



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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April 20, 2023

MEMORANDUM TO: Joshua M. Borromeo, Chief
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Office of Nuclear Reactor Regulation

FROM: Holly D. Cruz, Senior Project Manager
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SUBJECT: REPORT ON THE PRE-SUBMITTAL REGULATORY AUDIT OF THE
ATOMIC ALCHEMY, INC PRELIMINARY SAFETY ANALYSIS
REPORT (EPID L 2022 LRM-0075)

Holly D. Cruz Signed by Cruz, Holly
on 04/20/23

Atomic Alchemy, Inc (AAI) began pre-application discussions with the U.S. Nuclear Regulatory Commission (NRC) staff on their Versatile Isotope Production Reactor (VIPR) in October 2019. Prior to submitting the VIPR construction permit preliminary safety analysis report (PSAR), the NRC staff audited a pre-submittal version of the PSAR to assess any potential gaps relative to the applicable regulations and NRC staff guidance, identify regulatory or technical issues which may complicate the review, and enhance NRC staff knowledge of the VIPR design.

The audit plan, dated October 17, 2022, is provided in the NRC's Agencywide Documents Access and Management System at Accession No. ML22286A167. The audit was conducted from October 18 through November 29, 2022, via teleconference and documents provided in BOX.

Project No.: 99902080

Enclosure:
Audit Report

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ATOMIC ALCHEMY, INC

SUMMARY REPORT ON THE PRE-SUBMITTAL REGULATORY AUDIT OF ATOMIC

ALCHEMY, INC PRELIMINARY SAFETY ANALYSIS REPORT

October – November 2022

1.0 BACKGROUND

Atomic Alchemy, Inc (AAI) began pre-application discussions with the U.S. Nuclear Regulatory Commission (NRC) staff on their Versatile Isotope Production Reactor (VIPR) in October 2019. Over the past several years, AAI has submitted topical reports and white papers that apply to the VIPR. As discussed in various teleconferences and in a meeting held on August 9, 2022, AAI plans to submit an application for a construction permit (CP), including a preliminary safety analysis report (PSAR), for the VIPR in accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, “Domestic Licensing of Production and Utilization Facilities.” The staff plans to review the PSAR in accordance with NUREG-1537, Part 1, “Guidelines for Preparing and Reviewing Applications for the Licensing of Non-Power Reactors, Format and Content” (Agencywide Documents Access and Management System Accession No. ML042430055), or applicable guidance.

2.0 AUDIT REGULATORY BASES

The bases for the audit are the regulations in 10 CFR Part 50, Section 50.34(a), “Preliminary safety analysis report,” and Section 50.35, “Issuance of construction permits.”

3.0 AUDIT PURPOSE AND OBJECTIVES

The purpose of this audit was to provide the NRC staff with an opportunity to assess the readiness of the draft PSAR before AAI formally submits the CP application. This audit allowed the NRC staff to (1) identify any required information that is missing from the application, (2) identify technical or regulatory issues that may complicate the acceptance or technical reviews of the application, and (3) become familiar with the content of the application, particularly in areas where AAI plans to propose new concepts or novel design features.

4.0 SCOPE OF THE AUDIT AND AUDIT ACTIVITIES

The audit was conducted October 18, 2022, through November 29, 2022, via teleconference, and documents provided in BOX. The NRC staff conducted the audit in accordance with the pre-application audit plan dated October 17, 2022 (ML22286A167). There were no deviations from the audit plan.

NRC staff audit team members included:

Michael Balazik	Project Manager, Division of Advanced Reactors and Non-Power Production and Utilization Facilities (DANU) Audit Lead (responsible for technical review)
Holly Cruz	Sr. Project Manager, DANU (responsible for audit logistics)
Justin Hudson	Project Manager, DANU
Xiaosong Yin	Project Manager, DANU
Duane Hardesty	Sr. Project Manager, DANU
Michael Takacs	Security Specialist, DANU
Joshua Borrromeo	Branch Chief, DANU
Laurel Bauer	Geologist, Division of Engineering and External Hazards (DEX)
Kevin Quinlan	Meteorologist, DEX
Kenneth See	Hydrologist, DEX
Bryce Lehman	Structural Engineer, DEX
Andrew Prinaris	Structural Engineer, DEX
Ian Tseng	Mechanical Engineer, DEX
Adam Rau	Nuclear Systems Performance, Division of Safety Systems (DSS)
Kevin Heller	Nuclear Methods and Fuel Analysis, DSS
Gordon Curran	Reactor Systems Engineer, DSS
Rao Karipineni	Safety and Plant Systems Engineer, DSS
Rossnyev Alvarado	Instrumentation and Controls, DEX
Norbert Carte	Instrumentation and Controls, DEX
Dinesh Taneja	Senior Electronics Engineer, DEX
Jorge Cintron-Rivera	Electrical Engineer, DEX
Yawar Faraz	Fuel Facility Licensing, Office of Nuclear Material Safety and Safeguards (NMSS)
Charles Moulton	Fire Protection Engineer, Division of Risk Assessment (DRA)
Jay Robinson	Senior Fire Protection Engineer, DRA
Zachary Gran	Radiation Protection and Consequence, DRA
Edward Robinson	Senior Emergency Preparedness Specialist, Office of Nuclear Security and Incident Response (NSIR)
Kenneth Mott	Emergency Preparedness Specialist, NSIR
Charles Teal	Materials Security, NSIR
Dan Warner	Cybersecurity, NSIR
Andrea Keim	Quality Assurance and Vendor Inspection, Division of Reactor Oversight
Amy Beasten	Non-Power Production and Utilization Facility Oversight, DANU
Kevin Roche	Non-Power Production and Utilization Facility Oversight, DANU
Nancy Martinez	Environmental Scientist, NMSS
Glenn Tuttle	Material Control and Accounting, NMSS
Elijah Dickson	Senior Reliability and Risk Analyst, DRA
Trent Wertz	Senior Financial Analyst, NMSS

The NRC staff audited parts of the following documents:

1. Overall Introduction to the VIPR Design
2. AAI PSAR Chapters 2, 3, 4a, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 16 Appendix A, 17 and 21

The NRC staff did not acquire any documents during the audit.

5.0 SUMMARY OF OBSERVATIONS

The NRC staff's general audit observations are provided below. The main purpose of the audit was to identify issues which could challenge potential acceptance of the PSAR when submitted, as well as to identify highly challenging regulatory or technical issues which may need additional documentation. A detailed summary of NRC staff comments are provided for AAI reference, as a non-public attachment to this audit report, which may help to provide a more comprehensive submittal.

General Observations:

1. The NRC staff observed that in many instances information was not provided in the PSAR, and AAI notes that this information (sections, figures, tables, appendices, etc.) will be further developed in the final safety analysis report (FSAR). The staff's inability to review this information limits the effectiveness of the pre-application audit. This deferred review may result in a prolonged acceptance review period. Additionally, should the FSAR provide incomplete information, the CP acceptance review may result in non-acceptance with the opportunity to supplement.
2. The NRC staff notes that based on the draft PSAR, VIPR analysis methodologies may include significant changes from established methodologies. Accordingly, additional staff review may be necessary during reviews of a CP and/or operating license (OL) application.
3. The NRC staff observed that in some cases the PSAR does not clearly distinguish and/or justify what information is planned to be deferred to an OL application.

6.0 EXIT BRIEFING

The NRC staff conducted an audit closeout meeting on November 30, 2022. At the exit briefing the staff reiterated the purpose of the audit and discussed the activities conducted.

7.0 REQUESTS FOR ADDITIONAL INFORMATION RESULTING FROM AUDIT

The staff provided AAI questions and feedback during the audit, which AAI could consider and use to revise the PSAR prior to submittal of the CP application.

8.0 OPEN ITEMS AND PROPOSED CLOSURE PATHS

Not applicable. There are no open items as a result of this audit.