



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

October 30, 2019

Dr. Lora Weiss
Senior Vice President for Research
The Pennsylvania State University
304 Old Main
University Park, PA 16802-6501

SUBJECT: PENNSYLVANIA STATE UNIVERSITY - REQUEST FOR ADDITIONAL
INFORMATION FOR LICENSE AMENDMENT REQUEST REGARDING THE
REACTOR BAY VENTILATION SYSTEM FOR THE PENN STATE BREAZEALE
REACTOR (EPID L-2019-LLA-0089)

Dear Dr. Weiss:

By letter dated March 28, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19094B798), Pennsylvania State University requested an amendment to the Facility Operating License R-2 for the Penn State Breazeale Reactor. The requested licensing action would amend the facility operating license to allow for the improvement of the reactor ventilation system via the addition of a Reactor Bay Heating Ventilation and Exhaust System and an administrative change on its organizational chart.

The U.S. Nuclear Regulatory Commission (NRC) staff identified additional information needed to continue its review of the license amendment request (LAR), as described in the enclosed request for additional information (RAI). As discussed by telephone on October 8, 2019, and on October 30, 2019, provide a response to the RAIs or a written request for additional time to respond, including the proposed response date and a brief explanation of the reason, by December 20, 2019. Following receipt of the complete response to the RAIs, the NRC staff will continue its review of the LAR.

The response to the RAIs must be submitted in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) 50.4, "Written communications," and pursuant to 10 CFR 50.30(b), "Oath or affirmation," be executed in a signed original document under oath or affirmation. Information included in the response that you consider sensitive or proprietary, and seek to have withheld from public disclosure, must be marked in accordance with 10 CFR 2.390, "Public inspections, exemptions, requests for withholding." Any information related to safeguards should be submitted in accordance with 10 CFR 73.21, "Protection of Safeguards Information: Performance Requirements."

Based on the response date provided above, the NRC staff expects to complete its review and make a final determination on the LAR by May 31, 2020. This date could change due to several factors including a need for further RAIs, unanticipated changes to the scope of the review, unsolicited supplements to the application for [amendment, renewal, etc.], and others. If the forecasted date changes, the NRC staff will notify you in writing of the new date and an explanation of the reason for the change. In the case that the NRC staff requires additional information beyond that provided in the response to this RAI, the NRC staff will request that information by separate correspondence.

If you have any questions regarding the NRC staff's review or if you intend to request additional time to respond, please contact me at (301) 415-1404 or by electronic mail at Xiaosong.Yin@nrc.gov.

Sincerely,

/RA/

Xiaosong Yin, Project Manager
Non-Power Production and Utilization Facility
Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Docket No.: 05-005
License No.: R-2

Enclosure:
As Stated

cc:

Yuanqing Guo
Manager of Radiation Protection
The Pennsylvania State University
0201 Academic Project Bldg
University Park, PA 16802

Director, Bureau of Radiation Protection
Department of Environmental Protection
P.O. Box 8469
Harrisburg, PA 17105

Test, Research and Training
Reactor Newsletter
Attention: Ms. Amber Johnson
Dept of Materials Science and Engineering
University of Maryland
4418 Stadium Drive
College Park, MD 20742-2115

Dr. Jeffrey Geuther
Associate Director for Operations
104 Breazeale Nuclear Reactor Building
University Park, PA 16802-1504

Dr. Kenan Unlu, Director
The Pennsylvania State University
Breazeale Nuclear Reactor
Radiation Science and Engineering Center
University Park, PA 16802-2301

SUBJECT: PENNSYLVANIA STATE UNIVERSITY - REQUEST FOR ADDITIONAL
INFORMATION FOR LICENSE AMENDMENT REQUEST REGARDING THE
REACTOR BAY VENTILATION SYSTEM FOR THE PENN STATE BREAZEALE
REACTOR (EPID L-2019-LLA-0089) DATE: OCTOBER 30, 2019

DISTRIBUTION:

PUBLIC	UNPL R/F	RidsNrrDanu	RidsNrrDanuUnpl
RidsNrrDanuUnpo	NParker, NRR	GCasto, NRR	
AMendiola, NRR	XYin, NRR	WSchuster, NRR	

ADAMS Accession No. ML19296E142

*concurred via email

NRR-088

OFFICE	NRR/DANU/UNPL/PM*	NRR/DANU/UNPL/LA*	NRR/DANU/UNPL/BC	NRR/DANU/UNPL/PM
NAME	XYin	NParker	GCasto	XYin
DATE	10/30/19	10/30/19	10/30/19	10/30/19

OFFICIAL RECORD COPY

OFFICE OF NUCLEAR REACTOR REGULATION
REQUEST FOR ADDITIONAL INFORMATION
REGARDING LICENSE AMENDMENT TO
FACILITY LICENSE NO. R-2
PENN STATE UNIVERSITY - BREAZEALE REACTOR
DOCKET NO. 50-005

By application dated March 28, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. (ML19094B798), Pennsylvania State University, requested changes to the Penn State Breazeale Reactor (PSBR) Operating License No. R-2. The request proposes changes to the PSBR technical specifications (TSs) and the updated safety analysis report (SAR) regarding the installation of a reactor bay heating, ventilation, and exhaust system (RBHVES) to the reactor bay.

The U.S. Nuclear Regulatory Commission (NRC) staff reviewed the license amendment request (LAR), for compliance with the appropriate regulations in Title 10 of the *Code of Federal Regulations* using the following guidance and standard(s):

- NUREG-1537 Part 1, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Format and Content," issued February 1996 (ADAMS Accession No. ML042430055)
- NUREG-1537 Part 2, "Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Standard Review Plan and Acceptance Criteria," issued February 1996 (ADAMS Accession No. ML042430048)

Based on its review, the NRC staff requires the following additional information to continue its review of the LAR:

RAI-1

Page 3 of 9 in "Evaluation of the Proposed Change," states:

To simplify the reliability of the interface between the RBHVES control system and the emergency evacuation system, the only communication is through a set of auxiliary contacts on a multiplier relay in the **emergency evacuation system**. When the **evacuation system** is actuated, an evacuation relay opens contacts that interrupt the control power from the RBHVES system to the confinement damper actuators. Without power the dampers fail to the closed position. The RBHVES trips the exhaust supply and recirculation fans and opens the relief damper.

The RBHVES serves no safety function during airborne release. When the **evacuation alarm system is activated**, any operating RBHVES fans are shut down, associated motor-driven confinement isolation dampers shut in

Enclosure

approximately five seconds, and the EES system starts. (The FES, if operating, also automatically shuts down during an evacuation).

The SAR and TS markups also contain references to evacuation system and evacuation alarm system.

NUREG 1537, Part 2, provides guidance on the conduct of licensing action reviews to the NRC staff. Section 9.1 states that the areas should include modes of operation and features of the heating, ventilation, and air conditioning system designed to control (contain or confine) reactor facility atmosphere, including damper closure or flow-diversion functions, during full range of reactor operation.

The license amendment request (LAR) appears to describe two different evacuation systems, which appear to control confinement isolation. In the October 8, 2019, clarification call, discussion between the NRC staff and licensee appeared to conclude that both the emergency evacuation system and the emergency alarm system performed a single actuation to establish confinement. The NRC staff does not understand the relationship between these two systems.

Clarify whether there are two different systems as stated above that would activate the confinement damper actuators to close and provide a detailed explanation of the differences between the two systems.

RAI - 2

TS 3.5.a prior to the proposed change in the **LAR** states:

"If the reactor is operating not secured, at least one facility exhaust fan SHALL be operating and except for periods of time less than 48 hours during maintenance or repair, the emergency exhaust system SHALL be operable."

The proposed change revises TS 3.5.a into two parts, TS 3.5.a and 3.5.b, as follows:

3.5.a The reactor SHALL NOT be operated unless reactor bay differential pressure is negative.

Upon discovery of no operating exhaust fans, restore a reactor bay exhaust fan to operation within one hour or shutdown the reactor.

3.5.b Except for periods of time less than 48 hours during maintenance or repair, the emergency exhaust system SHALL be operable.

The following justification is provided for the proposed change in TS Change Summary Table (Item 4 in Page 5 of 9 of the enclosure "Evaluation of the Proposed Change"):

"The intent of the specification is to ensure that reactor bay differential pressure is negative. The revised TS recognize that the FES are not the only component of the upgraded exhaust system, and negative differential pressure may be attained with or without FES."

Page 1 of 9 in "Evaluation of the Proposed Change," states:

"The upgraded reactor bay heating ventilation and exhaust system (RBHVES) is intended to be used along with the existing FES fans, which may either be on or off depending on the RBHVES operating mode."

Pages 3 and 4 of 9 in "Evaluation of the Proposed Change," states:

The RBHVES includes a differential pressure indicator lamp that is read by the reactor operator every hour as part of the routine logs. This indicator lamp is extinguished if any one of three differential pressure transducers reads low differential pressure (i.e., DP greater than $-0.01'' \text{ H}_2\text{O}$). This indication of loss of pressure is not immediate. A timer, typically set to five minutes, is used to ensure that the loss of pressure signal is not a false positive. Upon observing the loss of negative pressure as indicated by the RBHVES indicator lamps, the reactor operator is expected to consult the duty SRO, who will be responsible for trouble shooting and rectifying the loss of normal function. The revised TS allow for one hour of operation following the discovery of loss of normal negative differential pressure after which the reactor must be shut down. The SRO's actions may include ensuring reactor bay doors closed, starting additional fans (such as FES), shutting down RBHVES, or other system maintenance. The quickest action would be for the operator to secure power to the RBHVES using a red pushbutton in the control room. Following loss of RBHVES power, the FES would automatically be energized and would restore negative differential pressure. The SRO could also toggle the FES control switches (Figure 2) to ON in order to ensure that the FES is operating regardless of RBHVES mode.

A new calibration requirement has been added to the proposed Technical Specifications to ensure that the differential pressure transducers are calibrated annually. The hourly reading of the differential pressure indicator lamp by the operator is preferred to the automatic scram (as with the optional FES power scram) because differential pressure may be temporarily negated by the opening bay doors for large tour groups or other routine causes, and therefore an added DCC-X scram based on differential pressure may cause a significant increase in unintentional reactor trips. (The timer in the DP lamp logic should avoid changes in indication for personnel access through the doors. However, the timer setting can be changed by offsite personnel with access to the supervisory control software and therefore DP should not be used for reactor trips.)

Based on the statements in the "Evaluation of the Proposed Change," it is evident that there could be situations for a loss of negative pressure during personnel ingress and egress to and from the reactor bay. Based on the design (i.e. five-minute delay), the number of times and the amount of time the differential pressure is compromised may be undetermined. Therefore, the revised TS 3.5.a stating "The reactor SHALL NOT be operated unless reactor bay differential pressure is negative," includes exemptions by design from this statement. Additionally, the limited condition of operation (LCO) in the proposed TS 3.5.a, as written, only allows an allowed outage time (AOT) of one hour for a non-operating exhaust fan. Other potential temporary or long term losses of negative pressure and AOT considerations for investigation and correction would not be permitted as discussed in the LAR before reactor shutdown would be required per the proposed TS 3.5.a or TS 3.5.b.

TS 3.5 that the staff considers the TS of record (Amendment No. 38, October 12, 2012) states:

Applicability

This specification applies to the operation of the facility exhaust system and the emergency exhaust system.

Objective

The objective is to mitigate the consequences of the release of airborne radioactive materials resulting from reactor operation.

Specification

- a. If the reactor **is operating**, at least one facility exhaust fan SHALL be operating and, except for periods of time less than 48 hours during maintenance or repair, the emergency exhaust system SHALL be operable.
- b. If irradiated fuel or a fueled experiment with significant fission product inventory is being moved outside containers, systems or storage areas, at least one facility exhaust fan SHALL be operating and the emergency exhaust system ALL be operable.

The TS 3.5 reference in the **LAR** does not align with the NRC staff understanding of the current, approved TS 3.5 of record. No discussion or justification for changing TS 3.5 from “secured” to “not operating” was provided in the LAR.

Provide the following:

- 1) Provide justification that the LCO for TS 3.5.a is intended ONLY to apply for loss of exhaust fans, and any other loss of negative pressure observation will require immediate shutdown of the reactor, or if the LCO was intended to represent any loss of negative pressure potential causes, as described in the LAR, change the LCO accordingly to apply to any described loss of negative pressure cause and justify the AOT proposed.
- 2) If you intend to apply any loss of negative pressure cause for AOT inclusion in TS 3.5, then provide justification that operating experience with ingress and egress does not result in loss of negative pressure for greater than one hour or propose an alternate TS statement that appropriately recognizes such exceptions.
- 3) Provide an LCO for not meeting proposed TS 3.5.b, or justify why the current proposed TS 3.5.b is acceptable with no action statement if the AOT is not met.
- 4) Justify the listing of the TS 3.5 version included in your LAR, as compared to the License Amendment No. 38 TS 3.5 that the NRC staff has identified as the license of record.
- 5) Provide the modified TSs markup pages that 1) are consistent with the most current updated TSs pages, 2) use page X.a, b, or c etc., to address a page “spillover” situation, do not add additional page numbers for the “spillover” and 3) with your response, provide a word version of all the proposed TSs pages directly to your facility project manager at the NRC.