C. Alternatives

Section C provides an overview of the alternatives screening process and the methodologies used when considering or eliminating an alternative based on CEQA criteria. This section is organized as follows: Section C.1 describes the CPUC's approach to the Applicant's proposed options to the Proposed Project; Section C.2 provides an overview of the alternatives screening process; and Section C.3 describes the methodology used for alternatives evaluation. Section C.4 describes the alternatives that have been retained for full EIR analysis; full impact analysis for these alternatives is located in the specific issue area chapters in Section D of the Draft EIR. Section C.5 presents the alternatives that were eliminated from EIR analysis and explains why they were eliminated, and Section C.6 describes the No Project Alternative.

PG&E proposed several options for the Proposed Project in its January 2004 Proponent's Environmental Assessment. During the scoping process (see Section I), the general public and government agencies did not offer any specific alternatives to the Proposed Project other than various alternatives for the No Project Alternative. After thorough research of the Proposed Project information and visits to DCPP and the surrounding area, the EIR preparation team developed and analyzed all possible alternatives to the Proposed Project. Other than what PG&E had proposed in its PEA and an Offsite Disposal Alternative (described in Section C.4.5), the EIR preparation team did not identify any additional alternatives that were technically feasible and would reduce the impacts of the Proposed Project. These conclusions were reached using CEQA Guidelines Section 15126.6(b) that states that consideration of alternatives should focus on those that are feasible and are capable of reducing or avoiding significant effects of the Proposed Project. As described in Section C.1 below, all options that PG&E identified in its PEA, which are not studied as part of the Proposed Project, were ultimately brought forward in this document as alternatives to the Proposed Project.

C.1 Applicant Proposed Options

In its January 2004 PEA, PG&E identified a number of options to various phases of the Proposed Project, many of which include only minor changes in location or scope. PG&E asked the CPUC to evaluate all of these options as part of the Proposed Project, rather than as alternatives. PG&E also asked the CPUC to approve all of these options as part of the Proposed Project.[1] PG&E has requested that the analysis be conducted in such a manner so that it would have future flexibility in selecting the appropriate option in coordination with the steam generator installation contractor. However, in order to fulfill the intent of the CEQA process and present a clear environmental analysis in the EIR, the CPUC asked PG&E to identify a preferred option for each phase of the project. The preferred options thus constitute the Proposed Project for the purposes of this EIR, and the other options are evaluated as alternatives.

In a November 22, 2004 response to a CPUC Data Request, PG&E identified its preferred option for RSG offloading and transport routes, temporary storage areas (TSAs), and OSG Storage Facility location areas (PG&E, 2004). These preferred options have been incorporated into the description in Section B (Project Description) of this report. The remaining options that were not preferred are considered alternatives and are detailed in Section C.4.2 through C.4.5. Table C-1 identifies the PG&E-proposed options that are identified as alternatives to the Proposed Project.

[1] This approval would occur in the CPUC general proceeding on PG&E's Application for the DCPP Steam Generator Replacement Project (A.04 01 009). Consistent with the purpose of CEQA, this EIR evaluates the Proposed Project and Alternatives carried through for full analysis in order to identify an Environmentally Superior Alternative.

Table C-1. PG&E Proposed Options Carried Forward as Alternatives in this EIR

PG&E Option	Proposed Project Alternative	Description/Location
Replacement Steam Generator Transport		
Intake Cove	RSG Offloading Alternative	Delivery of RSGs to the Intake Cover at DCPP
Replacement Steam Generator Staging and Preparation		
Option #2	TSA Alternative A	In Parking Lot 7
Option #3	TSA Alternative B	In Parking Lot 8
Option #4	TSA Alternative C	Modification of existing warehouse north of Parking Lot 1 and small portion of Parking Lot 1
Original Steam Generator Removal, Transport, and Storage		
Option #1	OSG Storage Facility Location Alternative A	In northeast corner of 500 kV switchyard
Option #3	OSG Storage Facility Location Alternative B	Northeast of intersection of Reservoir Rd. and Skyview Rd.
Option #4	OSG Storage Facility Location Alternative C	Adjacent to Skyview Rd. at intersection with Reservoir Rd.
Option #5	OSG Storage Facility Location Alternative D	Adjacent to Reservoir Rd. at intersection with Skyview Rd.

Source: PG&E, 2004h; PG&E, 2004f.

Due to the long time horizon of two to four years between the publication of the Final EIR and the commencement of the Proposed Project, it may be necessary for PG&E to initiate a different alternative (either one identified in Table C-1 or some variation) than the Project that may be approved by CPUC. It should be noted that a majority of the alternatives identified in Section C are only minor changes to the location and scope of the Proposed Project. If after the decision has been made, PG&E needs to change a project component that was not approved in the decision, PG&E would need to request that the CPUC evaluate the proposed changes and determine if the proposed substitution is substantially different from the project approved by the CPUC. Depending on the alternative, the CPUC would need to revisit the impact analysis through the preparation of an addendum or supplemental EIR. See Section H for details on this process.

C.2 Alternatives Development and Screening Process

One of the most important aspects of the environmental review process is the identification and assessment of reasonable alternatives that would potentially avoid or minimize the impacts of a Proposed Project, including a "No Project" Alternative (CEQA Section 15126.6(e)(1)). This requirement is emphasized in the CEQA Guidelines, Section 15126.6(a), which states:

> ***An EIR shall describe a range of reasonable alternatives to the project, or to the location of the project which would feasibly attain most of the basic objectives but would avoid or substantially lessen any of the significant effects of the project and evaluate the comparative merits of the alternatives.***

Section 15126.6(b) further states that the alternatives analysis shall include alternatives capable of eliminating or reducing the significant environmental impacts of a project, even if those alternatives would hinder the attainment of the project objectives, or would be more costly to implement. However, CEQA does not require the Lead Agency to evaluate every conceivable alternative, or those that are infeasible on economic, technical, legal, or regulatory grounds.

Potential alternatives analyzed were developed from comments received from the general public, and federal, State, and local agencies during the scoping period (October 1, 2004, through November 8, 2004). As described in Section C.1, alternatives were also developed by the Applicant in its January 2004 PEA. In addition, the EIR preparers conducted an extensive review of potential alternatives to the Proposed Project based on supplemental analysis and field visits.

C.3 Alternatives Screening Methodology

The evaluation of potential alternatives to the Proposed Project was completed using a screening process that consisted of three steps:

Step 1: Clarify the description of each alternative to allow comparative evaluation.

Step 2: Evaluate each alternative using CEQA criteria (defined below).

The advantages and disadvantages of the remaining alternatives were carefully weighed with respect to CEQA criteria for consideration of alternatives. In order to comply with CEQA requirements, each of the proposed alternatives has been evaluated based on the following criteria:

1. Does the alternative meet most basic project objectives?
2. Is the alternative feasible (economic, legal, regulatory, technical)?
3. Does the alternative avoid or substantially lessen any significant effects of the Proposed Project?
4. Would the alternative result in any significant effects that are greater than those of the Proposed Project?

Step 3: Determine the suitability of the each alternative for full analysis in the EIR. If the alternative is unsuitable, eliminate it from further consideration. Infeasible alternatives that clearly offered no potential for overall environmental advantage were removed from further analysis.

C.3.1 Consistency with Project Objectives

In PG&E's January 2004 PEA (Section 2 – Purpose and Need), the Applicant stated four main objectives for implementing the Proposed Project. This EIR does not endorse, nor is it governed by, the project objectives as defined by PG&E; instead it uses these objectives as guidance for determining the positive and negative benefits of the project as proposed by PG&E. For purposes of this EIR, the project objectives are:

- **Perform Steam Generator Replacement on Schedule to Minimize the Risk of Forced Outage or Plant Shutdown**

  The first basic objective of the Proposed Project is to perform steam generator replacement on schedule to minimize the risk of forced outage or plant shutdown. Replacement of DCPP's aging steam generators may reduce the risk of leakage, a permanent forced outage, or frequent mid-cycle inspections and the associated temporary plant shutdown. In addition, this objective serves to minimize the overall reduction in electrical generation at DCPP from continuing operation with ongoing tube degradation.

- **Reduce Costs Associated with Tube Degradation**

  The second basic objective of the Proposed Project is to operate DCPP in a cost-efficient manner by reducing costs associated with tube degradation, which is expected to accelerate over the next few years. Costs associated with tube degradation include increased maintenance costs, increased tube plugging, use of expensive sleeving, and a loss of electrical generation.

- **Ensure Continued Supply of Low-Cost Power**

  Each DCPP unit provides approximately 1,100 MW of low-cost, zero-emission power to the California power supply. The third basic objective of the Proposed Project is to ensure that this supply of power remains available to California users until the end of the two current NRC licenses for Unit 1 and Unit 2.

- **Perform Steam Generator Replacement on a Least-Cost Schedule**

  The fourth basic objective of the Proposed Project is to perform steam generator replacement on a least-cost schedule. Based on the current progression of tube degradation, the likelihood of a forced outage to replace the steam generators is substantially increasing, which in turn would increase the costs of operating with tube degradation. Replacing the steam generators according to PG&E's proposed schedule would ensure that such replacement is performed in the least-cost manner.

As stated previously, the CEQA Guidelines require consideration of alternatives capable of avoiding or substantially lessening significant environmental effects of the project, even though they may impede attainment of project objectives to some degree [Section 15126.6(b)]. Therefore, each potential alternative evaluated would not necessarily need to meet all of PG&E's objectives identified above.

C.3.2 Feasibility

The CEQA Guidelines (Section 15364) define feasibility as:

> ***" . . . capable of being accomplished in a successful manner within a reasonable period of time, taking into account economic, environmental, legal, social, and technological factors."***

The alternatives screening analysis is largely governed by what CEQA terms the "rule of reason," meaning that the analysis should remain focused, not on every possible eventuality, but rather on the alternatives necessary to permit a reasoned choice. Furthermore, of the alternatives identified, the EIR is expected to fully analyze only those alternatives that are feasible, while still meeting most of the project objectives.

In determining the feasibility of alternatives, the factors that may be taken into account include site suitability, economic viability, availability of infrastructure, general plan consistency, other regulatory limitations, jurisdictional boundaries, and site access/control (CEQA Guidelines Section 15126.6(f)(1)). Factors that can affect the feasibility of an alternative can include:

- **Legal Feasibility.** Does the alternative have the potential to avoid lands that have legal protections that may prohibit or substantially limit the feasibility of transporting or storing the steam generators?
- **Regulatory Feasibility.** Does the alternative have the potential to avoid lands that have regulatory restrictions that may substantially limit the feasibility or permitting of the replacement and subsequent storage of the steam generators? Is the alternative consistent with regulatory standards for nuclear power plant operation and maintenance?
- **Technical Feasibility.** Is the alternative feasible from a technological perspective, considering available technology? Are there any construction, operation, and maintenance difficulties?
- **Economic Feasibility.** Is the alternative so costly that implementation would be prohibited?

All of the above considerations were assessed for the Proposed Project in the alternatives screening analysis. For each alternative considered, a determination was made as to whether there was anything about the alternative that would be infeasible on technical, legal, economic, or regulatory grounds.

C.3.3 Potential to Eliminate Significant Environmental Effects

A key CEQA requirement for any alternative is that it must have the potential to "avoid or substantially lessen any of the significant effects of the project" (CEQA Guidelines Section 15126.6(a)). If an alternative was identified that does not provide potential overall environmental advantages compared to the Proposed Project, it was eliminated from further consideration. At the screening stage, it is not possible to evaluate all of the impacts of the alternatives in comparison to the Proposed Project with absolute certainty, nor is it possible to definitively quantify or predict all project impacts. However, it is possible to identify elements of an alternative that are likely to be the sources of significant impact and to relate them, to the extent possible, to general conditions in the subject area.

Appendix 1 (Notice of Preparation and Initial Study) presents a summary of the potential significant effects of the Proposed Project. This impact summary was prepared prior to completion of the EIR analysis; therefore, it may not be complete in comparison to the detailed analysis presented in Section D of the EIR. However, the potential impacts stated in Appendix 1 are representative of those resulting from preliminary review of the Proposed Project and were therefore used to determine whether an alternative met this CEQA requirement.

C.3.4 Summary of Screening Results

This section provides a summary of the alternatives identified and evaluated in this Draft EIR, and those potential alternatives that have been identified and eliminated from further analysis. The Proposed Project alternatives that are evaluated in this Draft EIR are detailed below in Section C.4 and illustrated in Figure C-1. Section C.5 identifies the potential alternatives that have been analyzed and eliminated from further consideration because they do not meet the criteria in Section C.3, and explains the reasons for elimination. See Figures C-2 through C-5 for illustrations detailing the location of the eliminated alternatives.

Alternatives Evaluated in this EIR

- Replacement Steam Generator Offloading Alternative – Intake Cove
- Temporary Staging Area Alternatives – A, B, C
- Original Steam Generator Storage Facility Location Alternatives – A, B, C, D
- Original Steam Generator Offsite Disposal Alternative

Alternatives Evaluated and Eliminated in this EIR

- Replacement Steam Generator Offloading Alternatives:
  - Port San Luis Vicinity - Avila Beach, Cal Poly Pier, Olde Port Beach, Fisherman's Beach
  - Port San Luis to DCPP Vicinity
  - DCPP Vicinity – Cove A, Patton Cove, Diablo Cove, Cove B, Cove C
  - Northwest of DCPP Facility

C.4 Alternatives Evaluated in this EIR

C.4.1 Introduction

The EIR preparers conducted a thorough review of the alternatives identified in PG&E's PEA, examining biological, geologic, land use, visual resources, and other issues associated with each potential alternative. In order to identify any additional alternatives, the EIR preparation team conducted a comprehensive review of the Proposed Project including three sets of deficiency responses, numerous data request responses and project materials, and visited the project site and surrounding area. Using the information garnered from this research, the EIR preparers evaluated all options that may reduce potential impacts associated with the Proposed Project.

This section describes the alternatives that have been retained for full EIR analysis within each individual issue area in Section D. As stated in Section C.1, all alternatives proposed by PG&E have been advanced to full environmental impact analysis. After detailed analysis of the project area, the EIR preparation team was not able to identify any additional alternatives (other than Offsite Disposal Alternative) that satisfied the requirements in Section C.3: consistency with project objectives, feasibility, and potential to eliminate significant environmental effects. All other potential alternatives were eliminated because they were not feasible or did not reduce the potential impacts associated with the Proposed Project. See Section C.5 for a detailed analysis of the potential alternatives evaluated and eliminated.

Sections C.4.2 through C.4.5 identify and present analysis of the Proposed Project alternatives that have been evaluated in this EIR. A majority of these alternatives are minor adjustments to the location and scope of the Proposed Project. Figure C-1 provides an illustration of the Proposed Project alternatives evaluated in the Draft EIR.

C.4.2 Replacement Steam Generator Offloading Alternative

This alternative calls for the RSGs to be delivered by barge from a southern California port directly to the Intake Cove at DCPP. Once inside the Intake Cove, the barge would anchor just west of the boat dock, and the steam generators would be offloaded and transported along existing roads one mile to the RSG storage facility. Basic methods and equipment used for offloading would be similar to the Proposed Project at Port San Luis. However, spacing constraints in the Intake Cove may require the use of smaller barges, each carrying two steam generators, rather than one large barge. This would increase the amount of time needed to offload the RSGs. Prior to the implementation of this alternative, PG&E would need to conduct a detailed analysis of potential engineering or other technical conflicts, particularly with respect to the DCPP cooling water intake system, that could occur if RSGs were offloaded at the Intake Cove. This analysis would verify that there would not be adverse impacts (e.g., increased sedimentation in the Intake Cove caused by transport and offloading equipment) that may affect normal DCPP operations.

This alternative is considered technically feasible because other large, heavy equipment has been delivered to the Intake Cove in the past without problems. In addition, the location of RSG delivery and offloading has existing roads that would allow for transport of the large, heavy steam generators to the RSG storage facility. It is assumed that the physical characteristics of the Intake Cove can accommodate the offloading of the RSGs, which is an important component of the Proposed Project.

Figure C-1. Proposed Project Alternatives

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Potential new impacts created by the use of this alternative include increased sedimentation in the Intake Cove, which could adversely impact intake water used in DCPP operations. However, this alternative is on private property (DCPP land) and has the potential to reduce the following potential impacts: noise disruptions from transport activities occurring near Port San Luis; recreation impacts including disruption of access to harbor facilities and the shoreline; fishing and boating disruptions; and transportation impacts from road closures, loss of travel lanes, and disruptions to ship traffic. In addition, barge offloading would be less visible to the public at the Intake Cove location. The Intake Cove offloading alternative may reduce impacts to recreation, noise, transportation and aesthetics, and therefore is retained for full analysis.

C.4.3 Temporary Staging Area Alternatives

A temporary staging area (TSA) on the DCPP site would be required to accommodate project activities and would consist of a RSG storage facility, offices, fabrication, mock-up, weld testing, warehouse, and laydown areas. This space may also include additional parking and security processing facility enhancements. PG&E has identified a number of alternative locations that could be used for the TSA. However PG&E's proposed location for the TSA is located in Parking Lot 1 in the southeastern part of the DCPP site, and is identified in Figure B-2. A detailed description of the proposed TSA facilities and their locations is provided in Section B.3.2.

The TSA alternative locations are expected to create similar impacts because all TSA facilities would require the same square footage and would be located on previously disturbed land. The TSA alternative locations are basically variations of the Proposed Project TSA location, and would therefore have similar degrees of technical and regulatory feasibility as the Proposed Project and would all serve to satisfy project objectives. Because the TSA alternatives are in slightly different locations, the potential impacts (e.g., biology, geology and others addressed in Section D) may be different based on the immediate surrounding environment. See Figure C-1 for a map of all TSA alternatives to be fully considered in the EIR. Each TSA location is further described in the following sections.

TSA Alternative A

Under this alternative, the TSA facilities would be located in Parking Lot 7, which is north of Shore Cliff Road and northwest of Patton Cove (see Figure C-1). This area is a flat, paved area with easy access from Shore Cliff Road. In addition, it is located adjacent to several existing buildings of similar dimensions, so the TSA facilities would be visually consistent with the surrounding infrastructure. TSA Alternative A is located approximately 300 feet from Patton Cove, and sits 105 feet above means sea level. Parking Lot 7 currently has 560 parking stalls. Locating the TSA in Parking Lot 7 would potentially remove a significant number of parking stalls, thus creating potential parking impacts for additional temporary workers. However, most of the displaced parking could be accommodated in other surrounding parking areas. This alternative has similar environmental impacts as the Proposed Project because they are located in generally the same area. This alternative was considered for full EIR consideration because it meets the Proposed Projects objectives and is feasible. It is within the coastal zone, which may require a coastal development permit from San Luis Obispo County prior to construction.

TSA Alternative B

TSA Alternative B would be located in Parking Lot 8, which is immediately northeast of Parking Lot 7 and adjacent to Reservoir Road. (see Figure C-1). Alternative B could potentially reduce the number of available parking stalls (254) for temporary employees, and therefore, has the potential to cause temporary impacts to parking availability during steam generator replacement. This alternative is also located on a previously disturbed flat, paved area. It is located on a bluff approximately 50 feet above TSA Alternative A. Alternative B may reduce potential geologic issues associated with the previously unstable area of Patton Cove by locating the TSA away this area. Despite having the potential to create new temporary parking issues, this alternative was evaluated in this Draft EIR because it fulfills the Proposed Project's objectives and is feasible. Similar to Alternative A, this alternative is also located in the coastal zone and may require a coastal development permit prior to construction of the facilities.

TSA Alternative C

Under TSA Alternative C, a second floor would be added to existing Warehouse B located north of the Access Road near its juncture with Reservoir Road and Shore Cliff Road (see Figure C-1). This alternative would also include a small building in Parking Lot 1 (location of the Proposed Project TSA) that would be used for the RSG storage facility. As with the other TSA Alternatives, Alternative C is expected to have the same environmental issues as the Proposed Project. This alternative may require additional construction activities from adding a second floor to Warehouse B. In addition, this TSA Alternative C would reduce existing parking available to temporary employees, which has the potential to create temporary impacts to parking availability during steam generator replacement. Despite having the potential to create new parking issues, Alternative C was considered for full EIR consideration because it meets the Proposed Project objectives and is feasible alternative according to the criteria in Section C.3.2. Similar to the other TSA Alternatives, this alternative is also located within the coastal zone and may require a coastal development permit.

C.4.4 Original Steam Generator Storage Facility Location Alternatives

PG&E has identified five locations for the OSG Storage Facility. All areas would be located northeast of the DCPP powerblock. Similar to the TSA locations, all OSG locations are expected to create similar impacts because all OSG facilities would require the same square footage and would be located on previously disturbed land. The potential impacts of the OSG Storage Facility Location Alternatives are discussed in detail in Section D. PG&E's proposed location for the OSG Storage Facility is located at the intersection of Reservoir Road and Oak Tree Lane, and identified in Figure B-2. All of the OSG Storage Facility Location Alternatives are evaluated below and depicted in Figure C-1.

OSG Storage Facility Location Alternative A

OSG Storage Facility Location Alternative A would place the OSG Storage Facility in the northwestern corner of the 500 kV switchyard adjacent to Oak Tree Lane (see Figure C-1). Under this alternative, the OSG Storage Facility would be located within the switchyard boundary and the surrounding security fence. Diablo Creek flows through a culvert under the southern portion of this proposed OSG Storage Facility location and the 500 kV switchyard. This alternative may create additional impacts over the Proposed Project including those concerning safety due to the close proximity to the switchyard. In addition, increased erosion near OSG Storage Facility Alternative A may adversely affect local water quality and hydrology due to the position of the subject building on engineered fill material near Diablo Creek. This alternative may allow any potential leaks that form in the OSG Storage Facility to reach the subterranean Creek easier than would occur under the Proposed Project. It is assumed that this alternative would have similar environmental issues as the Proposed Project. This alternative has been evaluated in the Draft EIR because it meets all of the Proposed Project objectives and is feasible.

OSG Storage Facility Location Alternative B

OSG Storage Facility Location Alternative B is located north of Reservoir Road on land currently occupied by Buildings 606, 607, and 608 (see Figure C-1). Many of the buildings may need to be relocated should this alternative be selected. The relocation of these buildings may cause additional construction impacts such as emissions from heavy duty construction equipment, soil erosion, etc. In addition, the western edge of this OSG Storage Facility location alternative would be located adjacent to a slope that drops down into Diablo Creek canyon. Potential erosion issues may result from the close proximity of Diablo Creek to this alternative. Unlike the Proposed Project, this alternative is located much closer to Diablo Creek and there is a greater potential of water quality impact to occur if an accident or catastrophic event caused a leak from the OSG Storage Facility that could seep into Diablo Creek. In all other issue areas, it is assumed that this alternative would have similar environmental issues as the Proposed Project. This alternative has been evaluated in the Draft EIR because it meets all of the Proposed Project's objectives and is feasible.

OSG Storage Facility Location Alternative C

OSG Storage Facility Location Alternative C is located southwest of the intersection of Reservoir Road and Skyview Road, between Reservoir Road and Building 401. This alternative OSG Storage Facility would be located in an area unoccupied by any existing DCPP buildings. However, a majority of Alternative C area is currently being used as debris storage or a laydown area for existing operations at DCPP. These items would need to be disposed of or relocated if this alternative is selected. This area currently consists of a disturbed unvegetated area of exposed dirt. This alternative is located approximately 250 feet from the slope that reaches down to Diablo Creek canyon, and therefore, may decrease the potential erosion impacts and water quality issues associated with the Proposed Project. In addition, this alternative meets the objectives of the Proposed Project and is a feasible alternative, thus is carried through for full analysis.

OSG Storage Facility Location Alternative D

OSG Storage Facility Location Alternative D is located adjacent to Reservoir Road directly west of Alternative C location. In comparison to the Proposed Project, this alternative would be located further away from Diablo Creek and potential erosion issues. Similar to OSG Storage Facility Location Alternative C, this alternative location is currently being used as a storage and laydown area for existing operations. The equipment currently located in Alternative D area would need to be disposed of or relocated if this alternative is selected. This OSG Storage Facility location alternative is located the farthest from Diablo Creek as compared to the Proposed Project and the other alternative OSG Storage Facility locations. This may decrease the potentially significant impacts caused by erosion or from potential leakage from the OSGs. In addition, Alternative D is feasible and meets the Proposed Project objectives, therefore, this alternative has been evaluated in the Draft EIR.

C.4.5 Original Steam Generator Offsite Disposal Alternative

The EIR preparation team looked at numerous alternatives to transport and store the OSGs at DCPP. The detailed evaluations of these alternatives and the rationales for elimination are presented in Section C.5. The only alternative evaluated and brought forward for full consideration in the Draft EIR is transport of the OSGs to an offsite disposal facility.

This alternative would require the OSGs to be moved from DCPP to an offsite disposal facility. This approach would be very similar to the methodology proposed by Southern California Edison (SCE) for its steam generators at San Onofre Nuclear Generating Station (SONGS). To prepare the OSGs for shipment, the upper section (e.g., the steam dome and internal components) would be removed from the lower section of the steam generator. The steam dome would be cut up to reduce the volume of waste, likely with the use of a plasma arc. The dismantled steam dome and other destroyed components of the original steam generators would then be loaded into shipping containers for transport to a licensed low-level radiological waste (LLRW) disposal facility.

The best option for transporting the OSGs to a LLRW disposal facility is by barge from either the DCPP Intake Cove or Port San Luis. From the Intake Cove or Port San Luis, the OSGs would be transported via barge to the selected permanent disposal facility or a transfer point for a different mode of transportation such as railway. No permanent disposal facilities have been selected at this time; however, appropriate facilities are located in Washington (Richland LLRW Dump on the Hanford Nuclear Reservation), Utah (Envirocare), and South Carolina (Barnwell). The transport, storage, and disposal of LLRW are regulated by the NRC and DOT. Refer to Section A.4 for more detailed information on the regulatory requirements for the transport, storage, and disposal of LLRW.

This alternative is feasible, provides a viable alternative to onsite disposal, and would alleviate community members' concerns regarding radiological exposure due to natural or human-caused catastrophic accidents associated with the OSGs. However, this alternative may create other impacts, such as air and noise emissions and visual resource impacts, to areas outside the DCPP facility, but the specifics of potential impacts would not be known until a final route and disposal facility were selected. Because this alternative meets the project objectives, is technically feasible, and may lessen existing onsite environmental effects, this alternative has been evaluated in Section D of this Draft EIR.

C.5 Alternatives Evaluated and Eliminated

C.5.1 Introduction

As discussed in Section C.1, alternatives were assessed for their ability to achieve the three-pronged goal of alternatives development, which were that alternatives should:

- Be technically feasible,
- Reasonably achieve the project objectives, and
- Reduce some of the potentially significant environmental impacts of the Proposed Project.

In developing alternatives to the Proposed Project, the EIR preparers thoroughly analyzed all material provided by PG&E, including the PEA, deficiency responses, and data responses. In addition, the EIR preparers participated in several site visits at the DCPP facility and surrounding area during which a thorough investigation of all possible transport routes and project facility locations was conducted. The EIR preparers also conducted a thorough public scoping process to solicit information on alternatives from public agencies as well as the public at large. As described previously, the general public and government agencies did not offer any specific alternatives to the Proposed Project other than various alternatives for the No Project Alternative.

The EIR preparers took into account the specific engineering requirements for transporting and housing the oversized and heavy pieces of equipment during the alternatives development. These requirements, in combination with the simple road network and limited working space at DCPP, limited the availability of alternatives to transportation and storage of the RSGs and OSGs at DCPP. The EIR preparers analyzed all storage and transport alternatives for the Proposed Project. No additional alternatives (outside of what PG&E has already developed and presented in its PEA) were identified that would provide a benefit to the environment or lessen the impacts of the Proposed Project. This section documents the detailed review of all potential alternatives to the Proposed Project.

C.5.2 Proposed Replacement Steam Generator Offloading Alternatives

This section documents the EIR preparation team's review of the offloading and transport alternatives associated with the Proposed Project. Feasibility of all potential offloading locations is presented in the following sections, beginning in Avila Beach and moving northwest to Montaña de Oro State Park.

C.5.2.1 Port San Luis Vicinity

PG&E identified Port San Luis as the preferred offloading location to be considered under the Proposed Project (PG&E, 2004h). The following alternatives within the Port San Luis vicinity were identified by the EIR preparation team. However, for reasons described below, these alternatives were eliminated from full consideration in the EIR.

Avila Beach Offloading Location

The Avila Beach offloading location is defined as the coastline between Avila Pier and the Cal Poly Marine Education and Research Pier (Cal Poly Pier) on the west (see Figure C-2). The eastern half of this area consists of a portion of Avila Beach, a public beach used extensively for sunbathing, sightseeing, picnicking, swimming, and surfing, and is adjacent to the eastern half of the Avila Beach community. The Avila Pier is a public fishing pier that includes a yacht club, restrooms, lifeguard station, bait and tackle shop, and other fishing services. The western half of this offloading location includes the mouth of the San Luis Obispo Creek and the juncture of Avila Beach Drive with the coast. The coastline that runs from this point to the Cal Poly Pier is marked by rock outcroppings, steep bluffs, and the presence of the San Luis Bay Inn on an upper bluff overlooking the ocean. The water offshore of this location has seasonal moorings and transient tie-ups for small boats.

The Avila Beach offloading location was determined to be undesirable due to its greater environmental impacts related to the significant visitor traffic to the public beach, the Avila Pier, and other nearby community facilities. The community of Avila Beach, with a 1998 population of 395 people and annual visitor rate of over 800,000, is directly adjacent to this area (Avila Beach Specific Plan, 2001). Offloading a barge in this location would prevent many people from using this location for its intended purposes, restrict emergency vehicle access, and obstruct normally unobstructed panoramic views of the ocean and Port San Luis. As a result, there would be substantially greater environmental impacts (e.g., land use, recreation, and visual resources). This would therefore not be a viable alternative because it would result in greater environmental impacts than the Proposed Project.

The mouth of the San Luis Obispo Creek is plagued by sedimentation and past pollution contamination from the Unocal Tank Farm (which was located east of Avila Beach). The western half of this location has rocky shores and steep cliffs that would make barge offloading difficult to impossible. In addition, the available space to maneuver once the barge has been offloaded is very small and is limited to the width of Avila Beach Drive as there is another bluff north of the roadway. Many of the bluffs along Avila Beach Drive have experienced erosion due to wave action and storms, and therefore are potentially weak and in need of stabilization (Port San Luis Harbor District, 2004). This instability further suggests that this location should be avoided as a barge docking and offloading point. The Avila Beach location was eliminated from further consideration in this EIR as a potential offloading point due to the fact that it would not reduce impacts of the Proposed Project without creating greater potential environmental impacts than the Proposed Project.

Cal Poly Pier Location

The Cal Poly Pier Location is defined as the area between the Cal Poly Pier (formerly Unocal Pier) and the boat ramp just west of the Pier (see Figure C-2). This location is characterized by rock outcroppings and rocky bluffs of between 15 and 20 feet in height. Avila Beach Drive runs parallel to the coast along this location with another steeper cliff just north of the roadway. These steep cliffs would present substantial technical difficulties. The Cal Poly Pier is currently used for undergraduate educational purposes and research. This location includes part of the main harbor of Port San Luis with 280 moorings for recreational and commercial boating.

While initially considered in an effort to determine the most feasible, least environmentally damaging offloading point, the Cal Poly Pier Location is not a feasible offloading location because it would be difficult to land and pin a barge in this environment with rocky shores and steep cliffs. In addition, this portion of the coast has similar erosion problems as the western half of the Avila Beach Location (see above), and while it has some riprap revetment, it may require additional armoring to prevent future erosion. This location also has a space constraint issue because the onshore staging and work area would be limited to the width of Avila Beach Drive. This would not allow sufficient space for offloading the 68-foot steam generators and maneuvering of the heavy equipment and transporters. Because the Cal Poly Pier Location is not technically feasible and has potentially greater environmental impacts, it was not given further consideration in the Draft EIR.

Olde Port Beach

Olde Port Beach is delineated by a boat ramp to the east and Nobi Point, an unimproved scenic overlook, to the west (see Figure C-2). The western terminus of this beach has a boat launch ramp, stairway access to the beach, a handicap ramp, and restrooms. Olde Port Beach is not as heavily used as Avila Beach, but has increased in popularity in recent years due to the addition of the boat ramp (Port San Luis Harbor District, 2004). This beach is currently one of the main locations in the area to launch small boats, kayaks, windboards, and jet skis. In addition to boating uses, Olde Port Beach is used for typical beach activities such as sunbathing, swimming, picnicking, and campfires. The beach sits below bluffs of 15 to 20 feet in height. Nobi Point provides the public with uninterrupted scenic views of the ocean and the Port San Luis area, as well as recreational vehicle parking and camping. Avila Beach Drive runs parallel along the coast in this location, and widens slightly to allow for automobile parking on both sides of the roadway. In addition, 280 moorings for recreational and commercial boats are located offshore.

Similar to the other coastal locations in the Port San Luis vicinity, the bluffs above Olde Port Beach are subject to erosive wave action that has made the blufftops unstable. These erosive effects are threatening Avila Beach Drive on the blufftop, as well as the beach below. This condition would make it infeasible to dock and offload a barge at this location. The heavy weight of the steam generator and the transportation equipment may exacerbate the current instability of this area. In addition, the bluff height and the beach width at this location would make it very difficult to span the gap with a temporary bridge. The bluffs above Avila Beach Drive are also subject to erosion that could wash into the roadway. Olde Port Beach has a significant number of visitors using the beach for various activities that would make offloading a barge in this location intrusive and visually unappealing. In addition, this alternative would result in substantial recreation impacts.

Figure C-2. Potential Alternatives in the Port San Luis Vicinity

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This location may not have enough space on the blufftop to unload, stage, and move the steam generators. Also the presence of offshore moorings would not allow for an unimpeded approach to the beach, and would necessitate temporarily moving some vessels. The presence of transporters on Avila Beach Drive would also constrain emergency vehicle access. Because the barge docking and steam generator offloading is technically infeasible at Olde Port Beach and it has potentially greater environmental impacts this alternative was eliminated from EIR consideration.

Fisherman's Beach

Fisherman's Beach runs from Nobi Point in the east to the juncture with Avila Beach Drive in the west (see Figure C-2). This beach is smaller than Olde Port Beach, but is used for similar activities. The beach has stairways that allow for vertical access to the beach from Avila Beach Drive. The blufftop above the beach allows for parking on both sides of Avila Beach Drive and has a small unimproved scenic overlook called Woodyard. The DCPP Access Road intersects with Avila Beach Drive in this location, and is the primary entrance for all workers and visitors to Diablo Canyon Power Plant. This location constitutes the main part of Port San Luis Harbor and includes 280 moorings for recreational and commercial boats.

While Fisherman's Beach provides the closet offloading site to the DCPP Access Road, the intersection of the Access Road and Avila Beach Drive has experienced substantial erosion and the road is in danger of washing out (Port San Luis Harbor District, 2004). Therefore, it would be technically infeasible to unload and stage the steam generators in this location. In addition, the permanently moored boats in this area would need to be moved for the duration of the offloading operation. Typical land uses, including recreation and public services, would be interrupted along with emergency access, and the normally unimpeded panoramic views would be obstructed. These recreational and aesthetic impacts would conflict with the California Coastal Act as implemented through the San Luis Obispo Local Coastal Program (see Section D.8.2 for a complete discussion of this act and its requirements within the Coastal Zone). Due to land use conflicts and the significant potential for erosion along the roadways, the Fisherman's Beach offloading site was determined to be infeasible for technical and regulatory reasons. This alternative also has greater potential environmental impacts in comparison to the Proposed Project. Thus, Fisherman's Beach was eliminated from EIR consideration.

C.5.2.2 Port San Luis to DCPP Vicinity

The coastline that extends approximately six miles from Harford Pier at Port San Luis to Cove A can be characterized as headlands bordered by steep cliffs immediately adjacent to the shoreline, which is primarily composed of rock outcrops and canyons (see Figure C-3). The blufftop along the coastline is a broad, flat and relatively open coastal terrace used for agriculture and recreation. There is no road capable of supporting steam generator transport nor is there a feasible offloading or barge docking location along this stretch of land. The only existing path besides the Proposed Project route extends from Port San Luis to San Luis Obispo Light Station. The narrow, dirt, and often steep Pecho Coast Trail traverses approximately 3.7 miles of undisturbed native habitat along the coastline between the lighthouse and the DCPP Access Gate at Avila Beach Drive (see Section D.8.1 for a detailed description of the Pecho Coast Trail). There are no technically feasible offloading location alternatives or usable roads in this area. Since this alternative is technically infeasible and because this location provides no reduction of environmental impacts, this alternative was eliminated from further EIR consideration.

C.5.2.3 DCPP Vicinity

The shoreline of the DCPP property is comprised of many coves and inlets (Figures C-4 and C-5). Areas surrounding the coves near DCPP were immediately removed from consideration because of turbulent ocean conditions, which would make steam generator offloading impossible. PG&E identified the DCPP Intake Cove as a potential alternative, which will be evaluated in the Draft EIR. After a thorough analysis, it was determined that all other coves and inlets in the DCPP vicinity were not feasible offloading locations for the replacement steam generators due to environmental and infrastructural constraints. The sections below describe each potential offloading site and the rationale for elimination from full EIR consideration.

Cove A

Cove A is located southeast of Patton Cove (Figure C-4). Similar to the other coves in the DCPP vicinity, Cove A is an unsuitable landing site because of the existence of rock reefs and steep cliffs along the shoreline. There is no road that runs adjacent to the shoreline that would support steam generator transport in the event that the offloading equipment was capable of raising the steam generators from the barge and over the cliff. In addition, the existing currents and wave action in this area make it very dangerous to offload heavy pieces of equipment like the steam generators. As a result of these technical infeasibilities, Cove A was not given further consideration in the EIR. In addition, this location would not reduce any of the Proposed Project's environmental impacts

Patton Cove

Patton Cove is located southeast of the DCPP Intake Cove (Figure C-4). Patton Cove has experienced landslide movement since 1970, and most recently in 1996 and 1997. The potential geologic instability of this cove makes it an unsuitable alternative to the proposed offloading site at Port San Luis. In addition to the unstable ground, Patton Cove appears to be too small to facilitate barge docking and steam generator offloading. Since it is technically infeasible to offload at Patton Cove and because this location provides no reduction of environmental impacts, this alternative was eliminated from further EIR consideration.

Diablo Cove

The DCPP cooling water outfall flows into Diablo Cove, which is located directly north of the DCPP Intake Cove (Figure C-4). Diablo Cove is not a feasible offloading site because it is lined with extensive rock reefs that would make a barge landing difficult or impossible. Cooling water from DCPP flows into Diablo Cove and contributes to the turbulent water conditions which may impede barge docking and steam generator offloading. Also, the north side of the cove contains a known archaeological site. This alternative is not capable of eliminating or reducing significant environmental effects. With regard to cultural resources, this alternative would have greater impacts than the Proposed Project. In addition, because offloading at Diablo Cove would likely be infeasible, this alternative was eliminated from further EIR consideration.

Cove B

Cove B is located directly north of Diablo Cove and southeast of Cove C. See Figure C-5 for the location of Cove B and the surrounding area. Cove B is unsuitable as a barge landing site due to extensive rock reefs along the shoreline and vertical cliffs rising from the water's edge. Also, a known archaeological site is located on the south side of the cove. Due to environmental constraints and the potential to adversely impact cultural resources in the area, Cove B was eliminated from full consideration in the Draft EIR.

Figure C-3. Potential Alternatives from Port San Luis to DCPP Facility
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Figure C-4. Potential Alternatives in the DCPP Vicinity
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Figure C-5. Potential Alternatives Northwest of DCPP Facility
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Cove C

Cove C, as illustrated in Figure C-5, is the northernmost inlet on DCPP facility property. It is directly northwest of Cove B. Cove C does not appear to have rock reefs lining the shore, unlike nearby coves. The shoreline consists of a small gradually sloping sandy beach, but there are steep cliffs surrounding the small cove, making access to the ground above the beach impossible. In addition, the closest road is unpaved and unlikely to support the weight of the RSGs without substantial road improvements. Road improvements of the scale necessary to support the RSGs would involve substantial earthworks and would therefore result in additional adverse environmental impacts greater than the Proposed Project (i.e., to air quality, terrestrial and marine biology, and hydrology and water quality). Offloading at this location, if not impossible, would involve substantial effort to lift the RSGs up or around the steep cliffs. Therefore, Cove C was determined to be technically infeasible and likely to result in greater adverse environmental impacts than the Proposed Project, and was eliminated from further consideration.

C.5.2.4 Northwest of DCPP Facility

The area northwest of the DCPP facility, beginning at Cove C and extending northwest to the border of Montaña de Oro State Park, continues to be steep and increasingly rocky (see Figure C-5). This area of coastline is undeveloped and has no paved roads capable of supporting steam generator transport. Approximately five miles north of Cove C, near Point Buchon, is the boundary of Montaña de Oro State Park where recreational use is common and steam generator offloading would not be permitted. Offloading the RSGs at a location north of the DCPP facility would adversely affect the pristine natural environment protected by the State Park and would likely conflict with the recreational usage of this area. Offloading alternatives in this area are technically infeasible and may create more adverse environmental impacts than the Proposed Project, particularly with regard to recreational and biological resources. Therefore, RSG offloading in the area northwest of DCPP was not given further consideration in this EIR.

C.5.3 Temporary Staging Area Alternatives Eliminated from EIR Analysis

Due to the topography of the DCPP facility property and the specific requirements for storage of the RSGs, there are a limited number of locations that would be suitable for the temporary staging area. The TSA would require approximately 90,000 square feet in temporary or existing facilities that should be located in close proximity to one another to maximize the efficiency of project staging activities as well as to minimize adverse environmental impacts, such emissions from excessive truck trips transporting equipment and material between portions of the TSA. PG&E proposed a preferred option and three alternatives in the January 2004 PEA, based on an analysis of the environmental impacts and the geologic stability in the area. Locating the TSA facilities outside of the areas proposed by PG&E would not serve to eliminate or reduce environmental impacts and would likely increase adverse environmental impacts. Therefore, no other TSA location alternatives are presented in this EIR aside from the four locations proposed by PG&E and explained in Section C.4.2.2.

C.5.4 Original Steam Generator Storage Facility Location Alternatives Eliminated from EIR Analysis

The Proposed Project includes onsite storage of the OSGs in an 18,000 SF storage facility for the remainder of the operating life of DCPP. In addition to accommodating the relatively heavy weight and large size of the steam generators, siting and construction of the OSG Storage Facility must consider the containment of hazardous materials during long-term storage. NRC regulations (10 CFR 20 and 40

CFR 190; see Section B.3.3.3 for additional applicable NRC regulations) require that the OSG Storage Facility be constructed on a reinforced concrete mat foundation or an independent floor with spread footings and the walls and roof must be constructed with reinforced concrete to block gamma ray radiation. These construction and containment factors restrict the available locations for an OSG Storage Facility within DCPP property (storage offsite was retained for full alternatives-level analysis in the EIR – See Section C.4.5). Following multiple project site visits and a thorough analysis of all materials, the EIR preparers determined that the only technically feasible alternative onsite locations for the OSG Storage Facility are all identified by PG&E in the January 2004 PEA.

C.6 No Project Alternative

CEQA requires an evaluation of the No Project Alternative so that decision-makers can compare the impacts of approving the project with the impacts of not approving the project. According to the CEQA Guidelines [Section 15126.6(e)], the No Project Alternative must consider (a) the conditions at the time of the Notice of Preparation (NOP) (i.e., baseline environmental conditions) and (b) the events or actions that would be reasonably expected to occur in the foreseeable future if the project were not approved.

The first definition of the No Project Alternative (condition (a) above) is described in the EIR for each environmental discipline as the "environmental baseline" or "setting." The environmental baseline or setting consists of the environmental conditions that exist at the time of analysis (for the Proposed Project, October 2004, at the issuance of the NOP). The baseline serves as a snapshot of current environmental conditions at the time of analysis.

Under the second definition of the No Project Alternative (condition (b) above), the OSGs would not be replaced, and they would continue to degrade from stress and corrosion cracking. For safety reasons, the tubes within the steam generators that show signs of degradation must be plugged and taken out of service. The OSGs will eventually reach a state where, according to DCPP's NRC operating licenses, they must be replaced or the unit must be shut down. Based on PG&E's projections, it is assumed that the OSGs will reach the end of their operating life in 2013 or 2014 and the plant would be shut down.

The No Project Alternative would include the continued use of the OSGs through 2013 or 2014. At that point, the steam generators would need to be shut down and DCPP Units 1 and 2 would no longer be available for generating electricity. Decommissioning of DCPP Units 1 and 2 may occur shortly after shut down, although there are other possible outcomes such as the transfer of the license or facility to another owner which could result in some form of continued operations at DCPP.

DCPP is a base-loaded facility that operates at approximately 80 percent annual capacity factor, typically operating 24 hours a days, 7 days a week except for refueling periods. As a result, the No Project Alternative would result in the loss of approximately 2,200 MW of base-load system generation capacity in 2013 or 2014. Power for approximately 2,200,000 households throughout California, or approximately 5 percent of the total power consumed in the State, would need to be provided by other means, such as new transmission or generation facilities.

The specific configuration of new generation or transmission facilities needed under the No Project Alternative would vary depending on a number of uncontrollable and unforeseeable factors (e.g., need, market forces). The replacement facilities would likely be installed in a location with convenient and economical access to fuel supplies, existing transmission facilities, and load centers. Construction and operation of replacement generation and transmission capacity would be subject to separate permitting processes that would need to be completed in the future. At this point, it is assumed that PG&E would need to take an integrated approach to procure 2,200 MW of replacement power for its customers before 2013.

If neither the Proposed Project nor an alternative were approved, PG&E and ISO would evaluate updated load forecasts and consider alternative courses of action that could be implemented to provide adequate electrical service to the DCPP service area. These alternative sources of electrical power include replacement generation facilities, replacement transmission facilities, alternative energy technologies, and system enhancement options, each of which is explored below.

It is not known at this time what courses of action would be taken to provide power service to the DCPP service area if DCPP shuts down. However, the No Project Alternative assumes that, at the very least, 2,200 megawatts of power generation, the amount of capacity at DCPP, must be replaced through other methods when DCPP shuts down. As stated in Section C.6.1 below, it is assumed that the most likely method of replacing this power generation is through the construction of at least four combined cycle gas turbine power plants. This assumption would likely occur under the No Project Alternative because there are environmental and safety concerns with other common base-load generation sources such as nuclear, hydroelectric, coal, and oil. This, however, does preclude the potential use of alternative energy technologies, but due to unique technical feasibility limitations these generation sources are unable to be sole replacement generation for base-load applications such as DCPP.

C.6.1 Replacement Generation Facilities

Natural gas provides the fuel for most new power generation facilities. Natural gas-fired generation in California is expected to increase from 36 percent in 2004 to 43 percent in 2013. (CEC, 2003b). It is anticipated that environmental and safety concerns are likely to preclude the addition of new nuclear, hydroelectric, and coal- and oil-fired generation as replacement for DCPP.

As described in PG&E's January 2004 PEA, under the No Project Alternative, PG&E has stated that it would need to design, permit and construct several combined cycle gas turbine power plants somewhere in northern California and in the southern Central Valley to replace the output of DCPP (if DCPP output were replaced exclusively with combined cycle gas turbine power plants, approximately four to five plants would need to be constructed [2,200 MW at 500 MW per plant]). These combined cycle gas turbine power plants are typically configured in a two-on-one design (two gas turbines and one steam turbine with associated heat recovery steam generators and duct burners). Considering auxiliary power requirements for the plant, the nominal net capacity output for General Electric Frame 7F Technology combustion turbines would be 500 MW. The capital cost for constructing this hypothetical 500 MW power plant is assumed to be approximately $500 million (CEC, 2002).

Approximately 25 to 30 acres of land are needed to construct and operate a typical 500 MW combined cycle power plant (CEC, 2002). Combined cycle power plants using evaporative cooling consume about six acre-feet of either fresh or recycled/reclaimed water per year per MW based on expected capacity factors. In addition, a new high efficiency combined cycle power plant would burn approximately 3.25 million cubic feet of natural gas per hour. The natural gas would need to be delivered through a pipeline system that can support the level of natural gas needed for a base-load power plant. See Figure C-6 for an illustration of the natural gas pipeline infrastructure in California, which may facilitate the delivery of natural gas to a replacement base-loaded power plant in the absence of the power normally distributed by DCPP.

Each new power plant would also require new transmission lines, as well as new or upgraded substations. See Section C.6.2 for a detailed discussion of transmission lines that may be needed under the No Project Alternative.

C.6.2 Replacement Transmission Facilities

Any large scale replacement generation facilities would need to connect to the PG&E transmission grid, which is currently configured to receive a large proportion of power from DCPP. This network would need to be rerouted to reflect the changed generation locations. Alternatively, new transmission facilities could be used as a substitute for some in-State generation by improving access to generation in the Pacific Northwest and Southwestern states. Major 500 kV transmission components connect DCPP to the Gates Substation in Fresno County and the Midway Substation in Kern County. Shutdown of DCPP would likely cause these segments to become obsolete, which would necessitate significant reconfiguration of the transmission grid in those areas.

Developing new transmission facilities requires roughly ten years of advance planning. Demonstrating need, securing environmental approvals and rights-of-way, and time-consuming construction activities contribute to the long lead-time needed for transmission planning. Because of the difficulty of securing new rights-of-way, replacement transmission facilities would likely follow existing major paths.

See Figure C-7 for an illustration of the major transmission infrastructure in California, which demonstrates how the grid currently relies upon a substantial generation source at DCPP.

C.6.3 Alternative Energy Technologies

As another option to replace DCPP generation, the CPUC examined the renewable and other alternative electricity generation technologies. Alternative generation technologies are notable in that they do not burn fossil fuels. These alternative technologies include solar thermal, photovoltaics, wind, geothermal, hydropower, fuel cells, and biomass. These technologies do not rely on a finite supply of fossil fuel, consume little water, and generate either zero or reduced levels of air pollutants and hazardous wastes. These technologies do, however, cause environmental impacts. They also have unique technical feasibility limitations. High costs and, in some cases, limited dispatchability inhibit their market penetration. It is assumed that these alternative energy technologies could not be used as the sole base-load replacement generation source, but may be able to contribute a limited amount of generation to supplement another source. The following sections summarize the current status of each of the seven alternative energy technologies.

California intends to manage its dependence on natural gas by using renewable energy technologies as established by the Renewables Portfolio Standard (RPS) program. The RPS requires that utilities, including PG&E, supply at least 20 percent of sales from renewable energy resources by 2017. PG&E has reported that it expects to meet this target well in advance of the 2017 goal (CEC, 2003b).

C.6.3.1 Solar Thermal

Solar thermal power generation uses high temperature solar collectors to convert the sun's radiation into heat energy, which is then used to run steam power systems. Solar thermal is suitable for distributed or centralized generation, but requires far more area than conventional power plants. Solar parabolic trough systems, for instance, use approximately five acres to generate 1 MW. Assuming that a parabolic trough system was located in a maximum solar exposure area, such as in a desert region, generation of 100 MW would

Figure C-6. Natural Gas Pipeline Infrastructure in California

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Figure C-7. Transmission Infrastructure in California

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require 500 acres. While the plants do not generate problematic air emissions and have relatively low water requirements, construction of solar thermal plants leads to potential habitat destruction and substantial aesthetic changes. Solar thermal can be a good peak power source because it collects the sun's radiation during daylight hours and generates power during peak usage periods. Because solar thermal power is not available 24 hours per day, it is typically not acceptable for base-load applications.

C.6.3.2 Photovoltaics

Photovoltaic (PV) power generation uses special semiconductor panels to directly convert sunlight into electricity. Arrays built from the panels can be mounted on the ground or on buildings where they can also serve as roofing material. Electricity generation from solar technologies, including both photovoltaic and solar thermal systems, currently totals about 0.3 percent of the State's electricity production. PV systems can have negative visual impacts, especially if ground mounted. Unless they are constructed as integral parts of buildings, PV systems require about four acres of ground area per MW of generation. Assuming that a PV system was located in a maximum solar exposure area, generation of 100 MW would require 400 acres. PV installations are highly capital intensive, and manufacturing of the panels generates some hazardous wastes. The daytime power output of PV systems closely matches California's peak electrical demands. The intermittent nature of the power, however, makes PV systems unsuitable for base-load applications.

C.6.3.3 Wind Turbines

Wind turbines capture kinetic energy from the wind and use it to turn electric generators. Wind farms currently account for 1.3 percent of California's electrical capacity. Capacities of a single wind turbine range from 400 watts up to 3.6 MW. Wind farms made up of multiple turbines typically require 5 to 17 acres per MW generated. Thus, production of 200 MW would use a minimum of 1,000 acres. Wind turbine "footprints," however, utilize only about 5 percent of the land on which the system is built. This allows dual use of a site, such as for agriculture or ranching.

A significant barrier to wind power development is the lack of available transmission access in areas with wind resources. Other major challenges to siting wind farms are the bird mortality resulting from collisions with turbine blades, and the noise of the rotors. Visual consequences are also concerns for siting wind farms. Because the power output can be intermittently generated during the day or during certain seasons, depending on the location, wind turbines can be viable alternatives to conventional peak-shaving power plants. However, their intermittent power makes them unsuitable for base-load applications.

C.6.3.4 Geothermal Power

Geothermal power plants employ high pressure steam and hot water from naturally occurring subsurface geothermal reservoirs to drive turbines and generate electricity. Condensed steam and used water are injected back into the geothermal reservoir to sustain production. Geothermal plants account for approximately 5 percent of California's power, and range in size from under 1 MW to 110 MW. Mercury and arsenic from geothermal reservoirs can concentrate, leading to hazardous waste generation. Cooling tower drift from reservoirs with high boron content can be harmful to surrounding plant life. Geothermal reservoirs typically contain hydrogen sulfide, which smells like rotten eggs and is toxic at high concentrations. Visual impacts of geothermal plants can also be barriers to their siting, especially in national forests, recreation areas, and undeveloped rural areas. Geothermal plants typically operate as base-load facilities and require 0.2 to 0.5 acres per MW. Generation of 100 MW would require at least 20 acres and many miles of new transmission facilities to deliver the power. Geothermal plants must be built near geothermal reservoir sites, because steam and hot water cannot be transported long distances without significant thermal energy loss. Future geothermal development could occur in Imperial, Modoc, Mono, and Siskiyou Counties (CEC, 2003a).

C.6.3.5 Hydroelectric Power

Hydroelectric power uses the energy of falling water to turn turbines and generate electricity. Power production increases with both greater water flow and greater fall. California hydropower plants range in size from less than 0.1 MW to over 1,200 MW. Hydropower currently provides 15 percent of the State's electricity production, generally in base-load applications. Hydropower facilities typically require 14 acres per MW of generation. Production of 100 MW would require inundation of about 1,400 acres. Hydropower generates no emissions or hazardous effluents and requires no fuel. However, building dams and reservoirs inundates streams and riparian lands, resulting in permanent ecological changes such as habitat destruction and barriers to fish passage. Large reservoir construction can lead to high volume releases during storms or dam failures, which can cause flooding downstream. Storage reservoirs can also alter downstream water temperatures and restrict normal sediment transport, resulting in sedimentation and turbidity downstream when poor quality water is released from reservoirs. Hydropower development can change recreational uses of the area from "dispersed forms" (stream fishing, hiking, and whitewater boating) to "concentrated uses" (boating and camping on and around reservoirs). However, development of new hydropower facilities is limited due to the severe environmental concerns and the lack of appropriate sites.

C.6.3.6 Biomass Power

Biomass power is generated from plant and animal wastes as well as from crops grown especially for energy purposes. Most biomass electricity is generated by burning these fuels in a boiler to produce steam, which then turns a turbine. Biomass can also be converted into a fuel gas such as methane and burned. Wood is the most commonly used biomass for power generation. Currently, 2.2 percent of the State's electricity derives from biomass and waste-to-energy sources. To save on high transportation costs, biomass plants generally are located near the source of biomass. Most biomass plant capacities are in the 3 to 10 MW range. Cooling water needs can be high for large plants. If "energy crops" are used to fuel the plant, typically 800 acres of agricultural land are required per MW of power production. Generation of 100 MW would require approximately 80,000 acres of agricultural operations to provide biomass. Biomass plants are labor-intensive to run, requiring a significantly larger staff than for comparable natural gas plants. Liquid wastes are generated by biomass plants and require careful monitoring and treatment. Biomass plants typically generate more air emissions per unit of energy than natural gas plants, and they generate ash that creates a disposal concern. Siting biomass plants and use of the accompanying land for energy crop production can lead to significant habitat destruction. Biomass plants can be used for both base-load and peaking applications.

C.6.3.7 Fuel Cells

Fuel cells convert the energy from a chemical reaction between a fuel (such as hydrogen) and an oxidizer (e.g., oxygen) into electricity. Fuel cells have ultra-low air emissions, and operate similar to batteries, but do not run down or require recharging. They run as long as fuel and oxidizer are supplied to them, and can operate using fuel gases from biomass conversion. Even small fuel cells can perform at high efficiencies. Fuel cell power plants from 10 kW to 3 MW have been field demonstrated in California. However, due to the required development time and cost, the use of fuel cells is not forecasted to be practical until after 2020.

Many fuel cell power plants require a fossil fuel such as natural gas to operate and thus must be located where the fuel can be delivered. In general, fuel cell plants require more land than combined cycle power plants, but emit about the same amount of carbon dioxide. No water-cooled systems are required by fuel cells; thus, water use and thermal discharges are avoided. Fuel cells generate some hazardous waste, including periodic removal and disposal of absorption beds. The elevated pressures (3 to 7 atmospheres) and explosion hazards of fuels such as hydrogen or natural gas present some public safety issues.

C.6.4 System Enhancement Options

These "non-wires" options would not involve the construction of new major generation facilities or transmission lines. Some level of demand-side management (e.g., conservation) and distributed generation would likely occur as a component of the No Project Alternative.

C.6.4.1 Demand-Side Management

Demand-side management programs reduce customer energy consumption and overall electricity use. Because there would be no construction, there would be no new environmental impacts created from this alternative. Some programs also attempt to shift energy use to off-peak periods.

The CPUC supervises various demand-side management programs administered by the regulated utilities, and many municipal electric utilities have their own demand-side management programs. The combination of these programs constitutes the most ambitious overall approach to reducing electricity demand administered by any state in the nation.

Reducing demand is an essential part of PG&E's operations. However, the available energy savings from these programs are insufficient to maintain service reliability to PG&E customers in the face of population and employment growth. Under the No Project Alternative, energy conservation would offset only a small fraction of the energy supply lost by the shutdown of DCPP.

C.6.4.2 Distributed Generation

According to the California Energy Commission, distributed generation (DG) is the widespread generation of electricity from facilities that are smaller than 50 MW in net generating capacity. Most DG facilities are very small, for example, a fuel cell could provide power in peak demand periods for a single hotel building. More than 2,000 MW of DG are now in place in California. Small business and retail customers of electricity normally install these systems to offset the power drawn from a utility such as PG&E. Over the next ten years, the CPUC aims to provide incentives for up to 3,000 MW of new distributed generation State-wide, for customers who wish to install new "clean" onsite DG up to 1 MW (Self-Generation Incentive Program).

Under the No Project Alternative, DG units owned by PG&E or by industrial, commercial, institutional or residential energy consumers would reduce the need for replacement generation or transmission facilities. There are many available DG technologies, including microturbines, internal combustion engines, combined heat and power (CHP) applications, fuel cells, photovoltaics and other solar energy systems, wind, landfill gas, digester gas and geothermal power generation technologies. Local jurisdictions such as cities, counties, and air districts, would need to conduct environmental reviews and issue required approvals or permits for these facilities. While DG technologies are recognized as important resources to the region's ability to meet its long-term energy needs, DG does not provide a means for PG&E to offset a substantial portion of the energy supply lost by the shutdown of DCPP.

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