

2023 NRC Reform Recommendations

Discussion Draft



Authors:

Patrick White, NIA

Judi Greenwald, NIA

Acknowledgements:

This discussion draft is the product of analysis, discussions, feedback, and iteration with advanced reactor developers, non-governmental organizations, and other stakeholders. These draft Nuclear Regulatory Commission (NRC) reform recommendations are intended to serve as a common basis for stakeholder engagement and discussion with policymakers. This discussion draft will be updated based on continued input and feedback from policymakers and stakeholders on how to improve advanced reactor licensing at the NRC.

Please contact Patrick White (pwhite@nuclearinnovationalliance.org) with questions, comments, and feedback on this discussion draft.

February 2023

© 2023 Nuclear Innovation Alliance, All Rights Reserved

These draft Nuclear Regulatory Commission (NRC) reform recommendations are intended to serve as a common basis for stakeholder engagement and discussion with policymakers during the 118th Congress (2023 - 2024). This discussion draft will be updated based on continued input and feedback from policymakers and stakeholders on how to improve advanced reactor licensing at the NRC.

The NRC will play a critical role in the development and deployment of advanced nuclear energy. More than a dozen advanced reactor companies are engaging with the NRC on various stages of pre-application interaction, application review, or construction oversight in 2023, with the number of applications expected to grow significantly over the course of this decade. The NRC will need to license hundreds of new reactors in the next two decades for advanced nuclear energy to make a significant contribution as a climate and energy solution in the United States. Effective NRC licensing and regulation in the next several years for the first-of-a-kind reactors and over the coming decade for subsequent deployments will be critical to the successful commercialization of advanced nuclear energy.

The NRC already values independence, openness, efficiency, clarity, and reliability as “Principles of Good Regulation,” but these values alone may not be sufficient to enable deployment of advanced nuclear energy at the scale and pace essential to combat the climate crisis. The NRC prides itself as a continuously learning organization and should be intrinsically motivated to improve the NRC’s capacity, capabilities, and processes as a modern regulator that can effectively license novel advanced reactor technologies.

For the purposes of this paper, effective licensing is generally defined as licensing processes that are:

- mission-focused (fulfilling the NRC’s stated mission to protect public health and safety, to promote the common defense and security, and to protect the environment)
- timely (providing licensing decisions on a timeline that facilitates commercial deployment),
- cost-effective (avoiding excessive staff or applicant costs to resolve application questions),
- efficient (making best use of staff and applicant time and personnel resources),
- predictable (meeting established applicant expectations for duration, cost, and requirements for both one-time and repeatable licensing processes),
- transparent (ensuring applicant, public understanding of regulatory processes and information)

Enabling effective licensing and regulation for advanced reactors would help transition the NRC into an innovative regulator that incorporates the importance of climate change into its core regulatory mission.

There is increasing interest from policymakers to resolve any actual and perceived barriers to the effective licensing and regulation of advanced reactors using existing processes. Both federally and privately supported advanced reactor development projects have targeted reactor operation by the end of this decade, with some developers targeting deployment in the next 5 to 10 years (e.g., TerraPower, X-energy, Kairos, Oklo, NuScale, GE Hitachi, BWXT, Westinghouse, Holtec, and USNC).

In response to this interest, NIA sought input from many stakeholders on their perspective on advanced reactor licensing activities at the NRC and potential barriers to advanced reactor licensing at the NRC. NIA has developed draft policy reform recommendations to address these barriers, specifically identifying actions that could be taken by NRC management, NRC Commissioners, and Congress to increase the effectiveness of advanced reactor licensing. NIA continues to seek input from policymakers and other stakeholders on the potential to improve advanced reactor licensing at the NRC.

Four barriers were identified as cross-cutting challenges to the efficient and effective licensing of advanced reactors by the NRC:

- Challenges to hiring, training, and retaining qualified staff and management with technical and project management expertise necessary to lead licensing reviews of advanced reactors
- Insufficient accountability for NRC staff in terms of schedule, breadth of scope, depth of review, or regulatory basis for technical and environmental reviews of advanced reactors
- Inadequate support and prioritization of innovative practices or processes for reviews, licensing, communication, and management
- Inconsistent stakeholder understanding and trust in the regulatory process

Potential policy solutions for each of these cross-cutting barriers are described below based on the roles that NRC management, NRC Commissioners, and Congress can play in making advanced reactor licensing more effective. Table 1 summarizes highest-priority reform recommendations for NRC management, NRC Commissioners, and Congress for the three cross-cutting licensing barriers. This table provides a summary of the set of policy solutions that could have the greatest impact on the effective licensing of advanced nuclear reactors by the NRC.

Additional barriers and policy solutions were identified as part of NIA's initial stakeholder outreach process. The complete set of identified barriers and potential policy solutions are provided in Appendix A to this white paper.

In considering and implementing each solution outlined in this paper, it is important to keep the end in mind. Each solution addresses one or more of the following objectives for improving the NRC and making the licensing processes for advanced reactor licensing more effective: mission-focused, timely, cost-effective, efficient, predictable, and transparent.

Adapting existing and developing new processes within the NRC's existing statutory mandate and regulatory frameworks provides the greatest likelihood of successful licensing of advanced reactors in the near term. While major legislative pathways such as new legislation may provide an opportunity for major regulatory, organizational or process changes, these solutions may inadvertently slow down near-term advanced reactor licensing processes or increase applicant uncertainty regarding project cost, timelines, and outcomes. Thus, it is important to ensure that we work on near, medium, and long-term improvements in parallel.

This paper highlights that there are many challenges to advanced reactor licensing that can be addressed by NRC management, NRC Commissioners, and Congress. Congress can play a critical role in reducing or eliminating challenges to the effective licensing and regulation of advanced reactors. Congressional funding for advanced reactor licensing programs and additional authorizations can provide the NRC the resources and tools it needs to accelerate advanced reactor licensing. Congressional oversight will also be invaluable to holding NRC Commissioners and senior management accountable for improvements to licensing processes. In other cases, additional Congressional legislative direction may be an effective method to prompt and guide agency changes.

An on-going dialogue among NRC, Congress, industry, and other stakeholders is critical to assessing how to best shape the NRC into a more effective regulatory agency that can enable the safe deployment of advanced nuclear energy in the public interest.

Table 1. Prioritized NRC Reform Recommendations

<i>Barrier</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
Challenges to hiring, training, and retaining staff and management with technical and project management expertise necessary to lead licensing reviews of advanced reactors	1. Take advantage of existing hiring flexibility to recruit top-tier technical staff and management.	1. Reemphasize agency role in enabling clean energy deployment and enable benefits of nuclear technology outlined in Energy Reorganization Act of 1974 by refocusing or clarifying the NRC mission. This could help increase staff retention by fostering a proactive rather than reactive agency mission and would not require the NRC act in a promotional role for advanced nuclear energy. ¹	1. Establish Blue Ribbon Committee to conduct a one-year review and audit of NRC effectiveness, agency culture, and organizational structure including staff, management, Office of General Counsel, and the Commission. Committee Members should include former NRC staff, management, and senior leadership as well as experts from other regulatory organizations.
Insufficient accountability for NRC staff in terms of schedule, breadth of scope, depth of review, or regulatory basis for technical and environmental reviews of advanced reactors	1. Have senior management hold middle management and staff accountable for completing reviews and reaching conclusions on safety. 2. Prioritize efficiency and effective regulation within employee performance reviews.	1. Prioritize project management training and peer learning for NRC staff and development of technical support for Project Managers and senior leadership. 2. Create a formal process for applicants and licensees to certify questions of regulatory scope and process and interpretation of applicable law directly to the	1. Blue Ribbon Committee review and audit of NRC effectiveness (see recommendation above). 2. Increase or modify NRC off-fee funding to enable greater project management training for NRC staff and management (appropriations required) . 3. Reform NRC fee recovery model for advanced reactor licensing to

¹ The NRC’s mission is currently stated as “The NRC licenses and regulates 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”

<i>Barrier</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
	<p>3. Re-introduce servant leader training as earlier implemented at NRC².</p> <p>4. Explore implementation of industry project management tools and management best practices for application reviews.</p>	<p>Commission or an administrative judge (AJ).</p> <p>3. Assess and clarify the current role and responsibilities of the Office of General Counsel (OGC) in licensing reviews, rulemaking, and other regulatory determinations.</p>	<p>enable more effective NRC budgeting and planning. This change would facilitate support for cross-cutting policy, process, and project management improvements for advanced reactors (appropriations and potentially authorization changes required).</p> <p>4. Move more activities off-fee to reduce burden on applicants and increase flexible appropriations to increase NRC's ability to respond to specific challenges for novel nuclear technologies and activities (appropriations and potentially authorization changes required).</p>
Inadequate support and prioritization of innovative practices or processes for reviews, licensing, communication, and management	1. Engage with FAA and FDA to share lessons learned across federal technology licensing processes.	<p>1. Create a new internal group at NRC focused on the development and implementation of regulatory innovation including reporting requirements on steps taken to incorporate innovative approaches into agency licensing.</p> <p>2. Create an external advisory group, like the Nuclear Energy Advisory Committee or Civil</p>	1. Provide off-fee funding to expand and accelerate future focused research at the NRC to support the development of regulatory processes that can enable industry to utilize new or novel technologies while the NRC can still meet its public health and safety mission (appropriations required).

² NRC achieved top rankings in 2008-2009 during a multi-year period when training on servant leadership was being provided by Enlightened Leadership Solutions.

<i>Barrier</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
		Nuclear Trade Advisory Committee (CINTAC) to advise the Commission on regulatory innovation.	2. Focus existing oversight or reporting requirements from the Commission to include details on development and implementation of regulatory innovation including on steps taken to incorporate innovative approaches into agency licensing.
Inconsistent stakeholder understanding and trust in the regulatory process	1. Increase staff engagement with public before, during, and after licensing activities. Proactive engagement with potentially affected communities is essential to ensure that the NRC informs the public about regulatory decisions prior to their resolution.	<p>1. Clarify direction to staff on engaging with the public on regulatory and nonregulatory issues.</p> <p>2. Broadly support staff engaging with stakeholders to explain the regulations and their safety findings.</p> <p>3. Prioritize and support proactive staff training and engagement with stakeholders.</p>	<p>1. Increase off-fee funding for NRC development of new digital information tools and frameworks (e.g., improve ADAMS, improve public meeting process) (appropriations required).</p> <p>2. Increase off-fee funding for dedicated staff to bolster transparency and public confidence in NRC programs by conducting proactive, two-way engagement with the public and developing simplified and accessible technical documents (e.g., Office of Public Engagement) (appropriations and potentially authorization changes required).</p>

Appendix – Detailed NRC Licensing Barriers and Potential Policy Solutions

NIA sought input and engagement from many stakeholders on their perspective on advanced reactor licensing activities and potential barriers at the NRC, and is continuing to do so. This appendix provides the full set of draft licensing barriers and potential policy solutions that were identified and developed as part of that engagement process thus far.

Five goals for NRC reform were identified through the engagement process:

- Ensure adequate staff capacity and capability to effectively license advanced reactors
- Ensure existing regulatory processes and procedures enable effective staff review
- Develop new regulatory frameworks, processes, and procedures³ to improve effectiveness of future regulatory reviews for both future first-of-a-kind (FOAK) reactors and subsequent and Nth-of-a-kind (NOAK) reactor projects
- Develop regulatory processes that enable the successful commercialization of advanced reactors
- Establish practices that increase stakeholder understanding and public trust in the regulatory process

Each of these goals were based specific identified barriers to an efficient and effective licensing process for advanced reactors and supported by policy solutions that could be taken by NRC management, NRC Commissioners, and Congress to increase the effectiveness of advanced reactor licensing. This appendix provides detailed discussion on the barriers and policy solutions for each of the five goals and highlights which changes would require additional Congressional appropriations or authorizations for successful implementation.

NIA continues to seek input from other stakeholders on the potential to improve advanced reactor licensing at the NRC and feedback on the goals, barriers, and solutions identified in this discussion draft.

³ Regulatory frameworks are the high-level regulatory requirements and organizational structures that are applicable to licensing activities. Regulatory processes are the management-level and staff-level activities that are completed to reach a decision on a licensing activity. Regulatory procedures are staff-level guidance that provide direction to staff on how to complete regulatory processes.

NRC Reform Goal 1: Ensure adequate staff capacity and capability to effectively license advanced reactors

The effective review of novel advanced reactor applications requires having the right staff in the right place, at the right time, and with the right skills to effectively review license applications. Failure to have sufficient capacity or capabilities for a licensing review can result in a delayed or ineffective review. Our review of barriers to the effective licensing of advanced reactors identified five major barriers to staff capacity and capabilities, including the:

1. Challenge of hiring top tier staff
2. Challenge of retaining and promoting top staff
3. Challenge of scaling necessary staff resources to perform increasing numbers of advanced reactor licensing reviews
4. Challenge of obtaining adequate staff expertise to complete novel advanced reactor licensing reviews
5. Challenge of providing sufficient management oversight, capabilities and expertise

Agency culture and working conditions as well as the reputation of the NRC as an employer can affect the NRC's ability to effectively license advanced reactors. The NRC's ability to hire and retain top tier staff and management will depend on how the NRC is perceived by both current and potential employees.

Today, it is not clear whether the NRC could effectively scale up capacity or capabilities over the next five years to meet the expected number of advanced reactor license applications based on agency attrition and retirements. As a result, there is a concern that the NRC will not have sufficient staff and management capacity and capability to effectively license advanced reactors.

Table A.1 lists the draft policy solutions for NRC management, NRC Commissioners, and Congress that were developed for this NRC Reform Goal Outcome.

Table A.1. Barriers and policy recommendations for ensuring adequate staff capacity and capability

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
<ul style="list-style-type: none"> • Challenge of hiring top tier staff • Challenge of retaining and promoting top staff • Challenge of scaling necessary staff resources to perform increasing numbers of advanced reactor licensing reviews • Challenge of obtaining adequate staff expertise to complete novel advanced reactor licensing reviews • Challenge of providing sufficient management oversight, capabilities, and expertise 	<ul style="list-style-type: none"> • Review and adapt GS tier limits for branches to ensure they do not limit hiring, promotion, retention, and knowledge management of key staff (i.e., do not arbitrarily limit the number of higher-grade staff in a branch or hiring at different levels within a GS tier). • Review and adapt the promotion and benefit process to ensure competitiveness with industry. • Evaluate the roles and responsibilities of technical experts and project managers within agency review and concurrence processes to ensure effective and efficient decision making. • Assess and adapt short-term, mid-term, and long-term agency staffing needs for expected advanced reactor licensing reviews to ensure that adequate staff are available to meet project needs. • Assess and adapt performance metrics and criteria for staff and management to ensure they incentivize innovation and 	<ul style="list-style-type: none"> • Request additional off-fee appropriations to support expanded hiring, training, and retention programs for advanced reactor licensing. • Assess and improve hiring processes to accelerate hiring and onboarding of experienced external managerial and technical staff from other federal agencies and private industry. • Assess and improve hiring process to accelerate hiring and onboarding of early-career staff. • Direct an external independent organization (e.g., advisory committee or consultant) to review staffing, hiring, and management to assess best practices for recruiting and retaining top agency staff. This could include external stakeholders and former NRC staff and management. • Direct and enable staff to make changes based on internal and external reviews. 	<ul style="list-style-type: none"> • Provide funding for internal or external NRC assessments of staff (appropriations required). • Provide funding for additional staff hiring authority (appropriations required). • Provide funding for Department of Energy (DOE) or NRC scholarship or fellowship programs that support college and university students training in disciplines relevant to advanced nuclear energy regulation (appropriations required). • Direct an external independent organization (e.g., GAO) to review staffing, hiring, and management and make recommendations (see staff-level solutions) and direct NRC to implement the recommendations. • Direct NRC to utilize existing hiring authority or provide additional hiring authority outside of existing programs to recruit and retain staff required to complete

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
	<p>efficiency in achieving safety objectives.</p> <ul style="list-style-type: none"> • Review and adapt staff training processes and priorities to enable staff to develop new technical skills that meet agency needs and promote staff technical development. • Review and adopt or enhance parallel management and technical tracks for NRC promotions. • Review hiring, promotion, and retention processes for new NRC staff to enable NRC to compete with other employers more effectively (e.g., private companies, national labs) for top talent. • Review and expand current internship and co-op programs to foster the next generation of NRC staff with a focus on students from diverse backgrounds and converting interns to fulltime hires. • Engage third party organizational culture experts and implement corrective actions they identify. 	<ul style="list-style-type: none"> • Take advantage of detailees, Intergovernmental Personnel Act (IPA), and other abilities to recruit technical expertise and external regulatory resources for specific regulatory or technical issues. • Leverage regulatory experts from other industries or agencies to provide management and regulatory expertise. • Set expectations and hold executives accountable to a servant leadership model. 	<p>advanced reactor licensing reviews.</p>

NRC Reform Goal 2: Ensure existing regulatory procedures and processes enable effective staff review

The timely and predictable review of advanced reactor applications requires regulatory procedures and processes that facilitate staff review of license applications. Poorly written or ineffectively implemented regulatory processes and procedures can make consistent and efficient licensing reviews difficult or impossible. Our review of barriers to the effective licensing of advanced reactors identified four major barriers to the effective use of existing regulatory processes:

1. Inadequate support and guidance for staff to complete reviews, especially on novel topics
2. Inadequate management resources and training to plan reviews and project schedules
3. Insufficient regulatory guidance and precedent for use of novel or untested regulatory processes (e.g., manufacturing licenses, prototype reactor rules)
4. Concurrence process that, while important, does not lead to effective decision making due to the need for deep breadth and technical expertise at the branch chief level

These barriers may limit the NRC's ability to license advanced reactors under existing processes even if it had adequate staffing capabilities and capacities. NRC regulatory reviews have historically been based on regulatory precedent established during the licensing of large light water reactors. The NRC staff are facing the challenge of both applying regulatory precedent after several decades without significant numbers of new reactor projects, and adapting historical regulatory and licensing precedent to advanced reactor designs. The NRC staff will need to quickly resolve these process barriers if they are to effectively license advanced reactors using existing regulatory processes.

Table A.2 lists the draft policy solutions for NRC management, NRC Commissioners, and Congress were developed for this NRC Reform Goal Outcome.

Table A.2. Barriers and policy recommendations for enabling effective review under existing regulation

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
<ul style="list-style-type: none"> • Inadequate support and guidance for staff to complete reviews, especially on novel topics • Inadequate management resources and training to plan reviews and project schedules • Insufficient regulatory guidance and precedent for use of novel or untested regulatory processes (e.g., manufacturing licenses, prototype reactor rules) • Concurrence processes, while important, that do not lead to effective decision making due to the need for deep breadth and technical expertise at Branch Chief level 	<ul style="list-style-type: none"> • Assess management incentives and promotions to prioritize project and organizational management with an acknowledgement of project management as a skilled field. • Create a separate technical expert track to enhance the depth of engineering expertise for individuals who do not wish to seek management roles. • Promote and communicate peer learning and sharing of lessons learned and best practices among NRC project managers. • Create qualified external project management training to enhance the skills of the NRC project management staff. • Promote and communicate peer learning, sharing of lessons learned, best practices, and insights from specific licensing activities among technical experts. • Prioritize early escalation of policy issues to NRC middle and senior management for resolution. 	<ul style="list-style-type: none"> • Prioritize external project management training for NRC staff and access to NRC subject matter experts by Project Managers and other senior leadership. • Prioritize staff and management accountability on licensing milestones and enhance the level of tracking of ongoing licensing activities. • Support staff attempts to test and incorporate innovative regulatory processes into licensing. • Prioritize early and timely engagement with NRC staff and management on policy issues that arise during pre-application interaction or early interaction reviews. 	<ul style="list-style-type: none"> • Provide sufficient off-fee funding for project management training (appropriations required). • Provide sufficient off-fee funding for implementation of innovative regulatory processes (appropriations required). • Provide sufficient off-fee funding for revision and updates to existing regulatory processes (appropriations required). • Include environmental reviews for new nuclear power plants (especially at brownfield industrial sites or in energy communities) in legislation on broader energy permitting reform. • Include nuclear energy in broader reforms for clean energy infrastructure permitting.

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
	<ul style="list-style-type: none"> • Create an expedited disagreement resolution process to enable staff, management, and applicants to reach more rapid resolution on technical issues during licensing reviews. • Assess and potentially revise (or eliminate) arbitrary human resource constraints (e.g., supervisor to staff ratios) to ensure they are not impediments to effective project management and execution. • Explore changes to the NRC Concurrence process to enable decisionmakers to delegate approval authority to other qualified staff or management on technical or policy questions. 		

NRC Reform Goal 3: Develop new regulatory processes to improve effectiveness of future regulatory reviews

While advanced reactors can be licensed using existing regulatory processes, development of new innovative licensing processes could dramatically increase the effectiveness of future regulatory reviews. Development of new licensing processes or practices based on NRC lessons learned or use of best practices from other regulatory agencies (e.g., Federal Aviation Administration, Food and Drug Administration) could help create new regulatory frameworks that dramatically reduce the time and cost of licensing while maintaining safety for nuclear power plants. Our review of the development and implementation of new regulatory processes for advanced reactors identified five major barriers to the NRC capacity and capabilities:

1. Difficult to proactively consider new approaches to regulation and licensing
2. Lack of targeted regulatory research to address licensing challenges/questions
3. Limited staff resources to collaborate on international licensing activities and best practices
4. Limited incentive to incorporate new regulatory processes or best practices into existing regulation
5. Limited incentives and opportunities for demonstration and testing of new regulatory processes

These barriers may limit the NRC's ability to develop, test, and incorporate new regulatory processes to improve effectiveness of future regulatory reviews. The challenges of developing innovative new regulatory processes for advanced reactor licensing is perhaps exemplified by the on-going development process for a new advanced reactor regulation under 10 CFR Part 53, where NRC staff is not incentivized to make transformative changes to the regulatory processes. As a result, the preliminary draft regulatory framework being developed by NRC staff under Part 53, thus far, does not provide significant regulatory process improvements as compared with existing regulatory frameworks. This misalignment of incentives to create innovative licensing processes could limit the NRC's ability to effectively license advanced reactors.

Table A.3 lists the draft policy solutions for NRC management, NRC Commissioners, and Congress that were developed for this NRC Reform Goal.

Table A.3. Barriers and policy recommendations for developing new regulatory processes

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
<ul style="list-style-type: none"> • Difficult to proactively consider new approaches to regulation and licensing • Lack of targeted regulatory research to address licensing challenges and questions • Limited staff resources to collaborate on international licensing activities and best practices • Limited incentive to incorporate new regulatory processes or best practices into existing regulation • Limited incentives and opportunities for demonstration and testing of new regulatory processes 	<ul style="list-style-type: none"> • Identify and remove barriers to the development, proposal, and implementation of innovative regulatory processes or approaches by NRC staff at all levels. • Support and incentivize staff development and testing of new regulatory approaches • Increase staff focus on the proactive development of new regulatory processes or research. • Increase staff engagement with international partners to enhance international licensing harmonization and alignment. • Assess and draw lessons from regulatory innovation in other sectors (e.g., FDA, FAA). • Provide explicit staff time to work on innovative ideas for regulatory processes as part of existing NRC off-fee program funding. 	<ul style="list-style-type: none"> • Prioritize and emphasize the importance of regulatory innovation with staff and stakeholders. • Foster and create a culture of innovation, including seeking external stakeholder input, to address regulatory challenges and improve staff activities. • Prioritize and expand internal NRC groups focused on the development and implementation of regulatory innovation including reporting requirements on steps taken to incorporate innovative approaches into agency licensing. • Create an external advisory group, like the Nuclear Energy Advisory Committee or Civil Nuclear Trade Advisory Committee (CINTAC) to advise the Commission on regulatory innovation. • Direct staff to develop clear expectations for U.S. review, incorporation of, or acceptance of reactor licensing reviews completed internationally. 	<ul style="list-style-type: none"> • Increased off-fee funding for staff level innovation on regulatory processes (appropriations required). • Increase off-fee funding for new staff activities focused on regulatory innovation and development of innovative regulatory frameworks (appropriations required). • Increase off-fee funding for international licensing activities (appropriations required). • Increase off-fee funding for regulatory research with a focus on developing sufficient in-house capabilities and not simply leveraging external parties (appropriations required). • Direct NRC to focus on international licensing activities with a prioritization on U.S. partner countries for export. This could include state-level agreements with other national regulators for staff exchange (appropriations required).

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
		<ul style="list-style-type: none"> • Emphasize development of inhouse agency expertise where appropriate instead of relying as heavily on contractors and national labs. 	<ul style="list-style-type: none"> • Direct GAO and/or NRC to assess and draw lessons from regulatory innovation in other sectors (e.g., FDA, FAA) and report on process improvements or changes (appropriations required). • Focus existing oversight or reporting requirements from the Commission to Congress to include details on development and implementation of regulatory innovation including on steps taken to incorporate innovative approaches into agency licensing.

NRC Reform Goal 4: Develop regulatory processes that enable commercialization of advanced reactors

The effective review of advanced reactor license applications ultimately requires regulatory processes that enable the commercialization of advanced reactors without creating unnecessary barriers to deployment. The NRC must be able to continue its statutory mission to protect public health and safety while ensuring that the cost, duration, and predictability of licensing don't deter companies' interest in deploying commercial advanced reactors. Our review of barriers to the effective licensing of advanced reactors identified three major barriers to commercialization of advanced reactors beyond the challenges associated with technical reviews of reactor safety:

1. Total cost to license advanced nuclear technology, especially for smaller developers
2. NRC fee structure complicates NRC budgeting and planning based on applicant and licensee fees and leaves insufficient resources for cross-cutting policy, process, and project management improvements
3. Lengthy environmental review durations could unreasonably extend project timelines and introduce unpredictability of large numbers of reviews

These barriers may limit the ability of advanced reactor developers and energy users, particularly smaller companies, to license and deploy advanced nuclear energy at scale. The high costs and significant uncertainty associated with NRC licensing could restrict deployment of nuclear technology to only the largest companies. This could reduce development of innovative advanced reactor solutions by smaller companies and limit deployment of advanced reactor technologies by smaller energy users, both limiting the overall potential impact of advanced nuclear energy as a climate solution. More effective regulatory processes that enable commercialization could have a significant impact on the commercialization and deployment of advanced nuclear energy at scale.

Table A.4 lists the draft policy solutions for NRC management, NRC Commissioners, and Congress that were developed for this NRC Reform Goal.

Table A.4. Barriers and policy recommendations for enabling advanced reactor commercialization

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
<ul style="list-style-type: none"> • Total cost to license advanced nuclear technology, especially for smaller developers • NRC fee structure complicates NRC budgeting and planning based on applicant and licensee fees and leaves insufficient resources for cross-cutting policy, process, and project management improvements • Lengthy environmental review durations could unreasonably extend project timelines and introduce unpredictability of large numbers of reviews 	<ul style="list-style-type: none"> • Promote peer learning and sharing of lessons learned, best practices, and insights on environmental reviews among technical experts including peers in other federal agencies. • Prioritize early escalation of policy issues to NRC middle and senior management for resolution. • Improve project management to minimize project hours, NRC costs and fees charged to applicants on across all licensing review activities. • Explore changes to NRC engagement with other agencies on environmental reviews to incorporate other agency best practices and improve the collaborative efficiency. 	<ul style="list-style-type: none"> • Prioritize the Generic Environmental Impact Statement for Advanced Reactors to facilitate more effective environmental reviews. • Revisit decision from SECY-21-0001 that focus on use of Categorical Exclusions, Environmental Assessments, and other environmental review processes to improve near-term and long-term environmental licensing of advanced nuclear reactors. • Eliminate the need for power assessments as part of environmental reviews as these are addressed by other economic regulators or market demands. 	<ul style="list-style-type: none"> • Reform NRC’s fee recovery model for advanced reactor licensing to enable more effective NRC budgeting and planning. This change would facilitate support for cross-cutting policy, process, and project management improvements for advanced reactors (authorization and appropriations required). • Move more activities off-fee to reduce burden on applicants and increase appropriations and increase NRC’s ability to respond to specific challenges for novel nuclear technologies and activities (appropriations required). • Consider how to defer licensing fee payment (e.g., for small businesses) to minimize upfront burden before a commercial entity is operating.

NRC Reform Goal 5: Establish consistent stakeholder understanding and trust in the regulatory process

The commercial deployment of advanced nuclear energy at scale as a climate solution will require not only a regulatory system that enables deployment but also stakeholders who support deployment. Creating consistent stakeholder understanding and trust in the regulatory process is important because it fosters public trust in the technology, developers, and regulators, and helps create clear lines of understanding between applicants and the regulator. Failure to build stakeholder trust can result in public opposition to projects, disagreements and misunderstanding between applicants and regulators, and other process issues that ultimately delay or scuttle new reactor projects. Our review of barriers to consistent stakeholder understanding and trust in the regulatory process identified four major barriers:

1. Distrust by some public groups and citizens, particularly in certain host communities with legacy nuclear facilities including mining, fuel processing, reactor operations, and waste management
2. Information is often not easily accessible to the public, or not transparent
3. Disconnect between NRC, industry, public, and community understanding of NRC processes and priorities
4. Discomfort or unwillingness by NRC staff and management to defend regulations and safety findings for nuclear technology in an effort to maintain an appearance of complete independence and neutrality

These barriers may limit the NRC's ability to clearly communicate with stakeholders and achieve alignment on the regulatory process. Improving stakeholder communication would benefit all stakeholders. As a result, it is essential for the NRC to prioritize steps that can help achieve consistent stakeholder understanding and trust in the regulatory process.

Table A.5 lists the draft policy solutions for NRC management, NRC Commissioners, and Congress were developed for this NRC Reform Goal.

Table A.5. Barriers and policy recommendations for creating consistent stakeholder understanding

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
<ul style="list-style-type: none"> • Distrust by some public groups and citizens, particularly in certain host communities with legacy nuclear facilities including mining, fuel processing, reactor operations, and waste management • Information is often not easily accessible to the public, or not transparent • Disconnect between NRC, industry, public, and community understanding of NRC processes and priorities • Discomfort or unwillingness by NRC staff and management to defend regulations and safety findings for nuclear technology to maintain an appearance of 	<ul style="list-style-type: none"> • Increase training, including dedicated staff, for NRC staff engagement with host communities and other public stakeholders. • Review existing public communication and meeting processes to identify and implement best practices. • Increase staff engagement with the public before, during, and after licensing activities. Proactive engagement with potentially impacted communities is essential to ensure that the NRC informs the public about regulatory decisions prior to their resolution. • Increase staff engagement with industry to clarify staff expectations and promote more efficient licensing processes. • Increase support for technical staff and communicators to provide more detailed information and discuss staff findings. 	<ul style="list-style-type: none"> • Clarify direction to staff on engaging with the public on regulatory and nonregulatory issues. • Clarify direction to staff on engaging with industry on regulatory and nonregulatory processes. • Broadly support staff engaging with stakeholders to explain the regulations and their safety findings. • Prioritize and support proactive staff training and engagement with stakeholders. • Prioritize in-person and on-site engagement with host communities. Work to incorporate local feedback (positive and negative) into engagement practices and outreach. • Prioritize staff development of and public access to information (digital, in-person, simplified technical documents, alternative language information, inclusive scheduling) including explaining 	<ul style="list-style-type: none"> • Increase funding for staff training or communications experts off fee base (appropriations required). • Increase funding for staff travel and engagement with communities and stakeholders off fee base (appropriations required). • Increase funding for NRC development of new communication tools (in-person, simplified technical documents, alternative language information) off fee base (appropriations required). • Increase off-fee funding for NRC development of new digital information tools and frameworks (improve ADAMS, improve public meeting process) (appropriations required). • Increase off-fee funding for dedicated staff to bolster transparency and public confidence in NRC programs by conducting proactive, two-way engagement with the public and developing simplified and

<i>Barriers</i>	<i>NRC Management Solutions</i>	<i>NRC Commission Solutions</i>	<i>Congressional Solutions</i>
complete independence and neutrality		<p>the regulations and their safety findings.</p> <ul style="list-style-type: none"> • Create an NRC Office of Public Engagement or other internal group to support on-going licensing activities outside of engagement normally handled by NRC Public Affairs. • Direct management and staff (including Office of General Counsel) to increase interactive engagement with the public and industry to explain regulations and their safety findings and collaboratively resolve issues. 	<p>accessible technical documents (e.g., Office of Public Engagement) (appropriations required).</p> <ul style="list-style-type: none"> • Focus existing NRC Congressional oversight and reporting requirements to emphasize importance of NRC interactive engagement with stakeholders and promote interactive communication with both public and industry stakeholders.