



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

September 28, 2021

Dr. Wei Ji, Facility Director
Rensselaer Polytechnic Institute
110 8th Street, JEC Room 5040
Troy, NY 12180-3590

SUBJECT: RENSSELAER POLYTECHNIC INSTITUTE – ISSUANCE OF AMENDMENT NO. 12 TO RENEWED FACILITY OPERATING LICENSE NO. CX-22 FOR THE CRITICAL EXPERIMENTS FACILITY REGARDING RESTRICTED AND EXCLUSION AREAS (L-2020-NFA-0008)

Dear Dr. Ji:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 12 to Renewed Facility Operating Licensing No. CX-22 for the Critical Experiments Facility. The amendment consists of change to technical specification 5.1 regarding its restricted and exclusion areas in response to application, dated July 11, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19205A066), as supplemented by letters dated February 20, 2020, August 24, 2020, and April 23, 2021 (ADAMS Accession Nos. ML20057D420, ML20238B853, and ML21119A311, respectively).

A copy of the NRC staff's safety evaluation is also enclosed. If you have any questions, please contact me at (301) 415-1404, or by electronic mail at Xiaosong.Yin@nrc.gov.

Sincerely,

A handwritten signature in blue ink that reads "Xiaosong Yin".

Signed by Yin, Xiaosong
on 09/28/21

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. 50-225
License No. CX-22

Enclosures:
As stated

cc w/enclosures: See next page

Rensselaer Polytechnic Institute

Docket No. 50-225

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Test, Research and Training
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SUBJECT: RENSSELAER POLYTECHNIC INSTITUTE – ISSUANCE OF AMENDMENT NO. 12 TO RENEWED FACILITY OPERATING LICENSE NO. CX-22 FOR THE CRITICAL EXPERIMENTS FACILITY REGARDING RESTRICTED AND EXCLUSION AREAS (L-2020-NFA-0008) DATED: SEPTEMBER 28, 2021

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NRR-058

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THE RENSSELAER POLYTECHNIC INSTITUTE

DOCKET NO. 50-225

CRITICAL EXPERIMENTS FACILITY

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 12
License No. CX-22

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for an amendment to Renewed Facility Operating License No. CX-22, filed by the Rensselaer Polytechnic Institute on July 11, 2019, as supplemented by letters dated February 20, 2020, August 24, 2020, and April 23, 2021, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in Title 10 of the *Code of Federal Regulations* (10 CFR) Chapter I;
 - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
 - C. There is reasonable assurance that (i) the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations set forth in 10 CFR Chapter I;
 - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;
 - E. The issuance of this amendment is in accordance with 10 CFR Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," of the Commission's regulations and all applicable requirements have been satisfied; and
 - F. Prior notice of this amendment was not required by 10 CFR 2.105, "Notice of proposed action," and publication of a notice for this amendment is not required by 10 CFR 2.106, "Notice of issuance."

2. Accordingly, the license is amended by changes as described in Attachment 1 to this license amendment and by changes to the Technical Specifications as indicated in Attachment 2. Paragraph 2.C.2 of Renewed Facility Operating License No. CX-22 is hereby amended to read as follows:

2. Technical Specifications

The technical specifications contained in Appendix A, as revised by Amendment No. 12, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 14 days.

FOR THE U.S. NUCLEAR REGULATORY COMMISSION

Joshua M. Borromeo, Chief
Non-Power Production and Utilization Facility
Licensing Branch
Division of Advanced Reactors and Non-Power
Production and Utilization Facilities
Office of Nuclear Reactor Regulation

Attachments:

1. Changes to Renewed Facility
Operating License No. CX-22
2. Changes to Appendix A,
"Technical Specifications"

Date of Issuance: September 28, 2021

ATTACHMENT TO LICENSE AMENDMENT NO. 12
RENEWED FACILITY OPERATING LICENSE NO. CX-22
DOCKET NO. 50-225

Replace the following page of the Renewed Facility Operating License No. CX-22 with the revised page. The revised page is identified by amendment number and contains a marginal line indicating the areas of change.

Renewed Facility Operating License No. CX-22

REMOVE

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INSERT

3

- c. to receive, possess, and use, in connection with operation of the facility, up to 80 grams of contained plutonium in the form of plutonium-beryllium neutron sources.
 - d. to receive, possess, use, but not separate, in connection with operation of the facility, such special nuclear material as may be produced by operation of the facility; and
3. Pursuant to the Act and 10 CFR Part 40 to receive, possess, and use, in connection with operation of the facility, up to 6 kilograms of depleted uranium and up to 100 grams of natural uranium.
 4. Pursuant to the Act and 10 CFR Part 30, to receive, possess, and use, in connection with operation of the facility, such byproduct material as may be produced by operation of the reactor, which cannot be separated except for byproduct material produced in non-fueled experiments.
- C. This license shall be deemed to contain and is subject to the conditions specified in 10 CFR Parts 20, 30, 40, 50, 51, 55, 70, and 73 of the Commission's regulations; is subject to all applicable provisions of the Act, and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

1. Maximum Power Level

The licensee is authorized to operate the facility at steady state power levels not in excess of 100 watts (thermal).

2. Technical Specifications

The Technical Specifications contained in Appendix A, as revised by Amendment No. 12, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

ATTACHMENT TO LICENSE AMENDMENT NO. 12
RENEWED FACILITY OPERATING LICENSE NO. CX-22
DOCKET NO. 50-225

Replace the following page of Appendix A, "Technical Specifications," with the revised page. The revised page is identified by amendment number and contains marginal lines to indicate the areas of change.

Technical Specifications

REMOVE

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INSERT

17

Specification

The criticality detector system, CAM and area gamma monitors shall be tested with a radiation source at least monthly and daily if the reactor is operated and calibrated semiannually.

Portable survey meters shall be calibrated at the manufacturer's recommended frequency.

Prior to discharge to the environment the moderator shall be monitored for radioactivity to prove that gross activity levels are lower than maximum levels permitted by 10 CFR 20 Appendix B Table 2.

Bases

Experience has demonstrated that calibration of the criticality detectors, CAM and gamma monitors semiannually is adequate to ensure that significant deterioration in accuracy does not occur. Furthermore, the operability of these radiation monitors is included in the daily pre-startup checklist. If the reactor is not operated for more than a month, the instruments are required to be checked to ensure operability. Portable instruments are calibrated at the manufacturer recommended frequency.

Experience has demonstrated that the moderator does not accumulate radioactive material due to the low operating neutron fluence. Therefore, periodic monitoring is not necessary. Verification is necessary, however, prior to discharge to the environment.

4.8 Experiments – None required

Since experiments may vary drastically no general surveillances are defined. However, approved experimental procedures may contain experiment specific surveillances.

4.9 Facility-specific Surveillance Requirements – None required

No facility specific surveillances are required.

5. DESIGN FEATURES

5.1 Site and Facility Description

Applicability

These specifications apply to the design of the RCF and the surrounding site.

Objective

The purpose of these specifications is to provide a layout of the site and the structures that contain the reactor in a means to protect personnel.

Specification

The facility is located on a site situated on the south bank of the Mohawk River in the City of Schenectady. An inner fence more than 28 feet from the center of the reactor defines the restricted area. An outer fence more than 35 feet from the center of the reactor defines the exclusion area.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 12 TO

RENEWED FACILITY OPERATING LICENSE NO. CX-22

THE RENSSELAER POLYTECHNIC INSTITUTE

CRITICAL EXPERIMENTS FACILITY

DOCKET NO. 50-225

1. INTRODUCTION

By letter dated July 11, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19205A066), as supplemented by letters dated February 20, 2019, August 24, 2020, and April 23, 2021 (ADAMS Accession Nos. ML20057D420, ML20238B853, and ML21119A311, respectively), the Rensselaer Polytechnic Institute (RPI) submitted a license amendment request (LAR) for the RPI Critical Experiments Facility (RCF). The LAR proposes that the NRC change RPI's license by modifying a technical specification (TS) defining the RCF restricted and exclusion areas.

The LAR proposed a change to TS 5.1, "Site and Facility Description." Specifically, the proposed TS would change the distances from the centerline of the RCF reactor to the fences, which define the restricted and exclusion areas around the facility.

The RCF sits on land owned by RPI, but is surrounded by industrial land previously belonging to the American Locomotive Corporation, eventually transferred to the control of the Schenectady Metroplex, and industrial development authority. The Metroplex has plans to redevelop the land into a mixed-use development including residential property, commercial activities, a hotel, and a marina.

The LAR proposes to change the TS that describes the restricted area and exclusion area fences. In the LAR, the licensee clarifies the new locations of the fences on each side of the facility. In some areas, the fences have been moved closer to the reactor building and reactor centerline, and in the other locations the fences are moved farther away. The licensee includes radiological information in the LAR, including dosimetry and survey data, calculations, and sampling information to demonstrate that regulatory requirements will continue to be met at the new fence lines.

The LAR would align the TSs with fence relocations completed by RPI without the prior approval of the U.S. Nuclear Regulatory Commission (NRC). As described in NRC Inspection Report (IR) No. 05000225/2018201-01 (ADAMS Accession No. ML20261H594), the licensee moved the inner and outer fences for the restricted and exclusion areas, respectively, as a result of an adjacent commercial and residential construction project, which involved the excavation and removal of a large area of the land mass and the creation of a new waterway

from the Mohawk River to the newly created boat marina. The fences were relocated before the licensee submitted the LAR to change TS 5.1. The fence relocation resulted in unresolved item (URI) 05000225/2020201, which will remain open until the NRC staff completes the review of the LAR and decides what appropriate actions to take to close this URI.

2. REGULATORY EVALUATION

The NRC staff reviewed the licensee's LAR and evaluated the proposed TS change based on the following regulations, guidance, and the NRC staff's safety evaluation report (SER) for the 20-year renewal of the RCF:

- Title 10 of the *Code of Federal Regulations* (10 CFR) Part 20, "Standards for Protection against Radiation," which provides the regulatory requirements for protection against ionizing radiation resulting from activities conducted under licenses issued by the NRC.
- Section 20.1301, "Dose limits for individual members of the public," of 10 CFR and Section 20.1402, "Radiological criteria for unrestricted use," of 10 CFR.
- Section 50.36, "Technical specifications," paragraph (b) of 10 CFR, which requires that the TSs be derived from the analyses and evaluation included in the safety analysis report and requires the TSs to include design features of the facility such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety (50.36(c)(4));
- Section 50.75, "Reporting and recordkeeping for decommissioning planning," of 10 CFR.
- The SER of NRC staff's review of the RCF 20-year renewal, June 2011 (ADAMS Accession No. ML111110690).

3. TECHNICAL EVALUATION

The regulation in 10 CFR 50.36(b) requires that the TSs be derived from the analyses and evaluation included in the safety analysis report and requires the TSs to include design features of the facility, such as materials of construction and geometric arrangements, which, if altered or modified, would have a significant effect on safety (50.36(c)(4)). The regulation in 10 CFR 20.1301(a)(2) specifies, in part, that the dose in any unrestricted area from external sources shall not exceed 2 millirem in any one hour (mrem/hr). The regulation in 10 CFR 20.1301(a)(1) specifies, in part, that the total effective dose equivalent (TEDE) to individual members of the public from the licensed operation shall not exceed 0.1 rem (100 mrem) in a year (100 mrem/yr TEDE), exclusive of the dose contributions from background radiation. The regulation in 10 CFR 20.1402 specifies, in part, that a site will be considered acceptable for unrestricted use if the residual radioactivity that is distinguishable from background radiation results does not exceed 25 mrem/yr TEDE to an average member of the critical group (as defined in 10 CFR 20.1002, "Scope"), including that from groundwater sources of drinking water, and the residual radioactivity has been reduced to levels that are as low as is reasonably achievable (ALARA).

As part of its review of the LAR, as supplemented, to change RPI TS 5.1 related to the facility fence, the NRC staff also reviewed if the change in fence locations would change previous staff conclusions regarding the radiological dose consequence of the postulated maximum

hypothetical accident (MHA) evaluated in Section 4.1 of the NRC staff's SER for the 20-year renewal of the RCF, June 2011. Further, the NRC staff reviewed the licensee's Annual Operating Reports (AORs) from calendar years (CYs) 2015 through 2020 and the NRC IRs from years 2015 through 2020.

3.1 Proposed Change to TS 5.1, "Site and Facility Description"

In its LAR, the licensee proposes to revise TS 5.1. The NRC staff identified the changes in proposed TS 5.1 using ~~strikeout~~ font for deleted text, and **bold** font for added text.

The current TS 5.1 states:

The facility is located on a site situated on the south bank of the Mohawk River in the City of Schenectady. An inner fence of greater than 30 feet radius defines the restricted area. An outer fence and riverbank of greater than 50 feet radius defines the exclusion area.

The proposed TS 5.1 states:

The facility is located on a site situated on the south bank of the Mohawk River in the City of Schenectady. An inner fence of ~~greater than 30 feet radius~~ **more than 28 feet from the center of the reactor** defines the restricted area. An outer fence and riverbank of ~~greater than 50 feet radius~~ **more than 35 feet from the center of the reactor** defines the exclusion area

The licensee states that this change would better define the RPI inner and outer fence locations because the current TS 5.1 does not provide a reference for the location of a point which is the center of the 30 feet radius and 50 feet radius areas. The licensee also states that construction around the RCF required relocation of the fencing around the facility. The new fencing, when measuring from the center of the reactor, has the closest section of the inner fence at 28.3 feet and the outer fence at 35.4 feet.

3.2 Radiation Surveys and Environmental Monitoring Resulting from New Facility Fence Locations and Soil Samples Post Land Exchange

In its LAR, supplemental information, and responses to the NRC staff's requests for additional information (RAI), the licensee indicates that the dose (exposure) rates using a radiation survey meter at the inner (restricted area) and outer (exclusion area) fences and environmental monitoring using thermoluminescent dosimeters (TLDs) attached to the new facility fences show that the public dose limits of 10 CFR Part 20 are met. The licensee indicates that since operations requiring radioactive materials (other than the use of test/calibration sources) have not been performed at the RCF, there are no specific nuclides of concern (such as activation, corrosion, and fission products) for soil testing and the results of the soil samples tested for ionizing radiation were consistent with background radiation typical for the area.

3.2.1 Radiation Surveys and Environmental Monitoring

In its LAR, the licensee provided the specific distances of the revised fence locations in LAR Table 1, which indicates that the south side will be nearest to the reactor center for both the inner and outer fence, at 28.3 feet (shown as "Total to inner fence") and 35.4 feet (shown as "Total to outer fence"), respectively. The licensee indicates that the facility will continue to meet

dose limits and regulatory requirements at the new fence locations. LAR Figure 1 shows the construction drawing of the fence locations. LAR Attachment 1 provides the licensee's evaluation as required by 10 CFR 50.59, "Changes, test and experiments," paragraph (c)(2). The LAR provided a calculation, assuming RCF operation at the license limit of 100 watts thermal power (Wt), to estimate the dose [exposure] rate for a member of the public at the nearest location (i.e., highest dose rate), which is the outer fence location of 35.4 feet, which was 1.85 milliroentgen per hour (mR/hr). Further, the licensee indicated that RCF operation is currently limited to 15 Wt by administrative procedures, which reduces the dose rate by about a factor of 6.

The NRC staff reviewed the LAR and determined that additional information was needed to begin its technical review, and issued a request for supplemental information by letter dated December 10, 2019 (ADAMS Accession No. ML19340C076), to which the licensee responded by letter dated February 20, 2020 (ADAMS Accession No. ML20057D420). The NRC staff found the supplemental information sufficient and issued its acceptance letter dated April 10, 2020 (ADAMS Accession No. ML20099F900).

The NRC staff's review of the supplemental information provided by letter dated February 20, 2020, found that some clarification was needed and issued a RAI by letter dated May 19, 2020 (ADAMS Accession No. ML20135H159), to which the licensee responded by letter dated August 24, 2020. In its response, the licensee clarified the distance of the south side inner fence from the reactor center is determined by measuring the distance (13.3 feet) from the reactor center to the south side wall of the reactor building and the distance (15.0 feet) from the south side wall of the reactor building to the south side inner fence. The sum of these two distances provides the final distance of 28.3 feet. The licensee also clarified that the dose rate at the south side inner fence at the nearest distance allowed by the TSs (more than 28 feet from the reactor center), at maximum power, was determined from measurements at the outer fence instead of at the inner fence. The licensee indicated that the original LAR used the inner fence to show compliance with 10 CFR 20.1301(a), but dose rate measurements at the outer fence are appropriate since RPI maintains control over and limits access to the exclusion area (outer fence) and the public does not have unrestricted access to this area.

By letter dated August 24, 2020, the licensee provided updated dose [exposure] measurements in Table 1 (reproduced below). The licensee indicated that the dose [exposure] rates in Table 1 were scaled by a power scaling factor of 9.66 (for average operating power of 10.35 Wt), derived from the fact that the reactor was operating at 10.35 percent (10.35 Wt) of the license power limit (100 Wt) at the time which the original measurements were performed. By letter dated August 24, 2020, the licensee also provided updated RCF fence distances relative to the reactor centerline, as shown in Table 2 (reproduced below).

Table 1. Dose rates measured at the outer fence (exclusion area) scaled to 100 Wt.

Location (Side)	Distance to Center of the Reactor [ft]	Dose [exposure] rate during measurement at average power level of 10.35 Wt (mR/hr)	Dose [exposure] rate scaled to operating limit of 100 Wt (mR/hr)
63 (East)	54.3	0.17	1.64
64 (North)	65.3	0.02	0.19
67 (West)	58.0	0.09	0.87
69 (South)	35.4	0.20	1.93

Table 2. Fence location relative to the reactor centerline for changes to TS 5.1 and Table 3 of the RPI TSs.

	North	South	West	East
Reactor center to building exterior (ft)	39.4	13.3	21.3	26.7
Building exterior to inner fence (ft)	14.7	15.0	24.8	15.4
Reactor center to inner fence (ft)	54.0	28.3	46.0	42.1
Inner fence to outer fence (ft)	11.3	7.1	12.0	12.3
Reactor center to outer fence (ft)	65.3	35.4	58.0	54.3

In response to the NRC staff's request, Figure 3 of the supplemental letter dated February 20, 2020, shows the exterior survey map surrounding the RCF of the six TLDs attached to the inner and outer fences used to monitor external radiation at environmental monitoring (EM) dosimetry locations EM1 through EM4 (exclusion area) and EM5 and EM6 (site boundary). Table 1 of the supplemental letter shows the annual dose results from six TLDs at locations EM1 through EM6. The TLDs at EM2 and EM6, were located at the new locations of the south side inner and outer fence from 2011 to 2018 and indicates the maximum annual dose at both the new inner and outer fence location did not exceed 8 mrem/yr for those eight CYs. However, the annual doses provided in Table 1 were with the reactor operating well below the maximum thermal power level allowed by TS 3.2.10, which specifies that "the thermal power level shall be controlled so as not to exceed 100 W, and the integrated thermal power for any consecutive 365 days shall not exceed 2 [kilowatt-hours] kW-hr." In addition, while the new TLD information provided in Table 1 were located at the new fence locations from 2015 (year of fence relocation) to 2018, many of these are significantly greater distances from the reactor center than were allowed by the proposed TS 5.1, which only specifies distances of more than 28 feet from the center of the reactor for the inner fence and more than 35 feet for the outer fence.

Further, the licensee stated that the RCF AORs from CY 2015 through CY 2020 reported no radioactivity detected above background for liquid discharges to the environment. Additionally, the RCF AORs reviewed by the NRC staff in support of NRC routine inspection activities from 2015 to 2020 state, in part, that “doses were well below the applicable regulatory limits and were typically at background levels,” and “effluent monitoring satisfied license and regulatory requirements,” for the applicable inspection aspects. The licensee also has limited the RCF operating power level to 10 Wt, which keeps the production of potential activation, corrosion, and fission products in the reactor very low.

The NRC staff reviewed the licensee’s radiation measurements at the fence, as provided in Table 1 above, and noted that the use of a Ludlum Model 3 survey meter may be used either as a count rate meter (reading out in counts per minute) with a scintillation detector or as an exposure rate meter with a Geiger-Mueller detector (reading out in mR/hr) for measuring beta-gamma radiation. For the purpose of estimating dose rate (in mrem/hr) with this type of radiation survey meter that measures exposure rate (in mR/hr), it is assumed that a quality factor or modifying factor of one (unity), as defined in 10 CFR 20.1004, “Units of radiation dose,” is appropriate to directly compare the licensee’s reported survey measurements with the dose rate limit specified in 10 CFR 20.1301(a)(2).

The NRC staff reviewed this information and also reviewed the RCF AORs for CY 2015 through CY 2020 submitted to the NRC, as required by TS 6.8. Based on the review, there was no reported detectable radioactivity above background released from the RCF. Because the reactor is limited to 2 kW-hr/yr (per TS 3.2.10), the annual dose rate would be expected to be well below the 100 mrem/yr TEDE public dose limit, as required in 10 CFR 20.1301(a)(1), even at the highest dose point at the outer fence. In addition, the radiation survey results, as scaled to the RCF licensed operating limit of 100 Wt, indicates that the dose rate at outer fence at maximum power will remain below 2 mrem/hr. Because of the low expected annual dose rate, the scaled radiation survey results, and the absence of reports of any radioactive effluent releases above background from CY 2003 to CY 2020, there is reasonable assurance that dose rates will remain below the 2 mrem/hr limit for an unrestricted area, as required in 10 CFR 20.1301(a)(2).

3.2.2 Soil Samples and Land Exchange

In response to the NRC staff’s request, Appendix 1 of the supplemental letter dated February 20, 2020, shows a drawing of both locations of the new fence and old fence (red lines with overlaid "x" symbols and text and arrows), and locations of the six core samples (B01 through B06). Figure 1 of the supplemental letter dated February 20, 2020, shows the sample locations relative to the old fencing in a satellite image. Figure 2 of the supplemental letter dated February 20, 2020, superimposes the sample locations on a photograph of the new site arrangement. Appendix 1A of the supplemental letter dated February 20, 2020, provides a safety analysis of the general construction plan and activities in the area surrounding the RCF. Appendix 1B of the supplemental letter dated February 20, 2020, provides a description and an analysis of the reconfiguration of the fence line boundaries surrounding the RCF.

Appendix 2 of the supplemental letter dated February 20, 2020, shows the locations of six soil samples (B01 through B06) along with their Global Positioning System (GPS) coordinates that were collected near the RCF. The locations of soil samples B04 and B06 were outside the exclusion area boundary, whereas, the locations of soil samples B01, B02, B03, and B05 were collected between the restricted area boundary and the exclusion area boundary. Two soil samples (“A” and “B”) were collected from each soil sample location at depth intervals of

0-8 feet and 8-16 feet, respectively. The soil samples were screened for ionizing radiation with readings that did not exceed 25 microrentgen per hour (equivalent to 0.025 mR/hr). The licensee indicates that these soil sample readings are consistent with typical background radiation.

Appendix 3 of the supplemental letter dated February 20, 2020, shows the results of the soil samples in Figure 1 discussed above containing radionuclide concentrations of naturally occurring Bismuth, Lead, Radium, Thallium, Thorium (Th), Uranium (U), and Potassium isotopes, and gross alpha and beta activities using the Environmental Protection Agency analytical and radiochemical quality control methods.

Appendix 4 of the supplemental letter dated February 20, 2020, shows the results of the soil samples in Figure 1 discussed above analyzed for Volatile Organic Compounds (VOCs), Semi-VOCs (SVOCs), Pesticides/Polychlorinated Biphenyls (Pest/PCBs), Target Analyte List (TAL) metals and radiologicals (Gross Alpha, Gross Beta, and Gamma). Four selected soil samples were also analyzed for U-238 and Th-232.

In response to the NRC staff's question in RAI letter dated August 24, 2020, the licensee referred to the radionuclide inventories data provided in supplemental letter dated February 20, 2020, to show lack of contamination of the surrounding brown field. The licensee indicated that the soil sample locations provided in Appendix 2 of the supplemental letter dated February 20, 2020, were chosen to support identification of issues and were selected near the building as this would have been the center of any potential contamination source. The license also stated that due to the low fuel utilization (burnup rates of tens of nanograms of U-235 per year), even common fission fragments are not expected to have been built up enough in significant quantity to be detected based on soil samples.

The NRC staff reviewed the radiological analyses of the twelve soil samples (samples "A" and "B" collected at a depth interval of 0-8 feet and 8-16 feet, respectively, at the same soil sample location and GPS coordinates) provided in Appendix 3 of the supplemental letter dated February 20, 2020. Based on the NRC staff's review, the results of the soil samples support the licensee's conclusion that the reported results show no contamination of the surrounding area in the soil samples analyzed that consider the minimum detectable concentration (MDC) and stated uncertainty of the analytical method used.

The NRC staff reviewed the licensee's RAI response by letter dated August 24, 2020 and identified the need for additional information to continue the review of the LAR. By letter dated February 23, 2021 (ADAMS Accession No. ML21050A386), the staff issued a second RAI because the LAR did not provide the information used to justify the release of land previously contained within the restricted area of the facility. As described in the NRC letter, the additional information needed included an analysis to evaluate the acceptability of the release of land from licensee control. By letter dated April 23, 2021, the licensee responded to the NRC staff's second RAI, supplementing the information provided in its responses on July 11, 2019, and on February 20, 2020.

By letter dated April 23, 2021, the licensee provided a detailed graphical history, site description and narrative of the Rensselaer property, RCF Site and the properties released.

In Part 1 of the licensee's RAI response by letter dated April 23, 2021, the licensee provided details of the site before and after the release of a fraction of the Rensselaer owned land and details of the acquired property.

The licensee explained that in October 2015, Rensselaer entered into an Agreement with Maxon-Alco Holdings LLC for the conveyance of 0.29 acres of Rensselaer Land in exchange for the conveyance of 0.29 acres of Maxon-Alco Holdings Land to Rensselaer. At that time, Rensselaer owned a 0.69 acre parcel along the Mohawk River in the City of Schenectady, New York, which contains the Institute's Walthousen RCF. This parcel was part of the original American Locomotive Company (ALCO) Site. The balance of the ALCO 57.49 Acres, owned by Maxon-Alco Holdings, was designated as a high-priority economic development site by New York State including the construction of a new harbor and marina. The construction of the harbor required the use of a portion of land owned by Rensselaer. To facilitate the construction of the harbor, an exchange of land was executed.

Figure 1 of the licensee's RAI response by letter dated April 23, 2021, provides a partial Site Plan of the ALCO Site prior to the exchange of land that shows Rensselaer's 0.69 Site and the access easement from Erie Boulevard on the Site Plan. Figure 2 of the licensee's RAI response by letter dated April 23, 2021, provides a 2015 aerial view of Rensselaer's Reactor Site taken prior to the exchange of land and the construction of the harbor that shows the locations of Rensselaer's Boundaries, Restricted Area and Exclusion Area and the Public Access Area as they existed before the Land Exchange. Figure 3 of the licensee's RAI response by letter dated April 23, 2021, identifies the Lands and 0.29 acre parcels involved in the Exchange of Lands between Rensselaer and Maxon-Alco Holdings superimposed on the (then) proposed harbor construction, and shows the Rensselaer Land released and conveyed to Maxon-Alco Holdings and also describes the land gained by Rensselaer when Maxon-Alco Holdings conveyed (released) the land to Rensselaer. Figure 4 of the licensee's RAI response by letter dated April 23, 2021, shows the current limits of Rensselaer's property after the exchange of land in October 2015 and shows the location of the RCF within the limits of Rensselaer Land. Figure 5 of the licensee's RAI response by letter dated April 23, 2021, shows the former and the current status of the Rensselaer Land, identifying the Lands Rensselaer has released, gained, and retained as summarized in the following four bullets and in Figure 6 of the licensee's RAI response by letter dated April 23, 2021, described below.

- Rensselaer released approximately 0.16 acres of land to Maxon-Alco Holdings LLC that was formerly public access and located outside the Exclusion Area. This land was used previously to facilitate access to the RCF from Erie Boulevard and is now public access to the Harbor.
- Rensselaer released approximately 0.12 acres of land to Maxon-Alco Holdings LLC that was formerly in the Exclusion Area and is now public access.
- Rensselaer released approximately 0.01 acres (456 square feet) of land to Maxon-Alco Holdings LLC that was formerly in the Rensselaer Restricted Area and is now public access area.
- In exchange for the land released to Maxon-Alco Holdings LLC above, Rensselaer acquired approximately 0.29 acres of land from Maxon-Alco Holdings LLC. The licensee states that "No portion of the new land acquired by Rensselaer, is used for licensed activities, except for site access."

Figure 6 of the licensee's RAI response by letter dated April 23, 2021, shows the current RCF Site and Rensselaer's property. The location of the current Restricted and Exclusion Areas and the Public Access Area are also shown in this figure.

In Part 2 of the licensee's response by letter dated April 23, 2021, the licensee provided a listing of RCF AORs from CY 2015 through CY 2020 (ADAMS Accession Nos. ML16158A370, ML17138A292, ML18108A122, ML19135A066, ML20241A060, and ML21091A012, respectively), and a listing of NRC IRs from 2015, 2016, 2017, 2018, 2019, and 2020 (ADAMS Accession Nos. ML15316A076, ML16348A297, ML17290A039, ML18283A644, ML19252A179, and ML20261H594, respectively). The RCF AORs from CY 2015 through CY 2020, reported no radioactivity detected above background for liquid discharges to the environment. The NRC IRs from 2015, 2016, 2017, 2018, 2019, and 2020, reported, in part, examination of records such as from environmental TLD data indicating that "doses were well below the applicable regulatory limits and were typically at background levels," and "effluent monitoring satisfied license and regulatory requirements," for the applicable inspection aspects.

Because the licensee's RAI response by letter dated August 24, 2020, did not specifically sample for activation, corrosion, and fission products, Part 3 of the licensee's RAI response by letter dated April 23, 2021, includes additional information on radiological analysis and supplemental soil testing for cobalt (Co)-60, strontium (Sr)-90, cesium (Cs)-137, and iodine (I)-131. These isotopes were chosen because they are commonly activated corrosion products or easily detectable fission fragments. The licensee indicated that "operations requiring radioactive materials other than test/calibration sources have not been performed at the RCF so there were no specific nuclides of concern; however, the Co-60 was added to the list of nuclides tested for as the largest calibration source at the facility." For this soil sampling, two soil samples ("A" and "B") were collected in each of the six boring locations (SB-01 through SB-06) advanced to approximately 15 feet below ground surface intersecting the groundwater table. The first soil sample labeled "A" was taken from the top 2 feet of the soil boring and the second soil sample labeled "B" was taken from the 2 feet at the water table. Locations SB-01 and SB-02 were selected because the RCF had infrequently discharged moderator (water) in that area. Figure 7 of the licensee's RAI response by letter dated April 23, 2021, shows the six sampling locations and GPS coordinates. The other locations (SB-03 through SB-06) were chosen to obtain a larger number of samples near the land released and the area most likely to provide the best estimate of the radiological status of the released land. Table 1 of the licensee's RAI response by letter dated April 23, 2021, which supplements the initial soil sample results provided in its RAI response by letter dated August 24, 2020, shows the radiological analysis of Co-60, Sr-90, Cs-137, I-131, U-234, U-235, and U-238 in soils located on the RCF site and the released land.

The NRC staff reviewed the results of the radiological analysis of the recent twelve soil samples (two at each of the six boring locations) on the RCF Site and Released Land for potential activation, corrosion, and fission products in supplement to the soil sample analysis results previously provided. The NRC staff found that the soil sample analysis results indicated no residual radioactivity distinguishable from background as these reported radionuclide concentrations determined by a qualified laboratory are shown to be within the MDCs and stated uncertainties for the analytical methods used. The NRC staff notes that the soil borings were collected at thicknesses greater than 5.9 inches (15 cm), which is assumed for the screening values, and notes that the reported radionuclide concentrations and uncertainties of the selected activation, corrosion, and fission products were found to be significantly smaller in comparison to their respective screening values (contamination that would be compliance with the unrestricted use dose limit of 25 mrem/yr TEDE in 10 CFR 20.1402), which are known to be generic (not site-specific) and conservative concentration levels. As required in 10 CFR 50.75(g), the licensee must maintain these records that are important to the safe and effective decommissioning of the facility until the license is terminated by the Commission.

3.3 Postulated Maximum Hypothetical Accident

The radiological dose consequence of the postulated MHA analyzed for the RCF described in Chapter 13, "Accident Analysis," of the RCF final safety analysis report assumes failure of an experiment that contains radioactive material released into the environment, which is conservatively estimated as 14 mrem, a small fraction of the public dose limit of 100 mrem/yr TEDE. The postulated MHA assumes no atmospheric dispersion during the release period and no credit taken for dilution or spread of the released radioactive material between the release point and the location of the member of the public.

The NRC staff reviewed if the change in fence locations would change previous staff conclusions regarding the postulated MHA. In Section 4.1 of the NRC staff's SER for the 20-year renewal of the RCF, June 2011 the NRC staff indicated that during the postulated MHA there was no atmospheric dispersion assumed during the release period and the dose remained below the 100 mrem/yr TEDE public dose limit. Since no credit was taken for dilution or spread of the released radioactive material between the release point and the location of the member of the public, moving the fences does not impact the NRC staff's conclusion that the postulated MHA will not pose an undue risk to public health and safety or the environment and that the 100 mrem/yr TEDE public dose limit will not be exceeded. As a result, the NRC staff finds that the postulated MHA dose analysis remains acceptable.

3.4 Conclusion

Therefore, based on the above, the NRC staff concludes that the change in TS 5.1 of the RPI TSs related to the facility fence does not pose an undue risk to public health and safety, facility personnel, or the environment. The NRC staff further concludes that there is reasonable assurance that the dose rate to a member the public from licensed operations will remain below 100 mrem/yr TEDE, as required by 10 CFR 20.1301(a)(1), and will remain below 2 mrem/hr in the unrestricted area, as required by 10 CFR 20.1301(a)(2). As a result, since doses to the public are expected to remain within 100 mrem/yr TEDE and 2 mrem/hr at the highest dose location outside of the outer fence, and since access inside the outer fence is controlled by the licensee, the NRC staff finds that the new fence locations to be acceptable for controlling public radiation exposure during normal operations. The areas inside the fences are restricted to RPI personnel and those members of the public that RPI grants access. RPI is responsible for ensuring appropriate access controls and radiation exposure controls inside of the fences, which has not changed as a result of this LAR. As a result, the NRC staff finds that the change in the facility fence locations would not have a significant effect on safety and continues to meet the requirements in 10 CFR 50.36(c)(4). Therefore, the NRC staff finds the proposed change to TS 5.1, acceptable.

4. ENVIRONMENTAL CONSIDERATION

The proposed amendment would change a requirement with respect to the definition of facility restricted and exclusion areas. Pursuant to 10 CFR 51.22, "Criterion for categorical exclusion; identification of licensing and regulatory actions eligible for categorical exclusion or otherwise not requiring environmental review," paragraph (b), no environmental assessment or environmental impact statement is required for any action within the category of actions listed in 10 CFR 51.22(c), for which the Commission has declared to be a categorical exclusion by finding that the action does not individually or cumulatively have a significant effect on the human environment.

4.1 Proposed Change to TS 5.1 Regarding the Restricted and Exclusion Areas

The regulation in 10 CFR 51.22(c)(9), states, in part, that issuance of an amendment that changes a requirement with respect to installation or use of a facility component located within the restricted area, as defined by 10 CFR Part 20, meets the definition of a categorical exclusion, provided that, the proposed change satisfies each of 10 CFR 51.22(c)(9) criteria listed below:

- (i) *The amendment or exemption involves no significant hazards consideration;*
[10 CFR 51.22(c)(9)(i)]

Pursuant to 10 CFR 50.92, "Issuance of amendment," paragraph (c), the Commission may make a final determination that a license amendment involves no significant hazards consideration if operation of the facility, in accordance with the amendment, would not:

- (1) *Involve a significant increase in the probability or consequences of an accident previously evaluated* [10 CFR 50.92(c)(1)];

Proposed TS 5.1 would change the distance from the center of the RCF to the inner and outer fences, which define the restricted area and exclusion area, respectively. In the license renewal SER, Section 4.1, the NRC staff evaluated the postulated MHA. The MHA bounds all accidents at the facility and assumes the failure of an experiment that contains radioactive material that is then released into the environment. The NRC staff indicated that in the postulated MHA analysis there was no atmospheric dispersion assumed during the release period and the dose remained below the 100 mrem/yr TEDE public dose limit. Since no credit was taken for dilution or spread of the released radioactive material between the release point and the location of the member of the public, moving the fences does not increase the dose or significantly increase the probability or consequences of an accident previously evaluated. Further, there are no proposed changes to reactor design or hardware, or to structures, systems, and components (SSCs) that are relied upon for accident detection, mitigation, or response. If an accident occurs, all portions of the TSs will continue to function as necessary to mitigate the consequence of an accident. In addition, the proposed amendment does not change the licensed power level of the reactor, fission product inventory, or change any potential release paths from the facility. Therefore, there is no significant increase in the probability or consequences of an accident previously evaluated.

- (2) *Create the possibility of a new or different kind of accident from any accident previously evaluated* [10 CFR 50.92(c)(2)];

Proposed TS 5.1 would change the distance from the center of the RCF to the inner and outer fences which define the restricted and exclusion areas. This change is related to the facility description and does not authorize any changes in the hardware, design, function, or operation of any equipment important to safety, or in the authorized reactor power level. The change does not create any new or different accidents from any accident previously evaluated because no changes are being proposed to SSCs that are relied upon for accident detection, mitigation, or response to an accident. In addition, the proposed TS would not

introduce any new accident scenarios, transient precursors, failure mechanisms, or limiting single failures, and there would be no adverse effect or challenges to any systems important to safety as a result of the proposed amendment. The proposed amendment also does not involve any changes to the operation of the reactor or create any new radiological accident release pathways. Additionally, the proposed TS does not alter or decrease the functional capability of any equipment used for defense in depth. Therefore, the amendment does not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Involve a significant reduction in a margin of safety [10 CFR 50.92(c)(3)];

Proposed TS 5.1 would redefine the fence locations for the restricted and exclusion areas. The proposed change does not authorize any changes in design, function, or operation of any equipment important to safety, or in the authorized reactor power level. The proposed amendment does not alter how safety limits, limiting safety system settings, or limiting conditions for operation are determined and does not adversely affect existing facility safety margins or the reliability of equipment assumed to mitigate accidents in the facility because the change of fence location outside of the reactor facility do not affect any reactor safety limits. Additionally, the proposed change does not alter or decrease the functional capability of any equipment used for defense in depth. Therefore, the proposed amendment does not involve a significant reduction in the margin of safety.

Based on the above, the NRC staff concludes that the amendment involves no significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite; and [10 CFR 51.22(c)(9)(ii)].

Proposed TS 5.1 would redefine the fence locations for the restricted and exclusion areas. The proposed TS does not change the types of effluents that may be released offsite or cause any significant increase in the amount of radioactive material that could be released offsite because the existing requirements for monitoring and release of radioactive effluents are unchanged. The NRC staff also reviewed the AORs for CY 2015 through CY 2020 and found no reported detectable radioactivity above background was released from the RCF. Further, the reactor power level, the amount of radioactive material used in operation of the reactor, and the design of equipment important to safety are not changed. Therefore, there is no significant change in the types or significant increase in the amounts of any effluents that may be released offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure [10 CFR 51.22(c)(9)(iii)].

Proposed TS 5.1 would redefine the fence locations for the restricted and exclusion areas. This change is related to the facility description and does not authorize any changes in the operation of the reactor. The reactor power level, the amount of radioactive material used in the operation of the reactor, and the design of equipment important to the safety of the reactor are not changed. The proposed change does not alter any technical or safety requirements for radiation monitoring at the facility or affect

occupational radiation exposure. Additionally, the licensee's radiation safety program has effectively controlled radioactive material exposure to prevent exposures that exceed the dose limits of 10 CFR Part 20 and the release limits in Table 2 of Appendix B to Part 20. Further, facility radiation protection program requirements, including the TS requirement to keep doses ALARA, remain unchanged. Therefore, there is no significant increase in individual or cumulative radiation exposure.

Accordingly, the NRC staff finds that the proposed amendment meets the eligibility criteria for categorical exclusion in 10 CFR 51.22(c)(9).

4.2 Environmental Conclusion

Based on the discussion above, the NRC staff concludes that the amendment meets the eligibility criteria for categorical exclusions set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment needs to be prepared in connection with the issuance of the amendment.

5. CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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