

RESOLUTION TO UPDATE THE
CALCULATION FOR THE INTERIM
MITIGATION PAYMENTS UNDER THE
WATER QUALITY CONTROL POLICY ON
THE USE OF COASTAL AND ESTUARINE
WATERS FOR POWER PLANT COOLING

FINAL STAFF REPORT

State Water Resources Control Board

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1. OVERVIEW

This Staff Report supports the Resolution to update the calculation for interim mitigation payments for coastal power plants required to comply with the statewide Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling ([Once-Through Cooling or OTC Policy](#)).

On May 4, 2010, the State Water Resources Control Board (State Water Board) adopted the OTC Policy to establish technology-based standards to implement the federal Clean Water Act section 316(b) requirement that the location, design, construction, and capacity of cooling water intake structures reflect the best technology available for minimizing adverse environmental impacts, and to otherwise reduce the harmful effects on marine and estuarine life that are associated with use of cooling water intake structures. The OTC Policy originally applied to 19 power plants. As of January 1, 2024, 12 power plants have achieved final compliance with the OTC Policy and the remaining seven power plants are working towards final compliance.

Marine life is harmed by power plants that withdraw ocean and estuarine waters to cool steam for generating electricity. In the process, aquatic organisms, including larvae and eggs, are harmed each year because organisms are either trapped against screens (impingement) or drawn into the cooling system (entrainment) and are exposed to pressure and high heat. The OTC Policy requires owners or operators of existing power plants to implement measures to offset the interim impacts from impingement and entrainment resulting from the use of cooling water intake structures.

The OTC Policy describes three options for demonstrating interim mitigation, and the eight power plants have selected to comply per OTC Policy section 2.C(3)(b) by providing funding to the California Coastal Conservancy (Coastal Conservancy) and the California Ocean Protection Council (OPC) for appropriate mitigation projects. The OTC Policy defines “mitigation projects” as projects to restore marine life lost through impingement and entrainment by restoring, enhancing, or protecting marine life and coastal marine and estuarine habitats. These projects include restoration of rocky intertidal habitats from Big Sur to San Diego, restoration of wetlands in Ormond Beach and other wetlands in southern California, and funding of implementation and or management of Marine Protected Areas. [Annual reports](#) from the OPC and the Coastal Conservancy with details on funded projects are posted on the [interim mitigation webpage](#). The State Water Board, the OPC, and the Coastal Conservancy have initiated discussion of revising the [Memorandum of Understanding](#) that was entered into by the three agencies in 2016 to update the guidelines on use of mitigation funds and project selection with consideration of public comments and input from tribes.

On August 18, 2015, the State Water Board adopted [Resolution No. 2015-0057](#) (2015 Resolution), which describes the procedures for calculating the interim mitigation

payments by summing three components: an entrainment payment, an impingement payment, and a management and monitoring payment. The 2015 Resolution also authorized the Executive Director of the State Water Board to approve, on a case-by-case basis, mitigation measures that power plant owners or operators shall undertake to comply with the interim mitigation requirements of the OTC Policy.

Updating the interim mitigation payment calculation will ensure the payments reflect more recent data and current economic conditions. The previous analyses on costs of mitigation projects were conducted first in 2012 (ERP II Report), again in 2015 when costs were updated to 2015 dollars, and most recently in 2017 when the site-specific cost for entrainment for Diablo Canyon Nuclear Power Plant (Diablo Canyon) was evaluated. The revision in the Resolution is necessary because costs of mitigation projects have increased in recent years and new information on existing mitigation projects is available to update the costs for entrainment and impingement. This revision accounts for available information on estimated and actual costs of mitigation projects to date in 2023 dollars. This revision also accounts for fluctuating inflation rates.

The updated calculation will likely be applied to the 2022-2023 interim mitigation period (covering impacts from October 1, 2022, to September 30, 2023).

The Resolution would result in the following updates to the interim mitigation payment calculation:

- The annual escalator for inflation would be either three percent or the California Consumer Price Index for urban consumers (CPI-U) annual percent change reported by the [California Department of Finance](#), whichever is greater.
- The annual escalator for inflation would be applied to impingement costs. An inflation escalator is currently only applied to entrainment costs.
- Revise the default cost for entrainment.
- Discontinue the site-specific cost for entrainment and apply the default cost for entrainment for Diablo Canyon.
- Revise the default cost for impingement.
- Establish a site-specific cost for impingement for Diablo Canyon.

Table 1: Cost comparisons between the most recent cost multipliers and the changes to interim mitigation calculation.

	As of 2021-2022 interim mitigation period	Starting 2022-2023 interim mitigation period
Default cost for entrainment	\$5.65 per million gallons	\$12.51 per million gallons
Site-specific cost for entrainment for Diablo Canyon	\$4.64 per million gallons	Not applicable
Default cost for impingement	\$0.80 per pound	\$102.73 per pound
Site-specific cost for impingement for Diablo Canyon	Not applicable	\$33.46 per pound

Based on average intake volume and pounds of fish impinged at each power plant, the revisions will increase the interim mitigation payments by an additional \$82,500,000 through 2030, or approximately \$12,000,000 annually.

2. OTC POLICY INTERIM MITIGATION REQUIREMENTS

Per Section 2.C(3) of the OTC Policy, owners or operators must implement measures to offset the interim impingement and entrainment impacts resulting from the use of cooling water intake structures. The interim mitigation requirements commenced on October 1, 2015, and continue up to and until the owner or operator achieves final compliance with the OTC Policy. The OTC Policy offers the following options for compliance with the interim mitigation requirement:

- Section 2.C(3)(a): Demonstrate compensation for the interim impingement and entrainment impacts through existing mitigation efforts.
- Section 2.C(3)(b): Provide funding to the Coastal Conservancy and the OPC for mitigation projects that restore and enhance coastal marine or estuarine habitats, including projects that protect marine life in existing marine habitats.
- Section 2.C(3)(c): Develop and implement a new mitigation project for the facility to compensate for interim impingement and compensation impacts.

The owners and operators of the seven power plants currently required to implement interim mitigation measures have selected to comply via the option described in Section 2.C(3)(b) of the OTC Policy.

In 2012, the State Water Board contracted with Moss Landing Marine Laboratories to establish an Expert Review Panel (ERP II) on minimizing and mitigating intake impacts on marine life from power plant and desalination facility seawater intakes. The ERP II developed a scientifically defensible method to calculate interim mitigation payments, using the Habitat Production Foregone (HPF) method (also known as Area of Production Foregone or APF) as required by the OTC Policy, that would compensate for

interim impingement and entrainment impacts due to once-through cooling intakes. The HPF method calculates the area of habitat that would need to be created to compensate for loss of resources, such as larval fish, due to entrainment. The ERP II submitted its [final report](#) (ERP II Report) with findings, which were used as the basis for the interim mitigation calculation method set forth in the 2015 Resolution.

In accordance with the 2015 Resolution, the State Water Board calculates the interim mitigation payments annually for each power plant over a 12-month period beginning each October 1. The interim mitigation calculation is comprised of three components: an entrainment payment, an impingement payment, and a management and monitoring payment. The entrainment calculation is based on the volume of OTC water used during the annual interim mitigation period multiplied by the cost for entrainment. The default cost for entrainment determined by the ERP II is used for all power plants except Diablo Canyon, which uses a site-specific cost for entrainment. Both the default cost for entrainment and the site-specific cost for entrainment for Diablo Canyon are adjusted to account for inflation using a three percent annual escalator. The impingement calculation is based on the pounds of fish impinged during the annual interim mitigation period and the average indirect economic value of the fisheries. The management and monitoring payment is calculated by taking twenty percent of the sum of the entrainment and impingement calculations.

Power plant owners and operators submit annual payments directly to the OPC and the Coastal Conservancy to fund appropriate mitigation projects as described in the OTC Policy. The State Water Board does not collect any payments.

3. CALCULATION REVISIONS

In 2023, the OPC, in consultation with the State Water Board, contracted with Dr. Peter Raimondi to re-evaluate the costs of mitigation projects and to consider updating the calculation for the interim mitigation payments. Dr. Raimondi participated in the ERP II and, hereafter, Dr. Raimondi and supporting members will be referred as Expert Review Team. The Expert Review Team considered actual costs of mitigation projects and impacts through 2022. Refer to Table 3, 4, and 5 of the Expert Review Team's final report "Recommendations to Update the Interim Mitigation Cost Calculation for Once-Through Cooling Intake Use Leading to Marine Life Entrainment and Impingement" (2023 Expert Review Report) for data used to determine recommendations. The following revisions to the interim mitigation calculation are based on considerations of the findings and recommendations in the 2023 Expert Review Report.

Inflation Escalator for Entrainment and Impingement

With the adoption of the 2015 Resolution, the annual inflation escalator was set to three percent. State Water Board staff submitted a proposal to Dr. Raimondi on alternative sources for an inflation escalator to best reflect the state's inflation rate at the time of the

impacts of impingement and entrainment. The Expert Review Team supports the staff recommendation, which is to:

- Set the annual escalator to three percent or the California Consumer Price Index for urban consumers (CPI-U) annual percent change, which is reported by the California Department of Finance ([Calendar Year averages: from 1950](#)), for the latter year of the respective interim mitigation period (January 1 to September 30), whichever is greater.

The Expert Review Team provided another recommendation to apply the non-building construction cost index to estimate increases in the cost of mitigation. However, State Water Board staff recommends the CPI-U be used as the source of the inflation escalator as it is derived from a government source and publicly available. The recommended source for the non-building construction cost index is not easily accessible to the public, not guaranteed to be updated annually, and does not indicate if findings are peer-reviewed.

Additionally, the application of the inflation escalator to the impingement component was unintentionally excluded from the 2015 Resolution. The Expert Review Team recommends the inflation escalator be applied to both the entrainment and the impingement components. The values of the cost multipliers listed in Table 1 and Table 2 have been adjusted to account for inflation. As such, the annual inflation escalator will not be applied to the cost multipliers until the 2023-2024 interim mitigation period.

Entrainment

The method used to analyze a compensatory cost from entrainment impact (i.e., based on the intake volume) remains unchanged from the method used to determine costs in the ERP II Report and as adopted in the 2015 Resolution.

The Expert Review Team recommends continuing to use the HPF method coupled with the empirical transport model (ETM) and available mitigation costs to determine the updated cost for entrainment in 2023 dollars. As the required method described in the OTC Policy, the HPF method determines the compensatory amount of habitat that would produce or replace the resources lost due to entrainment impact. The empirical transport model calculates proportional mortality of aquatic species due to entrainment and the area where entrained individuals come from. The relationship between the two models allows the attribution of a monetary value for compensatory mitigation to produce or replace resource loss of wetland and reef habitats based on the entrainment impact from the power plant intake structures. The equation below is used to determine the entrainment component of the interim mitigation payment:

$$\text{Entrainment} = \frac{\text{Default or Site Specific Cost of Entrainment}}{\text{Million Gallon (MG)}} \times \text{Annual OTC Intake Volume}$$

The Expert Review Team recommends applying the median value (50th percentile) of the analysis as the most appropriate estimate of the mean (average) cost to create habitat that could compensate for the loss of marine life from entrainment. However, the update to the default cost for entrainment is based on applying the upper 95th percentile value. The median value provides certainty that only 50 percent of mitigation projects would be sufficiently funded, whereas the 95th percentile provides greater certainty that interim mitigation payments will fully fund the large majority of mitigation projects and more fully compensate for entrainment by the OTC power plants.

Default Cost for Entrainment

The update to the default cost for entrainment is \$12.51 per million gallons (MG) of intake water. The default cost for entrainment derives from the upper 95th percentile value of the Expert Review Team's findings using a Default-Common Habitat approach (Table 1a in 2023 Expert Review Report) that consists of the rate per MG of intake water applicable to all facilities relative to creating or replacing resource loss from both habitat types with available data (wetland and rocky reef habitats). The cost of mitigation projects for both wetland and rocky reef habitats is appropriately applied to all power plants' cost for entrainment because marine organisms commonly affected by entrainment are planktonic (small sized, larval stage, or bacteria) and come from a broad geographic area.

Cost for Entrainment for Diablo Canyon Nuclear Power Plant

Diablo Canyon has unique conditions that differ from the other power plants, such as high intake volume, low intake velocity, and the surrounding rocky reef habitat. The State Water Board previously approved a site-specific cost for entrainment for Diablo Canyon based on two technical memoranda in 2017 submitted by Tenera Environmental and reviewed by Dr. Peter Raimondi. Consistent with the requirements in the 2015 Resolution, the two technical memoranda provided sufficient data to determine a site-specific cost for entrainment. The Expert Review Team offers values for updating the site-specific cost for entrainment for Diablo Canyon using the Default-Specific Habitat approach (Table 1b in 2023 Expert Review Report), that consist of the rate per MG of intake water applicable to all facilities and the cost to create (or replace) resource loss from rocky reef habitats. However, due to the high amount of water intake and related high levels of entrainment at Diablo Canyon, and because entrained marine life is usually planktonic and more widely distributed geographically (e.g., not primarily limited to species found in the adjacent rocky reef habitat), the default cost for entrainment is a better estimate of compensatory mitigation costs than the site-specific cost. Therefore, the update to the interim mitigation calculation for Diablo Canyon discontinues the use of the site-specific cost for entrainment and applies the default cost for entrainment.

Impingement

The HPF/ETM model used for entrainment is not recommended to analyze compensatory cost for impact by impingement primarily due to the differences in types

and life stages of organisms impacted. Entrained organisms are likely to be planktonic with no mechanism to avoid intake structure, while impinged organisms are likely juvenile and adult fish that are representative of a portion of the total species impacted by operations of the power plant's once-through cooling system. Therefore, volume of intake would not be the appropriate metric to analyze compensatory cost for impact. The difference in analyses is the conversion of the HPF method to cost per pounds from cost per acre of habitat creation required to replace loss from impact, rather than coupling with the ETM model. The primary factors for this analysis are the fish biomass density (pounds per acre), the cost per acre of mitigation, and cost information in 2023 dollar values.

The study used to determine cost for impingement for the 2015 Resolution incorporated the indirect economic impact of resources loss due to impingement mortality. The State Water Board agrees with the Expert Review Team that the basis of habitat creation due to resource loss due to impingement is more appropriate. The Expert Review Team analyzed two primary habitats surrounding the power plants using once-through cooling, wetland and rocky reef, and recommended the use of the average costs of these two habitats for the default cost for impingement. The equation below is used to determine the impingement component of the interim mitigation payment:

$$\text{Impingement} = \frac{\text{Default or Representative Habitat Cost of Impingement}}{\text{Pound (lbs.)}} \times \text{Annual lbs. of Fish Impinged}$$

Default Cost for Impingement

The update to the default cost for impingement is \$102.73 per pound of fish impinged. The default cost is the average of the upper 95th percentile values for the two types of habitats (Table 2 in 2023 Expert Review Report). The significant increase is due to having a better estimate of the cost per acre of habitat to compensate for impingement compared to the analysis for the 2015 Resolution, which was solely based on an economic analysis conducted for Huntington Beach Generating Station. The Expert Review Team assessed the average pounds of fish per acre from measured average biomass density in wetland and reef habitats based on several available sources and a review of impingement for coastal power plants in California. Additionally, use of the upper 95th percentile provides greater certainty that interim mitigation payments will fully fund the large majority of mitigation projects and more fully compensate for impingement at the OTC power plants. Finally, the increase is also due to calculating the cost information in 2023 dollar values.

Site-Specific Cost for Impingement for Diablo Canyon Nuclear Power Plant

The update to the site-specific costs for impingement for Diablo Canyon is \$33.46 per pounds of fish impinged, which is consistent with the Expert Review Team's recommendation. The impingement cost for Diablo Canyon derives from the median value of the Expert Review Team's findings based on the Site and Habitat Specific

approach (Table 2 in 2023 Expert Review Report) because Diablo Canyon has a low intake velocity, which results in low impingement, and is primarily surrounded by rocky reef habitat. The Expert Review Team found that biomass density is greater in reef habitats than in wetland habitats. The Expert Review Team also found lower costs per acre of mitigation for reef habitats than wetland habitats (Table 4 in the 2023 Expert Review Report) and acres per MG of intake water (Table 3 in the 2023 Expert Review Report).

Management and Monitoring

The management and monitoring component is a component of interim mitigation payments to ensure compensatory success and mitigation is achieved. The management and monitoring component will remain unchanged at twenty percent of the sum of the entrainment and impingement costs. The equation below is used to determine the management and monitoring component of the interim mitigation payment:

$$\text{Management and Monitoring} = (\text{Entrainment Payment} + \text{Impingement Payment}) \times 20\%$$

4. DELEGATION OF AUTHORITY TO EXECUTIVE DIRECTOR

The 2015 Resolution directs, in cases where the entrainment costs are calculated to be greater than \$6.50 per million gallons, the Executive Director to bring these cases before the State Water Board for approval. The revised default cost for entrainment already exceeds this value and is expected to continue increasing, and the site-specific cost for entrainment for Diablo Canyon is expected to surpass the \$6.50 cost threshold described in the 2015 Resolution. If the applied inflation escalator is the minimum value of three percent through the 2030-2031 interim mitigation determinations, the default cost for entrainment would be over \$15 per MG. Therefore, staff recommends the threshold cost for case-by-case approval by the State Water Board be 140 percent of the estimated 2030 entrainment cost, which equals \$22.50 per MG, to allow for varying inflation rates applied to the calculation.

5. CALIFORNIA ENVIRONMENTAL QUALITY ACT CONSIDERATIONS

The Resolution to update the calculation used to determine annual interim mitigation payments for owners and operators complying with Section 2.C(3)(b) of the OTC Policy does not constitute an action with the potential to cause a direct physical change to the environment or to result in a reasonably foreseeable indirect change to the environment and, therefore, is not a project requiring review under the California Environmental Quality Act (CEQA). The Resolution does not create a new rule or regulation that would require the need for environmental review under the California Code of Regulations Title

14, Section 15187. State Water Board regulations governing CEQA do not apply when the State Water Board determines that the activity is not subject to CEQA. (Cal. Code Regs., tit. 23, § 3720, subd. (d).)

6. REFERENCES

California Department of Finance. Consumer Price Index: Calendar Year averages: from 1950. <https://dof.ca.gov/forecasting/economics/economic-indicators/inflation/>

Foster, M.S., G.M. Cailliet, J. Callaway, P. Raimondi, and J. Steinbeck. 2012. Mitigation and fees for the intake of seawater by desalination and power plants. https://www.waterboards.ca.gov/water_issues/programs/ocean/desalination/docs/erp_intake052512.pdf

Raimondi, Peter. August 23, 2017. Technical Memorandum on Diablo Canyon Nuclear Power Plant Draft Determination. https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/diablo_canyon/docs/techmemo_raimondi.pdf

State Water Resources Control Board (State Water Board). 2015. Resolution No. 2015-0057. Sacramento, CA: State Water Board. https://www.waterboards.ca.gov/board_decisions/adopted_orders/resolutions/2015/rs2015_0057.pdf

Steinbeck, John (Tenera Environmental). April 26, 2017. Revised Proposed Calculation for Site-Specific Interim Mitigation Fee for Diablo Canyon Power Plant (DCPP). https://www.waterboards.ca.gov/water_issues/programs/ocean/cwa316/powerplants/diablo_canyon/docs/revised_tenera_memo.pdf