used to downplay the importance of the actual estimates of potential for the conservation options. This casual approach toward the numbers biases the choice of a preferred alternative by not providing a full and accurate account of the potential for demand management to reduce the discrepancy between supply and demand or the relative benefits and costs of demand management compared to developing new supply.

The numbers matter. Despite many uncertainties about the potential for demand management to both reduce anticipated future demands and to supply new water, the numbers used by CALFED directly affect outcomes, conclusions, and long-term California water plans. For example, projections of demand are used directly in all CALFED impact modeling and in the Economic Risk Model efforts. Inaccurate estimates of future demands will lead to inaccurate estimates of the costs and benefits of the "common" programs and any "preferred" alternative.

The Numbers are Not Right

The CALFED WUEC Technical Appendix substantially underestimates, by millions of acre-feet, the potential for cost-effective water-use efficiency improvements and conservation in both urban and agricultural settings. Some of the problems are traceable to serious flaws in data and methods adopted from the Department of Water Resources draft Bulletin 160-98. To their credit CALFED staff have made an effort to work around some of these problems, but many problems remain.

Methodological Problems

- There can be no single estimate of the potential for water-use efficiency improvements. Each CALFED alternative comes with a different set of assumptions, physical structures, and costs. These characteristics will determine which water-use efficiency components are most cost-effective, which are applicable in different regions, and ultimately, how much future demands for water in California can be reduced or modified.

- There is a misrepresentation in the CALFED WUEC about the definition and role of water-use efficiency improvements. In the WUEC, such improvements are incorrectly treated as supply options in the water balance, rather than as direct reductions in future demand. This leads to grossly inflated estimates of future water needs.

- Basic economic principles receive inadequate treatment and attention throughout the report. Both water demand and supply levels are projected independent of costs, prices, subsidy considerations, and market forces, and are therefore incomplete and unrealistic. In the one case where economic costs of demand management options are presented, the estimates are based on incorrect and incomplete data from DWR.

- The benefits of promoting water conservation in urban areas are understated and misinterpreted. A decrease in per-capita urban water demand due to water-use efficiency improvements will lead to direct reductions in the projections of future demand, will extend the supply available to meet future demand, and will have a wide range of other indirect water quality and ecosystem advantages. Total applied water reductions should be counted as reductions to future demand. A wide range of potential improvements that have been left out should be brought into the assessment.

- The benefits from improving water use in agriculture are understated and incorrectly described. These benefits include decreases in agricultural applied water needs, increased availability of water for other agricultural or non-agricultural uses, and improvements in instream flows and quality. Great uncertainties about total potential remain, but several methodological and data flaws should be corrected.

- Evaporation and transpiration from agriculture are treated as a single factor with a fixed value. They must be considered separately. Real savings from reductions in nonproductive evaporative losses are not evaluated in the WUEC, leading to an underestimate of the potential savings in agriculture. Insufficient consideration is given to ways of reducing transpiration.

- The WUEC incorrectly assumes that no landscape improvements down to 0.8 ETo are evaporative losses. The landscape conservation literature suggests that substantial reductions in consumptive losses are possible. The analysis also underestimates the fraction of residential landscape that can be reduced to 0.6 ETo, overestimating future outdoor landscape water needs.

Data and Information Gaps

- The greatest problem with the WUEC Technical Appendix is its reliance on the demand estimates and analysis of the California Department of Water Resources draft Bulletin 160-98. As noted here and elsewhere, the draft Bulletin 160-98 contains major methodological and data flaws. CALFED significantly improves on Bulletin 160-98 water-use efficiency estimates, but adopts some major flaws from that document. These flaws lead to overestimates of future water demand and underestimates of the potential for cost-effective water-use efficiency improvements by the year 2020 in both the urban and agricultural sectors. These errors are important: they drive the CALFED modeling efforts to evaluate impacts (the ongoing impact analyses) and they form the basis for the Economic Risk Model assumptions used to evaluate costs and benefits of various supply options.

- The baseline data on water use in California are adopted from the draft Bulletin 160-98. It now appears that this baseline significantly overestimates current demand for water. This overestimate, in turn, directly leads to a significant overestimate of future baseline demand for water and therefore an exaggeration of the gap between supply

and demand. As noted above, the supply/demand numbers drive much of the rest of the impact and assessment work of CALFED.

- No satisfactory water balance of supply and demand is provided within each region. This makes it impossible to compute regional water reuse factors, total applied water, or consumptive versus non-consumptive uses.

- The potential for urban demand management appears to ignore a wide range of existing cost-effective technology and policies. Detailed residential end-use studies suggest that even the current generation of conservation options can reduce indoor and outdoor end use to well below the levels assumed by CALFED. The potential for new and developing technologies over the next 22 years is excluded entirely.

- The value and scope of improvements in irrigation technology are underestimated. More quantitative analysis is needed of decreases in evaporative losses, reduced energy and economic costs to farmers of overapplication, and improvements in water quality.

- The WUEC discussion of the "costs of conservation" options is inadequate; the data used are inaccurate and incomplete. The single measure used – cost per acre-foot – is inappropriate. Other measures, including benefit/cost ratios and simple payback periods are also important indicators of costs. The data used reflect the upper end of current estimates, but not the lower end, and they are based on an incomplete reading of the literature by DWR. Detailed recommendations are provided in the full report.

In addition to the aforementioned problems, the following gaps in the data (only some of the many gaps) essentially make it impossible to analyze the CALFED document in proper detail. Many of these flaws are not the fault of CALFED – in many cases no good data actually exist. In order to make intelligent decisions, however, much of this information will have to be made available.

- Residential landscape area is highly uncertain;
- Residential landscape water use is poorly understood or measured;
- Distribution of residential water-using appliances, by type and use, is not known;
- Distribution of irrigation technology by type and crop, is not known;
- Statewide and regional values for agricultural water-use efficiency are not measured or separated into its component parts: evaporation and transpiration;
- Agricultural water-use efficiency, as a function of irrigation technology, is incompletely understood;

- Economic costs of conservation options are poorly understood and quantified;
- The water balance of major regions has not been adequately done;
- The implications for water quality of conservation options has not been explored analytically.

The Numbers Matter: Some Examples

Reducing 2020 indoor residential use to 45 gpcd would reduce urban applied water demand by more than an additional 530,000 acre-feet below the most ambitious CALFED Program estimate.

- The recent comprehensive indoor water end-use study conducted by the American Water Works Association (AWWA) suggests this change can be accomplished with **existing** technology and only five basic conservation approaches.
- Replacement by 2020 of the current population of vertical-axis machines with machines no more efficient than the horizontal-axis machines already on the market alone would reduce residential water demand between 170,000 and 200,000 acre-feet per year statewide.

DWR's assumed current urban baseline demand is too high; leading to an overestimate of 2020 demand.

- Correcting this would reduce projected 2020 urban demand by approximately 1 million acre feet/year.

Every one percent increase in irrigation efficiency or agricultural productivity will save on the order of 300,000 acre-feet of water.

- A 1.5-percent reduction in current agricultural demand would result in savings of 510,000 acre-feet of irrecoverable losses, larger than the amount that Bulletin 160-98 estimates can be saved by implementing the EWMPs. Sizeable reductions in both evaporation and transpiration are possible.

California agriculture has begun to make progress in the area of precision irrigation, but enormous potential remains. Changing irrigation method leads to both applied and new water savings by reducing evaporative losses.

- More than half of all California vineyards were still not using drip irrigation in 1991; more than 80 percent of orchards have yet to implement drip. The same survey

showed that 30 percent of orchards and 45 percent of vineyards were still using flood irrigation.

- Westlands Water District still uses furrow flooding or a combination of furrow with pre-irrigation with sprinklers on 76 percent of irrigated acreage. Precision drip irrigation is used on less than 10 percent.

The DWR error in defining "applied water" and "new water," adopted by the WUEC, leads to a major overestimate of 2020 demand.

- Total urban savings by 2020 from conservation measures should be at least the full 3.1 to 3.4 million acre-feet, instead of the 2.1 to 2.3 maf described as "real" savings.

Implementation Issues

In recent years, efforts to promote water-use efficiency programs by State agencies with the authority to require them have given way to efforts at voluntary programs for urban and agricultural agencies. These voluntary programs – the urban and agricultural "best management practices" (BMPs) – have been implemented in an effort to forestall, and perhaps eliminate, more formal requirements. The BMPs offer one mechanism for achieving conservation potential, but they are woefully incomplete and limited.

We urge CALFED to continue to explore ways to implement water-use efficiency and water conservation improvements as a fundamental component of local and regional water plans required prior to reallocation of "new" water supplies or water transfers.

CALFED assumes that "implementation of efficiency measures will occur mostly at the local and regional level by local agencies, not by State and federal CALFED agencies" (WUEC p.2-2, 2-4, 2-9, and elsewhere). To the extent that this is true, CALFED should develop guidelines and standards for local and regional organizations to assist implementation of water-use efficiency programs and to help State agencies monitor performance and achievement.

However, although we agree that local and regional agencies and organizations will play a vital role in implementing water-use efficiency and conservation programs, there remains an extensive role and responsibility for State and Federal agencies as well. Large implementation potential results from the ability of State and Federal agencies to

modify pricing structures under their control, implement state or national technology standards or environmental standards, affect technological development rates, or change the rules governing the water systems they own and operate. By ignoring these implementation avenues, CALFED underestimates not just the potential, but the likelihood, for implementation of efficiency measures.

Further, CALFED notes that they adopted implementation objectives established by the Water Use Efficiency Work Group (WUEC, p. 2-3). One of these is to emphasize incentive-based actions over regulatory actions. Yet extensive studies show that certain government roles cannot be devolved to local or private organizations, and that certain regulatory actions are valuable in pushing new technological development, in accelerating cost reductions of technology and policy options, and in advancing the rate of implementation. As just one example, the U.S. National Energy Policy Act of 1992 eliminated widely divergent and conflicting water-efficiency standards for appliances and set clear standards at the national level, at the request of consumers, industry, and state regulators. These simple national standards are expected to save more than 6.5 billion gallons per day by 2025 without affecting lifestyle or even requiring retrofit of old inefficient systems.[3] The standards also have other economic and environmental benefits in terms of avoided energy, chemical, and waste-water treatment costs. Vickers estimates that the cost savings from implementing these national standards will total hundreds of millions of dollars. Other effective State or Federal actions include certification and labeling programs, reductions in subsidies for inefficient water use from government owned or operated facilities, and national monitoring programs for water quality. Limiting actions to those based on incentives alone thus reduces the potential for implementation of a wide range of water-use efficiency options, reduces the effectiveness of the ones described, fragments policymaking, and rules out Federal and State actions that are valuable, effective, and more efficient than comparable local actions.

Moreover, the extensive supply options described by CALFED are assumed to require State and Federal intervention, action, and funding. Assuming that demand management options will only be implemented through local and regional efforts is thus

[3] Vickers, A. 1996. "Implementing the U.S. Energy Policy Act." Journal of the American Water Works Association." Vol. 88, No. 1. Pp. 18-.

inconsistent with the supply-side assumptions made elsewhere in the draft document. We strongly urge CALFED to change this emphasis.

Conclusions

Great uncertainties still remain about the potential for demand management and improvements in water-use efficiency in California. The magnitude of this potential depends on water prices, rate designs and structures, existing and developing technology, public opinion and preferences, and policies pursued by local, regional, and national water agencies and managers. Despite these uncertainties, problems with the methods and data used in the CALFED Water Use Efficiency Component Technical Appendix cause that analysis to substantially underestimate the potential to reduce demand for water in all sectors in California. There is a very high likelihood that appropriately designed water-use efficiency programs will generate far larger, cost-effective improvements in water-supply reliability, water quality, and ecosystem health than currently estimated. The framework and implementation of programs to achieve this potential have yet to be adequately addressed by CALFED.

Many of the uncertainties associated with the water-use efficiency programs can be reduced with modest investments in data collection and analysis. Until proper comparisons are made between demand-management potential and new supply infrastructure, large investments in new water-supply systems should be delayed, since they may prove economically and environmentally unjustifiable.

Finally, I note that some people refer to the focus on demand management and water-use efficiency as the "soft path," and do so with derision. I can only point out that the term the "soft path" was coined twenty years ago for use in the energy area and energy-use efficiency. The energy "soft path" has turned out to have saved Californians tens, if not hundreds of **billions** of dollars, and eliminated the need to build a projected 30 nuclear power plants along the California coast. As it is, some consumers are still paying very high electric rates for the few we **did** build, decades ago. The parallel should be obvious.

Thank you for your attention and the opportunity to offer these comments.
