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(2 pages) DO NOT REMOVE

PLANT NAME: DONALD C. COOK UNIT # 1

jcm

ACKNOWLEDGED

ENCLOSURE

Consists of Requested info. regarding, Potential consequences of a fuel handling accident inside the containment of Donald C. Cook Plant Unit No. 1......

(4 pages)

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 [March] 21, 1977

Donald C. Cook Nuclear Plant Unit No. 1
Docket No. 50-315
DPR No. 58

Mr. Bernard C. Rusche, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Rusche:

This letter is in response to Mr. Dennis L. Ziemann's request, dated January 17, 1977, for a detailed evaluation of the potential consequences of a fuel handling accident inside the containment of Donald C. Cook Nuclear Plant Unit No. 1. The evaluation was to use assumptions comparable to those given in Regulatory Guide 1.25 "Assumptions Used For Evaluating the Potential Radiological Consequences of a Fuel Handling Accident in the Fuel Handling and Storage Facility for Boiling and Pressurized Water Reactors." It was further specified that the analysis should be performed in two parts: (1) a conservative analysis using parameters as limited by the technical specifications and (2) an analysis using parameters associated with current known facility operating conditions. The details of these analyses are presented in Attachment 1.

The conservative analysis based on the assumptions in Regulatory Guide 1.25 yielded results which indicated that an individual at the site boundary would receive a 0-2 hour thyroid dose of 82.3 Rem and a 0-2 hour whole body dose of 1.3 Rem. In the realistic analysis, employing the assumptions listed in Regulatory Guide 4.2 appendix I, the 0-2 hour thyroid and whole body doses to an individual at the site boundary were estimated to be 5.61×10^{-3} Rem and 3.73×10^{-4} Rem, respectively.

Based on this analysis, the radiological consequences of a fuel handling accident inside the containment of Donald C. Cook Nuclear Plant Unit No. 1 are well within the limits (300 Rem to thyroid and 25 Rem to whole body) of 10 CFR Part 100.

Very truly yours,

John Tillinghast
Vice President

Sworn and subscribed to before me this 21st day of March, 1977 in New York County, New York

David G. Hume
Notary Public

DAVID G. HUME
NOTARY PUBLIC, State of New York
No. 31-4608113
Qualified in New York County
Commission Expires March 30, 1979

cc: G. Charnoff
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P. W. Steketee
R. J. Vollen
R. Walsh
R. W. Jurgensen - Bridgman
R. S. Hunter

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Attachment 1

Fuel Handling Accident Inside Containment of Donald C. Cook Nuclear Plant

Potential consequences of a fuel handling accident were evaluated using (1) the conservative assumptions listed in Regulatory Guide 1.25 and (2) the realistic assumptions given in Regulatory Guide 4.2 Appendix I.

I. Assumptions Used

A. Conservative Case

1) Gap activity from all rods in the assembly (204 rods) was released.

2) Accident occurs 100 hours after the plant shutdown

3) Radial peaking factor is 1.65

4) All the gap activity in the assembly is released and consists of 10% of iodines, 10% of all noble gases other than Kr-85, and 30% of Kr-85, of the total activity in the rods at the time of the accident.

5) Iodines are composed of 99.75% inorganic and 0.25% organic species.

6) Effective pool decontamination factors for iodines and noble gases are 100 and 1, respectively.

7) Activity is released into the atmosphere

8) No plateout of iodine inside containment or in ducts

9) Atmospheric dilution factor (X/Q value) = 3.15×10^{-4} sec/m^3) corresponds to 8-24 hour value given in Regulatory Guide 1.4.

10) Effective energies for Beta and gamma radiation are estimated using references given in Regulatory Guide 1.25

11) Breathing rates and dose conversion factors for iodines are taken from Regulatory Guide 1.25.

B. <u>Realistic Case</u>

1) Gap activity consists of 1% of the rod activity.

2) The gap activity from 1 row of rods in the assembly was released.

3) The accident occurred one week after shutdown.

4) Effective pool decontamination factor for iodine is 500.

5) X/Q value is 1/10th of that in Regulatory Guide 1.4 (3.15×10^{-5} sec./m^3)

II. Analytical Methods

A. Thyroid Dose Model

0-2 Hr. thyroid dose at the site boundary was estimated using $D = \frac{Fg\ I_i\ F\ P\ R_i\ (X/Q)}{(DF_p)\ (DF_f)} B$

D = thyroid dose from Isotope I_i (rads)

Fg = fraction of core damaged

I_i = core iodine inventory (curies)

R_i = Dose Conversion Factor for I_i

P = fuel peaking factor (1.65)

B = breathing rate (3.4×10^{-4} m^3/sec.)

X/Q = atmospheric dilution factor (sec./m^3)

DF_p = pool decontamination factors

DF_f = filter decontamination factor (1 for both cases - no credit is taken).

F = fraction of fuel rod iodine inventory in fuel rod void space (0.1)

Assumptions

1. The activity [illegible]

2. The gas [illegible] from [illegible] in the [illegible] may be increased.

3. [illegible]

4. Effective [illegible] dose [illegible]

5. The value [illegible] sec/m^3)

[illegible]

a. [illegible]

D-2 The thyroid dose at the site boundary [illegible]

D = thyroid dose [illegible] (rads)

R = fraction of core [illegible]

I = core iodine inventory (curies)

Q = Dose [illegible]

a = fuel [illegible] factor (1.5)

B = breathing rate (3.5×10^{-4} m^3/sec.)

X/Q = atmospheric dilution factor (sec/m^3)

F_c = [illegible] containment factors

F_f = filter decontamination factor (1 for [illegible] no credit is taken).

[illegible]

B. Whole Body Dose Equation

0-2 hour whole body dose was estimated using

$$D = (0.23\ \bar{E}_{\beta} + 0.25\ \bar{E}_{\gamma})\ X$$

where $\bar{E}_{\beta}$ = effective beta energy (Mev/dis)

$\bar{E}_{\gamma}$ = effective gamma energy (Mev/dis)

X = concentration of the isotope in the cloud (curies/m^3)

III. Results

The results of this analysis are listed below:

0-2 hour site boundary doses (rem)

	Thyroid	Whole Body
10 CFR 100 Limit	300	25
Conservative Case	82.3	1.3
Realistic Case	5.61×10^{-3}	3.73×10^{-4}

For both conservative and realistic cases, no credit was taken for the closure of the containment isolation valve, since the radiation monitor that generates the signal for the closure of this value is Seismic Class III and is not redundant. Further, it was observed that the minimum isolation valve closure times as specified in technical specification limits were longer than the calculated transit time for the radioactive puff to reach the valve from the pool. However, assuming no earthquake or single active failure of radiation monitor and with actual measured valve closure times as opposed to technical specification minimum, it was shown that only a small fraction of the above cited activity will be released to the environment since the isolation valve will close before the major portion of the gaseous release reaches the isolation valve.

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(Signed)

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IV. Conclusions

From the results of this analysis it is concluded that the radiological consequences due to a fuel handling accident inside containment are well within the limits set forth in 10 CFR Part 100.