3.0 DESCRIPTION OF THE PROPOSED PROJECTS

3.1 PROJECT DESCRIPTION

These two Steam Generator Replacement Projects each consist of two major overlapping phases. The first phase is the design, construction and delivery of replacement steam generators with state-of-the-art materials and design. The completion of phase one for both of the Proposed Projects will take approximately four years (2004 to 2008) from contract award until the second set of replacement steam generators is delivered to DCPP.

PG&E proposes to order replacement steam generators with the same operating characteristics as the steam generators originally installed at DCPP. PG&E will require the manufacturer to verify that the RSG design has the same heat transfer capability as the OSGs with the new Alloy 690TT tubing material. In addition, PG&E proposes to order RSGs with 10 percent additional tubes to allow for plugging margin over the operating life of the RSGs to ensure that they are capable of full power operation throughout their life in light of the tube degradation and tube plugging experienced with the existing steam generators. Based on current engineering knowledge, PG&E believes that the new Alloy 690TT alloy and this plugging margin should be sufficient to ensure that PG&E ratepayers obtain the benefit of their investment in the RSGs through the end of their operating life.

The second major phase of each Replacement Project is the removal and storage of the OSGs from the containment building and the installation and testing of the RSGs in the reactor coolant system. This second phase will take approximately four years (2005-2009) for the engineering, planning, construction, installation, and demobilization. Both of the Proposed Projects are expected to be completed in approximately 7 years.

PG&E must complete bid evaluation and award contracts for design, construction, and delivery of each unit's RSGs to DCPP by no later than June 2004 to meet the proposed installation date of the first unit at the least cost. Preliminary discussions with RSG manufacturers indicate that a 40-month delivery schedule for the steam generators is challenging, but achievable. The first replacement outage (Unit 2 – 2R14[2] outage) is scheduled for February 2008. A June 2004 contract signing with a 40-month schedule will result in delivery by approximately November 1, 2007. Because transportation of the RSGs must occur by sea, delivery should be completed before the winter storms that normally occur in December through February. The second outage

[2] PG&E uses shorthand such a "2R14" to describe the plant outages associated with each fuel cycle. 2R14, for instance, refers to the outage for Unit "2" associated with the end of cycle "14."

for the replacement of the OSGs (Unit 1 – 1R15 outage) is scheduled for January 2009. These RSGs will have to be delivered in September 2008 to allow for installation at that time (1R15).

If the 2R14/1R15 installation scenario is not achieved and steam generator replacement is delayed, an increasing risk of a forced outage will occur because of current and predicted tube degradation. Continued operation will increase the cost of steam generator inspection, repair, and maintenance, and will increase the risk of leakage, forced outages, extended refueling outages, and mid-cycle inspections. The probability of an extended shutdown increases as the planned outage schedule is delayed because of these risks. Additionally, the overall cost for each project increases as the planned replacement outage is delayed as explained in Section 2, Purpose and Need.

The DCPP plant and steam generators replacement process is briefly described in this section. More detailed and complete information on the DCPP is contained in the Final Safety Analysis Report and Steam Generator Technical Manual. Basic information for DCPP Units 1 and 2 is summarized in Table 3-1.

Table 3-1
DCPP Plant and Steam Generator Parameters

Parameter	Unit 1	Unit 2
Start of Commercial Power Operation	5/85	3/86
End of Operating License	2021	2025
Licensed Power Level, MWth	3,411	3,411
Nominal 100% Net Power Output, MWe	1,110	1,110
Tave, °F, 100% Power	574	574
Thot, °F, 100% Power	604	603
Nominal Steam Temperature, °F, 100% Power	518	517
Number of SGs	4	4
Model SGs	Westinghouse Model 51	Westinghouse Model 51
Type of Tubing	Mill annealed Alloy 600	Mill annealed Alloy 600
Type of Expansion in Tube Sheet Area	Full depth explosive expansion – WEXTEX	Full depth explosive expansion – WEXTEX
Number and Type of TSPs	7 drilled hole carbon steel support plates	7 drilled hole carbon steel support plates

The major project components anticipated timeline based on current planning is listed and described below and presented in Figure 3-1:

- Develop and issue Certified Design Specification and Requests for Proposals (RFP) for Replacement Projects: March 2003 to December 2003
- Obtain project approval from PG&E Board of Directors: June 2003 to December 2003
- Obtain CPUC approval of ratemaking application associated with steam generator replacement for Unit 1 and Unit 2**:** December 2003 to December 2004
- Obtain interim CPUC decision authorizing PG&E to execute long lead-time steam generator replacement contracts and, if the Commission does not ultimately approve the Proposed Projects, authorizing PG&E to recover payment for abandoned project costs for work done to the point of cancellation (June 2004);
- Evaluate SGR bids and award contracts to manufacture RSGs: March 2004 to June 2004
- Design and construct RSGs at vendor's site: June 2004 to September 2007 for the first four steam generators associated with the first project, for Unit 2, and June 2004 to August 2008 for the second four steam generators associated with the second project, for Unit 1
- Complete SGR analysis and licensing evaluation package: June 2003 to June 2007
- Design, obtain local building permits and develop OSG storage facility: 2005 to 2007
- Issue RFP and bid specification for RSG installation contracts: July to September 2004
- Evaluate bids and award contracts for RSG installation: December 2004 to June 2005
- Complete initial phase of installation contracts: June 2005 to January 2006
- Establish installation project team and perform second phase of installation contracts (including detailed engineering, planning, materials procurement, and completion of temporary facilities) leading to first SGR outage: January 2006 to February 2008
- Deliver RSGs to DCPP: September 2007 to November 2007 for the first four steam generators associated with the first project (Unit 2) and September 2008 to November 2008 for the second four steam generators associated with the second project (Unit 1).
- Store OSGs on site: Unit 2 – 2008, Unit 1 – 2009

- Install RSGs in Unit 2 and Unit 1: Unit 2 – February to May 2008, Unit 1 – January to April 2009
- Conduct startup testing to verify new equipment meets NRC license and warranty requirements: Unit 2 – June 2008, Unit 1 – May 2009
- Demobilize SGR project facilities and team: 2009.

3.2 PROJECT EXECUTION TEAM

The success of the Proposed Projects depend upon the organization and approach taken by the management and engineering teams. Steam generator replacement projects are resource-intensive, and they must be closely integrated with other plant activities. PG&E will take the lead role on the project team from the beginning, working with the supplier and installation contractor to assist in schedule development and technical evaluations, and serving as the primary contact point with station operations personnel. For this reason, the organizational structure will consist of a PG&E team closely aligned with the installation contractor. This structure will provide PG&E flexibility to take either of two approaches for coordinating and overseeing project implementation: (1) PG&E could limit the team to a small staff performing only an interface and coordination role between the installation contractor and other PG&E organizations; or (2) PG&E could instead augment the team with personnel to perform direct review and approval of the installation contractor's deliverables, as well as the designated PG&E engineering tasks.

The staffing levels can range from a minimum of 10 persons for the first option to 30 or more for the second. PG&E will determine the specific split of owner/contractor activities over the next two years as the installation contracts take shape. The support labor force for each process, including transport, replacement, removal, installation, and storage, shall be identified for each activity, as relevant.

3.3 CONSTRUCTION AND DELIVERY OF REPLACEMENT STEAM GENERATORS

3.3.1 Project Feasibility Study

In 1999, PG&E initiated work on a feasibility study for steam generator replacement based on early indications of changing degradation rates and a desire to understand the issues involved in replacing steam generators. PG&E requested Bechtel Corporation to perform the study, which Bechtel completed in 2002. In the study, Bechtel inspected the steam generators in both units during scheduled outages; reviewed design criteria and drawings; inspected the DCPP plant site;

and evaluated various haul routes and heavy lift tasks. Results of this work were provided to PG&E as a report.

3.3.2 Preliminary Assessment and Approval

PG&E conducted technical and financial evaluations of the condition and long-term reliability of the OSGs in order to develop a project approval recommendation for PG&E Management and the PG&E Board of Directors before pursuing steam generator replacement. PG&E contracted with Strategic Decisions Group (SDG) and Dominion Engineering to assess the feasibility and financial implications of continued operations with the OSGs. These evaluations resulted in the development of the Proposed Projects, which are the subject of the Environmental Assessment. Several of these studies are listed in the reference section for this document.

Additional preliminary project work included the development of a certified design specification for the design and construction of the replacement steam generators, the establishment of a project team, and development of anticipated project costs. These activities will be in compliance with NRC standards as required by 10 CFR 50.59. PG&E is conducting a separate technical review to confirm feasibility of the assumed steam generator load path and haul routes.

In addition to preliminary technical assessments, PG&E prepared the ratemaking application of which this Environmental Assessment is a part which seeks CPUC approval for the inclusion of project costs in its rate base. To avoid a significant probability of a forced outage and increased costs, replacement must occur by February 2008 for Unit 2 (2R14) and by January 2009 (1R15) for Unit 1. As described in detail in Section 2.0, Purpose and Need, in order to ensure that the RSGs are in place before there is a significant risk of a forced shutdown of DCPP due to the condition of the OSGs, the construction contract must be awarded by June 2004.

As part of this ratemaking application, PG&E has also requested that the CPUC issue an interim decision in this proceeding by June 2004, authorizing PG&E to execute long lead-time steam generator replacement contracts as discussed in Section 2.2 above.

3.3.3 SG Manufacturing Contracts

RSGs will be obtained through a competitive bidding process. There are six SG manufacturers in the world – all outside the United States. All of these are considered potential vendors for the Proposed Projects. In order to enter into a contract by June 2004, PG&E will finalize a certified design specification and request for proposal and issue these by the end of 2003. PG&E proposes that the selected vendor be contracted to design and build RSGs to the requirements in

the certified design specification on a schedule that allows steam generator replacement to occur during the steam generator replacement outage associated with the first project, in February 2008.

3.3.4 Design of RSGs

Design of RSGs will take place at a vendor's engineering office and will be based on the requirements of the PG&E CDS. PG&E will establish project management controls and design-element review and approval in the replacement steam generator contract. Frequent meetings and conference calls will be required to manage the Proposed Projects. Design drawings will be submitted to PG&E for review and approval for each step of the design process. The design phases will be most intense during the first 6 months after the contracts are signed, but will continue during the implementation of the two Proposed Projects, for refinements and longer lead items. PG&E on-site representatives will monitor implementation of the design after approval.

3.3.5 Licensing of RSGs

The manufacturing contracts will require replacement steam generators to be designed and constructed pursuant to NRC regulations (10 CFR § 50.59) so that steam generators can be replaced without amendments to the NRC licenses for Units 1 and 2. To support this approach, separate licensing sub-contracts will be included to verify that the design approach meets or exceeds the previously analyzed design and licensing bases. These subcontracts will be implemented during the first one to two years of the manufacturing contracts and will define what licensing analyses must be re-performed to ensure that the replacement steam generators meet the requirements of 10 CFR § 50.59.

3.3.6 Replacement Steam Generator Construction

Steam generators will be constructed at the vendor's site using tubing and forgings supplied by separate subcontractors. PG&E will establish a project management organization to manage the project technical, financial, and schedule interfaces, and an on-site oversight organization in 2004. This oversight organization will be located at the manufacturer's site in Japan, Korea, France, Italy, Spain, or Canada.

Both forging and tubing require long lead items and will control the overall delivery schedule. The major reason for expediting the manufacturing contract awards is to authorize the manufacturer to order forgings as soon as possible, due to limited worldwide capability. Tubing

construction requires similar advance preparation. There are a number of other steam generator replacement projects and reactor head replacement projects planned worldwide that will compete for space in the tubing and forging vendors' production lines.

The replacement steam generators will be constructed with Alloy 690TT tubing materials. This tubing material was developed in the 1980s for greatly improved resistance to stress corrosion cracking (SCC) and has yet to show degradation in lead plants after approximately 14 years of service. All modern U.S. replacement steam generators have been constructed with Alloy 690TT tubing. It is the most corrosion-resistant tubing material available. PG&E will use the EPRI report TR-016743-V2R1 for guidance in ordering this tubing. This tubing material has a slightly reduced heat transfer coefficient, and will require approximately 6 to 10 percent more surface area for equivalent heat transfer.

Other design improvements that will be included in the replacement steam generators are improved moisture carryover performance, greatly improved resistance to flow accelerated corrosion, increased thermal performance, and better access for inspections and maintenance. State-of-the-art moisture separation equipment typically produces less than 0.1 percent moisture as compared to the original steam generator specification of less than 0.25 percent moisture. Modern steam generator design has redirected and improved flow through the steam generator to minimize impurity deposit buildup, eliminate dry-out areas, and improve circulation ratio. In addition, inspection port locations will be enlarged as part of the new design. Finally, replacement steam generators will be thoroughly inspected with non-destructive techniques prior to being placed in service. This inspection will be part of the contract and will be conducted by the manufacturer or a qualified subcontractor. PG&E will oversee this inspection. Figure 3-2 shows a cut-away section of a typical steam generator depicting the tubing and other internal components.

3.3.7 Delivery of RSGs to Diablo Canyon Power Plant

Replacement steam generators will be delivered to DCPP by ship and barge. Manufacturers will have to use a heavy load ship to transport the replacement steam generators from the manufacturer's port to a nearby California port (Long Beach or San Pedro) because all manufacturing facilities are outside the U.S. (in Japan, Korea, Spain, France, Italy, and Canada). Once at the California port, the replacement steam generators will be offloaded onto a barge. Depending on location of the selected manufacturer, delivery will require 4 to 6 weeks. Steam generators will be offloaded from the barge at either the DCPP intake facility or at Port San Luis and will be transported to a temporary new on-site steam generator storage facility at DCPP (Figure 1-2).

3.4 REPLACEMENT STEAM GENERATOR TRANSPORT OPTIONS

The RSGs will be transported either to Port San Luis or the Intake Cove at the DCPP site as depicted on the map in Figure 3-3 and in the photos in Figures 3-4 and 3-5. Traditional shipping methods will be used in compliance with appropriate regulations. Modern transportation equipment will be used to offload the RSGs cautiously with measures to reduce any impacts to the shoreline. Once the RSGs arrive at either of these locations, they must be transported to the RSGSF for preparation and installation. All appropriate clearances and permits will be secured from regulatory agencies.

The two potential off-loading options (Port San Luis and the Intake Cove) are being analyzed to determine the most efficient method for delivering the RSGs. Transportation of the RSGs from Port San Luis to the temporary staging area will be along the 7-mile access road. Transportation of the RSGs from the Intake Cove will use existing roads within the plant site as indicated on Figure 1-2. These two transportation options are being equally considered and analyzed in this document. PG&E therefore seeks CPUC approval of both options at this time.

Delivery of replacement steam generators will also occur in two separate installments because steam generator replacement will occur at separate times for Unit 1 and Unit 2. The use of two barges per cycle may be necessary because of space constraints.

Once the barge or barges reach either off-load location, the steam generators will be transported to the temporary storage facility in the following manner: (1) each individual steam generator will be loaded onto a transporter and moved to the temporary storage facility in the temporary staging area; (2) the transporter will return in the reverse direction; and (3) other RSGs will be transported to DCPP along the original route until all RSGs are offloaded. After the final RSG is delivered to DCPP, the transporter will be removed from the area. Further details regarding each delivery option are provided in the following sections.

3.4.1 Port San Luis Transport Option

Under this option the RSGs will be transported from the Port San Luis area to the DCPP Avila Gate and then along the plant's access road for approximately 7 miles to the DCPP facility. PG&E plans to transport the steam generators across Avila Beach Road to the DCPP Main Gate at night to reduce traffic delays. This route is described in more detail below and is displayed in Figure 3-3.

The existing steam generators were delivered along approximately the same route during the construction of DCPP in the 1970s. For this reason, these roads were originally constructed to support heavy equipment loads. The eight OSGs were delivered without safety issues, public inconvenience, or environmental harm. PG&E will monitor the transport process and adhere to predetermined procedures in compliance with NRC requirements and agreed upon by local, regional, and state regulating agencies.

3.4.1.1 Schedule

The schedule for transport of the RSGs from Long Beach to Port San Luis is expected to take approximately two days. The steam generators will be transported from the shoreline in Port San Luis to the RSGSF at DCPP. The steam generators will be off-loaded and moved within an approximately one-week period. The PG&E Project Manager will oversee all aspects of the transport. Specialized crews will conduct all work activities according to project-defined needs as appropriate for the transport and support vehicles that will be used. Transport will proceed pursuant to the following general sequence: pre-transport activity, transport corridor preparation, and transport. The final transportation activities are expected to occur from September to November 2007 for Unit 2 RSGs and September to November 2008 for Unit 1 RSGs. These periods are preferred, if feasible, because they will avoid the typically stormy winter months. While Port San Luis is in a cove, access from the ocean and off-loading will be easier during this time period.

3.4.1.2 Barge Unloading and Transport Preparation

If possible, the barge will enter Port San Luis during high-tide conditions prior to the transport of the first RSG to the DCPP site. After offloading the RSGs the barge will also attempt to leave this location during high tide, if feasible. Ballast water will only be discharged from clean tanks on the barge, and only as necessary to stabilize the barge during unloading operations. Figure 3-6 shows the barge transport route through the mooring configuration at Port San Luis. Some of the vessels located along this route may have to be temporary relocated because of the clearance width required for the barge. A close-up depiction of the possible offloading docking and staging areas is shown in Figure 3-7. As noted above, it is possible that the Port San Luis Transport Option will use two small barges for each transport cycle rather than one large barge. The following delivery procedures will be used under either barge transport scenario.

Two likely options are planned for offloading at Port San Luis. The first option is called a “live offload” in which the barge is moored using hard points on the shore and one or two “push boats” at the other end to keep it stable. The second option is to “pin” the nose of the barge to

the ocean bottom, or most likely to the riprap at the edge of the shore. In this case, the riprap or ocean bottom will be protected with steel mats and the barge will be pulled in tight against the shore. Push boats will also be used to stabilize and maintain positioning.

Offloading the RSGs from the barge could occur using one of two methods. Under the first method, all four RSGs would be offloaded from the barge and staged in a nearby parking lot at the port. The RSGs will then be moved from the parking area to the RSGSF within 2 to 4 days. This approach will allow for release of the barge and push boats, and their associated crews as quickly as possible, possibly within one or two days. The second method involves offloading the RSGs from the barge and transporting them directly to the RSGSF in one step. This may require the barge to be stationed at the Port for one or two additional days for a total of four consecutive days. A barge with a larger surface area may be used to spread the weight of the SGs. This will allow the barge to have a shallower draft and allow access with minimal ocean floor disturbance. In both cases, the RSGs will be offloaded using a temporary bridge that spans from the barge to the shore.

Each RSG will be loaded onto a multi-wheeled transporter that will roll off the barge over the off ramp and then to either the temporary staging area in the Port San Luis parking lot, or up the access road to the RSGSF. A generic depiction of a transporter with a typical barge is shown on Figure 3-8.

The safe transport of the RSGs is dependent on favorable weather conditions. The PG&E Project Manager and the contractor of the transport operations will track the weather prior to transport of each unit. The National Oceanographic and Atmospheric Administration (NOAA) National Weather Service internet site and the Coast Guard Marine Forecast or similar sources will be used as the primary-data sources. PG&E will also confirm that unusually high tide or sea swell levels are not forecasted using the Scripps Institution of Oceanography Sea Swell Forecast Model, or other suitable model or models.

3.4.1.3 Transport Procedure and Route

Multi-wheeled transporters will be used to move the RSGs between Port San Luis and DCPP. Several types of transporters may be used, and all have similar characteristics to carry the designated load. The specific type of transporter will be determined at a point closer to the time when the projects will be implemented. There is, however, a limited potential range of likely equipment options. The transporters will likely be a towed system with rubber tires that have size and load capability within industry standard design specifications. The total payload weight of the RSG and transporter is expected to be approximately 500 tons. The estimated width of the

transporter trailer will be approximately 11 to 16 feet, and the total length is expected to be approximately 68 feet. The exact weight, width, and length will not be known until a final heavy transport vendor is selected closer to the time that the projects will be initiated. The specific transporter will be selected based on its ability to safely distribute the load uniformly over a large surface area, reducing excessive loads and impacts on existing surfaces (dirt road beds and engineered pavements) and to decrease the potential impact on buried utilities, such as piping, where present.

The transporter will travel approximately 3 to 10 miles per hour during transport. Up to three more prime movers capable of pushing and/or pulling the trailer along the haul route will be provided. A total of eight RSGs will be shipped, four for each unit. Therefore, a total of eight trips in a single direction, or 16 trips total will be required for both projects. Half of these trips will be return trips when no RSG will be present on the trailer.

3.4.1.4 Labor Force

For the Port San Luis Transport option, approximately 30 personnel will be employed on the project during the transportation activities. PG&E personnel will observe and coordinate the activity of the contractor and liaison with all appropriate governing authorities. The RSGs will be attended to during transport and the necessary security will be provided at all times. PG&E will be present during transport to observe and monitor appropriate transport procedures and to limit the potential environmental effects. The labor force used during transport will be skilled labor, with most of the work force likely originating in central California.

3.4.1.5 Equipment and Material

The associated heavy transportation and support equipment will be diesel, electric, and/or gasoline-operated. Although exact equipment will not be determined until the heavy transport contractor is selected, the following equipment description represents what is currently expected to be used for the Port San Luis Transport Option:

Prime Movers

- Three 500-horsepower (HP) diesel-powered Prime Movers (tractor trailers) to transport each RSG to the RSGSF
- Two 600-HP tugboats to stabilize barge movement

Service Fleet

- Three 400-HP diesel-powered tractor/trailers to be used as needed to shuttle gear
- Two 200-HP diesel- or gasoline-powered hydraulic pumps for gantry crane
- Three diesel-powered 18-ton forklifts to move and load equipment onto tractor/trailers and trucks as needed
- Five 1-ton-capacity diesel-powered utility/mechanic trucks
- Two diesel-powered cranes to set and remove ramps for barge unloading
- Four 110-volt diesel-powered portable light towers
- Six gasoline-powered pickup trucks and six gasoline-powered autos/SUVs for utility, personnel, and light-duty material transport
- Two gasoline-powered traffic control vehicles and arrow boards, when needed
- Four 110-volt gasoline-powered generators

All transportation equipment will be fitted with appropriate mufflers and all engines will be maintained regularly according to manufacturer specifications. The specific pieces of equipment to be used and their configurations may vary from the above list. However, this equipment list provides a conservative estimate of equipment so that potential project impacts can be assessed.

Certain materials will be transported by truck to the site, including drinking water, fuel, and lubricants for equipment. No hazardous waste is expected to be generated during the transport of the RSGs. Potential solid waste (e.g., trash) will be properly recycled and disposed of in off-site, PG&E, or contractor-owned receptacles. Construction crews will use portable chemical toilets or existing facilities.

Lighting will be supplied to facilitate nighttime work; the lights will be shielded and directed away from sensitive elements along the route.

3.4.1.6 Mats

Mats may be used to assist transport and to minimize disturbance to sensitive areas and facilitate transit, if needed. The mats are expected to be made of a material similar to high-density polyethylene and provide a strong, durable, uniform surface that can be used for access in special environments, the stabilization of heavy equipment, or ground protection. The mats allow weight to be distributed across a large surface area while remaining stable and strong. This type of mat has been used to transport heavy loads in other settings such as through wetlands, marshlands, soft sub-grades, dirt roads, shallow open water (several inches deep) and in a range

of weather conditions, without damaging the underlying environments. In selected areas steel mats (road plates) may be used to distribute load on paved or graded surfaces.

3.4.1.7 Natural Drainage Crossings

The Diablo Creek watershed contains several tributary drainages that traverse north and south along the DCPP property. The access road that will be used to transport the RSGs crosses only a small portion of the drainage system and not directly over Diablo Creek, which is at a lower elevation, 50 feet below the road. Drainage ditches are located adjacent to the road in some areas to collect and channel runoff into the creek. Construction required to reinforce unloading areas and roadway portions may cause some short-term effects from surface water runoff. Monitoring of possible erosion and sediment will be conducted to limit interaction with the existing drainage pattern.

3.4.1.8 Refueling

The transporter or associated prime mover(s) will not require refueling during transport of each RSG because of the short distance from Port San Luis. Other vehicles and equipment using diesel fuel or gasoline will be refueled at the DCPP. In the event of equipment spills or leaks, spill recovery equipment will be used consistent with the appropriate regulatory spill prevention guidance and hazardous waste management programs as implemented by the DCPP Spill Contingency Plan. Drip pans or other collection devices will be placed under the equipment at night to capture drips or spills. Equipment will be inspected daily for potential leakage or failures.

3.4.1.9 Bulldozer Usage

A standby prime mover (D9 Caterpillar bulldozer or equivalent) may be used as an assist puller if the transporter has traction problems. Additionally, upon arrival at the boat basin, two bulldozers may act as temporary bollards to secure and stabilize the barge. Bulldozers will be limited to travel on roads or other developed areas that were previously disturbed. Reinforced mats would be used if necessary.

3.4.2 Intake Cove Transport Options

Under this transportation option the replacement steam generators will be delivered by barge directly to DCPP. Because of space constraints in Intake Cove, the delivery may consist of two smaller barges each carrying two steam generators. This option will use existing roads for

transporting the RSGs within DCPP property approximately 1 mile to the RSGSF as shown in Figure 1-2. Figure 3-9 shows a close-up of the Intake Cove location.

The basic equipment to be used and the methods for barge off-loading and transporter loading are very similar to those described for the Port San Luis Transport Option. As mentioned above, specific types of equipment for each of these options are subject to change; however, the equipment described here is generally representative of what will be used. The Intake Cove Transport Option may require use of smaller barges, so two barges, rather than one, will be required to delivery each unit's RSG. This results from the physical constraints of the cove. In 1995, in accordance with NRC regulations (10 Code of Federal Regulations [CFR] § 50.59) a Nuclear Safety Related Structures, Systems, and Components (SSCs) review addressed the risk of transporting transformers through the cove. This review adequately analyzed potential conflicts with the DCPP Intake Facility. A similar analysis will be required for this offload option to verify that the power plant would not be adversely affected.

3.4.2.1 Schedule

The transportation of the steam generators from Long Beach Port to the Intake Cove should require approximately two days. The PG&E Project Manager will oversee all aspects of the transport. Specialized crews will conduct all work activities according to project-defined needs as appropriate for the transport and support vehicles that will be used, similar to the requirement under the Port San Luis option. Although the breakwater provides some protection within the cove, the preferred time for delivery of the RSGs is during non-winter months, to avoid the typically stormy ocean conditions.

3.4.2.2 Barge Unloading and Transport Preparation

Barge unloading and transport preparation will be similar to that for the Port San Luis Transport Option. The sizes of the barge and potentially of some vehicles will need to be reduced in order to maneuver within the confinements of the cove areas. Two RSGs may be delivered on each barge to allow for maneuverability in and around the breakwater and within the Intake Cove. The RSGs will be offloaded using a method similar to the method used to deliver large, heavy replacement transformers in 1995. The barge will be towed to a location just west of the boat dock, and anchored, and a ramp will be used to connect from the barge to the edge of the existing unpaved roadway. The RSGs will be lifted onto the transporter and then moved to the roadway and up the hill to the RSG storage facility. As stated earlier, the shoreline unloading area will be prepared to limit potential impacts. This will include the use of mats and other ground surface reinforcing methods, if necessary.

3.4.2.3 Transport Procedure and Route

Specialized transporters will be used to move the RSGs between the Intake Cove and DCPP staging area as described under the Port San Luis Option above. The transporter's size and load capability will be within industry standard design specifications to safely move the RSGs over the route selected.

3.4.2.4 Other Transport Considerations

The labor force, support activities, refueling, and other aspects of transport will be similar to the Port San Luis Option. The route from the Intake Cove does not traverse Diablo Creek. Appropriate measures will be taken to limit potential for disruption of any natural drainage courses.

3.4.2.5 Equipment and Material

The associated heavy transportation and support equipment will be diesel, electric, and/or gasoline-operated. Although exact equipment will not be determined until the heavy transport contractor is selected, the following equipment description represents what is currently expected to be used for the Intake Cove Transport Option:

Prime Movers

- Three diesel-powered Prime Movers (tractors trailers) to transport each RSG to the RSGSF
- Two 600-HP tugboats to stabilize barge movement

Service Fleets

- Three 400-HP diesel-powered tractor/trailers to be used as needed to shuttle gear
- Three diesel-powered 18-ton forklifts to move and load equipment onto tractor/trailers and trucks as needed
- Five 1-ton capacity diesel-powered utility/mechanic trucks
- Two diesel-powered cranes to set and remove ramps for barge unloading
- Six gasoline-powered pickup trucks and six gasoline-powered autos/SUVs for utility, personnel, and light duty material transport
- Two 110-volt diesel-powered light towers
- Two 200-HP diesel or gasoline powered hydraulic pumps for gantry crane

Transportation equipment will be fitted with appropriate mufflers and all engines will be maintained regularly according to manufacturer specifications. While the specific pieces of equipment to be used and their configurations may vary from the above list, it provides a representative maximum range of equipment reasonably expected to be used in order to assess project impacts.

Materials that will be transported by truck to the site include fuel and lubricants for equipment, and drinking water. No hazardous waste is expected to be generated during the transport of the RSGs. Potential solid waste (e.g., trash) will be properly recycled and disposed of in appropriate receptacles. Construction crews will use on-site facilities and portable chemical toilets.

3.5 REPLACEMENT STEAM GENERATOR PREPARATION (STAGING)

Site planning and preparation activities at DCPP must take place to prepare for removal and installation of the OSG/RSGs. The overall number of project personnel will range from 100 to 700 additional workers during the design, staging and preparation periods. Project personnel will likely increase to a peak of approximately 900 workers during the peak 80-day outage periods when removal and installation of the steam generators occurs (Figure 3-10). The 900 RSG project personnel will be in addition to the 1,100 workers required for the regular refueling outage. To accommodate the short-term increase in worker traffic, PG&E will incorporate alternate work hours for the workers for the 80-day outage period. Approximately 90,000 additional square feet (SF) will be required in temporary or existing facilities in order to establish services required to support new workers and associated activities. To the extent possible, existing DCPP structures and facilities will be used to serve as these facilities or to otherwise support the RSG activities.

The various staging facilities and areas must be prepared in advance of removing the OSGs and installing the RSGs in order for each project phase to follow in sequential order and on schedule. A temporary staging area (TSA) will be used to accommodate most project activities and will consist of offices, fabrication, mock-up, weld testing, warehouse, and laydown areas. A brief description of the primary staging facilities and areas are summarized in this section.

3.5.1 Replacement Steam Generator Storage Facility

The RSGs will be staged in a temporary enclosure located within the TSA prior to their installation. This new steam generator storage facility (also called the replacement steam generator storage facility, or RSGSF) will be a temporary enclosure to protect the replacement steam generators until they are installed. Replacement steam generators will be prepared for

installation in this storage facility, which will be removed after the second steam generator replacement outage. Several sites have been determined as alternative locations for the TSA. These are shown on Figure 1-2. It is important to locate all project staging areas in close proximity to one another, so space may be combined or connected with other TSA space described below.

Approximately 10,000 SF is required for the RSGSF. The RSGSF will be equipped with adequate electricity, lighting, communications, ventilation equipment, and other capabilities as required by uniform building code standards. The RSGs will be offloaded and staged on wood cribbing, concrete cribbing blocks, or other suitable material. Other RSG preparation work will also be performed as described below.

3.5.2 Temporary Warehouse and Laydown Area

Approximately 10,000 to 15,000 SF of temporary warehouse space and approximately 20,000 to 25,000 SF of laydown area will also be required within the TSA. This space could be combined and should be in close proximity to the RSGSF, mock-up, fabrication, and weld shops. Potential options for these areas are shown on Figure 1-2. The temporary warehouse and lay down area will be used for all services, including those needed by warehouse personnel, for record storage, for storage of any required materials as a receiving dock, for electricity, lighting, telephones, fire protection, and heating/ventilating equipment to ensure that ANSI N45.2.2, or applicable standard storage can be satisfied. These areas will also provide any additional space needed to temporarily stage any materials (miscellaneous parts and contractor outage equipment) to support either RSG or OSG activity.

3.5.3 Mock-Up Facilities

An approximately 5,000-SF training facility will be required to house a mock-up steam generator consisting of a steam generator channel head, reactor coolant pipes, steam generator supports, and adjacent structures and components to simulate actual plant access conditions. The mock-up will be used to train personnel in cutting, templating, machining, welding, and other specialized procedures to be used during the removal and installation of the steam generators. This area may also be used to provide space for nuclear welder training, qualification, and testing. The temporary mock-up facility will be equipped with electricity, lighting, communications, service air, running water, and ventilating equipment, and any other required equipment for its intended use. The proposed location will be within the TSA options shown in Figure 1-2.

3.5.4 Fabrication and Weld Test Shops

An approximately 5,000-SF temporary facility will be required for welder qualification and shop fabrication activities. This facility will contain workstations for practicing cutting, machining, and automatic welding operations and booths for welder qualification in both automatic and manual welding techniques. The fabrication facility will be used to prefabricate pipe system components, special tools, electrical make-ups, and to weld piping spool pieces. This facility may also contain the general welding test shop, insulation modification area, and clean tool crib. The fabrication shop facilities will be equipped with electricity, lighting, communications, service air, running water, ventilating equipment, and all required equipment. The location for the fabrication and weld shops will be the same as shown for the TSA options identified in Figure 1-2.

3.5.5 Replacement Team Office Space

The project team office space will be sized to house both the prime contractor and the PG&E project team in one area. Approximately 10,000 SF of office space will be required to accommodate up to 150 personnel. The office areas will be equipped with electricity, lighting, communications, HVAC system, required fire protection, and required office furniture and equipment. Existing building space may be made available to accommodate this group. Alternatively, temporary facilities may be required; these would be included in any of the TSA options. Major subcontractors also may elect to use their own office facilities (e.g., trailers) while mobilized at the job site. The installation contractor will need to coordinate the location of these facilities with PG&E on existing, developed property. Temporary office facilities (e.g., trailers), if required by subcontractors, will require water, power, sanitation, and telephone services.

3.5.6 Containment Access Facility

The existing containment access facilities will be inadequate to support the increased number of workers that will be assigned during the steam generator replacement outage. A temporary, dedicated, approximately 10,000-square-foot, containment access facility structure that will be constructed spanning the boundary of the radiation controls area and will serve as the central processing point for steam generator replacement workers to dress in anti-contamination clothing, receive their dosimetry[3] and briefings, and move into and out of the containment building. This facility will be constructed near the Unit 1 fuel handling building or at a similarly

[3] Personal radiation measurement equipment worn by all workers entering the radiation controls area.

suitable location, as depicted in Figure 1-2, and will also be used for a craft briefing and break area and as a control point for radiation protection personnel. This facility will be removed after the second steam generator replacement outage.

3.5.7 Security Processing Facility

While the existing Security Processing Facility can accommodate extra personnel on site, temporary enhancements to this facility may be required to serve project purposes.

3.5.8 Decontamination Facilities

Reconfiguration of the existing decontamination facility or an additional temporary decontamination space of approximately 2,000 SF may be required to support additional personnel during project activities. In addition, 2,000 SF will be required temporarily for laundering anti-contamination clothing for the additional personnel associated with these projects. If additional facilities are required, temporary facilities must be located near the Unit 1 and 2 containment structures, inside the Radiation Controls Area (RCA) for direct access purposes.

3.5.9 Parking

Parking accommodations for up to 900 SGRP personnel may be necessary during the peak outage period, in addition to the 1,100 outage personnel typically on site during each normal refueling outage. The current planning strategy indicates that adequate space is available at Parking Lots 1, 7, 8, and others around DCPP. The locations of these parking lots are shown in Figure 1-2. Shuttles to other parking areas could also be provided as required.

3.6 ORIGINAL STEAM GENERATOR REMOVAL, TRANSPORTATION, AND STORAGE

PG&E has evaluated three options for steam generator replacement and installation were reviewed: one-piece through the equipment hatch, two-piece through the equipment hatch, and one-piece through the containment wall. PG&E concluded that the one-piece through the equipment hatch was the most technically feasible and the most cost- and schedule-efficient. This replacement method allows the existing generators to be removed and installed in one piece, and requires less radiation exposure and in situ welding than the other two options. This method will also be the least invasive to existing plant structures and systems.

3.6.1 Steam Generator Removal and Replacement

The preferred method for removing the OSGs is to haul them out of the containment building through the equipment hatch over the Auxiliary Building roof and through the Fuel Handling Building. For installing the RSGs, the preferred approach employs essentially the same method in reverse. The sequential steps for moving the steam generators in and out of the Units 1 and 2 are represented in Figures 3-11 through 3-15 and are briefly summarized below.

Removal and Installation Components

The installation contracts will encompass the following:

- Construction and removal of all temporary facilities needed for the installation phase of the projects (early 2007 to mid-2009).

- Removal of a section of biological shield wall in order to clear the rigging path for the SGs in front of the equipment hatch.

- Commodities attached to the wall section requiring removal must be temporarily removed or permanently rerouted in order to facilitate removal of the wall section.

- Two temporary auxiliary cranes will be installed within the containment building to facilitate removal, replacement and installation of new permanent structures, piping, and steam generator appurtenances within the steam generator compartments,. The electrically powered hydraulic cranes will augment the polar gantry crane and thus improve equipment handling during critical path activities. This process is shown in Figure 3-12.

- A steel runway system will be installed inside the containment area for transporting the steam generators through the equipment hatch. The runway will span from the equipment hatch to the far side of the refueling pool. The runway will be skewed within each unit to minimize interference with the biological shield wall. The runway can be seen in Figures 3-11 through 3-15. The runway system will be designed in accordance with the NRC license requirements.

- The OSGs will be rigged out of the containment as intact assemblies using a temporary lifting device (TLD), as shown in Figure 3-12. The TLD is a gantry capable of traveling along the rails of the polar crane girders. The TLD will be

designed with sufficient height to allow passage of the steam generators between the crane bridge girders so that the bottom of the steam generator can clear the top of the lower biological shield walls.

- The steam generators will be transferred through the equipment hatch on the runway system and directly onto a hydraulic platform trailer (transporter) staged on the Auxiliary Building roof at the end of the runway. The hydraulic platform trailer will transport the OSGs across the Auxiliary Building at elevation 140 feet to the west rollup door of the Fuel Handling Building, where it will make a 90-degree turn passing through the Fuel Handling Building. At the east rollup door of the Fuel Handling Building, the OSGs will be transferred directly onto an outside runway system. This sequence is set forth in Figures 3-13 through 3-15.

- When handling the steam generators outside of the Fuel Handling Building, the existing subsurface conditions, outside interference, wind loading, and the fact that the steam generator centerline will be more than 35 feet above grade as it passes out through the rollup door will be considered. A rigging system will be installed to lift the steam generators from an elevated runway system and lower them to a site transporter staged below, as shown in Figures 3-13 through 3-15.

- After the OSGs are lowered onto the site transporter, they will be secured and transported to the Old Steam Generator Storage Facility (OSGSF). The RSGs will be moved into the containment following the same steps in reverse.

3.6.2 Storage of OSGs

The least-cost method of disposing of the OSGs at this time is to store them on site during remaining plant life and then decommission them along with the remaining plant equipment at end-of-life. The OSGSF would be an approximately 10,000-SF concrete building at the upper portion of the Diablo Canyon site in one of two areas near the 500 kV yard and out of the Coastal Development Zone, as indicated as item 1 shown in Figure 1-2. PG&E will obtain all appropriate permits for the facility from San Luis Obispo County and other key parties. As an alternative, the OSGs could be sent off site for immediate storage at additional cost. This will also require permits and coordination to move the material to a storage site.

- ***Protective coating:*** The exterior will be decontaminated to the extent possible inside containment (or potentially just outside the hatch, depending on space requirements), and then a plastic coating will be applied as a preventative measure

to secure loose material. The coating will prevent the spread of loose contamination. This procedure will be performed in accordance with NRC requirements for the handling of radioactive materials.

- The building can be constructed on a reinforced concrete mat foundation or an independent floor slab with spread footings. The most penetrating decay particle is the gamma ray. Gamma rays are blocked by the steel OSG shell and the concrete building such that their levels inside the building are less than the background radiation levels on the outside of the building. The walls and roof will be made of reinforced concrete to meet maximum permissible dose limits as prescribed by 40 CFR 190. As discussed above, access into the OSGSF will be controlled using locked personnel access doors. The OSGSF design would satisfy the implications embodied in NRC Generic Letter 81-38, the commitments of Diablo Canyon operating license, and any governing state and local building codes.

3.7 REPLACEMENT STEAM GENERATOR INSTALLATION

The replacement steam generators will be stored in the replacement steam generator storage facility until the steam generator replacement outage. The installation contractor will perform preparatory work prior to the outage, including removing the nitrogen purge, removing any protective shipping coating, removing nozzle shipping covers and plugs, preparing nozzle weld ends, cleaning and fitting support bolts, installing foreign material barriers and installing rigging attachments.

When the old steam generators have been removed and plant piping systems prepared, the replacement steam generators will be transported from the replacement steam generator storage facility to the outside containment lift system on the 115-foot level behind the fuel handling building. The replacement steam generators will travel along the existing paved road to reach the fuel handling building. The replacement steam generators will be installed in a manner that is essentially a reverse of the removal of the original steam generators. Replacement steam generators will be lifted to the transporter track system at the 140-foot level, moved into containment, upended using the temporary lifting device on top of the polar crane, landed in the proper steam generator cubicle, and then welded to the reactor coolant system loops. Welds will be verified with radiography as required by the ASME Section III and XI code. Main steam piping and other connections will be reattached as well as the steam generator supports. New thermal insulation and new steam generator access platforms will be installed. All disturbed commodities will be restored. The containment building will be restored and all temporary

equipment and lifting devices will be removed. The replacement steam generators will be installed in full compliance with ASME code requirements.

3.8 NO PROJECT ALTERNATIVE

The No Project Alternative for this document means the original steam generators are not replaced and DCPP Units 1 and 2 will no longer be available for service, resulting in the loss of approximately 2,200 MW of base load system generation capacity. The No Project Alternative presented in this document proposes construction of new generation capacity to meet system needs if DCPP Units 1 and 2 operation were to cease. The specific configuration of the No Project Alternative will vary depending upon a number of uncontrollable factors (e.g., need and market forces). Construction and operation of replacement generation capacity will be subject to separate permitting processes that will be completed in the future. This section describes a reasonable alternative that will satisfy the need for replacement facilities in a most cost-effective manner and allow a conceptual level of assessment of impacts for this report.

DCPP is a base-loaded facility that operates at approximately 90 percent annual capacity factor. Based on this factor, it is assumed that new replacement power for DCPP Units 1 and 2 will be from several combined cycle gas turbine (CCGT) plants. Natural-gas–fired CCGT plants are designed to operate very efficiently at base load conditions. This is considered the best-case option to replace DCPP Unit 1 and 2 generation.

A typical configuration for a proven modern CCGT plant is a two-on-one design (two gas turbines and one steam turbine with associated heat recovery steam generators and duct burners). It is further assumed that the gas turbines will be "F" class machines matched with an appropriate size steam turbine to produce approximately 500 to 600 MW (gross) of electrical generation. An appropriate amount of gas fuel duct firing is also assumed to augment maximum power production to make up for losses associated with ambient worst-case temperature conditions and transmission line losses. Assuming these conditions, an equivalent energy generation would be needed to replace the loss of 2,200 MW (net) at DCPP Units 1 and 2.

While the exact location of the new replacement CCGT generation facilities is not known at this time, this document assumes that the facilities would be divided between Northern California and the Southern Central Valley. Based on current generation proposals available on the California Energy Commission (CEC) website, approximately 1,000 MW could be located in Alameda County and 1,000 MW could be located in Kern County.

The exact location of the generators must be known before a transmission plan of service can be developed. To be conservative, this Environmental Assessment assumes simplified interconnection and network upgrades for the CCGT replacement generators because this information is not currently available. For the purpose of this evaluation, the CCGT generators in Alameda and Kern Counties are assumed to be approximately less than 2 miles from the Tesla or Midway Substations, respectively. It is further assumed that there is enough space in both substations to accommodate the line terminations and that the short circuit duties associated with the CCGT replacement generators will not exceed the rating of circuit breakers in the substations. In addition, the potential overloads will be taken care of by using remedial action schemes and reconductoring of existing lines and that installation of equipment in existing substations can be made within the substations, so that additional land will not be required.

Siting, construction, and operation of the replacement CCGT facilities would be subject to separate environmental impact analyses and final approval processes by various state and/or federal agencies. This document does not address those environmental impacts, except to generally characterize the environmental consequences of adding DCPP Units 1 and 2 replacement generation as a consideration of these Proposed Projects.

3.9 NO ACTION ALTERNATIVE

The No Action Alternative assumes that no action will be taken to replace the electrical capacity of DCPP Units 1 and 2. If no action were taken to replace the electrical capacity of DCPP Units 1 and 2, there will be potential for rolling blackouts in PG&E's service areas that could affect millions of people, with significant adverse effects on public health and safety and the regional economy. This alternative is not considered likely because of the magnitude of the impacts from loss of power supply that will result from it. Furthermore, it is not likely that DCPP Unit 1 and 2 power generation will cease without some form of replacement power being supplied to avoid impacts associated with potential loss of service that could otherwise occur. Under such an alternative, PG&E would also no longer be in compliance with CPUC requirements (PUC Code Section 451) for PG&E's electric system. Therefore, this alternative is not practicable and it is not carried forward in the sections assessing the impacts of individual alternatives.

3.10 OTHER ALTERNATIVES CONSIDERED BUT NOT CARRIED FORWARD

The Proposed Projects consist of replacing the existing steam generators at DCPP Units 1 and 2. Once the RSGs are transported to DCPP Units 1 and 2, replacement is relatively straightforward. Therefore, the primary alternatives to the Proposed Projects consist of alternative routes to

transport the RSGs to the DCPP. Alternative transport options (via highway or rail) were considered to be infeasible and were rejected due to limited road access and lack of rail access to the project site. Primary constraints include steep terrain and remote location of the project site.

Alternatives to the Proposed Projects all involve some consideration of new generation or potential loss of power as described in the No Project and No Action Alternatives (Sections 3.8 and 3.9). Different combinations of new generation may be possible; however, all of these potential projects would be subject to separate permitting and approval processes. These different combinations may not meet PG&E's required obligations to supply power in the most cost-effective manner and will not meet the basic project objectives set forth in Section 2.0 or serve the purpose and need of the Proposed Projects. Any such options will not, therefore, be legitimate project alternatives under CEQA. Thus, these other options are either not feasible on the basis of their cost-effectiveness or are too uncertain to define. The No Project Alternative described in Section 3.8 is the least-cost, most feasible no project alternative on a conceptual basis for the purposes of this environmental review process.

Figure 3-1. Diablo Canyon Unit 1 and 2 Replacement Implementation Schedule
CLICK HERE TO VIEW

Figure 3-2. Typical Steam Generator Cutaway Section
CLICK HERE TO VIEW

Figure 3-3. Barge Transport/Offload Options
CLICK HERE TO VIEW

Figure 3-4. View Toward Port San Luis - Potential Offloading Area
CLICK HERE TO VIEW

Figure 3-5. View Toward Intake Cove - Potential Offloading Area
CLICK HERE TO VIEW

Figure 3-6. Barge Transport Route to Port San Luis
CLICK HERE TO VIEW

Figure 3-7. Potential Port San Luis Docking/Staging Areas
CLICK HERE TO VIEW

Figure 3-8. Typical RSG Barge Offload Plan and Elevation
CLICK HERE TO VIEW

Figure 3-9. Potential Intake Cove Docking/Staging Areas
CLICK HERE TO VIEW

Figure 3-10. Additional Workforce During SGRP
CLICK HERE TO VIEW

Figure 3-11. SG on Runway through Equipment Hatch Handling in Containment: Plan View
CLICK HERE TO VIEW

Figure 3-12. SG on Runway and Lifted into Place Handling Process in Containment: Elevation
CLICK HERE TO VIEW

Figure 3-13. Passing SG through Auxiliary Building to Equipment Hatch: Plan View
CLICK HERE TO VIEW

Figure 3-14. Plan View - SG on Runway and Rotated Auxiliary Building
CLICK HERE TO VIEW

Figure 3-15. SG Lifting from Transporter Outside Auxiliary Building: Elevation
CLICK HERE TO VIEW