10 CFR 50.55a Project Final Report

EMBARK Venture Studio

Contents

Executive Summary

EMBARK Venture Studio (EMBARK), an organization within the U.S. Nuclear Regulatory Commission (NRC), Office of Nuclear Reactor Regulation, was created to remove barriers to innovation and launch initiatives that improve the way the NRC works to make safe use of nuclear technology possible and to help transform the agency into a modern, risk-informed regulator. EMBARK initiated a project to evaluate how the NRC might streamline the way it regulates using Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, "Codes and standards." Specifically, the NRC has leveraged American Society of Mechanical Engineers (ASME) codes and standards as regulatory tools and incorporates by reference ASME Boiler and Pressure Vessel Code (BPV Code), Sections III and XI, and ASME Operation and Maintenance of Nuclear Power Plants, Division 1 (OM Code), Section IST, into 10 CFR 50.55a. The EMBARK team consisted of a diverse cross-section of NRC staff with expertise and experience working with 10 CFR 50.55a, including rulemaking experts and engineering staff. Using brainstorming techniques, the team developed a list of nine initial ideas, along with associated technical bases and cost estimates. After initial discussions of these ideas, both internally and with external stakeholders, the team pursued the ideas that were legally feasible, met the needs of the industry, provided the greatest cost benefit, and produced no negative impact on safety. The team agreed to three recommendations for management consideration, based on the criteria that would increase the efficiency and effectiveness of regulating using 10 CFR 50.55a:

(1) Relax the Requirement to Update ISI and IST Programs Every 10 Years Following the Next Update to 2019/2020 ASME Codes.
The EMBARK team recommends relaxing the requirement to update the inservice inspection (ISI) and inservice testing (IST) programs to 10 years. This should occur following the next update to the 2019 ASME BPV Code or the 2020 ASME OM Code (or later editions).

(2) Institute Streamlined Rules for Unconditionally Approved Code Cases.
The EMBARK team recommends a direct final rule for unconditionally approved Code Cases. The staff noted that implementing periodic rulemakings for unconditionally approved Code Cases may cause bottlenecks, because the Office of Management and Budget only accepts one rulemaking per CFR part at a time. To mitigate this consequence, the NRC should reduce the frequency of Code edition rulemakings, as discussed in Item 3 below. Conditioned Code Cases, which garner increased public comments, will also need to be processed as efficiently as possible. Every other year, therefore, the Code Case rulemaking should include all Code Cases and should follow the standard rulemaking process, including public comment and comment resolution.

(3) Decrease the Frequency of Code Edition Rulemakings.
The EMBARK team recommends that, along with the other recommendations in this report, the cycle for Code edition rulemakings should be increased to every 6 years. With a relaxation of the 10-year ISI and IST program update requirements, as discussed in Item 1, there would no longer be a strong reason to incorporate by reference new Code editions in 10 CFR 50.55a on a 2-year cycle.

The EMBARK team concludes that the proposed streamlining recommendations would contribute to the efficiency and effectiveness of the NRC's 10 CFR 50.55a regulatory activities.

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1 Introduction

The U.S. Nuclear Regulatory Commission (NRC) has leveraged American Society of Mechanical Engineers (ASME) codes and standards as regulatory tools since 1971 (see Volume 36 of the *Federal Register*, page 11423 (36 FR 11423)). ASME Boiler and Pressure Vessel Code (BPV Code), Section III, specifies provisions for the design and construction of nuclear power plants and their structures, systems, and components (SSCs). ASME BPV Code, Section XI, specifies provisions for inservice inspection (ISI) of SSCs in nuclear power plants. ASME Operation and Maintenance of Nuclear Power Plants, Division 1 (OM Code), Section IST, sets forth inservice testing (IST) provisions for pumps, valves, and dynamic restraints in nuclear power plants. The NRC incorporates by reference ASME BPV Code, Sections III and XI, and the ASME OM Code into Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a, "Codes and standards." While the NRC's use of 10 CFR 50.55a has been a successful regulatory practice in many ways, there is a need to evaluate potential improvements to the longstanding process.

EMBARK Venture Studio (EMBARK) is an organization within the NRC Office of Nuclear Reactor Regulation created to spur innovative thinking as the NRC seeks to become a modern, risk-informed regulator. EMBARK initiated a project to develop ideas for transforming how the NRC uses 10 CFR 50.55a to regulate. The purpose of this report is to document the process and results of that effort, including a discussion of recommendations for improving 10 CFR 50.55a.

2 Project Team and Stakeholders

2.1 Project Team

The project team consisted of a diverse cross-section of NRC staff with different expertise and experience working with 10 CFR 50.55a, including rulemaking experts and engineering staff. The table below lists the members of the project team and their role in the development and use of 10 CFR 50.55a.

Name	Organization	Role
Stewart Bailey	R-II/DRP/RPB4	Engineering
Mekonen Bayssie	RES/DE/RGGIB	Regulatory Guidance
Michael Benson	RES/DE/CIB	Engineering
Cindy Bladey	NMSS/REFS/RASB	Rulemaking Policy
Angela Buford	NRR/EMBARK	Engineering
Sheldon Clark	OGC/GCRPS/RMR	Legal
Stephen Cumblidge	NRR/DNRL/NPHP	Engineering
Keith Hoffman	NRR/DNRL/NPHP	Engineering
John Honcharik	NRR/DNRL/NPHP	Engineering
Kamal Manoly	NRR/DEX	Engineering
James O'Driscoll	NMSS/REFS/RRPB	Rulemaking Policy
David Rudland	NRR/DNRL	Engineering
Aaron Sanders	NMSS/REFS/RASB	Cost Analysis
Thomas Scarbrough	NRR/DEX/EMIB	Engineering
Jill Shepherd	NMSS/REFS/RASB	Rulemaking Policy
Bob Wolfgang	NRR/DEX/EMIB	Engineering

2.2 Stakeholders

The EMBARK team interacted with several external and internal stakeholders. These individuals provided insights and comments on the EMBARK team's work, either verbally during face-to-face interactions or in writing. The table below lists stakeholders who provided substantive comment on the EMBARK team's efforts.

Name	Organization	Role
Various	NRC—Various Offices	Participation in Staff Town Hall Meeting
Tom Basso	Nuclear Energy Institute	Codes and Standards Task Force
Stephen Cumblidge	NRC	Participation in Public Meeting
Mark Ferlisi	True North Consulting	Industry Consultant BPV Code, Section XI

Name	Organization	Role
Scott Kulat	Inservice Engineering	Industry Consultant BPV Code, Section XI
Board on Nuclear Codes and Standards	ASME	Procedural Oversight of BPV and OM Code Consensus Process

3 Philosophy and Process

The team agreed on the following basic principles to guide this effort:

- encouraging freeform brainstorming
- setting aside the burdens of decision making and implementation
- committing to developing all ideas without regard to potential barriers
- encouraging objective analysis of all ideas, including level-of-effort estimates and legal issues, rather than advocating positions
- framing and bounding issues, rather than solving them

The process started with freeform discussion and brainstorming among the EMBARK team members. Each participant provided various ideas. These ideas were then documented in the form of white papers. The white papers represented an objective analysis of each idea, with bullet items describing pros and cons, identifying internal and external stakeholders, discussing level-of-effort estimates, and summarizing legal issues.

The next step was to engage a wider range of NRC staff members, particularly targeting those known to be involved with ASME codes and standards and rulemaking activities (i.e., a staff town hall meeting). The larger group of staff reviewed the white papers before the meeting and provided additional ideas for consideration.

After discussions with the staff, the EMBARK team organized a public meeting to engage external stakeholders, including the Nuclear Energy Institute (NEI), NextEra Energy, Entergy, and ASME. NEI provided its comments on the ideas documented in the white papers, including its own ranking of the ideas in terms of benefit to the industry. Additional discussion at the public meeting further informed the EMBARK team's thinking on this topic. In addition, the EMBARK team discussed written public comments received after the conclusion of the public meeting.

After completing these steps, the EMBARK team sought to distill the initial ideas into recommendations, based on all the feedback received in the larger discussions. The EMBARK team found that the initial ideas, while not necessarily workable solutions, engaged the stakeholders in the process and sparked valuable discussion. Through this iterative process, the EMBARK team formulated recommendations on streamlining 10 CFR 50.55a. This iterative model may serve as a starting point for other agency projects seeking innovative, transformative ideas on NRC processes.

4 Discussion of Initial Ideas

The EMBARK team placed its original proposals into three categories: (1) improving the clarity of the rule, (2) improving process efficiency, and (3) increasing flexibility for applicants and licensees. The discussion included brainstorming initial ideas among the EMBARK team, engaging internal and external stakeholders, and refining ideas into recommendations. This section describes in more detail the discussion points raised in the three categories.

4.1 Improving Clarity of the Rule

The EMBARK team's initial ideas in this category included the following:

- Create a user's guide for 10 CFR 50.55a.
- Relocate the text of 10 CFR 50.55a into a regulatory guide(s) and incorporate the regulatory guide(s) into 10 CFR 50.55a.
- Rewrite 10 CFR 50.55a.

Some stakeholders were interested in what information the user's guide would record. The user's guide might contain historical and background information, similar to what appears in the Statement of Considerations for each rule. It may also serve as a roadmap, pointing the user to where the rule addresses certain topics. The staff noted the risk of providing incorrect information in the user's guide. If the NRC instituted a public comment period for the user's guide, then the resource burden associated with the guide would increase.

Relocating the text of 10 CFR 50.55a in a guidance document is another method of improving clarity and organization of the rule, since the NRC would have control over formatting. While most stakeholders agreed that 10 CFR 50.55a is difficult to understand, they also noted that efforts to clarify the rule may not yield much benefit in the end. Other streamlining ideas may take priority over this one.

Scott Kulat of Inservice Engineering stated that a rewrite of 10 CFR 50.55a is more valuable than a user's guide. However, rewriting the rule may involve a significant effort, and it could impact licensees, as their programs reference 10 CFR 50.55a as it is written today. Knowledge management activity in this area may be a safer, more cost-effective option.

Stakeholder feedback strongly indicated that efforts to clarify the rule should not be given high priority. Stakeholders more strongly supported those ideas that led to tangible efficiency gains. However, 10 CFR 50.55a is difficult to understand and interpret. This problem may be exacerbated in the future as the NRC and industry engineers retire. As such, some form of knowledge management may be advisable, even if direct efforts to clarify the rule may be impractical.

4.2 Improving Process Efficiency

The EMBARK team's initial ideas in this category included the following:

- Document NRC approved votes and Code Cases for alternate approval process.

- Direct a final rule for unconditionally approved Code Cases.

- Add a change control process like that in 10 CFR 50.59, “Changes, tests and experiments,” to allow licensees to make minor deviations from the Code without NRC approval.

Two of the initial ideas from the EMBARK team focused on a central problem: the NRC’s process for approving Code Cases is slower than ASME’s process for issuing them. These two ideas included (1) developing a process outside of 10 CFR 50.55a that determines whether a published Code Case may be used without NRC approval, and (2) employing a direct final rule for noncontroversial Code Cases.

The NRC and industry stakeholders generally agreed that streamlining the approval process for ASME Code Cases could be very beneficial to both the NRC and industry. The first idea places more weight on NRC staff votes during the codes and standards development process. As such, it could have the side effect of slowing down the Code process, as the staff sees the vote as more consequential. For the second idea, some contend that more rules could face a bottleneck with the Office of Management and Budget (OMB) reviews because OMB only accepts one rulemaking per CFR part at a time.

An alternate process, outside of 10 CFR 50.55a, for approving Code Cases could lead to legal questions. [ATTORNEY-CLIENT PRIVILEGE INFORMATION]. A direct final rule for unconditioned Code Cases may be the most viable option for increasing the efficiency of the Code Case approval process.

Mark Ferlisi of True North Consulting stated that such a rule should be published once a year to be effective. The EMBARK team noted that increasing the number of rulemakings could lead to bottlenecks with OMB reviews. Decreasing the number of ASME Code edition rulemakings may mitigate this negative consequence. Mr. Ferlisi suggested issuing ASME Code edition rules every other year, as one option. This approach may combine well with the concept of increased flexibility in updating ISI and IST programs (see Section 4.3). If the industry is no longer required to update to the latest edition of the Code every 10 years, then there may not be a strong need to continue Code edition rulemakings at the current pace. Additionally, Code edition rules and Code Case rules may be combined during those years when the Code editions are being incorporated into the rule. The NRC may need to continue documenting technical reviews of newly published editions as they are published, even if the rule is not issued every other year. In concept, the direct final rule would not cover those Code Cases for which the NRC is considering conditions. Therefore, there should be a unified strategy in place to promulgate rulemakings for approved Code Cases, conditioned Code Cases, and Code editions.

A process like that in 10 CFR 50.59 is another option for streamlining Code Case approvals. This option may have merit, but it may take time and effort to fully develop this concept into a workable solution. For instance, “minor deviation” would have to be well defined. Therefore, this option may be considered as a long-term strategy.

The staff proposed one new idea to quickly publish a list of “acceptable” Code Cases, outside of the rulemaking process. This list would imply that the NRC could approve any relief requests involving the use of these Code Cases on an expedited basis. This may also raise legal questions, as the list could be de facto rulemaking, so the EMBARK team chose not to adopt this idea as a recommendation.

4.3 Increasing Flexibility for Licensees

The EMBARK team's initial ideas in this category included the following:

- Change the requirement on updating ISI/IST programs.
- Adopt a performance-based approach to ASME standards.
- Revisit the need to mandate codes and standards by removing BPV Code, Sections III and XI, and the OM Code from 10 CFR 50.55a entirely.

4.3.1 Inservice Inspection/Inservice Testing Program Updates

The current requirement to update ISI and IST programs to the latest editions incorporated into 10 CFR 50.55a every 10 years is a very prescriptive approach. Relaxing the requirement would provide the industry flexibility. The safety impacts of allowing such flexibility may be minimal, as indicated by comments by Stephen Cumblidge of the NRC related to ISI programs, provided licensees implement a recent Code edition. Before extending the ISI and IST program intervals, the NRC staff considers that licensees should update to a recent ASME Code edition (such as 2019 or 2020) to address the wide range of ISI and IST provisions specified in the Code editions and addenda currently being implemented at the nuclear power plants.

Mr. Kulat's comments suggest that there could be an erosion of safety if this approach is adopted and that the efficiency gains for the industry may be overstated. Mr. Kulat strongly advocated for 10-year updates as the ASME Code improves over time and the NRC incorporates later editions. From a safety perspective, though, plants are presumed safe today under their current rules. The publication of a new Code edition does not imply that the plants are unsafe if the new rules are not immediately adopted. The NRC has historically relied on ASME to update the BPV and OM Codes to reflect more effective methods for ISI and IST activities to improve the safety of nuclear power plants with the requirement in 10 CFR 50.55a to periodically update ISI and IST programs. However, if a safety issue arises, ASME may address it in a new edition or Code Case, which the staff could immediately mandate following the backfit provisions. The NRC may also impose requirements through other regulatory tools, such as orders, if deemed necessary for nuclear safety.

The 10-year ISI interval, along with related provisions, is a Code requirement (not a 10 CFR 50.55a requirement). The 10 CFR 50.55a requirement for ISI and IST programs states that licensees must update to the most recent edition of the ASME Code incorporated by reference in 10 CFR 50.55a every 10 years. If the NRC changes that requirement, there is no guarantee that ASME will adopt corresponding measures to change the definition of an interval and period. It is unclear, therefore, how this interaction may affect the anticipated efficiency gains of changing the ISI update requirement. For example, licensees may wish to request an alternative under 10 CFR 50.55a(z) to not implement the ASME Code definition of an interval and period. This topic may warrant further consideration in the implementation phase.

4.3.2 Performance-Based Approach

The performance-based option may be linked to removing ASME codes and standards from 10 CFR 50.55a. Using risk-informed categorization (i.e., 10 CFR 50.69, "Risk-informed

categorization and treatment of structures, systems and components for nuclear power reactors") as an example, the staff and industry understand, in principle, which components are most risk significant. The 10 CFR 50.55a regulations could be restructured to only contain rules for those risk-significant components.

External stakeholders expressed skepticism about the perceived value of the performance-based option. The NRC staff would likely see this as a safety deficit if it replaced the current method of mandating ASME Codes for operating nuclear plants. However, current consensus codes and standards may not be appropriate for advanced reactors. ASME is initiating efforts to create codes and standards for non-light-water reactors, such as ASME BPV Code, Section XI, Division 2. The NRC may need to develop a strategy for making use of codes and standards for advanced designs.

4.3.3 Revisiting the Need to Incorporate by Reference ASME Standards

The NRC has mandated the use of ASME codes and standards since 1971. Longstanding practices can benefit from fresh scrutiny. The EMBARK project provided a unique opportunity to evaluate the need to continue mandating these codes.

In general, the NRC's use of 10 CFR 50.55a has been a successful regulatory practice. It allows the NRC to leverage industry expertise to develop rules for design, ISI, and IST activities. The NRC develops the rules in a public forum that satisfies its goals for openness and transparency. The 10 CFR 50.55a regulations play an important role in the reactor oversight process, as NRC inspectors evaluate licensee compliance with ASME Code requirements incorporated by reference in 10 CFR 50.55a.

The views of external stakeholders on removing ASME codes and standards from 10 CFR 50.55a were mixed. NEI strongly supported this idea, as it provides maximum flexibility to manage plant operations. NEI suggested that U.S. industry performance is sufficiently high that such prescriptive rules are no longer needed. However, Mr. Kulat (an industry consultant) sees ASME codes and standards as necessary for safety and as cost effective.

The NRC staff largely saw this idea as an erosion of safety, especially for ISI and IST programs. Mr. Cumblidge specifically pointed to advancements in ASME provisions for nondestructive examination qualification as one example. The staff was also concerned about adverse impacts on enforceability, because incorporating by reference ASME codes and standards in the regulations allows NRC inspectors to enforce compliance with ASME provisions. As such, any major changes to 10 CFR 50.55a will impact the reactor oversight process.

A variant of this idea is to remove only ASME BPV Code, Section III, from 10 CFR 50.55a and endorse it in a regulatory guide, leaving ASME BPV Code, Section XI, and the ASME OM Code in 10 CFR 50.55a. However, EMBARK team members did not come to a full consensus as to whether this idea should become a recommendation.

The staff participants proposed other ideas as alternatives to removing ASME codes and standards from the rule entirely, including the following:

- Incorporate every other edition of the Code, rather than every edition, or only incorporate those editions deemed significant by the staff.

- Allow plants more time to update ISI and IST programs.

- Combine Code Case and Code edition rulemakings.
- Synchronize all plants to one edition of the Code.
- Move 10 CFR 50.55a to a separate CFR part.

5 Recommendations

The EMBARK team agreed on three recommendations for consideration in other agency processes for streamlining 10 CFR 50.55a. Agency decisionmakers may draw upon these recommendations and other information in this report when formulating strategies for streamlining the NRC's approach to 10 CFR 50.55a. Implementation will likely involve more traditional agency processes, outside of EMBARK.

As with any transformative ideas, individual stakeholders may have differing views on these recommendations. Actual implementation may require additional interactions with internal and external stakeholders. Some actions may require Commission approval before proceeding. A public meeting describing the NRC's overall plans for implementing changes to 10 CFR 50.55a may be advisable. The following three recommendations represent those concepts that obtained the most support from the wide array of stakeholders engaged in this EMBARK effort:

(1) Relax the requirement to update ISI and IST programs every 10 years following the next update to 2019/2020 ASME Codes.

(2) Institute streamlined rules for unconditionally approved Code Cases.

(3) Decrease the frequency of Code edition rulemakings.

The combination of these recommendations results in a proposed unified strategy for promulgating rulemakings on ASME codes and standards.

5.1 Relax the Requirement to Update Inservice Inspection and Inservice Testing Programs Every 10 Years Following the Next Update to 2019/2020 ASME Codes

Stakeholders agreed that relaxing the requirement to update ISI and IST programs every 10 years would have minimal impact on safety and provide flexibility to the industry, where licensees are implementing the more recent ASME BPV and OM editions. The NRC staff considers the relaxation of the requirement to update the ISI and IST programs beyond 10 years should occur following the next update to the 2019 ASME BPV Code or the 2020 ASME OM Code (or later editions) because of the significant range of ISI and IST provisions in the Code editions currently being implemented at nuclear power plants.

One option is to require program updates every 20 years, rather than every 10 years. Another option, as suggested by Mr. Ferlisi, is to allow licensees to adopt a range of Code editions every 10 years rather than forcing an update to the latest edition adopted into 10 CFR 50.55a. Both options potentially accomplish the goal of providing flexibility to licensees in a manner that does not compromise safety. In either case, the staff recommends that licensees adopt later editions of the BPV Code and OM Code before taking advantage of this increased flexibility.

One potential roadblock to this recommendation is the ASME Code-defined ISI interval, as first introduced in Section 4.3.1. The NRC has no direct control over how ASME chooses to define an inspection interval in ASME BPV Code, Section XI. If the NRC relaxes the requirement to update to a later edition of the Code every 10 years, licensees may still be held to the 10-year interval and related Code provisions. The NRC may need to conduct additional outreach to stakeholders to assess the impacts of this potential roadblock.

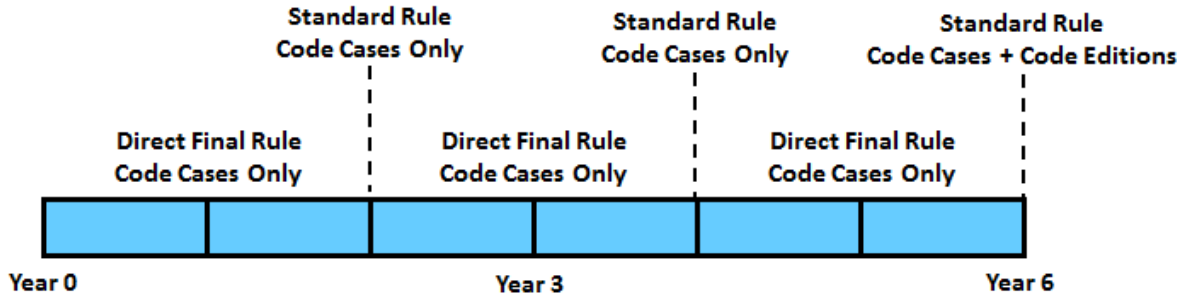
5.2 Institute Streamlined Rules for Unconditionally Approved Code Cases

Stakeholders agreed that increased efficiency in the completion of ASME Code Case rulemakings would be beneficial to both the NRC and the U.S. nuclear industry. The most viable option to accomplish this goal appears to be a direct final rule for unconditionally approved Code Cases. Implementing periodic rulemakings for unconditionally approved Code Cases may cause bottlenecks, because OMB only accepts one rulemaking per CFR part at a time. To mitigate this consequence, the frequency of Code edition rulemakings should be reduced, as discussed in Section 5.3.

Code Cases with proposed conditions may not be suitable for the direct final rule approach, since conditions are more likely to garner public comments. Conditioned Code Cases will also need to be processed as efficiently as possible. Every other year, therefore, the Code Case rulemaking should include all Code Cases and should follow the standard rulemaking process, including public comment and comment resolution.

5.3 Decrease the Frequency of Code Edition Rulemakings

As mentioned in Section 5.2, yearly rulemakings may cause bottlenecks that should be mitigated as much as possible. With a relaxation of the 10-year ISI and IST program update requirement (see Section 5.1), there would no longer be a strong driver to incorporate by reference new Code editions in 10 CFR 50.55a on a 2-year cycle. Given the other recommendations in this report, the cycle for Code edition rulemakings should be every 6 years. The Code edition rulemaking may contain each edition released since the last rulemaking or only the latest edition. The Code Case rulemaking should be folded into the larger Code edition rulemaking for efficiency, rather than proceeding with two rulemakings. The figure below shows a timeline illustrating the entire rulemaking cycle proposed in this report. The feasibility of yearly rulemakings, as illustrated in the figure, may need to be assessed.



Even though the recommendation is to decrease the frequency of Code edition rulemakings, the NRC should document technical reviews of each edition as each edition is released. The staff can incorporate the documentation of the technical reviews into the rulemaking at the appropriate time. Delaying technical reviews of Code editions until the rulemaking is an inefficient use of NRC resources, under this scenario.

5.4 Other Considerations

Sections 5.1–5.3 provide the EMBARK team's formal recommendations for streamlining 10 CFR 50.55a. This section presents three remaining points that agency decisionmakers may wish to consider in planning a path forward.

First, most stakeholders agreed that, while 10 CFR 50.55a is a challenge to interpret, efforts to clarify the rule may not be cost effective. As an alternative, the NRC should consider knowledge management efforts to aid future staff in understanding 10 CFR 50.55a. Developing recorded training sessions may be valuable. A Nuclepedia page may serve as a convenient location to archive all information related the rule.

Second, one initial idea was to develop a performance-based approach to codes and standards, as opposed to the prescriptive approach used in 10 CFR 50.55a today. This idea was originally proposed as a method to leverage codes and standards for advanced reactors, for which the current approach may not be suitable. This idea did not translate to a formal recommendation in this report, mainly due to staff and stakeholder safety concerns related to the operating fleet. However, the concern about codes and standards for advanced design is still relevant. The NRC may need to develop a strategy in this area.

Finally, the recommendations in Sections 5.1–5.3 are interrelated. For example, the proposed cycle for rulemakings is based upon the premise that the NRC will no longer require ISI and IST program updates every 10 years. As such, it may not be feasible to implement one recommendation without implementing all of them.