MEMO

TO: Michael Thomas
Central Coast Region, California Regional Water Quality Control Board

FROM: Scott Keen and Ron Rimelman
Tetra Tech, Inc.

DATE: November 25, 2002

SUBJECT: Diablo Canyon Power Plant, Construction of Off Shore Intake

Lifecycles of target taxa from the Diablo Canyon Power Plant 316(b) Demonstration Study indicate that organisms vulnerable to entrainment within the facility's existing cooling water system are, in general, species that spawn in near shore areas, have buoyant eggs, and/or planktonic (detached/floating) larvae. A few of the target species do have demersal (sinking) eggs, but those species also have planktonic larvae, subject to the currents and vulnerable to entrainment. This information suggests that positioning of the point of cooling water intake to a deeper, offshore and less biologically productive location could have the beneficial result of reducing entrainment.

Based on a bathymetry map provided by PG&E, Tetra Tech, Inc. and Hatch & Associates, LTD (Hatch) have considered the possibility of relocating/extending the power plant's point of cooling water intake approximately 1,100 feet, out of Intake Cove to a sea depth greater than 60 feet. Such an intake structure would require conduit, anchored to the sea floor, of 1,100 feet. To accommodate the plant's cooling water requirement of approximately 1.7 million gallons per minute and to maintain flow velocities at 4 feet per second, the conduit would have inside dimensions of 10 feet (height) by 100 feet (width).

The conduit considered by Tetra Tech, Inc. and Hatch would be constructed of concrete suitable for a saltwater application. The time to construct such a structure would be approximately 15 months; however, the power plant could continue to generate electricity for much of the construction period. Connection of such a conduit to the existing cooling water intake system could be staged so that only one unit would be off line and not generating at any one time. Although a detailed estimate of lost generating time has not yet been determined, Tetra Tech, Inc. and Hatch estimate that approximately 3 to 6 months of shutdown time per unit to "tie in" the new intake conduit to the existing intake structure will be required. Assuming this activity is timed to coincide with routine maintenance shutdowns, 2 to 5 months of generating capacity per unit would be lost.

Tetra Tech, Inc. estimates an installed cost for a 1,100 foot conduit to be approximately $105 MM. Application of retrofit (1.3), construction (1.65), and regional (1.1) factors, like those applied to capital costs for a fine mesh screen system at the plant, result in a capital cost estimate of $213 MM. With 2 to 5 months of lost generating capacity, the

utility would experience lost revenues of $110 to $274 MM, based on revenue estimates of $900,000 per unit per day.

The net present value of this alternative, assuming a twenty-year project life would be $302 to $455 MM. Annual costs, assuming amortization of capital costs over twenty years would be:

2 months lost generation: $127 MM (1st year) and $17 MM (thereafter)
5 **months lost generation:** $291 MM (1st year) and $17 MM (thereafter)

A twenty-year project life is used based on a twenty-year duration for the facility's operating license, as reported by PG&E. These cost figures do not take into account possible energy penalties due to increased pumping requirements and assume that O&M costs would not increase significantly from current expenditures.

Cost estimates for an extended intake conduit also do not allow for a highly irregular sea bottom, which could require preparation of the sea floor, or in the extreme case, could preclude implementation of such an alternative. It is also possible that the very large cross sectional size of the conduit could be reduced by as much as half. Such a change would increase flow velocity and require that a diffuser of a hundred feet or more be constructed near the existing intake structure to properly reduce velocity. Although a diffuser would be necessary, this change would not increase the estimate of capital costs.

Any further consideration of such an alternative must address the nature of the sea bottom. Are there pinnacles and rocks that would need to be removed, as the conduit needs to be as straight as possible. Also important would be a better understanding of the biology of the sea floor at the new location. Are there other species or populations that would be equally as vulnerable to entrainment as the near shore organisms?