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Staff Report Coastal Development Permit Application E-05-001 - (Pacific Gas & Electric Company)

California Coastal Commission

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STAFF REPORT
COASTAL DEVELOPMENT PERMIT APPLICATION

Application File No.:	**E-05-001**
Applicant:	**Pacific Gas & Electric Company**
Project Location:	Humboldt Bay Power Plant, adjacent to Humboldt Bay near King Salmon, Humboldt County.
Project Description:	Construct and operate an Independent Spent Fuel Storage Installation (ISFSI) to store used nuclear fuel from the Humboldt Bay Power Plant.
Substantive File Documents:	See Appendix A

EXECUTIVE SUMMARY

The proposed development is the construction and operation by Pacific Gas & Electric Company (PG&E, or the Permittee) of a facility to store spent nuclear fuel and other materials from the Humboldt Bay Nuclear Power Plant at a site just east of the community of King Salmon and adjacent to Humboldt Bay. The facility, known as an Independent Spent Fuel Storage Installation (ISFSI), would consist mainly of a below-grade concrete vault containing six canisters filled with used nuclear material.

The power plant consists of two gas-fired electrical generating units and a nuclear generating unit that was shut down in 1976. Its spent fuel has been stored since that time in a wet storage pool adjacent to the power plant. This fuel is highly radioactive and requires secure storage for thousands of years to prevent harm to humans and the environment. Because federal law pre-empts the state from imposing requirements related to nuclear safety or radiation hazards, this report evaluates only those issues necessary to determine conformity to the policies of the Coastal Act and does not impose requirements on aspects of the facility pre-empted by federal law.

Key Issues: Significant issues related to the proposed project's conformity to Coastal Act policies include:

- Perpetual presence of the ISFSI: Because there are no offsite alternative locations available to store the spent nuclear fuel and no certainty as to when or if such locations might be available, the ISFSI would be expected to remain at this site for the foreseeable future. The findings herein are therefore based on the long-term presence of the ISFSI at this location.

- Geologic Hazards: This report describes the seismic characteristics of the project site and surrounding area, the slope stability of the project site, and coastal erosion concerns at the site. As noted above, federal law pre-empts local or state governments from imposing conditions related to radiological hazards, and the findings in this report regarding these geologic issues therefore address only those concerns related to structural stability, stability of nearby landforms, and the potential for coastal erosion to affect the proposed project as required by the Coastal Act.

  The Commission staff geologist generally concurs with PG&E's descriptions and analyses of the project site's geologic characteristics, which have also been recognized as adequate for the proposed project by the federal Nuclear Regulatory Commission (NRC). Staff is recommending through **Special Conditions 1 and 2** that the site's slope stability and rate of shoreline erosion be monitored to provide necessary assurance that site conditions remain suitable for the facility. However, even with these Special Conditions, staff has determined that the proposed development of the ISFSI at this location does not conform to Coastal Act policies related to geologic hazards. This inconsistency results in a conflict with other Coastal Act policies that must be resolved through application of Coastal Act Section 30007.5, as described below.

- Visual: The storage area would be on a visually prominent blufftop near the shoreline of Humboldt Bay. The storage structure would be below grade, but other structures and fixtures would be visible from nearby public areas. **Special Condition #3** would require PG&E to use neutral tones on all visible structures and direct lighting inward and downward to the extent allowed by NRC requirements; however, even with this Special Condition, the project would not conform to the Coastal Act's visual resources policy. This inconsistency results in a conflict with other Coastal Act policies that must be resolved through application of Coastal Act Section 30007.5, as described below.

- Marine Resources and Water Quality: The project would increase the amount of impervious surface on the power plant site and change the stormwater drainage patterns, but these aspects are not expected to adversely affect coastal resources. Soil removed for construction will be stockpiled near the power plant site, and **Special Condition #4** would require PG&E to submit a Revegetation Plan for Executive Director approval. Installation of the ISFSI would allow decommissioning of the nuclear unit at the power plant, which would reduce existing discharges from the plant. The ISFSI would also result in improvements over existing conditions, as it would be less susceptible to risks from expected geologic events that would create adverse effects to nearby coastal waters and wetlands.

- Public Access: The ISFSI would be located about 150 feet from the Humboldt Bay shoreline and near an existing trail used for shoreline access. Presence of the ISFSI would require a security zone that would affect public access. Additionally, because the ISFSI is expected to be at this site for the foreseeable future, the predicted shoreline erosion and sea level rise is likely to affect public access due to the eventual need to modify the existing shoreline protective device or construct a new one. Further, as the shoreline moves landwards towards the ISFSI, the existing public access may decrease or be eliminated due to the necessary separation between the ISFSI and the public. **Special Condition 5** would require PG&E to maintain and enhance the existing accessway by establishing a deed restriction for the accessway and submitting a plan subject to Executive Director review and approval describing measures necessary to provide continued safe public access to the site.

- Conflict Resolution: The project as proposed is inconsistent with Coastal Act Sections 30253(1)-(2) and 30251. However, denying the ISFSI or modifying it to resolve these inconsistencies would result in nonconformity to other Coastal Act policies, specifically Sections 30230, 30231, and 30240 related to marine resources, water quality, and environmentally sensitive habitat areas.

  The Commission must therefore apply Sections 30007.5 and 30200(b), which allow the Commission to approve projects involving these conflicts in a manner that, on balance, is most protective of significant coastal resources. Staff recommends the Commission determine the benefits to marine resources, water quality, and environmentally sensitive habitat areas outweigh the project's nonconformity to Coastal Act policies regarding geologic risks and visual resources.

Staff recommends that the Commission **approve** the proposed project, as conditioned.

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EXHIBITS:

Exhibit 1: Location Map

Exhibit 2: Site Plan & ISFSI Layout

Exhibit 3: Memo from Commission geologist regarding the proposed project

Exhibit 4: Letter from Executive Director to Nuclear Regulatory Commission objecting to a proposed change in federal licensing requirements, and a memorandum from the Commission geologist to the Commission regarding this change.

1 STAFF RECOMMENDATION

Motion:

*I move that the Commission **approve** Coastal Development Permit E-05-001 subject to conditions set forth in the staff recommendation specified below.*

Staff recommends a **YES** vote. Passage of this motion will result in approval of the permit as conditioned and adoption of the following resolution and findings. The motion passes only by affirmative vote of a majority of Commissioners present.

Resolution:

*The Commission hereby **approves** the Coastal Development Permit for the proposed project and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act. Approval of the permit complies with the California Environmental Quality Act because either 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment, or 2) there are no further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.*

2 STANDARD CONDITIONS

1. **Notice of Receipt and Acknowledgment**: This permit is not valid until a copy of the permit is signed by the Permittee or authorized agent, acknowledging receipt of the permit and the acceptance of the terms and conditions, is returned to the Commission office.

2. **Expiration**: Construction activities for the proposed project must be initiated within two years of issuance of this permit. This permit will expire two years from the date on which the Commission approved the proposed project if development has not begun. Construction of the development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made at least six months prior to the expiration date.

3. **Interpretation**: Any questions of intent or interpretation of any condition will be resolved by the Executive Director of the Commission (hereinafter, "Executive Director") or the Commission.

4. **Assignment**: The permit may be assigned to any qualified person, provided the assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. **Terms and Conditions Run with the Land**: These terms and conditions shall be perpetual, and it is the intention of the Commission and the Permittee to bind all future owners and possessors of the subject property to the terms and conditions.

3 SPECIAL CONDITIONS

1. **Monitoring Bluff Slopes**: The Permittee shall annually monitor the bluff slopes adjacent to the ISFSI structure for sliding, ground movement, or other motion. Monitoring shall be done using the measures and monitoring devices described in the project's *Safety Analysis Report.* No later than June 30 of each year, the Permittee shall submit annual reports, prepared by a licensed Civil Engineering Geologist, to the Executive Director describing the results of the monitoring. The Permittee shall notify County staff and the Executive Director immediately in the event of slope failure or movement that may indicate imminent slope failure. If monitoring results for any annual report indicate slope movement may require additional measures to protect the development, the Permittee shall submit a coastal development permit application or request for an amendment to this permit.

2. **Monitoring Shoreline Erosion**: The Permittee shall conduct surveys of the shoreline of the ISFSI site no less than annually. The surveys shall start during the first year of project construction and continue through the life of the project. Surveys shall be conducted by a licensed Surveyor or Civil Engineer. Each annual survey shall be performed in the early spring when the beach level is lowest and the lower bluff face is most exposed, or as close to that time as is feasible. Each survey shall record the position of the upper bluff edge and lower toe of the bluff using conventional survey techniques (total station, rod and level, plane table, etc.), differential Global Positioning System (GPS), photogrammetry (with current ortho-rectified aerial photographs), by ground Light Detection and Ranging (LIDAR), or other comparable technique. Survey techniques used shall be consistent throughout the survey period or shall allow consistent comparison of yearly data. Survey measurements shall be accurate within 0.5' horizontal and 1.0' vertical.

   The Permittee shall report the results of each survey to the Executive Director by June 30 of each year. Each report shall include narrative and mapped analysis of the survey data, a determination of the average retreat rate for the full survey area, identification of any locations where the bluff change rate is more than two standard deviations from the average. Bluff change shall be calculated at 50' intervals (or smaller) to determine the average retreat, standard deviation and to identify areas of outlier retreat rates.

   If monitoring results for any annual survey indicate the development may be threatened by coastal erosion in less than five years, the Permittee shall submit within sixty days of the annual survey report a coastal development permit application or request for an amendment to this permit to relocate the ISFSI or other project components as needed.

3. **Visual Resources:** All structures and fixtures at the ISFSI's blufftop storage site visible from public areas shall be painted or otherwise finished in neutral tones that minimize their visibility from those public areas. Lighting at the storage area shall be directed downward and inward to the extent allowed by Nuclear Regulatory Commission requirements.

4. **Revegetation of Soil Disposal Area:** ***Prior to starting project construction***, the Permittee shall provide a soil disposal area revegetation plan subject to Executive Director review and approval. The plan, at minimum, shall include a list of the species to be used, planting density, timing of the planting, performance standards (e.g., percent coverage and timing), and monitoring that will be done to ensure the performance standards are met. The species used shall be limited to non-invasive species. The Plan shall also describe other measures and Best Management Practices, including maximum slopes of the soil, that will be taken to minimize runoff and sedimentation from the soil disposal area into nearby coastal waters or wetlands.

5. **Public Access:**

   a) Deed Restriction: ***Prior to issuance of the coastal development permit***, the applicant shall submit to the Executive Director for review and approval documentation demonstrating that the applicant has executed and recorded against the parcel(s) governed by this permit a deed restriction, in a form and content acceptable to the Executive Director: (1) indicating that pursuant to this permit, the California Coastal Commission has authorized development on the subject property subject to terms and conditions that restrict the use and enjoyment of that property; and, (2) imposing the Special Conditions of this permit as covenants, conditions and restrictions on the use and enjoyment of the Property. The deed restriction shall include a legal description of the entire parcel or parcels governed by this permit. The deed restriction shall also indicate that, in the event of an extinguishment or termination of the deed restriction for any reason, the terms and conditions of this permit shall continue to restrict the use and enjoyment of the subject property so long as either this permit or the development it authorizes, or any part, modification, or amendment thereof, remains in existence on or with respect to the subject property.

   The deed restriction shall establish an accessway based on the existing public use trail and shall extend along the shoreline from the western end of the power plant site near King Salmon to the rail line on the northern end of the power plant site. The accessway shall be no less than twenty feet wide at any point as measured landward from the Ordinary High Water Mark (OHWM). The deed restriction shall also reflect that this accessway will move with the shoreline; that is, the minimum dimensions of the accessway shall be maintained as the OHWM moves due to short- or long-term events such as coastal erosion, sea level rise, or other phenomena.

b) Access Plan: Prior to starting project construction, the Permittee shall submit an access plan subject to Executive Director review and approval. The plan shall, at minimum, include the following:

- A legal description of the accessway as recorded on the property deed.
- A description of improvements that will be made to ensure public access is safely maintained. The improvements shall include, at minimum:
  - Measures that will be taken to maintain the accessway in a safe and usable condition to ensure safe pedestrian use (e.g., providing a level walking surface, regular inspections of accessway conditions, placing garbage receptacles on or near the trail, etc.).
  - Signs at both ends of the accessway that describe the access available and the conditions related to the adjacent ISFSI that may affect access. The design and placement of signs should be consistent with those developed as part of the Humboldt Bay Trails Feasibility Study.
  - A schedule to complete installation of the initial improvements described in the plan. These improvements shall be installed concurrent with construction of the ISFSI and shall be completed within 30 days of the storage casks being moved into the ISFSI storage area.

c) Changes to Access: If any change to the safety or security measures associated with the ISFSI results in a change to, or limitation on, public access to the shoreline, PG&E shall file a complete application to amend this permit. The application for an amendment shall describe the nature of the change and its effect on public access, and shall include proposed measures that would provide at least an equivalent amount of shoreline access on or near the project site.

4 FINDINGS AND DECLARATIONS

The Commission finds and declares as follows:

4.1 PROJECT PURPOSE

The primary purpose of the project is to move spent nuclear fuel from its current location in a wet storage facility at the Humboldt Bay Power Plant (HBPP) to a dry storage system, known as an Independent Spent Fuel Storage Installation (ISFSI). The ISFSI would also store a limited amount of "Greater Than Class C" radioactive materials.[1] Only fuel and material generated at the HBPP is proposed to be stored at the ISFSI. Moving the spent fuel out of wet storage would facilitate dismantling the nuclear unit at the HBPP and would allow its eventual decommissioning. PG&E proposes to store the material at the ISFSI until it can be moved to an off-site permanent repository to be established by the federal government; however, because there is no certainty as to when such a facility might be available, it is presumed that the ISFSI would remain at this location for the foreseeable future.

Although described as "spent" fuel, it is considered high-level radioactive waste and must be stored securely for tens of thousands of years. As the fuel is used in a nuclear reactor, its level of radioactivity increases significantly due to radioisotopes formed during the nuclear fission process. When the fuel is removed from the reactor, it is initially stored in a "wet storage" pool adjacent to the power plant. The water in the pool and the materials used in the pool's construction provide the shielding necessary to prevent human and environmental exposure to the high level of radioactivity present when the fuel is first removed from the reactor. The fuel must remain in the pool for at least five years until that initial level of radioactivity is reduced. It can then be transferred to another facility, if one if available. All material currently stored in the pool at the HBPP has been there for several decades, so much of its initial radiological "heat" has dissipated; however, it still requires secure storage for the foreseeable future.

4.2 PROJECT DESCRIPTION

Background

The HBPP is located just south of Eureka along the shoreline of Humboldt Bay near the community of King Salmon (see Exhibit 1 – Location Map). The power plant currently consists of two natural gas-powered electrical generating units and an inactive nuclear generating unit. The nuclear unit was built in the early 1960s and started commercial operation in August 1963. It was shut down in July 1976, pending review by PG&E of seismic safety upgrades that would be needed to conform an order issued by the Nuclear Regulatory Commission (NRC) in May of that year. In 1983, PG&E determined it would not be cost-effective to perform the modifications

[1] "Greater Than Class C" waste is low-level radioactive waste generated by the commercial sector that exceeds U.S. Nuclear Regulatory Commission (NRC) concentration limits for Class C low-level waste, as specified in 10 CFR Part 61, and requires special storage.

necessary to re-start the unit and started the process to put the plant in "safe storage" (or SAFSTOR) pursuant to NRC regulations at 10 CFR 50. In 1988, the NRC approved PG&E's SAFSTOR plan and issued a "possess-but-not-operate" license to PG&E that expires in 2015. Since then, PG&E has taken a number of actions related to decommissioning or to improve safety or environmental conditions at the facility, including removing asbestos, characterizing radiological conditions of various structures, and replacing a 250-foot ventilation stack with a smaller 50-foot stack to reduce seismic risk. In 1999, PG&E proposed to the NRC that an ISFSI be constructed to store the spent fuel from the HBPP. In 2003, PG&E submitted its application for a site-specific license pursuant to the requirements of 10 CFR 72.

Environmental Characteristics of the Site

The power plant site is a 143-acre parcel located on the shore of Humboldt Bay just east of the community of King Salmon (see Exhibit 2 – Site Plan & ISFSI Layout). Several types of habitat exist on and near the site, with the most prominent being those associated with the Bay's open waters, tidal mudflats, and tidal marshes. The site itself consists largely of former coastal terrace prairie that has been substantially disturbed due to the long-term presence of the power plant.

The site extends along several hundred feet of shoreline, most of which includes riprap that has been placed to protect the power plant. Some portions of the site extend about 150 feet onto the intertidal mudflats of Humboldt Bay. The site also includes a canal that carries bay water used to cool the power plant from an entrance point in King Salmon, and a discharge canal that carries water from the power plant cooling system to the Bay on the north end of the site. To the north and east of the power plant lies an extensive area of tidal marsh bisected by a rail line.

The proposed ISFSI would be located on a coastal bluff about 400 feet northwest of the power plant. The bluff rises about 60 feet above Humboldt Bay at its highest point. It was partially developed as the location of oil tanks formerly used by the power plant and now consists of some remnant structures, a service road, and disturbed habitat. Areas proposed to be used for loading the spent fuel, transporting it, and storing it are all developed or previously-disturbed sites within the power plant complex and are not expected to result in direct disturbance to sensitive habitats.

Characteristics of the ISFSI

Once removed from a power plant, spent fuel is generally stored in wet storage pools for at least five years to allow it to "cool" sufficiently. It may then be moved to other forms of storage, such as an ISFSI. The material stored in the pool at the HBPP has been in place since about 1976.

There are several types of ISFSI designs, with most being a variation of different types of storage casks bolted to a thick concrete pad within a secured area. The storage casks are generally multi-layer containers made of concrete, steel, and other metals that contain most of the radioactivity being generated by the spent fuel. The casks to be used at the Humboldt ISFSI are "Multi-Purpose Canisters" in that they are intended for both storage and transport of the nuclear material. The ISFSI would have six casks – five for spent fuel, and one for "Greater Than Class C" waste.

The ISFSI design at the Humboldt Bay plant would differ from most other ISFSIs in that the storage casks would be stored below grade. This would improve the ISFSI's response during seismic events, would provide better security, and would reduce dose limits of radioactivity at the site boundary. The shielding provided by the earth would allow continued use of the nearby public accessway along the Humboldt Bay shoreline.

To date, the NRC has licensed over 30 ISFSIs at nuclear power plants around the county, and is reviewing applications for several more. Many power plants have constructed ISFSIs to provide additional storage in their wet storage pools for ongoing power plant operations. At the HBPP, there is no additional spent fuel being produced, but PG&E is proposing the ISFSI in part to allow decommissioning of the power plant complex.

Main Project Elements

The initial loading of the casks would be done at the wet storage pool, which is located in the refueling building adjacent to the power plant. The storage casks would be lowered into the pool and loaded with the spent fuel assemblies. After loading, they would be removed from the pool, the water drained from the casks, the air inside replaced with helium, and they be welded shut.

The casks would then be loaded onto a transporter vehicle, which is a large tracked vehicle built specifically to transport storage casks. PG&E plans to use the same transporter used at the ISFSI being built at the Diablo Canyon Nuclear Plant. The transporter would be shipped in parts by road to the HBPP site. The transporter would use an existing road from the power plant to the top of the bluff for moving the casks to the storage site. The road was used in the past as a service road for the tanks formerly used to store fuel for the power plant. It would be widened by about eight feet to accommodate the transporter.

The storage area would be built near the top of the on-site coastal bluff, known locally as Buhne Point. The casks would be stored in a six-vault reinforced concrete and steel structure to be sunk below grade. The surface of this structure would cover an area about 20 feet wide and 76 feet long and would be about flush with the existing grade (See Exhibit 3 – Site Plan & ISFSI Layout). The structures would be surrounded by a chain-link security fence around a 60-by-128 foot perimeter with lighting and surveillance equipment. There would be a 20-by-40-foot security building about 20 feet high located at the southeast corner of this fence.

The ISFSI would also result in an outer security zone of at least 100 meters, known as the "owner-controlled area". The size of this area is regulated pursuant to 10 CFR 72.106, which establishes federal requirements for a secure area around an ISFSI. These requirements are based primarily on limiting an individual's exposure to the radiation from the stored fuel, and currently include a requirement that the minimum distance from the stored waste to the boundary be at least 100 meters. As shown on the site plan (Exhibit 2 – Site Plan and ISFSI Layout), this area would extend through the existing public access trail and into the waters of Humboldt Bay.

The total area of the ISFSI, when complete, would be about 8400 square feet, including the security building and the area within the inner security fence, and about 6.5 acres within the 100-meter controlled area. The road improvements would represent about 10,000 square feet of additional impervious surface on the power plant site. The soil removed during ISFSI construction would be place in a spoils area of about 9,000 square feet adjacent to the power plant, which would be graded and vegetated to minimize runoff and sedimentation.

Project Decommissioning

If another facility becomes available for spent fuel storage, the casks from the ISFSI could be relocated and the ISFSI could be decommissioned. The casks are designed to be suitable for transport offsite if necessary. Decommissioning would occur only after all fuel is removed from the site and would involve decontamination and disposal of the remaining materials as appropriate. The current proposed project does not address decommissioning due in part to the uncertainty about when or if it would occur and how it would be regulated at that time. Decommissioning would require either a new coastal development permit or an amendment to this permit.

Additionally, and as noted above, PG&E is proposing the ISFSI in part to allow the retired nuclear power unit to be decommissioned. PG&E is also requesting proposals to provide replacement power for the 135 megawatts currently provided by the HBPP's two natural gas-fired units. The request specifies that the source of replacement power be located in Humboldt County. If the replacement power were provided by a facility to be built at the current power plant site, it would likely require additional Commission review and may be subject to any NRC-imposed safety and security requirements necessary during decommissioning and the ongoing presence of the ISFSI.

4.3 COASTAL COMMISSION JURISDICTION

Permit Jurisdiction

The project is entirely within the coastal zone and within the Commission's retained jurisdiction. The only necessary permit from local government is a building permit from Humboldt County, which PG&E will obtain prior to construction.

The operations of the existing power plant are regulated in part through a National Pollutant Discharge Elimination System (NPDES) permit issued by the North Coast Regional Water Quality Control Board. PG&E's NPDES permit allows discharges of up to about 80 million gallons per day from the power plant, as well as variable discharges for stormwater. The two operating gas-powered generating units at the power plant are permitted to use about 76 million gallons per day of bay water for cooling. About 7,000 gallons per day are discharged from the area of the nuclear unit and wet storage area, which would be reduced upon completion of the ISFSI and the subsequent decommissioning of these facilities.

Discharges during construction of the ISFSI will likely require either a modification to the HBPP's NPDES permit or a Construction Stormwater Permit from the Regional Board. Once the ISFSI is constructed, any stormwater discharges from the project area would be incorporated into the power plant's NPDES permit.

Federal permits and federal pre-emption

The ISFSI would be subject to an NRC site-specific license. This license requires specific performance standards and operating conditions at the facility, including design specifications, testing requirements, security measures, and other measures. The license is issued for twenty years, with an option for the Permittee to request a license extension for an additional twenty years. PG&E's project description characterizes the project as a temporary facility that would be in place for twenty to forty years; however, as described in Section 4.4 (Other Project-Related Issues) below, it is anticipated that it would be in place for a much longer period.

The NRC has exclusive jurisdiction over radiological aspects of the proposal. The state is preempted from imposing upon operators of nuclear facilities any regulatory requirements concerning radiation hazards and nuclear safety. The state may, however, impose requirements related to other issues. The U.S. Supreme Court, in *Pacific Gas and Electric Company v. State Energy Commission, 461 U.S. 190, 103 S.Ct. 1713 (1983)*, held that the federal government has preempted the entire field of "radiological safety aspects involved in the construction and operation of a nuclear plant, but that the states retain their traditional responsibility in the field of regulating electrical utilities for determining questions of need, reliability, costs, and other related state concerns." The facility's current and proposed possession, handling, storage, and transportation of spent nuclear fuel are therefore precluded from state regulation. The Coastal Commission findings herein address only those state concerns related to conformity to applicable policies of the Coastal Act, and do not evaluate or condition the proposed project with respect to nuclear safety or radiological issues.

4.4 OTHER PROJECT-RELATED ISSUES

Lack of a permanent storage facility

The need for onsite storage of spent nuclear fuel at power plants around the country is a consequence of the United States not yet establishing a permanent and safe repository for spent fuel and other nuclear materials. In 1977, the federal government announced it would take on the responsibility for spent fuel from all nuclear power plants in the U.S. In 1982, the Nuclear Waste Policy Act required the Department of Energy to accept spent fuel for permanent disposal by 1998. In 1987, after studies of several potential sites, the Act was amended to make a site at Yucca Mountain, Nevada the only site undergoing further consideration. Spent fuel would be shipped to the Yucca Mountain facility from power plants around the county in priority order – generally, the older the fuel, the earlier it would be accepted. Based on this priority system, material from HBPP would be among the first to be transported and stored at the Yucca Mountain site.

Since that time, the U.S. Department of Energy, the U.S. Environmental Protection Agency (EPA), and the NRC have conducted numerous studies at Yucca Mountain and have constructed parts of the facility. It has not yet opened, however, due to several significant technological issues and court challenges. The facility was scheduled to start accepting materials in 2010; however, in July 2004, a decision by the District of Columbia Circuit Court (*Nuclear Energy Institute, Inc. v. Environmental Protection Agency, D.C. App. 2004, No.01-1258*) found that the EPA had improperly set the facility's design standard well below the safety level required by Congress[2]. The court found that the EPA's use of a 10,000-year design standard violated a requirement of the 1992 Energy Policy Act that the design be based on findings and recommendations of the National Academy of Sciences, which had recommended a one million year design standard. The court offered two options to resolve this issue – the EPA could either reset its design standard to be consistent with that of the National Academy and then make necessary changes to the facility design, or it could wait for Congress to amend the act to authorize the lower standard. This court decision has resulted in significant doubt about when or whether the Yucca Mountain facility will open. The EPA recently announced new proposed standards, which are currently undergoing public review and comment; however, the issue of whether they are adequate remains unsettled. Additionally, there several other as-of-yet unresolved court cases involving Yucca Mountain related to water rights, transportation, and other issues, any of which could delay or prevent final approval.

One additional uncertainty about Yucca Mountain is the amount of storage that may eventually be available if the facility opens. Several recent power plant re-licensings by the NRC will result in more spent fuel being generated than the facility was designed to hold. Congress limited storage at Yucca Mountain to 70,000 tons of nuclear material, which was the amount estimated to be generated by power plants through 2010. Since approval of the Yucca Mountain design, the NRC has re-licensed fifteen nuclear power plants, which extends their operating life and increases the amount of spent fuel they will generate. The 20-year license extension for each of these fifteen power plants is estimated to produce an additional 9,000 tons of high-level waste needing permanent storage[3]. This additional material will require either that Congress authorize Yucca Mountain be redesigned to hold more material or that the material be stored elsewhere. While the current priority-based system for moving material to Yucca Mountain puts the HBPP spent fuel near the beginning of the priority list, it is unclear whether the same criteria would be used by the time Yucca Mountain might open. For example, the limited storage space may result in changes so that other material may be moved first, such as material "hotter" than that at the HBPP, or material stored near large population centers.

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[2] In 2002, Congress determined that the facility must meet an "individual risk standard" for exposure to radioactive elements "based on and consistent with" the recommendations of the National Academy of Sciences. The Academy determined that the facility required designs ensuring exposures would not be exceeded for tens to hundreds of thousands of years. The EPA, however, set the exposure standard at 10,000 years. The court determined the EPA's selection of the 10,000 year standard was not "based upon and consistent with" the recommendations of the National Academy of Sciences, as had been required by Congress.

[3] In addition, there are currently eighteen other power plants with re-licensing requests before the NRC. Approval of these requests would result in the need for additional permanent storage capacity for spent nuclear fuel.

Use of ISFSIs for Spent Fuel Storage

Because the storage anticipated at Yucca Mountain is not yet available and is uncertain to ever be available, the NRC and nuclear facility operators have recognized that they will need to provide interim storage for spent fuel at the various nuclear power plants around the country. The currently accepted preferred alternative for this storage are ISFSIs. To date, the NRC has approved more than 30 ISFSIs in 23 states, most of them located at the site of the power plant from which the spent fuel has been removed. In California, there are ISFSIs at the San Onofre Nuclear Generating Station (SONGS) in northern San Diego County and at the Rancho Seco Nuclear Power Plant near Sacramento. Another ISFSI is being constructed by PG&E at the Diablo Canyon Nuclear Plant.[4]

While the NRC considers wet storage pools to provide adequate safety for the stored materials, recent studies have identified several concerns about the use of these systems for ongoing storage. The National Academies, for example, have identified several safety and security risks associated with the pools being packed more densely than anticipated in their original designs and with the threats associated with possible terrorist attacks. The dry casks used in ISFSIs are generally considered to provide an increased margin of safety – the ISFSIs are an essentially "passive" storage system, in that they do not depend on continual maintenance required of a wet storage system, though they do require regular inspections. The ISFSIs additionally encapsulate the spent fuel into hardened structures, which are less likely than the wet storage pools to be affected by forces such as seismic activity, terrorist attack, or other phenomena.

Alternatives to the Proposed Project

As part of its proposal, PG&E evaluated several alternatives to the ISFSI as proposed. These included shipping the material offsite, siting the ISFSI at several locations on the HBPP site, and considering several alternative designs for the facility.

Of the alternative offsite locations considered, all were either unavailable or otherwise infeasible. Alternatives considered included:

- Shipping the material to a reprocessing facility: There are several reprocessing facilities in other countries, but none in the U.S. This option was not considered viable due to several significant political, legal, and logistical uncertainties.
- Shipping the material to a private storage facility: While there is one proposed private facility currently under consideration (at Skull Valley, Utah), there are currently none available in the U.S.; therefore, this alternative is infeasible.
- Shipping the material to another nuclear power plant that had sufficient storage space: PG&E found that other nuclear power plants either do not have adequate storage or have not included in their storage licenses the possibility of accepting spent fuel from other power plants. This alternative is therefore unavailable.

[4] The Commission approved the Diablo Canyon ISFSI in December 2004 and two ISFSIs at SONGS in February 2000 and March 2001.

Although there are currently no offsite locations available, PG&E has stated that it will continue to monitor the availability of these alternatives and will evaluate the feasibility of moving the material if other options become available.

In evaluating possible onsite locations for the ISFSI, PG&E considered the following criteria:

- To meet the NRC's ALARA ("as low as is reasonably achievable") requirements.[5]
- To ensure adequate size for storage, safety, and security requirements.
- No disruption of existing power plant operations.
- Free of known or potential geologic hazards, including landslides, debris flows, and coastal retreat.
- Away from marine storm surge areas and tsunami inundation areas.
- Suitable foundation properties, such as load bearing capacity, no liquefaction, etc.
- Suitable access and acceptable road grades (less than 8%) and stability.
- Minimal grading requirements and avoidance of steep topography.
- On a previously developed area, to the extent possible, to minimize environmental impacts.

Based on these criteria, PG&E selected five locations on the HBPP site for further evaluation. The site proposed in this application was chosen over the others for several key reasons: it is higher than the other sites and therefore less susceptible to tsunami-related hazards; it is further from the power plant and therefore raises fewer issues related to the logistics of decommissioning; its distance from the power plant allows plant personnel to work without unacceptable dose exposures to the ISFSI; and it raises fewer issues related to adverse geologic or geotechnical conditions.

Consequences of these Issues

The length of time the ISFSI would remain in place depends largely on resolution of the issues above. The NRC's ISFSI license has a term of 20 years with an option to renew for an additional 20 years. However, because there is no resolution to the concerns about Yucca Mountain or about other potential sites, there is no assurance that PG&E would be able to transfer material to the Yucca Mountain facility or to any other facility at the end of the 20- to 40-year license period. The Commission must therefore presume the ISFSI would remain at this location in perpetuity, regardless of the length of its license. Without evidence of a feasible and available alternative for permanent storage, the Commission must presume that the facility will affect coastal resources for the foreseeable future, and the findings and conditions herein are based on this presumption. Should the situation change, the Commission recognizes that PG&E may request an amendment to this permit if it desires.

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[5] 10 CFR 72.3 defines ALARA as meaning "as low as is reasonably achievable taking into account the state of technology, and the economics of improvement in relation to –
(1) Benefits to the public health and safety,
(2) Other societal and socioeconomic considerations, and
(3) The utilization of atomic energy in the public interest."

4.5 CONFORMITY TO APPLICABLE POLICIES OF THE COASTAL ACT

4.5.1 GEOLOGIC HAZARDS

Coastal Act Section 30253 states, in relevant part:

> *New development shall:*
> *(1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.*
> *(2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs...*

The proposed ISFSI site is located on the shoreline of Humboldt Bay, and directly opposite the mouth of the Bay. The ISFSI would be sited about 400 feet west of the power plant, on Buhne Point, a coastal bluff that rises about 60 feet above the Bay. This bluff consists largely of a marine terrace deposit known as the Hookton Formation, which is made up of poorly cemented sands and interbedded clays. The site is subject to several geologic hazards, including seismic activity, coastal erosion, tsunamis, and tsunami runup, each of which is briefly summarized below. Exhibit 3 provides a Geotechnical Review Memorandum that describes the Commission staff geologist's review of the proposed project, of materials provided by PG&E, and numerous other documents and reports. It also summarizes his recommendations regarding the proposed ISFSI's conformity to Coastal Act policies related to risks from geologic hazards.

Seismic characteristics of the site: The proposed ISFSI site is near the southern end of the Cascadia Subduction Zone and near a location known as the "Mendocino Triple Junction" where three crustal plates converge – the Pacific Plate to the south; the Gorda Plate and its extension, the Juan de Fuca Plate to the north; and, the North American Plate to the east. This area has been subject to very large earthquakes of a magnitude of about 9.0 that occur roughly every 300 to 400 years and usually result in large tsunamis[6]. The last such earthquake occurred in 1700.

The Humboldt Bay area has a substantial history of seismic activity, with more than 120 earthquakes of over magnitude 5 recorded within 100 miles of the proposed ISFSI site and 10 over magnitude 7. The immediate area of the proposed ISFSI include at least two active faults. The Buhne Point Fault lies directly under the proposed ISFSI site and surfaces about 300 feet to the southwest. The surface trace of the Discharge Canal Fault lies about 500 feet from the proposed ISFSI site. These two faults create a wedge, which is uplifted during fault movements, and which is largely responsible for the topography and elevation of Buhne Point. About two miles away is the surface trace of another fault that underlies the ISFSI site – the Little Salmon Fault – which is thought to rupture concurrently with the Cascadia Subduction Zone.

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[6] An earthquake's magnitude is a measure of energy released by an earthquake, as expressed on a logarithmic scale measuring the horizontal displacement caused by an earthquake and detected on a seismograph. A magnitude 6 earthquake, for example, produces ten times the amount of ground shaking as a magnitude 5 earthquake.

Earthquakes may be rated by the amount of ground shaking they cause.[7] The Humboldt Bay Power Plant has experienced six earthquakes with ground motion of greater than 0.10 g. The relationship between an earthquake's magnitude and its rate of ground shaking is not linear. For example, the two quakes that produced the largest recorded ground motions at the site (0.30 g and 0.55 g) were of magnitude 5.3 and 5.4, respectively, while a recent magnitude 7.2 quake in June 2005 produced ground motion of less than 0.1 g. Additionally, earthquakes affect structures based on the frequency (in cycles per second) of the seismic waves they generate. High frequency shaking is generally more damaging to smaller, more rigid structures, and low frequency shaking is generally more damaging to larger or more flexible structures.

PG&E designed the ISFSI in part using a probabilistic assessment of the "maximum credible earthquake" likely to occur at the site during a 2000-year return period. This design earthquake is of magnitude 9.1, roughly equivalent to the recent Sumatra earthquake of December 2004, and has a peak acceleration of almost 2.9 g, which is equivalent to the force near the upper limit of any earthquake anywhere in the world. The Commission's staff geologist has objected to the use of a 2000-year return period and instead recommends the use of a 10,000-year return period[8]; however, the Commission concurs with his determination that the overall assessment provided by PG&E results in a conservative design basis for the ISFSI. The Commission therefore recommends that designing the ISFSI to withstand this rate of ground shaking is consistent with Coastal Act section 30253(1) with respect to the ground motion hazard.

Liquefaction: Liquefaction can occur during ground shaking when loosely consolidated soils are saturated with water. Conditions at the ISFSI site suggest that liquefaction is not likely – the soils there are generally dense and stiff clays and sands of a type not subject to liquefaction. Additionally, Standard Penetration Tests conducted at the site showed that the soils were unlikely to be subject to liquefaction.[9] As a result, the Commission concurs with the conclusion of both the staff geologist and PG&E that liquefaction will not occur in these soils.

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[7] Ground shaking is a measure of the movement caused by the earthquake compared to the rate of acceleration caused by gravity. "Peak ground acceleration" (PGA) can be measured as a vertical or horizontal movement. For example, a PGA of 0.1 g means that the ground accelerated at one-tenth the rate of acceleration resulting from gravity (9.81 meters per second squared). PGA depends not only on the intensity or magnitude of an earthquake, but on the distance from the quake and on characteristics of the site – for example, ground acceleration will vary based on the depth and firmness of soil or bedrock at the site.

[8] Exhibit 5 includes an October 2002 letter from the Executive Director to the NRC objecting to a proposed change in federal requirements that would lower the return period from 10,000 years to 2,000 years. The NRC adopted this change in September 2003. Exhibit 5 additionally includes a memorandum from the Commission geologist to the Commission explaining this change in federal nuclear safety licensing requirements.

[9] Standard Penetration Tests involve striking a sampling tube with a standard weight hammer to determine how many blows it takes to drive the tube 12 inches into the soil. Generally, where the soils take 30 blows or more, liquefaction never occurs, and where soils take between 20 and 30 blows, liquefaction is very rare. Most of the tests conducted at the site resulted in counts above 30, with the rest above 20 and spatially isolated from one another.

Slope stability: The proposed ISFSI site is surrounded by the sloped sides of Buhne Point. The bluffs to the north and west are relatively steep, and the slopes to the east and south are relatively gentle. PG&E assessed slope stability under static conditions and determined the factor of safety to be 2.69 for the north side of the site (the coastal bluff) and 4.94 for the southern slope. For most coastal developments, a safety factor of at least 1.5 is considered necessary to ensure slope stability for the life of a proposed project. As discussed under "coastal erosion", however, this level of stability cannot be assured in perpetuity if coastal erosion impinges on the site.

The slope stability analyses indicated yield accelerations—the level of ground shaking needed to instigate landslides—to be 0.69g and 0.66g for the coastal bluff and the southern slope, respectively. Since these levels of ground shaking are less than the design basis earthquake, it is likely that the slopes will fail during such an earthquake. The amount of displacements of the slide masses was calculated using a Newmark sliding block approach to be about one foot during the design basis earthquake. This is far in excess of the 50 mm usually considered acceptable for new construction, but the applicant has indicated that the design of the ISFSI can accommodate this amount of displacement.

Surface fault rupture: Several active faults underlie the site. The Little Salmon Fault, The Bay Entrance Fault and the Buhne Point fault all dip to the northeast and underlie the site at various depths. The surface trace of the Buhne Point fault lies only about 300 feet south of the ISFSI site, and the surface trace of the Discharge Canal fault lies about 500 feet to the north. These two faults define a wedge, on which the ISFSI site is located. Through movement on these faults, the wedge is gradually uplifted and tilted. Although trenches across the site did encounter sand-filled fractures, none of them showed detectable offset and so are not considered active faults. PG&E believes that future deformation from displacement on the Little Salmon fault will be minor tilting with no differential displacements. The Commission's staff geologist agrees that this is likely, but additional believes it is possible that one or both of these faults will shift position and that future fault movement could occur at the ISFSI site. It is quite common for faults to rupture along traces offset from previous ruptures, defining a "fault zone" rather than a single fault plane. This is, in fact, the case for these two faults as well, although the zone of fracturing does not appear to be more than a few tens of feet wide. Further, it is possible that a future movement along these faults could result in a different style of faulting. Given the proximity of the ISFSI to these active faults, the Commission concurs with the staff geologist's position that during the perpetual presence of the ISFSI at this site, it will not be subjected to fault rupture.

PG&E has shown evidence that large, massive structures (including ammunition bunkers, bank vaults, and buildings with massive foundations) have performed well in previous earthquakes in Taiwan, Turkey, and Nicaragua. Although these anecdotal observations are encouraging, there also are many examples of quite large, massive buildings being damaged by surface faulting. Accordingly, the Commission finds the ISFSI is not consistent with the requirement of Coastal Act Section 30253(1) to minimize risk with respect to surface fault rupture.

Tsunami: The proposed ISFSI site is within an area identified as subject to tsunami hazards. It is on the shoreline of Humboldt Bay and directly opposite the mouth of the Bay, so it could readily be subject to direct or indirect tsunami wave energy.

PG&E assessed how the ISFSI site likely would be affected by tsunamis and tsunami runups. It determined that the maximum tsunami runup resulting from a Cascadian Subduction Zone earthquake during Mean Higher High Water would be from about 23 to 38 feet. Because the ISFSI site is at about 44 feet, and because it is below grade, PG&E concludes that the ISFSI would not be inundated and would not be damaged by debris carried by the tsunami.

However, for several reasons, the Commission cannot conclude that the site will be safe from tsunami hazards either during the relatively short-term or in perpetuity. First, similarities between the expected Cascadian Subduction Zone earthquakes and the December 2004 Sumatran earthquake raise doubts as to the validity of the expected tsunami runup height at the ISFSI site. The Sumatran quake resulted in tsunami runups of as much as 130 feet, which is about three times higher than the runup predicted at the ISFSI site, but the mechanisms for the earthquakes and the generation of tsunamis in each area are similar. Additionally, the predicted 38-foot runup at the ISFSI site is based only on the height above Mean Higher High Water and does not include the customary additional height provided if the tsunami occurred during a 100-year storm surge. This would put the runup at an even higher level, possibly at or above the 44-foot elevation of the ISFSI structure. Further, the ISFSI site is on a peninsula made up of poorly consolidated soils, and it would be subject during a tsunami to wave energy from both incoming and retreating waves, which could result in substantial erosion and damage to the ISFSI site.

Finally, because the ISFSI is expected to remain in perpetuity, Commission staff requested PG&E evaluate the longer-term potential for tsunami effects. PG&E applied the rate of tectonic uplift at Buhne Point (estimated at about 1.3 feet per 100 years) to several scenarios for anticipated rates of sea level rise. The analyses found that during the next several thousand years, overtopping of the site would be likely, though over the next 10,000 years, the anticipated sea level will likely fall due to increased glaciation and that ISFSI site would become less exposed to risks associated with sea level rise or tsunamis. Therefore, based on the above, the Commission finds that the siting of the ISFSI is inconsistent with the requirement of Section 30253(1) to minimize risks associated with tsunamis and tsunami runup.

Coastal Erosion: Section 30253(2) of the Coastal Act requires, in part, that new development not require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs. The ISFSI site is in an area where historic coastal erosion rates have been among the highest in the state. This has been due in part to its location relative to the two jetties that were built to maintain the mouth of Humboldt Bay, but which also act to direct wave energy towards the site. PG&E's assessment of historical shoreline retreat in the area between 1858 and 2000 shows that the shoreline retreated between 1248 to 1485 feet. The rate of retreat during this period was highly variable – for example, between 1858 and 1870, shoreline retreat averaged 24 to 35 feet per year; between 1870 and 1942, it averaged 4 to 9 feet per year; and from 1942 to 1959, it averaged 44 to 65 feet per year. Since 1952, however, the site has been protected by a riprap revetment built to protect the power plant. The revetment was enlarged in 1956-57 and

was repaired in 1989 after being damaged in winter storms. The revetment has essentially halted retreat of the shoreline. However, the bluff above the revetment has continued to retreat, at a rate of roughly one to four inches per year. It will likely continue to retreat until it attains a stable slope angle.

The slope stability analyses assume the current configuration of the bluff. Even with modest bluff retreat, such as is predicted even in the presence of the current revetment, the static factor of safety and the expected seismic displacement will be lower and higher, respectively, than the calculations presented by PG&E. This site is only protected from coastal erosion by a revetment that has required extensive maintenance in the past, and will only remain safe in the future with continued maintenance and, perhaps, expansion of the coastal armoring.

Further, given future sea level rise, overtopping of the existing revetment and erosion of the upper bluff by direct wave attack is likely within the next several hundred years. Accordingly, it seems likely that stability of the ISFSI will require the construction of some type of upper bluff shoreline protection device. To better assess the rate of erosion of both the bluff and the shoreline, and to provide adequate time to plan for, design, and implement any necessary shoreline protection, **Special Conditions 1 and 2** would require PG&E to monitor erosion and to report to the Executive Director when erosion would cause a threat to the ISFSI's stability.

Conclusion

The site and proposed development are likely to be subject to severe ground shaking, surface fault rupture, slope failures, tsunamis, and coastal erosion. While PG&E believes that the ISFSI design is adequate to withstand these hazards, the Commission finds that siting the ISFSI at this location does not fully conform to the requirement of Section 30253(1) that new development minimize risks to life and property. Further, even with the existing revetment and with the two **Special Conditions**, the combination of bluff erosion and of sea level rise over the next several decades will likely require construction of additional shoreline protection on the bluff to protect the ISFSI, and the Commission finds the ISFSI would be inconsistent with the requirement of Section 30253(2) that new development not require shoreline protective structures during its anticipated operating life.

However, although siting the facility at this location results in inconsistencies with Sections 30253(1) and (2), to deny the proposed project or to modify it to remove these inconsistencies would result in effects on coastal resources that conflict with other Chapter 3 policies. The Commission must resolve these inconsistencies by applying Coastal Act Section 30007.5, as is described below in Section 4.5.6 of this report.

4.5.2 VISUAL RESOURCES

Coastal Act Section 30251 states, in relevant part:

> *The scenic and visual qualities of coastal areas shall be considered and protected as a resource of public importance. Permitted development shall be sited and designed to protect views to and along the ocean and scenic coastal areas, to minimize the alteration of natural land forms, to be visually compatible with the character of surrounding areas, and, where feasible, to restore and enhance visual quality in visually degraded areas...*

The ISFSI would be located near the top of a coastal bluff about 150 feet from the shoreline of Humboldt Bay. The storage structure would be constructed below grade and would not be visible from nearby public areas or coastal waters; however, the ISFSI would also include a new security building, a new fence, and associated lighting and security equipment, all located near the top of a visually prominent coastal bluff. Although these project elements are similar to those currently in place at the power plant, the ISFSI would represent an expansion of those effects into a new area visible from public viewpoints on the adjacent coastal waters, from parts of the nearby community of King Salmon, and from public roads. These areas are valued in part for their views of the Bay, for wildlife and bird watching, and for other activities done in part in appreciation of the scenic qualities of Humboldt Bay.

These project elements are necessary parts of the ISFSI's safety and security measures pursuant to NRC requirements. However, to reduce the project's impacts on visual resources, **Special Condition #3** would require PG&E to use neutral tones on all visible structures at the ISFSI and would require PG&E to direct all necessary lighting downward and inward to the extent allowed by NRC security requirements.

Conclusion

Even with this Special Condition, however, the ISFSI's location on a visually prominent bluff would interrupt views to and along the scenic coastal waters and shoreline of Humboldt Bay. The Commission therefore finds the project would be inconsistent with the requirement of Section 30251 that development be sited and designed to protect views to and along the ocean and scenic coastal areas. Additionally, although siting the ISFSI at this location results in an inconsistency with Section 30251, to deny the proposed project or to modify it to remove this inconsistency would result in effects on coastal resources that conflict with other Coastal Act policies, including Sections 30230 & 30231 (marine resources and water quality), and 30240 (environmentally sensitive habitat areas). There are no measures available that would allow full consistency with Section 30251 and the other applicable Coastal Act policies. The Commission must therefore resolve this conflict by applying Coastal Act Sections 30007.5 and 30200(b), which is discussed below in Section 4.5.6 of this report.

4.5.3 MARINE RESOURCES AND WATER QUALITY

Coastal Act Section 30230 states:

> *Marine resources shall be maintained, enhanced, and where feasible, restored. Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will sustain the biological productivity of coastal waters and that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific, and educational purposes.*

Coastal Act Section 30231 states:

> *The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of ground water supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams.*

Background

The ISFSI would be built about 150 feet from Humboldt Bay and would involve vegetation removal, grading and excavation, road construction, soil removal and stockpiling, and placement of new impervious surfaces at the power plant site. The HPBB is currently subject to an NPDES permit issued by the North Coast Regional Water Quality Control Board. The permit includes conditions related to allowable amounts of intake water from the Bay, allowable volumes and types of non-radiological discharges from the various facilities on the site, and other measures meant to prevent adverse impacts to coastal waters.[10]

Construction of the ISFSI would be subject to additional review and possible permitting by the North Coast Regional Water Quality Board for conformity to requirements for construction stormwater. These discharges are subject to Best Management Practices to avoid and minimize adverse effects to nearby waterbodies. Most project activities would take place in areas where much of the runoff is currently subject to Best Management Practices and other water quality control measures. Ongoing operation of the ISFSI would result in minor changes to the drainage patterns and stormwater runoff from the site. The facility's NPDES permit would likely be modified to incorporate any discharges related to the ISFSI. Additionally, when the existing wet

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[10] As noted previously, storage and use of hazardous radioactive materials, including the spent fuel, is subject to the requirements of the NRC. State and local governments are pre-empted by federal law from regulating activities related to nuclear safety and radiological hazards. Similarly, the design elements of the ISFSI related to nuclear safety and radiological hazards are subject solely to requirements imposed by the federal government.

storage pool is decommissioned as a result of this project, overall discharges from the power plant are expected to decrease by about 7,000 gallons per day. With these Best Management Practices and water quality measures in place, normal ISFSI operations are not expected to adversely affect marine resources or coastal water quality, and with decommissioning of part of the power plant, may allow improvements to water quality.

Construction of the ISFSI also involves removal of soil due to widening the road and constructing the storage site. The removed soils are proposed to be stored on an approximately 9,000 square-foot site near the power plant. To ensure these soils are managed to reduce runoff and sedimentation and to prevent adverse effects to nearby wetland areas, **Special Condition #4** would require that this soil be graded to minimize runoff and sedimentation into nearby coastal waters and that it be vegetated with non-invasive species pursuant to a plan subject to approval by the Executive Director.

Conclusions

Based on the above, the Commission finds that the project, as conditioned, conforms to the policies of Coastal Act Sections 30230 and 30231.

4.5.4 ENVIRONMENTALLY SENSITIVE HABITAT AREAS

Coastal Act Section 30240(b) states:

> *Development in areas adjacent to environmentally sensitive habitat areas and parks and recreation areas shall be sited and designed to prevent impacts which would significantly degrade those areas, and shall be compatible with the continuance of those habitat and recreation areas.*

Much of the HBPP site is former coastal prairie terrace, although the power plant's presence during the past nearly fifty years has resulted in significant areas of development, impervious surfaces, and other disturbances on the site. Nearby however, are extensive coastal marshes, primarily to the north and east, and the waters and shoreline of Humboldt Bay.

The ISFSI would be built on a previously disturbed site at the power plant. The site is near the oil tanks formerly used to fuel the power plant and near the road between the power plant and the tanks. The ISFSI site is vegetated primarily with ruderal or introduced species. The spoils site would be on a grassy area near the power plant.

In 1999 and 2002, PG&E conducted site surveys for sensitive species, including terrestrial and marine plants and animals. While none were found during the surveys, there are several areas at the power plant site that could provide suitable habitat for such species. Habitat at or near the site is considered suitable for several special-status fish species, including Chinook salmon, coho salmon, steelhead, coastal cutthroat trout, and tidewater goby, and several freshwater aquatic species, including northern red-legged frog, foothill yellow-legged frog, tailed frog, southern torrent salamander, and the northwestern pond turtle. As noted above, none of these species were observed on site, and construction and operation of the ISFSI is not expected to adversely affect the species or the habitat listed above.

Indirect impacts to the nearby environmentally sensitive habitat areas due to runoff and noise are not expected to cause adverse impacts. Runoff would be controlled through Best Management Practices required as part of the power plant's NPDES permits, and noise levels during construction are expected to be similar to levels already emanating from the operating power plant site. Soil removed to construct the ISFSI would be stored at a previously disturbed area near the power plant, accessible by an existing road. These soils would be graded and revegetated to reduce impacts due to sedimentation and runoff.

Conclusion

Based on the above, the Commission finds that the project conforms to the policies of Coastal Act Section 30240(b).

4.5.5 PUBLIC ACCESS AND RECREATION

Coastal Act Section 30210 states:

> *In carrying out the requirement of Section 4 of Article X of the California Constitution, maximum access, which shall be conspicuously posted, and recreational opportunities shall be provided for all the people consistent with public safety needs and the need to protect public rights, rights of private property owners, and natural resource areas from overuse.*

Coastal Act Section 30211 states:

> *Development shall not interfere with the public's right of access to the sea where acquired through use or legislative authorization, including, but not limited to, the use of dry sand and rocky coastal beaches to the first line of terrestrial vegetation.*

Coastal Act Section 30212(a) states:

> *Public access from the nearest public roadway to the shoreline and along the coast shall be provided in new development projects except where: (1) It is inconsistent with public safety, military security needs, or the protection of fragile coastal resources, (2) Adequate access exists nearby, or, (3) Agriculture would be adversely affected. Dedicated accessway shall not be required to be opened to public use until a public agency or private association agrees to accept responsibility for maintenance and liability of the accessway.*

Coastal Act Section 30214 states:

(a) The public access policies of this article shall be implemented in a manner that takes into account the need to regulate the time, place, and manner of public access depending on the facts and circumstances in each case including, but not limited to, the following:
(1) Topographic and geologic site characteristics.
(2) The capacity of the site to sustain use and at what level of intensity.
(3) The appropriateness of limiting public access to the right to pass and repass depending on such factors as the fragility of the natural resources in the area and the proximity of the access area to adjacent residential uses.
(4) The need to provide for the management of access areas so as to protect the privacy of adjacent property owners and to protect the aesthetic values of the area by providing for the collection of litter.

(b) It is the intent of the Legislature that the public access policies of this article be carried out in a reasonable manner that considers the equities and that balances the rights of the individual property owner with the public's constitutional right of access pursuant to Section 4 of Article X of the California Constitution. Nothing in this section or any amendment thereto shall be construed as a limitation on the rights guaranteed to the public under Section 4 of Article X of the California Constitution.

(c) In carrying out the public access policies of this article, the commission and any other responsible public agency shall consider and encourage the utilization of innovative access management techniques, including, but not limited to, agreements with private organizations which would minimize management costs and encourage the use of volunteer programs.

Coastal Act 30220 states:

Coastal areas suited for water-oriented recreational activities that cannot readily be provided at inland water areas shall be protected for such uses.

Coastal Act Section 30221 states:

Oceanfront land suitable for recreational use shall be protected for recreational use and development unless present and foreseeable future demand for public or commercial recreational activities that could be accommodated on the property is already adequately provided for in the area.

Coastal Act Section 30234.5 states:

The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.

Coastal Act Section 30252 states:

The location and amount of new development should maintain and enhance public access to the coast by (1) facilitating the provision or extension of transit service, (2) providing commercial facilities within or adjoining residential development or in other areas that will minimize the use of coastal access roads, (3) providing nonautomobile circulation within the development, (4) providing adequate parking facilities or providing substitute means of serving the development with public transportation, (5) assuring the potential for public transit for high intensity uses such as high-rise office buildings, and by (6) assuring that the recreational needs of new residents will not overload nearby coastal recreation areas by correlating the amount of development with local park acquisition and development plans with the provision of onsite recreational facilities to serve the new development.

Coastal Act policies generally require that developments such as the proposed ISFSI, located adjacent to the shoreline in an area with ongoing public use, not interfere with that use and provide access to the shoreline. In addition to the applicable Coastal Act policies, and pursuant to state and federal law, public access established as part of a permit decision must generally be based on an appropriate nexus between the proposed project's effects on access and the measures taken to establish access – that is, there must be a credible relationship between any loss of access caused by the project and the measures required to replace or regain that access. Further, those measures must be roughly proportional to the effects of a project.

Background and Existing Access

The ISFSI would share the 143-acre site of the existing PG&E power plant. It would be located about 400 feet northwest of the power plant and about 150 feet from Humboldt Bay. Public access along the shoreline is currently provided on the power plant site on a path and on the riprap placed to protect the power plant. There is a gate across the western end of this accessway, which is kept open at all times except during operations at the power plant where safety or security measures require it to be closed. The access provided along the shoreline, however, has not yet been established or protected by a deed restriction or easement.

The existing access area is used largely for low-intensity recreational uses, such as saltwater fishing, bird and wildlife watching, and scenic enjoyment of the Bay. The closest nearby coastal access points include a beach and picnic area at King Salmon, a boat launch at Field's Landing about a mile south of the site, and the Elk River Wildlife Area Viewpoint about a mile to the north. This shoreline along the power plant site is also described as an important link in the proposed implementation of the Humboldt Bay Trails Feasibility Study, prepared in 2001 by the Redwood Community Action Agency with funding from the California Coastal Conservancy. This study describes a system of trails and public accessways around Humboldt Bay, which includes shoreline access along the power plant site that would connect with a trail in King Salmon to the west and with a trail along the railroad to the north of the power plant.

Coastal Access Required Due to the Development

Development of the ISFSI would result in two security zones around the storage area. The innermost area would cover about 8000 square feet on the top of the bluff and would be protected by a chain link security fence and surveillance and monitoring equipment. The outer area, known as a "controlled area", is currently required by the NRC to extend a minimum of 100 meters in all directions from the ISFSI. The NRC requires that licensees have the ability to limit, but not necessary prohibit, access within this zone. Most of this controlled area around the ISFSI would be within the PG&E site, but it would include about 500 feet of the existing lateral access along the shoreline and would extend into Humboldt Bay to include just less than an acre of coastal waters.

Development of the ISFSI would include adding a fence and gate in this area to provide additional controls on public access within 100 meters of the ISFSI during some periods of project construction and operation. PG&E states that the gate is to be kept open except during very limited times when required for security and safety reasons. These closures are described as being during the time spent fuel casks would be loaded into the ISFSI storage area, which PG&E estimates would take about a week, and in the event of an ISFSI emergency or if casks need to be removed from the storage area for maintenance. However, PG&E characterizes these two latter events as highly unlikely. Providing continued public access to this area is therefore consistent with required NRC safety and security measures.

The ISFSI would result in further limitations on access due to the uncertainty about whether a permanent storage facility will be available to replace the ISFSI at the end of its 20- to 40-year license period. With that uncertainty, the ongoing presence of the facility must be expected to result in the exclusion zone remaining for the foreseeable future. As described in Section 4.5.1 above, expected changes to the site include inland movement of the shoreline due to phenomena such as coastal erosion and sea level rise. These changes would affect access at some point, either by the need to place additional shoreline stabilization structures to protect the ISFSI or by movement of the shoreline closer to the ISFSI and its inner security zone, which would result in public access being "squeezed out" of this section of the shoreline.

Special Condition #5 would address these effects in several ways. It would require PG&E to establish the accessway through use of a deed restriction that ensured public access to the shoreline would remain, and that the accessway would move in concert with the shoreline. It would also require PG&E to provide several basic improvements to the existing accessway, such as an even walking surface, signage, and similar elements. It would further require PG&E to request from the Commission a permit amendment when changes to the accessway conditions, such as the expected environmental changes (e.g., coastal erosion, sea level rise, etc.) or changes in regulations, ownership, or other administrative elements, would reduce public access to the shoreline.

Conclusion

Based on the discussion above, the Commission finds that the project, with the inclusion of **Special Condition #5**, will conform to the public access and recreation policies of the Coastal Act.

4.5.6 RESOLVING POLICY CONFLICTS

Coastal Act Section 30007.5 states:

> *The Legislature further finds and recognizes that conflicts may occur between one or more policies of the division. The Legislature therefore declares that in carrying out the provisions of this division such conflicts be resolved in a manner which on balance is the most protective of significant coastal resources. In this context, the Legislature declares that broader policies which, for example, serve to concentrate development in close proximity to urban and employment centers may be more protective, overall, than specific wildlife habitat and other similar resource policies.*

Coastal Act Section 30200(b) states:

> *Where the commission or any local government in implementing the provisions of this division identifies a conflict between the policies of this chapter, Section 30007.5 shall be utilized to resolve the conflict and the resolution of such conflicts shall be supported by appropriate findings setting forth the basis for the resolution of identified policy conflicts.*

As noted previously in this report, the proposed ISFSI is inconsistent with Sections 30253(1)-(2) (geologic hazards) and Section 30251 (visual resources) of the Coastal Act. However, as explained below, denying or modifying the proposed project to eliminate these inconsistencies would lead to nonconformity to other Coastal Act policies, namely Sections 30230, 30231 (marine biology and water quality), and 30240 (environmentally sensitive habitat areas).

Regarding its inconsistency with Section 30253(1)-(2), even though the ISFSI's proposed location is the most suitable of the feasible and available sites for reducing geologic risks, approving the ISFSI at this location would not be fully consistent with the requirements of Section 30253(1) to minimize those risks. The ISFSI would be located at a site subject to geologic risks associated with seismic activity, tsunami, surface rupture, coastal erosion, and sea level rise. Even with design measures to reduce the risks associated with these hazards, the ISFSI's location does not minimize those risks and it is therefore inconsistent with Section 30253(1). Additionally, the perpetual presence of the ISFSI at this location would require construction of additional shoreline protection during the life of the project, which conflicts with the requirement of Section 30253(2) that new development not require protective structures that would substantially alter natural landforms along bluffs and cliffs. Regarding its inconsistency with Section 30251, the ISFSI is proposed to be sited near the top of a coastal bluff, as this is the most suitable site for reducing risks from geologic hazards, though approving it at this location would not protect views to and along the ocean, which would make it inconsistent with that requirement of the Coastal Act's visual resource policy.

However, denying the ISFSI on the basis of these inconsistencies would result in the continued presence of the existing storage facility, which would likely result in significant adverse impacts to marine biology, water quality, and environmentally sensitive habitat areas caused by the same geologic hazards that make the blufftop a safer location than the existing storage pool. In such a situation, when a proposed project is inconsistent with a Chapter 3 policy, and denial or modification of the project would be inconsistent with another policy, Section 30007.5 of the Coastal Act provides for resolution of such a policy conflict.

Applying Section 30007.5

As indicated previously, the standard of review for the Commission's decision on a coastal development permit in the Commission's retained jurisdiction is whether the proposed project is consistent with the Chapter 3 policies of the Coastal Act. In general, a proposal must be consistent with all relevant policies in order to be approved. If a proposal is inconsistent with one or more policies, it must normally be denied or conditioned to make it consistent with all relevant policies.

However, the Legislature recognized through Sections 30007.5 and 30200(b) that conflicts can occur among those policies. It therefore declared that when the Commission identifies a conflict among the policies of Chapter 3, the conflict is to be resolved "in a manner which on balance is the most protective of significant coastal resources", pursuant to Coastal Act Section 30007.5.

Resolving conflicts through application of Section 30007.5 involves the following seven steps, each of which is explained in greater detail below, followed by how each applies to the proposed ISFSI project:

1) The project, as proposed, is inconsistent with at least one Chapter 3 policy;
2) The project, if denied or modified to eliminate the inconsistency, would affect coastal resources in a manner inconsistent with at least one other Chapter 3 policy that affirmatively requires protection or enhancement of those resources;
3) The project, if approved, would be fully consistent with the policy that affirmatively mandates resource protection or enhancement;
4) The project, if approved, would result in tangible resource enhancement over existing conditions;
5) The benefits of the project are not independently required by some other body of law;
6) The benefits of the project must result from the main purpose of the project, rather than from an ancillary component appended to the project to "create a conflict"; and,
7) There are no feasible alternatives that would achieve the objectives of the project without violating any Chapter 3 policies.

1) The project, as proposed, is inconsistent with at least one Chapter 3 policy:

For the Commission to apply Section 30007.5, a proposed project must be inconsistent with an applicable Chapter 3 policy. In the case of this proposed ISFSI, the inconsistency is with Sections 30253(1)-(2) and 30251.

2) The project, if denied or modified to eliminate the inconsistency, would affect coastal resources in a manner inconsistent with at least one other Chapter 3 policy that affirmatively requires protection or enhancement of those resources:

A true conflict between Chapter 3 policies results from a proposed project which is inconsistent with one or more policies, and for which denial or modification of the project would be inconsistent with at least one other Chapter 3 policy. Further, the policy inconsistency that would be caused by denial or modification must be with a policy that affirmatively mandates protection or enhancement of certain coastal resources. Denial of the ISFSI would be inconsistent with three policies of this type –Section 30230, which requires, in part, that "Marine resources shall be protected for such uses"; Section 30231, which requires, in part, that biological productivity "shall be maintained"; and Section 30240, which requires, in part, that environmentally sensitive habitat areas "shall be protected against any significant disruption of habitat values" *[emphasis added in each]*. In most cases, denying a proposed project will not cause adverse effects on coastal resources for which the Coastal Act mandates protection or enhancement, but will simply maintain the status quo. Where denial of a project would result in such effects, as with this ISFSI, a conflict between or among two or more Coastal Act policies is presented.

3) The project, if approved, would be fully consistent with the policy that affirmatively mandates resource protection or enhancement:

For denial of a project to be inconsistent with a Chapter 3 policy, the proposed project would have to protect or enhance the resource values for which the applicable Coastal Act policy includes an affirmative mandate. That is, if denial of a project would conflict with an affirmatively mandated Coastal Act policy, approval of the project would have to conform to that policy. If the Commission were to interpret this conflict resolution provision otherwise, then any proposal, no matter how inconsistent with Chapter 3, that offered a slight incremental improvement over existing conditions could result in a conflict that would allow the use of Section 30007.5. The Commission concludes that the conflict resolution provisions were not intended to apply to such minor incremental improvements.

Because the ISFSI storage casks are designed to prevent the releases that would adversely affect the biological resources mentioned above, the project, as proposed and conditioned, is therefore fully consistent with Coastal Act Sections 30230, 30231, and 30240.

4) The project, if approved, would result in tangible resource enhancement over existing conditions:

This aspect of the conflict between policies may be looked at from two perspectives – either approval of the project would result in improved conditions for a coastal resource subject to an affirmative mandate, or denial or modification of the project would result in continued degradation of that resource.

Approval of the ISFSI would result in removal of hazardous material from the wet storage pool to a location less susceptible to expected events that would cause releases in violation of the Coastal Act's marine resource, water quality, and ESHA policies. It would also result in overall significantly lower risks associated with geologic hazards than the current storage system. The ISFSI would be at a higher elevation, making it less susceptible to tsunamis, and it would be on a site not prone to liquefaction. The nuclear material stored in the ISFSI would be in a more stable configuration for safety during seismic events. Further, implementing the ISFSI would allow PG&E to continue the decommissioning process at the power plant, resulting in eventual removal of the wet storage system and the nuclear unit from a location highly susceptible to those expected events.

Denial of the ISFSI would result in the continued operation of the wet storage pool and the continued higher risks associated with its response to expected geologic events, including tsunamis and seismic movement. But for the ISFSI, the storage pool and its contents would be expected to remain at the site for the foreseeable future. During that time, it is probable that any or all of several events could occur that would be of sufficient magnitude to adversely affect the pool and its contents – an earthquake above the design limits of the facility, a tsunami, coastal erosion, or sea level rise. Any of these events would likely result in damage or destruction of the storage pool and release of debris and its contents to the marine waters and tidal wetlands adjacent to the power plant, which would be inconsistent with Coastal Act policies established to protect marine life, water quality, and sensitive habitat areas. Similarly, while modifying the ISFSI by siting it at one of the alternative onsite locations would lead to fewer visual impacts, those locations would not result in minimization of the geologic risks and would not fully comply with the policies to protect biological resources. Therefore, either denial or modification of the ISFSI would conflict with the policies of Sections 30230, 30231, and 30240.

5) The benefits of the project are not independently required by some other body of law:

The benefits that would cause denial of the project to be inconsistent with a Chapter 3 policy cannot be those that the project proponent is already being required to provide pursuant to another agency's directive under another body of law. In other words, if the benefits would be provided regardless of the Commission's action on the proposed project, the project proponent cannot seek approval of an otherwise-unapprovable project on the basis that the project would produce those benefits. In essence, the project proponent does not get credit for resource enhancements that it is already being compelled to provide. In the case of this ISFSI, PG&E is proposing the project in part to support its ongoing efforts to decommission the HBPP nuclear unit and associated facilities, and in part because it would be less expensive to operate and maintain than the wet storage pool. While PG&E must obtain approvals for the ISFSI from both the Coastal Commission and the NRC, this type of storage system is not being mandated by the NRC or any other regulatory body and PG&E could choose to maintain its existing system.

6) The benefits of the project must result from the main purpose of the project, rather than from an ancillary component appended to the project to "create a conflict":

A project's benefits to coastal resources must be integral to the project purpose. If a project is inconsistent with a Chapter 3 policy, and the main elements of the project do not result in the cessation of ongoing degradation of a resource the Commission is charged with enhancing, the project proponent cannot "create a conflict" by adding to the project an independent component to remedy the resource degradation. The benefits of a project must be inherent in the purpose of the project. If this provision were otherwise, project proponents could regularly "create conflicts" and then request that the Commission use Section 30007.5 to approve otherwise unapprovable projects. The balancing provisions of the Coastal Act could not have been intended to foster such an artificial and easily manipulated process, and were not designed to barter amenities in exchange for project approval.

The ISFSI is designed to be a more stable and less intensive system of storage than wet storage. The project as proposed by PG&E consists of measures necessary to ensure long-term storage of spent nuclear fuel in a secure environment. Its benefits are a result of its basic design elements, which consist of enclosing spent nuclear fuel in multiple layers of concrete and metal within a reinforced concrete structure. The "essence" of the ISFSI is that fuel would be moved out of a facility that is at a lower elevation and is highly susceptible to the geologic events described above, and into a more stable facility less subject to those events and the risks associated with those events.

7) There are no feasible alternatives that would achieve the objectives of the project without violating any Chapter 3 policies:

Finally, a project does not present a conflict among Chapter 3 policies if at least one feasible alternative would meet the project's objectives without violating any Chapter 3 policy. Thus, an alternatives analysis is a condition precedent to invocation of the balancing approach. If there are alternatives available that are consistent with all of the relevant Chapter 3 policies, then the proposed project does not create a true conflict among those policies.

As noted in Section 4.4 above, PG&E conducted an alternatives analysis to determine the best feasible location for the ISFSI. The analysis evaluated the "no project", offsite, and onsite alternatives. The "no project" alternative would have PG&E maintain the current wet storage system. While this system meets current federal requirements for nuclear safety, denial of the ISFSI would result in continued operation of the wet storage system and, as noted above, that system is not built or located in a manner that minimizes geologic risks. Therefore, denial of the ISFSI would result in a development inconsistent with that requirement of Section 30253(1). Regarding the offsite alternative, PG&E determined that there are no feasible offsite locations available. The Commission concurs that there are no offsite alternatives available at this time or in the foreseeable future. Regarding the five onsite alternatives, PG&E's analysis shows that each was less desirable than the proposed location, and the Commission concurs with that conclusion. Locating the ISFSI at any of

these alternative sites would have conflicted with the Section 30253(1) requirement to minimize geologic risks, since the other sites were at lower elevations or were less stable.

Existence of a Conflict Between Chapter 3 Policies: Based on the above, the Commission finds that the proposed project presents a conflict between Sections 30253(1)-(2) and 30251, on the one hand, and Sections 30230, 30231, and 30240, on the other, that must be resolved through application of Section 30007.5, as described below.

Conflict Resolution: After establishing a conflict among Coastal Act policies, Section 30007.5 requires the Commission to resolve the conflict in a manner that is on balance most protective of coastal resources. As noted previously, the project would reduce but not minimize risks due to geologic hazards, it would eventually require shoreline protection during its anticipated operating life, and it would result in adverse visual impacts, thus making it inconsistent with Coastal Act Sections 30253(1)-(2) and 30251. However, denying the project because of its inconsistency with these policies would result in significant adverse effects on biological resources due to the greater geologic risks associated with the existing storage area.

In sum, the Commission finds that while the ISFSI would cause adverse visual impacts, would not minimize risks due to geologic hazards, and would eventually require a shoreline protection structure, it would also be sited at a location that is vastly superior to the location of the existing spent fuel storage pool, thus reducing the risks associated with those geologic hazards and, for that reason, increasing protection of coastal biological resources. The Special Conditions in Section 3 of this report are necessary to ensure the ISFSI's adverse impacts are minimized and its benefits are fully realized. Therefore, the Commission finds that approval of the proposed project notwithstanding its inconsistencies with several Coastal Act policies is "most protective of coastal resources" for purposes of the conflict resolution provisions of Coastal Act Section 30007.5.[11]

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[11] Staff is recommending the Commission use Section 30007.5 to address the project's inconsistencies with several Chapter 3 policies. Alternatively, however, the proposal is approvable notwithstanding its inconsistencies with Chapter 3 policies under the "override" provisions of Section 30260, as described below.

Coastal Act Section 30260 states:

> *Coastal-dependent industrial facilities shall be encouraged to locate or expand within existing sites and shall be permitted reasonable long-term growth where consistent with this division. However, where new or expanded coastal-dependent industrial facilities cannot feasibly be accommodated consistent with other policies of this division, they may nonetheless be permitted in accordance with this section and Sections 30261 and 30262 if (1) alternative locations are infeasible or more environmentally damaging; (2) to do otherwise would adversely affect the public welfare; and (3) adverse environmental effects are mitigated to the maximum extent feasible.*

Coastal Act Section 30260 provides that "coastal-dependent" industrial facilities that do not fully conform to other applicable Chapter 3 policies may nonetheless be permitted if they meet three tests. Coastal Act Section 3001 defines a "coastal-dependent" development or use as that which "requires a site on or adjacent to the sea to be able to function at all." The Humboldt Bay Power Plant ("HBPP") was designed as a coastal-dependent industrial facility dependent on seawater to cool its generators and was sited next to the Bay to allow use of that water. The wet storage pool for the spent fuel was a necessary part of the power plant, as there were no offsite options for

storing the material. The proposed ISFSI is an equally integral component of that coastal-dependent industrial facility and therefore shares the coastal-dependent character of the larger HBPP of which it is a part.

The Commission may apply Section 30260 to approve a "coastal-dependent industrial facility" if it meets three tests – first, that alternative locations are infeasible or more environmentally damaging; next, that to do otherwise would adversely affect the public welfare; and finally, that adverse environmental effects are mitigated to the maximum extent feasible.

The first test of Section 30260 requires that there be no feasible, less environmentally damaging alternatives. As discussed above in Section 4.4, there are no other offsite locations available to store the spent fuel and there is considerable doubt as to when, if ever, alternative sites might become available. Additionally, none of the onsite alternative locations at the power plant would be less environmentally damaging, since they are lower in elevation or less stable geologically and therefore more prone to the geologic hazards described in Section 4.5.1. Therefore, the proposed ISFSI meets the first test of Section 30260.

The second test of Section 30260 allows coastal-dependent industrial development to be permitted if to do otherwise would adversely affect the public welfare. There are several public benefits of the proposed project that would not occur if the project is not completed, including some based on the relative merit of the ISFSI over the existing wet storage pool. First, constructing and operating the ISFSI is one of many steps necessary for PG&E to decommission the existing nuclear power unit and storage area. By moving the spent fuel to the ISFSI, PG&E will be able to continue the decommissioning process, which will eventually reduce the overall environmental risks associated with the site – for example, decommissioning will eliminate the wastewater discharges now permitted from that part of the power plant and thus reduce adverse effects to the quality of the waters of Humboldt Bay. Second, the ISFSI is expected to be less costly to operate and maintain than the wet storage facility. Once built, it will have relatively low maintenance costs compared to the ongoing and intensive requirements of the wet storage pool. This difference is likely to be reflected in overall lower costs or lower rate increases for Californians within PG&E's service area. Finally, and most importantly, although it is not perfect, the ISFSI is considered safer in many ways than the wet storage pool. By storing the spent fuel and other materials in the ISFSI, the project is likely to reduce if not eliminate the risks associated with any number of accidents, natural phenomena, or direct attack, including structural or operational failure of the pool, human error, seismic activity, tsunami, and terrorism. The consequences of such events are almost unimaginable and significantly lessening the risks of such events occurring are clearly in the public interest. At the same time, the project would be detrimental to the public welfare in that it would create adverse visual impacts along this stretch of the Humboldt Bay shoreline, although those effects would be minimized through imposition of Special Condition #3. The Commission finds, however, that on balance, the benefits of the proposed project to the public welfare exceed the detriments, and the project therefore meets the second test of Section 30260.

The third test requires that adverse environmental effects be mitigated to the maximum extent feasible. The ISFSI is designed to meet federal safety and security requirements related to nuclear waste storage. For those elements of the proposed project not pre-empted by federal law, and based on the characteristics of the ISFSI site, the Special Conditions imposed by the Commission provide the maximum feasible mitigation to address impacts to coastal resources. Additional measures that would minimize geologic risks would conflict with other Coastal Act policies – for example, hardening the bluff face would minimize risks but would not conform to Section 30253(2). The Special Conditions mitigate effects on other coastal resources – for example, the project's adverse effects on public access to the shoreline are addressed by ensuring that access will be maintained at the site through an appropriate legal instrument and submittal of an access plan with specific requirements to enhance existing access, and its effects on coastal waters and visual resources are minimized through necessary conditions. Therefore, the project as proposed and conditioned meets the third test of Section 30260.

Conclusion

Based on the discussion above and the findings in previous sections of this report, the Commission finds that the ISFSI, although inconsistent with Coastal Act Sections 30251 and 30253(1)-(2), is a coastal-dependent industrial facility and may therefore be approved as it complies with the requirements of Coastal Act 30260.

CALIFORNIA ENVIRONMENTAL QUALITY ACT

Section 13096 of the Commission's administrative regulations requires Commission approval of coastal development permit applications to be supported by a finding showing the application, as modified by any conditions of approval, to be consistent with any applicable requirements of the California Environmental Quality Act (CEQA). Section 21080.5(d)(2)(A) of CEQA prohibits approval of a proposed development if there are feasible alternatives or feasible mitigation measures available that would substantially lessen any significant impacts that the activity may have on the environment. As discussed above, the proposed project has been conditioned to be found consistent with the policies of the Coastal Act. Mitigation measures that will minimize or avoid all significant adverse environmental impacts have been required. As conditioned, there are no feasible alternatives or feasible mitigation measures available, beyond those required, that would substantially lessen any significant adverse impact that the activity would have on the environment. Therefore, the Commission finds that the proposed project, as conditioned to mitigate the identified impacts, can be found consistent with the requirements of CEQA.

APPENDIX A: SUBSTANTIVE FILE DOCUMENTS

California Coastal Water Quality Monitoring Inventory. Monitoring Program Summary for PG&E's Humboldt Bay Power Plant NPDES Permit (at http://www.sfei.org/camp/servlet/DisplayProgram?which=General&pid+NCCA0005622). Accessed July 28, 2005.

Congressional Research Service. Spent Nuclear Fuel Storage Locations and Inventory (Order Code RS220001). December 21, 2004.

Nuclear Regulatory Commission. Fact Sheet on Decommissioning Nuclear Power Plants, Feb 11, 2004 (accessed via http://www.nrc.gov/reading-rm/doc-collections/fact-sheets/decommissioning.html)

Pacific Gas & Electric Company. Safety Analysis Report, Environmental Report, and Emergency Plan from application to Nuclear Regulatory Commission for 10 CFR 72 ISFSI License, 2003.

_____. Humboldt Bay Independent Spent Fuel Storage Installation Emergency Plan. October 2004.

Redwood Community Action Agency, Natural Resources Services Division. Humboldt Bay Trails Feasibility Study. December 21, 2001.

[See also citations related to geology issues in Exhibit 3.]

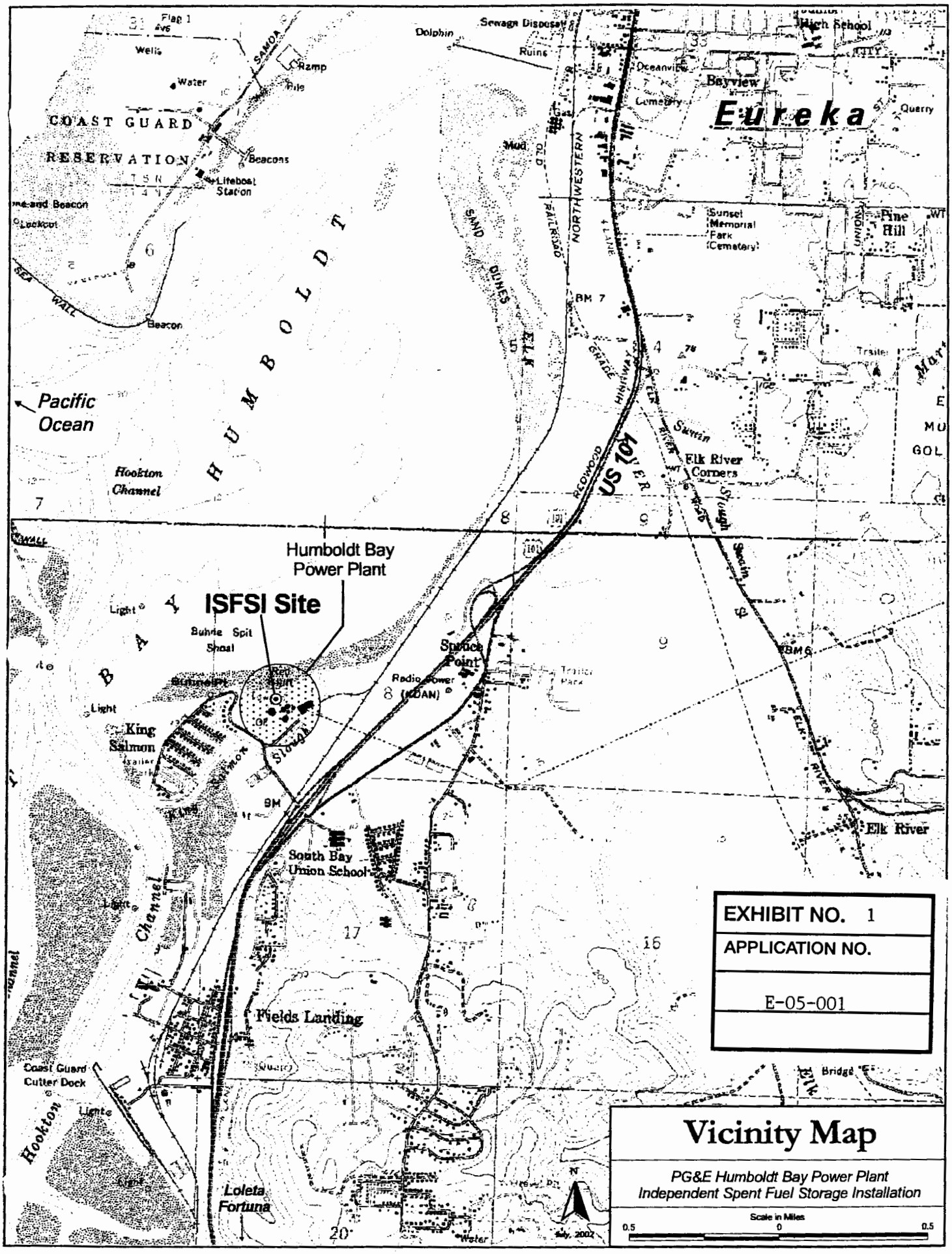

EXHIBIT NO. 1
APPLICATION NO.
E-05-001

Vicinity Map

PG&E Humboldt Bay Power Plant
Independent Spent Fuel Storage Installation

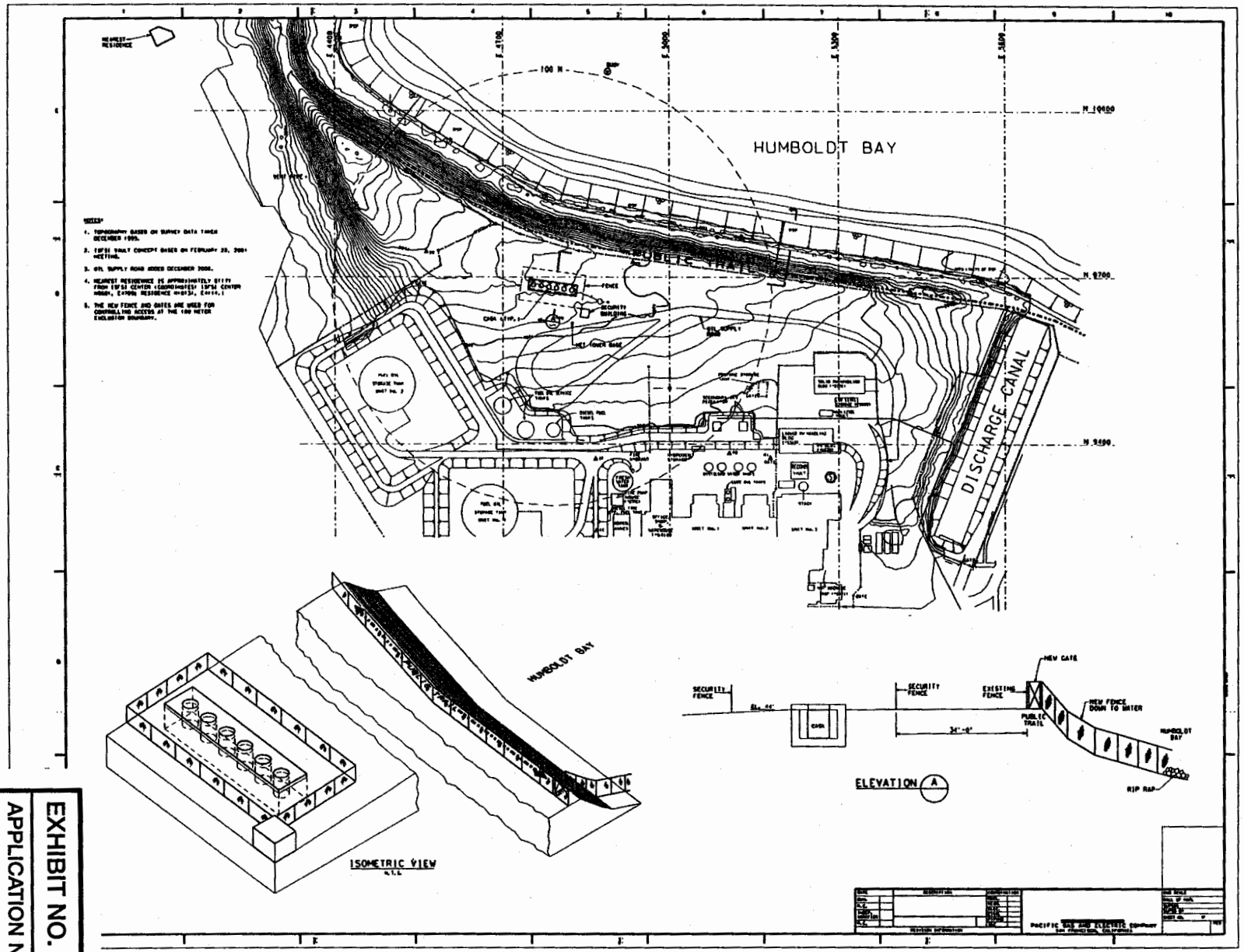

EXHIBIT NO. 2

APPLICATION NO.

cE-05-001

STATE OF CALIFORNIA—THE RESOURCES AGENCY ARNOLD SCHWARZENEGGER, *GOVERNOR*

CALIFORNIA COASTAL COMMISSION

45 FREMONT, SUITE 2000
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12 August 2005

GEOTECHNICAL REVIEW MEMORANDUM

To: Tom Luster, Coastal Program Analyst
From: Mark Johnsson, Staff Geologist
Re: E-05-001 (Pacific Gas and Electric Company, Humboldt Bay Power Plant Independent Spent Fuel Storage Installation)

In regard to the above referenced Coastal Development Permit Application, I have reviewed the following documents submitted by the applicant to the Nuclear Regulatory Commission in support of their license from that Commission:

1) Pacific Gas and Electric Company, 2004, "Humboldt Bay Independent Spent Fuel Storage Installation Environmental Report" dated October 2004.
2) Pacific Gas and Electric Company, 2004, "Humboldt Bay Independent Spent Fuel Storage Installation Safety Analysis Report" dated October 2004.

After reviewing these documents, I had several remaining concerns regarding the potential for coastal erosion at the site. In addition, because the Commission previously has determined that there is no reasonable expectation that a Federal spent nuclear fuel repository will ever be licensed to receive wastes from commercial nuclear power plants (see appeal A-3-SLO-04-035, Pacific Gas and Electric Company, Diablo Canyon Power Plant Independent Spent Fuel Storage Installation, December 2004), I asked the applicant to consider the effects of geologic hazards at the site on the proposed development over perpetuity, rather than over the 50-year design life cited by the applicant. These applicant addressed these questions with the following documents.

3) Pacific Gas and Electric Company 2004, "Assessment of erosion at Buhne Hill, Humboldt Bay ISFSI", 32 p. report dated 10 September 2004 and signed by W. D. Page (CEG 1432).
4) Pacific Gas and Electric Company 2005, "Implications of long-term global warming and tectonic displacements at Buhne Hill, Humboldt County, California", 86 p. report dated 18 July 2005 and signed by W. D. Page (CEG 1432).

During the review of this application a major earthquake occurred in the vicinity of the proposed development. The applicant prepared the following report on the earthquake and its effects on the existing infrastructure at the Humboldt Bay Power Plant:

5) Pacific Gas and Electric Company 2005, "Report on the M7.2 Offshore Northern California earthquake of June 14, 2005", 9 p. report dated and signed by M. McLaren, S. Nishenko, N. van der Elst and M. Stanton.

EXHIBIT NO. 3
APPLICATION NO.
E-05-001

To help address the tsunami hazard at the site, the applicant submitted the following documents, which I also have reviewed:

6) Abramson, H., 1998, Evidence for tsunamis and earthquakes during the last 3500 years from Lagoon Creek, a coastal freshwater marsh, Northern California [Masters thesis]: Arcata, California, Humboldt State University.
7) Anonymous, 1981, E.A. White, The Union.
8) Gardner, H.W., Lindberg (CEG 1895), D.N., Bickner, F.R., and Manhart, G.L., 1999, Final report of seismic study phase 3 at College of the Redwoods Eureka Campus: Eureka, California, LACO Associates, p. 24.
9) Garrison-Laney, C.E., 1998, Diatom evidence for tsunami inundation from Lagoon Creek, a coastal freshwater pond, Del Norte County, California [Masters thesis]: Arcata, California, Humboldt State University.
10) Kroeber, A.L., 1976, Yurok Myths: Berkeley, California, University of California Press, 488 p.
11) Kroeber, A.L., and Gifford, E.W., 1949, World Renewal: A cult system of native northwest California: Anthropologic Records, v. 13, p. 1-155.
12) LACO Associates, 1999, Site evaluation for the Child Development Center, fault rupture hazard, Phase C Investigation, College of the Redwoods, 7351 Tompkins Hill Road, Eureka California: Eureka, California, LACO Associates, p. 15.
13) Leroy, T.H., 1999, Holocene sand dune stratigraphy and paleoseismicity of the north and south spits of Humboldt Bay, northern California [Masters thesis]: Arcata, California, Humboldt State University.
14) Patton, J.R., 2004, Late Holocene coseismic subsidence and coincident tsunamis, southern Cascadia Subduction Zone, Hookton Slough, Wigi (Humboldt Bay), California [Masters thesis]: Arcata, California, Humboldt State University.
15) Waterman, T.T., 1920, Yurok Geography: University of California Publications in American Archeology and Ethnology, v. 16, p. 177-314.
16) Witter, R.C., Patton, J.R., Carver, G.A., Kelsey, H.M., Garrison-Laney, C., Koehler, R.D., and Hemphill-Haley, E., 2002, Upper-plate earthquakes on the western Little Salmon Fault and contemporaneous subsidence of southern Humboldt Bay over the past 3,600 years, northwestern California, U.S. Geological Survey National Earthquake Hazards Reduction Program, p. 19.

I also have made use of a number of other references from the scientific literature on the Cascadia Subduction Zone, its seismic potential, and potential consequences of a major earthquake in the zone. These include:

Atwater, B.F., Stuiver, M., and Yamaguchi, D.A., 1991, Radiocarbon test of earthquake magnitude at the Cascadia subduction zone: Nature, v. 353, p. 156-158.
Clague, J.J., 1997, Evidence for large earthquakes at the Cascadia subduction zone: Review of Geophysics, v. 35, p. 439–460.
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I have visited the site on three occasions over the past two years. On each of these visits, I examined the site itself and the current facilities. In addition, in March 2004 I participated, together with members of the Nuclear Regulatory Commission, in a field trip to examine rock units and the trace of the Little Salmon Fault in the Humboldt Bay area. The applicant's geotechnical team also prepared a two-day field for me in May 2005 to examine the sites of tsunami investigations in the Humboldt and Del Norte County area. I have had numerous meetings and conversations with Lloyd Cluff, director of the Geoscience Department at PG&E, and with members of his staff including Drs. William Page, Joseph Sun, Marcia McLaren, AND Norm Abrahamson.

This memo will not be a point-by-point review of each of the documents cited above. Instead, after briefly describing the geologic and tectonic setting, I will summarize the geologic hazards at the site and indicate whether, in my opinion, the development can be found consistent with section 30253 of the Coastal Act, that states, in part:

> New development shall:
>
> (1) Minimize risks to life and property in areas of high geologic, flood, and fire hazard.
>
> (2) Assure stability and structural integrity, and neither create nor contribute significantly to erosion, geologic instability, or destruction of the site or surrounding area or in any way require the construction of protective devices that would substantially alter natural landforms along bluffs and cliffs.
>
> ...

Geologic and Tectonic Setting

The Humboldt Bay Power Plant lies on the eastern shore of Humboldt Bay, directly opposite the inlet between North and South Spits. The proposed site for the ISFSI is near the top of Buhne Point, a hill that rises some 60 feet above the bay. The point is made up of the Hookton Formation, a marine terrace deposit approximately 80,000 years old that consists of poorly cemented sands and interbedded clays.

The site lies near the southern end of the Cascadia Subduction Zone, marking the junction of the North America plate and the Gorda Plate to the west. The Gorda Plate, and its northern extension, the Juan de Fuca Plate are being thrust beneath the North America Plate as the latter moves relatively westward. This movement is manifested in periodic very large earthquakes—best estimated at about magnitude 9.0 with a recurrence interval of about 300-400 years. These earthquakes usually result in large tsunamis, and it is in fact deposits left from tsunamis that has been most useful in identifying past Cascadia Subduction Zone earthquakes. The last such earthquake occurred in the year 1700, and resulted in a tsunami that was recorded in historical Japanese documents of the era.

The Little Salmon Fault is a thrust fault likely originating at the Gorda/North America plate interface at depth along the Cascadia Subduction Zone, and continuing to the surface of the North America Plate. The fault passes within two miles of the ISFSI site. This fault is thought to rupture concurrently with the Cascadia Subduction Zone.

Two other active faults lie even closer to the ISFSI site, and also likely rupture concurrently with the Cascadia Subduction Zone. The Buhne Point Fault is a thrust fault dipping to the northeast that directly underlies the ISFSI site and reaches the surface some 300 feet southwest of the site. The Discharge Canal Fault is a high angle fault with a surface trace approximately 500 feet northeast of the ISFSI site. Together these two faults define a wedge, containing the ISFSI site, that is uplifted during fault movement. It is this uplift that is responsible for the topographic high that is Buhne Point. Despite extensive trenching across the ISFSI site, no signs of faulting within this wedge have been detected.

Ground Shaking

Historical Seismicity:
The Humboldt Bay region is an area of high seismic activity. There have been over 120 recorded earthquakes greater than magnitude 5 within 100 miles of the ISFSI site, including 10 that have exceeded magnitude 7. Most of these earthquakes have occurred in the offshore region within and along the southern margin of the Gorda plate and on the Mendocino fault zone at its southern margin. Only one of these earthquakes occurred on the actual interface of the Gorda and North American plates (The M 7.2 1992 Petrolia earthquake); most of the others have occurred on the overriding North America plate.

Six earthquakes have produced ground motions >10%g at the Humboldt Bay Power Plant. Two moderate earthquakes, ML 5.3 in 1975 and ML 5.4 in 1994, produced relatively large ground motions of 0.30g and 0.55g, respectively, the largest ground motions recorded at the site to date.

In June 2005 there was a magnitude 7.2 earthquake in the middle of the Gorda Plate, approximately 60 miles offshore, approximately 50 miles from the proposed ISFSI site. This was a strike-slip event in a fault on the North America Plate, above the Gorda Plate descending in the Cascadia Subduction Zone. Despite the large magnitude of this quake, ground shaking at the ISFSI site was less than 0.1 g, and the tsunami that was generated was measured in inches and only detectable by careful examination of tide gages.

Ground Shaking in Future Earthquakes

An earthquake of a given magnitude will produce different levels of ground shaking at different locations, depending on the distance of the location from the earthquake hypocenter, the nature of the soil or rock between the location and the earthquake, and soil and rock conditions at the site. The level of shaking is expressed by a term called "intensity", and is quantified by the Modified Mercalli Index, whereby intensities ranging from I (not felt) through XII (near total destruction) are assigned based on the level of damage sustained by human structures. Better quantification of the level of shaking also is possible; and the standard measure is peak ground acceleration (PGA), usually expressed as a fraction of the acceleration due to gravity (9.81 m/s2, or 1.0 g). Other measures, such as peak ground velocity, also may be used but these are more rarely tabulated. Peak ground acceleration is typically measured in horizontal and vertical directions. It can be expressed deterministically ("a given earthquake can be expected to produce a peak horizontal ground accelerations at the site of *X* g"), or probabilistically ("given the seismic environment at the site, there is a 10% chance that a peak ground acceleration of *X* g will be exceeded in 50 years"). The current trend is to express seismic risk in probabilistic terms.

Peak ground accelerations depend not only on the intensity of the causative earthquake and the distance of the site from the hypocenter of the earthquake, but also on site characteristics. Most important is the depth and firmness of the soil and/or bedrock underlying the site. All of these parameters are evaluated in producing a seismic shaking hazard assessment of a site. In evaluating the response of structures to ground shaking, the frequency (cycles per second) of that shaking is important—higher frequency shaking is more damaging to smaller, more rigid structures, whereas lower frequency shaking is more damaging to larger, or more flexible structures. The proposed ISFSI facility fits into the latter category. Different ground acceleration values apply to seismic waves with different frequencies or periods. Thus, an earthquake with a peak ground acceleration of 0.7 g may have a peak "spectral acceleration" (SA) of 1.1 g for waves of 0.3 second period, but only 0.5 g for waves with periods of 1 second. A typical earthquake produces seismic waves with many different periods, and a plot of spectral accelerations for an earthquake shows the ground accelerations for waves of all periods.

The applicant has assessed the ground shaking that would occur at the site using a probabilistic seismic hazard analysis. The probabilistic analysis assumed a 2000 year return period; a lesser standard than the 10,000 year return event required for nuclear power plants. This is allowable because of a rule change made by the Nuclear Regulatory Commission in 2003, lowering the design standard for ISFSI's to a 2000 year return event. At the time this rule change was proposed, Commission staff provided comments to the Nuclear Regulatory commission objecting to the reduction in standards largely because the choice of a lower standard was arbitrary. A copy of this comment letter is attached to this memo.

Part of developing a probabilistic seismic hazard assessment is identifying the maximum earthquake likely on any faults that could provide ground shaking at the site. The applicant has modeled this "maximum credible earthquake" as the simultaneous rupture of the entire length of the Cascadia Subduction Zone (some 600 miles long) coupled with the rupture of the Little Salmon Fault. Because of the size and locations of these faults a very large earthquake is assumed—up to a magnitude 9.1. This is roughly equivalent to the 26 December 2004 Sumatran

earthquake, and near the upper bound of any earthquake likely anywhere on Earth. The seismic potential of this area is as large as any spot on Earth.

In order to assess the ground shaking at the site, the seismic energy is propagated from the presumed epicenter to the site, accounting for directivity effects and attenuation of energy that occurs through distance. The soil characteristics of the site are then used to judge any amplification effects. The final probabilistic seismic hazard assessment resulted in a seismic spectra peaking at nearly 2.9g at a period of 0.25 seconds. At the longer periods most important for influencing large structures such as the ISFSI, spectral accelerations were still over 1g. These values of ground shaking were then used to derive design criteria for the construction of the ISFSI.

These very high ground accelerations would seem to provide a conservative design basis for the ISFSI. Although I do object to the use of the 2000 year return period in the calculation of the probabilistic seismic hazard assessment, the analysis is so dominated by the M9.1 Cascadia event that it is essentially such an event that is being modeled. It is therefore my opinion that the ground shaking possible at the site has been adequately characterized, and designing to this standard will result in a project that is consistent with Coastal Act section 30253 with respect to the ground motion hazard.

Liquefaction

Liquefaction of soils can occur during strong ground shaking if soils are water saturated and consist of loosely consolidated, well sorted sands. At the ISFSI site the water table lies at about six feet above sea level, or some 35 feet below ground level. In addition, there may be temporary perched ground water on clay layers within the Hookton. A relatively shallow ground water table coupled with the subterranean nature of the ISFSI indicates that liquefaction is a concern.

Borings at the site show that the top 23 ft of soils consists of clayey sands and clays, followed by very dense sands and silty sands to depth of 50 to 53 ft. Very stiff to hard sandy silts/silts and very dense sand extend from 50 ft to below 400 ft. A standard means of testing for the liquefiability of soils is to perform a Standard Penetration Test, in which the number of blows it takes a hammer of standard weight to drive a standard sampling tube a distance of 12 inches. Empirically, it is found that for soils with blow counts of more than about 30, liquefication never occurs, and it is indeed rare in soils with blow counts between 20 and 30. The results of various Standard Penetrometer Tests in borings at the ISFSI site indicated that nearly all blowcounts are above 30. The few blowcounts that are below 30 are typically above 20 (dense) and are spatially isolated. From these data the applicant concludes, and I concur, that liquefaction will not occur in these soils.

Slope Stability

The applicant assessed slope stability under static conditions by calculating the factor of safety against sliding, using soil strength parameters measured at the site. They found that the factor of

safety at the ISFSI location was 2.69 with regard to the western slope (the coastal bluff) , and 4.94 with respect to the more gentle eastern slope towards the plant. These values are far in excess of the industry standard for new development of 1.5. As discussed under "coastal erosion," however, this level of stability cannot be assured in perpetuity if coastal erosion impinges on the site.

The slope stability analyses indicated yield accelerations—the level of ground shaking needed to instigate landslides—to be 0.69g and 0.66g for the coastal bluff and the eastern slope, respectively. Since these levels of ground shaking are less than the design basis earthquake, it is likely that the slopes will fail during such an earthquake. The amount of displacements of the slide masses was calculated using a Newmark sliding block approach to be about one foot during the design basis earthquake. This is far in excess of the 50 mm usually considered acceptable for new construction, but the applicant has indicated that the design of the ISFSI can accommodate this amount of displacement. Accordingly, it is my opinion that overall global stability of the slopes adjacent to the site is sufficient that the ISFSI will not be subject to landslide hazards unless the slope configurations change as a result of coastal erosion.

Surface Fault Rupture

Several active faults underlie the site. The Little Salmon Fault, The Bay Entrance Fault and the Buhne Point fault all dip to the northeast and underlie the site at various depths. The surface trace of the Buhne Point fault lies only about 300 feet south of the ISFSI site, and the surface trace of the Discharge Canal fault lies about 500 feet to the north. These two faults define a wedge, on which the ISFSI site is located. Through movement on these faults, the wedge is gradually uplifted and tilted. Although trenches across the site did encounter sand-filled fractures, none of them showed detectable offset and so are not considered active faults. The applicant believes that future deformation from displacement on the Little Salmon fault will be minor tilting with no differential displacements. I agree that this is likely, but I believe that it is certainly possible that one or both of these faults will shift position and that future fault movement could occur at the ISFSI site. It is quite common for faults to rupture along traces offset from previous ruptures, defining a "fault zone" rather than a single fault plane. This is, in fact, the case for these two faults as well, although the zone of fracturing does not appear to be more than a few tens of feet wide. Further, it is possible that a future movement along these faults could result in a different style of faulting. Given the proximity of the ISFSI to these active faults, I do not feel that it can be assured over perpetuity that the ISFSI will not be subjected to fault rupture.

The applicant has shown evidence that large, massive structures (including ammunition bunkers, bank vaults, and buildings with massive foundations) have performed well in previous earthquakes in Taiwan, Turkey, and Nicaragua. Although these anecdotal observations are encouraging, there also are many examples of quite large, massive buildings being damaged by surface faulting. Accordingly, I cannot find that the site will be safe from fault rupture hazard.

Tsunami

The applicant has sponsored extensive study of ancient tsunami deposits in Humboldt and Del Norte Counties; studies that have demonstrated repeated inundation by tsunamis during Cascadia Subduction Zone earthquakes. Most of these deposits were discovered in sheltered locations at relatively low elevation and give very little information regarding the maximum elevation to which tsunamis can run up. One exception is that tsunami deposits were not found behind North Spit, suggesting that the line of dunes, here about 40 feet high, is sufficient to protect that part of the bay from direct tsunami influence. In addition, Yurok oral legends tell of the tsunami of 1700, and indicate that the maximum run-up was just to the lower portion of a village site at Orick, which lies at 40 feet elevation, In addition, the applicant has modeled the tsunami height expected from a Cascadia Subduction Zone earthquake, and also arrived at estimated runup heights of 30 to 40 feet on the open coast. The tsunami would be partly attenuated as it entered Humboldt Bay, and the modeled runup elevation at the ISFSI site is 21 to 36 feet. Even at Mean Higher High Water, the modeled runup is only 23 to 38 feet. Accordingly, the applicant concludes that the ISFSI site, at an elevation of 44 feet, would not be inundated. Further, the ISFSI site is below ground level and not subject to damage by missiles carried by the tsunami. Finally, the ISFSI would be unaffected by inundation.

There are three reasons, however, that I cannot conclude that the site will be safe from a Cascadia Subduction Zone tsunami hazards in perpetuity. First, and perhaps most significant, is the comparison between the expected runups at this site and the observed runups of as much as 130 feet that occurred in Indonesia as a result of the 26 December 2004 Sumatran Earthquake. As indicated above, both the earthquake mechanism and the mechanism of tsunami generation for that earthquake is very similar to that expected for a Cascadia Subduction Zone earthquake and it is unclear why the near-source tsunami runups would be so different for the two earthquakes. Second, it is customary when assessing tsunami inundation to model the tsunami at not only high tide, but also with a storm surge (usually a 100-year storm) as well. If a Cascadia Subduction Zone tsunami were to hit during a period of high storm surge, the ISFSI site may well be damaged. Finally, the ISFSI site comprises a peninsula-like terrace that is underlain by poorly consolidated sands, silts, and clays. During a tsunami, this peninsula would be attacked from two directions. Erosion resulting from both incoming and retreating waves could, in my opinion, compromise the integrity of the ISFSI site.

Because it is anticipated that the ISFSI will occupy the site in perpetuity, I asked the applicant to address what role sea level rise might have on the site. They prepared an analysis superimposing the tectonic uplift of Buhne Hill (estimated at about 1.3 feet per 100 years) on sea level ruse under several scenarios for time periods of 100, 1000, 10,000 and 100,000 years. Their analysis of sea level rise, although necessarily poorly constrained, indicates that overtopping of the ISFSI by sea level rise in the next several thousand years is possible. Under such conditions, overtopping by a tsunami is likely. Sometime between 1000 and 10,000 years, however, it is likely, based on our understanding of driving forces of glacial cycles, that the Earth will enter another glacial period. The resulting spread of polar ice will lock up large amounts of water, resulting in a lowering of sea level. Given continued uplift of Buhne Hill, the ISFSI site actually will become safer from such effects as tsunamis and coastal erosion.

Coastal Erosion

The subject site, like a long stretch of Humboldt Bay to the north, is armored by a rip-rap revetment. In the vicinity of the power plant, the revetment dates to 1952, when rip-rap was first placed to protect Unit 1. The rip rap was enlarged and modified in 1956-7, to protect Unit 2. After suffering storm damage in the 1980's, the revetment was repaired in 1989. This rip-rap has been very effective in protecting the site from coastal erosion. For some perspective in how erosion might effect the site if the revetment is not maintained at the site, the applicant examined historic shoreline retreat in reference (3)

The applicant assessed historic shoreline retreat by reviewing 16 aerial photographs and maps (U.S. Coast Guard Charts and USGS maps) spanning the time interval 1852 to 2000. Eight of these were deemed to be of sufficient accuracy and scale to provide estimates of the shoreline position. From 1858 until 2000 total shoreline retreat has amounted to 1248 to 1485 feet. Prior to construction of the jetties at the mouth of Humboldt Bay, South Spit overlapped North Spit and, at least for the early 19th century, Buhne Hill was not exposed to attack by ocean waves. With the construction of the jetties, erosion was rapid. Between 1858 and 1870, the shoreline retreated at a rate of 24-35 feet. Between 1870 and 1942 the rate of retreat was 4 to 9 feet, but between 1942 and 1959 the bluff retreated at an average rate of 44 to 65 feet per year. The actual rate was somewhat higher than this, because the revetment was at least partially in place by 1952.

Since the construction of the revetment, the bluff above the revetment has continued to retreat, but at a much lower rate (estimated at 1-4 inches per year). Much of this retreat has been by shallow landslides, and the bluff has been flattening through time. The bluff will continue to retreat, at least until a stable slope is attained., at which time one would expect the rate of bluff retreat to slow further or stop.

What is clear from this analysis, however, is that in the absence of shoreline protection, coastal erosion will threaten the ISFSI on a decadal time span. The slope stability analyses assume the current configuration of the bluff. Even with modest bluff retreat, such as is predicted even in the presence of the current revetment, the static factor of safety and the expected seismic displacement will be lower and higher, respectively, than the calculations presented above. This site has experienced one of the highest coastal erosion rates documented in the state, is only protected from that erosion by a revetment that has required extensive maintenance in the past, and will only remain safe in the future with continued maintenance and, perhaps, expansion of the coastal armoring.

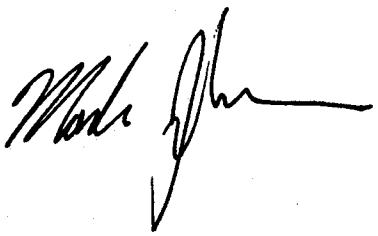
Further, given future sea level rise discussed in reference (4), overtopping of the existing revetment and erosion of the upper bluff by direct wave attack is likely within the next several hundred years. Accordingly, it seems likely that stability of the ISFSI will require the construction of some type of upper bluff shoreline protection device, in clear violation of Section 30253 of the Coastal Act.

Summary

The applicant is to be commended in presenting a candid analysis of the geologic hazards at the site. They have demonstrated that the site is likely to be subjected to severe ground shaking, slope failures, tsunami, and coastal erosion. In addition, I believe that the site may be subject to surface fault rupture hazard as well. The applicant believes that all of these hazards can be mitigated for. On the other hand, the tsunami, surface fault rupture hazard, and coastal erosion hazard at this site, coupled with an essentially infinite design life, lead me to believe that it is not possible to assure that the proposed development will not be significantly affected by these geologic hazards, as required by section 30253 of the Coastal Act.

I hope that this review is helpful. Please contact me with any questions or concerns.

Sincerely,



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Staff Geologist

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EXHIBIT NO. 4
APPLICATION NO.
E-05-001

GRAY DAVIS, GOVERNOR

Th3

7 October 2003

To: Commissioners and interested parties

From: Mark Johnsson, Staff Geologist

Re: Nuclear Regulatory Commission rule change regarding Geological and Seismological Characteristics for Siting and Design of Dry Cask Independent Spent Fuel Storage Installations and Monitored Retrievable Storage Installations

On 22 July 2002 the Nuclear Regulatory Commission (NRC) published a proposed change to 10 CFR Part 72, which would have three functions:

1. Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a probabilistic seismic hazard analysis (PSHA) or suitable sensitivity analyses, for determining the design earthquake ground motion (DE). All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation. (§ 72.103)

2. Allow new ISFSI or MRS applicants to use a DE appropriate for and commensurate with the risk associated with an ISFSI or MRS (§ 72.103); and

3. Require general licensees to evaluate that the designs of cask storage pads and areas adequately account for dynamic loads, in addition to static loads. (§ 72.212)

Commission staff objected to several aspects of the proposed rule change, especially the fact that the rule change would effectively lower the seismic design standard for dry cask storage facilities without justification. On 16 October 2002 the Executive Director

sent a comment letter (attached) to the Secretary of the Nuclear Regulatory Commission. The Commission staff was joined in this effort by the California Energy Commission and the California Seismic Safety Commission, who sent similar comment letters under the same cover.

On 16 September 2003 the Nuclear Regulatory Commission issued the final rule, which is essentially unchanged from the proposed rule. Response to Commission comments were published in the Federal Register at that time, and staff considers them unresponsive. The final rule becomes effective on 16 October 2003.

The Commission's staff geologist will present the NRC's responses to the Commission during in the Energy and Ocean Resources Report on Thursday morning, 9 October 2003 (item Th3).

STATE OF CALIFORNIA – THE RESOURCES AGENCY GRAY DAVIS, GOVERNOR

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16 October 2002

Secretary, U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Dear Commissioners,

This letter is to express the concerns of the California Coastal Commission staff with respect to the proposed rule change regarding geologic and seismologic characteristics for siting and design of dry cask independent spent fuel storage installations (ISFSI) and monitored retrievable storage (MRS) installations, described in the Federal Register (v. 67, n. 140, pg 47745-47755). As detailed in the Federal Register, the proposed changes to 10 CFR Part 72 would have three functions:

1. Require a new specific license applicant for a dry cask storage facility located in either the western U.S. or in areas of known seismic activity in the eastern U.S., and not co-located with a nuclear power plant, to address uncertainties in seismic hazard analysis by using appropriate analyses, such as a probabilistic seismic hazard analysis (PSHA) or suitable sensitivity analyses, for determining the design earthquake ground motion (DE). All other new specific license applicants for dry cask storage facilities would have the option of complying with the proposed requirement to use a PSHA or suitable sensitivity analyses to address uncertainties in seismic hazard analysis, or other options compatible with the existing regulation. (§ 72.103)

2. Allow new ISFSI or MRS applicants to use a DE appropriate for and commensurate with the risk associated with an ISFSI or MRS (§ 72.103); and

3. Require general licensees to evaluate that the designs of cask storage pads and areas adequately account for dynamic loads, in addition to static loads. (§ 72.212)

These comments principally regard function (2), which would be achieved through Regulatory Guide DG-3021, "Site evaluations and determination of design earthquake ground motion for seismic design of independent spent fuel storage installations and monitored retrievable storage installations." As outlined in the Environmental Assessment, the proposed rule change, in conjunction with Regulatory Guide DG-3021, would have the effect of lowering the design standard for ISFSI and MRS installations from a DE with a mean annual probability of exceedance of 1.0×10^{-4} (i.e., a DE with a return interval of 10,000 years) to a DE with a mean annual probability of exceedance of 5.0×10^{-4} (i.e., a DE with a return interval of 2,000 years). Three ISFSI's are currently proposed for the coast of California. Coastal Commission staff are very concerned that they be built to appropriate seismic design standards.

The California Coastal Commission was established in 1976 by the California Coastal Act (California Public Resource Code § 30000 et seq.) to provide long-term protection of California's 1,100-mile coastline for the benefit of current and future generations. A prime responsibility of the Commission is the review of proposed development projects located within areas of the Commission's jurisdiction, and the evaluation of local government decisions that have been appealed to the Commission. One component of this review is to assure that proposed development will minimize risks to life and property in areas of high geologic hazard, and assure stability and structural integrity of the proposed development (California Public Resource Code § 30253). An important tool in achieving this assurance is the application of appropriate seismic design standards. In an area as populated, economically important, and environmentally sensitive as the coast of California, the capacity for any development to release hazardous material during a major earthquake must be reduced to the lowest possible level. Ideally, this can be achieved by siting such development away from environmentally sensitive resources or populated areas. Where this is complicated by logistic or, as in the case of an ISFSI, regulatory constraints, the only recourse to assure the safety of the environment is adherence to appropriate design standards. In the case of high-level nuclear waste, located adjacent to the sea in populated regions, the highest possible seismic design standards must be applied.

The Coastal Commission staff has no objection to those portions of the proposed rule change that would require a PSHA for an ISFSI not co-located with a nuclear power plant. Nor does staff object to the provisions that allow an ISFSI co-located with a nuclear power plant to apply either a PSHA or adhere to the currently existing regulation. In addition, we raise no objection to the proposed requirement that the designs of cask storage pads and areas adequately account for dynamic loads.

Commission staff does object, however, to the proposed reduction in seismic design standards as manifested by the reduction from a DE with a mean annual probability of exceedance of 1.0×10^{-4} to one with a mean annual probability of exceedance of 5.0×10^{-4}. The Environmental Assessment lists a number of factors that may lead to a lower radiological risk at an ISFSI or MRS as compared to a nuclear power plant. Without debating the merits of these arguments, we note that no basis is provided for lowering the DE to any particular value. In the absence of quantitative evidence justifying a particular value, we feel that the conservative, precautionary approach of requiring ISFSI and MRS installations to meet the same design standard as a nuclear power plant is most appropriate. We note that meeting those standards would be far easier at an ISFSI or MRS than at a nuclear power plant, due to the relative simplicity of construction and robust character of these structures as compared to a nuclear power plant. Accordingly, we request that Regulatory Guide DG-3021 specify a DE with a mean annual probability of exceedance of 1.0×10^{-4}, consistent with the requirement for nuclear power plants.

If the Nuclear Regulatory Commission desires to change the required DE for ISFSI and MRS installations, then the NRC must provide a sound quantitative basis for choosing any particular DE. Part of the difficulty in justifying a particular DE is that there are no clearly articulated performance standards behind the proposed rule change. What, exactly, are the seismic design standards intended to achieve? Are they intended to prevent the release of radiation beyond a certain level? What level? Are they intended to assure the structural integrity of the facility following a major earthquake? To what extent? Are they intended to allow continued operation

of the facility? In short, what level of damage is to be tolerated?—Only after the identification of definite performance goals will it be possible to justify any particular seismic design standard to meet those goals. Accordingly, we request that the NRC identify such performance goals before further consideration of any change in seismic design standards for ISFSI and MRS installations.

We are particularly concerned that a lowering of the DE might be construed as allowing for a concomitant lowering of the design-basis tsunami for locally sourced tsunamis. It is especially important that an appropriate standard for a locally sourced tsunamis be applied because perhaps the most likely scenario for release of radiation to the environment is damage to an ISFSI or MRS during a major earthquake, immediately followed by inundation of the damaged facility by a tsunami.

Further, Coastal Commission staff feels that it is inappropriate to write the proposed new section, 10 CFR § 72.103, in such a way as to remove from the regulation the detailed guidance found in Appendix A of 10 CFR Part 100. As proposed, the new section contains only general reference to non-seismic factors affecting geologic stability of the site, including slope stability, tsunamis, and secondary seismic effects such as ground lurching, liquefaction, and dynamic compaction. Removing detailed guidance on how to analyze for such issues places the entire responsibility of review at the discretion of the NRC. Not only does this inappropriately remove the statutory requirements for specific types of evaluation, it removes the certainty for both the license applicant and the interested public as to what is expected during such a review. Accordingly, we request that the NRC retain the guidance found in Appendix A of Part 100 as statutory requirements for licensing ISFSI and MRS installations.

We question the assertion that the NRC now has considerable experience in the licensing of dry cask storage systems and in analyses demonstrating the robust behavior of dry cask storage systems, as stated in the Environmental Assessment. The NRC has licensed only four ISFSI's in the western United States, the most seismically active part of the country, and none of these are as close to major plate-boundary faults as the three ISFSI's planned for coastal California. Further, we submit that experience in licensing does not equate with "real world" experience that will only be achieved when an ISFSI experiences strong ground motions as a result of a nearby major earthquake. As such, the provisions in neither the specific nor the general licenses have been tested.

Finally, we note that under the California Coastal Act, either the State of California or a local government with a certified Local Coastal Plan will be required to issue a coastal development permit authorizing the construction of any ISFSI to be located within the Coastal Zone of California. Permits granted by local governments may be appealable to the Coastal Commission. In order to issue a coastal development permit, a finding must be made that the proposed ISFSI will minimize risks to life and property in areas of high geologic hazard, and assure stability and structural integrity of the proposed development. When the Coastal Commission issued a coastal development permit for the ISFSI at the San Onofre Nuclear Generating Station (SONGS) in San Diego County, making such a finding was difficult given uncertainty regarding the seismic environment at the site. During permit review, the applicant relied on the seismic evaluation undertaken for licensing of the nuclear power plant. However, new information that became available in the years following the licensing of SONGS cast some doubt on the suitability of the

Safe Shutdown Earthquake (SSE) ground motion. It was only because the applicant proposed a seismic design standard far in *excess* of the SSE that the Coastal Commission was able to make the required finding (attached). Such a finding may not be possible at future sites if, as a result of the proposed rule change, applicants design future ISFSI's to lower seismic design standards than those required for nuclear power plants. The proposed rule change makes the approval of coastal development permits for future ISFSI's difficult, at best.

Please contact me or Dr. Mark Johnsson of my staff at 415-904-5200 if you have any additional questions or comments. The Coastal Commission staff looks forward to continuing to work with the NRC on these issues and respectfully requests a response that addresses our concerns.

Sincerely,

Peter Douglas
Executive Director

Attachment: SONGS Coastal Development Permit staff report

cc: Coastal Commissioners
Mark Johnsson, Staff Geologist, California Coastal Commission
James Boyd, Commissioner, California Energy Commission
Richard McCarthy, Executive Director, Seismic Safety Commission
James Davis, State Geologist
Mary Nichols, Secretary of Resources
Gray Davis, Governor