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SUBJECT: Provides response to request for addl info on radiation effects aspects of spent fuel pool mod at plant.

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April 23, 1998

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Attn: Guy S. Vissing
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Washington, D.C. 20555

Subject: Response to Request for Additional Information on the Radiation Effects Aspects of the Spent Fuel Pool Storage Rack Modification at R. E. Ginna Nuclear Power Plant (TAC No. M95759)
Docket No. 50-244

Ref.(1): Letter from G. S. Vissing (NRC) to R. C. Mecredy (RG&E), Subject: Request for Additional Information on the Radiation Effects Aspects of the Spent Fuel Pool Storage Rack Modification at R. E. Ginna Nuclear Power Plant (TAC No. M95759), dated March 2, 1998.

Dear Mr. Vissing:

By Reference 1, the NRC staff requested additional information regarding the Radiation Effects Aspects of the Spent Fuel Pool Modification at R. E. Ginna Nuclear Power Plant. Attachment 1 of this letter provides the requested information.

Very truly yours,

Robert C. Mecredy

Attachment
JPO\500

Subscribed and sworn to before me
on this 23rd day of April, 1998

Marie C. Villeneuve
Notary Public
MARIE C. VILLENEUVE
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A001 1/1

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Attachment 1

Response to Request for Additional Information on the Radiation Effects Aspects of the Spent Fuel Pool Storage Rack Modification at R. E. Ginna Nuclear Power Plant

Question No. 1:

In Chapter 6.0, Radiological Evaluation of the Spent Fuel Pool Re-Racking Licensing Report (February 1997), you address the offsite dose consequences at the EAB and LPZ for both a fuel handling and tornado missile accident. For these same two accidents, provide a discussion of the thyroid and whole body dose consequences to the control room operator. These dose consequences should be within the acceptance criteria of 30 rem thyroid and 5 rem whole body.

Response to Question No. 1:

RG&E has performed control room dose calculations for both fuel handling accident in the auxiliary building, and the tornado missile accident. The results of the limiting analyses are presented below. In both cases, the dose limits of General Design Criterion 19 were met.

A. Introduction

The offsite dose consequences were determined for the limiting, hypothetical fuel handling and tornado missile accidents. Airborne fission product releases resulting from the hypothetical fuel handling accident (FHA) or tornado missile accident (TMA) would result in the introduction of some noble gas and iodine activity into the control room atmosphere. Conservative calculations have been performed that estimate the resulting absorbed thyroid and whole body doses to a receptor assumed to be present in the control room for the assumed accident duration of two hours. The fuel handling accident was performed with the control room assumed to be in the normal operating configuration. This is assumed to result in 2000 CFM of unfiltered air being taken into the control room for the first 30 seconds following the fuel handling accident, until the control room is isolated and the system switches to the emergency recirculation mode with the air being forced through a charcoal filter system. The tornado missile analysis was analyzed with the control room ventilation system isolated. This is consistent with Ginna Station procedure ER-SC.1, which requires that the system be placed in this configuration in the event a tornado is in the vicinity of the site.

B. Fuel Handling Accident Analysis

The total isotopic activity available for release was determined using isotopic and release assumptions published in Section 15.7.3.2 of the UFSAR. Key assumptions are

- one assembly damaged having 100 hours decay
- pool decontamination factor of 100
- filtration system efficiency of 90% for inorganic and 70% for organic species of iodines
- no credit for decay until isotopes were introduced to the control room atmosphere

The atmospheric dispersion factor (X/Q) was calculated using the bounding-value algorithm:

$$X/Q = [C^*A^*\bar{u}]^{-1} \quad (sec/m^3)$$

where

C=building shape factor
A=area of perturbing building (m^2)
$\bar{u}$=average wind speed (m/s)

The assumptions used to determine the X/Q were:

- Building shape factor is an increasing function of aerodynamic "smoothness"; it varies between 0.5 for a "streamlined" building to 2.0 for a "bluff" building. The pertinent buildings at Ginna are much closer to the latter than the former, thus it could be argued that C would be closer to 2 than to 0.5. But for conservatism, and to account for the subjective nature of the definition of C, a value of 1.0 was assumed for C.
- Exhausted effluents homogeneously mix with the air between the containment/intermediate building and the control building. The activity concentration at the control room intake (on top of the control building) is assumed to be equal to the concentration in the cavity between the buildings.
- Wind speed is assumed to be 1.0 m/sec. This is in agreement with Regulatory Guide 1.25 assumption for a ground level release.

These assumptions resulted in a X/Q value of 6.95×10^{-4} sec/m^3 for the area between the spent fuel pool ventilation exhaust point and the intake to the control room ventilation system.

Control room configuration assumptions:

- The concrete shielding around the control building is assumed to be sufficient to reduce contributions to the gamma dose inside the building from sources outside the building to negligible levels.
- Control Room intake is unfiltered. For the first 30 seconds, the intake rate is 2000 CFM. Design inleakage is assumed for the time period 30 sec $< T <$ 2 hours.
- Control room exhaust flow is assumed to be 0.0 CFM for the first 30 sec. Control room exhaust flow is assumed to be equal to intake flow for 30 sec $< T <$ 2 hours.
- Filtered recirculation of control room air volume is started at t = 30 sec. Recirculation filter efficiency is assumed to be 90% for inorganic and 70% for organic species of iodines. Recirculation rate is 2000 CFM.

The thyroid dose was calculated as follows:

1. Determined integrated activity in the control room (Ci-sec) for 0 - 2 hours, under the above assumptions.
2. Calculated the integrated dose using the above assumptions and the ICRP-30 dose conversion factors.

The whole body dose was calculated as follows:

1. Determined the integrated activity (Ci-sec) in the control room for 0 - 2 hours, using the appropriate assumptions.
2. Converted the integrated activity source to an energy dependent time-integrated gamma source (γ/cc).
3. Determined the integrated gamma dose at the center of the control room using a closed-form solution to the gamma flux integral equation and applied energy-dependent flux-to-dose conversion factors.

The resulting FHA doses for a two hour period were:

2 hour thyroid dose $\leq$ 23 Rem
2 hour whole body dose $\leq$ 0.09 Rem

Both of these values are less than the acceptance criteria of 30 rem to the thyroid and 5 rem to the whole body and are therefore acceptable.

C. Tornado Missile Accident

The total isotopic activity available for release was determined as described in Section 6.2.6 of the February 1997 SFP Rerack Licensing Report. Key assumptions are

- nine assemblies damaged - five with 100 hours of decay and four with 60 days of decay.
- conservative radial peaking factor of 1.2 for all assemblies damaged.
- pool decontamination factor of 100.
- no filtration of iodines.

The atmospheric dispersion factor (X/Q) was calculated using the bounding-value algorithm described in Section B above. For conservatism, the same X/Q value of 6.95×10^{-4} sec/m^3 was used (extremely conservative since tornado conditions exist):

Control room configuration assumptions:

- The concrete shielding around the control building is assumed to be sufficient to reduce contributions to the gamma dose inside the building from sources outside the building to negligible levels.
- The release occurs through a hypothetical hole in the auxiliary building roof (i.e. no filter credit)
- Control Room is operated in the recirculation mode throughout the event.
- Filtered recirculation of control room air volume is at a rate of 2000 CFM, with recirculation filter efficiency assumed to be 90% for inorganic and 70% for organic species of iodines.

This scenario resulted in control room doses of:

2 hour thyroid dose $\leq$ 11.9 Rem
2 hour whole body dose $\leq$ 0.3 Rem

Both of these values are less than the acceptance criteria of 30 rem to the thyroid and 5 rem to the whole body and are therefore acceptable.

Question No. 2:

In Table 6.5-1 of your February 1997 SFP re-racking report, you list the auxiliary building gaseous releases for 1994 and 1995. This table does not show any contribution from Kr-85, which has been identified as one of the radionuclides released from other plants. Provide your reasoning for not seeing any Kr-85 in the auxiliary building releases.

Response to Question No. 2:

A review of the 1994 and 1995 effluent reports indicates that there was no measurable Kr-85 released from the plant other than from batch releases from the gas decay tanks. The Kr noble gases are not normally released from the Auxiliary Building on a continuous basis. Preliminary data for 1997 shows a small amount of Kr-85 released during the third and fourth quarters. This release is attributed to the refueling outage and the failed fuel that occurred during the 1997 operating cycle.