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General Comment

See attached file(s)

Attachments

BTI Commment on Generic Environmental Impact Statement for Licensing of New Nuclear Reactors

BREAKTHROUGH INSTITUTE

December 18, 2024

Subject: BTI Comments on the Draft NUREG-2249, "Generic Environmental Impact Statement for Licensing of New Nuclear Reactors." [Docket ID NRC-2020-0101].

The Breakthrough Institute (BTI) appreciates this opportunity to comment on the draft NUREG-2249, "Generic Environmental Impact Statement for Licensing of New Nuclear Reactors" (NR GEIS), and to express our thoughts on the proposed rule. BTI is an independent 501(c)(3) global research center that advocates for appropriate regulation and oversight of nuclear reactors to enable the new and continued use of safe and clean nuclear energy. BTI acts in the public interest and does not receive funding from industry.

It is important to emphasize the significance of a generic environmental impact statement (GEIS) in the NRC's regulatory practice. Historically, a GEIS has proven to be an effective tool, particularly in the context of license renewals, where its use has been upheld by courts as an appropriate method of analysis to comply with the National Environmental Policy Act (NEPA). Generic analyses streamline the review process, improving efficiency while maintaining robust environmental protection. This efficiency will be especially critical in the coming years, given the potential volume of applications that the NRC may receive for *new* reactors. By enabling consistent, technology-neutral evaluations of common environmental impacts, the NR GEIS positions the NRC to meet this anticipated demand effectively and responsibly.

This comment provides an evaluation of key elements of the NR GEIS and responds to the NRC's specific requests for comment, emphasizing alignment with the stated purpose of the GEIS.

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Connection to Recent Legislation

The NR GEIS is increasingly salient in relation to recent direction from Congress. This stems from a national demand for reliable, clean, and affordable energy and the rising need to meet increasing electricity demand. Congress has explicitly recognized the role of nuclear energy in meeting the nation's energy needs and development goals, passing key legislation that emphasizes modernized frameworks for licensing and reviewing nuclear projects.

In 2019, the Nuclear Energy Innovation and Modernization Act (NIEMA) directed the NRC to develop a technology-inclusive framework for new and advanced reactors, resulting in the proposed 10 CFR Part 53. This framework is intended to streamline licensing while maintaining high safety and environmental standards, aligning with the intent and usability of the NR GEIS to ensure efficient and inclusive environmental reviews.

On June 3rd, 2023, President Joe Biden signed the Fiscal Responsibility Act (FRA) into law. This law, among other provisions, established time constraints and page limits on environmental impact statements and environmental assessments (EIS and EA, respectively), which all federal agencies must comply with. This directive underscores the need for tools like the NR GEIS to support compliance with these regulatory and procedural efficiencies while maintaining rigorous environmental oversight.

On July 9th, 2024, President Biden signed the Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy (ADVANCE) Act into law, which includes provisions directly tied to the development and utility of the NR GEIS. Several sections of the ADVANCE Act are particularly relevant to the development and application of the NR GEIS:

- **Section 204:** The NR GEIS can broadly improve the efficiency of the NRC's review for additional locations by providing generic findings that expedite environmental evaluations.
- **Section 206:** This section focuses on licensing advanced reactors at existing brownfield sites. By recategorizing certain Category 2 issues for projects located in these areas, the NRC could streamline licensing processes by leveraging the NR GEIS.
- **Section 207:** The NRC must establish and implement expedited procedure timelines for issuing combined licenses (COLs) for applications that use reactor designs or sites previously approved by the NRC. Leveraging Category 1 findings, the NR GEIS could play a key role in accelerating environmental reviews in adherence to the requirements in Section 207.
- **Section 208:** The potential for microreactors to use streamlined environmental pathways, such as an EA/FONSI or even a categorical exclusion (CATEX), highlights the need for the NR GEIS to enable widespread deployment of standardized designs with well-understood impacts.
- **Section 501:** Section 501 requires the NRC to revise its mission statement and provide guidance to the staff on how to perform the revised mission effectively. The updated mission statement is required to indicate that regulation of civilian use of radioactive

materials and nuclear energy must be conducted efficiently and not unnecessarily limit benefits to society.[1] The NR GEIS is directly related to this direction.

- **Section 504 and Section 505**: Performance metrics and milestones should guide the NRC's implementation of the NR GEIS to improve overall efficiency, aligning with the broader goals of modernized regulatory processes.
- **Section 506**: This section specifically references the expanded use of categorical exclusions, EAs, and GEISs. The NR GEIS is a critical component of implementing this directive, contributing to more efficient and comprehensive environmental reviews.

The NR GEIS is central to addressing the congressional direction outlined in these legislative measures. It helps the NRC meet the demands of modernized environmental reviews and facilitates the deployment of advanced nuclear technologies.

Response to Section IV: Specific Requests for Comment

1. PPE and SPE Values and Assumptions

a. Is NRC using an inappropriate value to result in a SMALL impact?

The Plant Parameter Envelope (PPE) and Site Parameter Envelope (SPE) establish design and site-specific assumptions, respectively, that determine whether an applicant can rely on generic findings in the NR GEIS for environmental reviews. By bounding key factors like reactor design, operation, and site characteristics, this approach streamlines environmental impact analyses, reducing redundancy and enabling targeted reviews for site-specific issues.

The PPE and SPE values and assumptions outlined in the GEIS are well-constructed to support a generic analysis of environmental impacts. The PPE and SPE approaches consolidate information on reactor and site designs to establish generic bounding values: The PPE represents the physical and operational characteristics of a hypothetical reactor design, including thermal output, water usage, and waste generation; The SPE includes environmental attributes of a site, such as topography, hydrology, and proximity to sensitive ecological areas. Both envelopes are based on a comprehensive review of regulatory limits, permitting requirements, historical data, and subject matter expertise.

BTI believes the NRC staff is using an appropriate value to result in a SMALL impact. The NRC defines a SMALL impact as: Effects that are not detectable or, if detected, are insignificant in

[1] BTI whitepaper on *Mission Statement Update Options Pursuant to Subsection 501(a) of the ADVANCE Act of 2024*, SECY-24-0083, ML24337A218.

altering any important resource attribute.[2] This is evaluated quantitatively (e.g., measurable criteria like air pollutant levels) and qualitatively (e.g., effects on visual aesthetics).

The PPE and SPE are intentionally designed to include conservative values, ensuring that even worst-case scenarios are unlikely to exceed SMALL impacts.[3] The NRC assumes adherence to well-established best practices. These measures are often enforced through permitting and regulatory compliance, ensuring their implementation.

There is consistent alignment with regulatory standards. For example, the values for air and water quality impacts are consistent with federal guidelines from the Environmental Protection Agency (EPA) and other agencies, ensuring a legally backed and scientifically grounded approach. The draft also complies with the Clean Water Act, the Clean Air Act, the Endangered Species Act, the National Historic Preservation Act, and many more regulatory standards. Additionally, the NRC incorporates cumulative effects into its impact assessments and provides opportunities for site-specific review during licensing. This dual-layered approach ensures that generic analyses are supplemented with detailed evaluations where warranted.

BTI supports this thorough evaluation to determine SMALL impacts and underscores the NRC's commitment to balancing environmental protection with efficient regulatory processes.

2. Environmental Issues Evaluated

a. *Are there any environmental issues that the NRC did not include in the scope of the NR GEIS and the proposed rule that should be included?*

The final NR GEIS must accurately address the negative impacts of the no-action alternative and consider the replacement alternatives as a categorized environmental issue. The current draft of the NR GEIS fails to fully evaluate the broader environmental and societal implications of forgoing nuclear energy.[4] Section 9.1 of Draft Regulatory Guide DG-4032 (proposed Revision 4 to Regulatory Guide (RG) 4.2, Preparation of Environmental Reports for Nuclear Power Reactors)[5] addresses the no-action alternative briefly saying, "The discussion of alternatives in the ER should

[2] Draft NUREG-2249, "Generic Environmental Impact Statement for Licensing of New Nuclear Reactors," dated September 2024, ML24176A220. (Hereinafter Draft NR GEIS) Page 1-4.

[3] An example in the draft that highlights this is limiting permanent land disturbance to 30 acres which provides a stringent cap that minimizes potential environmental degradation. Draft NR GEIS, Page 3-2.

[4] Draft NR GEIS, Page xviii.

[5] Draft Regulatory Guide DG-4032, (RG 4.2 Rev 4), "Preparation Of Environmental Reports For Nuclear Power Station," ML24176A228.

include the no-action alternative under which the requested license or permit is not granted by the NRC."[6]

However, the omission of the no-action alternative in the NR GEIS text undermines the purpose of the National Environmental Policy Act (NEPA), which requires agencies to assess all significant environmental effects of proposed actions and their alternatives, including the No-Action Alternative.[7] It is imperative for the NRC to include those aspects in the NR GEIS, not only because it is required by NEPA,[8] but also to improve how the it considers the negative environmental impacts of the no-action alternative for future reactors.

Furthermore, nuclear energy provides substantial environmental benefits compared to other energy sources. Unlike fossil fuel-based energy, nuclear reactors emit no greenhouse gases or harmful pollutants, making nuclear energy a critical tool in mitigating climate change. Due to its natural energy density, nuclear power requires significantly less land than most other energy sources, including wind and solar. This reality comparatively minimizes disruption to land use and ecological habitats, reducing impacts on biodiversity and avoiding risks that might disproportionately affect vulnerable communities. Beyond its advantages to the environment, nuclear energy also holds immense societal benefits, such as bolstering energy independence and reliability, local development and economic growth, and strengthening national security. Given this wide range of advantages, choosing not to utilize nuclear energy could lead to the loss of these environmental and public health benefits.

BTI recommends that the Staff revise the draft to incorporate this new requirement as a categorized environmental issue within the scope of the NR GEIS and expand upon this revision in relevant implementing guidance, even if the impact is observed on a plant-by-plant basis.

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[6] DG-4032, Page 151.

[7] NEPA, as amended by the FRA, mandates consideration of the negative impacts of not implementing the proposed agency action, including the no-action alternative. In SECY-24-0046, the Staff states that it is "ensuring the analysis of the no-action alternative discusses reasonably foreseeable negative environmental impacts, per NEPA section 102(2)(C)(iii)."

[8] Section 102(2)(c)(iii) of NEPA directs that an agency must include "an analysis of any negative environmental impacts of not implementing the proposed agency action in the case of a no action alternative."

3. Categorization of Issues

a. *Are the environmental issues categorized appropriately (Category 1 versus Category 2)?*

The categorization of environmental issues in the draft reflects a thoughtful division between those requiring generalized analysis (Category 1) and those necessitating site-specific evaluation (Category 2). Category 1 issues, which conclude SMALL adverse impacts, align well with the PPE/SPE methodology. Category 1 issues are those that have been comprehensively studied across a range of plausible scenarios, allowing for conclusions that apply uniformly to all or most reactor sites. Conversely, Category 2 issues require a more detailed, site-specific evaluation because their impacts are highly influenced by local conditions.[9]

While almost all of the 20 Category 2 issues listed in Table 1-1[10] accurately reflect issues that necessitate supplemental, site-specific analysis, BTI urges the NRC staff to provide additional clarity and, optimally, revise the classification of one Category 1 issue: *Greenhouse Gas Emissions*; and six Category 2 issues: *Need for Power, Purpose and Need, Climate Change, and the three non-resource related Alternatives*.

Category 1 Environmental Issues

Greenhouse Gas Emissions

The current analysis for greenhouse gas (GHG) emissions during operation focuses on two 1,000 MW reactors, which is overly narrow for the wide spectrum of reactor designs envisioned for advanced nuclear technology.[11] This focus excludes designs like the AP1000, which exceeds the 1,000 MW threshold at 1,117 MWe, and advanced reactors with significantly smaller capacities, which could have distinct operational profiles affecting their life-cycle GHG emissions.

The Category 1 classification for GHG emissions is well-supported by the conclusion that operational emissions represent only 0.001% of 2019 U.S. energy sector emissions.[12] However, the scope of the analysis should extend beyond a single reactor size scenario to maintain credibility across all advanced designs. As advanced reactors evolve, GHG emission profiles may improve due to innovations in fuel cycles, transportation efficiencies, and operational systems. A

[9] Draft NR GEIS, Page xvii.
[10] Draft NR GEIS, Pages 1-13 - 1-18.
[11] Draft NR GEIS, Section 3.3.2.2.2 *GHG Emissions during Operation,* Page 3-24.
[12] Ibid.

performance-based framework, rather than static bounding assumptions, would allow the GEIS to remain relevant for future technologies.

While the PPE values for a 40-year operational period (57,400 MT/yr) may generically bound advanced reactor designs with similar or smaller footprints, they could underrepresent or misrepresent the emissions profile of larger designs like the AP1000. The NR GEIS should explicitly acknowledge and adapt to these variations.

Revisions should incorporate a more inclusive analysis of GHG emissions that considers a broader range of reactor sizes, technologies, and configurations. For example, designs like microreactors, small modular reactors (SMRs), and large advanced reactors all differ in their operational emissions and life-cycle GHG impacts. At a minimum, a larger 1,200 MW capacity should be used in the GEIS analysis to ensure that generic impacts are considered and appropriately determined to be SMALL for all new reactor designs. The current analysis that uses 1000 MW potentially limits the applicability of the GEIS.

Category 2 Environmental Issues

Purpose and Need & Need for Power

The NR GEIS categorizes both Need for Power and Purpose and Need as Category 2 environmental issues, necessitating site-specific evaluations. While the intention of this categorization reflects the NRC's commitment to ensuring comprehensive and localized assessments, BTI recommends revisiting these classifications to ensure they align with modern reactor applications, legislative developments, and environmental review efficiency.

Atomic Energy Act Requirements

On these two environmental issues, the NR GEIS implies that the Atomic Energy Act (AEA) requires them to consider risks and impacts compared to benefits.[13] The AEA actually says they must manage consequences to public health and safety, protect the environment, and provide for common defense and security through regulations.[14] At the same time, while managing the consequences, they also must maximize the general welfare.[15] The text of the GEIS should be

[13] Draft NR GEIS, page 1-10

[14] Atomic Energy Act of 1954, 42 U.S.C. § 2011 et seq. (Hereinafter AEA)

[15] See "Considering Nuclear Energy's Benefits to Society," A. Stein, November 2024, ML24337A023. ;

adjusted to consider that, as required by the AEA, contribution to the general welfare should be maximized, *not* weighed relative to the consequences. The consequences need to be separately managed through the regulations. There is no requirement to weigh one against the other, and doing so implies a zero-sum situation that does not exist — both consequences and benefits could be improved at the same time. NEPA reviews allow for that situation by considering, not weighing, both positive and negative impacts.[16]

That being said, see our following evaluation and recommendations:

Purpose and Need

BTI recognizes that the Purpose and Need issue is a foundational element in NEPA reviews. It helps define the scope of the environmental review and determines which alternatives are reasonable. A well-crafted Purpose and Need can align environmental considerations with regulatory and technological objectives.[17]

However, The NR GEIS approaches these issues very differently than the recently approved Generic Environmental Impact Statement for License Renewal of Nuclear Plants (LR GEIS).[18] In our opinion, the LR GEIS addresses this requirement more efficiently and effectively. It states that the purpose is to provide an option that allows for power if the energy system needs it, subject to meeting all other NRC regulations. This approach does not unnecessarily limit the potential benefits of nuclear energy to society.[19] In contrast, the NR GEIS imposes a stricter framework by requiring a Purpose and Need statement that the NRC uses to evaluate project justification. This can inadvertently limit innovative projects or non-traditional reactor use cases, such as those for

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NRC's mission to protect public safety and security remained in service to the policies Congress established in the AEA, e.g., "to make the maximum contribution to the general welfare . . ."

[16] National Environmental Policy Act of 1969 § 102(2)(C)(iii), 42 U.S.C. § 4332.

[17] For instance, the Hermes 2 Environmental Assessment used this framework to reject alternatives that failed to support the stated purpose of testing new nuclear technologies. Environmental Assessment and Finding of No Significant Impact for the Construction Permits for the Kairos Hermes 2 Test Reactors, Draft Report for Comment, April 2024, https://www.nrc.gov/docs/ML2410/ML24103A002.pdf.

[18] NUREG-1437, Volume 1, Revision 2, "Generic Environmental Impact Statement for License Renewal of Nuclear Plants," August 2024, ML24086A526. (Hereinafter LR GEIS)

[19] See ADVANCE Act § 501: the NRC Commission shall "update the mission statement of the Commission to include that licensing and regulation of the civilian use of radioactive materials and nuclear energy be conducted in a manner that is efficient and **does not unnecessarily limit**— (1) the civilian use of radioactive materials and deployment of nuclear energy; or (2) **the benefits of civilian use of radioactive materials and nuclear energy technology to society**."

process heat or water desalination, as applicants must frame these goals within a power-centric paradigm, or use a separate 'alternative' analysis. The draft NR GEIS currently states:

> The applicant must describe in its ER the purpose and need for its proposed action, i.e., the reasons for developing the project (10 CFR 51.45(b); TN250). The NRC staff will use this information to inform its development of the NRC's purpose and need in the SEIS. Properly defining the purpose and need is a critical step in the development of an environmental document for the purposes of meeting NEPA requirements because it establishes the need for the action and the range of reasonable alternatives that must be considered. For additional information, see RG 4.2 (NRC 2024-TN7081, ISG COL/ESP-ISG-026 (NRC 2014-TN3767), and COL-ISG-029 (NRC 2019-TN6523).[20]

In comparison, the LR GEIS emphasizes flexibility and avoids weighing economic factors or justifying the need for power within the NRC's purview, reflecting a broader, systemic view:

> The purpose and need for the proposed action (license renewal) is to provide an option that allows for baseload power generation capability beyond the term of the current nuclear power plant operating license to meet future system generating needs, as such needs may be determined by State, utility, system, and, where authorized, Federal (other than NRC) decisionmakers. Except to the extent that findings in the safety review required by the Atomic Energy Act or in the environmental review could lead the NRC to not renew the operating license, the NRC has no role in the energy-planning decisions of power plant owners, State regulators, system operators, and, in some cases, other Federal agencies as to whether the nuclear power plant should continue to operate.[21]

Need For Power

The NR GEIS currently evaluates Need for Power as a deterministic Category 2 issue tied predominantly to grid electricity demands, stating:

> The Atomic Energy Act requires the social and environmental consequences of the civilian use of nuclear materials be weighed against the benefits that their use would provide. Historically, the primary benefit of nuclear power generation

[20] Draft NR GEIS, Page 1-10.

[21] LR GEIS, Page xxxiii.

> projects has been to provide electrical power to the grid. Therefore, the NRC staff has evaluated the need for power in its new reactor EISs. Any new nuclear reactor that uses this GEIS may also provide power to the grid, and if so, may require the same type of need for power evaluation in both the ER and SEIS. However, some nuclear reactors may be built for other purposes (e.g., to generate process heat, to desalinate water, or as a research and demonstration project). In such cases, the applicant will need to present, and the NRC staff will have to evaluate, the need for the project (10 CFR 51.45(b); TN250).[22]

BTI finds numerous challenges with the intent and description of Need for Power in the current draft. On a broad level, this perspective does not align with all modern applications of advanced nuclear reactors, such as microreactors or specialized industrial uses. The NRC's interpretation, anchored in DG-4032, ties Need for Power evaluations predominantly to electricity sales by utilities. DG-4032 states:

> The need for electrical power analysis should be limited to the discussion of the supply and demand for electricity from the present to the end of the permit period. Any other primary commodities (e.g., desalinization of water, area or industrial heat) that would be produced by the proposed project should follow the guidance in Appendix C, Section C.2.8. Discussion of ancillary benefits (e.g., reduced greenhouse gas emissions, fuel diversity, or grid stability) should be addressed in the benefit-cost section of the ER.[23]

As such, Need for Power exclusively discusses the use of nuclear power for electricity. In these cases, the Need for Power and Purpose and Need often converge, making the traditional evaluation framework less applicable. Further, a deterministic delineation between power and non-power applications provides no additional value to protect the environment. The staff does acknowledge that there are other use cases (to generate process heat, to desalinate water, or as a research and demonstration project) but provides alternative requirements for showing need other than through power elsewhere. Appendix C Section C.2.8 of DG4032 also acknowledges non-electricity uses (e.g., process heat or desalination), but these applications are treated as ancillary and not fully integrated into the Need for Power analysis. A performance-based

[22] Draft NR GEIS, Page 1-10 - 1-11.

[23] DG-4032, Page 143.

approach to Need for Power would allow flexibility in *all* new reactor applications and efficient environmental reviews.

The NRC posits its explanation in referencing a requirement in the AEA: "The Atomic Energy Act requires the social and environmental consequences of the civilian use of nuclear materials be weighed against the benefits that their use would provide."[24] As stated above, the AEA mandates that benefits and consequences be weighed independently. However, the NR GEIS deterministically applies a Need for Power metric to fulfill this requirement, potentially contravening the AEA's intent by precluding broader benefit considerations. AEA's directive to maximize contributions to general welfare suggests that benefits (e.g., energy security, technological advancement) should be weighed on their own merit, not solely against environmental or social impacts. The AEA does include a provision to consider the need for power, at the Commission's discretion, that is specifically in relation to antitrust provisions.[25]

Also note that the NR GEIS is incorrectly citing a regulatory requirement in § 51.45(b). There is no specific requirement in that section that there must be a *need for power*: "Environmental considerations. The environmental report shall contain a **description of the proposed action, a statement of its purposes, a description of the environment affected, and discuss the following considerations**" [emphasis added].[26] 10 CFR § 51.45 requires impacts to be *discussed* and *considered* with no analysis weighing impacts vs benefits to approve an EIS. 10 CFR § 51.45(b) does not explicitly nor implicitly require a *need for power*.

The ADVANCE Act also required the NRC to consider non-power applications for nuclear energy in Section 203.[27] The ADVANCE Act's goal of expanding nuclear energy deployment could be undermined by rigid interpretations of the Need for Power that limit projects serving diverse or localized needs. This is further evidenced by Chapter 8 of DG-4032. It provides detailed, prescriptive guidance to applicants on preparing a need-for-power analysis. DG-4032 states that "[t]he need-for-power analysis should fully describe and characterize the physical, geographic,

[24] Draft NR GEIS, Page 1-10.

[25] The Atomic Energy Act of 1954, 42 U.S.C. § 105(c)(6)

[26] 10 CFR § 51.45(b)

[27] See ADVANCE Act § 203: "(a) IN GENERAL.—Not later than 270 days after the date of enactment of this Act, the Commission shall submit to the appropriate committees of Congress a report addressing any unique licensing issues or requirements relating to—(1) the flexible operation of advanced nuclear reactors, such as ramping power output and switching between electricity generation and nonelectric applications; (2) the use of advanced nuclear reactors exclusively for nonelectric applications; and (3) the colocation of nuclear reactors with industrial plants or other facilities."

regulatory, and administrative provisions and constraints which affect the current and forecast supply of and demand for power, and "be in sufficient detail to fully demonstrate how the proposed project would supply some or all of the service area's future need for power."[28]

Furthermore, there are prominent divergences in precedent. Recent policies, such as those in the LR GEIS, adopt a more flexible approach that defers power justification to states or other federal bodies, avoiding unnecessary limitations on nuclear projects' societal benefits. BTI emphasizes the fact that the Commission approved the LR GEIS (and therefore approved the more flexible approach) more recently than the 2003 Commission that is cited in DG-4032. The relevant section of the LR GEIS NUREG-1437, Revision 2 10 CFR 51.95(c)(2) states, in part:

> The supplemental environmental impact statement for license renewal is not required to include discussion of need for power or the economic costs and economic benefits of the proposed action or of alternatives to the proposed action except insofar as such benefits and costs are either essential for a determination regarding the inclusion of an alternative in the range of alternatives considered or relevant to mitigation.[29]

Recommendations

BTI recommends refining the classifications of "Purpose and Need" and "Need for Power" to better align with the diverse applications of advanced reactors and the modern policy landscape. A more flexible and performance-based approach, consistent with the precedent set by the LR GEIS and directives from the ADVANCE Act, would streamline environmental reviews and avoid unnecessary restrictions on innovative reactor projects. These adjustments are vital to ensure the NRC framework supports the broader goals of maximizing societal benefits and expanding nuclear energy deployment efficiently and effectively. See the following:

1. **Purpose and Need**
    a. **Align the NR GEIS with the more effective precedent set by the LR GEIS:**
        i. Revise the Purpose and Need language to acknowledge non-power use cases in Section 1.3.3.2.3, Line 32-40 of the NR GEIS, ensuring the framework supports the diverse range of new reactor applications

[28] DG-4032, Page 143.
[29] LR GEIS, Page 1-14 - 1-15.

ii. Incorporate greater flexibility to the NR GEIS and related supporting documents and analysis to acknowledge non-power use cases, ensuring the framework supports diverse reactor applications.

2. **Need for Power**
    a. Revise related sections on Need for Power to address all concerns (not limited to any other revisions the NRC deems appropriate related to the concerns identified in this comment) and maintain Need for Power as its own Category 2 issue.
    b. Alternatively, integrate the Need for Power into Purpose and Need as a unified environmental issue, emphasizing flexibility and performance-based approaches rather than deterministic forecasting.
3. **DG-4032**
    a. Update DG-4032 to reflect the concerns laid out in the above commentary on modern reactor capabilities and ensure guidance aligns with the ADVANCE Act's legislative intent to expand nuclear applications.

Climate Change

The NRC's current classification of climate change as a Category 2 issue rests on the argument that its effects are location-specific and cannot be evaluated generically. However, this framing limits the utility of the NRC's environmental reviews and should be reconsidered based on the following rationale:

Environmental Impact Statements (EIS) assess the potential environmental effects of projects. These effects are feasible to quantify when they are direct, tangible, and local, like pollution going into a stream near the site of a project. Assessing the site-specific climate change impact from the project itself is much more challenging because carbon dioxide is a well-mixed greenhouse gas that disperses evenly throughout the Earth's atmosphere over time. This global mixing ensures that CO_2 emissions contribute to the enhanced greenhouse effect regardless of their geographic origin, and thus, the impact of CO_2 emissions on the climate is independent of where those emissions occur.[30] Further, CO_2 accumulates in the atmosphere resulting in impacts that are the sum result of cumulative emissions over time. The global cumulative CO_2 emissions since the late 1800s have been around 2,500 GtCO2.[31] There are many assessed impacts of those cumulative emissions[32] but the impacts attributable to any one source are necessarily small. For example, the

[30] See IPCC AR6 WG1 Ch. 7, https://www.ipcc.ch/report/ar6/wg1/chapter/chapter-7/#Effective
[31] See IPCC SR15 Fig. 2.3, https://www.ipcc.ch/sr15/chapter/chapter-2/2-2/2-2-2/2-2-2-1/figure-2-3/
[32] See IPCC AR6 WG2 https://www.ipcc.ch/report/ar6/wg2/

carbon footprint of a large nuclear power plant over its lifetime might be on the order of 2.5 million metric tons of CO_2.[33] This would only be $2x10^{-6}$ (0.0002%) of the global cumulative CO_2 emissions since the late 1800s. Thus, any climate change-related impact (either at the location of the plant or elsewhere) attributable to the emissions of the plant itself would be scientifically indeterminable. Even if direct impacts could be causally determinable and attributable, it would be relatively negligible compared to cumulative emissions.

The primary impact of a nuclear reactor project related to climate change is its contribution to or reduction of greenhouse gas (GHG) emissions. The NR GEIS appropriately classifies GHG emissions as a Category 1 issue. This is inherently a global issue, not tied to specific locations, as GHG emissions from one site contribute to climate trends worldwide. The net positive impact of nuclear energy in reducing emissions is uniform across projects, making this aspect well-suited for Category 1 classification.

The current rationale that location-specific climate change impacts (e.g., changing precipitation patterns) cannot be generically evaluated creates inconsistencies. For instance, attributing specific climate outcomes (e.g., local rainfall changes) to emissions from a single plant is scientifically unsupported. Generic treatment could streamline reviews while maintaining scientific rigor.

Similar to other issues categorized as Category 1 where impacts are uniform across sites, the climate benefits of nuclear power—such as displacing fossil fuels—are well-documented and could be generically addressed.

Alternatively, climate change could be folded into cumulative effects evaluations. This approach acknowledges that climate-related changes, such as regional temperature or precipitation shifts, are part of broader environmental trends influenced by multiple actions (local and global). This aligns with NRC's definition of cumulative effects, which considers "past, present, and reasonably foreseeable actions."[34] Section 9.3.5 of DG-4032 describes this connection in saying, "The potential impacts of climate change should be considered under cumulative impacts for alternative sites."[35]

[33] Draft NR GEIS, 3.3.1, Page 3-18, Line 31.
[34] Draft NR GEIS, page 1-10
[35] DG-4032, Page 157.

The NR GEIS further explains cumulative effects as a Category 2 issue: "Effects would depend on regional resource characteristics, the resource-specific impacts of the proposed project, and the cumulative significance of other factors affecting the resource."[36] BTI contends that climate change is inextricably linked to that explanation. Combining climate change with cumulative effects reduces redundancy and confusion. For example, instead of addressing climate change impacts in isolation, applicants could integrate these analyses into cumulative effects, focusing on how proposed projects fit into broader trends and environmental baselines.

Recommendations

BTI recommends the NRC staff to take one of the following revisions:

1. Reclassify the climate change impacts from nuclear plants on GHG emissions as a Category 1 issue, reflecting the generic and uniformly positive nature of these impacts.
2. Alternatively, if the NRC Staff deems that climate change impacts remain a Category 2 issue, combine climate change into the related cumulative effects Category 2 issue to streamline the review process.

Site, Energy, and System Design Alternatives

The current regulatory framework for evaluating site, energy, and system design alternatives may unintentionally create barriers for advanced nuclear technologies, including microreactors, small modular reactors (SMRs), and co-located facilities. These technologies are often designed for specific contexts, such as remote areas, industrial integration, or grid support, where traditional alternatives are either unsuitable or irrelevant.

Challenges

- **Site Alternatives**: Microreactors and co-located facilities are often designed for specific load requirements or industrial integration. Requiring consideration of alternative sites for projects inherently tied to a specific location (e.g., proximity to data centers or chemical plants) adds unnecessary complexity and delays without meaningful environmental benefit.
- **Energy Alternatives**: Comparing advanced nuclear projects to other energy sources does not account for their unique contributions, such as carbon-free baseload power, grid

[36] Draft NR GEIS, page 1-10

resilience, and decarbonization of industrial sectors. These features are critical to meeting national and global climate goals but are not directly comparable to intermittent renewables or fossil fuels.

- **System Design Alternatives**: Mandating alternative designs for advanced reactors, especially modular systems optimized for specific applications, undermines the efficiency and standardization that these designs rely on. This could hinder the deployment of safe, cost-effective nuclear solutions.

Recommendations

The NRC should consolidate its approach to site, energy, and system design alternatives into either a combined Category 2 issue or designate them as individual Category 1 issues. This would better reflect the specific characteristics and deployment contexts of advanced nuclear technologies.

1. If Combined as a Category 2 Issue:
    a. The NRC would be able to still conduct a more nuanced, context-specific analysis but integrate site, energy, and system design considerations. This approach would streamline reviews while ensuring that key environmental and safety impacts are appropriately addressed.
2. If Designated as Individual Category 1 Issues:
    a. For projects that meet specified criteria (e.g., microreactors, co-located facilities, or advanced modular systems), establish clear guidance exempting them from extensive alternative analyses when their deployment context or design purpose inherently precludes viable alternatives.

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By addressing common issues generically while reserving detailed analysis for site-specific concerns, the NRC achieves a balance between efficient licensing processes and thorough environmental protection. BTI appreciates that the division also undergoes periodic reassessment to incorporate advances in technology and evolving environmental and societal priorities.

4. Scope of Proposed Rule Changes and NR GEIS

a. *Is the applicability of the NR GEIS clear? Do the proposed revisions adequately address all licensing scenarios associated with evaluating the environmental impacts of permitting and licensing new nuclear reactor construction and operation?*

The NR GEIS aims to "improve the efficiency of the NRC staff's environmental review of a new nuclear reactor application by identifying those potential environmental issues that are expected to be common, or generic, to the construction, operation, and decommissioning of many new nuclear reactors."[37] Previously scoped as the "Advanced Nuclear Reactor GEIS," the rule would have been limited in applicability to reactors that fit the definition of "advanced reactor" in the rule. BTI appreciates the shift in scope to a technology-neutral and performance-based approach that leverages broad usability with specific values and assumptions. We support the change to expand the applicability of the GEIS, reflecting the Commission's intent to enhance flexibility and efficiency.[38] This is a significant step toward streamlining the environmental review process for nuclear reactor licensing.

If the draft were overly specific, then applicants would end up with the potential for less regulatory certainty and more regulatory costs as the rule may require applicants to seek exemptions, or the rule may need to be updated in the future to allow for new licensing pathways. Allowing the GEIS to be general in scope will facilitate greater use of the rule and avoid amendments in the long run if and when new rulemakings are finalized. BTI is pleased to see that the NRC has utilized this opportunity to address all *new* commercial nuclear plants in compliance with Commission direction.

Having said that, the NR GEIS has the opportunity to expand the scope past commercial applicants. The draft needs additional clarity to determine the applicability of non-power research and test reactors (RTRs). The Commission did not distinguish between commercial reactors and RTRs when referring to the staff to revise the limited applicability of this GEIS to "any new nuclear reactor application."[39] BTI argues that the NR GEIS should apply to both new commercial reactors and new RTRs. Should proposed RTR facilities and sites meet the determined

[37] See Federal Register Notice, Supplementary Information A. "Purpose of the Regulatory Action," https://www.federalregister.gov/d/2024-22385/p-13

[38] Nuclear Regulatory Commission, Staff Requirements — SECY-21-0098 — Proposed Rule: Advanced Nuclear Reactor Generic Environmental Impact Statement, SRM SECY-21-0098, April 17, 2024, ML24108A200.

[39] Nuclear Regulatory Commission, Staff Requirements — SECY-21-0098 — Proposed Rule: Advanced Nuclear Reactor Generic Environmental Impact Statement, SRM SECY-21-0098, April 17, 2024, ML24108A200.

PPE and SPE values and assumptions in the NR GEIS, the rule should not unnecessarily limit these non-power facilities from utilizing this comprehensive analysis for generic environmental issues. Note existing construction permits and environmental assessments for RTRs where impacts were concluded to be SMALL or displayed findings of no significant impact (FONSI).[40] It is probable that new non-power applications will be submitted to the NRC, and ensuring that the NR GEIS can be used would align with the overarching intent of the rule and expand the effort of performing efficient and consistent environmental reviews.

BTI recommends that the NRC staff make the appropriate revisions to expand the applicability of the draft NR GEIS. By broadening the scope of the GEIS to include RTRs, the NRC will be able to address common environmental issues, eliminate redundant analyses, improve regulatory efficiency, and ensure focused attention on site-specific considerations for new *and* advanced reactors.

5. Guidance for Applicants

a. *Are the methods described in the draft revision to RG 4.2 for demonstrating values and assumptions appropriate?*

At a high level, no, the methods described in the draft revision to RG 4.2 are not entirely appropriate. Changes need to be made to address the issues described in this comment. These changes include (*but are not limited to other potential revisions that may be appropriate depending on how comments on this rulemaking are dispositioned*):[41]

- Section C, VI. Implementation of the LWA Rule — Definition of Construction and Preconstruction
- Chapter 1, 1.2. Description of the Proposed Action and the Purpose and Need
- Chapter 2:
    - 2.7.2. Air Quality
    - 2.7.1. Climate

[40] Nuclear Regulatory Commission, Environmental Impact Statement for the Construction Permit for the Kairos Hermes Test Reactor; Final Report, NUREG-2263, August 2023, ML23214A269; Nuclear Regulatory Commission, Environmental Assessment and Finding of No Significant Impact for the Construction Permits and Environmental Review Exemptions for the Kairos Hermes 2 Test Reactors; Final Report, August 2024, ML24284A191; Nuclear Regulatory Commission, Environmental Assessment for the Construction Permit Application for the Abilene Christian University Molten Salt Research Reactor January 2024, ML23300A053.

[41] The NRC staff should also revise other relevant sections of RG 4.2 not listed here to adequately address the concerns and incorporate the recommendations outlined in this comment.

- Chapter 8. Need for Power
- Chapter 9:
    - 9.1. No-Action Alternative
    - 9.2. Energy Alternatives
    - 9.3.5. Proposed and Alternative Sites
    - 9.4. System Alternatives
- Table C-1-1. Guidance Related to Demonstrating That the Value or Assumption Has Been Met

We believe that clear and practical methods for evaluating PPE and SPE values and assumptions are essential to ensure consistent and efficient licensing processes. Additionally, supporting guidance on the categorization of Category 1 and Category 2 issues must be accurate and aligned with the overarching objectives of the NR GEIS.

Finally, we emphasize that a collaborative, iterative process for refining this guidance based on stakeholder feedback will be critical. This will ensure the guidance is both robust and adaptable to the evolving landscape of nuclear energy deployment, while maintaining the efficiency and effectiveness that the NR GEIS aims to achieve.

6. Limited Work Authorizations

a. *Should the NR GEIS and the rule be expanded to include NRC approval of LWAs for new nuclear reactor applications? Specifically –*
    i. *Should an LWA applicant that demonstrates that its proposed project meets or is bounded by the PPE and SPE values and assumptions for a given Category 1 issue be able to rely on the generic findings for that issue in preparing the environmental report?*
    ii. *Should the NRC be able to rely on the generic findings for that Category 1 issue in preparing its supplemental environmental impact statement?*

The inclusion of LWAs within the GEIS framework is a logical extension, provided that LWA applicants meet or remain within the PPE and SPE bounds. The LWA would, by definition, be a part of the larger project impact and therefore should not exceed it. If the project qualifies to use the NR GEIS, the LWA should as well. The LWA should be tied to a specific project to ensure it is part of the larger environmental review. Allowing LWA applicants to rely on Category 1 findings would reduce redundancies without compromising environmental protections. This approach enhances regulatory certainty and reduces costs, which is particularly valuable for applicants.

A primary concern with incorporating LWAs into the GEIS is that it could permit environmental impacts to occur before a full Environmental Impact Statement (EIS) is finalized—raising the question of whether activities tied to a project without full agency approval should proceed. The answer, in this case, should be yes, for three key reasons. First, sites eligible for LWAs are often already disturbed or permitted for grading and other preparatory activities; they do not need to be pristine, undisturbed greenfields. Second, because an LWA is a subset of the overall project, its environmental impacts are necessarily smaller in scale and remain bounded within those of the full application. Third, the activities and impacts associated with LWAs are well understood, as they align with long-standing practices in early-stage construction for major infrastructure projects.

The final rule should explicitly expand the scope of the NR GEIS to include LWAs, with a clear requirement that applicants demonstrate compliance with the PPE and SPE assumptions. This ensures that LWAs remain integrated into the broader project-specific environmental review and that their impacts are bounded by those already analyzed in the GEIS. Furthermore, where LWA activities align with the PPE and SPE assumptions, the NRC should extend the use of Category 1 findings to supplemental environmental impact statements for such applications. This clarification would not only align with the principles of NEPA but also provide applicants with a more predictable and efficient regulatory pathway.

Conclusion

The NR GEIS represents a well-considered framework for addressing common environmental issues in nuclear reactor licensing. The NRC can further enhance the utility, transparency, and robustness of the NR GEIS as indicated in this commentary. This approach will support the efficient licensing of new nuclear reactors while maintaining rigorous environmental protections.

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Sincerely,

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The Breakthrough Institute