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August 27, 1999

Re: Indian Point Unit No. 2
Docket No. 50-247

Document Control Desk
US Nuclear Regulatory Commission
Mail Station P1-137
Washington, DC 20555-0001

Subject: Response to Request for Additional Information – Status Update for the NRC Staff's Review of the Pilot Plant Amendment Application. (TAC No. M96650)

This letter, and Attachment A, provide the response of Consolidated Edison Company of New York, Inc. (Con Edison) to the NRC's request for additional information for the Pilot Plant amendment application dated May 5, 1999.

As previously discussed with members of the staff, we are currently completing calculations for revised radiological doses and the results will be provided for review in the near future.

The commitments made in this letter are provided in Attachment B.

Should you or your staff have any concerns regarding this matter, please contact Mr. John McCann, Manager, Nuclear Safety & Licensing.

Very truly yours,

310110

Attachments

A001

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ATTACHMENT A

Response to Request for Additional Information Regarding
Response to Status Update for the NRC Staff's Review of the Pilot Plant Amendment
Application (TAC NO. M96650)

Consolidated Edison Company of New York, Inc.
Indian Point Unit No. 2
Docket No. 50-247
August 1999

RAI RESPONSES (Re: TAC M96650) To NRC letter dated May 5, 1999

Question 1: **In WCAP-14542 decontamination factor for elemental iodine was based on the value of partition coefficient of PC=10,000. This value is conservative relative to the PC given in NUREG/CR-2900, dated 1982. However, more recent information provided in NUREG-CR-4697 gives much lower values for PCS. For example, for pH=7, temperature = 77°F and iodine concentration = 6E-6 mol./liter, the value of PC at 1000 seconds is approximately 360. It is considerably lower than the value given in WCAP. Please, provide justification for basing your decontamination factor on PC=10,000.**

Response to Question 1:

The information in Figure 4 of NUREG/CR-4697 does indicate a partition coefficient of between 316 and 398 for the conditions of 1.2E-5 gram-atoms of iodine per liter (i.e., 6.0E-6 moles per liter) at a pH of 7.0 and a temperature of 77 degree F. However, this temperature is far below the projected post-LOCA sump solution temperature which would be in excess of 212 degree F for some period of time after the accident. NUREG/CR-4957 does not adequately address the impact of increased temperature on the partition coefficient since the report considers only temperatures of 77 degree F and 122 degree F but it still observes that increased temperature will result in more rapid iodine hydrolysis, producing nonvolatile products that increase the partition coefficient.

Figure 7 of NUREG/CR-4697 shows good agreement between the experimental values for partition coefficient and the values determined by calculation in NUREG/CR-2900. This is especially true at the shorter time interval of 1000 seconds. This direct support of the calculated determination of partition coefficients is limited to the relatively low temperature of 77 degree F. However, there is no reason to believe that the partition coefficients predicted for 212 degree F solution in Figure 33 of NUREG/CR-2900 are not also valid. Thus, the partition coefficient of 10,000 obtained from Figure 33 of NUREG/CR-2900 and conservative for use in determining the amount of elemental iodine that would be retained in solution. As noted in NUREG/CR-2900, the partition coefficient increases dramatically with time due to the continuing conversion of elemental iodine to nonvolatile forms. Any elemental iodine becoming airborne would rapidly be recaptured in solution and the partition coefficient would increase to far greater than the 10,000 assumed in the analysis.

Question 2: **Provide an assessment of the impact of the proposed design changes on the environmental qualification of safety-related electrical equipment.**

Response to Question 2:

The proposed design changes (removal of containment fan cooler unit charcoal and HEPA filters) will have no effect on the environmental qualification of safety-related electrical equipment. The current EQ radiation dose basis, as described in the Indian Point Unit 2 EQ Program Plan, takes no credit for removal mechanisms inside containment such as sprays, filters, or plateout.

<u>Question 3</u>: To evaluate pH control please address the following:

a.) The amount and location of chlorine-containing polymers such as Hypalon and Polyvinylchloride.

<u>Response to Question 3a</u>:

Inventory inside containment of:

Hypalon – 8747 linear feet
3.2 cubic feet
1304 sq. feet surface area

PVC - 2644 linear feet
1.2 cubic feet
275 sq. feet surface area

b.) The volume of water containing fission products including the sump plus the flooded volume.

<u>Response to Question 3b</u>:

Mass of water inside containment post-accident containing fission products

Maximum Water - 3.986E6 lbs.	Maximum amount of boric acid – 9651 lbs. boron
	Minimum amount of boric acid – 6927 lbs. boron
Minimum Water - 3.313E6 lbs.	Maximum amount of boric acid – 7970 lbs. boron
	Minimum amount of boric acid – 5582 lbs. boron

The volume of water is temperature dependant. Assuming 212 degrees Fahrenheit the maximum and minimum volumes would be 66641.9 and 55390 cubic feet respectively.

c.) The amount of boric acid .

<u>Response to Question 3c:</u>

See response to question 3b above

<u>Question 4:</u> IP2's current mode of operation for the control room emergency filtration system (CREFS) is the recirculation mode. In IP2's current licensing basis dose analysis, 1660 cfm (1840 - 10%) is assumed for recirculation, 500 cfm is assumed for unfiltered inleakage, and filter efficiencies of 95% and 90% are credited for elemental and organic iodine, respectively. WCAP-14542 states that the CREFS will now be operated in the pressurization mode during an accident with 600 cfm assumed for pressurization, 1400 cfm assumed for recirculation, 30 cfm assumed for unfiltered inleakage, and filter efficiencies of 95% and 90% credited for elemental and organic iodine, respectively. To evaluate the effects on the Control Room, please address the following:

a. Describe all of the modes of operation of the control room emergency filtration system that will be available following approval of this TS amendment and what signals automatically initiate them.

<u>Response to Question 4a</u>:

Should the Technical Specification amendment be approved, the Central Control Room (CCR) HVAC system will be modified to perform in the following modes of operation:

Mode 1 (Normal) will remain the normal mode of operation mixing approximately 920 cfm of unfiltered outside air with approximately 8280 cfm of return air to the CCR. In this mode, approximately 920 cfm of air is exhausted to the outside atmosphere via the toilet exhaust fan.

Mode 2 (Pressurized) will be the new incident mode of operation. Mode 2 will be automatically initiated by a Safety Injection signal or a high radiation signal. In this mode, approximately 1300 cfm of outside air and 500 cfm of recirculated air will be directed through HEPA and carbon filters to the CCR. The outside air serves to pressurize the CCR to a pressure positive to adjacent areas.

Mode 3 (Recirculation) will remain the incident mode of operation during a toxic gas or smoke event. Mode 3 will be automatically initiated by a toxic gas signal or a signal from the smoke detector.

A modification to the CCR HVAC system (scheduled for the 2000 refueling outage) will assure that the design basis single active failure criterion is met for mode 2.

b. **WCAP-14542 specifies an unfiltered inleakage of 30 cfm rather than 500 cfm. Describe the basis for this value other than just stating that it is due to the pressurization mode of operation.**

<u>**Response to Question 4.b)**</u>

The basis for the 500 cfm is a controlled pressurization test. Mode 3 inleakage cannot be correlated to Mode 2 inleakage and the 30 cfm specified in WCAP-14542 will be revised to show actual inleakage as determined by a recently performed tracer gas test performed in Mode 2.

c. **Since WCAP-14542 states that the control room emergency filtration system will now be operated in the pressurization mode during an accident, TS Section 4.5.E.4.c should be revised to state "with respect to adjacent areas" instead of "relative to outside atmosphere."**

<u>**Response to Question 4c)**</u>

Technical Specification 4.5.E.4.c will be revised to read "with respect to adjacent areas."

d. **In TS Section 4.5.E.4.c for the control room emergency filtration system, what does "positive pressure" mean? What positive pressure is the control room emergency filtration system designed to maintain the control room envelope at during pressurization mode? TS Section 4.5.E.4.c should be revised to specify the design positive pressure.**

<u>**Response to Question 4.d)**</u>

Since Indian Point 2 is using the results of actual air inleakage (as determined by the above mentioned tracer gas test) and measuring positive pressure to adjacent areas (as described in 4.c above), specifying an actual design positive pressure in the technical specifications would be redundant and not required.

e. **Describe how can you take credit for a control room emergency filtration system charcoal filter efficiency of 90% organic and 95% elemental with a 1" charcoal filter bed depth?**

<u>Response to Question 4.e)</u>

Credit is not being taken for the specified filter efficiencies with a 1 inch charcoal filter bed. The Indian Point CCR HVAC carbon filter unit was modified several years ago to include two, 2 inch deep carbon filters in series. The stated elemental iodine filter efficiency is consistent with a 2 inch bed per Regulatory Guide 1.52 and the defined organic iodine removal efficiency is conservatively low. At this time, credit is only being taken for one 2 inch deep filter.

f. **The current TS specify a flow rate of 1840 cfm ±10% through the filter unit of the control room emergency filtration system, but WCAP-14542 uses a flow rate of 600 cfm for pressurization and 1400 cfm for recirculation. The TS should be revised to have a separate surveillance test for verifying the pressurization flow rate ±10% and a separate surveillance test for verifying the recirculation flow rate ±10% rather than just a combined overall flow rate test. In addition, since the combined overall flow rate is now 2000 cfm, the TS should be revised to specify 2000 cfm ± 10% rather than 1840 cfm ± 10%. Does the increased flow rate through the filter unit adversely affect the charcoal filter efficiency? Has the face velocity across the charcoal increased?**

<u>Response to Question 4.f)</u>

The Technical Specification does not specify a requirement for separate surveillance tests for pressurization and recirculation flow because these flow rates separately have little effect on the calculated dose to the control room personnel in Mode 2 with the alternate source term. The combined overall flow rate will continue to be measured as part of a surveillance test.

The Technical Specification will be revised to specify 2000 cfm +/-

10% for this test. The increased flow rates do not affect the filter efficiency since the filter trays are designed and sized for this flow rate. The face velocity will increase slightly but the filter trays are designed and sized for this velocity.

g. **The current licensing basis dose analysis assumed the worst case recirculation flow rate of was 1840 - 10% (1660 cfm). Are the WCAP-14542 flow rates of 600 cfm for pressurization and 1400 cfm for recirculation the worst case considering ± 10%.**

<u>**Response to Question 4.g)**</u>

The WCAP-14542 flow rates for pressurization are 1400 cfm and for recirculation 600 cfm. The calculations are being revised to reflect the actual measured flow rates from the tracer gas tests, and to reflect the worst case in-leakage with a total filter flow of 2000 cfm +/- 10%. The calculations will also reflect a 95% confidence level in the measured in-leakage from the tracer gas test.

Question 5: **Please address the following questions concerning the impact of removing the charcoal absorbers and the HEPA Filters from Containment:**

a) **What impact would the removal of the HEPA and Charcoal filters from the containment fan cooler units will have on the performance of the fans during a design basis accident ? Specifically, what is the possibility of fouling and/or clogging of the fans without the HEPA filters due to the increased particulate loading expected from the alternative source term?**

Response to Question 5a)

The impact of the HEPA and Charcoal Filters removal from the Containment Fan Cooler Units decreases the pressure drop in the units and increases the fan flow. The impact on fan capacity was evaluated, and it was determined that the fan flow will increase to 72,500 cfm (within the fan design capability).

The cooling coils and demisters upstream of the fans will condense and remove most of the moisture and particulates with it. Nevertheless, an evaluation of increased mass loading on the fans was performed assuming all of the particulates are released into containment and none are removed by the containment sprays and Fan Cooler cooling coils and demisters. This increased loading from particulates is insignificant compared to the design loading for the fans. The increased density in the Containment atmosphere due to additional aerosols (radioactive and non-radioactive) is only .0003 lbs/cu ft which is insignificant when contrasted to the design value of .170 lbs/cu ft for the coolers. Therefore, the change in steam/air mixture density due to aerosols is not expected to change the performance of the fan cooler units.

The containment post accident atmosphere is expected to be at 100 percent Relative Humidity. The Fan Cooler cooling coils and demisters are therefore designed to remove essentially all of the moisture (to prevent moisture loading on the existing HEPA and charcoal filters). It is expected that the efficient condensing of moisture on the cooling coils will also cause any plate out of particulates to be carried away with the condensate (since the particulate loading is so small). Particulates associated with the alternate source term, therefore, are not expected to cause fouling/clogging of the fans.

5b) **As steam condenses on the cooling coils radioactive and nonradioactive aerosols will plate out on the cooling coils. What impact will this particulate loading and possible fouling have on the heat transfer rates assumed in Section 6.4.1.9 of the IP2 FSAR? Also, describe what effect the decay heat produced by the radioactive aerosols which have plated out on the cooling coils would have on the assumed heat transfer rates?**

Response to Question 5b)

The Fan Cooler Unit cooling coils are designed to condense steam continuously during a LOCA. The condensation is removed by the existing drain system. Continuous condensation will eliminate any radioactive and non-radioactive aerosol fouling or plate out on the coils and therefore the heat transfer rate of coils assumed in IP2 final safety analysis report (FSAR) will not be affected. There will also not be significant decay heat since radioactive aerosols will not remain on the coils but will be carried away with the condensate.

5c) **Section 6.4 of the IP2 FSAR discusses the condensate collection and drain system of the containment cooling fans. What impact would the aerosols (radioactive and nonradioactive) described in NUREG-1465 have on the condensate collection and drain system? Removal of the HEPA and charcoal filters will decrease the flow resistance which may result in higher steam condensation rates due to increased flow over the cooling coils. What effect would this have on the condensate collection and drain system?**

Response to Question 5c)

We agree that removal of the HEPA and charcoal filters will decrease the flow resistance which will result in higher steam condensation rates due to increased air flow over the cooling coils. The analysis shows that the condensation rate will increase from 170 GPM (Service Water temperature design value at 85 degrees F) to a maximum of 225 GPM (calculated at 35 degrees F service water temperature). The existing drain capacity was calculated to be 792 GPM when the drain pipe runs full. The existing drain lines therefore are adequately sized.

ATTACHMENT B

List of Commitments

The following list identifies those actions committed to by Con Edison in this document. Any other actions discussed in the submittal represent intended or planned actions by Con Edison. These other actions are described to the NRC for the NRC's information and are not regulatory commitments. Please notify Mr. John McCann, Manager Nuclear Safety and Licensing of any questions regarding this document or any associated regulatory commitments.

Commitment	Due Date
Perform a modification to the CCR HVAC system will assure that the design basis single active failure criterion is met for Mode 2 .	Implementation of Modification is scheduled for completion by the end of our 2000 RFO
Technical Specification amendment request will be made to specify 2000 cfm +/- 10 percent for the CCR Mode 2 performance test.	October 1999
An amendment request for Technical Specification 4.5.E.4.c revision to " with respect to adjacent areas" instead of "relative to outside areas" will be made	October 1999
Provide copies of the calculations of radiological doses.	September 1999