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

MAR 1 1 1988

GCA 88-124

U. S. Nuclear Regulatory Commission
Attn: Frank J. Miraglia, Jr.
Associate Director for Projects
11555 Rockville Pike
Rockville, MD 20852

Docket No. 50-312
Rancho Seco Nuclear Generating Station
License No. DPR-54
RESPONSE TO ONE ACTION ITEM RESULTING FROM THE NOVEMBER 13, 1987 MEETING OF SMUD AND THE NRC ON RADIOLOGICAL EFFLUENTS

Dear Mr. Miraglia:

Attached is a response to one of SMUD's action items from our November 13, 1987 Radiological Effluent meeting. The response addresses the action item to "Provide the NRC with SMUD's evaluation supporting proposed Technical Specification 3.17.3 (10 curie limit)" and to "Evaluate the plant's ability to comply with the proposed 10 curie limit on the BWST."

Please contact me if you have any questions. Members of your staff with questions requiring additional information or clarification may contact Mr. Harvey Story at (209) 333-2935, extension 4826.

Sincerely,

for S H Crocker

G. Carl Andognini
Chief Executive Officer,
Nuclear

Attachment

cc: G. Kalman, NRC, Rockville
A. D'Angelo, NRC, Rancho Seco
J. B. Martin, NRC, Walnut Creek

A009
1/1

ATTACHMENT

OUTDOOR TANK ACTIVITY LIMITS

Introduction

This attachment provides the basis for the activity limit on outdoor tanks defined in Rancho Seco Technical Specification 3.17.3. It shows how the limit is consistent with dose restrictions promulgated in 10 CFR 20 and assesses the plant's ability to comply with the limiting condition of operation and the associated action statement.

The Specification states, in part, that the quantity of radioactive material in outdoor tanks shall be limited to 10 curies excluding tritium and noble gases. The numerical limit is the default value given in NUREG 0133. Per NUREG 0133 and the Standard PWR Technical Specifications, the limit applies to outdoor tanks without surrounding retaining structures (e.g., liners, dikes) and whose drains, overflows and area drains are not connected to a radwaste system. The following tanks at Rancho Seco fall within this category:

-Borated Water Storage Tank, BWST (T-250)
-Demineralized Reactor Coolant Tank, DRCST (T-621)
-Miscellaneous Water Holdup Tank (T-993)
-A and B Regenerant Holdup Tanks, RHUT (T-950 A and B)

The BWST and DRCST are both seismic Class I equipment. The probability of a catastrophic failure is very low. These two tanks plus the Miscellaneous Water Holdup Tank all have drains and overflows which are connected to the Reactor Coolant or Miscellaneous Liquid Radwaste Systems. However, the local storm drains near these tanks connect to the Clean Drain System (CDS).

The 'C' RHUT (T-950 C) and the Condensate Storage Tank (T-358) are excluded because they do not ordinarily contain radioactive materials. The former receives regeneration wastes and analytical element process water from the Makeup Demineralizer trains (service water), and the latter is maintained free of radioactive contamination by securing the secondary side inflow to the tank as part of the Steam Generator Tube Rupture emergency operating procedure (E.6).

Major Flowpath

The first three tanks are located in the tank farm. Their nearest area storm drains are directed offsite (Clay Creek) through the first mixing box (Y-951A) in the CDS. There the drains combine with nonradioactive streams and dilution water from Folsom South Canal. The CDS flow (plant effluent discharge stream) is monitored for radioactivity by process monitors R-15017A and B. The setpoint for this instrument is fixed at a level corresponding to the Maximum Permissible Concentration (MPC) for a historical mix of isotopes. On a radiation HI alarm (1 MPC) the monitor signal will close FV-95103 and open either FV-95201 or FV-95301, thus diverting the effluent stream to a Retention Basin (Y-952 or Y-953). Each Basin has a 500,000 gallon capacity and can therefore contain the volume of even the largest tank (BWST and DRCST are 450,000 gallons each). In addition, the Basin which is not in service may be manually lined up on a high Basin level alarm to prevent a Basin overflow.

During a Basin release the discharge pump (P-957) takes suction from the Basin and either returns the water to the Basin (recirculation) or directs it offsite through FV-95401. Normally a Basin is released by first recirculating it and then diverting part of the recirculation flow offsite. By varying the fraction of flow returned to the Basin and by throttling FV-95401, the operators can empty the Basin at extremely low flow rates. The Basin discharge can be diluted with water from Folsom South Canal which enters the CDS through FV-95101 at the first mixing box and through PCW-053 (manual valve) located downstream of the Basins. The manual valve is set to provide a minimum offsite dilution flow of 8500 gpm. Due to limitations of the flow indication, the administrative maximum for the total offsite flow is set at 10,000 gpm.

For conservatism, the following assumes that all of a ruptured tank contents is directed to the nearest surface water supply instead of the CDS. In this case, a rupture of one of the three tanks would cause some of that tank's contents to be absorbed into the ground in the tank farm. Some water may flow over the ground and through drainage ports located in the tank farm wall. This water would be directed to an impoundment or the pasture located just south of the restricted area, and the water would most likely remain within the site boundary and within the District's control. This unlikely occurrence is discussed further in the Regenerant Holdup Tanks section.

Dose Assessment

Of the three, the Miscellaneous Water Holdup Tank results in the most restrictive case because its smaller volume (30,000 gallons) produces the highest concentration for a given activity. The isotopic composition of the tank water varies with plant configuration and operation. To simplify the calculation, all the activity in the tank will be assumed to be the single isotope cesium-137. Because of a lack of plant data for the tank's isotopic composition, cesium-137 was chosen because it is expected to be the most abundant isotope. Although it does not have the most restrictive MPC value, cesium-137 lies in the lower end of the range of the anticipated nuclides and so may be assumed to be an "average" given the conservatism in the rest of the analysis.

Assuming further that the maximum tank activity occurs when the tank is full, the concentration is then

$$10E6\ (\mu Ci) / (30{,}000\ gal * 3785\ ml/gal) = 8.8E\text{-}2\ \mu Ci/ml$$

For the purpose of the assessment, the following is assumed:

- -Dilution operations will be done with a single Basin. No credit will be taken for Basin to Basin transfers with intermediate dilution
- -The receiving Basin is half full when the tank contents arrive there (total contents are then 250,000 + 30,000 = 280,000 gallons)
- -The remaining Basin capacity will be filled with uncontaminated water
- -No credit will be taken for dilution capacity of the water already present in the Basin.

This procedure will produce a maximum concentration of

$$8.8E\text{-}2\ \mu Ci/ml * (20{,}000\ gals/220{,}000\ gals) = 1.2E\text{-}2\ \mu Ci/ml$$

Raising the offsite dilution flow to 10,000 gpm and discharging the Basin at a rate of 15 gpm will produce an effluent concentration of

$$\frac{1.2E\text{-}2\ \mu Ci/ml * 15\ gpm}{(15 + 10{,}000)\ gpm} = 1.8E\text{-}5\ \mu Ci/ml,$$

and the resulting fraction of the limit specified in 10 CFR 20 Appendix B, Table II, Column 2 is

$$1.8E\text{-}5\ \mu Ci/ml\ /\ 2.0E\text{-}5\ \mu C/ml = 0.90$$

Similar analysis for the larger tanks indicate that a basin discharge flow of roughly 35 gpm (with no prerelease dilution) will be sufficient to comply with the Appendix B concentration limits. Also note that the discharge is monitored by radiation monitor R-15017A. Its setpoint will correspond to an effluent concentration of 1 MPC. On a high radiation signal, the monitor will automatically terminate the release by closing FV-95401.

Regulatory Compliance

Historically, the plant has had little difficulty maintaining the maximum activity in outdoor tanks below 10 curies. For example, because the Miscellaneous Water Holdup Tank is used for decontamination, the activity concentration in this tank is normally below 1E-5 μCi/ml gross beta. This corresponds to a total activity of 1 mCi in the tank. In addition, typical concentrations found in the DRCST are on the order of 1E-7 μCi/ml of Cs-137 and less for other gamma emitting nuclides. This corresponds to an approximate tank activity content of less than 0.2 mCi.

The Borated Water Storage Tank is the tank most likely to exceed the limit. Since this tank is seismically qualified, it is also the least likely to leak. In June 1987, the Nuclear Engineering Department did a calculation to determine the maximum anticipated BWST activity. Their review of radiochemistry records indicated that the highest concentrations (gross beta) occurred during periods of refueling. A typical value for the radioactive contents during a refueling is approximately 5 curies. This number has risen above 10 curies approximately six times. The maximum was 17.3 curies (5 Feb 81).

On such occasions, the plant has been able to satisfy the action requirement of the Technical Specification which directed the operators to bring the tank contents to the 10 curie limit within 48 hours. The proposed Specification allows 72 hours to reduce the tank activity below the 10 curie limit, thereby providing a more reasonable time frame for processing that volume and concentration of water.

Regenerant Holdup Tanks

The A and B RHUTs require a different analysis from that used for tanks in the Tank Farm because the area drains in the vicinity of the RHUTs do not go to the CDS. Rather, they run offsite due south through a storm drain to a pasture roughly a dozen yards from the south fence. Any leakage would collect in the indentation (impoundment) left after the removal of the holding ponds formerly constructed there. The topography does not permit much further dispersion, and no significant contact with other surface or ground water is anticipated. If the impoundment or diked area should degrade over the years, then it would become possible for a ruptured RHUT contents to leak out beyond the diked area and into the open pasture area south of the restricted area. It is also possible that storm runoff may fill the impoundment and cause leakage from a RHUT to flow beyond the impoundment and into the pasture. While the pasture lies outside the restricted area, it is still within the site boundary.

If either RHUT should leak, the flow would receive no dilution water in transit to the security fenceline. Consequently, should the tank contain 10 curies, the effluent will have a concentration greater than 1 MPC at the perimeter of the restricted area. For the historical mixture of isotopes seen in these tanks, 1 MPC translates to roughly 0.8 millicuries of total activity. However, the basis for the Technical Specification states:

> Restricting the quantity of radioactive material contained in the specified outdoor tanks provides assurance that in the event of an uncontrolled release of the tank's contents, the resulting concentration at the nearest potable water supply and the nearest surface water supply in an unrestricted area would be less than the limits of 10 CFR 20 . . . .

Because the pasture at issue does not belong to or drain to any nearby potable or surface water supplies, the specified limit is consistent with the intent and language of the basis. Historically, the tank contents have exceeded 1 MPC after steam generator tube ruptures. Since the tanks do have provisions for dilution with service water, demineralization with local equipment, or return to the Miscellaneous Liquid Radwaste System, the plant should be able to meet the required action statement without difficulty..

Each RHUT is equipped with an overflow line. If an overfill situation should occur on a RHUT, the overflow line will direct the excess water through the CDS, and thus any overflow will be monitored by radiation monitors R-15017A and B.

Conclusion

The NUREG 0133 default value for the maximum activity content of an outdoor tank is reasonable for the Rancho Seco site. Of the applicable vessels in the tank farm, the Miscellaneous Water Holdup Tank with its smaller volume represents the most restrictive case. The above analysis indicates that the dilution capacity of the Site Water Supply and the Clean Drain System permit the discharge of effluent in concentrations within the standards set in 10 CFR 20. Given the configuration of the storm drains around the RHUTs, the 10 curie limit does not guarantee that leakage from an RHUT would remain within the 10 CFR 20 concentrations for the unrestricted area; however, the Specification is consistent with its basis because the release terminus lies within the site boundary and does not pose any threat to nearby potable water or surface water supplies.

Historically, only the BWST has exceeded the 10 curie limit and then only for less time than that provided in the action statement of the Specification. The proposed time period provides sufficient time to reduce the activity to the limit and satisfy the Specification.