CLEARPATH

WHITE PAPER:
ADVOCATING THE USE OF GENERIC ENVIRONMENTAL IMPACT STATEMENTS IN SUPPORT OF THE CONSTRUCTION AND OPERATION OF ADVANCED NUCLEAR REACTORS

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Advocating the Use of Generic Environmental Impact Statements in Support of the Construction and Operation of Advanced Nuclear Reactors

Clearpath is an ideologically conservative non-profit that endorses clean energy solutions. Clearpath believes that fostering nuclear, carbon capture, hydropower, and other energy technologies is essential to making the domestic energy sector cleaner. Moreover, Clearpath's conviction is that the private sector must play a leading role in developing the next generation of American power technologies.

Building a strong, domestic clean energy sector has never been more important. As the world at large becomes attuned to the problems posed by global climate change, clean energy solutions take on an increased significance. Nuclear power stands to be a vital part of any solution. By streamlining unnecessarily burdensome regulatory requirements to facilitate the commercialization of new, advanced reactor designs with enhanced safety designs, the United States could (and must) play a leading role in addressing climate change, as well as recapturing global leadership in nuclear technology.

Consistent with these beliefs, Clearpath respectfully submits this white paper on the need for the Nuclear Regulatory Commission ("NRC") to adopt streamlined environmental review procedures for the approval of "advanced nuclear reactors," i.e., "Generation III+ small modular reactors" and "Generation IV" reactors. Specifically, Clearpath hereby proposes that the NRC develop a Generic Environmental Impact Statement ("GEIS") for the construction and operational licensing of advanced nuclear reactors. Clearpath envisions the proposed GEIS being flexible enough to capture the various advanced nuclear reactors currently being developed, while acknowledging that not all parts of the GEIS will be applicable to each new reactor design.

I. Introduction and Overview

The need to bring advanced nuclear reactors to market is driven by the high costs and technical difficulties of building new, large, light-water reactors ("LWRs") using Generation II, III, or III+ technologies to meet the nation's energy needs. This reality reflects various factors, such as competition from natural gas and renewables, safety concerns that are either difficult or costly to address, and loss of construction expertise. Accordingly, the continued use of nuclear energy, which is highly desirable as a clean energy source (and, in fact, relatively unique in its ability to meet low-carbon baseload generation), depends on the ability to bring innovative reactor technologies to market. While existing nuclear reactor designs are demonstrably and significantly safer than most other power generation technologies, the next generations of nuclear reactors feature models that are even smaller and possess enhanced safety features relative to existing reactor designs. The newest nuclear reactor designs (Generation IV) include smaller non-light water reactors ("non-LWRs"), which use helium, liquid metal, or molten salt to cool the uranium fission reactions. The new reactors also have enhanced safety features, including less radioactive inventory, more stable fuel forms, higher system thermal capacities, and passive safety measures. Moreover, while conventional nuclear plants were custom-built onsite, many of these new reactor designs are considerably smaller as well as modular, meaning they can be manufactured on a modern production line. Such mass production further improves the reliability of reactors, eliminating the potential for variation. This characteristic will also provide enhanced levels of safety and cost-effectiveness in design, fabrication, and construction.

Notwithstanding the manifold benefits of advanced nuclear reactors, there are significant administrative hurdles to licensing them under the Atomic Energy Act ("AEA") and its implementing regulations in Title 10 of the Code of Federal Regulations. One such hurdle arises under 10 CFR § 51.20(b). Per this regulation, the construction and operation of nuclear reactors requires the preparation of an Environmental Impact Statement ("EIS"). However, this regulation reflects, in essence, NRC's interpretation of the National Environmental Policy Act of 1969, 42 U.S.C. § 4321, et seq. ("NEPA") and the White House Council on

Environmental Quality's ("CEQ's") implementing regulations at 40 CFR §§ 1500–1508. In fact, both NEPA and the CEQ regulations afford significant latitude and multiple mechanisms by which federal agencies may fulfill their environmental review obligations. This flexibility is germane, for, as has been widely recognized, the standard EIS process is unnecessarily burdensome. Having to undergo this process on each occasion that an advanced nuclear reactor plant is constructed would present a considerable barrier to using such technologies to satisfy the nation's clean energy needs. Fortunately, NEPA allows the use of a GEIS to avoid unnecessary duplication of effort in conducting environmental reviews when issues can be addressed generically (*see* 40 C.F.R. § 1502.4), and there is nothing in the statute or implementing regulations that would automatically preclude the use of a GEIS in support of the construction and operation of nuclear power plants. As discussed below, for environmental impacts that cannot be addressed in a GEIS, the NRC can develop Supplemental Environmental Impact Statement ("SEIS").

Clearpath's position is that the environmental impact analysis for advanced nuclear reactors (as defined in Section II of this report) can be addressed generically, and that NRC should prepare a GEIS for the licensing of such reactors. As explained in greater detail below, the use of a GEIS would be timely given recent activity by the White House and Congress (Section III) and consistent with NRC policy, the objectives and requirements of NEPA, and the underlying logic in other GEIS that NRC has developed (Sections IV and V). In making the case for why a GEIS is appropriate for advanced nuclear reactors, this paper also establishes a framework and methodology for the generic treatment of key EIS components (Section V).

By adopting the optimized EIS regulatory review process advocated in this white paper, the NRC would be meeting the requirement to evaluate the environmental impacts of advanced reactor technologies in a manner that balances realistic environmental risks with the business needs of industry, the demonstrated history of minimal negative environmental impact and significant positive impact of reactor deployment in the U.S., and the energy needs of the nation. At the same time, the NRC would be able to dedicate fewer resources to environmental reviews of new reactors. This outcome, which is consistent with NRC's own goals, would also advance broad policy objectives, including preserving the United States' status as an innovator of nuclear technology and providing domestic sources of clean and secure energy.[1] The NRC would also stand to facilitate the use of technologies that legitimately can be included as part of the solution to global climate change.

II. Definition of "Advanced Nuclear Reactor"

Clearpath believes that an important and fundamental step in its proposed GEIS approach is the adoption of a useful definition of "advanced nuclear reactor" that captures the expected field of Generation III+ and Generation IV nuclear reactors. To date, NRC has not provided a specific definition of "advanced nuclear reactor," although it has published a set of expectations regarding the design of such reactors and certain recent legislation contains definitions or guidelines that serve as a starting point.[2]

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[1] *See* Policy Statement on the Regulation of Advanced Reactors, 73 Fed. Reg. 60,612 (Oct. 14, 2008); U.S. Nuclear Reg. Comm'n, "NRC Vision and Strategy: Safely Achieving Effective and Efficient Non-Light Water Reactor Mission Readiness," Dec. 2016, ADAMS Accession No. ML 16356A670; U.S. Nuclear Reg. Comm'n, "A Regulatory Review Roadmap for Non-Light Water Reactors," Dec. 2017, Accession No. ML 17312B567.

[2] *See* 73 Fed. Reg. at 60,615. Note that the criteria hardly amount to the level of specifications and, instead, involve loose descriptions of desired enhancements to Generation II nuclear reactors. Section 3 of S. 512, the Nuclear Energy Innovation and Modernization Act, contains the following definition:

> A nuclear fission or fusion reactor, including a prototype plant … with significant improvements compared to commercial nuclear reactors under construction as of the date of enactment of this Act, including improvements such as —

We begin by considering Generation IV reactors. As the NRC itself has noted, the common feature shared by the Generation IV reactors conceived to date is that they have "designs that are different than the currently operating reactors, which use water for both cooling and supporting the nuclear reactions in the core by moderating or slowing neutrons generated by the fission process." The Generation IV reactor technologies being considered do not include light-water reactors but, rather, reactors using coolants such as helium, liquid metal, and molten salt.

On the other hand, simply defining the term synonymously with "non-light water reactor" would be inadequate, as such a narrow definition would exclude certain Generation III+ technologies. Therefore, the definition of "advanced nuclear reactor" should be expanded to include "both non-light water reactors and small modular light-water reactors (including micro-reactors of 50 MW or less), with passive or inherent safety features that require comparatively fewer controls or operational intervention to avoid accidents in the event of malfunction, and rely on natural forces such as gravity, natural convection, or resistance to high temperatures."

III. Timeliness of This Initiative

The development of a GEIS for the licensing of advanced nuclear reactors would be consistent with recent executive branch and Congressional activity focusing on the need to expedite NEPA review and bring innovative nuclear technologies to market. For example, NRC has endorsed Title 41 of the Fixing America's Surface Transportation Act ("FAST-41"), which became effective on December 4, 2015 and authorizes new procedures to enhance efficiency in the federal government's environmental review and approval of covered infrastructure projects, including new reactor licensing and reactor decommissioning, uranium recovery facilities, fuel cycle facilities, spent fuel and transportation, and byproduct materials licensing and regulatory activities.[3]

Indeed, the past year and a half has seen considerable activity on these fronts. On August 15, 2017, the White House issued Executive Order 13807, to establish discipline and accountability in conducting environmental reviews of infrastructure projects. In relevant part, this Executive Order states: "More efficient and effective Federal infrastructure decisions can transform our economy, so the Federal Government, as a whole, must change the way it processes environmental reviews and authorization decisions."

Less than a year later, on June 20, 2018, the CEQ published an Advanced Notice of Proposed Rulemaking, soliciting comment on whether it should "update the [NEPA] regulations and ensure a more efficient, timely, and effective NEPA process consistent with the national environmental policy stated in NEPA."[4]

(A) additional inherent safety features;
(B) significantly lower levelized cost of electricity;
(C) lower waste yields;
(D) greater fuel utilization;
(E) enhanced reliability;
(F) increased proliferation resistance;
(G) increased thermal efficiency; or
(H) ability to integrate into electric and nonelectric applications.

[3] *See* NRC's statement at https://www.nrc.gov/reactors/new-reactors/regs-guides-comm/erp.html.

[4] *See* 83 Fed. Reg. 28,591 (June 20, 2018).

By the close of the public comment period on August 20, 2018, CEQ had received 12,541 comments, many of which advocated for regulatory amendments to streamline the NEPA process. A common theme endorsed by nuclear industry commenters was the need to increase the use of GEIS to eliminate costly, time-consuming, and, ultimately, unnecessary case-specific EIS preparation for issues that can be dealt with generically.[5]

Meanwhile, the National Defense Authorization Act for Fiscal Year 2019, which was passed on July 25, 2018, requires the Department of Energy to develop a pilot program for microreactors, a category of small modular reactors with a capacity of 50 MW or less. Additionally, on October 1, 2018, President Trump signed the Nuclear Energy Innovation Capabilities Act, a bill passed with bipartisan support in both the House and Senate, to facilitate the development of advanced nuclear reactors in the United States.

Most recently, on January 14, 2019, President Trump signed the Nuclear Energy Innovation and Modernization Act ("NEIMA"), passed by both the Senate and the House (with an overwhelming majority of 361 to 10 in the House). Among other things, this legislation directs the NRC to modify the licensing process for commercial advanced nuclear reactor facilities to enhance predictability and efficiency, while ensuring adequate protection and public health and safety. The NRC must also develop a new technology-inclusive, regulatory framework by the end of 2027 that encourages greater technological innovation for the advanced nuclear reactor program.

The NRC should act consistently with the spirit of these developments – including potentially imminent amendments to CEQ's implementing regulations for NEPA – by working to develop a GEIS for advanced nuclear reactors. If it does not do so, the Commission risks creating a bottleneck that may stifle the propagation of these environmentally beneficial technologies.

IV. Development and Use of a GEIS for Advanced Nuclear Reactors Would Be Consistent with NRC Policy Statements Made to Date, NEPA Requirements, and the Commission's Regulation of Other Activities

NRC already has articulated its desire to adopt a flexible licensing program for advanced nuclear reactors.[6] For example, the Commission has indicated that it "generally agrees" with the use of "type-licensing" and "fast-track combined operating licenses" for advanced reactor technologies.[7] The use of a GEIS to streamline the environmental review process would comport with, and be a natural extension of, these past statements. Moreover, it would be entirely consistent with the objectives and requirements of NEPA.

Specifically, CEQ's implementing regulations articulate policies to reduce administrative burdens and delays in the environmental review process. For example, 40 CFR § 1500.2 articulates NEPA's policy that federal agencies implement procedures to make the environmental review process:

> "more useful to decisionmakers and the public; to reduce paperwork and the accumulation of extraneous background data; and to emphasize real environmental issues and alternatives." The same provision further states that EIS documents must be "concise, clear,

[5] *See, e.g.*, Clearpath's Letter, dated August 15, 2018 to M. Neumayr, CEQ Chief of Staff, re: Docket No. CEQ-2018-0001/13246; Nuclear Energy Institute, "Comments of the Nuclear Energy Institute in Response to the Council of Environmental Quality's Advance Notice of Proposed Rulemaking: Update to the Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act" (Docket No. CEQ-2018-0001, RIN 0331-AA03) (Aug. 20, 2018).

[6] *See* 73 Fed. Reg. at 60,613 (responding to comment "Walker-2").

[7] *See* 73 Fed. Reg. at 60,613.

and to the point, and shall be supported by evidence that agencies have made the necessary environmental analyses."

Moreover, 40 CFR §§ 1500.4 and 1500.5 affirmatively require that steps be taken to avoid unnecessary paperwork and administrative delays, and as indicated above, 40 CFR § 1502.4 allows the use of a GEIS to avoid unnecessary duplication of effort in conducting environmental reviews when issues can be addressed generically. These codified principles create impetus for the development of a streamlined environmental review process for next generation reactor technologies expected to hit the market.

NRC will likely continue receiving license/permit applications for advanced nuclear reactors, and as much of the environmental impact analysis for the different reactor types and construction and operation projects are likely to be the same (as described in Section V), it would be a waste of Commission and industry resources to prepare EIS documents *de novo* in support of each application. Moreover, the implementation of an environmental review process with unnecessary administrative and financial burdens is wholly at odds with NEPA.[8]

As mentioned above, the use of a GEIS is a regulatorily-mandated means of avoiding such burdens. Under 40 CFR § 1502.4, when an agency prepares "statements on broad actions . . . agencies may find it useful to evaluate proposal(s) . . . [g]enerically, including actions which have relevant similarities, such as common timing, impacts, alternatives, methods of implementation, media, or subject matter." The Commission's regulations recognize that, in practice, not all issues covered by a GEIS will apply to each project. Therefore, 10 CFR § 51.95 requires that a site-specific SEIS" be prepared to address information that cannot be treated generically.

The NRC has been more active than other federal agencies in the use of GEIS to facilitate environmental review. To date, the Commission has prepared GEIS documents for five types of conditions or activities: (1) the relicensing of nuclear power plants, (2) the handling and storage of spent nuclear reactor fuel, (3) the decommissioning of nuclear facilities, (4) in support of rulemaking on radiological criteria for license termination, and (5) in-situ uranium recovery facilities.[9] Thus, the Commission already has experience and institutional knowledge in the development of GEIS. Consequently, it would be entirely in accordance with NRC's past practice to expand the field of issues subject to GEIS to include the construction and operation of advanced nuclear reactors.

V. Proposed Framework for Generic Treatment of Environmental Issues

The NRC document entitled, "Standard Review Plans for Environmental Reviews for Nuclear Power Plants: Environmental Standard Review Plan (NUREG-1555)," specifies the contents of an EIS prepared under 10 CFR Part 51 for new power plants.[10] For purposes of evaluating whether a generic form of the document would suffice, the key portions of an EIS consist of (1) describing the affected environment, (2) identifying the environmental issues that will be subject to construction and operational impact analysis, as well as mitigation measures, which, if implemented, would prevent significant environmental impacts, and (3) performing an alternatives analysis comparing the impacts expected from the proposed alternative to

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[8] *See*, *e.g.*, 40 C.F.R §§ 1500.4(j)("Agencies shall reduce excessive paperwork…"), 1500.5(g) ("Agencies shall reduce delay…").

[9] *See* NUREG-0586 (2002); NUREG-1437, Revision 1 (2013); NUREG-1496 (1997); NUREG-1910 (2009); NUREG-2157 (2014); 10 C.F.R. 51.23. *See also* James R. Park, *The Role and Use of Programmatic Environmental Impact Statements and Environmental Assessments in Fulfilling NEPA and State Environmental Mandates* (June 2014).

[10] *See* NUREG-1555 (2007). *See also* U.S. Envtl. Prot. Agency, EPA-315-X-08-001, "§ 309 Reviewers Guidance for New Nuclear Power Plant Environmental Impact Statements" (2008).

other potential courses of action (in this case, comparing the use of advanced nuclear reactors to conventional nuclear technologies and other alternative energy sources, as well as to a no-action alternative). Clearpath's suggested approach for addressing each of the three core areas is set forth below.

1. Why the description of the affected environment can be addressed generically: NRC has drafted generic descriptions of the affected environment in various GEIS issued to date, and there is no reason why this approach cannot be replicated for a GEIS involving advanced nuclear reactors. A particularly instructive example is the treatment of the affected environment found in the Generic Environmental Impact Statement for License Renewal of Nuclear Plants (NUREG-1437). Specifically, NUREG-1437 describes the different environmental features at and around existing nuclear power plants.[11] Because this GEIS covers the entire fleet of licensed nuclear power plants (as it existed in 2013), the description of the affected environment in this document catches the likely physical settings for nuclear power plants.[12] The description of the affected environment set forth in NUREG-1437 can be largely carried over to other GEIS prepared for NRC-regulated activities, including a potential GEIS for advanced nuclear reactors. However, the description should be expanded from that in NUREG-1437 to account for the physical settings of possible future reactor sites, such as Alaska, Puerto Rico, and certain islands. The only material difference in such a case would be that, whereas NUREG-1437 expounds upon different design features of existing nuclear power plants, the proposed GEIS would elaborate upon the design differences of different advanced nuclear reactor models.

2. Why the discussion of construction and operational impacts and mitigation measures may be addressed generically: The GEIS approach depends on not having to perform numerous detailed, site-specific discussions of potential environmental impacts. A GEIS is therefore best-suited for projects where the vast majority of environmental impacts will be minor (based on common general technical approaches) or capable of being mitigated through commonly available means (*see* **Appendices A and B**). This has been the logic employed in the GEIS that NRC has published to date, including, notably, NUREG-1437. This GEIS lists 78 potential environmental impacts, organized into 20 broad categories, which NRC has cited in subsequent documents as capturing the full range of potential operational impacts.[13] Of these 78 issues, 59 were dealt with entirely generically without the need for site-specific supplements (category 1) based on technical specifications suggesting limited environmental impacts and the availability of mitigation measures. Meanwhile, the use of SEIS to provide site-specific information was recommended for the remaining 19 issues (category 2).

Clearpath advocates a similar approach for advanced nuclear reactors and takes the position that operational impacts for advanced nuclear reactors would, at most, be approximately commensurate with those identified in NUREG-1437 for existing power plants. Consider that all nuclear technologies are zero-carbon emitters, which, combined with the fact that any plant would be subject to federal and/or state air permitting requirements, obviates the need for detailed review of potential air impacts during the operation phase. Furthermore, construction-related impacts (which are not addressed in NUREG-1437) are also virtually guaranteed to be small for advanced nuclear reactors subsumed in the proposed definition. For small modular reactors ("SMRs"), construction-related impacts will be minimal and of short duration, conceptually similar to the types of activities (e.g., decommissioning, plant refurbishment) that NRC has elected to address generically in the

[11] *See* NUREG-1437, at Section 3.

[12] Clearpath concedes that, in the event of a material departure from a physical setting described in NUREG-1437, an SEIS would be appropriate.

[13] *See* NUREG-2157, at p. 3-1, emphasizing the appropriateness of relying upon NUREG-1437 to identify the total scope of the potentially affected environment.

past. The GEIS for power plant decommissioning (NUREG-0586) provides a useful template for addressing land disturbance activities with a small geographical footprint generically. It is particularly applicable given that most of the advanced nuclear designs stand to require the use of a very small footprint of 50 acres or less.

Moreover, potential environmental impacts that can be mitigated or controlled through compliance with permits issued by agencies besides NRC may be dealt with generically. This approach would cover impacts to groundwater and surface water, for during both construction and operation, such discharges would be subject to Clean Water Act permits issued under the National Pollutant Discharge Elimination System ("NPDES") program (including general permits covering stormwater discharges associated with construction and industrial activities). Air quality impacts can be mitigated through air permits issued by the U.S. Environmental Protection Agency and relevant state environmental agencies. Likewise, potential impacts to wetlands would be suitable for generic coverage, to the extent they would be covered by the terms of a Clean Water Act Section 404 Permit, issued by the U.S. Army Corps of Engineers or state or local agencies. Because the Clean Water Act permitting process should account for potential environmental impacts, there is no need to repeat the analysis under NEPA.

Clearpath advocates that, in the spirit of other GEIS that NRC has issued, the proposed GEIS for advanced nuclear reactors should cover the full range of next generation technologies, while understanding that not all provisions of the proposed GEIS necessarily would apply to each reactor type. For example, particular provisions may be applicable to LWRs, whereas others may apply to non-LWRs. Clearpath further appreciates that certain advanced reactor designs and environmental issues may warrant site-specific analysis. However, Clearpath believes that, on the whole, the next generation of advanced nuclear reactors contain specific features that militate in favor of treating potential impacts generically.

3. Why the alternatives analysis may be addressed generically: A rigorous alternatives analysis should not be required for the proposed GEIS. Current NEPA regulations require that an EIS evaluate the "purpose of and need for" the proposed action, "unless the agency determines that there is a compelling reason to do otherwise."[14] A compelling reason exists for abandoning the alternatives analysis in the present instance, an action that is clearly within the policymaking authority of the NRC under NEPA. There are two basic types of project proponents (governmental authorities and private corporations), both of which, as a practical matter, would be extremely unlikely to be swayed by an NRC alternatives analysis. Consider that: (1) if the impetus to increase or generate power reflects a governmental decision (for sites in which energy facilities are regulated by a public utilities commission), the need for power analysis has already been performed by governmental authorities; or (2) if the impetus to expand baseload power is a private party decision, the project proponent already would have performed the analysis and will bear the risk of an incorrect market-based decision.[15] For these reasons, Clearpath strongly recommends that the NRC invoke its rulemaking authority to drop the alternatives analysis in its preparation of the proposed GEIS.

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[14] 40 C.F.R. § 1502.10.

[15] Additionally, as advanced reactors are smaller (typically less than 300 MWe), the impact they have on the existing power grid are substantially smaller than adding one or more gigawatt sized reactors, thus obviating the need to conduct the analysis. Similarly, for non-power applications, such as process heat and desalinization, the market would make the decision regarding whether to use nuclear technology and, if so, what type should be used.

In the event that the NRC rejects the complete abandonment of an alternatives analysis, Clearpath recommends that the alternatives analysis be streamlined to consider only the realistic alternatives of supplying energy needs pursuant to a conventional baseload deployment involving existing technologies, including coal- or gas-fired plants, commercial nuclear reactor designs, and alternative energy sources (e.g., solar, wind, etc.), as in NUREG-1437.[16] Such an alternatives analysis would necessarily state that the environmental impacts of constructing and operating advanced nuclear reactors would be considerably less than for conventional nuclear reactors, especially in the case of SMRs and micro-reactors, and a common feature of all advanced nuclear reactors is further enhanced safety features relative to existing Generation II and III reactors. With respect to coal-fired and natural-gas plants, not only would the construction-related impacts be less, but so would the operational carbon footprint (by a substantial margin). Regarding alternative energy sources, some of these (e.g., solar energy) may have different or even lesser environmental impacts; however, they would be unlikely to provide the same baseload of energy as advanced nuclear reactors. In the same vein, the no-action alternative would mean that no baseload electrical power would be generated and, therefore, fail to meet the purpose and need of the proposed action (i.e., the generation of carbon-free power using advanced nuclear reactors). Therefore, the alternatives analysis can be addressed generically for advanced nuclear reactors.

VI. Conclusions

As this paper seeks to show, the use of a GEIS for advanced nuclear reactors is consistent with NEPA and recent White House and Congressional activity, not to mention the NRC's own articulations of policy regarding the desirability of flexible licensing for these technologies. Moreover, existing GEIS developed by the Commission – especially, the GEIS for license renewal and, to a lesser extent, for plant decommissioning – provide useful precedents for how a GEIS may be drafted to address the environmental issues associated with the construction and operation of advanced nuclear reactors. The NRC should begin developing a GEIS for the construction and operational licensing of advanced nuclear reactors to meet the intent of NEPA as defined by CEQ under 40 CFR § 1500:

> "Ultimately, of course, it is not better documents but better decisions that count. NEPA's purpose is not to generate paperwork—even excellent paperwork—but to foster excellent action. The NEPA process is intended to help public officials make decisions that are based on understanding of environmental consequences, and take actions that protect, restore, and enhance the environment."

This effort is in line with the NRC's transformation efforts, as noted in SECY-18-0060 (Enclosure 5): "closer adherence to the streamlining principles in the CEQ regulations could result in environmental documents that provide a clearer, more focused discussion of environmental impacts that would benefit both NRC decisionmakers and interested members of the public."

The development of a GEIS for advanced reactors furthers the intent of Congress under the AEA, NEPA and the recently enacted NEIMA to implement regulations for reasonable assurance of adequate protection. The use of a GEIS (with supplemental SEIS as necessary) would reduce NRC staff resources dedicated to environmental issues while allowing greater focus on any significant environmental impacts that may exist.

[16] Likewise, the use of advanced nuclear reactors for non-power purposes (e.g., process heating or desalinization) should focus on a realistic alternatives analysis that considers other existing technologies that can serve the purpose.

Appendix A – Preliminary Assessment of Major Categories of Environmental Impact

Environmental Issue	Brief Explanation of Genericity and Anticipated Impacts
1.Onsite Land Use	Construction: Expected to be small for Generation IV reactor sites. Treatment in SEIS may be appropriate for certain designs where onsite land use varies from the parameters specified in the GEIS. Operation: Can be addressed generically and should not vary between Generation III+ small modular LWRs and Generation IV technologies.
2. Offsite Land Use	Construction and Operation: Should be the same for Generation III+ small modular LWRs and Generation IV reactors.
3. Visual Resources	Construction and Operation: Should be the same for Generation III+ small modular LWRs and Generation IV reactors.
4. Air Quality Impacts	Construction: Air quality impacts would be limited to fugitive dust emissions and emissions from construction equipment, which would be subject to permitting requirements, and unlikely to make a significant impact even in non-attainment zones. Operation: Air permitting will adequately limit air impacts. Treatment in SEIS may be necessary if the plant is sited in a non-attainment area.
5. Noise Impacts	Construction and Operation: Not expected to be significant and will be approximately the same for both Generation III+ small modular LWRs and Generation IV reactors.
6. Geological Environment	Construction and Operation: Not expected to be significant and will be the same for both Generation III+ small modular LWRs and Generation IV reactors.
7. Surface Water Resources	Construction: Can be prevented through best management practices and (for wetlands) compliance with permit terms. Operation: Small, even for Generation III+ small modular LWRs (see NUREG-1437). Best management practices can be used as necessary. Additionally, a number of advanced reactor designs are considering the deployment of air cooling which could obviate surface water impacts.
8. Groundwater Resources	Construction and Operation: Capable of being prevented or mitigated through permitting and groundwater protection plans, such as those implemented at existing nuclear sites. Operation-phase impacts may vary depending on power cycle operation.
9. Terrestrial Resources	Construction: Treatment in SEIS may be necessary depending on the specific type of resources. However, as a general proposition, these can be mitigated through revegetation and other nuances of siting. Operation: Small, even for Generation III+ small modular LWRs (see NUREG-1437).

Environmental Issue	Brief Explanation of Genericity and Anticipated Impacts
10. Aquatic Resources	Construction: SEIS may be necessary depending on the specific aquatic resources at the site. However, as a general proposition, impacts on aquatic resources can be prevented or mitigated through best management practices and compliance with permit terms. Operation: Generally small but, depending on cooling system specifications and specific aquatic organisms present, treatment in an SEIS may be necessary. As some advanced reactor designs are considering the deployment of air cooling, this design choice could obviate surface water impacts.
11. Special Status Species and Habitats	Construction and Operation: Generally small and can be mitigated based on consultations with coordinating agencies, but treatment in SEIS may be necessary depending on specific circumstances.
12. Historic and Cultural Resources	Construction and operation: Capable of prevention or mitigation through SHPO processes.
13. Socioeconomics	Construction and Operation: Treatment in SEIS not required based on existing GEIS.
14. Human Health	Construction and Operation: Compliance with regulatory radiological dose limits would obviate the need for treatment in SEIS.
15. Postulated Accidents	Construction and Operation: Accident consequences are governed by the NRC license, so additional evaluation should not be necessary for design basis or severe accident conditions. Advanced nuclear reactor designs are generally safer than existing commercial reactors, and many have no offsite consequences.
16. Waste Management	Construction and Operation: Mitigated through comprehensive regulatory controls. Revise NUREG-2157 to address different fuel cycle considerations for advanced nuclear reactors.
17. Environmental Justice	Construction and Operation: To be considered in SEIS.
18. Cumulative Impacts	Construction and Operation: To be considered in SEIS.
19. Uranium Fuel Cycle	Operation only: Can be treated generically per NUREG-1437 (subject to minor modifications to that NUREG). Reactors using thorium should be addressed in a SEIS.
20. Termination of Nuclear Power Plant Operations and Decommissioning	May vary, but plant decommissioning already has been dealt with generically in the NUREG-0586 GEIS.

Appendix B – Key Factors Driving Generic Treatment of Advanced Nuclear Reactors

Factors	Explanation Regarding Relevant Areas of Environmental Impact
Small size of reactor	• Truer for small modular reactors and microreactors. • Lessens impacts related to onsite land use, offsite land use, noise, and specific resources (e.g., surface water, groundwater, etc.).
Enhanced safety features	• Lessens impacts associated with postulated accidents.
Reliance on federal and state permits, environmental management plans, etc.	• NEPA was enacted when environmental permitting regimes and environmental laws were not as robust or, in the case of agencies, experienced as they are now. • Now, federal and state authorities issue permits covering air quality impacts associated with construction equipment, generator units at plants, stormwater discharges, discharges to surface waters, activities affecting wetlands, etc. • The federal government and most states now have robust waste management regulations.
Coordination with other federal or state agencies outside the context of permit issuance	• Obviates the need for NEPA review with respect to special status species and archaeological and cultural resources.
Reliance on other NRC Issued GEIS (allowing for potential modifications to such documents to account for technical details of advanced nuclear reactors)	• Waste management (NUREG-2157). • Uranium fuel cycle (NUREG-1437). • Plant decommissioning (NUREG-0586).
Redundancy with other NRC requirements	• Human health (compliance with NRC radiological dosage levels within plant boundaries). • Postulated accidents (NRC license governs terms of design basis or severe accident conditions).