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RS-01-279

November 30, 2001

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Additional Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station

Reference: Letter from J. M. Heffley (AmerGen Energy Company, LLC) to U.S. NRC, "Request for License Amendment for Extended Power Uprate Operation," dated June 18, 2001

In the referenced letter, AmerGen Energy Company (AmerGen), LLC submitted a request for changes to the Facility Operating License No. NPF-62 and Appendix A to the Facility Operating License, Technical Specifications (TS), for Clinton Power Station (CPS) to allow operation at an uprated power level. The proposed changes in the referenced letter would allow CPS to operate at a power level of 3473 megawatts thermal (MWt). This represents an increase of approximately 20 percent rated core thermal power over the current 100 percent power level of 2894 MWt. The NRC, in a conference call, requested additional information regarding the proposed changes in the referenced letter. The attachment to this letter provides the information requested in NRC Questions 4.2(e), 5.15, 6.2, and 6.3.

A001

Rec'd 12/19/01

Should you have any questions related to this information, please contact Mr. Timothy A. Byam at (630) 657-2804.

Respectfully,

K. R. Jury
Director – Licensing
Mid-West Regional Operating Group

Attachments:

Affidavit
Attachment: Additional Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station

cc: Regional Administrator – NRC Region III
NRC Senior Resident Inspector – Clinton Power Station
Office of Nuclear Facility Safety – Illinois Department of Nuclear Safety

bcc: Clinton Power Station Project Manager – NRR
Manager of Energy Practice – Winston & Strawn
Director – Licensing, Mid-West Regional Operating Group
Manager – Licensing, Clinton Power Station (MWROG)
Site Vice President – Clinton Power Station
Plant Manager – Clinton Power Station
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Document Control Desk Licensing (Electronic Copy)
Ron Frantz, Clinton Power Station (NSRB Coordinator)

STATE OF ILLINOIS	)	
COUNTY OF DUPAGE	)	
IN THE MATTER OF	)	
AMERGEN ENERGY COMPANY, LLC	)	**Docket Number**
CLINTON POWER STATION, UNIT 1	)	**50-461**

SUBJECT: Additional Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station

AFFIDAVIT

I affirm that the content of this transmittal is true and correct to the best of my knowledge, information and belief.

Keith R. Jury

K. R. Jury
Director – Licensing
Mid-West Regional Operating Group

Subscribed and sworn to before me, a Notary Public in and

for the State above named, this 30 day of

November, 2001.

Anese L. Grigsby
Notary Public

OFFICIAL SEAL
ANESE L. GRIGSBY
NOTARY PUBLIC, STATE OF ILLINOIS
MY COMMISSION EXPIRES 3-13-2005

ATTACHMENT

Additional Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station

Question 4.2(e)
The staff has reviewed Amergen's response dated October 17, 2001 to its request for additional information. Question 4.2e requested: "Please provide a justification for control room unfiltered inleakage assumptions that have not been substantiated by appropriate integrated boundary leakage testing." Based on the information provided, the staff finds the Amergen response to be insufficient. Amergen is requested to supplement its response to RAI Question 4.2e with the requested justification of the CRS unfiltered inleakage assumption.

Amergen's response noted:

> *Although integrated boundary leakage testing has not been conducted at CPS, a combination of design and surveillance testing assures that the inleakage into the control room emergency zone will not exceed the assumptions used in the dose assessment.*

The response concludes that maintaining the control room emergency zone at a positive pressure relative to all adjacent areas is adequate to assure no unfiltered inleakage.

Several power reactors (representing over 20% of the U.S. plants, including those with filtered zone isolation and pressurization) have performed integrated testing of their control room inleakage, and in all but one case, the test results showed inleakage in excess of the facility's design basis. Based on this experience, concluding that the positive pressurization surveillance tests would result in no unfiltered inleakage (other than access doorways) during an accident condition is questionable. Given Amergen's projected post-EPU dose for the control room of 29 rem out of an allowable 30 rem, a increase in unfiltered inleakage could result in doses exceeding GDC-19.

Response 4.2(e)
The dose assessment for the control room operators to demonstrate compliance with 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 19, "Control room," considers three sources of potentially contaminated air. The first source of contaminated air is makeup air, which is supplied to the control room ventilation system (CRVS), or VC system, at a nominal rate of 3,000 cfm through a 99% efficient charcoal filter. The second source of contaminated air is leakage into negative pressure CRVS ductwork outside the control room. An inleakage rate of 650 cfm is assumed, and this inleakage is filtered by the 70% efficient supply filter unit before entering the control room. The final source of contaminated air is unfiltered, unidentified inleakage into the control room, which is assumed to occur at a rate of 10 cfm. The control room atmosphere is continuously recirculated through the supply filter.

The sources of contaminated air used in the dose assessment are based on the design of the CRVS, which utilizes zone isolation with filtered recirculation and zone pressurization. A simplified diagram of the system is shown in Figure 4.2-1. The system consists of two independent trains composed of a supply fan, a return fan, a makeup fan, a supply air filter package and a makeup air filter package. Each train is capable of

providing 100% of the required air flow, so only one train is normally operating. When the High Radiation (i.e., "Hi Rad") mode of operation is initiated by high radiation readings in the intake duct, the makeup fan in the operating train, which is normally not running, is automatically started. A nominal makeup flow of 3,000 cfm is passed through the makeup filter unit, which contains a 99% efficient charcoal filter for iodine removal. The return fan continues to operate at a nominal flow rate of 61,000 cfm from the control room. The return, or recirculation, flow is combined with the makeup flow and is passed through the supply filter before being supplied to the control room. The supply filter unit contains a 70% efficient charcoal filter for iodine removal.

A significant portion of the ductwork and equipment in the CRVS is located outside the control room habitability zone. Ductwork outside the control room is a potential pathway for inleakage of unfiltered and potentially contaminated outside air if the ductwork is at negative pressure relative to the outside atmosphere. The only portion of the system that is at negative pressure during the "Hi Rad" mode of operation is the ductwork upstream of the return fan. Technical Specifications (TS) assure that the actual inleakage into this ductwork is less than the value used in the dose assessment. Any leakage into this ductwork passes through the supply filter, so this is considered filtered inleakage. The design of the system is such that the remainder of the ductwork downstream of the charcoal filters is maintained at positive pressure, which precludes the infiltration of additional outside air into the CRVS.

This design was selected to preclude unidentified, unfiltered leakage of outside air into the control room envelope. The supply of 3,000 cfm of outside air is sufficient to maintain the pressure inside the control room at greater than 1/8-inch water gauge relative to all adjacent areas. Also, control room access is controlled through vestibules with two doors in series to preclude leakage into the control room during access or egress. The dose assessment conservatively assumes 10 cfm of unfiltered inleakage, which is in addition to the 650 cfm of filtered inleakage into the ductwork outside containment. The conclusion that the inleakage assumed in the Clinton Power Station (CPS) dose assessment is conservative is based on three considerations.

- Testing: The control room ventilation boundary has been tested to demonstrate the control room is maintained at a positive pressure with respect to all adjacent areas when the CRVS is operating in the "Hi Rad" mode.

  CRVS Testing Results
  During initial startup testing at CPS, the differential pressure between the control room and each adjacent area was measured. This test was repeated during 1998 to confirm that the original test results were still applicable (Reference 1). This test concluded that the control room was at a positive pressure of greater than 1/8-inch water gauge relative to all areas. The results of the test demonstrated the installed differential pressure gauges used in periodic surveillance are representative of the area with the smallest differential pressure. This provides assurance that positive pressure readings on the installed pressure gauges indicate the control room is at positive pressure relative to all adjacent areas.

- Surveillance: To assure that the control room remains at a positive pressure relative to adjacent areas, a differential pressure test is conducted periodically in accordance with TS 3.7.3, "Control Room Ventilation System." Also, the ductwork outside the control room that is at a negative pressure is periodically tested to demonstrate compliance with the TS inleakage requirements.

  Surveillance Test Results
  Confirmation of the ability of the CRVS to maintain the required differential pressure is accomplished by periodically starting the system in the "Hi Rad" mode and measuring the pressure between the control room and the adjacent areas (Reference 2). The differential pressure between the control room and adjacent areas is measured by pressure gauges located in the train A and train B ductwork. The differential pressures measured by these two gauges are representative of the areas with the smallest differential pressure as determined in the tests described above. The differential pressure test execution indicates that the differential pressure with a makeup flow rate of <2700 cfm is much larger than the minimum required (1/8-inch water gauge), confirmaing that the differential pressure can be maintained with a smaller makeup flow rate.

  For the portion of the CRVS that is outside the control room envelope, periodic testing is conducted to establish the amount of outside air inleakage into this portion of the system (Reference 3). This testing is conducted using the direct measurement method as described in American National Standards Institute (ANSI)-N510, "Testing of Nuclear Air Cleaning Systems," 1980. This involves using a blower to draw a sufficient vacuum on the ductwork and then measuring the flow rate required to maintain the test pressure using a calibrated orifice tube and inclined manometer. Each of the redundant trains in the CRVS is tested, and the total combined inleakage is required to meet the requirements of Surveillance Requirement (SR) 3.7.3.5. The most recent surveillance test for leakage into the ductwork outside the control room was conducted in October 2000. The results of this test indicate that the leakage from each train is less than 300 cfm. This is expected, since the total leakage (both trains combined) is required to be less than 650 cfm.

- Dose Analysis Margin: The analysis used to demonstrate compliance with GDC 19 contains many conservative assumptions. Although 10 cfm of unidentified, unfiltered inleakage is assumed in the calculation, an inleakage of more than 160 cfm is required to exceed GDC 19 limits after accounting for conservatisms in the data used in the analysis.

  Dose Analysis Margin
  The control room operator dose following a loss of coolant accident (LOCA) is calculated (Reference 4) using the assumptions in Regulatory Guide 1.3, "Assumptions Used for Evaluating the Potential Radiological Consequences of a Loss of Coolant Accident for Boiling Water Reactors" and Standard Review Plan 6.4, "Control Room Habitability System." All CRVS parameters are set to the TS value that produce the highest dose (e.g., 3300 cfm makeup). In addition, the worst single

failure is assumed to occur, and unidentified, unfiltered inleakage is set at 10 cfm. The thyroid dose is the most limiting operator dose. The dose reported in Attachment E to Reference 5, 29 rem thyroid, is the calculated value (25.96 rem) plus 10% and rounded to the next whole number. The additional 10% is added to provide flexibility in accounting for transient conditions without having to change the licensing basis. It is not considered a requirement for all radiological dose assessments.

The reported dose of 29 rem is considered conservative and has enough margin to account for a substantial increase in unidentified, unfiltered inleakage. For example, if the 10% margin is removed, the unfiltered inleakage can increase to more than 90 cfm before the GDC 19 limits are exceeded. Also, the assumption of 650 cfm filtered leakage into the ductwork outside containment assumes two trains are operating. Since only one train will operate at a time, the actual filtered leakage (which has been confirmed by test) will be less than 325 cfm, one-half the 650 cfm limit. Using 325 cfm rather than 650 cfm for the filtered inleakage increases the allowable unfiltered inleakage to more than 160 cfm. The behavior of the calculated control room thyroid dose as a function of unfiltered inleakage for the two values of filtered inleakage is illustrated in Figure 4.2-2. Another conservatism used in the analysis that if removed will also decrease the operator dose is the assumption that the makeup flow is 3300 cfm (i.e., the SR 3.7.3.6 limit plus 10%). The flow required to pressurize the control room is actually less than 2700 cfm, as demonstrated by the differential pressure test.

Conclusion

Based on the configuration of the CRVS, the results of tests and routine surveillances, and the conservative assumptions used in the dose analysis, it is concluded that the operator dose in the control room following a design basis LOCA will be well below the GDC 19 limits. By removing conservatisms from the control room dose analysis it has been shown that unidentified, unfiltered inleakage in excess of 160 cfm would be required to cause the calculated operator dose to exceed the GDC 19 limits. This is considered sufficient margin to account for any CRVS unidentified, unfiltered inleakage, and therefore integrated leak testing is not required.

Figure 4.2-1 Simplified VC Diagram - A Train "Hi Rad"

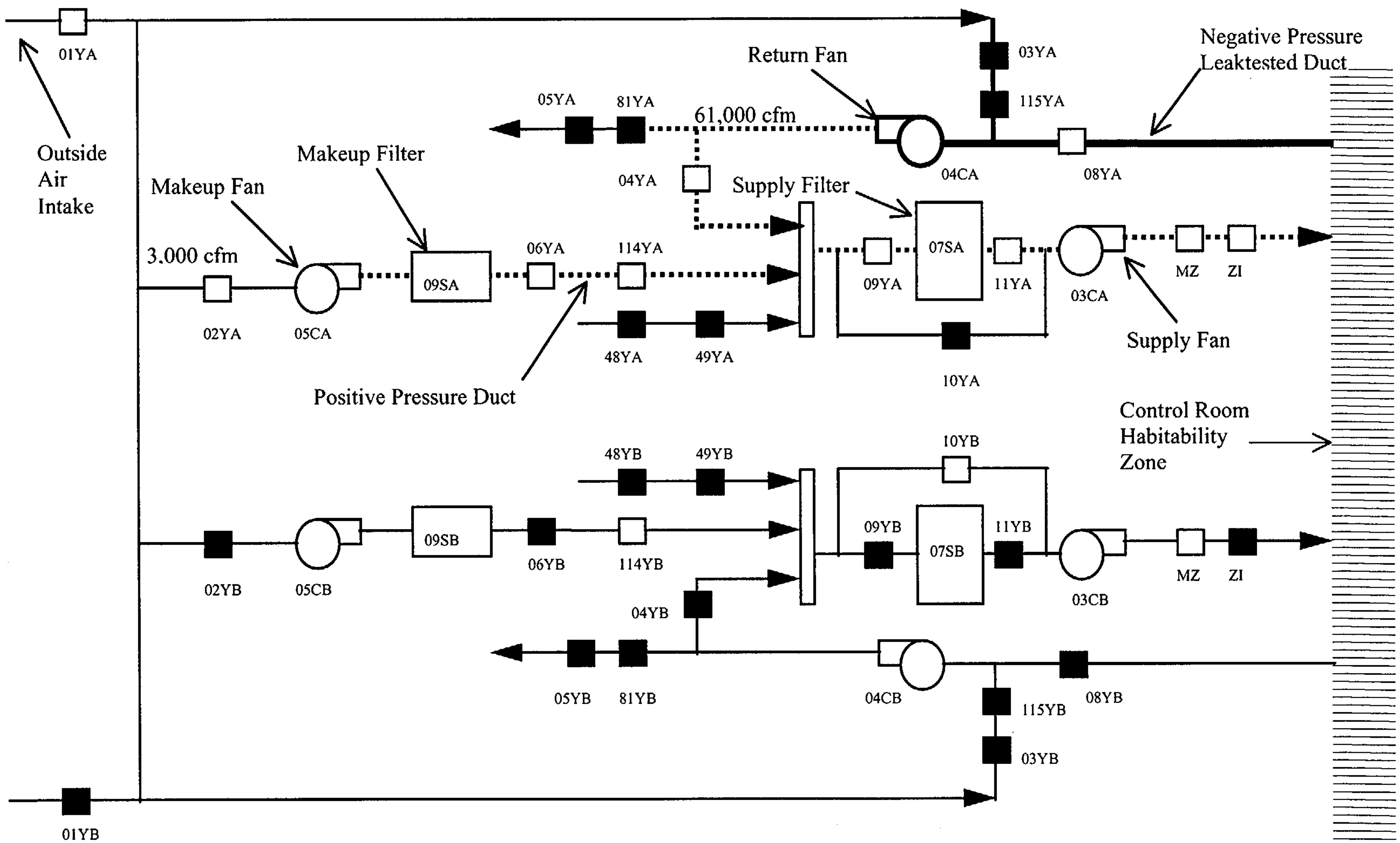
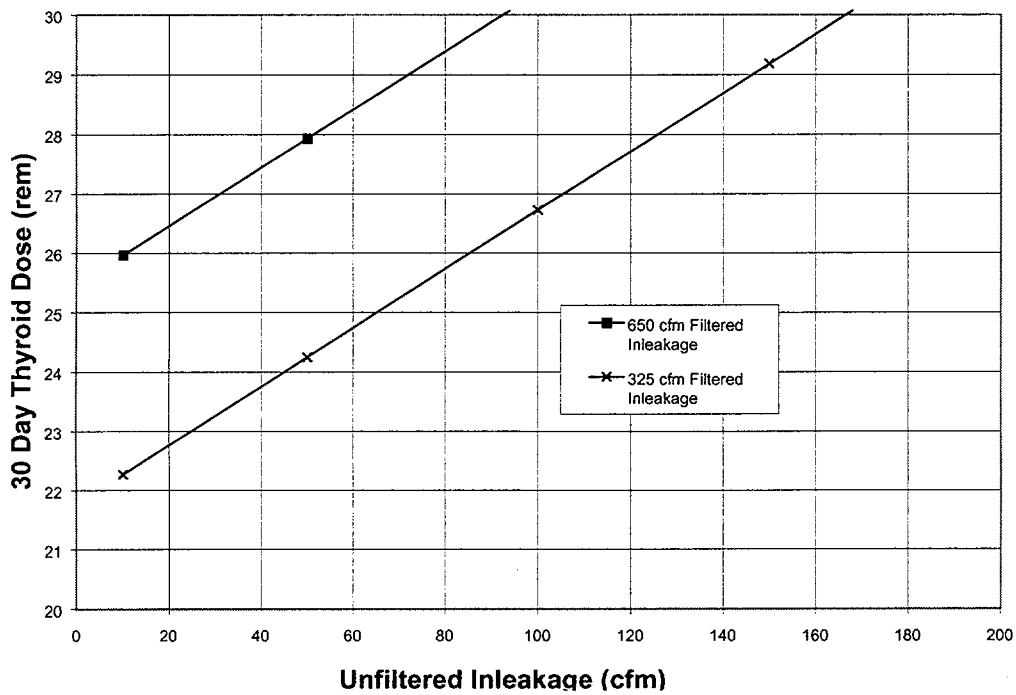


Figure 4.2-2 CPS Control Room Post-LOCA Dose



<u>Question 5.15</u>

Will a full-core be offloaded during normal (planned) refueling outages at Clinton Power Station? If a full core off-load is the normal practice during planned refueling outages, then a single failure of the spent fuel pool (SFP) cooling system should be assumed in the SFP thermal analysis for the planned refueling outages. Discuss how the most severe single failure (e.g., failure of: a FPCC system train, a residual heat removal system train, EDG, etc.) has been identified and accounted for in the SFP thermal-hydraulic analyses. A single failure of the SFP cooling system need not be assumed for unplanned full core offload events.

<u>Response 5.15</u>

The normal (planned) refueling outage at CPS is a partial core offload, sufficient in scope to allow the completion of the reload plan. A full core offload is not anticipated under other than emergency (unplanned) conditions. This is further discussed in the Updated Safety Analysis Report Section 9.1, "Fuel Storage and Handling." The single failure analysis for partial core offload events is provided in Reference 6.

<u>Question 6.2</u>

With 20% MWe increase, Reactive Power (VARs) produced by the generator will be reduced. Are you going to install any capacitor banks or voltage stabilizers to compensate for the reduction in VARs?

ATTACHMENT

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Response 6.2
The CPS main generator VAR capability will not be reduced by the power uprate. Analysis of the generator capability shows that generator gross VARs (lagging) will increase from approximately 489 MVAR at the current licensed power level to approximately 518 MVAR during Cycle 9 and 550 MVAR during Cycle 10 and beyond. Therefore, no capacitor banks or voltage stabilizers will be installed.

Question 6.3
What modifications are being performed to electric supply and distribution system to maintain GDC 17 compliance?

Response 6.3
Due to anticipated grid conditions and the increased plant auxiliary loading due to power uprate operation, the Reserve Auxiliary Transformer (RAT) will be replaced. This replacement is currently planned for refueling outage C1R09, concurrent with the second stage of uprate. Also, the Emergency Reserve Auxiliary Transformer (ERAT) will be modified to utilize its load tap changer to automatically respond to grid conditions. The change to ERAT operation is due to anticipated grid conditions and is not EPU related.

References:

1. CPS Condition Report (CR-1-98-04-189), "Surveillance Test Does Not Verify Control Room Positive Pressure Relative to All Adjacent Areas"

2. CPS Procedure (No. 9070.02), "Control Room HVAC High Rad, Initiation Functional"

3. CPS Procedure (No. 9866.04), "VC Negative Pressure Ductwork Leak Test"

4. CPS Calculation (C20, Volume E), "Feedwater LCS Fill Time and Dose Study"

5. Letter from J. M. Heffley (AmerGen Energy Company, LLC) to U.S. NRC, "Request for License Amendment for Extended Power Uprate Operation," dated June 18, 2001

6. Letter from K. A. Ainger (Exelon Generation Company, LLC) to U.S. NRC, "Additional Information Supporting the License Amendment Request to Permit Uprated Power Operation at Clinton Power Station," dated November 8, 2001