31 July 2008

Final SWRCB OTC Expert Review Panel Responses to Questions Related to "Scoping Document: Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling, SWRCB/CEPA March 2008

Responses summarized by Michael Foster, ERP Project Director, from minutes taken at 8 July 2008 ERP meeting in Sacramento. Primary responses in **bold**.

Current "CEQA Baseline" Impacts and Related Issues

1. *Have current statewide and individual power plant impingement and entrainment mortality been correctly estimated?*

Background: It had been determined by some of the ERP, and stated in some of the public comments, that the estimates in the 2008 Scoping Document were incorrect, in some cases not based on the most current data. ERP member John Steinbeck was tasked with providing a report summarizing the most current and accurate information available in order to update these estimates. The other ERP members are asked to deliberate and comment on Steinbeck's report.

Responses:

A. The primary entrainment data available and reported by Steinbeck are number of fish larvae entrained / flow volume/ individual power plant. Assuming 100% larval mortality, the only "impact" indicated by the data is mortality of larval fish.

B. Fish larval mortality and other biological and oceanographic data can be used in the Empirical Transport Model (ETM) to estimate the percent of the total larvae lost due to entrainment in the volume of ocean water from which the larvae can be entrained. This estimate may also reflect % losses to organisms in sea water that are not sampled in entrainment studies (e.g., invertebrate larvae and other zooplankton, and phytoplankton) and is thus a more comprehensive measure of entrainment impacts. .

C. **The number of fish larvae entrained has been correctly estimated** in the Steinbeck report given the available data. Note there are no data for the Pittsburg and Contra Costa Power Plants given the lack of recent, comprehensive 316b studies at these plants. The Ormond Beach Generating Station datum may be an exception as the Average Larval Fish Concentration (0.0446/m3) seems low. This should be checked.

D. **Adult fish mortality from impingement has been correctly estimated** in the Steinbeck report given the available data.

E. Data on entrainment and impingement mortality to fish eggs, adult and larval invertebrates, and other planktonic organisms are not available or only available from a few facilities, making it impossible to accurately estimate total mortality to all marine organisms from entrainment and impingement. Modeling using ETM, however, could be used to estimate entrainment mortality for these other groups.

1a. For CEQA baseline, is it sufficient to base entrainment impacts only on fish and selected invertebrate larvae? Should other invertebrate meroplankton be considered (and require 200 micron mesh size)? Other groups?

Responses:

A. Question should be reworded: "For CEQA baseline, are entrainment estimates and associated estimates of impacts sufficient to characterize impacts due to entrainment in the state? Can models such as ETM be used to characterize impacts to species not well sampled?"

B. **Overall entrainment impacts on fish larvae can be estimated using larval fish data and ETM modeling.**

C. There are insufficient data to accurately consider meroplankton or other groups. At present general impacts to these can only be estimated using modeling approaches such as ETM.

D. Entrainment effects on species of special interest (e.g., abalone) could be examined in special studies at power plants where these species may be affected. Very few such studies have been done.

1b. Could the I/E be normalized for flow for each of the plants (i.e., I/E per million gallons of flow)?

Response: **Yes for each individual plant but not across all plants due to differences in larval abundance in the water entrained.**

1c. For entrainment, what are the periods/seasons of greatest larval abundance (i.e., greatest potential impact) for each plant or at least per region: southern Calif. coast, southern Calif. bays, central California, and San Francisco Bay/Delta? For impingement, what are the periods/seasons of greatest potential impact for adult fish?

Responses:

A. **Temporal variation in the abundance of fish larvae, determined from power plant entrainment studies and by region is provided in the Steinbeck report.** Similar data for invertebrates are not available, but general estimates could be obtained from the literature for particular species.

B. **Temporal variation in impingement would be very difficult to determine using current sampling methodology.** Seasonality is confounded by numerous factors including the timing of impingement sampling and heat treatments.

1d. In a qualitative way, what are the possible effects of I/E on the ecosystem (e.g., selective removal of certain predatory species from impingement or prey species due to entrainment)?

Response: **There are certainly ecosystem effects but these are impossible to accurately estimate directly or by modeling.** There may be effects on trophic interactions but these are difficult to determine given that both predatory and forage fish are entrained and impinged. Moreover, because of larval dispersal, the effects on adult populations may occur in geographic areas separate from where entrainment occurs.

1e. Is it possible to accurately consider cumulative impacts? Should they be considered?
Responses:

A. **This could be done using ETM based on recent entrainment studies combined with larval dispersal modeling and recently available oceanographic data.** It could be done for the southern California Bight where numerous OTC power plants occur relatively close to each other. A preliminary assessment of OTC power plant cumulative impacts was for the Huntington Beach Generating Station in 2005. The same approach could be used for the San Francisco Bay-Delta if appropriate entrainment studies were available for the Contra Costa and Pittsburg Power Plants.
B. Prior California OTC power plant cumulative impact analyses other than the Huntington Beach study should be used with caution or disregarded because of questionable accuracy.

1f. *Are reference sites needed to accurately determine entrainment and impingement impacts?*
Responses:

A. **Because it is recognized that marine populations subject to entrainment and impingement may already be altered by human activities, including those associated with power plants, it would be difficult if not impossible to find comparable, unaltered (reference) sites to assess the magnitude of alteration.** Moreover, entrainment impacts are likely widely distributed, making it extremely difficult to quantify impacts.
B. It might be possible to assess alteration due to impingement for species with small home ranges by sampling a gradient of similar habitats away from a power plant. It might be possible to assess alterations in more enclosed water bodies using a comparative life history approach.
C. The concept of reference sites (temporal and spatial) is appropriate for assessing the thermal effects from power plant discharges.

2. *Should possible positive impacts of cooling water flow (e.g., increased circulation through areas with low water flow) be considered in the baseline and the impact assessment?*
Background: Some public comments stated that if cooling water flows are eliminated, this might be considered a negative impact. Certain anthropogenic habitats (harbors and shallow canals) may be benefiting from circulation due to OTC. Stagnation may result from the elimination of OTC. The ERP was informed by SWRCB legal counsel that positive effects must be considered in the context of establishing a baseline under CEQA.
Response: Determining the original condition of habitats and benefits to them from power plants may be difficult. **Priority should be given to consideration of options other than power plant flows for maintaining or improving water quality.**

Track II, Calculation Baseline and Related Issues

3. *Should Track II compliance be allowed on a plant basis or units within a plant basis? If on a plant basis could a 90 and 95% or better control (entrainment/ impingement) from baseline be achieved?*

Background: Some public comments indicated that Track II may be feasible with some combinations of conversion to closed cycle cooling and limited use of remaining OTC units as peakers; another example is the potential for use of treated wastewater as a partial replacement for OTC water.

Response: **Track II compliance should be allowed on whatever basis that achieves the required reductions in entrainment and impingement while allowing maximum flexibility in plant operations.** This could be by plant, by intake, or by units within a plant. On a larger scale, it could be by plants in a given area cooperating such that they comply as a group versus individually. Compliance, however, needs to be based on reductions in number of larvae entrained or fish impinged, not just flow, as the number of larvae or adult fish /volume varies among plants, and can vary among units or intakes within a plant as well as seasonally (see Steinbeck report).

Note: There are technological limits on using currently available screens to reduce entrainment such that screening out small life stages (anything that would not be excluded or collected by a < ~ 0.5 mm mesh size) is not possible without affecting flow. If compliance included reducing entrainment of these small organisms, then flow reduction would be the only way to comply.

4. *Should the calculation baseline for Track II be design (currently permitted), actual (and if so, what averaging period), or generational flow? Alternatively, provide a statement about the pros and cons of each approach.*

Responses: The ERP decided to list the pros and cons-

Design flow: Pro - reflects potential entrainment and impingement
Con - entrainment and impingement mortality will be less than if actual flows were used

Actual flow: Pro - better characterizes actual entrainment and impingement and will achieve more reduction in mortality
Con - may not be considered fair for plants that have recently reduced flows
- may decrease state-wide generating capacity during peak demand as plants already at very low capacity may not be able to operate

Note: One ERP member who was not at the 8 July 08 meeting when these questions were discussed has stated that the baseline for Track II should be design flow.

5. *If flow reductions are used to accomplish Track II, should the reduction be based on simply gallons per day, or should it be weighted by considering seasonal larval abundance for that region?*

Response: As indicated in responses to question 3., **reductions should be based on larval abundance, not simply flow, and larval abundance should be weighted (monthly?) based on temporal variation** (see responses to 1b, lc, 3 and 7).

Note: One ERP member was not present at the 8 July 2008 meeting when these questions were discussed. This member previously stated that reductions should be based on simply flow.

6. *Should Track II credit be given for existing control technology (e.g., fish returns) above the EPA baseline (= shore intake with opening at or near surface and 3/4 inch mesh traveling screens oriented parallel to shore)?*

Response: **If California chooses to apply the EPA baseline and credit is given for existing technologies, the effectiveness of the technologies should be demonstrated for each facility using them.** The SWRCB might provide a list of accepted technologies to help reduce debate over what technologies qualify for potential credit. Currently used technologies to reduce impingement include velocity caps and a fish return system (SONGS). Technologies currently used at some facilities to reduce both impingement and entrainment include variable speed pumps and closed cycle cooling.

7. *Should plants operating at very low % capacity factor (e.g., 10%) be limited to a 90% of their design flow, or current permitted flow, whichever is lower?*

Response: **See response to 4.** It is not clear that these plants could continue to operate if actual flow were used. Perhaps with a combination of variable speed pumps and if the reduction were averaged over a permit cycle (~ 5 yrs.). Regulation might be via penalties that escalate with the amount exceeded.

Note: One ERP member suggested it was unlikely that older plants would upgrade with variable speed pumps.

Note: One ERP member pointed out that the proposed Track II compliance is actually ~ 80% reduction, 90% of a 90% effective cooling tower. Another member stated that if flow reductions were set at 80% this would provide a huge reduction in potential OTC impacts and provide industry the necessary flexibility to comply with the new regulations and meet energy needs during peak demand. The 80% level would be especially appropriate if the percentage reduction is based on actual entrainment, not just flow, since this would be difficult for many of the plants to meet especially in southern California where peak demand coincides with periods of peak larval abundance.

7a. *What capacity factor averaging period should be used? 2005, 2005-2007, 2006-2007?*

Background: The Energy Commission comments indicated that 2006 and 2007 are more representative of current conditions and should be added to the next staff report.

Response: **Use the most recent flow period (5 yrs.?) if actual flow is used.** The five year period is consistent with the duration of NPDES permits.

7b. *If flow reductions relative to design flow are used to accomplish Track II for very low capacity factor plants, should these become the absolute allowable flows permitted by Regional Water Boards?*
Response: **Yes** and as mentioned previously, these should be based on entrainment-weighted flows.

7c. *Should the limit be based on daily flow restrictions with seasonal restrictions (i.e., 10% of design MGD but only during allowable seasons), or some other method (monthly maximums during allowable seasons)?*
Background: In this scenario, plants would still be required to reduce impingement by reducing the velocity at the intake (for shoreline intakes) to a maximum of 0.5 feet per second and comply with the interim controls (becoming permanent) and restoration fees. If these plants later decide to opt out of this approach, they would be required to re-power or retrofit with closed cycle cooling on a whole plant basis (i.e., Track I), and the flow restriction would continue until the re-power or retrofit is completed.
Response: **The limit should be based on entrainment-weighted flows over a yearly or perhaps longer period** (see previous responses to similar questions).

8. *For Track II, should the policy require monitoring appropriate to determine percent reductions in mortality?*
Response: **Previous ERP consensus on this issue was yes, but how this would be done depends on what is done for compliance.** For technology, verification that the technology works is required, and this may require monitoring.

8a. *If compliance were by flow reduction, would monitoring of flows be sufficient?*
Response: **Yes**, monitoring by entrainment-weighted flows that will also capture seasonal adjustments where necessary.

8b. *If compliance were with new entrainment or impingement reduction technology (e.g., screens or fish returns), how should I/E compliance be determined?*
Response**: Compliance should be determined in some scientifically acceptable way,** and may include before-after installation measurements, or after measurements made outside versus inside a structure such as a screen. Pilot tests of a technology may be useful, but may not scale up to the full installation.

Interim Controls

9. *What tetrapod exclusion devices should be required to eliminate wildlife impacts? What have power plants (even out of State) currently installed and how effective are exclusion devices at reducing the take of marine life?* **a)** *For offshore intakes can a nine-inch bar spacing be employed with little or no effect on plugging or fish impingement? Would this also exclude large fish?* **b)** *Are there Delta T&E or otherwise protected species that would benefit from exclusion devices? Are plugging or incidental impingement when plugged issues in the Delta vs. marine applications?*

Background: Federal law requires protection of marine mammals, and endangered or threatened species. The NMFS is currently considering an incidental take permit with restrictions, including exclusion devices. While some comments received suggest that only federal wildlife authorities should handle this, the NMFS comments supported the State Water Board's preliminary draft policy. Thirteen facilities have applied for NMFS incidental take permits. Dan Lawson of NMFS has reported that he is considering requiring 18" minimum spacing on offshore intake structures, including SONGS. Public comments indicate that some plants with offshore intakes have recently installed exclusion bars. For example DWP Scattergood has installed bars with 9 in. spacing.

Response: **The Steinbeck report summarizes current tetrapod (as "Mammal Exclusion") exclusion devices currently used at California OTC power plants with offshore intakes. The sizes of tetrapods impinged should be reviewed to determine appropriate spacing (9 or 18 in.). The sizes of threatened or endangered fish impinged at San Francisco Bay-Delta plants should be reviewed to determine if there is a feasible screening technology that could reduce entrainment of these fish.**

Note: One ERP member not present on 8 July 2008 when these questions were discussed has previously stated that regulation of tetrapod impacts should be left up to the NMFS.

9c. *For onshore intakes, can 4-6" spaced trash racks as currently designed be considered adequate exclusion devices? Are modifications necessary to reduce ability of mammals to enter from the bottom?*

Response: **Some tetrapods become trapped between the face of intakes and the bar racks. Further studies are needed to determine if this can be prevented by requiring modifications to intake structures.**

10. *If flow reduction is adopted as an interim control, should the reduction in impacts be evaluated according to yearly flow or as seasonal variation in flow as it interacts with seasonal variation in larval availability?*

Response: **It should be evaluated based on entrainment-weighted flows** (see previous responses to similar questions).

11. *What are the pros and cons involving the restriction of flows to <10% of the permitted flow rate if the plants are not generating electricity for two or more consecutive days?*

Response: **The ERP did not have a response to this question.**

Interim Restoration

12. *If restoration is adopted as an interim control measure, should it be done on a plant-by-plant basis (with companies having responsibility for restoration projects, monitoring and success)?If plant-by-plant, should restoration fully compensate for all impacts? What approach would be used to determine the amount and kind of restoration? (e.g., Habitat Production Foregone?)* ***OR*** *via a mitigation fee based on flow, with the fee going to a restoration committee or State agency involved in coastal restoration? How would the fee*

be calculated (e.g., based on experience with the "going rate" for existing restoration projects plants like Moss Landing or SONGS, possibly converted to flow or MW production)? For example the fee could go to the California State Coastal Conservancy who could decide how best to use that money for coastal restoration, and how to monitor resulting projects.

Response: If restoration is adopted as an interim control measure then, based on experience with determining mitigation on a plant-by-plant basis, **the ERP favors using a mitigation fee based on entrainment-weighted flow.** This fee might best be "pooled" from all power plants and administered by a one institution that collects and allocates funds for projects based on consultation with the Regional Water Quality Control Boards responsible for power plant regulation. The process should include independent technical review of proposed projects and their success. The funds should be used in a timely manner, for mitigation relevant to impacts, as close to the impact as possible while balancing the need for regional planning, and in a way that involves regional stakeholders. The fee should be based on entrainment-weighted flow. The amount of the fee might be based on existing restoration projects, but this requires further discussion.

12a. *Should the existing "restoration /compensation" done at Moss Landing, Huntington Beach and San Onofre Power Plants be counted towards the interim restoration?*

Response: If restoration is adopted as an interim control measure, the answer is **Yes.** Because of restoration/mitigation done by these plants, they should be considered in full compliance with interim restoration.

Note: The ERP was informed by SWRCB staff that, for legal reasons, this restoration cannot be considered as compliance for Track I or II.

Track I

13. . *For Track I, are adverse impacts associated with conversion to closed-cycle cooling adequately considered?*

Response: **No.** The energy penalty may be underestimated (especially during summer), there is no estimate of actual increases in air emissions, and no discussion of impacts of noise, land required for dry cooling, and possible heat trapping during inversions. SWRCB should involve appropriate experts to determine and evaluate adverse impacts associated with closed-cycle cooling.