OTC Special Studies Draft Scope

Objective

The objective of this document is to satisfy the requirement established by the State Water Resources Control Board (SWRCB) for Southern California Edison (SCE) and Pacific Gas and Electric (PG&E) to jointly create a scope document containing criteria to be used by an independent third-party engineering consultant to conduct evaluations to assess compliance alternatives to once-through cooling for the San Onofre Nuclear Generation Station (SONGS) and the Diablo Canyon Nuclear Power Plant (DCPP).

Background

The SWRCB's "Statewide Water Control Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling" (herein referred to as "the Policy") contains unique provisions for the state's two existing nuclear-fueled power plants that use once-through cooling water technology, SONGS and DCPP.

The Policy provisions require the owner or operator of a nuclear facility to undertake "special studies" to investigate alternatives for the facility to meet the Policy requirements. The Policy requires the establishment of a Review Committee (Review Committee for Nuclear-fueled Power Plants—RCNFPP) to oversee the special studies. The eight-member Review Committee includes representatives from affected state agencies, the nuclear plant owners, the environmental community, and staffs of the State Water Board, appropriate Regional Water Boards, and an IPP lobbying organization.

The Review Committee was convened by the Executive Director of the State Water Board (as required by the Policy) to oversee the special studies, which will investigate ability, alternatives, and cost for SONGS and DCPP to meet the Policy requirements.

The special studies review will be conducted by an independent third party with sufficient experience and expertise within the state of California directly related to nuclear power plant design, engineering, construction, licensing, environmental permitting; scope, cost and scheduling, and other requisite qualifications that ensure all significant areas related to the special studies technologies are rigorously addressed.

Consultant Criteria

In order to ensure that an independent third party has the appropriate qualifications
NOTE: Is there any "independent third party" who is not an industry consultant/affiliate? Any third party who consults or contracts with the nuclear industry would presumably have a business conflict of interest, even if the consultant does not work for PG&E or SCE. A nuclear industry consultant is not likely to come to a conclusion that PG&E or SCE don't like. The "conflict of interest" question probably only goes to actual conflicts (i.e., the third party does work for PG&E or SCE), not to business/reputational conflicts.

to be considered for completing this scope of work, a consultant criteria list was developed by representatives from PG&E and SCE. The list included the following:

- Do We Have A Current Contract With Them?
- Are They a USA/STARS Supplier? (cooperative of nuclear plant operators)
- Do They Have a California Presence?
- Could There Be a Conflict of Interest?
- Do They Have Relevant Design Experience?
- Do They Have Relevant Build Experience?
- Specifically, Do They Have Relevant Cooling Tower Experience?
- Specifically, Do They Have Relevant Cooling Tower Alternatives Experience?
- Do They Have Relevant Environmental Experience?
- Specifically, Do They Have Relevant §316(b) Experience?
- Do They Have Relevant Project Management Experience?
- Do They Have Relevant Nuclear Experience?
- Do They Have Contemporary DCPP or SONGS Experience?

Criteria Checklist Guidance for Feasibility Determination

The decision-making process is a systematic approach to ensure that all impacts of each conceptual technology are identified and assessed for feasibility. Every criterion for each conceptual technology must be determined to be clearly feasible for the technology to be considered feasible as a whole. To reach a conclusion of feasibility, the independent third party performing this assessment must clearly and comprehensively demonstrate and document the basis for such a conclusion, and not rely on a perception or suggestion that it is possibly feasible.
NOTE: "clearly feasible" may mean an assumption that alternative technologies are "infeasible" unless proven otherwise through "comprehensively" demonstrated documentation. Likewise, this is a very, very high burden – and combined with likely industry consultant bias (see above), almost certainly will lead to a finding that alternative technologies are not feasible.

"Not feasible," for purposes of this work product, will be defined as it is in the Policy; that is, "Cannot be convincingly demonstrated to be accomplishable due to any of the following: space constraints or the inability to obtain necessary permits due to public safety considerations, unacceptable environmental impacts, local ordinances, regulations, and other criteria in the Criterion Checklist included herein."

CRITERION

GENERAL TECHNOLOGY ASSESSMENT CRITERION:

1. FIRST OF A KIND TO SCALE Ensure that the proposed technology is commercially obtainable and has been demonstrated in a commercial nuclear power plant-scale proven
   NOTE: Does this even exist? The answer seems ascertainable a priori

   application considering the unique nature of the site settings and physical characteristics; particularly from the perspective of cooling tower retrofit or alternative cooling retrofit. Concept-only or laboratory-scale technologies that cannot be directly evaluated through existing industrial operational experience cannot be determined to be feasible.

2. EXTERNAL APPROVAL AND PERMITTING (NON-NUCLEAR LICENSING) All external organizations other than the Nuclear Regulatory Commission (such as the California Coastal Commission, local Air Pollution Control District/AQMD with jurisdiction, etc.) that must approve the technology installation project have been identified. The process for obtaining the approval has been identified. There is reasonable assurance, either by correspondence (preferred) or verbal agreement, that formal approval of the potential project will be successful. Consider site specific topographical constraints, including plant site and adjacent land ownership, use, and control issues.

3. OPERABILITY GENERAL SITE CONDITIONS Assess operability and operational issues to determine if it can be comprehensively and convincingly demonstrated
   NOTE: Again, seemingly unattainable burden of demonstration

   that the proposed technology change is acceptable/feasible to operate in site specific environmental conditions. Assessment should consider such issues as existing cooling source water conditions including currents, temperature ranges, occurrence of detrimental ocean storm/high-swell conditions, range of water column debris loading conditions, and marine biofouling concerns.

4. IMPINGEMENT/ENTRAINMENT DESIGN Determine the feasibility in the effectiveness of the technology to reduce cooling water impingement and entrainment losses, either alone or in combination with another technology, to the levels required for compliance with Track 2 of the Policy (i.e. 83.7% reduction of impingement and entrainment of marine life for the facility). Evaluate the potential or probability that reduction in one detrimental cooling water use impact would likely be offset by an increase in another impact with known or unknown consequences (i.e. plant entrainment reduction through screening technology application could result in significantly increased impingement losses).

NOTE: The example here is a red herring because there really are not entrainment screening technologies (that would increase impingement); the organisms we're talking about are too small to screen. The only technologies to address entrainment impacts are alternative systems – wet recirculation towers, cooling ponds, air cooling, hybrid wet/dry systems

5. OFFSETTING ENVIRONMENTAL IMPACTS Evaluate the potential the technology installation would create additional and/or offsetting detrimental environmental impacts.
NOTE: In San Luis Obispo, industry will likely argue that it cannot get the necessary air credits – the Moss Landing gas plant made precisely this argument.

   Specifically, the assessment should consider impacts beyond water quality issues (i.e., significant increases in facility air emissions would result in order to achieve reductions in source cooling water withdrawals, etc.)

6. SEISMIC ISSUES Assess if the proposed technology could reasonably be constructed and operated in a seismically active zone, and/or what specific seismic upgrades or requirements must be considered. (i.e. could natural draft cooling towers effectively be installed when considering the seismic characteristics of the plant site)
NOTE: Same thing – more ways out of the policy…the added irony is that if it would be unsafe to build a new cooling system at the plants, what does this say about the existing seismic surety and footprint at the nuclear sites?

7. STRUCTURAL Identify the critical loading conditions and determine that there is reasonable assurance that new structures and impacts to existing structures can be accommodated during a detailed design phase of the technology.

8. CONSTRUCTION Ensure that a conceptual technology installation design is sufficiently detailed to determine that fabrication, required access and availability of space for installation and staging activities, installation, and associated physical modifications to the plant can be accomplished.

9. MAINTENANCE Identify maintenance activities to ensure that the design will not create a personnel hazard, and/or an unrealistic (non-commercially viable) operational maintainability burden.

   NUCLEAR SPECIFIC ASSESSMENT CRITERION:

10. LICENSING NUCLEAR SPECIFIC Perform a 10CFR50.59 feasibility assessment to determine whether approval by the Nuclear Regulatory Commission (NRC) would be required. Scope the Nuclear Design Change Criteria that must be considered and addressed to develop a comprehensive and complete Operating License Amendment Request (LAR). Assess the potential, and consider what reasonable assurances may exist, that the proposed change will be approved by the NRC.
NOTE: Advance assurance of future approval? Impossible standard. And many unknowns regarding NRC policy, particularly in relation to seismic requirements, is impossible at this time due to ongoing post-Fukushima evaluations, the NRC timeline for which is still much in dispute.

11. SEISMIC NUCLEAR SPECIFIC Identify all seismic issues and determine if there is reasonable assurance that all aspects of seismic design and potential seismic interaction with Seismic Category I structure systems and components (SSC's) can be addressed in the detailed design phase. Potential

impact on plant reliability for a seismic event that is less than the design basis earthquake must be considered.

12. OPERABILITY NUCLEAR SPECIFIC Assess if operation of the technology at the plant site would potentially increase nuclear unit trip risks, and/or design or operational issue that must be addressed to ensure additional risks are not realized. Assessment should consider, but not be limited to, issues such as reliability of main and auxiliary electrically transmission systems, reliability of emergency diesel generator systems, potential for increased corrosion and degradation of plant equipment and control systems, and potential for plant flooding (i.e. resulting from elevated cooling system configurations).

13. TRANSIENT ANALYSES Perform a transient analysis to assess plant impacts considered in the design to determine if all impacts have been explicitly identified and are appropriately conservative to determine plant impact and response to the transients.

14. NUCLEAR FUEL (ACCIDENT ANALYSES) Perform a feasibility assessment of the UFSAR Accident Analyses and determine that the impact due to the proposed design change is acceptable.

15. SINGLE FAILURE Identify Updated Final Safety Analysis Report (UFSAR) Single Failure Analyses issues and determine that there is reasonable assurance that these are acceptable.

16. HYDRAULIC DESIGN Identify impacts to hydraulic designs and ensure that sufficient analysis has been performed to determine that the systems will function within sufficiently conservative design parameters.

17. PROBABILISTIC RISK ASSESSMENT Identify Probabilistic Risk Assessment issues and determine their acceptability.

18. INSTRUMENTATION, CONTROLS, AND ALARMS Ensure that conceptual design is sufficiently detailed to determine what instrumentation, controls and alarms are required. Ensure that the proposed instrumentation, controls and alarms can be installed, provide adequate monitoring and are acceptable to support safe, correct and efficient operation of the units.

19. DETAILED COST AND SCHEDULE Produce a detailed cost and schedule, required as part of any major project, to be used as additional criteria to provide reasonable assurance of project feasibility.

Scope of Work

The selected independent third party will conduct a detailed evaluation to determine feasibility based on detailed criteria of each technology, on a site specific basis, based on their independent assessment. Prior studies are provided for reference and made available for review by the independent third party. The independent third party must clearly document the basis on which any portion of these prior studies are used in any way as part of their independent and comprehensive assessment of feasibility.

Evaluation Process

The criteria checklist will be used in such a manner as to afford the special study independent party an opportunity to conduct an efficient assessment process. The technology assessment should progress in two distinct phases. The general assessment criterion list provided should be considered first. Those technologies that are determined not feasible due to failure to meet the entire general criterion should not be considered for further, more detailed assessment.

NOTE: Only one of 19 criterion not met means "not feasible" and technology is eliminated—this represents and unfair and unreasonable criteria. IF this same standard were applied to nuclear power plant design, nuclear power would itself fail as an entity.

The nuclear specific assessment criterion should only be evaluated in the event a technology clearly and comprehensively has been demonstrated feasible in the initial phase.

The criteria checklist for each technology therefore may not need to have every item evaluated. Additionally, for certain technologies, all criteria in the initial assessment (general criteria) may also not need to be evaluated to reach a conclusion the technology is not feasible for a specific site.

NOTE: Therefore, when we get to no. 3 on the list and find it cannot be met, we don't have to do any further assessment? How does this process lend itself to a thorough and complete evaluation?

The check list will be previewed for each technology, and an agreement established with the independent party as to an organized, efficient and systematic approach conducive to an optimized cost and schedule approach. A single point of contact from each utility will assist in this preview.

Reports, Evaluations and Documents

For each facility, review and assess the following documents, reports and regulatory agency evaluations:

- San Onofre Nuclear Generating Station (SONGS) Appendix A
- Diablo Canyon Power Plant (DCPP) Appendix B

Conclusions

Each technology's conceptual design must be determined to be completely feasible for installation and operation at either DCPP or SONGS per the complete Feasibility Determination Criteria Checklist, if not, then it is by default determined to be not-feasible. Determination regarding the available technologies which are not-feasible for either facility shall not be considered for further evaluation by the RCNFPP or the SWRCB.

NOTE: This confirms the entire tenor of the prior five pages. The default is "not-feasible" and the burden to prove otherwise, by a consultant who likely wants to stay in the good graces of the industry, is extremely high – almost like "beyond a reasonable doubt," except that the jury is biased against conviction.

Deliverables

There are two distinct types of deliverables for this effort; progress reports and a final work product.

Progress reports are required bi-monthly and/or after any single technology evaluation has been fully completed. Progress reports necessitate detailed status, schedule updates, and identification of barriers to completing evaluations as expected.

The final work product is to be provided in both written and electronic report format, with supporting references that sufficiently and succinctly address the feasibility of each of the technologies evaluated for each facility. Due to the plausible dissimilarities between each unit's operating designs and sitings, opportunities for possible misperceptions will be avoided by producing an individual detailed report addressing each facility. An executive summary will be produced describing the overall conclusion of the special study for each site. This will include a tabular listing of all the technologies evaluated with a corresponding determination of feasible or not-feasible for implementation.

Individual summary evaluations of each technology feasibility assessment and associated conclusions will also be provided. This will include a tabular listing of the entire criteria check list items evaluated with a corresponding determination of feasible, not-feasible, or not evaluated for each. Include or reference relevant supporting information from existing technology feasibility assessments, and any additional application specific assessments conducted in support of the determinations. A 'not evaluated' determination is appropriate/applicable to criteria after a not-feasible determination is assessed for any one of the criteria on the check list.

Technologies to be Evaluated

Evaluation will be limited to the following industrial technologies as addressed in the reports and evaluations listed for each nuclear site:

1) Closed-Cycle Cooling Systems (Cooling System Retrofit)
   a) Passive Draft Dry / Air Cooling System
   b) Mechanical (Forced) Draft Dry / Air Cooling System
   c) Hybrid Wet (*) / Dry Cooling System (Evaporation Enhanced Dry Cooling Radiator System)
   d) Wet (*) Natural Draft Cooling Tower System
   e) Wet (*) Mechanical (Forced) Draft Cooling Tower System
      i) Surface freshwater or groundwater resources
      ii) Reclaimed freshwater resources

   (*) For wet closed-cycle cooling systems, evaluate site-specific makeup water restrictions for evaporative or blow-down loss replenishment. Determine any primary dependency on a specific makeup water source, i.e. seawater or freshwater. Evaluate the general availability of freshwater resources in proximity to each plant. The assessment shall include availability of any infrastructure that would be necessary to deliver sufficient freshwater (if such sources exist).

2) Inshore mechanical (active) intake fine mesh screening systems. Include site specific screen sizing requirements. Assess probable operational efficacy of an installed fine mesh screening system:
   - Structural survivability and reliable operability in site-specific environmental conditions.
   - Probable/Potential screened marine organism impingement survivability and subsequent viability.
   - Probable operational issues associated with screen loading (debris accumulation and/or differential pressures).

3) Offshore modular wedgewire or similar exclusion screening systems. Include site specific screen sizing requirements. Assess probable operational efficacy of installed wedgewire screening arrays or similar system:
   - Evaluate site specific current regimes (reliable currents necessary for successful screen back-flushing operations).
   - Structural survivability and reliable operability in site-specific ocean and environmental conditions.
   - Probable/Potential screened marine organism impingement survivability and subsequent viability.
   - Potential operational issues associated with offshore screening array reliability (fouling control and thru flow).

4) Initial intake relocation; offshore intake (DCPP), shoreline intake (SONGS).
5) Deep water offshore intake (point of initial intake to piping/conveyance systems).
6) Variable speed cooling water pumping systems.
7) Source water substrate filtering/collection systems
   a) Shoreline (beach) sand well collection system
   b) Benthic substrate filtration collection system

APPENDIX A

Note: Nuclear Review Committee Chair provided preference for newer (last decade) study information & documents.

San Onofre Nuclear Generating Station (SONGS)

Reference Documents Provided in Chronological Order:

1) *Final Report of the Marine Review Committee to the California Coastal Commission*, MRC Document 89-02, August 1989. (http://marinemitigation.msi.ucsb.edu/documents/MRC_reports/final_report/mrc-final-rpt_to_ccc.pdf)

2) Southern California Edison Company's (SCE) coastal development permit for the San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 (permit no. 6-81-330A, formerly 183-73).

3) *Comprehensive Demonstration Study for Southern California Edison's San Onofre Nuclear Generating Station* Final Report, January 2008.

4) *California's Coastal Power Plants: Alternative Cooling System Analysis*. Tetra Tech Inc., February 2008. Chapter-7 Facility Profiles, Section N. San Onofre Nuclear Generating Station [Pages N-1 through N-42]. (*Report Independently Prepared for the California Ocean Protection Council*)

5) *Feasibility Study for Installation of Cooling Towers at San Onofre Nuclear Generating Station*. Enercon Services Inc., September 2009.

Additional Relevant Documents for Consideration:

Assessment of Marine Review Committee Recommendations for SONGS Units 2 and 3, prepared by PLG, Inc. (formerly Pickard, Lowe, and Garrick) as part of a multi-year study by the independent Marine Review Committee (MRC), February 1990.

Issues Analysis of Retrofitting Once-Through Cooled Plants with Closed-Cycle Cooling California Coastal Plants, Electric Power Research Institute [EPRI], 2007
Substantial for San Onofre Section B.15 & General Technologies Info; DCPP Only Brief w/References Section 6.3.2.

Preliminary Costs and Benefits of California Draft Policy on the Use of Coastal and Estuarine Waters for Power Plant Cooling, prepared by NERA Economic Consulting, September 2009

APPENDIX B

Note: Nuclear Review Committee Chair provided preference for newer (last decade) study information & documents.

Diablo Canyon Power Plant (DCPP)

Reference Documents Provided in Chronological Order:

1) Diablo Canyon Power Plant Cooling 316(b) Demonstration Report. Tenera Environmental Services, 2000. Section 6.0 Evaluation of Alternative Intake Technologies [Pages 6-1 through 6-36].

2) Evaluation of Cooling Systems Alternatives, Diablo Canyon Power Plant. Tetra Tech Inc., 2002. (*Report Independently Prepared for the Central Coast Regional Water Quality Control Board*)

3) Feasibility of Retrofitting Cooling Towers at Diablo Canyon Power Plant Units 1 & 2. Burns Engineering Services Inc., 2003.

4) Staff Testimony for Regular Meeting of July 10, 2003 Pacific Gas and Electric Company's (PG&E's) Diablo Canyon Power Plant Renewal of NPDES Permit. Central Coast Regional Water Quality Control Board (CCRWQCB), 2003. [Pages 1-18].

5) California's Coastal Power Plants: Alternative Cooling System Analysis. Tetra Tech Inc., 2008. Chapter-7 Facility Profiles, Section C. Diablo Canyon Power Plant [Pages C-1 through C-40]. (*Report Independently Prepared for the California Ocean Protection Council*)

6) Feasibility of Installation of Closed-Cycle Cooling Towers at the Diablo Canyon Power Plant. Enercon Services Inc., 2009.

Additional Relevant Documents for Consideration:

Assessment of Alternative Intake Technologies for the Diablo Canyon Power Plant, Tera Corp., 1982.
Older Comprehensive Study Used as Reference in All Primary Listed Documents

Issues Analysis of Retrofitting Once-Through Cooled Plants with Closed-Cycle Cooling California Coastal Plants, Electric Power Research Institute [EPRI], 2007
Substantial for San Onofre Section B.15 & General Technologies Info; DCPP Only Brief w/References Section 6.3.2.