REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR:7902210189 DOC.DATE: 79/02/12 NOTARIZED: NO DOCKET #
FACIL:50-220 Nine Mile Point Nuclear Stations, Niagara Mohawk Powe 05000220
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IPPOLITO,T.A. Operating Reactors Branch 3

SUBJECT: Forwards partial responses to questions in 790108 ltr re radwaste reduction sys.Include discussion of annual man-rem estimates & transfer of solid waste ash from dry cyclone to product container.W/oversized drawing.

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NIAGARA MOHAWK POWER CORPORATION/300 ERIE BOULEVARD WEST, SYRACUSE, N.Y. 13202/TELEPHONE (315) 474-1511

February 12, 1979

Director of Nuclear Reactor Regulation
Attn: Mr. Thomas Ippolito, Chief
Operating Reactors/Branch #3
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Ippolito:

Re: Nine Mile Point Unit 1
Docket No. 50-220
DPR-63

Attached are partial responses to the questions enclosed in your January 8, 1979 letter relating to the Radwaste Reduction System (RWR-1).

Very truly yours,

NIAGARA MOHAWK POWER CORPORATION

R. R. Schneider
Vice President-Electric Production

LMM/szd

Attachments

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NIAGARA MOHAWK POWER CORPORATION

Nine Mile Point Unit 1

Docket No. 50-220

DPR-63

RADWASTE REDUCTION SYSTEM

Additional Information

RADIOLOGICAL ASSESSMENT BRANCH

Question 1

Based on operating experience and on the specific design features of the Nine Mile Point 1 radwaste handling system, provide an estimate of the annual man-rem associated with each of the following functions; operation, maintenance, and inservice inspection. Include in your response 1) the radiation fields (R/hr) associated with all components and cubicles of the radwaste system where personnel may require access to perform the above mentioned functions, 2) the occupancy times (hrs/yr) required in each of these locations, and 3) the exposure (man-rems/yr) received for each function and/or location. Supply this information for all segments of the radwaste system, including the off-gas clean up system, from the inputs to the RWR-1 system to the shipment of solidified wastes offsite.

Response

The maximum radiation fields expected are shown on Niagara Mohawk Power Corporation drawings C-31786-C, C-31787-C and C-31788-C. Final drawings will be provided by May 1, 1979. The building and wall thicknesses are based on these maximum radiation fields. Normal operating levels are expected to be about a factor of 10 lower than the maximum values.

The occupancy times and exposures relating to maintenance and in-service inspections have been determined generically but not specifically for Nine Mile Point Unit 1. These figures are expected to be finalized by May 1, 1979. Nevertheless, the design features incorporated in the new radwaste facility will be consistent with the criteria of Regulatory Guide 8.8 (ALARA).

Question 2

Describe how the solid waste ash is transferred from the dry cyclone to the product container. Describe the means of regulating the amount of waste ash inserted into each product container. What features are incorporated to ensure that personnel doses during this operation are maintained ALARA?

Response

Various "ash transfer" components (i.e., from the dry cyclone to the 55 gallon drum) are being evaluated at this time. Primary considerations in this design are remote operability, high reliability, minimum radiation exposure, and low maintenance as well as the criteria delineated in Regulatory Guide 8.8 (ALARA). Several designs are being considered involving basic commercial concepts of moving a dry product. The design will be leak tight and totally enclosed to the drum fill connection. Volumetric and/or gravimetric principles will be applied to measure the quantities of ash transferred into each drum.

The design of these components is expected to be finalized by May 1, 1979. At that time, appropriate information on that design will be provided.

Question 3

Provide the approximate locations of and give the criteria used for placement of radiation monitors in the radwaste drumming and incinerator areas.

Response

Radiation monitors will be placed in accessible areas that could be subject to sudden increases in radiation level. A high alarm would be provided locally and in the Radwaste Control Room to indicate a significant rise in level above normal background. In addition, the monitors will be located 4-5 feet above the floor to approximate the representative whole body dose to an individual. This criteria is consistent with that outlined in the Standard Review Plan.

Niagara Mohawk Power Corporation does not intend to put monitors inside normally non-accessible cubicles such as the Radwaste Reduction System process vessel or product container. If maintenance is to be performed, portable survey equipment would be brought in. Radiation levels in these areas can fluctuate widely depending upon materials being processed and mode of operation.

The preliminary locations of the monitors are indicated on Niagara Mohawk Power Corporation drawings C-31786-C, C-31787-C and C-31788-C.

ACCIDENT ANALYSIS BRANCH

Question 1

Justify your statement that the maximum credible accident is the gross failure of the product container by discussing radiological consequences and likelihood of other postulated accidents such as gross incinerator failure, failure of piping between incinerator and dry cyclone, failure of piping between dry cyclone and quench tank, and the failure of tanks containing radioactive liquids, such as the scrub liquid tank.

Response

Other credible accidents were considered in the Licensing Topical Report (LTR). The relevant paragraphs are from Section 4.3.2 of this report.

A number of potential accidents have been considered, such as rupture of the resin-sludge dewatering tank, fracture of the dry waste hopper, rupture of the calciner/incinerator, leaks in the off-gas system, rupture of the scrub liquid tank, and failure of any component in the off-gas system. None of these accidents was as potentially serious as the violent rupture of the product container. This is due to the fact that no other component of the system can accumulate as much activity in dry form. The only other component of the Radwaste Reduction System which can accumulate much activity is the scrub liquid tank. If this tank were to rupture, the activity would be released into the radwaste building in wet form. In this form it would be much less likely to pass into the air and escape from the building than it would be in the dry, granular form of the material in the product container. Further, the scrub tank will contain less radioactivity than a full product container. The tanks containing liquid feed that are in the Radwaste Reduction System are too small to contain much radioactivity.

The tanks which accumulate resin, sludge or liquid waste prior to processing in the Radwaste Reduction System will contain activity but their contents are wet. The largest tank outside the Radwaste Reduction System containing waste would be an 8,000 gallon concentrated waste tank. Tanks containing resin or

Response to Question 1 (Cont'd)

filter sludge are 2000 gallon day tanks. These tanks feed the Radwaste Reduction System and have a much lower specific activity than the volume reduced waste. The contents of these tanks are wet. Tank liners will be provided in all cubicles in which these tanks are located.

The process vessel and off-gas piping do not accumulate a significant amount of product. During operation, the air flow through the system is such that, at any one time, the airborne inventory of these components is small. Were the entire process bed to escape, it would only amount to 24 kilograms of product, whereas, the product container (hopper) could conceivably contain 624 kilograms.

Question 2

For the maximum credible accident as you describe, i.e., gross failure of a product container, explain why a dilution factor (X/Q) for an elevated (100 meter) release is appropriate. What is the radiological impact if a ground-level release is assumed?

Response

For the maximum credible accident, the only significant air flow from the building will be through the building ventilation system. The ventilation system exhausts to the plant stack which constitutes an elevated release. This is based on the fact that the building housing the Radwaste Reduction System is planned to be a seismic I structure. Also, the ventilation system is designed to maintain the building under a slight negative pressure. Under these circumstances, an elevated release is appropriate.

Nevertheless, both ground and elevated releases will be analyzed using site specific data (X/Q values). This is discussed in response to Hydrology-Meteorology Branch Questions Q372.2 and Q372.3.

Question 3

The operation of incinerators in the past has resulted in a significant number of explosions. Discuss the likelihood of an explosion in your incinerator, measures taken (by design or administrative procedures) to prevent explosion, and the radiological consequences of an explosion.

Response

Explosions occasionally occur in batch-fed incinerators because a large amount of material is added at one time. The Radwaste Reduction System is a continuously fed system, therefore flammable material will be introduced slowly. The shredding of the dry, combustible waste ensures that any flammable material will be broken up and mixed with other waste. Should highly flammable material appear in the feed during incineration, the temperature would increase and the automatic control system would reduce the feed rate to obtain the proper temperature. The buildup of flammable material at operating incineration temperatures is not physically possible. The buildup of fuel oil fumes in the process vessel is not probable because an interlock prevents starting the fuel oil pump until all the blowers have been operating for over a minute and a flame sensor shuts off the pump if the flame goes out.

Even though the system has been designed to prevent fuel oil vapor in the process vessel, the results of the ignition of a stoichiometric mixture of fuel oil vapor and air in the vessel have been analyzed. The resulting pressures (125 psig or less) were found to be much less than the design pressure of the vessel (650 psig).

Question 4

Provide layout drawings including expected radiation fields, shielding thicknesses and personnel access routes for the building proposed to house the radwaste reduction system.

Response

Niagara Mohawk Power Corporation preliminary drawings C-31786-C, C-31787-C, and C-31788-C show the access routes, design radiation fields and wall thickness. The expected levels would be approximately 1/10 of the design values.

Question 5

Discuss what actions you've taken in the design of the facility and what action you expect to take during the operation of the facility to assure that occupational radiation exposures will be as low as is reasonably achievable. Regulatory Guide 8.8 may be used for guidance for activities which may be incorporated to meet this requirement.

Response

Regulatory Guide 8.8 was used as guidance in the design of the facility to meet As Low As Reasonably Achievable (ALARA) criteria. The design is in conformance with all items listed in C.3 of Regulatory Guide 8.8. The design will continually be reviewed to assure ALARA concepts are implemented through the final design.

Niagara Mohawk intends to extend the same philosophy to the operation of the Radwaste Reduction and Waste Handling Solidification additions. This implies application of Regulatory Guides 8.8 and 8.10.

HYDROLOGY-METEOROLOGY BRANCH

Question Q372.2

In your evaluation of the maximum credible accident, you used the model described in Regulatory Guide 1.3 and assumed an elevated release. As stated in Regulatory Guide 1.3, the guide's model should be used only until adequate site meteorological data are obtained. It is our position that you should either (1) provide relative concentration (X/Q) values based on site data for both elevated and ground level releases for the maximum credible accident, or (2) justify that your FSAR or latest assessment of short term diffusion estimates is conservative. If you undertake to justify your recent assessment, describe the atmospheric dispersion model which you have used to estimate X/Q values for the maximum credible accident. (Also, see Q.372.3.) Provide (or reference) the meteorological data that you have used and justify that it is either representative of the air layers into which the effluents will be released or provides for a conservative assessment. Include a discussion on the marine-air/land-air transition zone as it relates to the meteorological tower data and the atmospheric diffusion model.

Response

Regulatory Guide 1.3 was used primarily because it is a recognized NRC standard and was expected to result in more conservative X/Q values than our site specific data. Per your request, we will use our site specific data to calculate new values for both ground and elevated releases. It is expected that the offsite doses will be lower as a result of using the site data. This information will be available by May 1, 1979.

Question Q372.3

In your response to part 1 of 372.2 above, we suggest you consider DRAFT Regulatory Guide 1.XXX, "Atmospheric Dispersion Models for Potential Accident Consequence Assessments at Nuclear Power Plants" (9/23/77), which is attached. The Draft describes a procedure for calculating short-term relative concentration (X/Q) values. This method considers 1) lateral plume meander; 2) atmospheric dispersion conditions as a function of direction; 3) wind direction frequencies; and 4) exclusion area boundary distances as a function of direction. Also enclosed is an interim branch technical position concerning the use of the Draft and the model described in Standard Review Plan 2.3.4.

Response

Regulatory Guide 1.XXX will be evaluated and appropriately considered along with the reevaluation of the doses using site specific meteorology.

Question Q372.4

For any effluent particulate matter with an effective deposition velocity greater than five centimeters/second, provide the effective deposition velocity.

Response

There will be no significant amount of effluent particles with an effective deposition velocity as great at 5 cm/sec.

Spheres with a diameter of 30 μm and a density of 2 g/cm^3 settle at 5 cm/sec. (Air Pollution, A.C. Stern, Vol. I, p. 51). Particulate material from the Radwaste Reduction System under a microscope is seen to be highly non-spherical. Therefore, a particulate would have to be at least 50 μm in equivalent diameter to settle at 5 cm/sec. The exact size is unimportant because very few particles larger than 10 μm will pass through the Radwaste Reduction offgas system. The efficiency of every component of the system increases with particle size, so the reported overall decontamination factor of 4×10^4 would be much greater for particles as large as 30 or 50 μm.