Consumers Power Company

David J VandeWalle
Nuclear Licensing Administrator

General Offices: 1945 West Parnall Road, Jackson, MI 49201 • (517) 788-1636

March 15, 1983

Dennis M Crutchfield, Chief
Operating Reactors Branch No 5
Nuclear Reactor Regulation
US Nuclear Regulatory Commission
Washington, DC 20555

DOCKET 50-155 - LICENSE DPR-6 - BIG ROCK POINT PLANT -
SEP TOPIC XV-18, RADIOLOGICAL CONSEQUENCES OF
MAIN STEAM LINE FAILURE OUTSIDE CONTAINMENT -
RESPONSE TO NRC REQUEST FOR ADDITIONAL INFORMATION

By letter dated September 15, 1982, the NRC staff issued its final safety evaluation report (SER) for SEP Topic XV-18, "Radiological Consequences of Main Steam Line Failure Outside Containment". In its SER, the staff recommended that the plant adopt the GE Standard Technical Specifications concerning iodine activity and control in the reactor coolant. The purpose of this letter is to substantiate our opinion that the adoption of the Standard Technical Specifications is unwarranted. Our opinion is based on the fact that the probability of exceeding the equilibrium concentration is low. Also, in the event that the concentration is exceeded, the resulting dose is only a fraction of 10CFR100 guidelines.

During the initial phase of the Integrated Assessment (IA) meeting held at the plant site on November 15-19, 1982, the staff inquired specifically into the need for a two-tier limit (equilibrium concentration and shutdown concentration) on the primary coolant system. Consumers Power Company stated at the IA meeting that further calculations would be performed to determine these limits and compare them to the existing Technical Specification limits. These calculations are presented below.

The dose to the thyroid at the site boundary can be determined as follows:

$$\text{Dose} = \left(\begin{matrix}\text{Pounds}\\ \text{released}\end{matrix}\right)\left(\text{ml}/\text{pound}\right)\left(\mu\text{Ci}/\text{ml}\right)\left(X/Q\right)\left(\begin{matrix}\text{Breathing}\\ \text{Rate}\end{matrix}\right)\left(\frac{\text{Rem}}{\text{Ci}}\right)$$

Using the Technical Specification value of 35 uCi/ml, the resulting dose was calculated to be 92 Rem. The NRC's IA team requested two calculations; a calculation to determine the limiting shutdown concentration and one to determine the limiting equilibrium concentration. The shutdown concentration is

A035

oc0383-0156a142

that value of µCi/ml which yields a dose of 300 Rem. The "equilibrium" concentration is that concentration which exists at the time of the main steam line break (MSLB) outside containment which, when gradually increased by a 500 fold increase in iodine production rate (from the core to the coolant), results in a dose of 30 Rem. To obtain the equilibrium concentration, the quanity of iodine in the primary coolant system must be determined. The amount of iodine is found using the following methodology:

$$\frac{dI}{dt} = P - \frac{FI}{M}$$

Where I = Curies in primary system

F = Cleanup flow rate taken to be 37,000 lb/hr (Cleanup system flow rate)

M = Mass of primary coolant taken to be 110,000 pounds

P = Production rate; Ci/sec of iodine from core to coolant

At steady state $\frac{dI}{dt} = 0$ and $\frac{I}{M}\left(\frac{\mu Ci}{ml}\right) = \frac{P}{F}$

The equilibrium concentration is found as follows:

1. Choose an initial I/M (chosen to be 1.0 µCi/ml).

2. Find a steady state production rate, P, using steady state relations.

3. Then find I(t) during the accident using $\frac{dI}{dt} = 500P - \frac{F}{M}I$.

4. Plug in I(t) into dose equation and integrate over time; sum to get dose.

5. If dose ≠ 30 Rem, choose another initial I/M.

The equilibrium concentration was calculated (using the above equations and assuming an iodine isotopic distribution as given by the computer code ORIGEN) to be 7.2 µCi/ml. Therefore, to meet the Standard Review Plan criteria, the Technical Specification concerning primary coolant system iodine concentration should be 7.2 µCi/ml for the equilibrium concentration limit and 114 µCi/ml for the shutdown concentration limit. (Note that a concentration of 35 µCi/ml results in a dose of 92 Rem.)

An iodine concentration of 7.2 µCi/ml corresponds to a 216,000 ± 33,800 µCi/sec noble gas release rate. This relationship was found by relating primary coolant system iodine concentration to stack gas release rate at 10 different times during the first half of 1982. The times were chosen so that the iodine concentration was at its steady state value. The Big Rock Point

Plant Operating Procedures (Off-Normal Procedures and Alarm Procedures) specify that the plant must be manually tripped (not gradually shut down) when the noble gas release rate exceeds 50,000 µCi/sec.

The Big Rock Point Plant Technical Specifications state that an alarm shall sound when the release rate exceeds 100,000 µCi/second. The operator can reset the alarm (once the alarm has sounded at 100,000 µCi/sec) to 200,000 µCi/sec and may reset it again to 400,000 µCi/sec. Plant power, however, must be reduced when the release rate exceeds $0.47/\bar{E}$ Ci/sec (about 580,000 µCi/sec). Therefore, in order to exceed the primary coolant system iodine equilibrium concentration, the procedures must be violated, an alarm must sound with no subsequent mitigating action and a second alarm must sound with no subsequent mitigating action. Even if the operators were to allow the noble gas release rate to reach the Technical Specification limit of $0.47/\bar{E}$, and the Main Steam Line ruptures outside containment, the resulting dose would be 80 $\pm$15 Rem which would represent a small fraction of the 10 CFR 100 guidelines. Therefore, since the probability of the above occurring is exceedingly small, and the probability of exceeding the equilibrium iodine concentration limits is also exceedingly small, no change in the Plant Technical Specifications is warranted.

David J. VandeWalle

David J VandeWalle
Nuclear Licensing Administrator

CC Administrator, Region III, USNRC
NRC Resident Inspector-Big Rock Point

oc0383-0156a142