Written Testimony of

Ted Nordhaus

Founder and Executive Director, The Breakthrough Institute

To the U.S. House of Representatives

Committee on Energy and Commerce

Subcommittee on Energy, Climate, and Grid Security

Hearing Entitled:

American Nuclear Energy Expansion: Updating Policies for Efficient, Predictable Licensing and Deployment

July 18, 2023

Thank you for inviting my testimony. My name is Ted Nordhaus, and I am the founder and executive director of the Breakthrough Institute. We are an independent global research center based in Berkeley, California that identifies and promotes technological solutions to environmental and human development challenges. We have, for over a decade, been strong advocates for nuclear energy as a critical environmental technology necessary to effectively address climate change and other environmental and public health challenges.

It is a particular honor for me to testify before this committee because my father, Robert R Nordhaus, served as general counsel to the Commerce Committee in the early 1970's and played a significant role in drafting much of the foundational federal energy and environmental law enacted by this committee during that era, most notably for purposes of this hearing, the Energy Reorganization Act of 1974, which created the Nuclear Regulatory Commission.

Today, the United States faces far different environmental and energy security challenges from the ones that these laws were enacted to address in the early 1970s. In no area is that more clearly the case than America's profoundly outdated approach to the regulation of nuclear energy.

That regulatory framework was developed at a time when far less was known about the public health consequences of either low dose radiation or fossil fuel combustion. America led the world in nuclear energy technology and deployment. And almost no one had heard about the problem of climate change.

Today, our understanding of all of these subjects is quite different. Thanks to decades of nuclear medicine and long term epidemiological studies of subjects exposed to radiation at Hiroshima, Chernobyl, Three Mile Island, nuclear test sites, uranium mines, and nuclear power stations, radiological health is the most widely studied and well understood environmental health exposure in the field of public health. What we know today is that exposure to low doses of radiation is associated with far lower health and mortality consequences than was believed to be the case fifty years ago. So low, in fact, that in most cases, the health effects associated with exposure to low doses of radiation cannot be reliably observed in epidemiological studies.

We also know far more about the health toll associated with using fossil fuels, particularly for marginalized communities that bear a disproportionate share of the public health burden associated with fossil fuel combustion. Conventional air pollution results in 200,000[1] excess deaths annually in the United States. A substantial share of that air pollution emanates from the electricity sector due to our continuing dependence on fossil fuels to power the grid.

[1] Fabio Caiazzo et al., "Air Pollution and Early Deaths in the United States. Part I: Quantifying the Impact of Major Sectors in 2005," Atmospheric Environment 79 (November 1, 2013): 198–208, https://doi.org/10.1016/j.atmosenv.2013.05.081.

In contrast to the early 1970's, the United States has largely ceded its leadership in civilian nuclear energy technology. The two new plants beginning operation in Georgia this year were the first new reactors to begin construction in over 30 years and are the first new reactor designs ever licensed by the NRC in its almost 50 year history to commence commercial operation, a decade behind schedule and billions of dollars over budget. China, during this same period has commercialized multiple new reactor designs, including its first high-temperature gas reactor, and currently has more than 20 new reactors under construction.[2] With the world's largest new build nuclear program,[3] China's nuclear reactor fleet is expected to surpass the United States' as the largest in the world. Russia, meanwhile, has become the world's largest exporter of nuclear energy technology and fuel.

Finally, we know that a warming climate is likely to bring significant human and economic costs to the United States in the coming decades. Limiting warming will require deep cuts in carbon emissions globally over the course of this century.

Taken together, these facts suggest that a major overhaul of US regulation of nuclear energy is long overdue, in order to protect public health, assure America's energy security and global leadership, and address climate change.

Over the 70 year history of commercial nuclear energy generation, accidents resulting in the release of significant amounts of radioactive material have been rare, public exposure to radiation from these events has been vanishingly small, and the public health consequences of these exposures have been non-existent. Yet the NRC continues to regulate commercial nuclear energy as if these events represented existential threats to America's public health. The agency continues to promulgate regulations and licensing determinations that prioritize elimination of infinitesimally low radiation exposure over the deployment and operation of nuclear power plants that have a documented record of both safe, clean operation and displacing the combustion of fossil fuels that emit air pollutants that are far more dangerous.

Despite a clear mandate from Congress, the NRC also appears unprepared to efficiently license a new generation of small, advanced reactors. Regulatory frameworks and practices at the commission are still based upon the large light water reactors (LWR) that constitute the entirety of the US commercial nuclear reactor fleet today. The commission has thus far failed to develop a workable framework for licensing advanced reactors - appropriate for reactor technologies that are typically much smaller than conventional reactors, have far less fissile material in their reactor cores, and utilize fuels and coolants that can accommodate much simpler designs and operate with an even higher margin for safety than today's extremely safe LWRs.

---

[2] IAEA, Power Reactor Information System, Under Construction worldwide as of June 2023, by country. https://pris.iaea.org/pris/worldstatistics/underconstructionreactorsbycountry.aspx

[3] IEA, World Energy Outlook 2022, 2022, https://www.iea.org/reports/world-energy-outlook-2022

As an early proponent within the environmental community of the need to reconsider nuclear energy, it has been heartening to see strong bipartisan action in Congress to commercialize a new generation of advanced reactors in the United States for both domestic use and for export around the world. Congress has put real money on the table, authorized the demonstration of at least two advanced reactors this decade, and directed the NRC to develop a modernized licensing framework for advanced reactors. The Biden administration is now counting heavily on next-generation nuclear technology in order to achieve the commitments it has made in international climate negotiations over the last two years. And particularly in the wake of Russia's invasion of Ukraine last year, US allies around the world, most especially in Eastern Europe, are lining up to import new US nuclear technology to assure their energy security, if we can license and commercialize it.

But if there is one critical point that I hope that this committee will take away from my testimony today, it is that none of these initiatives can succeed if we don't fix the Nuclear Regulatory Commission.

There are other critical challenges that the US nuclear sector will need to address. These include the need to develop a domestic fuel source for advanced reactors, the need for a streamlined process for permitting and siting new reactors, and the need for the nuclear industry to reinvent itself as an innovative technology sector, able to compete in both domestic and global energy markets that are vastly different than those of the 1960s and 70s.

But the development of a rational and efficient framework for regulating advanced nuclear reactors - one that recognizes the benefits of nuclear energy to the public welfare, grounds regulatory standards in epidemiologically sound public health science, and can accommodate advanced reactor technologies that are fundamentally different from those that the agency is accustomed to regulating - is a precondition for solving any of those further challenges.

Developing an innovative next-generation nuclear sector to meet our domestic energy needs and for export to our allies around the world will require licensing not just a handful, but on the order of hundreds of new reactors (Table 1).[4] Our modeling demonstrates that even at relatively high initial costs, the US power sector will see substantial growth in new nuclear generation if advanced reactors are available over the coming decades, as the power sector shifts from coal and gas generation to a grid that is predominantly powered by renewable sources and advanced reactors.

[4] Stein, Adam et.al, "Advancing Nuclear Energy:Evaluating Deployment, Investment, and Impact in America's Clean Energy Future", Breakthrough Institute, 2022. https://thebreakthrough.org/articles/advancing-nuclear-energy-report

Table 1. Range of advanced nuclear reactors deployed by date across all scenarios.[5]

Year	Total Number of Advanced Reactors
2035	59-260
2040	152-939
2050	560-3,415

That, in turn, will require a paradigm shift in how the regulatory process works, not minor efficiency improvements that tiptoe around fixing problems that have been endemic to US nuclear licensing and regulation for a generation.

We are pleased to see continuing interest in both chambers of Congress to take further action to modernize nuclear licensing and regulation. The ADVANCE Act, which recently passed out of the Senate Environment and Public Works Committee, would take important steps to reduce licensing fees for advanced reactor developers, improve the NRC's workforce recruitment and retention, extend the Price-Anderson Act, and incentivize development of advanced reactor designs. This committee has recently introduced a number of important proposals to take similar action on the House side.

There is an urgent need, however, for Congress to take further action to better align the NRC's licensing and regulatory standards and practices with the nation's environmental, energy security, geopolitic, and economic interests. Critically, we would urge this committee to consider the following steps to assure that the NRC is prepared to license a new generation of globally competitive and economically viable advanced reactors.

1. Clarify the NRC's Mission

There is a long-standing myth that Congress created the NRC with the explicit intent that it regulate nuclear safety with no consideration of the benefits of nuclear energy. There is no statutory basis for this claim. The NRC's licensing and regulatory authority derives from the Atomic Energy Act of 1954, which established the mission and legal mandate of the NRC's predecessor, the Atomic Energy Commission.[6] Specifically, the Act states the following[7]:

[5] Stein, Adam et.al, "Advancing Nuclear Energy:Evaluating Deployment, Investment, and Impact in America's Clean Energy Future", Breakthrough Institute, 2022. https://thebreakthrough.org/articles/advancing-nuclear-energy-report

[6] The Energy Reorganization Act of 1974 (P.L. 93–438) divided the powers of the AEC: the "licensing and related regulatory functions" were passed down to the NRC (Sec. 2(c)) and the other powers including promotion of nuclear power were given to a different agency which later became the Department of Energy.

[7] Atomic Energy Act of 1954 (P.L. 83–703) (Sec. 1)

> *Atomic energy is capable of application for peaceful as well as military purposes. It is therefore declared to be the policy of the United States that–*
>
> *a. the development, use, and control of atomic energy shall be directed so as to make the maximum contribution to the general welfare, subject at all times to the paramount objective of making the maximum contribution to the common defense and security; and*
>
> *b. the development, use, and control of atomic energy shall be directed so as to promote world peace, improve the general welfare, increase the standard of living, and strengthen free competition in private enterprise.*

The Energy Reorganization Act of 1974 divided the AEC's responsibilities, situating its "licensing and related regulatory functions" with the newly created NRC while delegating its oversight and operation of national laboratories, nuclear weapons manufacturing facilities, and other research and promotional activities to what would become the Department of Energy.

Nowhere in the Energy Reorganization Act of 1974, however, did Congress suggest that the NRC's sole responsibility was to regulate nuclear safety at the plant level. To the contrary, The Energy Reorganization Act of 1974 largely restates the broader mission and mandate defined in the earlier Atomic Energy Act, stating[8]:

> *The Congress hereby declares that the general welfare and the common defense and security require effective action to develop, and increase the efficiency and reliability of use of, all energy sources to meet the needs of present and future generations, to increase the productivity of the national economy and strengthen its position in regard to international trade, to make the Nation self-sufficient in energy, to advance the goals of restoring, protecting, and enhancing environmental quality, and to assure public health and safety.*

Despite this broad mandate for the benefit of the nation, the NRC has interpreted its mission far more narrowly, focused entirely upon regulating "the Nation's civilian use of radioactive materials to provide reasonable assurance of adequate protection of public health and safety and to promote the common defense and security and to protect the environment."[9] As a result, the NRC limits its regulatory and licensing activities to consideration of potential negative public health impacts of using nuclear energy without any consideration of the consequences to public health and safety of not using nuclear energy.

In its safety goal policy,[10] the NRC does recognize that nuclear energy risks should be considered relative to other energy sources. However, the NRC does not actually account for the

---

[8] Energy Reorganization Act of 1974 (P.L. 93–438) Sec. 2(a).

[9] "About NRC." NRC Web. https://www.nrc.gov/about-nrc.html

[10] The NRC's top line Safety Goal is that, "Societal risks to life and health from nuclear power plant operation should be comparable to or less than the risks of generating electricity by viable competing technologies and should not be a significant addition to other societal risks" https://www.nrc.gov/reading-rm/doc-collections/commission/policy/51fr30028.pdf

comparative risks of alternative energy sources in any way in its actual decision-making and, to the contrary, consistently applies regulatory standards to commercial nuclear reactors that are significantly stricter and less risk tolerant than those applied to any other source of energy.

As a result, the NRC has for decades endeavored to regulate nuclear risk and uncertainty as close to zero as possible, with no consideration of the cost to nuclear developers and operators of doing so or the environmental, public health, energy security, or economic consequences of not building and operating nuclear energy plants. No other environmental, public health, or safety regulator in the United States takes a similar approach, for the simple reason that limiting the purview of regulators in this way predictably results in regulation that reduces rather than improves public health and safety.

To assure that the NRC is prepared to license and regulate advanced reactors consistent with the national interest, Congress should amend Section 202 of the Energy Reorganization Act of 1974 to make it explicitly clear that the NRC mandate is in line with the overall objective of the Act and should further amend that mandate to encompass reducing the overall public health burden and carbon intensity of the electricity system. Such an amendment would reaffirm the NRC's responsibility to consider a broader range of factors, including the costs and benefits of regulatory actions on society,[11,12] and the consequences of impeding nuclear deployment. By aligning the NRC's mission with our national objectives, we can empower the agency to make informed decisions that broadly benefit public health, safety, and the environment.

2. Ground NRC Public Health Standards in Epidemiologically Observable Metrics and Harmonize Them With EPA Air Toxic Standards, as Congress Expected

The NRC, through its Quantitative Health Objectives (QHO),[13] As Low As Reasonably Achievable (ALARA) approach, proposed Alternative Evaluation of Risk Insights (AERI),[14] and other radiological dose limits, sets radiological health thresholds and standards for both normal operations and rare design basis accidents. These standards are so low as to be entirely theoretical - meaning that health consequences associated with these exposures would not be statistically observable in a large exposed population,[15] even over many decades - and are far

[11] Additional examples of federal agency missions have been compiled here: https://thebreakthrough.imgix.net/Agency-Mission_Vision-Statements.pdf

[12] The Environmental Protection Agency (EPA) considers the broad impacts to society, economics relative to the regulation, and available technology, not just the cost to reduce the exposure.

[13] Stein, Adam, "Quantitative Health Objectives in a Performance-Based Regulation", Breakthrough Institute, January 2022. https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML22038A112

[14] Smith, Charlyne, Stein, Adam, Flaws with the Alternative Evaluation of Risk Insights (AERI), Breakthrough Institute, 2022. https://thebreakthrough.imgix.net/AERI-whitepaper-2.pdf

[15] Stein, Adam, "Quantitative Health Objectives in a Performance-Based Regulation", Breakthrough Institute, January 2022. https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML22038A112

stricter than those enforced for pollutants associated with similar energy production and industrial activities by the Environmental Protection Agency (EPA).

Since the 1970s for criteria air pollutants and the 1980s for air toxics, the EPA has enforced air pollution standards related to fossil fuel combustion. In a recently published working paper[16] comparing the underlying latent cancer risk upon which these standards are based, we conclude that the EPA's air toxics regulations are significantly less stringent than those enforced by the NRC. In fact, the NRC applies more stringent standards for rare, worst-case accidents than does the EPA's for steady-state everyday operation of regulated facilities.

The result, insofar as NRC health standards have significantly constrained or increased the costs of licensing, building, and operating nuclear power plants, as much evidence suggests they have, has been to propagate, rather than reduce, the public health burden associated with the US energy system.

The enforcement of different standards for toxic air pollutants by EPA and NRC is clearly inconsistent with Congressional expectations. Congress included ionizing radiation as a regulated pollutant under Section 112 of the 1990 amendments to the Clean Air Act, explicitly endorsed the EPA's approach to defining "an ample margin of safety to protect public health," and explicitly established that the EPA standard would be the controlling authority for all sources of such radiation—including nuclear power plants—unless EPA could certify that NRC regulations regarding the release of ionizing radiation could comply with the EPA's "ample margin" standard.

Because NRC standards are so much lower than EPA standards, EPA has certified that NRC regulations comply with requirements stipulated in Section 112. But it is clear from the statute and legislative history that Congress intended EPA's Section 112 approach to be the yardstick for regulation of radiation from nuclear power plants—not that the NRC would impose standards far more restrictive.

The expectation from Congress that the EPA and NRC harmonize their approach to regulating toxic air pollutants was well considered. The failure to harmonize environmental health standards across energy sources that are highly substitutable has resulted in significant excess mortality and illness over recent decades, both due to the closure of existing nuclear plants and the failure to build new ones.

Congress would be well advised to establish explicitly that the NRC should not establish or enforce health standards that deviate significantly from those that the EPA enforces for alternative sources of energy, consistent with Congressional intent in the 1990 amendments to the Clean Air Act under Section 112. Congress should also consider explicitly defining a

[16] Stein, A., et. al., "Comparing the NRC's Risk Regulatory Regime for Reactors with the EPA's Risk Regulatory Regime for Sources of Toxic Air Pollutants", Breakthrough Institute, July 2023. https://thebreakthrough.org/articles/comparing-the-nrc-and-epa-risk-regulatory-regime

threshold for radiological risks associated with licensing advanced nuclear reactors. This threshold should be based on observable negative health consequences within the population surrounding the facility. For example, such a threshold could be the following:

> *The threshold is defined as negative health consequences as a result of the operation of a nuclear power facility that would be epidemiologically observable in the population in the vicinity of the facility.*

3. Clarify Congressional Expectations With Regard to Implementation of NEIMA

The Part 53 rulemaking is a crucial component of the Nuclear Energy Innovation and Modernization Act (NEIMA), which calls for the development of a modernized, risk-informed, and performance-based license framework for advanced nuclear reactors. At present, the Part 53 rulemaking, pursuant to Congressional direction in NEIMA to develop a modernized licensing framework for licensing of advanced nuclear reactors, has been conveyed to the Commission by the NRC staff.

Indications from public remarks by the Commissioners suggest that the Part 53 rulemaking is on track and on schedule. However, the NRC staff draft[17] raises serious questions[18] as to the ability of the NRC to meet the Congressional mandate under NEIMA to develop a modernized, risk-informed, and performance-based license framework for advanced nuclear reactors.

The proposed Part 53 draft includes the codification of risk standards such as QHOs, ALARA, and AERI that establish regulatory dose limits that provide no observable health benefit to the public.[19] and, in the case of AERI, require assumptions regarding the frequency of design basis accidents and the demographics of exposed populations that are, at best, highly improbable.

Moreover, the proposed rules largely maintain the current prescriptive and deterministic licensing paradigm, limiting flexibility to use alternative analytical and regulatory tools appropriate to the wide range of new nuclear technologies seeking regulatory approval and hindering the path to timely commercialization of advanced nuclear reactors. In fact, most advanced reactor developers have expressed their reluctance to utilize Part 53 as proposed for licensing their technology.

---

[17] NRC. "SECY-23-0021: Proposed Rule: Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors" ADAMS Accession number: ML21162A093 (hereinafter, the Proposed Part 53 Rule). accessed here: https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21162A093

[18] "Review of the Draft Proposed Part 53 Rule Language", Breakthrough Institute, 2022. https://thebreakthrough.imgix.net/Whitepaper-Review-of-draft-Part-53-package-Dec-2022.pdf

[19] Letter from NEI/USNIC to NRC's Executive Director for Operations, Dan Dorman, re: "Comprehensive Industry Comments on the NRC's Rulemaking on, Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors" November 21, 2021, (RIN-3150-AK31; NRC-2019-0062).

Congress can play a vital role in reinforcing the intent of NEIMA by making amendments to the legislation. For instance, NEIMA currently instructs the NRC to employ risk-informed and performance-based techniques "where appropriate." Congress should consider directing the NRC to use these methods "to the maximum extent possible."[20] This amendment would more clearly establish that the new framework for advanced reactors should differ from the prescriptive frameworks used for LWRs, ensuring flexibility and proper consideration of risks. Congress should also reinforce that previous and ongoing efforts by public stakeholders should be considered and incorporated into the final rule.

4. Enabling On-The-Go Innovation

Additionally, there is a pressing need to address the challenge of enabling rapid innovation in the nuclear industry. The current licensing process, particularly the Licensing Amendment Request (LAR) process under 10 CFR Parts 50/52, is ill-suited for the iterative innovation required for advanced reactors. If a licensee needs to make changes to their existing license, a LAR is required. It is the traditional route to regulatory approval of changes in plant design and/or operation.

Although the LAR process is well defined under Part 50, the regulatory framework is not technology-inclusive and was drafted with large LWRs in mind. By contrast, advanced reactors are expected to utilize a factory production model where several reactors are in process at a time and innovation can be applied as needs arise. Due to the nature and characteristics of these newer reactor designs, rapid innovation is necessary and anticipated. The lengthy and expensive nature of the LAR process is likely to deter developers from making non-safety-significant advancements, hindering the progress of advanced reactor technologies. A LAR does not appropriately provide a streamlined pathway for license amendments since it is not only expensive but can also take up to two years[21] to gain approval from the NRC. As a result, the LAR process as written is not aligned with NEIMA and can disincentivize iterative innovation of non-safety-significant components in advanced reactors.

To overcome these challenges, Congress should direct the NRC to expect rapid innovation and develop a more streamlined amendment process that aligns with NEIMA. The NRC needs to prepare for on-the-go innovation after a design is approved, especially for newer advanced reactors that are widely scalable due to their factory-built characteristics.

---

[20] For example, see NEIMA, Public Law 115-439, Sec. 3 (14): “The term ‘technology-inclusive regulatory framework’ means a regulatory framework developed using methods of evaluation that are flexible and practicable for application to a variety of reactor technologies, including, where appropriate, the use of risk-informed and performance-based techniques and other tools and methods.” Emphasis added.

[21] “Generic Milestone Schedules of Requested Activities of the Commission.” NRC Web, https://www.nrc.gov/about-nrc/generic-schedules.html.

5. Modernization of Environmental Reviews

Successfully licensing, commercializing, and scaling up a new generation of advanced reactors will require significant improvements to the NRC's current processes for complying with requirements under the National Environmental Policy Act. Current NRC process for environmental hearings is an outlier among federal agencies. For major federal actions requiring an EIS, federal agencies typically conduct scoping, provide public notice and comment on the draft EIS, review and respond to comments, and then issue a final EIS. The NRC's process goes a step further by allowing trial-type hearings where third parties can challenge safety and NEPA issues before an Atomic Safety and Licensing Board. These hearings are often misused by intervenors to delay or derail new nuclear projects.

Using the current process, contentions may be raised after the final Environmental Impact Statement (EIS) is issued. Consequently, the issues raised and fully addressed during the public comment process for the draft EIS also may be (and often are) raised again during these proceedings. Substantial applicant and agency resources are required just to address the admissibility of those contentions. The entire process can take many months (sometimes years) to complete and unnecessarily complicates/extends the NEPA review process. Because these issues were already addressed during the earlier process, the additional time does not result in additional benefits. Notably, this is the process that recently resulted in the roll-back of subsequent license renewals for several existing plants.

The NRC also overutilizes Environmental Impact Statements (EIS) when less resource-intensive Environmental Assessments (EA) will often suffice. In addition to other changes to NEPA, the recently passed Fiscal Responsibility Act of 2023 has directed federal agencies to utilize Environmental Assessments (EAs) instead of the more resource-intensive Environmental Impact Statements (EISs) whenever possible.[22] This recognizes the fact that, while EISs are essential for assessing significant environmental impacts, it is crucial to consider the appropriateness of conducting an EA as an initial step. Unless significant impacts from the project are strongly expected, NEPA reviews should start with an EA and move to an EIS only if a finding of medium impact or greater is determined.[23]

This practice is particularly problematic as the NRC prepares to license a new generation of advanced reactors that are much smaller and will often be manufactured entirely, or in significant

[22] Public Law No: 118-5.Sec. 321.

[23] Reducing the use of unnecessary EIS's saves both time and money for all parties. For example, NASA's Radioisotope Power Systems (RPS) Program specified that the NEPA process for its missions would start with an EA, when it previously automatically began with an EIS, and they implemented a programmatic NEPA approach. These two changes could result in "NEPA process costs of $50K as opposed to $2M." For more information see: Eppig, Bethany et al. "NASA's Approach to Nuclear National Environmental Policy Act Compliance." Nuclear and Emerging Technologies for Space Lightening Talks, 2021. https://nets2021.ornl.gov/wp-content/uploads/2021/08/Lightening-Talks.pdf

part, offsite. Presently, the NRC considers the licensing of a new reactor to be a "major action" that requires a full EIS under 10 CFR § 51.20:

> *The following types of actions require an environmental impact statement or a supplement to an environmental impact statement … Issuance or renewal of a full power or design capacity license to operate a nuclear power reactor, testing facility, or fuel reprocessing plant…*

This decision was made with large LWRs in mind and will often not be the case for advanced reactors, which in many cases will be far smaller, and thus will have less impact on the environment.

To address these challenges, Congress should direct the NRC to modify its procedures to align with other agencies by allowing the existing notice and comment provisions for an EIS to simultaneously serve as an "informal" hearing under the Administrative Procedures Act. This approach, widely accepted and understood among other federal agencies, would fulfill any hearing requirement without providing an additional redundant opportunity to essentially "re-adjudicate" NEPA issues in front of an administrative judge.

Importantly, the informal process provides a more accessible pathway for the public to raise legitimate concerns, while limiting opportunities for unproductive interventions aimed at delaying and derailing projects. A limited scope rulemaking to revise 10 CFR Parts 2 and 51 would be appropriate to avoid undesired out-of-scope revisions.[24]

Alternatively, the NRC could limit the hearing process rather than removing it altogether. This could involve reducing the time available for filing complaints or interventions and restricting participation to those who have already participated in the public comment process.

To address the overuse of environmental impact statements, Congress should instruct the NRC to remove the licensing of new reactors from the list of actions requiring an EIS. Instead, the level of environmental evaluation should be determined on a case-by-case basis, allowing for a more tailored approach that considers the specific characteristics of each reactor. Unless significant impacts from the project are strongly expected, NEPA reviews should start with an EA and move to an EIS only if a finding of medium impact or greater is determined. While recent amendments to NEPA are already in effect, without further direction from Congress to promptly implement these changes, the NRC may take years to start the rulemaking process to revise existing regulations and guidance.

6. Modernization of NRC's Fee Structure

[24] For more information see: O'Neill, Martin J. (2021). Forging a clear path for advanced reactor licensing in the United States: Approaches to streamlining the NRC environmental review process. Nuclear Law Bulletin No. 105. Volume 2020/2 at p. 43-45. Accessible at: https://www.oecd-nea.org/upload/docs/application/pdf/2021-05/7534_nlb_105.pdf

We must also address the need for modernizing the Nuclear Regulatory Commission's (NRC) fee structure. Currently, licensees and applicants contribute approximately 90% of the NRC's budget through fees based in part on staff hours spent reviewing applications.[25] Licensees are unable to dispute the hourly rates or estimation of staff hours necessary to review an application, and there is no recourse if a review exceeds that estimate. Reviews can take upwards of 18,000 hours even for small reactors. Although nuclear reactors used to be built by established conglomerates that could afford those costs, many of today's developers of advanced reactors are start-ups that are less equipped to bear the extra expenses.

Congress should direct the NRC to adopt a fee structure that will better enable innovation and support a diverse range of reactor developers. The recently introduced ADVANCE Act[26] offers a promising starting point for reforming the NRC's fee structure, but further amendments may be necessary to address the challenges at hand. One recommendation is to reduce the percentage of fees the agency must recover from applicants, which would help reduce the burden on both applicants and staff, and balance this relationship. Another recommendation is to defer NRC fees until after an applicant has obtained a license and the ability to generate revenue from sales. In the meantime, the NRC could recover its real-time costs through a small rolling fund initially seeded by the government. This approach would ensure that license applications are not solely limited to large corporations or utilities, removing barriers to rapid deployment.

Moreover, we propose implementing a cost cap on the review of accepted applications, with costs exceeding the cap covered by Congressional appropriations. This cap would be determined based on recent NRC review schedules. This would incentivize the NRC to issue timely license decisions while maintaining sufficient flexibility to protect public safety. Several agencies already utilize a flat fee system for licensing or certification. Implementing these changes may necessitate an increase in the NRC's overall resources and staff capacity.

7. Modernizing the Role of the Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards (ACRS) is an independent committee formed to review safety studies and facility license applications on a request basis from the Commission.[27] However, the ACRS's role is evolving into a committee that reviews all license applications in the queue. Even now, their review schedule is typically full despite having only one application in process at a time. With the expected influx of applications over the next few years, the ACRS could potentially impede the licensing process by becoming a bottleneck.

---

[25] For Fiscal Year 2023, the NRC's professional hourly rate is $300 an hour, 88 FR 39120, 39122.

[26] "Capito, Carper, Whitehouse Introduce Bipartisan Nuclear Energy Bill, the Advance Act." U.S. Senate Committee on Environment and Public Works, April 3, 2023. https://www.epw.senate.gov/public/index.cfm/2023/4/capito-carper-whitehouse-introduce-bipartisan-nuclear-energy-bill-the-advance-act.

[27] See the ACRS Charter: https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20337A117

To address this issue, we recommend that Congress request a report from the Commission on the function of the ACRS. This report should evaluate the committee's potential limitations, opportunities for increased efficiency, and provide recommendations to rectify these limitations while improving licensing efficiency. Additionally, the Atomic Energy Act should be amended to remove the requirement for the ACRS to review all construction permit and operating license applications. Instead, the ACRS should focus on novel and safety-significant issues.

8. Extension of the Price-Anderson Act

Price-Anderson requires the industry to maintain substantial insurance to cover the costs of an accident with offsite consequences and provides a backstop where the government would provide coverage in excess of the insurance. Though a step in the right direction, the recently introduced ADVANCE Act only grants a 20-year extension, which is halfway through the reactor licensing period under the provisions of the Price-Anderson Act. A longer extension of the Price-Anderson Act would provide assurance to potential investors and developers that reauthorization will not be a future barrier to starting a new project.

To provide market certainty and encourage investments in new projects, we urge Congress to extend the Price-Anderson Act for 40 years, the typical reactor licensing period.

9. Fuel Availability, Spent Fuel Reprocessing, and/or Disposal

A. High Assay Low-Enriched Uranium

The availability and security of domestic high assay low-enriched uranium (HALEU) fuel is a critical concern due to reliance on foreign resources, particularly in light of the Russian invasion of Ukraine. Access to reliable domestic HALEU is essential for deploying new and advanced reactors in the United States, strengthening our national security.

Congress should support funding initiatives to secure domestic fuel availability separate from foreign sources. This would require rapid scaling up of production capabilities within the United States and, if feasible, in collaboration with our allies.

10. Improving Public Engagement

Some parties have suggested that the NRC should establish a new office in charge of community engagement to aid the agency in its public outreach, as has been proposed in the NRC Office of Public Engagement and Participation Act of 2022. We strongly support efforts to improve public engagement and participation in NRC proceedings. However we are not sure that a new office within the NRC is the right way to accomplish this objective.

Placing these responsibilities in a new office or division risks stovepiping them, rather than internalizing better and consistent public engagement practices in the NRC's present departments. The idea of establishing a dedicated office for these activities within the NRC is largely modeled on a similar office established by the Federal Energy Regulatory Commission (FERC) two years ago. However this office is new so it is difficult at this point to determine whether it has been successful, much less whether this approach, drawn from utility rate proceedings, is an appropriate model for assuring adequate public engagement in nuclear licensing, regulatory, or siting proceedings.

For these reasons, we believe that replicating the FERC model at the NRC is premature. In the meantime, there are far more straightforward steps that the NRC could take to improve public participation. Over the last several years, we believe that we have engaged NRC public proceedings more frequently than any other civil society based public interest organization. Based upon those experiences, we believe that resources intended to improve public participation at the NRC might be best spent at this time in a number of important ways. These include improving the NRC's ADAMS system, which is currently unnavigable for anyone not deeply familiar with its use. Public noticing practices are also highly inconsistent across departments and even individual licensing proceedings, as are instructions as to how to obtain access to public meetings, and the manner in which meetings are supported and can be accessed remotely.

To improve public participation, Congress should direct the NRC to revamp the ADAMS system in a manner that is straightforward and intuitive for the public to navigate and establish consistent public noticing and meeting practices across all of its departments and proceedings, and provide NRC with adequate budget resources to do so.

11. Conclusion

Leadership in new nuclear technologies has enormous potential for America's energy future. Advanced nuclear reactors offer a range of benefits, such as versatility, reliability, efficiency, and scalability, making significant contributions to energy reliability, public health, and climate mitigation goals. To fully realize these benefits and maintain our position in the international nuclear market, increased investment and policy support are essential.

Congress has taken important steps by passing the Nuclear Energy Innovation and Modernization Act (NEIMA) in 2019 to modernize regulations and support advanced reactor deployment. However, further action is needed to ensure proper implementation and alignment with NEIMA. The hesitance or resistance from the Nuclear Regulatory Commission (NRC) to adapt agency practices highlights the importance of additional policy support to facilitate NRC modernization.

As a prominent public interest organization in the nuclear regulatory field, the Breakthrough Institute has identified key regulatory challenges inhibiting progress in licensing and regulating advanced nuclear technologies.

It is crucial for the NRC to recognize its full mandate and consider factors beyond nuclear safety during the licensing process. Addressing issues related to risk tolerance, fee structures, the Advisory Committee on Reactor Safeguards (ACRS), staffing needs, market uncertainty, fuel supply, and spent fuel management are all critical for the successful deployment of advanced reactors.

The Nuclear Regulatory Commission plays a pivotal role in driving rapid decarbonization, enhancing energy infrastructure security, and supporting the growth of advanced nuclear technologies. By addressing the identified challenges and implementing necessary adjustments, the NRC can become a global model for effective and efficient regulation. Continued collaboration among Congress, regulatory agencies, the nuclear industry and civil society representatives is crucial to unlock the full potential of advanced nuclear technologies, leading us towards a cleaner and more secure energy future.