September 25, 2003

MEMORANDUM TO: File

FROM: Girija S. Shukla, Project Manager, Section 2 **/RA/**
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

SUBJECT: DIABLO CANYON NUCLEAR POWER PLANT, UNIT NOS. 1 AND 2 – LICENSEE'S RESPONSE TO NRC'S REQUEST FOR ADDITIONAL INFORMATION – SPENT FUEL CASK HANDLING LICENSE AMENDMENTS (TAC NOS. MB4998 AND MB4999)

On September 11, 2003, Pacific Gas and Electric Company (PG&E or licensee) submitted the attached draft response to the following NRC request for additional information (RAI) dated September 9, 2003.

> The technical basis for this license amendment is, in part, design modifications to the fuel handling building crane. Appendix C of NUREG-0612 provides guidelines on modifications of existing cranes. To help the staff determine the regulatory basis for the proposed modifications, please show in a matrix how you satisfied these guidelines.

This draft RAI response was discussed in a teleconference with the licensee on September 11, 2003. The licensee stated that it plans to revise the draft RAI response based on the staff's discussion in the teleconference and formally submit the response to the NRC for staff review.

Docket Nos. 50-275
and 50-323

Attachment: Draft Response

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{DRAFT} Enclosure 1
DCPP FHB Crane Auxiliary Lift NUREG-0612 Appendix C Conformance Matrix

NUREG-0612 Appendix C NUREG-0554 Guidelines Section	**Guidance**	**DCPP Auxiliary Lift Conformance Results**
(1)	"The allowable stress limits should be identified and be conservative enough to prevent permanent deformation of the individual structural members when exposed to maximum load lifts."	Conformant. The FHB Crane Auxiliary Lift meets the basic allowable stresses from AISE No. 6 (used to design the existing crane) as follows: Bearing = 0.70Fy; Bending (fully supported) = 0.55 Fy; Shear = 0.33 Fy; Tension = 0.55Fy. These stress limits preclude permanent deformation of the material [ref. PG&E Letter DCL-03-047, RAI Question 1-3, 1-4].
(2)	"The minimum operating temperature of the crane should be determined from the toughness properties of the structural materials that are stressed by the lifting of the load."	Conformant. The FHB Crane, an indoor crane located near the ceiling of the Fuel Handling Building in a conditioned environment, is not susceptible to low temperature operating conditions. Minimum operating temperature is not a concern for this application.
(3)	"The crane should be capable of stopping and holding the load during a seismic event equal to a Safe Shutdown Earthquake (SSE) applicable to that facility."	N/A. FHB crane, structure, and supporting runway and building superstructure are seismically qualified at full rated load [ref. PG&E Letter DCL-03-047, RAI Question 2-1 Table 2-1-1]. The seismically-qualified main hoist of the FHB crane always carries the load during crane operations. The auxiliary lift can be loaded only by a non-seismic failure of the main hoist system. Thus, the auxiliary lift structure itself does not require seismic qualification since the transfer of load to it from the main hoist constitutes the single failure in the system [ref.

NUREG-0612 Appendix C NUREG-0554 Guidelines Section	Guidance	DCPP Auxiliary Lift Conformance Results
		PG&E Letter DCL-02-044, Section 4.2.1 and PG&E Letter DCL-03-047, RAI 1-3, 1-4, 1-7].
(4)	"Automatic controls and limiting devices should be designed so that component or system malfunction will not prevent the crane from stopping and holding the load safely."	Conformant. The auxiliary lift is positioned by processing weight sensing signals from the main hoist system and comparing them with weight applied to the auxiliary lift structure. Using direction or travel input from the main hoist, the auxiliary lift adjusts vertical position to maintain a slight preload on the interconnecting rigging. No active movement of the auxiliary lift beam is required at the instant of load transfer from the main hoist. By maintaining proper position with respect to the main hoist load block, the lift is ready to receive a load transfer. Any failure of the auxiliary lift to maintain position would be annunciated to the crane operator and stop hoisting operations. Crane electrical systems will use applicable logic to stop crane operation in a fail-safe mode (i.e., de-energized control component states). Electrical devices for protection of the auxiliary lift will be independent from those of the main hoist [ref. PG&E Letter DCL-03-047, RAI Question 1-6]. The FHB Crane Auxiliary Lift basic design does not allow for the load to overhaul the lift drive system. The mechanical design of the screw jack thread geometry does not allow the screw jack shaft to rotate under an applied load on the traveling nut from the

NUREG-0612 Appendix C NUREG-0554 Guidelines Section	Guidance	DCPP Auxiliary Lift Conformance Results
		lower lifting beam. In addition, there is an electromechanical holding brake (typically mounted on the end of the drive motor) for the screw jack. Though the auxiliary lift structure is free to pivot in the lateral directions, to preclude any side loading of the auxiliary lift, the crane control system will be modified to restrict the crane to single axis operation during use of the auxiliary lift. A diverse, master (crane and aux. lift) "all stop" function will also be added to aid the crane operator upon apparent crane malfunction to assure the crane stops and holds the load safely. Lastly, load measuring to sense and preclude load hang-up conditions will stop crane motion to assure the crane stops and holds the load safely [ref. PG&E Letter DCL-03-047, RAI Question 2-1 Table 2-1-1].
(5)	"Design of the wire rope reeving system should include dual wire ropes."	N/A. The FHB Crane Auxiliary Lift operates in parallel with the wire rope-reeved main hoist but does not use a wire rope reeving system to hold its load [ref. PG&E Letter DCL-02-044, LAR Figure 5]. The slings between the auxiliary lift and the cask lift yoke are designed as non-redundant devices to a minimum overall safety factor of 10 [ref. PG&E Letter DCL-03-047, RAI 1-4]. The auxiliary lift is never fully loaded under normal operating conditions where its movement parallels the main hoist lower block.

NUREG-0612 Appendix C NUREG-0554 Guidelines Section	Guidance	DCPP Auxiliary Lift Conformance Results
		Therefore, the amount of operational wear on the auxiliary lift components is not expected to be of concern. Load holding functions of the lift structure when demanded are assured by mechanical design features as described in (4) above. The maximum calculated stress in the main hoist wire rope, based on the efficiency of the single path reeving, weight of the lower block assembly in addition to the crane rated load is 1/6 of the manufacturer's specified breaking strength [ref. DCPP FSAR Update Section 9.1.4.2.1.3].
(6)	"Sensing devices should be included in the hoisting system to detect such items as overspeed, overload, and overtravel and cause the hoisting action to stop when limits are exceeded."	Conformant. The FHB Crane Auxiliary Lift mechanical thread design does not allow an overspeed condition found in rope-reeved systems. The auxiliary lift will include sensing devices in its control system to preclude overload (motor current, load cell measurement) and overtravel (motor encoder position, travel limit sensors). Upon an additional crane operating condition as postulated by the Guidance of this section, plant crane operating and maintenance procedures will prescribe steps to begin troubleshooting and restoration of hoist and lift functions as applicable.
(7)	"The reeving system should be designed against the destructive effects of 'two-blocking.'"	Conformant. The FHB Crane Auxiliary Lift will use redundant travel limit devices to preclude a "two-block" event between its

NUREG-0612 Appendix C NUREG-0554 Guidelines Section	Guidance	DCPP Auxiliary Lift Conformance Results
		upper and lower cross members and stop all hoist and lift operations if tripped. The FHB Crane main hoist control system currently has two redundant upper limit devices that preclude a two-block event. These devices would be modified to preclude a two-block event between the lower block and the auxiliary lift lower lifting beam due to the reduced vertical headroom under the trolley to mount the auxiliary lift.
(8)	"The hoisting drum(s) should be protected against dropping should its shafts or bearings fail."	N/A. The FHB Crane Auxiliary Lift does not use a hoisting drum [ref. PG&E Letter DCL-02-044, LAR Figure 5; PG&E Letter DCL-02-047, Figure 1-5-1]. The worm gear inside the screw jack drive housing is captured by the base of the housing and the baseplate on the auxiliary lift to which the screw jack assembly is mounted. The minimum factor of safety reported from the manufacturer for the load bearing components of each screw jack assembly of the lift is 7 to yield and 9 to ultimate [ref. PG&E Letter DCL-03-047, RAI 1-4]. Therefore a pullout of the screw jack threads is highly unlikely. There is no credible malfunction of the lift that could cause the top block pin to fail because the moving components of the auxiliary lift do not have the capability to apply driven forces onto the trolley to which the lift is mounted.
(9)	"Safety devices such as limit switches provided to reduce the	Conformant.

NUREG-0612 Appendix C NUREG-0554 Guidelines Section	Guidance	DCPP Auxiliary Lift Conformance Results
	likelihood of a malfunction should be in addition to those normally provided for control of maloperation or operator error."	The control system for the FHB Crane Auxiliary Lift and main hoist will use additional, independent devices to provide control signals for determining if the lift is outside its normal expected range of operation [ref. PG&E Letter DCL-02-044, Section 4.2.1].
(10)	"The crane system should be given a cold proof test if material toughness properties are not known."	Conformant. See results for Section (2) above.