Economic Equivalency Analysis

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CALFED Bay-Delta Program
Analytical Approach to an Economic Evaluation of Water Management Alternatives
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Background

Several agencies and stakeholder groups have suggested that CALFED needs a more thorough economic analysis of water management options and should identify the most cost-effective means of achieving the Program's water supply reliability goals. Completing a valid least-cost water management plan on a statewide basis is a challenging goal due to the need to define and simplify many complex issues including: institutional constraints, Delta conveyance constraints, surface water – ground water interactions, third party impacts, and environmental impacts. Considerable time and effort will be required to develop a comprehensive analytical approach for evaluating the hydrologic and economic impacts associated with various combinations of water supply and demand management options. More time and effort will be required to reach some level of consensus on the many simplifying assumptions needed to manage such a complex study. However, while short of identifying a statewide least-cost water management plan, existing hydrologic and economic modeling tools could be used over the next several months to provide some insight into the relative hydrologic and economic effects of specific water management actions.

A two-part approach to providing a comprehensive economic evaluation of water management alternatives is envisioned. First, existing system operation and economic models will be used to provide an initial evaluation of the relative economic impacts of specific assumed water supply allocations and distributions. These allocations and distributions would represent assumed results of various demand management or water transfer actions. Second, the Program will support the development of a more comprehensive analytical approach that could assist in the development of a more tenable statewide least-cost water management plan over the next several years.

Short-Term Analytical Approach – Equivalency Analyses

A short-term effort using existing tools could provide CALFED agencies and stakeholders with information regarding the relative hydrologic and economic effects of specific water management actions. This evaluation would focus on environmental, agricultural land use, water supply price, and relative statewide economic consequences of various scenarios of water supply allocations and distributions. These scenarios could include water supply allocations that approximate "equivalency" of demand management and water transfer actions to Bay-Delta Program storage and conveyance alternatives in terms of regional water supply reliability or Delta flow patterns. For example, under one scenario, total Delta exports could be reduced to approximate the reduction in south Delta exports that might occur under a dual Delta conveyance alternative. This analysis might provide insight into the relative economic effects of the "equivalent" actions (in terms of south Delta pumping) of implementing south of Delta demand management programs or constructing an isolated conveyance facility.

Recent demand management and water transfer studies, such as the State Drought Water Bank, CVPIA-PEIS, USBR Least-Cost CVP Yield Increase Plan, Bulletin 160-98, existing CALFED analyses, and the YCWA Settlement Agreement, could provide some basis for many assumptions and analytical procedures necessary in a water management evaluation of the CALFED Program Alternatives. Following a background research process, several demand management and water transfer scenarios could be evaluated. Existing system operation and economic models including DWRSIM, CVPM and LCPSIM would be employed in this analysis. For each scenario the hydrologic, economic and environmental impacts and benefits resulting from changes or reductions in Delta export patterns related to Delta conveyance and storage would be estimated or qualitatively described, including:

- Water supplies available to Agricultural/Urban Sectors
- Use of short-term and long-term water management options (including extraordinary conservation, recycling, and water transfers) in the South Coast and Bay Area Regions
- Regional and statewide economic effects
- Environmental effects on fisheries, in-delta water quality, export water quality, and terrestrial impacts
- Third party impacts
- Social effects

A number of demand management and water transfer scenarios could be evaluated over the next several months.

Long-Term Analytical Approach -- Least-Cost Economic Analysis

A thorough least cost evaluation will require significant model development along with an extensive stakeholder process to identify institutional and operational parameters. The general approach in conducting a thorough economic analysis is as follows:

- **Depletion Analysis.** Use the Consumptive Use and Depletion Analysis Models to estimate upstream hydrology changes based on water management assumptions.

- **DWRSIM.** Use DWRSIM to generate system operation data, based on a range of operating assumptions. Currently, DWRSIM, as configured for CALFED studies, does not allocate water supplies between the CVP and SWP; because new storage and conveyance facilities are considered "joint use", the model only evaluates overall system supply and demand. While not critical for the programmatic evaluation completed to date, this is a serious consideration for a least-cost economic evaluation.

- **CVGSM.** Use the Central Valley Groundwater System Model (CVGSM) to model the depth to groundwater, groundwater pumping and surface water applied in a service area.

- **LCPSIM.** Use DWR's Least-Cost Planning Simulation Model (LCPSIM) to model least-cost urban water management in the South Coast and Bay Area Regions in response

to the costs and availability of short-term and long-term local water supply options including water transfers, yearly SWP and CVP supplies, and losses due to deficiencies.

- **CVPTM.** Use the Central Valley Production and Transfer Model (CVPTM) to evaluate the short-term and long-term responses of agriculture (including changes in groundwater pumping and crop shifts) to conservation measures, changes in the availability and cost of water (including groundwater), changes in revenues (e.g. due to changes in yields) and other production costs, and water transfer opportunities.

- **IMPLAN.** Use the regional input-output modeling capabilities of the US Forrest Service's Impact Analysis Model (IMPLAN) to estimate regional and statewide third-party economic effects by business sector associated with changes in crops grown.

These models would be linked in such a way that urban water service deficiencies and associated costs and losses would create a demand upon the agricultural sector, resulting in reallocation of agricultural water. The linkages would have to reflect physical system constraints on the movement of water, water rights constraints, and third-party constraints. While linking the models is relatively straightforward, the challenge is establishing realistic assumptions to satisfy the agencies and stakeholders in the CALFED process.

It is recommended that we focus on identifying system operation, institutional and economic constraints as an initial step in the long-term least-cost economic analysis. This could be partly accomplished through the Westside economic modeling effort under Dr. David Sunding of U.C. Berkeley. He has conducted several economic studies on the agricultural impacts of varying water supplies through supply cuts, technology adoption, land retirement and expanded trading opportunities within Westlands Water District service area and provides a recent water management case study on water transfer activities.

The next step would be to update the CVPTM by incorporating the results of the Westside economical analyses under the guidance of a technical advisory group. This effort could provide enough detailed information on institutional constraints and mechanisms necessary for increased level of trading between agriculture and urban users. This effort alone is anticipated to take many months and will focus primarily on trading opportunities within the SWP/CVP service area. However, the analytical procedures developed could provide a foundation for a more comprehensive least-cost study, which integrates statewide system operations, groundwater modeling, and various economic models.

It is expected that at least one year will be required to develop an initial analytical approach, reach an acceptable level of agreement on assumptions, and develop the model linkages. Refinement will take additional time and will likely become an ongoing process. However, initiating this work now will improve understanding of water management issues and provide improved tools for decision-makers during the implementation phase of the CALFED Program. Meanwhile, coordination will continue with other research efforts such as the Howitt and Lund "Quantitative Analysis of Finance Options for California's Future Water Supply," currently underway at U.C. Davis.