



ATOMIC ALCHEMY

PRODUCING HIGH-VALUE ISOTOPES FOR THE WORLD

TRTR 2021

Licensing Challenges of a Modular, Non-Power Facility

Thomas Eiden | TRTR 2021

Objectives

- **About Atomic Alchemy Inc.**
- **Design Approach**
- **Licensing Issues**
- **Proposed Solution**

Atomic Alchemy

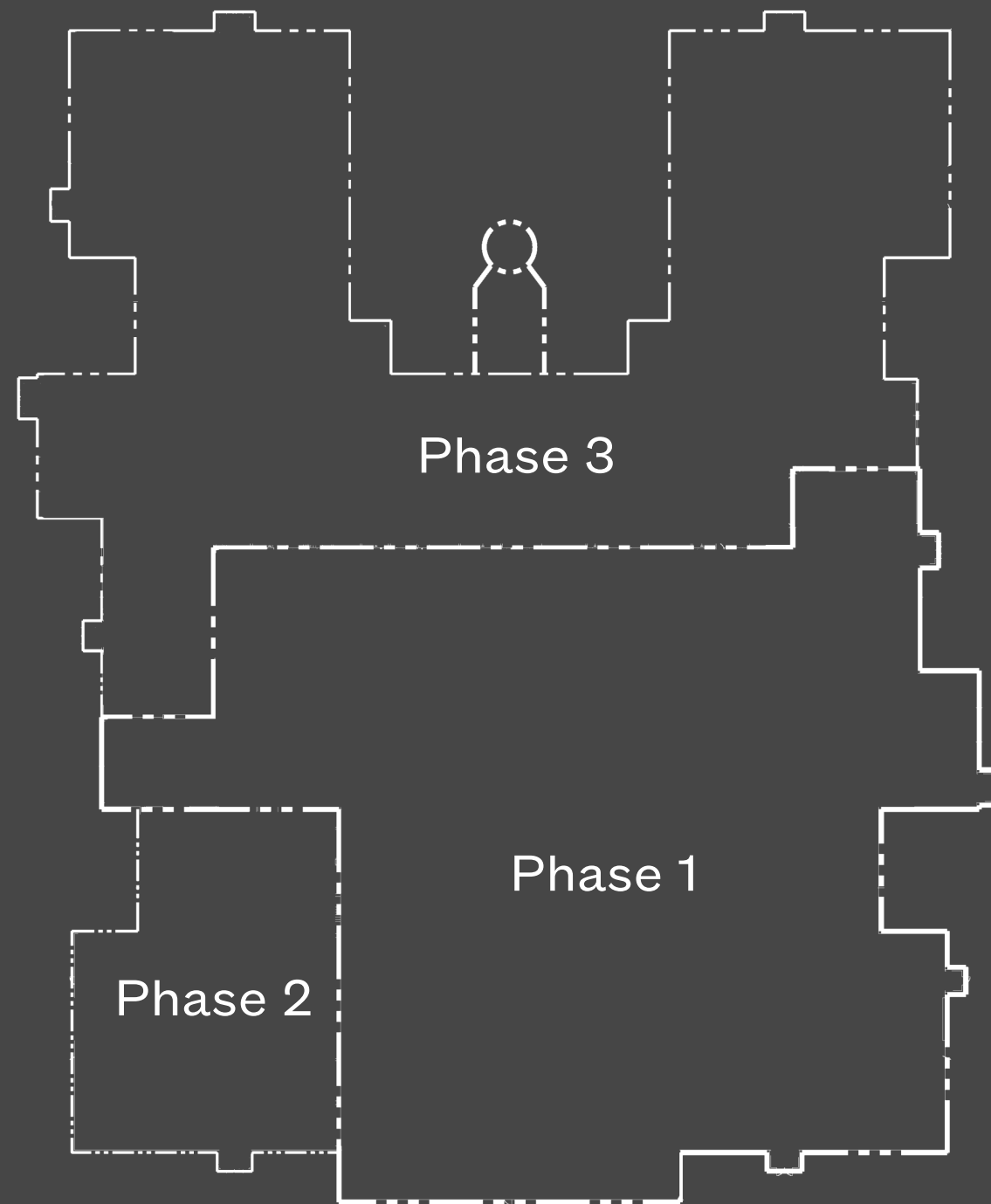
- **Founded in 2018; venture-backed**
- **Submitted LOI to NRC in November 2019**
- **Substantial pre-application interaction (QAPD, PDC, Regulatory GAP Analysis Topical Reports)**
- **Submittal of construction permit application next year**

Versatile Isotope Production Reactor (VIPR)

We've developed a low-cost, high-efficiency reactor and the world's first scalable reactor and chemical processing facility optimized for the efficient and cost-effective production of radioisotopes.



Phased Construction



Licensing Considerations

Approval for full facility; constructed in phases:

- **Standardization of the design**
- **Reactor modules identical**
- **Process modules identical**
- **SAR/Technical Specifications identical**
- **Initial buildout nicely fits 10 CFR 50**
- **Seismic responses performed for each construction phase**
- **Additional buildout effects security/fire/emergency plans**

Licensing Considerations

How are later modules treated?

- **Additional construction “Part 52-like” (10 CFR 52.47(c)(3))**
- **Modules are “connected but separate”**
 - **Minimal shared safety-related systems**
 - **No reactor safety-related systems shared**
 - **No need for safety related a/c power for safe shutdown of reactors or processes**
 - **Need for operational flexibility between modules**

Proposed Solutions

As described in SECY-09-0101, “Licensing of a Babcock and Wilcox Medical Isotope Production System,” dated July 9, 2009, and the related staff requirements memorandum dated October 9, 2009, there is no legal impediment under Section 161.h of the AEA to issuing one Operating License for an entire facility consisting of numerous isotope production reactors and one or more production facilities under 10 CFR Part 50.

Proposed Solutions

As stated in SECY-10-0034, Section 2.2, License Structure for Multi-Module Facilities, “Although resolution of these issues before submittal of a design certification or license application may be more important to an SMR license applicant trying to support its business case at the design certification stage, the staff believes that resolution of these issues need not occur until after a licensing application is submitted because it concerns activities that will need to be addressed during an operating license review.”

Proposed Solutions

In SECY-11-0079, the NRC inform the Commission of the staff's assessment for the license structure for multi-module facilities composed of small nuclear reactor modules or units. The NRC developed five alternatives. The staff assessed the various alternatives and believed that the issuance of a license for each reactor module, as described under Alternative 3 (Individual Reactor Module Licenses), would be the best approach for the licensing of multi-module power reactor facilities.

Proposed Solution

We will be submitting a detailed white paper outlining our solutions:

- **Single facility license with license conditions**
 - **Must avoid transients in one reactor affecting operations of the others**
 - **What about the hot cells/processing facility?**
 - **Modules under construction/startup testing should have minimal impact on operating modules (digital twin)**
- **Propose how to extend construction permit for subsequent modules (via LAR)**
- **Propose ITAAC-like operational readiness reviews for commissioning additional modules**

