Economics Benefit Scope of Work

DESCRIPTION OF TASK:

The Department of Water Resources (DWR) requests the Contractor assist in completion of portions of the socioeconomic analysis of the Bay Delta Conservation Plan (BDCP). Specifically, this assistance includes an economic assessment of water supply reliability, seismic risks and water quality, and analysis of public benefits of Delta conservation and species recovery.

SCOPE OF WORK:

The following tasks will be performed by the Contractor:

Assistance in Socioeconomics Assessment for the BDCP

1. Economic Assessment of Water Supply Reliability
2. Economic Assessment of Seismic Risks
3. Economic Assessment of Water Quality Improvement
4. Analysis of Public Benefits of Delta Conservation and Restoration
5. Task Order Management and Administration

All of the models proposed for use as part of these tasks already exist; however, most will need to be verified and/or updated with current information

Task 1. Conduct Economic Assessment of Water Supply Reliability

The water supply reliability benefits of the BDCP are a main driver of the economics of the Plan. This task will consider these benefits from two perspectives: the capitalized value of annual water supply benefits under various alternatives; and on the margin, conditional on assumed water supplies under a given alternative. The first perspective is useful because benefits can then be compared to capital costs and the present value of operating costs. The second perspective is important for assessing practicability and defending yield assumptions conditional on various alternatives.

The starting point for an economic analysis of the water supply reliability benefits of a new Delta infrastructure would be a representation of annual exports under the status quo and isolated facility cases, conditional on a repeat of the historic hydrology. Contractor will coordinate with the hydrologic modelers to interpret modeling results, coordinate on CALSIM II inputs and assumptions, and properly sequence the results.

Once the water supply impacts of an isolated facility are understood across a range of hydrologies, they can be inputted into various economic models that measure outcomes in different sectors of the economy. In particular, Contractor will assess outcomes for both urban and agricultural water users who rely, at least in part, on Delta exports.

The urban sector impact model is based on Metropolitan Water District's (MWD) IRPSIM model, but extended to include other districts receiving water from the State Water Project (SWP). The Brattle Group has developed this integrated engineering-economic impact framework to accurately measure the economic consequences of changes in Delta exports. This model incorporates relevant system operations at the local level, including withdrawals from storage, use of alternative supplies and conservation. Economic loss functions have been developed for each agency to measure the cost of mandatory reductions in end use, and the model allows for a flexible allocation of shortage across sectors. As part of this project, Contractor will update and verify assumptions about water supply alternatives available to various agencies, verify the operating rules coded into the model, and verify assumptions about demand growth over the planning period to 2050.

For agriculture, Contractor will consider evidence of the value of water supply reliability, including water transfer prices, land values in districts with different degrees of supply reliability, and a "rationing" analysis that disaggregates water use by crop by district and calculates demands directly.

The results of the urban and agricultural impacts analysis will be a distribution of benefits from an isolated facility over various hydrologies. From this range of impacts, Contractor will then calculate mean benefits, characterize the distribution of benefits, and calculate a range of present values of future benefit streams. The analysis will also provide an indication of the distribution of water supply benefits across SWP and Central Valley Project (CVP) contractors.

This analysis will include evaluating alternative costs of water supply (e.g. recycling, desalination, local ground, etc.) for Delta export regions, and evaluating potential and cost of demand management options for Delta export regions.

Contractor will coordinate with the hydrologic modelers to interpret modeling results, coordinate on CALSIM II inputs and assumptions, and properly sequence the results.

For agriculture, Contractor will use the Statewide Agricultural Production (SWAP) programming model to measure the impact of changes in water supply on agricultural production in the San Joaquin Valley. This model has been used in numerous applications, and produces estimates of changes in land allocation, input usage, and profits.

Task 1 subtasks are:

1. Define at least two infrastructure scenarios for economic modeling (e.g., No Action, 15,000 cubic feet per second (cfs) isolated facility)
2. Receive and interpret CALSIM II runs corresponding to each scenario
3. Refine water demand forecasts to 2060 for urban and agricultural water districts

4. Define amount and cost of urban and agricultural water supply alternatives
5. Calculate end-use impacts and operational changes for various scenarios
6. Calculate the annual and present value of welfare impacts and the range of outcomes over the historic hydrology
7. Define risk factors that may influence results

Task 2. Conduct Economic Assessment of Seismic Risks

An isolated facility may improve water supply reliability in the event of an earthquake in or near the Delta. Such earthquakes have been identified as very likely to occur in the next 30 years and the economic consequences of such an event could play an important role in an overall evaluation of the benefits of an isolated facility.

There is significant uncertainty about the magnitude and location of future earthquakes in the Delta region and the effect of earthquakes on levees. While hydrodynamic models have been constructed to evaluate the water quality and water supply impacts of various combinations of islands failing, it is difficult to develop with any precision formal distributions of various consequences of a Delta earthquake. Further, contingency plans are at present being updated by DWR and these plans may affect the recovery time from a Delta earthquake.

As a result of these various uncertainties, it is prudent to evaluate a few outage durations and use variants of the agricultural and urban impact models described previously to measure economic impacts. Impacts from earthquakes will be modeled under a range of historic hydrologies (the same ones used to model water supply benefits) and at various points in the future under different demand assumptions.

The results of this analysis will be a set of impacts for a range of outage durations in different types of water years (a given earthquake can cause much more economic damage in a dry period than in a wet one). After developing estimates of the probability of various outage scenarios, Contractor will calculate expected losses and characterize the risk inherent in the current system.

This analysis will include updating and using the Delta Risk Management Strategy (DRMS) agricultural models to evaluate Delta export disruption costs for Delta and San Joaquin Valley agriculture.

Task 2 subtasks are:

1. Define two representative outage durations (i.e., 6 months and 18 months)
2. Calculate end use impacts and operational changes based on assumed outages
3. Calculate welfare impacts resulting from urban and agricultural water shortages resulting from seismic events across the historic hydrology
4. Identify risk factors that may influence results

Task 3. Conduct Economic Assessment of Water Quality Improvements

Construction of an isolated facility can have important water quality benefits to both urban and agricultural exporters. Under this task, Contractor will use economic methods to place a value on these water quality improvements.

As with the water supply impacts, the first step in the water quality analysis is to characterize changes in export quality resulting from construction of an isolated facility. Contractor will work with DWR and other agencies, and the Delta exporting agencies, to fully characterize these changes and isolate the ones that are likely to have the greatest economic significance.

Contractor will consider the economic importance of given water quality changes. There are two basic categories of impacts: changes in treatment costs and changes in water user utility. Treatment costs are important for urban agencies and Contractor will work with MWD, Santa Clara and others to understand what changes in treatment may result from higher quality Delta exports, taking into account any blending of Delta supplies that occurs at the local level. Both capital and operating costs will be considered, and present values of changes in costs will be calculated.

With respect to water quality changes experienced by the end user, a distinction will be drawn between urban and agricultural impacts. Urban impacts may result from changes in taste and appearance and also from potential public health impacts. Once the suite of quality changes that may be the most economically significant is determined, Contractor will develop loss functions for various contaminants. (As an example, there are fairly well developed relationships for willingness of urban consumers to pay to avoid salts in their drinking water).

This analysis will include the investigation of treatment cost changes that result from higher quality Delta exports and the development of loss functions for various contaminants.

Additionally, Contractor will coordinate with the hydrologic and water quality modelers to interpret modeling results, coordinate on CALSIM II and DSM2 inputs and assumptions, and properly sequence the results.

Lastly, Contractor will provide and participate in the development of existing water quality economics models and loss functions for salinity contaminants for both urban and agricultural.

Task 3 subtasks are:

1. Define water quality constituents that may affect economic welfare (i.e., salinity)
2. Receive and interpret information on water quality changes under various scenarios
3. Use existing economic models to value changes in salinity of Delta exports
4. Consider available evidence on benefits of other types of water quality changes, especially organics

Task 4. Analyze Public Benefits of Delta Conservation and Restoration

The restoration of the Delta resulting from the BDCP may be highly valued by the public. There are numerous prominent examples in the United States where the public has expressed a willingness to pay for environmental restoration and it is likely that the same would be true of the Delta. Environmental economists have developed a set of techniques to value changes in environmental quality. Under this task, Contractor will apply the tools of this field to gauge the economic benefits to the public as a result of the BDCP.

There are several types of economic benefits that can result from restoration of the Delta ecosystem and recovery of the species dependent on it. Use values are those that relate to actual use of a resource. Examples include values derived from fishing, boating, and other forms of recreation. Nonuse values are those that derive from the mere existence of a resource. While somewhat more controversial with respect to measurement, most economists believe that nonuse values exist and can be significant in some instances.

This benefits analysis will be limited to two types of research: describing and categorizing the main kinds of environmental benefits that would result from the BDCP, and using techniques of benefit transfer to monetize use and nonuse values. Benefit transfer is a widely used technique in environmental economics that entails using the results of prior academic studies to infer ranges of values in a particular location and for a particular type of resource.

To categorize the types of benefits resulting from the BDCP, Contractor will gather information on how the Delta is used at present. Contractor will also assess how these types of uses may be affected by predicted changes in the landscape such as the creation of habitat and changes in water quality within the Delta. The second step in the process, the benefits transfer analysis, will draw on the extensive academic literature in environmental economics to place values on these changes for each of the various uses of the Delta, and for nonuse values. This analysis will identify a range of potential public benefits resulting from the BDCP.

Task 4 subtasks are:

1. Receive and interpret information on changes to recreational resources
2. Gather information on the amount and types of wetlands to be created and restored as part of the BDCP
3. Perform benefits transfer analysis of use and nonuse values resulting in anticipated environmental restoration
4. Describe uncertainties associated with benefits estimates
5. Describe distribution of environmental benefits among water agency customers
6. Assess willingness of urban and agricultural water consumers to pay for environmental benefits in the Delta