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ENGINEERING AND RESEARCH DEPARTMENT

Mr. Walter R. Butler, Director
BWR Project Directorate #4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, DC 20555

DEC 29 1986

Docket No.: 50-353

Subject: Limerick Generating Station, Unit 2
Charcoal Filter Cooldown Mode for
Reactor Enclosure Recirculation System

File: GOVT 1-1 (NRC)

Dear Mr. Butler:

Philadelphia Electric Company proposes to make changes to the design and operation of the Reactor Enclosure Recirculation System (RERS) for Limerick Generating Station Unit #2. The RERS is a safety-related air recirculation and filtration system consisting of two 100 percent capacity filter train/fan assemblies. The function of the RERS is to provide for the recirculation (mixing) and filtration (Pre-HEPA-Charcoal-HEPA) of the Reactor Enclosure Secondary Containment post accident air volume to reduce the concentration of radioactive iodides and particulates. Additional filtration (HEPA-Charcoal-HEPA) is provided by the safety-related Standby Gas Treatment System (SGTS), which is downstream of RERS, for effluent discharged to the environment. The RERS does not run during normal plant operation.

The design of the RERS has provisions to provide a cooldown flow path to a charcoal adsorber that is not in operation and is experiencing excessive temperature increases due to radioactive decay heat. To accomplish this, cooldown air inlet ductwork is provided upstream of each charcoal adsorber and a ductwork inter-tie is provided downstream of each charcoal adsorber prior to the fans. Safety-related electro-hydraulically actuated isolation valves are provided in the ductwork to establish the required flow paths (See attached sketch). Control logic is provided to place a non-operating charcoal adsorber in the appropriate cooldown configuration when the associated RERS handswitch is placed in the "COOLDOWN" position. Different flow paths are established depending on whether the redundant RERS filter train is operating or neither RERS filter train is in operation.

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The charcoal adsorber cooldown mode was originally provided in the design to limit potential radioactive decay heat build-up to assure that the charcoal temperature is kept below the point where significant desorption (300°F) or auto-ignition (626°F) could occur. At the time, the radioactive decay heat built-up in the charcoal adsorbers was not quantified and cooldown modes were conservatively provided.

Since the original design, calculations have been performed to quantify the potential radioactive decay heat buildup in the RERS charcoal adsorbers. The calculations have used a source term consistent with the SER Supplement #3 LOCA analysis and have conservatively assumed that one of the RERS filter trains operates post LOCA and provides for a 100% removal efficiency for radioactive iodides postulated to be filtered by the charcoal adsorber. At the point of maximum loading, it is assumed that the charcoal adsorber is isolated (no air flow) and the resultant charcoal bed temperature rise due to decay heat was calculated. The resultant maximum temperature rise in the adsorber was calculated to be 3.2°F. Using the conservative assumption that the Reactor Enclosure Secondary Containment post LOCA atmosphere is 150°F, this results in a cumulative charcoal bed temperature of 153.2°F. This is well below the temperature where significant iodine desorption could occur (300°F) and the minimum charcoal auto-ignition temperature (626°F).

Based on the foregoing, we propose to eliminate the charcoal adsorber cooldown mode from RERS for Limerick Unit 2.

The approach to provide a charcoal adsorber cooldown mode only if a potential need exists is consistent with existing regulatory guidelines and industry standards. The applicable guidance on charcoal adsorber cooldown modes is as follows:

1. NRC Regulatory Guide 1.52, Rev. 2, Position C.3.K.

"The design of the adsorber section should consider possible iodine desorption and adsorbent auto-ignition that may result from radioactivity-induced heat in the adsorbent and concomitant temperature rise. Acceptable designs include a low-flow air bleed system, cooling coils, water sprays for the adsorber section, or other cooling mechanisms."

2. Nuclear Power Plant Air Cleaning Units and Components, ANSI N509-1980, Paragraph 4.9

"Where heat of radioactive decay or heat of oxidation or both may be significant, means shall be provided to remove this heat from the adsorbent beds to limit temperatures to values below 300°F to prevent significant iodine desorption."

3. Nuclear Air Cleaning Handbook, ERDA 76-21, Section 2.2.4 (1969)

"The limiting temperature of adsorbents for capturing radioactive iodine and iodine compounds is related to the desorption temperature of the adsorbed compound and of the impregnants with which the material has been treated to enhance its adsorption of organic radioiodides. For triethylenediamine (TEDA) impregnated activated carbon, this temperature may be as low as 300 to 350°F. When temperatures higher than the operating limits of air cleaning system components must be accommodated, heat sinks, dilution with cooler air, or some other means of cooling must be provided to reduce temperatures to levels that those components can tolerate."

Based on the above guidance, it is concluded that a charcoal adsorber cooling mechanism need only be provided when the potential for significant radioactive decay heat buildup exists. Since it has been determined that there is no potential for significant RERS charcoal adsorbent radioactive decay heat build-up the elimination of the cooldown mode would comply with both regulatory and industry guidance.

The elimination of the RERS charcoal adsorbent cooldown mode does not reduce the margin of safety for Limerick Generating Station - Unit 2. There will be no increase in offsite doses reported in the FSAR since the worst case charcoal adsorber temperature is well below the desorption temperature. In addition, the RERS charcoal adsorbers will be monitored with temperature sensors that provide temperature indication and alarm annunciation on three distinct levels of off-design temperature conditions (200°F, 250°F, 550°F). In the unlikely event of a charcoal adsorber fire the operators would have sufficient information to be aware of off-design temperatures. It should be noted that no external source for initiating a charcoal adsorber fire has been identified. Mitigating actions of isolating the charcoal adsorber and actuating the manual charcoal adsorber water spray fire protection system could be taken.

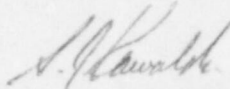
The elimination of the RERS cooldown mode will result in simplification and increased reliability for this safety-related system. It will also result in significant first cost savings, as well as annual savings by not having to perform the monthly, yearly and five-yearly inspection and maintenance activities on the system components as recommended by the vendor.

Philadelphia Electric Company is therefore requesting NRC review and approval for the deletion of the RERS cooldown mode for Limerick Unit 2. The installation of the cooldown mode equipment has been placed on-hold, with installation activities planned to commence in June 1987 to support system completion. In order to realize the maximum advantage

from the deletion of the cooldown mode, we request your decision on this proposal by April, 1987. We will proceed with the appropriate FSAR changes upon approval of this request.

If we can be of further assistance in this matter, please contact us.

Sincerely,



S. J. Kowalski
Vice President
Engineering and Research

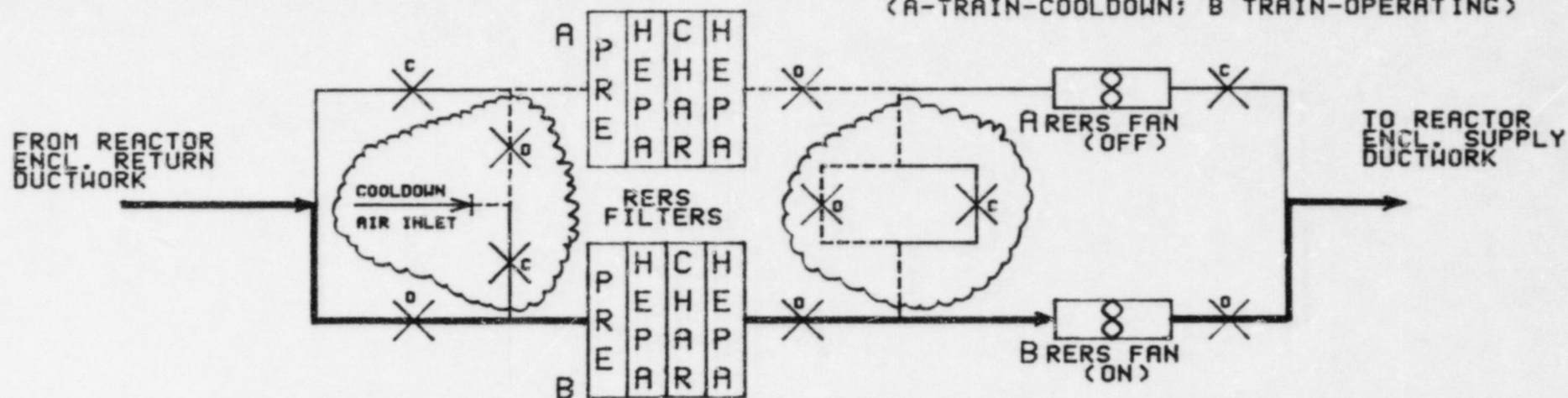
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Enclosure

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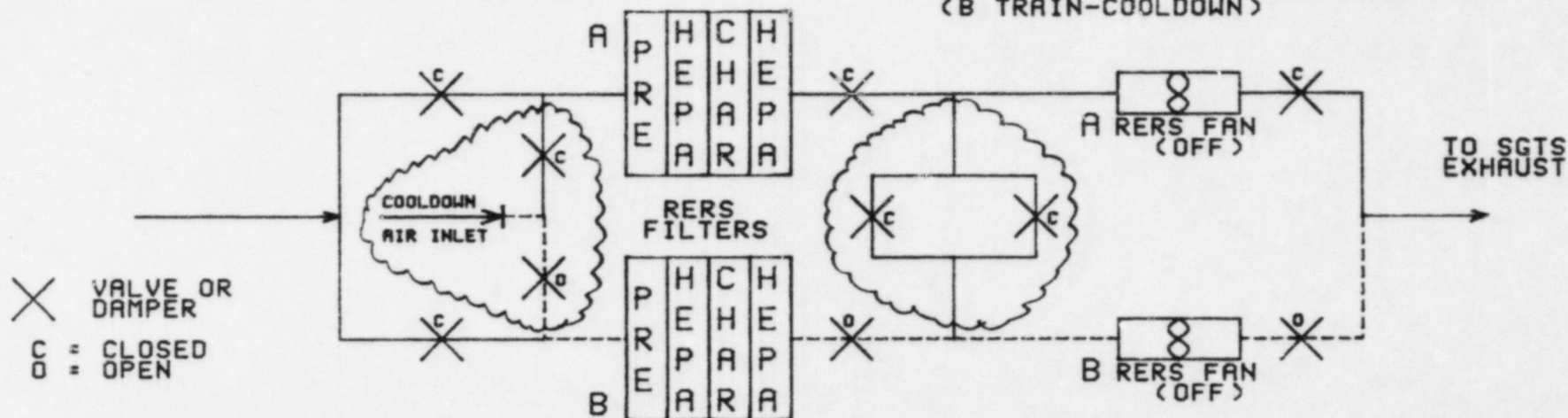
RERS COOLDOWN FLOW PATH NO. 1

COOLDOWN FLOW PATH THRU STANDBY
FILTER WITH LEAD FILTER IN OPERATION
(A-TRAIN-COOLDOWN; B TRAIN-OPERATING)



RERS COOLDOWN FLOW PATH NO. 2

COOLDOWN FLOW PATH THRU FILTER
WITH NEITHER RERS IN OPERATION
(B TRAIN-COOLDOWN)



X VALVE OR DAMPER
 C = CLOSED
 O = OPEN

— RERS MAIN FLOW
 - - - COOLDOWN PATH
 — NO FLOW
 (cloud) PROPOSED DELETION