



POLICY ISSUE **(Notation Vote)**

February 28, 2020

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FOR: The Commissioners

FROM: Margaret M. Doane
Executive Director for Operations

SUBJECT: RESULTS OF EXPLORATORY PROCESS FOR DEVELOPING A
GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR THE
CONSTRUCTION AND OPERATION OF ADVANCED NUCLEAR
REACTORS

PURPOSE:

The purpose of this paper is to inform the Commission of the results of the staff's exploratory process to consider the viability of developing a generic environmental impact statement (GEIS) for the construction and operation of advanced nuclear reactors (ANRs). The staff has concluded that developing a GEIS for ANRs is viable. The staff plans to use a technology-neutral plant parameter envelope (PPE) approach to bound small-scale ANR projects. For the purposes of this exploratory process, the staff considered a small-scale ANR as having the potential to generate up to approximately 30 megawatts thermal (Mwt) per reactor with a correspondingly small environmental footprint. The actual bounding thermal power level of the ANR used in the GEIS will be a topic for further engagement with external stakeholders during the scoping process for the ANR GEIS.

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SUMMARY:

The staff has completed its exploratory process to determine if a GEIS is viable for advanced reactors. The staff conducted public outreach and gathered valuable information to aid staff in considering whether a GEIS is viable. This paper provides a summary of the four options staff considered during the exploratory process and explains staff's reasoning for choosing to move forward with developing a GEIS for advanced reactors with a generating output of approximately 30 Mwt per reactor immediately. The staff will continue to explore the appropriate bounding thermal power levels to be used in the ANR GEIS, and this determination will be finalized through further engagement with external stakeholders during the scoping process.

This paper also explains the staff's intention to develop the ANR GEIS in a manner consistent with the way in which the license renewal GEIS has been developed. However, unlike license renewal the ANR GEIS findings will not be codified in a rule, because rulemaking is not necessary to realize the efficiencies in the environmental review process. However, a rulemaking can be considered at a future date if it is later determined to be beneficial to the licensing process. Accordingly, the staff would evaluate the impacts associated with ANRs to determine if the impacts to various resource areas could be resolved generically in a GEIS or would require a site-specific evaluation.

BACKGROUND:

The NRC staff has been exploring whether a GEIS for the construction and operation of advanced reactors would be an effective and efficient alternative to support the U.S. Nuclear Regulatory Commission's (NRC's) regulatory decision-making related to advanced reactor environmental reviews. This paper provides the results of the staff's exploratory process. The staff's exploratory assessment was informed by interactions with internal and external stakeholders, as described in this paper, and is consistent with recent Congressional correspondence on the topic (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19176A444). On July 29, 2019 (ADAMS Accession No. ML19192A267), the NRC indicated to Congress, that if the staff's near-term assessment of the viability of preparing a GEIS justifies further effort, the agency will develop a schedule for the project and initiate efforts to prepare the GEIS.

DISCUSSION:

Advanced reactors can encompass a broad spectrum of technologies. For the purposes of creating a potential ANR GEIS, the staff's exploratory process has focused on a non-light-water reactor that generates an output of approximately 30 Mwt or less. This usage is within the scope of the definition of "advanced nuclear reactor" in the Nuclear Energy Innovation and Modernization Act (NEIMA; Public Law No. 115-439). The staff expects that the scope of an ANR GEIS could potentially be expanded to include other advanced reactor technologies (e.g., fusion reactors) and higher power levels in the future.

Through advanced reactor stakeholder meetings held on June 27, 2019, and August 15, 2019, the staff engaged with the public on the potential development of an ANR GEIS. Subsequently, on November 15, 2019, the staff issued a *Federal Register* notice (84 FR 62559), announcing an exploratory process and soliciting comments to determine whether to develop a GEIS for advanced reactors. The exploratory process included an additional two public meetings, a comprehensive public workshop attended by multiple stakeholders, and a site visit to the Idaho National Laboratory. As part of the exploratory process, the staff also reflected on its

experience with previous GEIS documents. The NRC has experience using GEISs since 1976 when it issued NUREG-002, Generic Environmental Statement for Mixed Oxide Fuel (GESMO). The staff considered more recent GEISs, including ones that support power reactor license renewals, in-situ uranium recovery facilities, and decommissioning. Based on experience with GEISs, the staff found that for a technology-inclusive GEIS to be effective, its scope should be appropriately limited so that the issues it addresses can be resolved generically for a range of technologies.

During the exploratory process, the staff gathered the necessary information to determine whether a GEIS for the construction and operation of advanced reactors is viable. However, the staff did not receive sufficient information on advanced reactors with power level greater than approximately 30 Mwt and a correspondingly small footprint. Therefore, the staff could not include these larger size reactors in the determination of viability of the GEIS at this time. The staff is still exploring the appropriate thermal power levels to be used in the ANR GEIS, and this determination will be finalized through further engagement with external stakeholders during the scoping process.

The staff received comments that supported the development of a GEIS, as well as ones that opposed the concept. Commenters who supported development of a GEIS thought that it would improve the efficiency of the environmental review process, would avoid duplication of effort, and would focus future reviews on important environmental issues. Commenters who did not support development of a GEIS thought that an ANR GEIS would be premature at this time and that the staff did not have sufficient information available to resolve issues generically. The comment response report is available at ADAMS Accession No. ML20044C854.

In assessing the viability and value of a GEIS, the staff considered the following questions.

Would a GEIS improve the efficiency of the environmental review process and avoid duplication of effort?

Assessment: Yes. Environmental issues related to ANRs could be identified and categorized in the same manner as was done for license renewals for operating power reactors in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 51, "Environmental Protection Regulations for Domestic Licensing and Related Regulatory Functions," Subpart A, "National Environmental Policy Act—Regulations Implementing Section 101(2)," Appendix B, "Environmental Effect of Renewing the Operating License of a Nuclear Power Plant." Following that model, a proposed GEIS could be constructed to address issues as follows:

- **Category 1** issues would be identified and resolved generically for ANR projects with the potential to generate up to approximately 30 Mwt per reactor. Category 1 issues would thereafter not be subjected to further evaluation in any application review for such facilities, absent special circumstances.
- **Category 2** issues would be site specific and may include issues particular to the site and its proposed demonstration or utilization purposes, such as desalination, electricity, and hydrogen and process heat production, or combinations thereof. These issues would have to be addressed in the site-specific environmental review.

The staff reviewed the resource areas that it normally considers in an environmental review and analyzed those that it believes could be addressed generically. Currently, staff environmental

reviews for power reactors consider approximately 10 high-level resource areas. Based on preliminary information on advanced reactor technologies, the staff intends to develop the PPE for the GEIS to scope in facilities that would result in reduced impacts on several of these resource areas. The staff's qualitative assessment is that the environmental resource impacts for approximately six resource areas are likely to be small and could be dispositioned as Category 1 in the ANR GEIS. The staff expects that resource areas like land use and water resources (if the reactor was air-cooled or used little water) can be dispositioned generically. With the majority of environmental issues resolved by generic determinations in the GEIS, resources needed for subsequent staff reviews of environmental issues in individual advanced reactor applications would therefore be reduced substantially.

The GEIS would also enhance consistency across environmental reviews for advanced reactors. This would improve the overall efficiency of staff environmental reviews and help to streamline the review process. Development of a GEIS would avoid duplication of effort, as the staff would incorporate the GEIS findings by reference into site-specific environmental review for advanced reactors.

Is sufficient information available about the types of advanced reactor technologies and environmental impacts to support development of a GEIS?

Assessment: Yes. Preliminary information from the staff's outreach activities indicates that there is sufficient information on advanced reactor technologies to support development of an effective ANR GEIS. The staff's exploratory process determined that initial GEIS development efforts would be best focused on reactor designs involving units with generating outputs of approximately 30 Mwt with minimal heat sink demands and a smaller environmental footprint. This is because detailed design information is less likely to be needed to resolve the environmental issues that would be associated with these projects. The staff would develop a technology-neutral set of parameters that bound the characteristics of anticipated ANR designs that would be within the scope of the ANR GEIS.

What are the costs and benefits of developing a GEIS that can be referenced by site-specific environmental reviews versus not preparing a GEIS and relying upon individual environmental reviews for each site-specific application?

Assessment: Developing a GEIS would reduce individual licensing review time and associated costs and increase regulatory stability and predictability. As discussed above, generic determinations in a GEIS would reduce the number of issues that must be considered in any individual ANR environmental review. Historically, reactor environmental reviews for large LWRs generally exceeded 36 months in duration. Due to the smaller environmental footprint, the staff estimates that an advanced reactor EIS review period without referencing a GEIS could be 24 months or less. The staff anticipates that an advanced reactor referencing a GEIS would facilitate a review schedule savings of 25 percent. The reason for reduction in schedule is that the staff would only need to develop a supplemental EIS to consider Category 2 site-specific issues, which could shorten the review period by 6 months or more. Similarly, the length of a large LWR EIS without referencing a GEIS is approximately 1200 pages. The length of an EIS for a 30 Mwt EIS advanced reactor not referencing a GEIS is estimated to be approximately 400 pages. A supplemental EIS referencing a GEIS could reduce the estimated page number from 400 pages without a GEIS to 250 pages with a GEIS, below the Council on Environmental Quality's guidance of 300 pages for a complex EIS. These reductions will therefore be consistent with the goals of Federal directives on streamlining environmental reviews (e.g., Title 41 of the Fixing America's Surface Transportation Act (FAST-41); Executive Order (EO) 13807,

“Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects,” dated August 15, 2017). The staff’s qualitative assessment is that use of the GEIS will reduce the costs of individual supplemental environmental reviews by at least 25 percent. This is because there are fewer issues requiring detailed site-specific analysis, resulting in a shorter report, and a shorter review schedule.

The staff also determined that development of a GEIS would provide significant qualitative benefits to the agency’s advanced reactor infrastructure development programs. These include the demonstration of early engagement and resolution of environmental issues for ANR construction and operation and the reduction of uncertainty for ANR developers. An ANR GEIS would also enhance regulatory clarity and stability by resolving generic issues early and would demonstrate continued stakeholder engagement on ANR environmental issues. Further the experience and training staff would receive in developing the ANR GEIS increases the staff’s readiness to review future applications. Developing an ANR GEIS also ensures a wider range of stakeholder interactions than environmental reviews for site-specific advanced reactor applications would provide.

The staff recognizes that there is an initial resource investment to develop an ANR GEIS. However, there are cost savings for each supplemental EIS after the initial one that references the GEIS. Therefore, the value of the GEIS would be proportional to the number of individual advanced reactor environmental reviews that reference it.

Options Considered by the Staff:

The staff identified and considered four options for the development of an ANR GEIS.

Option 1: No GEIS

The staff can complete an environmental review of an advanced reactor application without a GEIS. The staff is developing interim staff guidance (ISG) for micro-reactors that will support streamlining the environmental reviews of applications for units with a generating capacity of up to 30 Mwt. The ISG was published in the *Federal Register* as a draft for comment on February 26, 2020 (85 FR 11127). The ISG provides the staff with guidance on evaluating impacts in proportion to the size and footprint of a micro-reactor

There is no cost associated with this option. However, if a GEIS is not developed, there would be no cost savings for each individual advanced reactor application review because the staff will not have dispositioned generic environmental issues. This could lead to a lack of predictability, as environmental issues with no major site-specific differences would still need to be evaluated on a site-specific basis. Further, without a GEIS, the staff would be challenged to support a reduced review schedule for individual applications and would not avoid duplication of efforts. In addition, not developing a GEIS would hamper the NRC’s efforts to enhance its environmental reviews consistent with FAST-41 and EO 13807.

Option 2: Start the GEIS Immediately with a Plant Parameter Envelope Approach

The staff could begin developing the GEIS immediately using a technology-neutral PPE approach to bound any reactor design with a generating output up to approximately 30 Mwt per reactor with a small site environmental footprint. The staff would define the PPE criteria (e.g., site acreage) and would analyze each environmental resource (e.g., land use) using these criteria. The GEIS would resolve issues generically for reactors that fit within the PPE and could therefore streamline the environmental review process and avoid duplication of effort. The GEIS would reduce environmental review timelines and the expenditure of resources, consistent with government-wide initiatives like FAST-41.

Use of an ANR GEIS is expected to reduce the cost for an individual environmental review. The staff reviewed the resource areas that it normally considers in an environmental review and analyzed those that it believes could be addressed generically. The staff expects to decrease the number of resource areas that would be considered in individual environmental reviews by relying on generic determinations on most resource areas in the GEIS. However, the uncertainties in the number of future advanced reactor applications the NRC will receive may impact the benefit of developing an advanced reactor GEIS.

The development of the ANR GEIS supports the development of the advanced reactor framework and therefore the staff would use off-fee base resources. The staff currently has the resources to develop the GEIS through use of off-fee base resources and also to complete near-term licensing environmental reviews.

Option 3: Develop the GEIS After Completing the Review of the First Advanced Reactor Application

The staff considered delaying the start of work on the GEIS until after the NRC has completed its review of an application for an advanced reactor. Under this approach, the staff could gather lessons learned from the first environmental review of an advanced reactor application and could more readily identify any potential reduction of costs for development of a GEIS after the review is complete.

However, developing the GEIS at a later date would delay the benefits of a GEIS for potential advanced reactor applicants and would delay substantive engagement on generic environmental issues with a broad range of stakeholders.

Option 4: Develop the GEIS Over a Longer Time Period

The staff could also begin development of the GEIS immediately, but use a lower rate of resource expenditure. Through this approach, the staff could learn from the first advanced reactor environmental review and incorporate insights from the individual review concurrently with the development of the ANR GEIS. This approach would extend the time needed to develop the GEIS and increase total resources needed, but would require fewer resources immediately and provide more flexibility in redirecting GEIS development as additional information becomes available. The staff could also continue to conduct public outreach and information gathering to further inform the GEIS. However, delayed development of the GEIS would create the same concerns raised in Option 3.

Rulemaking

The staff considered whether to conduct a rulemaking to codify the findings in the GEIS. The staff has previously codified generic environmental findings for reactor license renewals and continued spent fuel storage. In other cases, such as with the decommissioning GEIS, the staff's practice has been to incorporate the GEIS findings by reference into a site-specific environmental review document. The staff notes that codifying the environmental findings in the advanced reactor GEIS through a rulemaking would limit the potential issues that could be permissibly raised during the hearing process on advanced reactor applications. However, because a rulemaking is not necessary to realize the efficiencies in the environmental review process, the staff does not intend to pursue rulemaking at this time. A rulemaking can be considered at a future date if it is later determined to be beneficial to the licensing process.

CONCLUSION:

The staff has decided to pursue Option 2, start the GEIS immediately with a Plant Parameter Envelope Approach. The staff would begin developing the GEIS immediately using a technology-neutral PPE approach to bound any reactor design with a generating output up to approximately 30 Mwt per reactor with a small site environmental footprint. Based on the results of the staff's exploratory process, there is sufficient information for the staff to complete an ANR GEIS. An ANR GEIS would generically resolve many environmental issues, which will save staff resources for an individual review and provide predictability for potential applicants in developing their applications. In addition, the efficiency, stability, and cost benefit afforded by an ANR GEIS would align with the goals of FAST-41 and EO 13807 and be consistent with the NRC's Principles of Good Regulation in that it provides openness, reliability, and efficiency. The staff will not pursue rulemaking to codify the results of the GEIS at this time.

RESOURCES:

The staff estimates that it would take 24 months to develop the ANR GEIS. The enclosure contains the resource estimates for developing the ANR GEIS described under Option 2.

COORDINATION:

The Office of the General Counsel reviewed this package and has no legal objection to its contents.

The Office of the Chief Financial Officer reviewed this package and determined that it has no financial impact.

/RA/

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Enclosure:
Resource Estimate for the
Advanced Nuclear Reactor GEIS

SUBJECT: RESULTS OF EXPLORATORY PROCESS FOR DEVELOPING A GENERIC ENVIRONMENTAL IMPACT STATEMENT FOR THE CONSTRUCTION AND OPERATION OF ADVANCED NUCLEAR REACTORS DATED: February 28, 2020.

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