BEFORE THE

UNITED STATES NUCLEAR REGULATORY COMMISSION

In the Matter of	:	
	:	Docket No. 50-352
PHILADELPHIA ELECTRIC COMPANY	:	

APPLICATION FOR AMENDMENT

OF

FACILITY OPERATING LICENSE

NPF-39

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Philadelphia Electric Company, Licensee under Facility Operating License NPF-39 for Limerick Generating Station Unit 1, hereby requests that the Technical Specifications contained in Appendix A of the Operating License be amended to delete references to the cooldown mode of operation for the Unit 1 Reactor Enclosure Recirculation System (RERS) and the common plant Standby Gas Treatment System (SGTS). The proposed changes are indicated by vertical bars in the margin of attached pages 3/4 6-54 and 3/4 6-56.

Philadelphia Electric Company requests these changes so that the Reactor Enclosure Recirculation System (RERS) and the common plant Standby Gas Treatment System (SGTS) may be modified during the Unit 1 second refueling outage to remove the

charcoal adsorber cooldown mode of operation. The Unit 1 second refueling outage is currently scheduled from January to April, 1989 and approval of the proposed amendment is needed prior to the outage to allow completion of the modification work during the outage.

The cooldown mode is designed to supply air to the charcoal adsorber beds in the RERS and SGTS filter trains to limit potentially excessive charcoal temperature increases due to radioactive decay heat buildup in the charcoal adsorbers during and following a Loss of Coolant Accident or Refueling Accident.

Licensee has performed an analysis which concludes that the post accident conditions are such that elimination of the RERS and SGTS cooldown modes will not result in excessive charcoal temperature increases which were the reason for including the cooldown modes. In recognition of the lack of need for the cooldown modes, the NRC has previously approved the deletion of the cooldown mode from the Limerick Unit 2 RERS filter trains in the letter from R. Bernero (USNRC) to E. G. Bauer, Jr. dated March 18, 1987. This application addresses the proposed elimination of the cooldown modes in the Unit 1 RERS and the common SGTS.

This application presents a discussion of the charcoal adsorber cooldown mode for RERS and SGTS, a description of the proposed facility and Technical Specification changes, a safety assessment of the proposed changes, justification for no significant hazards consideration determination, and an environmental consideration.

Discussion:

The Unit 1 RERS and common plant SGTS are safety related air recirculation and filtration systems. The proposed changes to delete the cooldown mode are the

same for both systems and are addressed together in this discussion. The RERS and SGTS are standby systems which do not routinely operate during normal plant operation.

LGS Unit 1 RERS is an atmosphere cleanup system designed to reduce halogen and particulate concentrations which result from a LOCA by recirculating the Unit 1 Reactor Enclosure air through a series of filters. Unit 1 RERS consists of two redundant filter trains in the reactor enclosure each capable of handling 100% of the RERS fan capacity. Each of the RERS filter trains consists of a bank of prefilters, two banks of HEPA filters (upstream and downstream of the charcoal adsorber), a vertical two-inch deep charcoal adsorber bed and associated instruments. The charcoal adsorber is a gasketless, welded seam type filled with impregnated activated charcoal. The filter bank holds a total of approximately 13,000 pounds of charcoal having an ignition temperature of not less than 626 degrees F. The charcoal adsorber is capable of removing not less than 95.0% of elemental iodine and 95.0% of organic iodine at 70% Relative Humidity (RH).

The SGTS is an atmosphere cleanup system designed to reduce halogen and particulate concentrations potentially present in the reactor enclosure following a LOCA or a postulated fuel handling accident in the refueling area, before the air is discharged to the environment. The system exhausts a controlled amount of filtered air to the atmosphere during the Reactor Enclosure and/or Refueling Area isolation to restore and maintain a negative pressure in the affected secondary containment zone(s). Each of the two 100% redundant SGTS filter trains consists of two banks of HEPA filters (upstream and downstream of charcoal adsorber), a vertical 8-inch deep charcoal adsorber bed and associated ducts, instruments, valves and controls. The charcoal adsorber is a gasketless, welded seam type filled with impregnated activated charcoal. The bank holds a total of approximately 2400 pounds of charcoal having an

ignition temperature of not less than 626 degrees F. The charcoal adsorber is capable of removing not less than 99.0% of elemental iodine and 99.0% of organic iodine at 70% RH.

A cooldown mode is included in both the RERS and SGTS system design. This mode enables air to be admitted to each train that is not in operation, to limit excessive charcoal temperature increases due to potential radioactive decay heat buildup in the charcoal adsorbers after shutdown of the train. The cooldown mode is designed to prevent 1) auto-ignition of the charcoal and 2) potential iodine desorption.

The SGTS and the RERS cooldown modes are designed to be operated in the same way and serve the same purpose. The design of each filter train includes a temperature sensor and three different temperature alarms which annunciate in the Main Control Room at 200 degrees F, 250 degrees F, and 550 degrees F for the charcoal adsorbers. The fire protection provided for the RERS and the SGTS is a water flooding system. In the event of postulated charcoal heat up, the first high temperature alarm will sound in the control room. The operator may turn the SGTS or RERS system to the cooldown mode, which lets the air recirculate through the charcoal adsorbers to cool down the charcoal. If the charcoal continues to heat up, the second and/or the third high temperature alarms will sound. The cooldown mode is stopped and the charcoal adsorber's fire protection systems will be manually initiated to cool down the charcoal.

The proposed deletion of the cooldown modes will not affect the existing temperature alarms or fire protection systems.

The potential temperature increases in the RERS and SGTS charcoal beds have been analyzed and the maximum potential temperatures generated by radioactive decay were calculated to be less than the auto-ignition and iodine desorption temperatures. Further description of this analysis and its results are presented in the Safety Assessment section of this application.

Proposed Page Changes:

The proposed change to page 3/4 6-54 is to delete surveillance requirement 4.6.5.3.d.3 which requires "Each standby gas treatment subsystem shall be demonstrated OPERABLE: at least once per 18 months by: Verifying that the standby gas treatment system can be placed in the cooldown mode of operation from the control room."

The proposed change to page 3/4 6-56 is to delete surveillance requirement 4.6.5.4.d.3 which requires "Each reactor enclosure recirculation subsystem shall be demonstrated OPERABLE: At least once per 18 months by: Verifying that the reactor enclosure recirculation system can be placed in the cooldown mode from the Control Room."

Safety Assessment:

With the cooldown mode removed from the RERS and SGTS as proposed, plant operation will continue to meet the industry standards and Regulatory Guides applicable to the design of nuclear plant air cleaning systems which require cooldown air only if it is required to prevent elevated temperatures from affecting system operation.

Section 2.2.4 of the Energy Research and Development Administration (ERDA) Nuclear Air Cleaning Handbook 76-21 identifies "dilution with cooler air" as one of several means to maintain air cleaning system components within their operating limits when elevated temperatures are a problem.

Section 4.9 of ANSI N509-1980 also addresses charcoal adsorbant cooling. Cooldown air is required only when elevated charcoal temperatures of 300 degrees F or more may cause significant iodine desorption.

Position C.3.k of Regulatory Guide 1.52 requires the design of charcoal adsorbers to consider possible iodine desorption and auto-ignition.

The Limerick FSAR Tables 6.5-2 and 9.4-4 show the RERS and SGTS filtration systems to be in compliance with Position C.3.k of Regulatory Guide 1.52 and ANSI N509 requirements. Standard Review Plan (SRP) Table 6.5.1-1 also references Regulatory Guide 1.52 and ANSI N509 requirements.

A safety evaluation was performed to quantitatively assess the effect of removal of the cooldown mode from the RERS and SGTS. The safety evaluation, which determined the maximum temperature increase in the charcoal beds due to radioiodine decay heat buildup, is similar to the safety evaluation performed to support deletion of the Limerick Unit 2 RERS cooldown mode. The calculation models are presented below, followed by the results and conclusion.

Calculation Model Description

The activity levels in the RERS and SGTS charcoal filters were calculated using Bechtel Standard Computer program LOCADOSE NE319 Revision 1. Regulatory Guide

1.3 iodine source term for a DBA LOCA consisting of 25% of the core iodine inventory was used as the initial activity airborne inside the primary containment available for release. Further, it was conservatively assumed that 50% of the core iodine was in the suppression pool water. The airborne activity inside the primary containment is assumed to leak to the reactor building at a rate of 0.5% per day with an additional 11.5 scfh leakage per Main Steam Isolation Valve (MSIV). Also, an equipment leakage of 5 gpm of suppression pool water is conservatively assumed to leak into the reactor building. A decontamination factor of 10 was used to determine the fraction of iodine activity becoming airborne from the equipment leakage. The airborne activity in the reactor building is then accumulated in the RERS at 60,000 cfm. A mixing efficiency of 50% was assumed within the reactor enclosure (secondary containment).

To maximize the activity loading on the RERS filters, the following assumptions were used:

1. no unfiltered leakage to the environment during the 2 minutes 15 seconds drawdown time.

2. no credit for iodine removal mechanisms were assumed.

3. 100% charcoal filter efficiency for the RERS filters was assumed.

The Bechtel Computer program NE299 FILTLOAD was used to calculate the mass loading in grams and the heat loadings in watts using the activities generated from LOCADOSE NE319. The heat loadings are calculated assuming 100% of the beta energies and 50% of the gamma energies for each isotope are conservatively absorbed in the filter. The remaining 50% of the gamma energies were assumed lost.

Heat losses from the charcoal filters due to natural convection and radiation were considered in the RERS cooldown analysis. The surface area for convective heat transfer was taken as the face area of the front of the filter (1520 ft^2) and the surface area for radiative heat transfer was taken as the outside steel surface area (820 ft^2). The convective heat transfer coefficient used in the program FILTLOAD is the empirical constant for natural convection (0.221 Btu/hr-ft^2 ^oR) taken from Oak Ridge National Laboratories ORNL-4602. No heat loss due to cooling from air flow through the charcoal filters was considered once maximum activity loading on filters was attained. The temperature rise was then calculated by subtracting the heat loss from the heat loading due to radioactive decay.

Heat loading due to oxidation was not calculated since the contribution is small. It is estimated that at the maximum heat load (at 240 hours), the oxidation heat load is approximately 42 watts, 3% of the decay heat load. The decay heat load from noble gases heldup in the RERS filters was not calculated but was estimated to be no greater than the oxidation heat load.

Results - Safety Evaluation

The results of the safety evaluation calculations are presented in Table 1 and discussed below.

RERS

The maximum heat load on the RERS charcoal filters is 1411 watts. This is reached 240 hours after the start of the LOCA. Using a conservative assumption of 60,000 cfm recirculation air flow at 60 degrees C (150 degrees F) through 100% efficient RERS charcoal filters, a maximum temperature rise was calculated to be 0.05

degrees C (0.1 degrees F). For the bounding case where no flow through the filters is assumed after reaching peak activity accumulation, the maximum temperature rise was 1.8 degrees C (3.2 degrees F).

For the bounding case which assumes no flow through the RERS filters and 150 degrees F Reactor Enclosure air, the maximum cumulative post-LOCA RERS charcoal bed temperature is 153.2 degrees F. This maximum temperature is significantly less than the 626 degrees F charcoal auto-ignition temperature and the 300 degrees F iodine desorption temperature. Operation of the RERS with the cooldown mode removed would therefore continue to meet the requirements of Section 2.2.4 of ERDA Nuclear Air Cleaning Handbook 76-21, Section 4.9 of ANSI N509-1980, Position C.3.K of Regulatory Guide 1.52, the Standard Review Plan, and the LGS FSAR.

Table 1 presents the bounding case maximum temperature rise of 3.2 degrees F as a 1 percent reduction in margin to the 626 degrees F charcoal auto-ignition temperature and a 2 percent reduction in margin to the 300 degrees F iodine desorption temperature. These reductions in the margin to the limiting temperatures are not significant relative to the amount of existing margin (472.8 degrees F to the auto-ignition temperature and 146.8 degrees F to the iodine desorption temperature).

SGTS

The maximum heat load on the SGTS charcoal filters is 1343 watts. This is reached at 240 hours after the start of the LOCA. For the SGTS charcoal filter, two cases were analyzed.

The first case assumes 95% efficiency for the RERS filters and 1250 cfm exhaust flow at 60 degrees C (150 degrees F) through 100% efficient SGTS filters.

The maximum temperature rise was calculated to be 0.011 degrees C (0.02 degrees F). The more conservative calculation where no flow through the SGTS filter is assumed to contribute to cooling the SGTS filter, the maximum temperature rise was 0.02 degrees C (0.04 degrees F).

The second case assumes the RERS filters are not operational with 0% efficiency. Assuming 1250 cfm flow at 60 degrees C (150 degrees F) through 100% efficient SGTS filters, the maximum temperature rise was 1.7 degrees C (3.1 degrees F). The bounding case for the SGTS charcoal filters which assumed 0% efficient RERS filters and no air flowing through the SGTS filters after reaching peak activity accumulation determined the maximum temperature rise was 12.63 degrees C (22.7 degrees F).

For the bounding case, which assumes no flow through the SGTS filters, 0% efficient RERS filters, and 150 degrees F Reactor Enclosure air; the maximum cumulative post-LOCA SGTS charcoal bed temperature is 172.7 degrees F. This maximum temperature is significantly less than the 626 degrees F charcoal auto-ignition temperature and the 300 degrees F iodine desorption temperature. Operation of the SGTS with the cooldown mode removed would therefore continue to meet the requirements of Section 2.2.4 of ERDA Nuclear Air Cleaning Handbook 76-21, Section 4.9 of ANSI N509-1980, Position C.3.K of Regulatory Guide 1.52, the Standard Review Plan, and the LGS FSAR.

Table 1 presents the bounding case maximum temperature rise of 22.7 degrees F as a 5 percent reduction in margin to the 626 degrees F charcoal auto-ignition temperature and a 15 percent reduction in margin to the 300 degrees F iodine desorption temperature. These reductions in margin to the limiting temperatures are

not significant relative to the amount of existing margin (453.3 degrees F to the auto-ignition temperature and 127.3 degrees F to the iodine desorption temperature).

Conclusion - Safety Assessment

The bounding case calculations for the RERS and SGTS filters produced maximum cumulative post-LOCA charcoal adsorber temperatures of 153.2 degrees F for RERS and 172.7 degrees F for SGTS. These results indicate that the maximum temperature rises result in RERS and SGTS charcoal adsorber temperatures significantly less than the 626 degrees F charcoal auto-ignition temperature and the 300 degrees F iodine desorption temperature referenced in ANSI N509-1980. Operation of the RERS and SGTS with the cooldown modes removed would therefore continue to meet the requirements of Section 2.2.4 of ERDA Nuclear Air Cleaning Handbook 76-21, Section 4.9 of ANSI N509-1980, Position C.3.K of Regulatory Guide 1.52, the Standard Review Plan, and the LGS FSAR.

Significant Hazards Consideration Determination

The proposed amendment to the Limerick Operating License to delete the cooldown modes from the RERS and SGTS does not constitute a significant hazards consideration. In support of this determination, an evaluation of each of the three standards set forth in Title 10 CFR Section 50.92 is provided below:

(1) Plant operation with the RERS and SGTS cooldown modes removed does not involve a significant increase in the probability or consequences of any accident previously evaluated.

The purpose of the cooldown modes is to limit excessive charcoal temperature increases to prevent 1) auto-ignition of the charcoal and 2) potential iodine desorption. LGS FSAR Section 6.5.1 presents the response to a rise in RERS or SGTS charcoal adsorber bed temperatures when indicated by three different high temperature setpoint alarms (200 degrees F, 250 degrees F, and 550 degrees F). Upon receipt of the first high temperature setpoint alarm, 200 degrees F, the cooldown mode is actuated. If the other two alarms are activated, the cooldown mode is manually stopped and the water system is used for fire suppression. The results of the conservative bounding case calculations discussed in the Safety Assessment section of this application are presented in Table 1. The maximum cumulative post-LOCA charcoal temperatures of 153.2 degrees F for the RERS filters and 172.7 degrees F for the SGTS filters resulting from radioactive decay heat buildup are significantly less than the 626 degrees F charcoal auto-ignition temperature and the 300 degrees F iodine desorption temperature referenced in ANSI N509-1980. For the bounding cases, the margin to the iodine desorption temperature is 146.8 degrees F for RERS and 127.3 degrees F for SGTS. The charcoal adsorber bed temperatures will not rise to the charcoal auto-ignition temperature or the iodine desorption temperature or the first high temperature setpoint alarm unless there is a fire; therefore, operation of the cooldown mode is unnecessary. In the event of a fire, the fire protection system provided for the RERS and the SGTS, which is not affected by the proposed change, would be initiated as stated in the FSAR.

Based upon the results of the conservative bounding case calculations, plant operation with the cooldown mode removed from the RERS and SGTS does not increase the probability or consequences of any accident previously evaluated.

(2) Plant operation with the RERS and SGTS cooldown modes removal does not create the possibility of a new or different kind of accident from any accident previously evaluated.

Plant operation with the cooldown mode removed from the RERS and SGTS would continue to meet the requirements of section 2.2.4 of ERDA Nuclear Air Cleaning Handbook 76-21, Section 4.9 of ANSI N509-1980, and Position C.3.K of Regulatory Guide 1.52. The cooldown modes are considered to be the response to the lowest high temperature setpoint alarm for the charcoal beds. The conservative boundary case calculations discussed previously have shown operation of the cooldown mode to be unnecessary. Each charcoal adsorber filter bed is equipped with high temperature setpoint alarms and water spray or flooding systems. These fire protection systems provide acceptable means of charcoal adsorber fire detection and suppression in accordance with Regulatory Guide 1.52; therefore, plant operation with the RERS and SGTS cooldown modes removed does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Plant operation with the RERS and SGTS cooldown modes removed does not significantly reduce a margin of safety.

The conservative bounding case calculation discussed in the Safety Assessment produced maximum cumulative post-LOCA charcoal temperatures of 153.2 degrees F for the RERS and 172.7 degrees F for the SGTS filters. Table 1 provides a comparison of the post-LOCA safety margins to the limiting temperatures for plant operation with and without the cooldown mode in operation. The reduction in margins to the iodine desorption temperature (300 degrees F) of 2 percent (3.2 degrees F) for RERS and 15 percent (22.7

degrees F) for SGTS are not significant relative to the resultant margins of 146.8 degrees F for RERS and 127.3 degrees F for SGTS. Plant operation with the cooldown mode removed from the RERS and SGTS does not affect the systems' ability to perform their safety related functions as required by Technical Specifications 3/4.6.5.3 and 3/4.6.5.4 and their bases and therefore, does not significantly reduce the margin of safety as defined in the basis for any technical specification.

Environmental Consideration:

An environmental impact assessment is not required for the changes requested by this Application because the requested changes conform to the criteria for "actions eligible for categorical exclusion" as specified in 10 CFR 51.22(c)(9). The requested changes will have no impact on the environment. The Application involves no significant hazards consideration as demonstrated in the preceding section. The Application involves no significant change in the types or significant increase in the amounts of any effluents that may be released offsite, and there is no significant increase in individual or cumulative occupational radiation exposure.

Conclusion

The Plant Operations Review Committee and the Nuclear Review Board have reviewed these proposed changes to the Technical Specifications and have concluded that they do not involve any unreviewed safety questions or any Significant Hazards Considerations, and will not endanger the health and safety of the public.

Respectfully submitted,

PHILADELPHIA ELECTRIC COMPANY

Vice President

COMMONWEALTH OF PENNSYLVANIA :

: ss.

COUNTY OF PHILADELPHIA :

J. W. Gallagher, being first duly sworn, deposes and says:

That he is Vice President of Philadelphia Electric Company, the Applicant herein; that he has read the foregoing Application for Amendment of Facility Operating License and knows the contents thereof; and that the statements and matters set forth therein are true and correct to the best of his knowledge, information and belief.

J W Gallagher

Subscribed and sworn to
before me this 5th day
of July, 1988

Melanie R. Campanella

Notary Public

MELANIE R. CAMPANELLA
Notary Public, Philadelphia, Philadelphia Co.
My Commission Expires February 12, 1990

TABLE 1
COMPARISON OF MAXIMUM CHARCOAL BED TEMPERATURES WITH AND WITHOUT COOLDOWN MODE OPERATION

FILTRATION SYSTEM	POST-LOCA WITH COOLDOWN MODE IN OPERATION WITH 150 F AIR			POST-LOCA WITHOUT COOLDOWN MODE IN OPERATION			PERCENT CHANGE IN SAFETY MARGINS	
	MAXIMUM CHARCOAL BED TEMP F	SAFETY MARGINS		MAXIMUM CHARCOAL BED TEMP F	SAFETY MARGINS		PERCENT INCREASE IN MARGIN TO AUTO-IGNITE TEMP OF 626 F	PERCENT INCREASE TO IODINE DESORPTION TEMP OF 300 F
		MARGIN TO AUTO IGNITE TEMP OF 626 F	MARGIN TO IODINE DESORPTION TEMP OF 300 F		MARGIN TO AUTO IGNITE TEMP OF 626 F	MARGIN TO IODINE DESORPTION TEMP OF 300 F		
RERS	150	476	150	153.2	472.8	146.8	1	2
SGTS WITHOUT RERS OPERATION	150	476	150	172.7	453.3	127.3	5	15