SMUD
SACRAMENTO MUNICIPAL UTILITY DISTRICT ☐ 6201 S Street, P.O. Box 15830, Sacramento CA 95852-1830, (916) 452-3211
AN ELECTRIC SYSTEM SERVING THE HEART OF CALIFORNIA

DAGM/NUC 93-217

December 2, 1993

Office of Nuclear Material Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Docket No. 72-11
Rancho Seco Independent Spent Fuel Storage Installation
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION REGARDING REVISION 1 TO THE RANCHO SECO INDEPENDENT SPENT FUEL STORAGE INSTALLATION ENVIRONMENTAL REPORT

Attention: Michael G. Raddatz

As requested in your letter dated October 25, 1993, we are providing our response to your request for additional information so that you can complete your review of Revision 1 to the Rancho Seco Independent Spent Fuel Storage Installation (ISFSI) Environmental Report.

Members of your staff with questions requiring additional information or clarification may contact Bob Jones at (916)452-3211, extension 4676.

Sincerely,

for James R. Shetler
Deputy Assistant General Manager
Operations

310017

NFO6 1/1

cc: B. Faulkenberry, NRC, Walnut Creek
S. Weiss, NRC, Rockville
Document Control Desk, Washington

ADDITIONAL INFORMATION IN SUPPORT OF THE RANCHO SECO ISFSI ENVIRONMENTAL REPORT

Question 1:

a) *What fission gas inventory did you use in the site boundary accident dose calculation?*

b) *Also, the X/Q value used in the ER is different than the default value in the safety analysis report (SAR). Where did you get this number?*

Responses:

a) Pacific Nuclear Calculation 2069.0505 "Rancho Seco NUHOMS Fission Gas Release Dose Assessment" demonstrates compliance with the regulatory exposure limits for a canister leakage accident at the Rancho Seco ISFSI. The fission gas inventory considered for the site boundary calculation included a number of fission gas nuclides whose inventories were determined using ORIGEN2.

Of those nuclides, ^{85}Kr was considered to be the only significant contributor to offsite accident case exposures (17,345 Curies of ^{85}Kr were assumed to be released by one leaking canister). This is due to its relatively large abundance in the decayed fuel, and the nature of the postulated accident. The leakage scenario is characterized by relatively low temperatures and no dispersion of fuel matter (as in a plant LOCA). Details regarding the determination of the fission gas inventory in a design basis fuel assembly, and the accident dose calculation, are discussed in calculation 2069.0505 (see Volume IV of the ISFSI Safety Analysis Report (SAR).

b) The default X/Q value used in Revision 0 to the ISFSI SAR was based on the originally proposed ISFSI location, approximately 100 feet south of the Interim Onsite Storage Building (IOSB). The X/Q value used in Revision 1 to the Environmental Report is a conservative value based on the currently proposed ISFSI location, approximately 600 feet west of the IOSB.

Assuming a wind speed of 0.6 m/s, ground level release, Pasquill F wind stability, and a 350 meter fence distance, the X/Q factor was calculated using the following relation [1]:

$$\frac{X}{Q} = \frac{1}{\pi \bar{\upsilon} \sigma_y \sigma_z} \exp\left(\frac{h^2}{2}\sigma^{2_z}\right)$$

$$= \frac{1}{\pi(0.6)(18)(6.1)}(1)$$

$$= 4.83E\text{-}3$$

Question 2:

To verify the off-site dose, we need to know what was used for the source term, what was the decay period, and what is the height of the berm?

Response:

Pacific Nuclear Calculation 2069.0500 "Radiological Source Term Calculation for Rancho Seco Fuel" determined the design basis storage and transportation radiological source terms for a Rancho Seco design basis fuel assembly. Calculations were made using the ORIGEN2-PC computer code.

As discussed in calculation 2069.0500 (see Volume IV of the ISFSI SAR), the Rancho Seco design basis fuel total gamma source term is 4.78×10^{15} photons/sec/assembly, and the neutron source term is 1.63×10^{8} neutrons/sec/assembly for a 5.5 year decay period. The berm height was assumed to be zero.

Question 3:

The orientation of the pad to the closest ISFSI boundary is at an angle to the site boundary. Did you use the closest point, with shielding at the boundary from those closest casks to those behind it?

Response:

Shielding calculations were based on the distance from the closest site boundary to the edge of the closest horizontal storage module. The site dose calculations take no credit for either the two casks or the 2x11 array of storage modules providing any shielding.

Question 4:

Also Table 5-1 of the ER seems to contain a typo. The source strength says per assembly, when the NUHOMS SAR says it is per DSC (e.g., 24 assemblies).

Response:

As discussed in the answer to Question 2 above, the Rancho Seco design basis fuel total gamma source term is 4.78×10^{15} photons/sec/assembly, and the neutron source term is 1.63×10^{8} neutrons/sec/assembly for a 5.5 year decay period. These were the source terms used in the Rancho Seco site-specific ISFSI dose calculations.

Table 5-1 of the ER does contain a typo since the total gamma source and total neutron source per DSC, as contained in Table 3.1-1a of the SAR for the standardized NUHOMS storage system, refers to the design basis fuel used for the standardized SAR radiological analyses.

ADDITIONAL INFORMATION IN SUPPORT OF THE
RANCHO SECO ISFSI ENVIRONMENTAL REPORT

Question 5:

In order to verify occupational doses we need to know the dose rate at each step of the operation.

a) How many people are required for each step? For how long?

b) Did you use the numbers from the NUHOMS SAR for these?

Response:

a) Table 7-3 of the Rancho Seco ISFSI SAR, Revision 1, shows the occupancy, ambient dose rate, and duration factors used for each step of the occupational dose calculation. It is attached to these responses for the reviewer's convenience.

b) The ambient dose rates around a loaded NUHOMS-MP187 cask were not taken from the NUHOMS SAR, they were calculated specifically for this license application. Other general area exposure rates, numbers of personnel, and operation durations were estimated based on actual data from Oconee NUHOMS-24P system fuel loads.

References

1. USNRC Regulatory Guide 1.109, "Calculations of Annual Doses to Man from Routine Releases of Reactor Effluents for the Purpose of Evaluating Compliance with 10 CFR Part 50, Appendix I," Revision 1, October 1977.

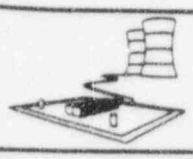

Table 7-3

Estimated Occupational Exposure for One HSM Load

Operation	Number of Personnel	Effective Time in Radiation Field (hours)	Total Personnel Dose (mrem)
LOCATION: Auxiliary Building and Fuel Pool			
Ready the DSC and Cask for Service[1]	2	0.0	0.0
Place the DSC into the Transfer Cask	3	1.0	6.0
Fill the Annulus and Install the Seal	2	2.0	8.0
Fill the DSC Cavity with Water	1	0.5	1.0
Place the Cask in the Fuel Pool	5	1.0	10.0
Verify and Load the Assemblies in the DSC	3	8.0	48.0
Place the Cask/DSC in the Decon Area	5	2.0	20.0
LOCATION: Cask Decon Area			
Cask Decontamination	7	1.0	51.8
Drain Water Above DSC Shield Plug	3	0.25	23.3
Decon the DSC Top Shield Plug[2]	N/A	N/A	N/A
Remove Water from the DSC Cavity	2	0.5	26.0
Set-up Welding Machine	2	1.5	103.0
Weld the Top Shield Plug and Perform NDE[3]	3	6.0	129.0
Drain the DSC Cavity[3]	2	0.5	26.0

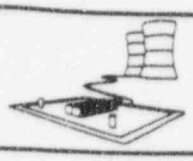

Table 7-3

Estimated Occupational Exposure for One HSM Load
(continued)

Operation	Number of Personnel	Effective Time in Radiation Field (hours)	Total Personnel Dose (mrem)
Vacuum Dry and Helium Backfill[3]	2	0.5	26.0
Helium Leak Test the Shield Plug	2	1.0	4.0
Seal Weld Vent and Siphon Ports	2	1.5	150.0
Fit-Up the DSC Top Cover Plate	2	1.0	105.0
Weld the Top Cover and Perform NDE[3]	5	14.0	199.8
Drain the Annulus	2	0.25	35.9
Install the Cask Lid	2	1.0	59.6
LOCATION: Auxiliary Building Bay			
Ready the Skid and Trailer for Service[1]	2	0.0	0.0
Place the Cask Onto the Skid	2	0.5	12.1
Install the Ram Trunnion Support and Cask Shielding	2	1.0	29.8
Secure the Cask to the Skid	2	1.0	31.4

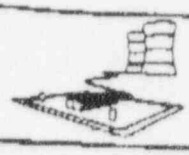

Table 7-3

Estimated Occupational Exposure for One HSM Load
(concluded)

Operation	Number of Personnel	Effective Time in Radiation Field (hours)	Total Personnel Dose (mrem)
LOCATION: ISFSI Site			
Ready the HSM and Ram for Service[1]	2	0.0	0.0
Transport the Cask to the ISFSI[4]	6	1.0	0.0
Position the Cask Close to the HSM[4]	3	1.0	0.0
Remove the Cask Lid	3	1.0	59.7
Align and Dock the Cask with the HSM	2	0.25	85.3
Lift the Ram Into Position and Align With the Cask	2	0.5	14.9
Transfer the DSC to the HSM[4]	3	0.5	0.0
Lift the Ram Onto Trailer and Un-Dock the Cask	2	0.25	100.8
Install the HSM Access Door	2	0.5	34.2
TOTAL			**1400.6**

NOTES:

(1) This operation is performed away from any significant radiation field

(2) Not applicable. The DSC inner and outer top covers are installed above the top shield plug, which does not, therefore, require decontamination.

(3) Monitoring operation - personnel may leave the radiation work area.

(4) Workers are assumed to remain at a distance from the Cask sufficient to expose them to a negligible dose.