

## **Proposed Subcommittee Comments on Bechtel's Assessment of Alternatives to Once-Through-Cooling for Diablo Canyon Power Plant<sup>1</sup>**

### **Recommendations Overview**

The Subcommittee of the Review Committee for Nuclear Fueled Power Plants (the Subcommittee) finds that there is no basis for an exemption from the once-through-cooling (OTC) Policy for Diablo Canyon Power Plant (Diablo Canyon). Based on the special study on alternatives to OTC for the state's nuclear facilities, the Subcommittee concludes that closed cycle cooling is a viable technology that could ensure Diablo Canyon's compliance with the state's OTC Policy. While there is a wide range of estimated costs associated with the closed cycle cooling technology, the Subcommittee believes that the only definitive way to determine the costs of retrofitting Diablo Canyon is for the utility to competitively bid the project with appropriate risk management and performance terms.

The fine mesh and wedge wire screen technologies assessed in the study do not appear viable despite having lower costs. There are serious questions regarding the effectiveness of the screens in reducing entrainment and impingement impacts. In addition to being ineffective in reducing marine impacts to the level necessary to meet the OTC Policy, the screen technologies are likely to face significant challenges in dealing with the level of debris loading anticipated at the site. The wedge wire screen technology faces the additional challenge that there has been no industrial experience at scale with this technology. At a minimum, several years of expensive research, development, and pilot testing would be necessary to prove out the concept, and the outcome is not likely to be successful.

In order to give the utility and its regulators sufficient time and appropriate information to make the best decision regarding relicensing, the Subcommittee recommends that Water Board make compliance with the Track 1 of the OTC Policy a condition for relicensing rather than requiring adoption of a date certain on the current license. This will allow consideration of the economic, safety, and environmental implications of closed cycle cooling and other viable cooling options at Diablo Canyon along with all of the other important considerations associated with relicensing of the plant, including seismic issues and the economics of aging reactors.

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<sup>1</sup> These comments were prepared by a Subcommittee of the Review Committee for Nuclear Fueled Power Plants consisting of representatives from the California Energy Commission, California Public Utilities Commission, the Center for Energy Efficiency and Renewable Technologies and the Alliance for Nuclear Responsibility.

## Introduction

In October, 2010, the State Water Resources Control Board (the Water Board) adopted its OTC Policy to address ongoing marine impacts from the use of coastal and estuarine waters for power plant cooling in the state. The OTC Policy is a technology-based standard that will address the adverse effects associated with these cooling water withdrawals without disrupting the critical needs of the state's electricity system. The OTC Policy applies to 19 existing power plants, including two nuclear plants, at which the intake flow rate must be reduced to the level attained by a closed-cycle wet cooling system.

The OTC Policy requires special studies, conducted by an independent third party, for the state's two nuclear-fueled power plants, Diablo Canyon and San Onofre Nuclear Generating Station (SONGS).<sup>2</sup> The special studies are designed to "investigate alternatives for the plants to meet the policy's requirements." The Review Committee for Nuclear Fueled Power Plants (Review Committee) oversaw the studies and was asked to submit comments on the ability of these plants to achieve compliance, the cost of compliance, and potential environmental impacts of compliance. A Subcommittee consisting of four representatives serving on the Review Committee has prepared these comments to the Water Board.<sup>3</sup>

The Subcommittee comments discuss the following issues:

- The process for completing the technical studies on alternatives to OTC for nuclear plants.
- The importance of reducing marine impacts from Diablo Canyon, the single largest user of marine and estuarine waters for power plant cooling.
- The viability of alternative cooling options, including closed cycle cooling at Diablo Canyon, to meet the OTC Policy and their associated costs and environmental impacts.
- The need to consider OTC requirements for Diablo Canyon in the context of the other issues that will affect its operation beyond its current operating licenses.

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<sup>2</sup> The assessment of alternatives to OTC for SONGS was discontinued after Southern California Edison (SCE) made the decision to permanently close the facility in June, 2012. Continued OTC withdrawals are needed to meet critical safety requirements associated with operation of the on-site spent fuel pool, but they have been reduced by 96% since October 1, 2013 and the plant is now in compliance with the OTC Policy.

<sup>3</sup> The Subcommittee limited its' members to four in recognition of the Bagley-Keene Open Meetings Act, which requires a public meeting when a quorum of the Review Committee members meets. The Subcommittee was unable to incorporate comments from other Committee members as a public meeting was not within the Water Board's scheduling considerations.

## **Review Committee Oversight of Special Studies**

The Review Committee was convened by the Water Board and composed of representatives from the state and regional agencies, utilities, and the environmental community.<sup>4</sup> The Water Board selected Bechtel Power Corporation (Bechtel), based on a solicitation conducted by PG&E and SCE, to serve as an independent third party with nuclear plant engineering experience to perform the study.

The Nuclear Committee met 16 times in publicly noticed meetings beginning on March 2011. Several organizations provided comments and input at these open meetings including the Natural Resources Defense Council, Heal the Bay, Surfrider Foundation, Friends of the Earth (FOE) and Diablo Canyon Independent Safety Committee (DCISC). The Final Phase 1 Reports on Diablo Canyon Power Plant and SONGS were posted for public comment in November, 2012. The second phase of the study for SONGS was discontinued due to SCE's decision to permanently close the facility in June, 2012 and OTC withdrawals have been reduce by 96%. The Phase II Draft Report on Diablo Canyon was posted for public comment in September, 2013.

The first phase of the study assesses the viability of eight potential technologies to meet the OTC Policy that were indentified in the Review Committee's Scope of Work.<sup>5</sup> These technologies were assessed against a set of evaluation criteria, which included whether the technology was first of a kind to scale, operability, impingement/entrainment design, environmental impacts, seismic and tsunami, structural, construction, and maintenance issues. In a second phase of the assessment, technically feasible technologies were then reviewed in more detail, which included developing preliminary designs, evaluating costs and schedules, and conducting a nuclear specific assessment.

In November, 2013, after release of Bechtel's preliminary cost estimates, Friends of the Earth (FOE) requested that the Review Committee hold a public meeting so they could present an evaluation of Bechtel's cost and schedule estimates. Based on the input from FOE and other parties, along with Bechtel's responses to the FOE comments, the Review Committee requested that Bechtel assess the costs of a potentially less expensive salt water cooling system located within the existing footprint of the plant, even though it would delay the completion of the project.

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<sup>4</sup> Members of the Review Committee included representatives from the Water Board, the California Coastal Commission, the California Energy Commission, the California Public Utilities Commission, the Central Coast Water Quality Control Board, the San Diego Regional Water Quality Control Board, Pacific Gas and Electric, Southern California Edison, Alliance for Nuclear Responsibility and the Center for Energy Efficiency and Renewable Technologies.

<sup>5</sup> *Scope of Work Report by the Review Committee to oversee Special Studies for the Nuclear Fueled Power Plants Using Once through Cooling*, Review Committee for Nuclear Fueled Power Plants, November 7, 2011.

## Diablo Canyon OTC impacts

Diablo Canyon, with a design flow of 2.5 billion gallons per day (BGD) and an average flow of 2.3 BGD from 2000-2005, is responsible for nearly one third of the combined average withdrawals of all OTC power plants (7.9 BGD) for the same period.<sup>6</sup> As the environmental document for the OTC Policy states: “The consensus among regulatory agencies both at the state and federal levels is that OTC systems contribute to the degradation of aquatic life in their respective ecosystems.”<sup>7</sup> The Water Board notes that these OTC systems, many of which have been in operation for 30 years or more, present a considerable and chronic stressor to the state’s coastal aquatic ecosystems by reducing important fisheries and contributing to the overall degradation of the State’s marine and estuarine environments.<sup>8</sup>

Over the course of a year, billions of fish eggs and larvae are removed from coastal waters, or entrained, as they are drawn through the cooling systems of power plants. In addition, millions of adult fish are lost due to impingement when they are trapped against screens meant to exclude larger objects from entering the cooling system. The accepted premise among industry and regulatory agencies is that the number of organisms entrained is more or less proportional to the water volume withdrawn through the intake structure.<sup>9</sup> Reduced intake flow is also assumed to reduce the impingement rates.<sup>10</sup> Due to the large withdrawals of seawater on a continuous basis at Diablo Canyon, an estimated 1.5 billion larvae are entrained and 710 pounds of fish are impinged annually.<sup>11</sup>

The Water Board staff considered whether the nuclear facilities should be exempted from the OTC Policy and concluded that the impacts of OTC operation at nuclear facilities, including Diablo Canyon, “have not been sufficiently addressed such that they can be considered compliant with Section 316(b)’s technology-based mandate.”<sup>12</sup> They further note that excluding the nuclear facilities would ignore a significant portion of all OTC related impingement and entrainment losses in the state’s coastal aquatic communities. One of the major benefits of the premature closure of SONGS is an over 90 percent reduction in OTC damages to the waters surrounding the reactors. That leaves Diablo Canyon as the state’s largest contributor to OTC impacts.

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<sup>6</sup> *Water Quality Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling: Final Substitute Environmental Document*, State Water Resources Control Board, May 4, 2010, p. 33, Table 2, Estimated Annual Entrainment.

<sup>7</sup> *Ibid.* p. 29.

<sup>8</sup> *Ibid.* p. 1.

<sup>9</sup> *Ibid.* p. 60.

<sup>10</sup> *Ibid.* p. 60.

<sup>11</sup> Diablo Canyon is a base load power plant that is run at close to the maximum output for long periods of time except during scheduled outages for refueling or forced outages.

<sup>12</sup> *Ibid.* p. 51-52.

## **Evaluation of Alternatives to OTC**

Bechtel determined that inshore mechanical intake fine mesh screens and offshore modular wedge wire screens, as well as five variations of closed cycle cooling systems (except for wet cooling using seawater for makeup) were technically feasible for Diablo Canyon.<sup>13</sup> A discussion of the design issues for the alternative options (including a nuclear-specific assessment) and their potential environmental impacts, along with the costs and schedules for implementing the different options is presented below.

### ***Wedge Wire and Fine Mesh Screens***

#### **Design Considerations**

For the onshore mechanical fine mesh screen technology, six of the existing flow-through mesh traveling screens (10 ft by 30 ft with 9.5 mm mesh) at Diablo Canyon would be replaced with dual flow traveling screen with smooth woven mesh with 1-6 mm rectangular slots. Fine mesh screen technology only reduces the through screen velocity from 1.95 fps to 1 fps, while the OTC Policy requires a through-screen velocity of 0.5 fps. Bechtel indicated that for both screen technologies the potential for debris loading favors large screen slot sizes, while small slot sizes are needed to provide entrainment and impingement benefits.

The offshore modular wedge wire screen system involves 30 screens that are 8 ft by diameter and 35 foot long, with a 6 mm slot size.<sup>14</sup> The existing water intake cove would be closed to form a shoreline basin and a new 1000 ft. circulating water conveyance would be needed from the basin to the ocean.<sup>15</sup> A tunnel that is 30-32 feet in diameter would be constructed using a tunnel-boring machine. The open sea oceanography at Diablo Canyon is difficult for such a project with high waves, wind and rainfall along with kelp and algae production.

The DCISC raised several concerns about the screen technologies related to Bechtel's conclusion that no Nuclear Regulatory Commission (NRC) license amendment request (LAR) is likely to be needed for the two options evaluated.<sup>16</sup> The DCISC concluded that "this assessment is questionable for the offshore, modular wedge wire system, because this option requires the installation of a new, safety-related stop-log system in the plant

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<sup>13</sup> Wet cooling with salt water was initially eliminated by Bechtel based primarily on their assumption that limited PM 10 credits in the regional air quality district would preclude this option. This premise was later challenged and a salt water cooling option was subsequently evaluated by Bechtel.

<sup>14</sup> A 1 mm slot size would require 48/ 8 ft wedge wire screens.

<sup>15</sup> Bechtel examined both a buried pipeline and tunnel options and selected the tunnel option because it was less expensive.

<sup>16</sup> Letter to Jonathan Bishop, State Water Resources Control Board from Per R. Peterson, DCISC, September 5, 2013, Appendix A, p. 4-5.

intake cove,” which they believe will “certainly require a NRC LAR.” The DCISC found that Bechtel’s conclusion that no LAR would be needed “might be correct for the inshore fine-mesh screening system option, because this option involves the least extensive modifications to the plants.”

#### Potential Environmental Impacts

The Review Committee requested that Tenera Environmental conduct an assessment of the impingement and entrainment impacts of screens to approximate potential reductions for target organisms to help evaluate their feasibility. Unfortunately, the analysis revealed that the screen technologies would be much less effective in reducing impingement and entrainment than initially identified in Phase I assessment.<sup>17</sup> The results of the Tenera Study are presented in the Table 1 below.

**Table 1. Tenera Study Results – Average Percent Reduction in Mortality**

Slot Size	0.75 mm	1 mm	2 mm	3 mm	4 mm	5 mm
Average Percent Reduction	53.7 %	39.7 %	8.4 %	1.0 %	0.1 %	0.0 %

The Tenera report, which was based on the results of head capture analysis, indicated that mesh or slot openings larger than about 3 mm would result in very little reduction in population-level mortality.<sup>18</sup> For Diablo Canyon, Bechtel concluded that there is very little reduction in entrainment for any mesh or slot openings larger than about 1mm due to the generally smaller size of the larvae entrained there. Bechtel viewed this as a significant shortcoming for the screen alternatives.

The construction of the tunnel for water conveyance for the wedge wire screen option will pose major construction impacts, which appear to be the biggest potential environmental impact. There would be significant spoils from the excavation that would have to be put somewhere (the specific amount or where it would be placed is not identified in the report).

The placement of the wedge wire screens may require temporary offshore platforms or barges and may cause localized turbidity impacts from disruption of the local sea bed. Assessing the balance of the wedge wire system construction impacts to the sensitive and productive marine habitats versus its ability to further reduce impingement impacts

<sup>17</sup> *Length-Specific Probabilities of Screen Entrainment of Larval Fishes Based on Head Capsule Measurements, In support of California State Water Resources Control Board Once-Through Cooling Policy for Nuclear Fueled Power Plant Special Studies*, Tenera Environmental, Revised July 31, 2013.

<sup>18</sup> A short-coming of the analysis is that there are no water column data for the environment offshore of Diablo Canyon where the wedge wire screens would be located.

will address one of the primary environmental concerns. The placement of the fine mesh screens may result in minor onshore environmental impacts during construction.

### ***Closed Cycle Cooling Towers***

#### **Design Considerations**

Bechtel evaluated five alternative closed cycle cooling systems including:

- Passive draft dry/air cooling would require four metal hyperbolic towers approximately 590 feet in diameter and 590 feet high.
- Mechanical (forced) draft dry/air cooling would require four towers approximately 1,200 feet long, 100 feet wide, and 100 feet high.
- Wet natural draft cooling requires two hyperbolic natural draft towers approximately 590 feet in diameter and 590 feet high.
- Wet mechanical (forced) draft cooling would require two circular concrete cooling towers approximately 542 feet in diameter and 180 feet high.
- Hybrid wet/dry cooling would require two circular concrete towers similar to the wet mechanical (forced) draft cooling towers approximately 576 feet high and 180 feet in diameter.

Bechtel found that dry cooling technologies require minimal make-up water to account for system leaks/losses once the system is initially charged and would not require as much land as the wet cooling alternatives. Wet cooling technologies for Diablo Canyon would require 33,100 GPM of make-up water to compensate for evaporation, blowdown, and drift losses. Make-up water could be obtained from a combination of a new on-site desalination plant and processed reclaimed water obtained from the surrounding communities. Bechtel notes that to access local wastewater sources would require at least 20 miles of new pipeline for each source. However, even before the current water crisis, the City of Morro Bay and San Luis Obispo admitted that they have very limited waste water that could be used and appear unlikely to commit water supplies for Diablo Canyon.<sup>19</sup>

One of the more costly aspects identified in the evaluation of the closed cycle cooling systems was Bechtel's determination that there was insufficient area within the existing

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<sup>19</sup> Letter from Rob Livick, PE/PLS, Public Services Director/City Engineer, City of Morro Bay, to Review Committee for Nuclear Fueled Power Plans, October 22, 2013. Letter from Carrie Mattingly, Utilities Director, City of San Luis Obispo, to Review Committee for Nuclear Fueled Power Plants, October 9, 2013.

power plants footprint to accommodate cooling towers.<sup>20</sup> As a result, they determined that the mountain immediately north of the plant power block would need to be leveled to 115 feet to accommodate major structures such as towers, a new pump house, and a desalination plant. The leveled area required would be approximately 62 acres for two cooling towers and 109 acres for four cooling towers. The excavation quantities for the two-tower option would be 190 million cubic yards, while the four-tower option would be 317 million cubic feet.<sup>21</sup>

The DCISC concluded that Bechtel's assessment that no LAR would be needed for the various closed cycle cooling options is incorrect, noting the very extensive modifications that have the potential to affect the operability of the safety-related system both during and following construction. The DCISC concludes that potential undesirable interactions of major modifications would require a detailed design review by NRC.

#### **Potential Environmental Impacts**

Bechtel identified potentially significant visual impacts from the cooling towers, biological impacts to upland and riparian habitats, and land use issues associated with the closed cycle cooling options. The air-cooled towers would have no visible plume, while the wet cooling towers would generate visually intrusive, unabated plumes. Bechtel suggests that the lower profile plume abated hybrid wet/dry cooling towers could mitigate some visual concerns. Fugitive dust from earthwork and concrete activities associated with construction of the cooling towers is expected to be significant. Potentially significant diesel and gasoline engine air emissions are also expected during construction.

For towers using fresh or reclaimed water, no potential air quality issues were identified beyond those during construction. However, Bechtel concluded, based on previous studies, that a saltwater wet cooling system would generate PM-10 in excess of the emission reduction credits available in the San Luis Obispo Air Pollution Control District.

#### ***Bechtel Cost Estimates for Alternatives to OTC***

Bechtel presents cost estimates for the alternative technologies based on their proprietary estimating process, which includes costs from other power plants, capital improvements, and engineering projects, as well as requesting cost bids from suppliers. Bechtel also provides estimated schedules for total permitting and construction period for the various options.

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<sup>20</sup> FOE notes that Bechtel budgets \$3.3 billion primarily to remove the mountain to make space for the cooling towers and desalination plant.

<sup>21</sup> For comparison purposes, the construction of the Panama Canal required the excavation of about 200 million cubic feet of material. [http://en.wikipedia.org/wiki/Panama\\_Canal](http://en.wikipedia.org/wiki/Panama_Canal)



FOE filed a letter on November 21, 2013 stating that: “Bechtel cost estimate is not credible due in substantial part to the selection of a steep and cost-prohibitive site chosen for the cooling towers.”<sup>22</sup> FOE argued that a saltwater cooling tower located in the south parking lot area would result in much lower costs, citing previous studies that had concluded that there was sufficient space for cooling towers. In addition, FOE argued that Bechtel had eliminated salt water cooling, premised on the faulty assumption that PM-10 credits would not be available. The Review Committee requested that the Water Board staff work with FOE and Bechtel to specify a lower cost option for saltwater closed cooling system located on the southern portion of the existing plants site. The Review Committee also requested that the Water Board staff contact the San Luis Obispo Air Quality Management District regarding the availability of PM-10 offset credits. The Subcommittee finds no basis for excluding the salt water cooling from further consideration.

The cost and schedules prepared by Bechtel are presented in Table 2 below.

**Table 2. Summary of Technology Cost and Schedule<sup>23</sup>**

Technology	Cost in Millions	Schedule Duration in Years
<b><i>Closed Cycle Cooling</i></b>		
<b>Mechanical (Forced) Draft Dry/Air Cooling</b>	<b>\$10,200 - \$14,134</b>	<b>13</b>
<b>Passive Draft Dry Air Cooling</b>	<b>\$10,104 - \$14,045</b>	<b>13</b>
<b>Wet Mechanical (Forced) Draft Cooling</b>	<b>\$8,567 - \$11,647</b>	<b>14</b>
<b>Wet Natural Draft Cooling</b>	<b>\$10,185 - \$14,112</b>	<b>14</b>
<b>Hybrid Wet/Dry Cooling</b>	<b>\$8,654 - \$11,723</b>	<b>13</b>
<b>Salt Water Wet Mechanical Cooling<sup>24</sup></b>	<b>\$7,483 - \$7, 505</b>	
<b><i>Screen Technologies</i></b>		
<b>Onshore Mechanical Fine Mesh Screening</b>	<b>\$346 - \$438</b>	<b>8</b>
<b>Offshore Modular Wedge Wire Screening</b>	<b>\$456 - \$602</b>	<b>10</b>

<sup>22</sup> *Comments on September 2013 Bechtel Phase 2 Final Technologies Assessment for Alternative Cooling Technologies at Diablo Canyon Power Plants*, November 18, 2013, Dr. Peter Henderson and Dr. Richard Seaby, PISCES Conservation Ltd, Lymington, England and Bill Powers, P.E., Powers Engineering, San Diego, California, p. 13.

<sup>23</sup> *Alternative Cooling Technologies or Modifications to the Existing Once-Through Cooling System for the Diablo Canyon Power Plant (Draft)*. Bechtel Power Corporation, December 13, 2013, p. 8

<sup>24</sup> Cost estimates for the salt water cooling system are presented in the Bechtel Draft Addendum, which has not yet been publicly released. *Draft Addendum to Alternative Cooling Technologies or Modifications to the Existing Once Through Cooling System*, July 2, 2014, Table 6.3-2 and 6.6-3, p.37-38.

The closed cycle cooling options, which will fully meet the OTC Policy, range from a low of \$7,483 million for salt water cooling to a high of \$14,134 for passive draft dry air cooling. The costs for the screen technologies, while substantially lower than costs of closed cycle cooling would not achieve the impingement and entrainment reductions at Diablo Canyon and as a result should not be considered a viable alternative to OTC.

### ***Comparison of Cost Estimates for Wet Cooling Towers***

FOE provided cost estimates from two additional studies on the cost of the closed cycle wet cooling option on the existing power plant footprint. This provided a comparison of Bechtel's cost estimates with other studies as shown in Table 3 below.<sup>25</sup> The PG&E cost estimates are about half the Bechtel estimate, while the TetraTech estimates are about 1/6 the estimates prepared by Bechtel. At a minimum, the disparity in the different cost estimates is a good indicator of the high level of uncertainty about project costs.

**Table 3. Comparison of Cooling Tower Cost Elements**

Technology	Bechtel <sup>26</sup> (\$ millions)	PG&E (\$ millions)	TetraTech (\$ millions)
1) Site Work, Excavation, Retaining Walls	3,632	325	213
2) Demolition, replacement (buildings, roads, etc.)	N/A	316	219
3) Recirculating/make-up water pumps, tunnels, etc.	506	298	
4) Permitting, engineering, management, security	370	269	See #11
5) Cooling towers	272	242	61
6) Electrical systems, process/instrumentation, etc.	133	199	16
7) Worker transport, commute wages, parking	21	189	N/A
8) Upgrades – condensers, sewage treatment, SCW	See #2	131	26
9) Blowdown water treatment, mixing station, diffuser	See #2	56	See #3
10) Plant shutdown and start-up	N/A	56	N/A
11) Indirect costs and contingency	3,480	614	360
Total Construction Costs	8,414	2,689	895
Replacement Power Costs	1,493	614	360
TOTAL PROJECT COST	9,907	4,489	1,622

<sup>25</sup> *Comments on September 2013 Bechtel Phase 2 Final Technologies Assessment for Alternative Cooling Technologies at Diablo Canyon Power Plants*, November 18, 2013, Dr. Peter Henderson and Dr. Richard Seaby, PISCES Conservation Ltd, Lymington, England and Bill Powers, P.E., Powers Engineering, San Diego, California. p. 25-26.

<sup>26</sup> The Bechtel estimates used by FOE in this comparison were early estimates from the September 20, 2013 Draft Report that were subsequently increased in the Draft Final Report.

In developing cost estimates, it appears that achieving cost savings in designing alternatives was not one of the criteria Bechtel used. This may explain to some degree the much larger Bechtel cost estimates when compared with previous studies. Bechtel described how they used “accepted guidelines and criteria” during the study “to identify the *best technical location without regard to cost* to site cooling towers for the closed cycle cooling options.”<sup>27</sup> Bechtel also concluded that the “southern area is not the *optimal* location for the tower.”<sup>28</sup> Another of Bechtel’s criteria for the placement of towers was “proper spacing to obtain *best performance*.” From these examples it appears that Bechtel’s estimates are based on designs that reflect ideal conditions. In reality, retrofitting an existing site not originally designed for the retrofit is by definition anything but ideal. It seems reasonable to assume that some level of cost reduction could be achieved for the different options without risking the safety and reliability of the plant. One sure way to determine costs would be for PG&E to conduct a competitive bid for the project with appropriate risk management and performance terms as determined with concurrence by the CPUC.

### **Other Considerations Affecting Diablo Canyon**

The Water Board should be aware that the question of whether PG&E moves forward with retrofitting Diablo Canyon to comply with the OTC Policy is part of a larger discussion regarding relicensing of the facility. Some will argue that the cost of compliance with the OTC Policy is so great that Diablo Canyon should be exempted from the OTC policy altogether, suggesting that a decision by the Water Board to require Diablo Canyon to comply with the same requirements as the other OTC power plants in California will make it cost-prohibitive to operate Diablo Canyon beyond its current licenses. Some parties, such as NRDC, believe that it is essential that the nuclear plants comply with the OTC policy and that the Bechtel study not be used to develop an explanation as to why Diablo Canyon cannot comply.<sup>29</sup> Others, such as A4NR, will argue for retirement timed with the expiration of the current licenses, not just because of the costs for OTC compliance but for a number of other issues that will affect Diablo Canyon, largely associated with seismic issues.

Ultimately, the decision about retrofitting Diablo Canyon with closed cycle cooling will be part of the relicensing decision made by the CPUC and the NRC. The CPUC recently identified a number of issues that must be addressed by PG&E prior to seeking any

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<sup>27</sup> Handout from December 18, 2013 Review Committee Meeting entitled *Bechtel – Cooling Tower Location*. See [http://www.swrcb.ca.gov/water\\_issues/programs/ocean/cwa316/rcnfpp](http://www.swrcb.ca.gov/water_issues/programs/ocean/cwa316/rcnfpp)

<sup>28</sup> Ibid.

<sup>29</sup> Letter from NRDC to Review Committee for Nuclear Fueled Power Plants RE: Comments on the Final Interim Technical Assessment Report for SONGS and Diablo Canyon Nuclear Power Plants, January 23, 2013.

requests for ratepayer funding of relicensing activities.<sup>30</sup> Diablo Canyon is nearing its fourth decade of operation and as an aging nuclear facility faces a number of challenges. Several nuclear plants in the U.S., including the SONGS, are being retired early some for purely economic reasons and others based on excessive costs of repair.<sup>31</sup> Aging plants face increasing non-fuel O&M costs, greater risk of outages, which across the nation have become more frequent and of longer duration, and competition from lower cost, less risky alternatives. In addition, over the years concerns have been raised over Diablo Canyon's potential vulnerability to seismic events. There are seismic issues including the hazards posed by multiple fault zones (and their interconnectivity) within the vicinity of Diablo Canyon including the Hosgri, Shoreline, San Luis Bay, Los Osos and Irish Hills zones of faulting and the possibility of an earthquake directly beneath the plant. The CPUC intends to do a thorough evaluation of the overall economic and environmental costs and benefits of a license extension for Diablo Canyon including seismic issues.

## Conclusions

The Subcommittee finds that there is no basis for an exemption for Diablo Canyon from the OTC Policy. Based on the information presented above, the closed cycle cooling options are viable alternatives to OTC for Diablo Canyon and should be considered with other viable cooling options. While the costs for closed cycle cooling are highly uncertain, there is no doubt about the viability of closed cycle cooling in meeting the OTC policy. As a consequence, Diablo Canyon should be required to meet the same standards set forth in the OTC Policy for the other OTC plants under Track 1.<sup>32</sup> It appears that salt water mechanical draft cooling located on the existing footprint of the plant presents the least costly alternative. However, there are significant logistical challenges that will need to be overcome for any of the closed cycle cooling options.

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<sup>30</sup> Letter from Michael R. Peevey, President CPUC, to Christopher Johns, President of PG&E, February 19, 2014.

<sup>31</sup> See: <http://www.nytimes.com/2013/06/15/business/energy-environment/aging-nuclear-plants-are-closing-but-for-economic-reasons.html>;  
<http://thebulletin.org/nuclear-aging-not-so-graceful>;  
<http://www.nytimes.com/2012/10/24/business/energy-environment/economics-forcing-some-nuclear-plants-into-retirement.html>.

<sup>32</sup> Track 1 of the OTC Policy requires an owner or operator of an existing power plant to reduce the intake flow rate at each unit, at a minimum, to a level commensurate with that which can be attained by a closed cycle cooling system. OTC Policy, Section 2.A (1).