INL/RPT-23-72206
Revision 0

Recommendations to Improve the Nuclear Regulatory Commission Reactor Licensing and Approval Process

April 2023

Stephen J. Burdick, J.D.

Dr. John C. Wagner

Dr. Jess C. Gehin

Idaho National Laboratory

INL is a U.S. Department of Energy National Laboratory
operated by Battelle Energy Alliance, LLC

INL/RPT-23-72206
Revision 0

Recommendations to Improve the Nuclear Regulatory Commission Reactor Licensing and Approval Process

April 2023

Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

Page intentionally left blank

CONTENTS

FIGURES

TABLES

Page intentionally left blank

ACRONYMS

ACRS	Advisory Committee on Reactor Safeguards
ADVANCE	Accelerating Deployment of Versatile, Advanced Nuclear for Clean Energy
AEA	Atomic Energy Act
AEC	Atomic Energy Commission
ARDP	Advanced Reactor Demonstration Program
ASLB	Atomic Safety and Licensing Board
BEA	Battelle Energy Alliance, LLC
COL	Combined License
CP	Construction Permit
DCA	Design Certification Application
DOE	Department of Energy
EIS	Environmental Impact Statement
ERA	Energy Reorganization Act
ERDA	Energy Research and Development Administration
ESP	Early Site Permit
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FEMA	Federal Emergency Management Agency
FFRDC	Federally Funded Research and Development Center
FOCD	Foreign Ownership, Control, or Domination
GEIS	Generic Environmental Impact Statement
INL	Idaho National Laboratory
LWA	Limited Work Authorization
LWR	Light Water Power Reactor
MARVEL	Microreactor Applications Research, Validation, and Evaluation
M&O	Management and Operations
NEIMA	Nuclear Energy Innovation and Modernization Act
NEPA	National Environmental Policy Act
NPUF	Nonpower Production or Utilization Facility
NRC	Nuclear Regulatory Commission
OL	Operating License
PAA	Price-Anderson Act
R&D	Research and Development
SER	Safety Evaluation Report

TRISO	Tristructural Isotropic

Recommendations to Improve the Nuclear Regulatory Commission Reactor Licensing and Approval Process

1. INTRODUCTION AND SUMMARY

Idaho National Laboratory (INL) is a multi-program U.S. Department of Energy (DOE) Federally Funded Research and Development Center (FFRDC). Its primary focus is to function as the nation's nuclear energy research, development, and demonstration laboratory providing and directing resources and capabilities to support nuclear energy, national security, and other applied energy missions. Battelle Energy Alliance, LLC (BEA) is the management and operations (M&O) contractor for INL. Given the responsibilities at INL, BEA has personnel with extensive knowledge and experience related to current and advanced nuclear systems and associated technologies, including their operations, regulations, and licensing processes.

Due to the urgency around climate change and associated goals for clean energy transition, as well as BEA's role described above, numerous stakeholders have asked for BEA's thoughts and recommendations to improve the U.S. Nuclear Regulatory Commission's (NRC)[1] licensing review and approval process. On April 14, 2023, the House Committee on Energy and Commerce requested BEA input on "information and recommendations to improve the licensing review and approval process, . . . as well as the siting, licensing, construction, and oversight of advanced nuclear reactor technologies."

As an M&O contractor for an FFRDC, BEA is a long-term partner with the Government in seeking to achieve clean energy goals, yet has a level of independence needed to appropriately evaluate the above topics. The views herein are informed by extensive BEA experience supporting nuclear energy endeavors including ongoing discussions with current and former regulators, nuclear reactor developers, applicants, licensees, and other stakeholders.

With this background in mind, the United States benefits from having an agency such as the NRC, which is viewed internationally as the leader in nuclear safety licensing and regulation. Nonetheless, while acknowledging the important nuclear safety role provided by the NRC, it is apparent that one of the most significant time and resource intensive activities for developers of new nuclear systems, including advanced nuclear reactors, is the NRC licensing process. The time and cost to obtain NRC licenses represent significant fractions of the total time and cost for new nuclear projects and may result in abandonment of projects or failure to even begin new projects. The challenge is particularly acute for advanced reactors which may raise unique or new regulatory questions and may be smaller in size, resulting in a much higher proportional impact from the time and costs associated with NRC licensing. This situation presents a particularly troublesome risk for the nation given the urgency in which utilities and other significant energy generators are working to transition to clean, firm, non-carbon-emitting energy sources like nuclear energy.

Thankfully, reforms to the NRC licensing process have the potential to greatly increase efficiency and predictability and support the successful progress of new reactors. The NRC can retain its world-class nuclear safety reputation while becoming a world leader for regulatory efficiency and a critical enabler to the clean energy transition. This report describes potential NRC reforms, focusing on those with a statutory connection. Recognizing the potential tradeoffs with any proposed changes, the report attempts to highlight those considerations in the analysis of the reforms. The recommendations are presented as a set of options for consideration. Unless noted, they are independent options, offering stakeholders the option to select a subset for further consideration. Although difficult to calculate precise time improvements for some of the changes, the reforms have the potential for substantial improvements, perhaps even by a factor of two. As an example, the first reform discussed below—removal of mandatory hearings—would directly reduce the timeframe for certain licensing actions by about half a year.

1. This paper generally uses "NRC" to refer to the entire agency. "Commission" is used to refer to the 5-member Commission which heads the NRC. "NRC Staff" refers to NRC employees other than the Commission.

As described in more detail in Section 2, the following changes should facilitate the licensing of new reactors at the NRC:

Reforms to Streamline NRC Hearings

2.1.1. Remove the Atomic Energy Act requirement for the NRC to hold an uncontested "mandatory hearing" for select new reactor licensing actions, saving approximately six months from the critical path for the actions.

2.1.2. Remove the NRC contested hearing opportunity on environmental topics to align with the traditional public comment and challenge process under the National Environmental Policy Act (NEPA).

2.1.3. Require use of a simplified legislative hearing process for NRC contested new reactor licensing proceedings, instead of the existing lengthy and costly hearing procedures.

Reforms to Expedite NRC Safety and Environmental Reviews

2.2.1. Clarify the NRC's mission statement from a singular safety focus to include the timely and efficient licensing of new nuclear projects, similar to other safety-focused federal agencies such as the Federal Aviation Administration.

2.2.2. Reduce the excessive burden of Advisory Committee on Reactor Safeguards (ACRS) reviews by limiting its reviews to unique or new safety issues referred by the Commission as having significant hazard potential.

2.2.3. Allow non-public meetings between the NRC Staff and applicants to facilitate the efficiency of licensing reviews, while retaining the extensive information and processes otherwise available to the public.

2.2.4. Exclude small (< 20 megawatts thermal) non-commercial reactor projects on DOE sites from NEPA, whether subject to DOE authorization or NRC licensing.

2.2.5. Formulate an external review team to shadow an entire NRC licensing review start to finish and provide recommendations to further streamline the licensing process, including appropriate application of the reasonable assurance standard.

Reforms to Otherwise Improve NRC Licensing

2.3.1. Strengthen the requirements for NRC milestones for new reactor licensing activities, including shorter timelines, more rigid reporting requirements, and accounting for the full duration of licensing activities.

2.3.2. Clarify which non-commercial demonstration nuclear reactor projects may be authorized by DOE versus licensed by the NRC.

Reforms to Provide Financial Benefits to New Reactor Projects

2.4.1. Modify the NRC fee structure for the licensing of new nuclear reactors or otherwise provide financial support for those projects.

2.4.2. Permit foreign investment by U.S. allies in U.S. nuclear projects licensed by the NRC as long as the Commission determines that the entity is not inimical to common defense and security or the health and safety of the public.

2.4.3. Indefinitely extend the Price-Anderson Act coverage for nuclear hazards indemnification for covered DOE contractors and NRC licensees.

BEA also recognizes other ongoing efforts to improve the NRC licensing process. As an example, a bipartisan group of senators recently introduced the Accelerating Deployment of Versatile, Advanced

Nuclear for Clean Energy (ADVANCE) Act of 2023.[2] Although not its entire focus, the ADVANCE Act includes provisions that would substantially benefit the NRC licensing process. All of those provisions are not repeated herein, but some of them are discussed below in the context of the suggested reforms in this report.

In summary, although there have been many recent and ongoing efforts to incorporate efficiency and timeliness into the NRC's advanced reactor licensing regime, much more can be done. This report identifies potential NRC reforms which should individually and collectively result in significant efficiency and predictability improvements. If implemented, these reforms have the potential to enhance the NRC's stature as a world leader in nuclear safety to also include leadership in timely and efficient advanced reactor licensing.

2. AREAS OF REFORM FOR NRC NEW REACTOR LICENSING

2.1. Reforms to Streamline NRC Hearings

2.1.1. Remove the Atomic Energy Act requirement for the NRC to hold an uncontested "mandatory hearing" for select new reactor licensing actions, saving approximately six months from the critical path for the actions.

The Atomic Energy Act of 1954, as amended (AEA),[3] requires that the NRC hold a "mandatory hearing" for certain types of licensing activities. Specifically, AEA Section 189a.(1)(A) states: "The Commission shall hold a hearing after thirty days' notice and publication once in the Federal Register, on each application under section 103 or 104b. for a construction permit for a facility, and on any application under section 104c. for a construction permit for a testing facility."[4] This means that the Commission must hold a mandatory hearing for each Construction Permit (CP) under 10 C.F.R. Part 50; each Limited Work Authorization (LWA) under 10 C.F.R. Part 50; each Early Site Permit (ESP), which is considered a partial CP, under 10 C.F.R. Part 52; and each Combined License (COL), which includes a CP and Operating License (OL), under 10 C.F.R. Part 52.

A mandatory hearing is a non-contested proceeding in which only the applicant and the NRC Staff participate. The Commission is the presiding officer or delegates the responsibility to an Atomic Safety and Licensing Board (ASLB). The mandatory hearing process commences once the NRC Staff completes its review (i.e., issues final Safety Evaluation Report (SER) or Environmental Impact Statement (EIS), whichever is later) and publishes a SECY information paper to the Commission describing its review. The process includes written questions and responses, written testimony, and an in-person hearing with sworn witnesses. The process concludes with a decision by the presiding officer.[5]

Because the mandatory hearing process does not begin until the NRC Staff completes its review (and is ready to issue the permit/license), the process is squarely on the critical path for the licensing action. In fact, past mandatory hearings have taken 4-7 months to complete, directly adding this delay to the licensing action. This is shown below in Table 1. The table lists projects subject to mandatory hearings held during the past 15 years, including ESPs for new reactors, COLs for new reactors, and CPs for medical isotope facilities. This timeframe was selected because it covers most of the 10 C.F.R. Part 52 new reactor projects subject to mandatory hearings, as well as projects which used the NRC's current procedures for mandatory hearings. For each project, the table identifies the date the later of the SER or EIS was issued (representing the end of the NRC Staff review), the date of the licensing action, and the resulting delay due to the mandatory hearing. The table is organized chronologically according to the

2. *See, e.g.*, Carper, Capito, Whitehouse Introduce Bipartisan Nuclear Energy Bill, the ADVANCE Act (Apr. 3, 2023), https://www.epw.senate.gov/public/index.cfm/2023/4/carper-capito-whitehouse-introduce-bipartisan-nuclear-energy-bill-the-advance-act.

3. Public Law 83-703, 68 Stat. 919, 42 U.S.C. § 2011 et seq.

4. 42 U.S.C. § 2239(a)(1)(A).

5. *See generally* Internal Commission Procedures, Ch. IV, at 11 (Aug. 2016), *available at* https://www.nrc.gov/docs/ML1625/ML16250A666.pdf#page=11.

second column. As shown in the fourth column, the delay due to the mandatory hearing ranged from 4-7 months, but the delay was most frequently six months.

Table 1. Information on recent NRC mandatory hearings.

Project	Last of SER/EIS Issued	License/Permit Issuance	Mandatory Hearing Delay	Presiding Officer	Different Findings Based on Mandatory Hearing?
Vogtle ESP & LWA[6]	2/2009	8/26/2009	6 months	ASLB	No
Vogtle 3&4 COL[7]	8/2011	2/10/2012	6 months	Commission	No, but added conditions primarily due to Fukushima
Summer 2&3 COL[8]	8/2011	3/30/2012	7 months	Commission	No, but added conditions primarily due to Fukushima
Fermi 3 COL[9]	11/2014	5/1/2015	6 months	Commission	No
STP 3&4 COL[10]	9/2015	2/12/2016	5 months	Commission	No
SHINE CP[11]	10/2015	2/29/2016	4 months	Commission	No
PSEG ESP[12]	11/2015	5/5/2016	6 months	ASLB	No
Levy 1&2 COL[13]	5/2016	10/26/2016	5 months	Commission	No
Lee 1&2 COL[14]	8/2016	12/19/2016	4 months	Commission	No
Turkey Point 6&7 COL[15]	11/2016; revised hearing notice 10/2017 after consultations	4/12/2018	6 months, based on revised hearing notice	Commission	No

6. Issued Early Site Permit – Vogtle Site, https://www.nrc.gov/reactors/new-reactors/large-lwr/esp/vogtle.html.
7. Issued Combined Licenses and Limited Work Authorizations for Vogtle, Units 3 and 4, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/vogtle.html.
8. Combined Licenses for Virgil C. Summer Nuclear Station, Units 2 and 3, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/summer.html.
9. Application Review Schedule for the Combined License Application for Fermi, Unit 3, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/fermi/review-schedule.html.
10. Issued Combined Licenses for South Texas Project, Units 3 and 4, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/south-texas-project.html.
11. SHINE Medical Technologies, LLC, https://www.nrc.gov/info-finder/nonpower/shine-medical-tech.html.
12. Issued Early Site Permit – PSEG Site, https://www.nrc.gov/reactors/new-reactors/large-lwr/esp/pseg.html.
13. Issued Combined Licenses for Levy Nuclear Plant, Units 1 and 2, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/levy.html.
14. Issued Combined Licenses for William States Lee III Nuclear Station, Units 1 and 2, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/lee.html.
15. Issued Combined Licenses for Turkey Point, Units 6 and 7 Application, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/turkey-point.html.

Project	Last of SER/EIS Issued	License/Permit Issuance	Mandatory Hearing Delay	Presiding Officer	Different Findings Based on Mandatory Hearing?
	and hurricane delays				
North Anna 3 COL[16]	1/2017	6/2/2017	5 months	Commission	No
Northwest Med. Isotopes CP[17]	11/2017	5/9/2018	7 months	Commission	No
Clinch River ESP[18]	6/2019	12/19/2019	6 months	Commission	No

Finally, the table identifies the presiding officer for the mandatory hearings and whether the mandatory hearing resulted in any findings different than the NRC Staff review.

In addition to the significant delays from mandatory hearings discussed above, the hearings also serve little purpose. The applications related to these mandatory hearings already are subject to significant review from other sources, examples include:

- These applications typically undergo thousands of hours of review by hundreds of NRC Staff reviewers with substantial subject matter expertise.
- AEA Section 29 established an Advisory Committee on Reactor Safeguards (ACRS) to "review safety studies and facility license applications referred to it . . . ."[19] Under current practice, the ACRS reviews all new reactor applications over many months with many meetings with the NRC Staff and applicant. Under a change proposed below in Section 2.2.2, the ACRS review would be narrower in scope than this current practice, but it still would cover unique or new safety issues posing potential hazard.
- The entirety of each application is subject to challenge by any person. In fact, most of the above applications were challenged through the contested hearing opportunity.
- The applications are subject to numerous public meetings and opportunities for public comment.

The Commission should be permitted to rely on the review by its experts and the open opportunity for any member of the public to review and challenge the applications.

Importantly, none of the mandatory hearings identified above reached a different conclusion from the NRC Staff on the findings needed to support the licensing action. In other words, the results of all these licensing actions were not impacted by the mandatory hearings. This finding is not surprising given the thorough review performed by the NRC Staff and the ACRS (even with the limited scope proposed in Section 2.2.2 below for the ACRS).

Perhaps the only direct value of a mandatory hearing is possibly to educate the Commission on an application. This education, however, can be and typically is performed outside of the mandatory hearing process. Indeed, the Commission should be informed of pending applications well before the NRC Staff

16. Issued Combined Licenses for North Anna, Unit 3, https://www.nrc.gov/reactors/new-reactors/large-lwr/col/north-anna.html.
17. Northwest Medical Isotopes, LLC, https://www.nrc.gov/info-finder/nonpower/nw-medical-isotopes.html.
18. Issued Early Site Permit – Clinch River Nuclear Site, https://www.nrc.gov/reactors/new-reactors/large-lwr/esp/clinch-river.html.
19. 42 U.S.C. § 2039.

completes its review. Feedback from the Commission information briefings can be considered during the licensing review process rather than lengthening the critical path for the licensing action. If the Commission finds value in informational meetings, there is no statutory or regulatory bar preventing it from holding such meetings during the application review. The Commission's decision to delegate the mandatory hearings to the ASLB in some cases further shows the lack of value of the mandatory hearing from an educational standpoint.[20]

In summary, although the mandatory hearing process may have been helpful many decades ago while licensing the first commercial nuclear reactors, that usefulness is long gone given the extensive experience with the licensing process. The mandatory hearings result in significant delay to CP, LWA, ESP, and COL licensing actions without a corresponding benefit. Any benefit can be addressed through other informational meetings held during the NRC's review. The mandatory hearing obligation should be removed from the AEA.

2.1.2. Remove the NRC contested hearing opportunity on environmental topics to align with the traditional public comment and challenge process under NEPA.

AEA Section 189a.(1)(A) states: "In any proceeding under this Act, for the granting, suspending, revoking, or amending of any license or construction permit, . . . the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding."[21]

As implemented, the NRC provides a very broad and, in some cases, duplicative opportunity for persons to challenge applications of all types. The NRC's rules of practice and procedure are found in 10 C.F.R. Part 2. Those rules generally allow a person to challenge any portion of an application, including the environmental report submitted by the applicant, if their interests are affected by the project.[22] On issues arising under NEPA, persons also may challenge the NRC's review document (e.g., Environmental Assessment, EIS).[23]

This ability to challenge the NEPA review through a Commission-granted hearing exceeds the typical practice for NEPA reviews for other federal actions. Normally, members of the public can participate in significant NEPA reviews through a public scoping process, comments on draft NEPA review documents, and federal court challenges.[24] The NRC process provides these public input opportunities in addition to the hearing process.[25]

Challenges to environmental issues as part of a contested hearing process have the potential to cause significant delay to the NRC's review. If an environmental issue proceeds to an evidentiary hearing, then that hearing typically would not commence until after issuance of the NRC's environmental review document.[26] Depending on the circumstances, the contested hearing process could be on the critical path

20. *See, e.g.*, Staff Requirements – SECY-21-0107 – Selection of Presiding Officer for Mandatory Hearings Associated with Construction Permit Applications (Mar. 23, 2022), *available at* https://www.nrc.gov/docs/ML2208/ML22083A045.pdf (approving delegation of presiding officer role for mandatory hearings to ASLB, except for the first for each advanced reactor technology design).

21. 42 U.S.C. § 2239(a)(1)(A).

22. *See* 10 C.F.R. §§ 2.309(a), (f)(2).

23. *See* 10 C.F.R. § 2.309(f)(2).

24. *See, e.g.*, EPA, How Citizens can Comment and Participate in the National Environmental Policy Act Process (describing NEPA public participation opportunities, including public scoping and public comment), https://www.epa.gov/nepa/how-citizens-can-comment-and-participate-national-environmental-policy-act-process; CRS Report, National Environmental Policy Act: Judicial Review and Remedies (Sept. 22, 2021) (describing judicial review for NEPA claims against federal agencies and established remedies for successful claims), *available at* https://crsreports.congress.gov/product/pdf/IF/IF11932.

25. *See generally* 10 C.F.R. Part 51; 10 C.F.R. § 2.309.

26. *See* 10 C.F.R. § 2.332(d).

of the licensing action and could result in a delay of a year or more for the hearing and appeal activities.[27] The participation opportunities through the public scoping and comment process more appropriately occur during the NRC's preparation of its NEPA review document.

Removing the ability to challenge NEPA issues in the contested hearing process would remove redundancy and minimize potential for delay during application reviews while retaining public participation opportunities.

2.1.3. Require use of a simplified legislative hearing process for NRC contested new reactor licensing proceedings, instead of the existing lengthy and costly hearing procedures.

The AEA requires the opportunity for contested hearings on new reactor applications, but does not provide much direction for how the NRC is to conduct contested hearings. AEA Section 189a.(1)(A) broadly states: "In any proceeding under this Act, for the granting . . . of any license or construction permit . . . , the Commission shall grant a hearing upon the request of any person whose interest may be affected by the proceeding, and shall admit any such person as a party to such proceeding."[28] This lack of statutory direction has provided much discretion to the NRC to develop its hearing procedures.

The NRC's rules of practice and procedure governing the conduct of most NRC hearings, including those addressing new reactors, are found in 10 C.F.R. Part 2. The contested hearing process for new reactors typically commences with the NRC publishing a notice of opportunity to request a hearing or petition for leave to intervene in the *Federal Register* either at the time of docketing an application or shortly thereafter. Subpart C of Part 2 provides the rules of general applicability and covers many topics such as hearing requests, presiding officer powers, and general hearing management. If a hearing request is granted, then 10 C.F.R. § 2.310 addresses the selection of hearing procedures and directs that most proceedings for the grant of licenses or permits under 10 C.F.R. Parts 50 and 52 should proceed under 10 C.F.R. Part 2, Subpart L (Simplified Hearing Procedures for NRC Adjudications).

Notwithstanding the title of "Simplified Hearing Procedures," the use of Subpart L commences a hearing process which can be very complicated and require significant effort, cost, and time. Some of the features of Subpart L include the following:

- The NRC Staff must prepare and file the "hearing file," which includes the application, amendments, NRC EIS, and any correspondence between the applicant and the NRC *relevant to the admitted contention*.[29] Depending on the subject of the hearing, the hearing file can be very extensive. As a fairly recent example, the initial hearing file in the Clinch River ESP proceeding identified 432 documents, representing many thousands of pages of documents.[30]

27. One example of this type of delay is the Turkey Point COL proceeding. The NRC completed the EIS for the project in October 2016 with a supplement in December 2016 and completed the Final Safety Evaluation Report in November 2016. *See Fla. Power & Light Co.* (Turkey Point Nuclear Generating Units 6 & 7), CLI-18-1, 87 NRC 39, 50-51 (2018). Thereafter, the ASLB held an evidentiary hearing on a contention related to wastewater injection and issued its decision on July 10, 2017, about nine months after the EIS. *See generally Fla. Power & Light Co.* (Turkey Point Units 6 & 7), LBP-17-5, 86 NRC 1 (2017). The NRC, however, did not issue the COLs until April 2018 due to other delays which postponed the mandatory hearing. *See Turkey Point*, CLI-18-1, 87 NRC at 51.

28. 42 U.S.C. § 2239(a)(1)(A).

29. 10 C.F.R. §§ 2.336(b), 2.1203.

30. Letter from K. Roach, NRC Staff Counsel, to Administrative Judges (Dec. 15, 2017), *available at* https://www.nrc.gov/docs/ML1734/ML17349A992.pdf.

31. 10 C.F.R. § 2.336(a) (emphasis added).

- The applicant and parties other than the NRC Staff must file their "mandatory disclosures," including information on experts, list of privileged or protected documents, and "[a] copy (for which there is no claim of privilege or protected status), or a description by category and location, of all tangible things (e.g., books, publications and treatises) in the possession, custody or control of the party that are *relevant to the contention*."[31] Depending on the subject of the hearing, the mandatory disclosures can be very extensive. As one example, the applicant's initial mandatory disclosures in the North Anna COL proceeding identified 880 documents, also representing many thousands of pages of documents.[32]
- The above disclosure requirements are continuing and must be updated monthly.[33]
- The parties may prepare and respond to motions related to the proceeding, including motions for summary disposition.[34]
- The parties may file new or amended contentions throughout the NRC review, which if admitted, may multiply the hearing burdens.[35]
- The parties must prepare and submit numerous hearing documents, including written statements of position, written testimony with supporting affidavits, written responses and rebuttal testimony with supporting affidavits, proposed questions for the presiding officer to consider for propounding to the persons sponsoring the testimony, and post-hearing proposed findings of fact and conclusions of law.[36]
- The parties typically must prepare for and participate in oral hearings with the presiding officer.[37]
- The parties may then appeal decisions to the Commission first and then to the federal courts.[38]

Some of the above activities related to the hearing file, discovery, and motions practice may occur in parallel with the NRC's application review. The filings and preparation leading to the oral hearing, however, typically would not begin until the NRC Staff completes either its draft safety evaluation for relevant safety topics or the Final EIS for environmental topics.[39] This timing could result in a contested hearing process which coincides with the critical path for the licensing action. The timeline for the hearing process from the Staff completion of the triggering document could take a year or more until the presiding officer issues a decision on the hearing.

Any reduction of the level of effort and timeframes related to contested proceedings would be a significant benefit to new reactor applications, particularly changes related to document discovery and the timeframes of the hearing. One option would direct new reactor hearings to utilize a legislative hearing process rather than the Subpart L process. NRC's rules at 10 C.F.R. Part 2, Subpart O already provide for "Legislative Hearings" for certain activities. These hearings are intended to be simplified with less discovery, simpler paper filings, and a limited oral hearing. As explained in Subpart O, these proceedings would involve written statements on Commission-identified issues, may include documentary and demonstrative information, and would include an oral hearing with the presiding officer questioning

31. 10 C.F.R. § 2.336(a) (emphasis added).
32. Production Log for Dominion's Initial Disclosures (Oct. 1, 2008), *available at* https://www.nrc.gov/docs/ML0827/ML082750602.pdf.
33. 10 C.F.R. § 2.336(d).
34. 10 C.F.R. §§ 2.1204, 2.1205.
35. 10 C.F.R. § 2.309(c).
36. 10 C.F.R. §§ 2.1207(a), 2.1210.
37. 10 C.F.R. § 2.1207(b).
38. 10 C.F.R. § 2.1212.
39. 10 C.F.R. § 2.332(d).

witnesses.[40] The timeframes in Subpart O contemplate a very expedited process which could be completed in a few months, rather than the year plus which could be required for a Subpart L proceeding. To further limit the impact of the hearing on the licensing action, it is recommended that the Commission commence legislative hearings on topics during the NRC Staff's review rather than awaiting conclusion of the review. Some changes to Subpart O would be required to conform with this recommendation, such as broadening the scope to include new reactor proceedings and changes to make it clear that mandatory disclosures and the hearing file would not be required.

2.2. Reforms to Expedite NRC Safety and Environmental Reviews

2.2.1. Clarify the NRC's mission statement from a singular safety focus to include the timely and efficient licensing of new nuclear projects, similar to other safety-focused federal agencies such as the Federal Aviation Administration.

The AEA provided the foundational requirements for the licensing of nuclear reactors, including leadership and oversight by the Atomic Energy Commission (AEC). Among its purposes, the AEA includes "[a] program of conducting, assisting, and fostering research and development in order to encourage maximum scientific and industrial progress" and "[a] program to encourage widespread participation in the development and utilization of atomic energy for peaceful purposes . . . ."[41] Under the AEA, the AEC supported both research and development (R&D) and commercial licensing activities.

The Energy Reorganization Act of 1974, as amended (ERA),[42] abolished the AEC and generally split its functions into two new agencies. First, the ERA established the Energy Research and Development Administration (ERDA) as an independent executive agency to, among other things, support nuclear R&D.[43] ERDA was charged with "encouraging and conducting research and development . . . related to the development and use of energy from . . . nuclear . . . sources."[44] Second, the ERA established the NRC as an independent regulatory commission to generally perform the AEC's licensing and related regulatory functions separate from ERDA.[45] Subject to other provisions, the NRC was given "principal licensing and regulation" authority for all reactors, materials facilities, and materials licensed under the AEA.[46]

In creating the NRC, the ERA did not identify a clear mission statement. Instead, the ERA broadly stated in Section 2(c): "The Congress finds that it is in the public interest that the *licensing and related regulatory functions* of the Atomic Energy Commission be separated from the performance of the other functions of the Commission . . . ."[47] ERA Section 201(a)(1) further states: "There is established an *independent regulatory commission* to be known as the Nuclear Regulatory Commission . . . ."[48]

These limited statements have resulted in an NRC focused on licensing and regulatory issues from a safety standpoint with little direction as to how those activities are to be conducted. Indeed, the NRC's own mission statement states: "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

40. *See* 10 C.F.R. §§ 2.1506, 2.1507.

41. 42 U.S.C. § 2013.

42. Public Law 93-438, 88 Stat. 1233, 42 U.S.C. § 5801 et seq.

43. 42 U.S.C. §§ 5801(b), 5811, 5813. The Department of Energy Organization Act of 1977, as amended, Public Law 95-91, 91 Stat. 565, 42 U.S.C. § 7101 et seq., established DOE within the executive branch and transferred all of the functions of ERDA into DOE. 42 U.S.C. §§ 7131, 7151.

44. 42 U.S.C. § 5813(2).

45. 42 U.S.C. §§ 5801(c), 5841(a)(1).

46. 42 U.S.C. §§ 5843(b)(1), 5844(b)(1).

47. 42 U.S.C. § 5801(c) (emphasis added).

48. 42 U.S.C. § 5841(a)(1) (emphasis added).

promote the common defense and security and to protect the environment."[49] While addressing important topics, this mission of health and safety provides the NRC with little motivation to undertake its activities with a focus on timeliness and efficiency. This is not to say that the NRC entirely ignores timeliness and efficiency, but that these are lesser priorities and are not considered in all activities.

It is possible to argue that promoting common defense and security and similar mission statements imply a notion of urgency. The need to expedite the deployment of nuclear energy to support the nation's carbon-free energy objectives together with nuclear energy's proven ability to provide reliable energy security even during stressful circumstances should invoke adherence to "common defense and security." Nonetheless, that urgency is not apparent.

A slight modification to the statutory mission of the NRC to incorporate a timeliness and efficiency focus could greatly improve the speed and success of new reactor licensing activities and other NRC activities. Ensuring public health and safety remain the prime NRC objectives, but with improved metrics that foster timely and efficient reviews and decisions, would drive the NRC to increase productivity and shorten its licensing reviews. A modified mission statement and associated metrics would help the NRC identify internal changes that it is responsible for and responsive to.

Precedent exists for other agencies with a safety mission to also proceed in an expeditious and efficient manner. For example, the Federal Aviation Administration (FAA) states: "Our continuing mission is to provide the safest, *most efficient* aerospace system in the world."[50] Similarly, the FAA's vision states: "We strive to reach the next level of safety and *efficiency* and to demonstrate global leadership in how we safely integrate new users and technologies into our aviation system. We are accountable to the American public and our aviation stakeholders."[51] This mission and vision is consistent with the FAA statutory obligations, which repeatedly refer to conducting its activities efficiently.[52]

As another example, the U.S. Food and Drug Administration (FDA) states the following as part of its mission: "FDA is responsible for advancing the public health by *helping to speed innovations* that make medical products more effective, safer, and more affordable and by helping the public get the accurate, science-based information they need to use medical products and foods to maintain and improve their health."[53] The need for speeding innovations at the FDA to support public health is similar to the need for speeding innovations at the NRC to support public health related to the provision of carbon-free baseload power sources. Similar to the FAA, the FDA's mission is consistent with statutory obligations which also address timely and efficient action.[54]

The two agencies discussed above—FAA and FDA—are particularly relevant to discussing the mission of the NRC, because those agencies also have important safety missions. The inclusion of a timely and efficiency component in their missions does not appear to have had any detrimental impact on their safety missions.

49. *See* About NRC, https://www.nrc.gov/about-nrc.html.

50. *See* Mission, https://www.faa.gov/about/mission (emphasis added).

51. *See id.* (emphasis added).

52. *See, e.g.*, 49 U.S.C. § 106(b) (stating that the Administrator must "carry out efficiently the duties and powers of the office"), § 106(p)(7)(E)(i) (stating the Air Traffic Services Board must consider efficient operation of the FAA). Additionally, Section 221 of Pub. L. 104-264 includes a Congressional finding that "The Administration must become a more efficient, effective, and different organization to meet future challenges." 49 U.S.C. § 106 note.

53. What We Do, https://www.fda.gov/about-fda/what-we-do (emphasis added).

54. *See, e.g.*, 21 U.S.C. § 393(b) (stating that the mission of the FDA includes "promote the public health by promptly and efficiently reviewing clinical research and taking appropriate action on the marketing of regulated products in a timely manner").

2.2.2. Reduce the excessive burden of ACRS reviews by limiting its reviews to unique or new safety issues referred by the Commission as having significant hazard potential.

The ACRS serves as an advisory committee to the Commission for a variety of topics identified in the AEA. AEA Section 29 states in part the following about the ACRS:

> *There is established an Advisory Committee on Reactor Safeguards consisting of a maximum of fifteen members appointed by the Commission for terms of four years each. The Committee shall review safety studies and facility license applications referred to it and shall make reports thereon, shall advise the Commission with regard to the hazards of proposed or existing reactor facilities and the adequacy of proposed reactor safety standards, and shall perform such other duties as the Commission may request.*[55]

AEA Section 182b. further states:

> *The Advisory Committee on Reactor Safeguards shall review each application under section 103 or section 104b. for a construction permit or an operating license for a facility, any application under section 104c. for a construction permit or an operating license for a testing facility, any application under section 104a. or c. specifically referred to it by the Commission, and any application for an amendment to a construction permit or an amendment to an operating license under section 103 or 104a., b., or c. specifically referred to it by the Commission, and shall submit a report thereon which shall be made part of the record of the application and available to the public except to the extent that security classification prevents disclosure.*[56]

Based on the above requirements, the ACRS performs a detailed review of safety issues in every new reactor application. The review includes meetings with the NRC Staff and applicants and development of reports on those reviews. The ACRS webpage on the NRC's website illustrates the tremendous number of meetings and reports undertaken by the ACRS.[57] In some busy licensing years, this can result in approximately 80 meetings and 70 reports by the ACRS.[58] This workload could increase significantly if there is a wave of advanced reactor applications.

55. 42 U.S.C. § 2039.

56. 42 U.S.C. § 2232(b).

57. *See* Advisory Committee on Reactor Safeguards Document Collections, https://www.nrc.gov/reading-rm/doc-collections/acrs/index.html.

58. *See, e.g.*, 2011 Advisory Committee on Reactor Safeguards (ACRS) Meeting Schedule and Related Documents, https://www.nrc.gov/reading-rm/doc-collections/acrs/agenda/2011/index.html; Advisory Committee on Reactor Safeguards (ACRS) 2011 Letter Reports, https://www.nrc.gov/reading-rm/doc-collections/acrs/letters/2011/index.html.

59. Letter from T. Bergman, NuScale, to M. Doane, NRC EDO, Lessons-Learned from the Design Certification Review of the NuScale Power, LLC Small Modular Reactor, Enclosure, at 2 (Feb. 19, 2021) ("NuScale Lessons-Learned Report"), *available at* https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21050A431.

These reviews by the ACRS have become burdensome and time-consuming for industry and regulators alike and have resulted in essentially a new review of safety issues, redundant with the NRC Staff's review. As one example, NuScale has explained that during its design certification review for the NuScale Small Modular Reactor, the ACRS conducted some 40 meetings, totaling approximately 440 hours of in-person meeting time.[59] As part of its lessons learned from the NRC review, NuScale recommended:

> *Clarify the role of the Advisory Committee on Reactor Safeguards (ACRS). The ACRS's approach during the NuScale [design certification application (DCA)] review worked because the NuScale SMR was the only advanced reactor design under review. However, it was unnecessarily broad and burdensome and the same approach may not work if there are multiple advanced reactor designs under review, as expected in the near future. The consequence of not clarifying the role of the ACRS is that the ACRS, due to resource constraints, may delay the approval and deployment of nuclear power plants with advanced safety features.*[60]

It is challenging to determine the specific cost and delay due to excessive ACRS meetings as those meetings are intermingled with the Staff review. Nonetheless, the cost and delay must be significant given the need to submit information to the ACRS, prepare for formal meetings with the ACRS, participate in those meetings, and address feedback from the ACRS. This process requires significant effort by both the NRC Staff and the applicant, diverting those resources away from the Staff's application review and the applicant's support of that review.

With the above experience in mind, and with the expectation of numerous advanced reactor applications, it is appropriate to revisit the scope of the ACRS review. The ACRS was formed at a time in which the AEC had full responsibility for initial new reactor projects. That is no longer the case as the NRC is established as an independent regulator and has many decades of experience. Additionally, although AEA Section 182b. directs the ACRS to review certain applications, the AEA does not describe the level of detail of that review. However, it certainly cannot mean that the 15-member ACRS must perform a detailed review for each new reactor application resulting in dozens of meetings, hundreds of hours in meetings, and countless hours reviewing each application outside of meetings.

This detailed review is unnecessary for all new reactor proceedings. The statutory language in AEA Sections 29 and 182b. should be revised to establish a new charter for the ACRS directing the appropriate scope and level of review for new reactor applications. This scope would instruct the ACRS to only review items the Commission refers to it and that the Commission should only refer safety topics which are new or unique and present a potential significant hazard. A revised scope should also include deletion of AEA Section 182b. and rely upon and clarify the language in AEA Section 29 so that ACRS reviews address "safety studies and facility license applications referred to it." This approach should be clarified to instruct the ACRS to only conduct a review of new or unique issues with some potential hazard, not every license application. This would require a specific referral from the Commission to the ACRS specifying issues to be reviewed. This balance should allow the NRC to continue to benefit from the independent review capabilities of the ACRS for the most risk significant topics, while minimizing the overall impact on licensing actions. Although some efficiencies in ACRS reviews may be obtained without statutory changes, the above statutory changes are the most direct means to achieve immediate and lasting improvements.

59. Letter from T. Bergman, NuScale, to M. Doane, NRC EDO, Lessons-Learned from the Design Certification Review of the NuScale Power, LLC Small Modular Reactor, Enclosure, at 2 (Feb. 19, 2021) ("NuScale Lessons-Learned Report"), *available at* https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML21050A431.

60. *Id.* at 2.

2.2.3. Allow non-public meetings between the NRC Staff and applicants to facilitate the efficiency of licensing reviews, while retaining the extensive information and processes otherwise available to the public.

The NRC has issued a policy statement on public meetings and has interpreted it in a way that almost all substantive verbal interactions between an applicant and the NRC Staff must occur in a public meeting.[61] The NRC states the purpose of the policy statement is "to conduct business in an open manner, and to balance openness and transparency with the need to exercise regulatory and safety responsibilities without undue administrative burden."[62] Notwithstanding this reference to a balance, including undue administrative burden, the NRC provides only limited exceptions to making interactions between the NRC Staff and applicants on substantive application topics subject to a public meeting. The available exceptions in the policy statement are as follows:[63]

a. Is specifically authorized by an Executive Order to be withheld in the interests of national defense or foreign policy (classified information);

b. Is specifically exempt from public disclosure by statute (e.g., safeguards or proprietary information);

c. Is of a personal nature where such disclosure would constitute a clearly unwarranted invasion of personal privacy;

d. Is related to a planned, ongoing, or completed investigation, or contains information compiled for law enforcement purposes;

e. Could compromise the ongoing reviews and inspections associated with an open allegation;

f. Could result in the inappropriate disclosure and dissemination of preliminary, pre-decisional, or unverified information;

g. Is for general information exchange having no direct, substantive connection to a specific NRC regulatory decision or action; however, should discussions in a closed meeting approach issues that might lead to a specific regulatory decision or action, the NRC staff may advise the meeting attendees that such matters cannot be discussed and propose discussing the issues in a future public meeting; or

h. Indicates that the administrative burden associated with public attendance at the meeting could interfere with the NRC staff's execution of its safety and regulatory responsibilities, such as when the meeting is an integral part of the execution of the NRC inspection program.

Except for some limited circumstances involving security or proprietary information, none of these exceptions typically would apply to the substantive interactions between an applicant and the NRC Staff related to an application. This restriction prevents the free flow of information and requires the scheduling of public meetings to address topics which could be resolved or clarified in a brief conversation between the applicant and the NRC Staff. Indeed, the policy statement specifies that the NRC provides a minimum of 10 days' notice for these public meetings.[64] Such a delay is unreasonable when the administrative burden of setting up a call, posting a meeting notice, hosting a meeting, preparing meeting notes, etc. may delay the continuous progress of the NRC Staff review of an application when a brief telephone call may prevent delay, avoid extensive public meetings, and reduce the number of Requests for Additional Information from the Staff. The current practices also are not consistent with the current technology-driven and faster pace of communications in today's society. With the current public meeting practices, it is not surprising that NRC reviews are so lengthy and costly.

Although the transparency of the NRC is to be commended, the use of these extensive and delayed public meetings is not the only means for transparency on these application topics. Except for limited

61. *See* Enhancing Participation in NRC Public Meetings, 86 Fed. Reg. 14,964 (Mar. 19, 2021).

62. *Id.* at 14,965.

63. *Id.* at 14,967.

64. *Id.* at 14,965.

exceptions (e.g., Safeguards Information), members of the public have full disclosure of application documents, including all revisions to the application during the licensing review. They also have access to NRC Requests for Information, responses to those requests, other public meetings, etc. If needed, the NRC also could prepare summaries of communications held between only the NRC Staff and the applicant and make those summaries publicly available through the NRC website. Congressional direction to the NRC about more flexibility to engage with applicants outside of formal public meetings would greatly streamline this portion of the NRC Staff review.

2.2.4. Exclude small (< 20 megawatts thermal) non-commercial reactor projects on DOE sites from NEPA, whether subject to DOE authorization or NRC licensing.

One of the most significant costs and burdens of new reactor licensing projects is compliance with the requirements of NEPA, which generally requires environmental review of federal actions. The NRC has taken some important steps to reduce the challenge of NEPA activities for advanced reactors. As one example, the NRC is developing a Generic Environmental Impact Statement (GEIS) for advanced reactors which would perform a generic and bounding analysis of certain environmental topics.[65] This has the potential to significantly reduce both the effort required by an applicant to prepare the environmental content of its application and the effort by the NRC Staff to review the environmental impacts and prepare its NEPA documentation. In order to provide a benefit to most advanced reactor applicants, the NRC must ensure that the GEIS is completed expeditiously.

Additional refinements to NEPA reviews are possible. For example, the NEPA review requirement can be particularly frustrating for projects which have very low likelihood of any significant environmental impact, such as smaller non-commercial reactor projects on existing DOE sites. These projects typically will only impact existing facilities/buildings, previously disturbed land, and/or well-characterized areas. Depending on other circumstances, these projects could be subject to either DOE authorization or NRC licensing.

Recent experience with NEPA reviews for small reactors at INL has shown very low potential environmental impacts under these scenarios. For example, in June 2021, DOE issued an Environmental Assessment for the Microreactor Applications Research, Validation, and Evaluation (MARVEL) project.[66] The MARVEL project involves a 100-kilowatt thermal microreactor and is intended to offer experimental capabilities for performing R&D on various operational features of microreactors and improving integration of microreactors to end-user applications, such as off-grid electricity generation and process heat.[67] Following the environmental review, DOE concluded: “Implementing the MARVEL microreactor would result in small adverse impacts to the environment. However, these impacts, in conjunction with other past, present, and reasonably foreseeable future actions, would not result in discernible cumulative impacts.”[68]

65. *See* Advanced Nuclear Reactor Generic Environmental Impact Statement (GEIS), https://www.nrc.gov/reactors/new-reactors/advanced/rulemaking-and-guidance/advanced-reactor-generic-environmental-impact-statement-geis.html.

66. Final Environmental Assessment for the Microreactor Applications Research, Validation, and Evaluation (MARVEL) Project at Idaho National Laboratory, DOE/EA-2146 (June 2021), *available at* https://www.id.energy.gov/insideNEID/PDF/DOE%20EA-2146%20Final%20Environmental%20Assessment%20for%20the%20MARVEL%20Project%20at%20INL.pdf.

67. *Id.* at 2-3.

68. *Id.* at 51.

As another example, in February 2022, DOE and the Department of Defense Strategic Capabilities Office issued an EIS for Project Pele to construct and demonstrate a prototype mobile microreactor.[69] As reviewed, Project Pele would be capable of producing 1 to 5-megawatts electric and would be a small, advanced gas-cooled reactor using high-assay low-enriched uranium tristructural isotropic (TRISO) fuel and air as the ultimate heat sink.[70] Following the environmental review, the agencies concluded: "The impacts of Project Pele activities . . . would be a small fraction of the impacts of current operations . . . and would be an even smaller fraction when the impacts from other reasonably foreseeable actions are considered . . . . Therefore, . . . the incremental impacts for all resource areas from Project Pele activities would be very small and would not substantially contribute to cumulative impacts."[71]

Given the low likelihood of any significant impacts and the need for fast progression of advanced reactor development, small non-commercial reactor projects on existing DOE sites should be statutorily excluded from the requirements of NEPA. A threshold of 20 megawatts thermal is an appropriate cut-off for a small project as this should encompass projects intended for research, development, and demonstration and should ensure that the environmental impacts are kept small. Removing the NEPA requirements for these small projects on DOE sites would significantly improve the ability of DOE to provide access to capabilities in a timely manner to support new nuclear development. Furthermore, even absent NEPA, the projects still would need to comply with other environmental requirements, such as the National Historic Preservation Act, which should address any potential environmental impacts.

There is some precedent for Congress excluding certain federal activities from NEPA requirements. One example is rebuilding assistance provided by the Department of Homeland Security's Federal Emergency Management Agency (FEMA), which is excluded from NEPA by the Stafford Act (42 U.S.C. § 5159). The Congressional Research Service describes the statutory exemption as follows:

> *In responding to emergencies and major disasters, existing provisions of the Stafford Act statutorily exempt certain FEMA-funded activities from NEPA. Statutory exclusions generally apply to actions that are emergency in nature or are necessary for the preservation of life and property. They apply to most Public Assistance actions funded by FEMA, but do not apply to hazard mitigation, flood mitigation, unmet needs projects, or FEMA grant programs.*[72]

The statutory exemption includes actions related to general federal assistance; essential federal assistance; repair, restoration, and replacement of damaged buildings; debris removal; and federal emergency assistance.[73] Similar to this example related to rebuilding assistance after an emergency, the basis for excluding small reactors from NEPA would be the need to rapidly progress advanced reactor projects given their important benefits to the nation. This recommendation is applicable whether a project is subject to DOE authorization or NRC licensing.

2.2.5. Formulate an external review team to shadow an entire NRC licensing review start to finish and provide recommendations to further streamline the licensing process, including appropriate application of the reasonable assurance standard.

Although there are some good opportunities to make the NRC new reactor licensing process more efficient with the statutory changes identified in this report, these do not directly address all the day-to-day delays during a licensing review that contribute to the overall long duration to obtain a new

69. Construction and Demonstration of a Prototype Mobile Microreactor Environmental Impact Statement, DOE/EIS-0546 (Feb. 2022), *available at* https://www.energy.gov/sites/default/files/2022-02/final-eis-0546-mobile-microreactor-2022-02-volume-1.pdf.

70. *Id.* at 1-3 to 1-4.

71. *Id.* at 5-6.

72. Implementing the National Environmental Policy Act (NEPA) for Disaster Response, Recovery, and Mitigation Projects, at 7 (Aug. 31, 2017), *available at* https://crsreports.congress.gov/product/pdf/RL/RL34650.

73. *Id.* at 7-8.

reactor license. Many of those delays appear to involve excessive reviews of non-safety significant topics, a rigid interpretation of what constitutes reasonable assurance, excessive "confirmatory" analyses performed by NRC Staff, process challenges, etc.

As one example, the AEA and the NRC mission focus on whether activities provide a "reasonable assurance" of adequate protection of public health and safety. The reasonable assurance standard for licensing actions has been applied too rigidly, resulting in a standard of essentially perfection and zero risk. This has resulted in excessively lengthy licensing reviews. For example, NuScale stated the following based on the NRC review of its DCA:

> *NuScale completed the first NRC review of an advanced reactor application, and overall the NuScale DCA review was a success. Staff completed review of the first small modular reactor design in 41 months following docketing of the application. The review was thorough; it involved over a quarter million review hours, about two million pages of documentation made available for review or audit, and about 100 gigabytes of test data. The ACRS conducted some 40 meetings totaling approximately 440 hours.*[74]

This reasonable assurance standard should be clarified to ensure that it does not require absolute certainty or risk avoidance. In 2018, the NRC provided the following explanation of the reasonable assurance standard:

> *The Atomic Energy Act of 1954, as amended, which authorizes and governs our work, does not specify the precise level of safety the Commission must assure or define the factors the Commission may or should consider in defining the appropriate level of safety. Instead, the AEA gives the Commission broad discretion to weigh and balance factors, such as the state of the art of nuclear safety, the risk of accidents, the record of past performance, and the need for further improvement in nuclear safety, along with other matters, in reaching licensing decisions.*
>
> *Similarly, the AEA does not define "reasonable" or "adequate." It does, however, contain language such as "adequate protection," "unreasonable risk," "minimize danger," and "inimical." "Adequate protection" focuses rather narrowly on radiological risk, and not on something broader. Looking at these terms to try to determine what "reasonable assurance" means, the NRC has historically inferred from these words that some risks may be tolerated and something less than absolute protection is required.*
>
> *The NRC implements the AEA through its regulations, and in cases challenging the agency's application and interpretation of its regulations, courts have agreed that absolute safety or zero risk is not required. Throughout our history, as technology has advanced, courts have recognized the Commission's broad discretion to balance the factors it deems relevant to determine what level of protection is adequate and reasonable in reaching licensing decisions. In addition, courts, including the U.S. Supreme Court, have recognized that nuclear technology continues to change and advance and what constitutes "reasonable assurance of adequate protection" will also change as the state of the art of nuclear safety advances. The Commission retains the authority to establish the level of protection that is adequate and reasonable.*[75]

These statements are helpful to acknowledge that some risks may be tolerated and absolute protection is not required. With civil nuclear energy exceeding 60 years and with over 100 commercial nuclear

74. NuScale Lessons-Learned Report, Enclosure, at 2.

75. Memorandum from F. Brown, NRC, to New Reactor Business Line, Expectations for New Reactor Reviews, at 4-5 (Aug. 29, 2018), *available at* https://www.nrc.gov/docs/ML1824/ML18240A410.pdf.

reactors licensed and operated, the United States has significant experience that should be considered in licensing new reactors. This experience should allow the NRC to better identify risks and initiating situations that can lead to significant consequences to public health and safety. NRC studies also have refined their understanding of risks and causal factors due to accidents. This experience and the reasonable assurance standards mentioned above are particularly relevant as advanced reactors are expected to be safer than past generations of reactors. Reactors that incorporate passive safety features that enhance safety should see some benefit in the regulations, or there will be limited incentive to invest in such technologies, to only be reviewed in a similar manner as traditional reactors. It is not apparent, however, that the hands-on NRC reviewers are allowing this level of flexibility in their reviews.

Based on recent new reactor licensing experience, the NRC's review standards must be finetuned further to allow for the more efficient review of new reactor applications. This can be a challenge given that the review standards are manifested through the day-to-day review of applications by NRC Staff subject matter experts. However, one option to support this refinement is to establish a team of experts on the NRC review process without any responsibilities for a particular licensing review to shadow the review process and identify process improvements. To ensure a sufficient level of independence, the review team should be composed of outside experts rather than internal NRC employees. This independent assessment team could then provide reports to Congress and identify improvements by the NRC. This review should be performed in parallel with other changes discussed herein, so the time for the review does not hold up other improvements.

This review must ensure that the reasonable assurance standard is further clarified to account for an acceptable level of risk and to ensure that NRC decision-making is risk-informed. If it can be demonstrated, for example, that a fuel type is inherently safe (e.g., TRISO), a lower threshold of review should be applied, such as the test reactor standard in ANS 15.21, *Format And Content For Safety Analysis Reports For Research Reactors*.

2.3. Reforms to Otherwise Improve NRC Licensing

2.3.1. Strengthen the requirements for NRC milestones for new reactor licensing activities, including shorter timelines, more rigid reporting requirements, and accounting for the full duration of licensing activities.

The NRC licensing process for advanced reactors includes many different steps, starting with the pre-application activities (i.e., meetings, draft application review), followed by docketing and NRC Staff reviews and issuance of the SER and EIS, and concluding with issuance of a license. The following NRC flow chart illustrates the licensing process for a COL, as well as the construction period.[76] Although this chart applies to COLs, it includes many of the same steps as other NRC new reactor licensing actions.

76. NUREG/BR-0298, Nuclear Power Plant Licensing Process, at 11 (Rev. 2, July 2004), *available at* https://www.nrc.gov/docs/ML0421/ML042120007.pdf.

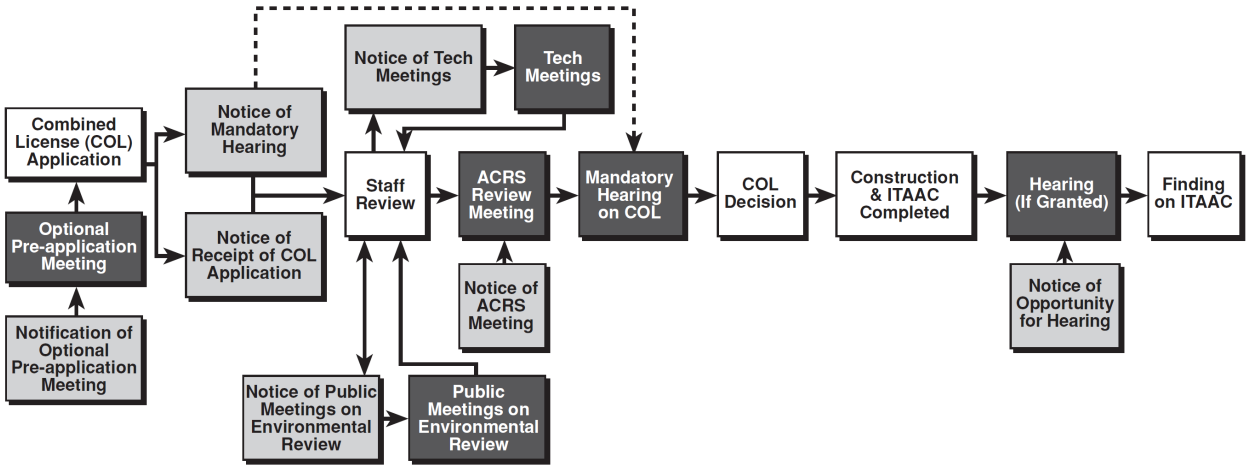

Figure 1. COL Licensing Process.

Section 102(c) of the Nuclear Energy Innovation and Modernization Act (NEIMA) required that the NRC develop performance metrics and milestone schedules for "requested activities of the Commission."[77] Section 3 of NEIMA defines requested activity of the Commission to include the processing of applications for (i) design certifications or approvals; (ii) licenses; (iii) permits; (iv) license amendments; (v) license renewals; (vi) certificates of compliances; and (vii) power uprates, as well as any other activity requested by a licensee or applicant.[78] The NRC developed generic milestone schedules of requested activities of the Commission and has posted them on its website.[79] The generic milestone schedules for new reactor activities are shown in Table 2.

Table 2. NRC new reactor generic milestone schedules.

Activity	Type	Generic Milestone to Issue Final Safety Evaluation
Design Certifications and Standard Design Approvals (including Topical Reports required to support the application and submitted in parallel or earlier than the application)	Light Water Power Reactor (LWR) – Part 52	42 months
	Non-LWR – Part 52	36 months
Licenses (including Topical Reports required to support the application and submitted in parallel or earlier than the application)	Operating (LWR) – Part 50	42 months
	Operating (Non-power production or utilization facility (NPUF) or Non-LWR) – Part 50	36 months
	Combined (LWR or non-LWR referencing a certified design) – Part 52	30 months
	Combined (LWR not referencing a certified design)	42 months

77. 42 U.S.C. § 2215(c).

78. 42 U.S.C. § 2215 note.

79. *See* Generic Milestone Schedules of Requested Activities of the Commission, https://www.nrc.gov/about-nrc/generic-schedules.html.

Activity	Type	Generic Milestone to Issue Final Safety Evaluation
	– Part 52	
	Combined (non-LWR not referencing a certified design) – Part 52	36 months
	Manufacturing (LWR or non-LWR referencing a certified design) – Part 52	30 months
	Manufacturing (non-LWR not referencing a certified design) – Part 52	36 months
	Manufacturing (LWR not referencing a certified design) – Part 52	42 months
Permits and Authorizations	Construction Permit – Part 50	36 months
	Limited Work Authorization – Parts 50 and 52	36 months
	Early Site Permit – Part 52	24 months

Although these appear to generally be improvements over recent precedent for similar types of NRC licensing activities, this report suggests opportunities exist to substantially shorten these timeframes, perhaps by half. As one example, Table 2 shows a 30-month milestone for a COL for either an LWR or non-LWR referencing a certified design. This timeframe provides only a 6-month or a 12-month improvement, respectively, in comparison to a COL milestone for a non-LWR or LWR which does not reference a certified design. A reactor design certified by the NRC—which itself is subject to a 36- or 42-month milestone—should include approval of the vast majority of design issues. Thus, the above table indicates a certified design only provides a half year or a year improvement in the COL process. This rather marginal improvement in the timelines does not appear reasonable.

Furthermore, the above milestones do not represent the total licensing timeframe between submittal of an application until the licensing action is final. In other words, these milestones only represent the time period between acceptance, or "docketing," of an application and issuance of a final safety evaluation. That docketing typically will take a month or two, but can take many months if the NRC seeks additional information. Therefore, a risk exists that the clock for the above milestones will not start for months after an application is submitted to the NRC, and there is a risk that portions of the NRC review will drift to the docketing timeframe to ensure the NRC can meet the established milestones. Although this may help from a reporting standpoint, it does not help reduce the overall licensing timeframe for a new reactor project. This docketing risk could be prevented by limiting the time for the NRC to docket an application, adding a statutory requirement for docketing new applications, or requiring reporting to Congress if certain docketing timeframes are exceeded. The NRC also should be required to report the basis for rejecting any applications.

Additionally, the issuance of the final safety evaluation is not the same as issuance of a license. The mandatory hearing discussed in Section 2.1.1, which is required for CPs, LWAs, ESPs, and COLs, adds 4–7 months to the licensing action. Any contested hearings also may extend the licensing process for months or years. The NRC should be evaluating the real timeframes from submittal of an application until the licensing activity is complete. This type of evaluation will drive efficiencies and improvements across the entire timeframe. Finally, the NRC should be required to revisit the milestones annually to look for improvements.

NEIMA Section 102(c) further provides reporting requirements for exceeding the above milestones. Specifically, the NRC Executive Director for Operations must inform the Commission of a delay in issuance of the final safety evaluation within 30 days after missing a milestone.[80] Similarly, the Commission must submit a report to appropriate congressional committees if the milestones are exceeded by 180 days, including a detailed explanation accounting for the delay and a plan for timely completion of the final safety evaluation.[81] While these reports are substantial improvements over the prior practice, they also can be improved.

As noted above, focusing on the timeframes between docketing and the final safety evaluation ignores the long docketing durations and the many months which may occur between the final safety evaluation and licensing action. The reporting requirements should be revised to address docketing and the overall timeframe to reach a licensing action. They should require reports to the Commission and appropriate congressional committees of any docketing decisions exceeding two months. Additionally, the reporting requirements should be revised to inform the Commission three months before reaching a milestone. Prior notification is required for the Commission to take action not to exceed a milestone. Finally, any projects that exceed a milestone should be reported to the appropriate congressional committees immediately, not wait for half of a year.

2.3.2. Clarify which non-commercial demonstration nuclear reactor projects may be authorized by DOE versus licensed by the NRC.

AEA Section 110 states: "Nothing in this subchapter shall be deemed a. to require a license for . . . (2) the construction or operation of facilities under contract with and for the account of the Commission . . . ."[82] Although this provision mentions the "Commission," which originally was a reference to the AEC, the courts have confirmed that Commission in this provision now must be read to include DOE.[83] Therefore, the default position is that construction and operation of nuclear facilities under contract with and for the account of DOE do not need an NRC license, and can therefore proceed under DOE authorization. In the legislative history for the ERA, Congress further recognized DOE authorization for nuclear R&D by stating that ERDA/DOE self-regulation is "especially imperative in the noncommercial nuclear R. & D. area because the [NRC] will have no licensing jurisdiction over such [] nuclear activities."[84]

Some exceptions exist to the above default position in AEA Section 110. ERA Section 202 identifies specific types of facilities which are subject to NRC licensing and related regulatory authority, notwithstanding AEA Section 110.[85] Of most relevance here, those facilities include: "(2) Other demonstration nuclear reactors—except those in existence on the effective date of this Act—when operated as part of the power generation facilities of an electric utility system, or when operated in any other manner for the purpose of demonstrating the suitability for commercial application of such a reactor." Therefore, if a reactor placed on a national laboratory site is a "demonstration" reactor and either (1) is operated as part of the power generation facilities of an electric utility (i.e., places power on the

80. 42 U.S.C. § 2215(c)(2).

81. 42 U.S.C. § 2215(c)(3).

82. 42 U.S.C. § 2140.

83. *See, e.g.*, *Waste Control Specialists, LLC v. DOE*, 141 F.3d 564, 567 n.16 (5th Cir. 1998) ("42 U.S.C. § 2140(a). 'Commission' refers to the Atomic Energy Commission. 42 U.S.C. § 2014(f). The district court found that Commission also applied to the DOE, and DOE does not disagree with that."); *Waste Control Specialists, LLC v. DOE*, 1997 U.D. dist. LEXIS 19717 (N.D. Tx. 1997) ("The Atomic Energy Commission was abolished in 1974 and its functions were transferred to the NRC and the [ERDA]. In 1977, Congress terminated the Energy Research and Development Administration and transferred its functions to the newly-created DOE. As a result, the reference to 'Commission' in Section 110a.(2) of the AEA must be read to refer to the DOE."); *see also* Congressional Research Service Memorandum from Todd Garvey, Legislative Attorney, to Aaron Weston, House Committee on Science, Space and Technology, NRC Licensing of Proposed DOE Nuclear Facilities, at 2 n.9 (July 20, 2015), *available at* https://docs.house.gov/meetings/SY/SY20/20150729/103833/HHRG-114-SY20-20150729-SD009.pdf.

84. Senate Report No. 93-980, 93th Cong., 2nd Sess. 1974, 1974 U.S.C.C.A.N 5470, 5492 (June 27, 1974).

85. 42 U.S.C. § 5842.

commercial grid); or (2) is operated to demonstrate the "suitability for commercial application," then it must be NRC licensed.

Although the first part of this exception ("operated as part of the power generation facilities of an electric utility") draws a fairly clear line for NRC licensing, the second part of the exception has presented some confusion due to the lack of definition of "demonstrating the suitability for commercial application." For example, one could argue that almost any demonstration project with a private company proponent is being pursued as part of commercial application. On the other hand, prior to demonstrating suitability for commercial application, even private sector companies may have many research, experimental, analysis, and operational characteristics to demonstrate, test, and understand, that come long before commercial suitability. This has raised questions about whether projects proposed for a national laboratory should require an NRC license. This confusion has the potential to cause significant delay awaiting NRC licensing. It also may prohibit projects given the potential regulatory conflicts for individual facilities having both NRC licensed and DOE authorized projects.

The NRC addressed some of these requirements in a letter to DOE in February 2020 in response to a Request for Information on the Advanced Reactor Demonstration Program.[86] The letter discussed the NRC licensing process and issues relevant to advanced reactors, including the question of DOE authorization versus NRC licensing. The NRC began by acknowledging that a reactor affiliated with DOE may or may not require an NRC license depending on the circumstances.

Consistent with the above discussion of ERA Section 202, the NRC further stated that "[a]n NRC license is also required for demonstration reactors operated as part of the power generation facilities of an electric utility system or otherwise to demonstrate the reactor's suitability or practical value for industrial or commercial application . . . ."[87] Thereafter, however, the NRC provided some additional interpretation of what this means: "In general, a demonstration reactor project that is subject to NRC licensing . . . is one that serves to demonstrate an entire reactor for commercial purposes, rather than demonstrating only a portion of the reactor." But this differentiation between an entire reactor and a portion of a reactor is not found in the legislative requirements discussed above.

The NRC continued by acknowledging that "DOE has statutory authority to self-regulate construction and operation of reactors on DOE property for the purpose of developing or testing new reactor technologies or concepts, or the safety and workability of systems or components individually or as part of the overall reactor system, where the project does not rise to the level of demonstrating an entire reactor for commercial suitability."[88] While helpful, this threshold still relies upon undefined terms to determine whether NRC licensing is needed.

Consistent with AEA Section 110, projects constructed and operated at a national laboratory site and which do not sell commercial power or any other commercial product (e.g., heat, hydrogen) should be allowed to proceed under DOE authorization rather than NRC licensing. There is no incentive for a private company to pursue a project at a national laboratory site without selling power or another commercial product, unless the project is needed for an R&D purpose. The cost simply would not be justified. Requiring an NRC license under these conditions would add significant cost and time not appropriate for those projects. The likely outcome is the projects will avoid national laboratory R&D and move directly to commercial licensing at the NRC, which may itself result in more time, expense, and uncertainty.

The preferred approach is to delete the "Other demonstration nuclear reactors" exception in ERA Section 202 in its entirety. Projects would then look to AEA Section 110 to determine if they are "under contract with and for the account of" DOE. If so, then they could be DOE authorized. The phrase "under

86. Letter from H. Nieh and R. Furstenau, NRC, to E. Dye, DOE, U.S. Nuclear Regulatory Commission Response to the U.S. Department of Energy, Information Request on the Advanced Reactor Demonstration Program (DE-FOA RFI-0002271) (Feb. 21, 2020), *available at* https://adamswebsearch2.nrc.gov/webSearch2/main.jsp?AccessionNumber=ML20140A272.

87. *Id.* at 3.

88. Id.

contract with and for the account of" DOE should be clarified to include projects operated by a DOE M&O contractor. Alternatively, the ERA Section 202 exception could be modified to clarify that the NRC has licensing jurisdiction on DOE sites only for reactors that commercially sell electricity or another commercial product to an entity other than DOE. This modification would remove the uncertainty for non-commercial projects on DOE sites.

2.4. Reforms to Provide Financial Benefits to New Reactor Projects

2.4.1. Modify the NRC fee structure for the licensing of new nuclear reactors or otherwise provide financial support for those projects.

The costs to new reactor applicants for NRC review fees are extremely high. The NRC is required by law to recover approximately 90% of its annual budget, which the NRC recovers through annual fees and hourly fees. A 2019 Nuclear Energy Institute white paper on microreactor regulatory issues estimated that COL reviews have cost about $30M and design certification reviews have cost about $45-90M in NRC review fees.[89] The overall cost for preparing an application and supporting the NRC review of that application would be much higher. As one example, it has been reported that NuScale spent over $500M to develop the information to prepare its DCA.[90]

Any mechanism which would provide financial support to new reactor applicants would benefit the advancement of new nuclear projects. However, any changes should ensure that the costs are not shifted to existing licensees. Here are some potential options for potentially addressing the high new reactor review costs:

- Do not require the NRC to recover costs for any new reactor application reviews.
- Section 204 of the ADVANCE Act (Enabling Preparations for the Demonstration of Advanced Nuclear Reactors on Department Sites) would exclude costs for pre-application activities and to review ESP applications to demonstrate an advanced nuclear reactor on a DOE Site. A slight modification to this approach may be beneficial. An ESP application typically would be submitted by the future owner or operator of the reactor covered by the application. However, it would be possible and very beneficial for a national laboratory to submit an ESP application for potential new reactor projects on a national laboratory site to prepare and approve new reactor locations on the site before a specific owner/operator is identified. The application could utilize a "Plant Parameter Envelope" (similar to past ESP applications) to bound a hypothetical future reactor or reactors. Once DOE approves an appropriate owner/operator for a reactor on a site, the national laboratory could transfer the ESP to that company. This would potentially save years of effort by the owner/operator to site and construct the reactor. Funding for preparing such ESP applications would be beneficial.
- ADVANCE Act Section 201 supports fees for certain advanced reactor application review activities.
- ADVANCE Act Section 202 provides prizes for advanced nuclear reactor licensing, which could be expanded to address more projects.
- NRC should not collect any fees for pre-application activities with potential new reactor applicants, allowing education on the reactor technology and NRC licensing process. These pre-application activities would include public meetings, but also discussions directly between the applicant and the NRC Staff.
- NRC should provide a fixed application review cost based on the type of application and the size and type of reactor, providing cost certainty to new reactor applicants. This fixed review cost also could be based on an agreed upon, detailed engagement plan between the NRC and the applicant.

89. Micro-Reactor Regulatory Issues, at A-1 to A-2 (Nov. 13, 2019), *available at* https://www.nrc.gov/docs/ML1931/ML19319C497.pdf.

90. NuScale SMR Receives US Design Certification Approval (Sept. 1, 2020), https://world-nuclear-news.org/Articles/NuScale-SMR-receives-US-design-certification-appro.

- NRC could provide a sliding scale for application fees, which would be reduced after a base amount is passed.
- NRC could provide a payback strategy based on a reactor subject to an application review entering operation.
- Congress could directly appropriate funds to cover the licensing costs associated with projects that it encourages for the national good, such as advanced reactor demonstration projects that are fully or partially funded by appropriations to DOE, including the two Advanced Reactor Demonstration Program (ARDP) demonstration projects.

2.4.2. Permit foreign investment by U.S. allies in U.S. nuclear projects licensed by the NRC as long as the Commission determines that the entity is not inimical to common defense and security or the health and safety of the public.

AEA Sections 103d and 104d prohibit issuance of a license "if the Commission knows or has reason to believe it is owned, controlled, or dominated by an alien, a foreign corporation, or a foreign government."[91] This prohibition has prevented or significantly affected new reactor projects. For example, the Calvert Cliffs Unit 3 COL was stopped due to indirect French foreign ownership.[92] Another project, STP Units 3 & 4 COL, had to fight this issue in a contested hearing due to partial indirect Japanese foreign ownership.[93]

Section 301 (Investment by Allies) of the ADVANCE Act identifies long overdue changes to the Foreign Ownership, Control, or Domination (FOCD) requirements if the Commission determines the entity is not inimical to (1) the common defense and security, or (2) the health and safety of the public. These changes should be pursued. Little risk exists from foreign ownership of nuclear projects by allies to the United States, and the Section 301 approach would still require a review by the NRC. These changes also could result in positive additional investment in U.S. nuclear projects.

The list of countries in Section 301 subject to the change, however, is quite narrow. It applies to a member of the Group of Seven as of November 25, 2020 (i.e., United Kingdom, Germany, Canada, Japan, France, and Italy), or the Republic of Korea. The list excludes many U.S. allies. The list should be broadened or flipped to identify the countries excluded. Alternatively, the list could be deleted entirely and rely upon the NRC's required inimicality review and finding.

2.4.3. Indefinitely extend the Price-Anderson Act coverage for nuclear hazards indemnification for covered DOE contractors and NRC licensees.

The Price-Anderson Act (PAA) amended the AEA in 1957 to establish a system of financial protection for those who are either liable for or injured by a nuclear incident.[94] The purpose of the PAA was to both protect the public and to encourage the development of the atomic energy industry. DOE and the NRC administer their respective obligations under the PAA. The financial protections primarily apply to DOE contractors undertaking activities involving the risk of a nuclear incident and to specified NRC licensees, including those holding licenses for new reactors. The primary PAA provisions are found in AEA Section 170 with indemnification authority for NRC licensees found in Section 170c. and indemnification authority for DOE contractors found in Section 170d.[95] The PAA has been amended multiple times and has extended the PAA authority until December 31, 2025.[96]

91. 42 U.S.C. §§ 2133(d), 2134(d); *see also* 10 C.F.R. § 50.38.
92. *See, e.g.*, Capital Gazette, ASLB Terminates Foreign-Ownership Proceeding for Calvert Cliffs Reactor, https://www.capitalgazette.com/cg2-arc-8fe5cfcf-4df7-53b0-8eef-394ea958bb57-20121103-story.html.
93. *See Nuclear Innovation North America LLC* (South Texas Project Units 3 & 4), LBP-14-3, 79 NRC 267 (2014).
94. *See* Pub. Law 85-256, 71 Stat. 576 (Sept. 2, 1957).
95. *See* 42 U.S.C. §§ 2210(c), (d).
96. Id.

Given the upcoming deadline for PAA authority, and as required by AEA Section 170p, both the NRC and DOE have submitted reports to Congress regarding the need for continuation of PAA authority after December 31, 2025.[97] The NRC recommended that Congress continue the PAA "because the Act provides a valuable public benefit by establishing a system for the prompt and equitable resolution of public liability claims resulting from a nuclear incident."[98] In describing its conclusions following review of the PAA, the NRC provided the following favorable description:

> *Protection of the public has been a principal purpose of the Price-Anderson Act, along with removing barriers to the nuclear energy option as a private commercial endeavor. The statutory scheme of government indemnification and/or private insurance has been intended to assure the availability to the public of adequate funds in the event of a nuclear incident. Other benefits to the public include such features as emergency assistance payments, consolidation and prioritization of claims in one court, channeling of liability through the "omnibus" feature, and waiver of certain defenses in the event of a large accident. The system has removed the deterrent to private sector participation in nuclear power programs by reducing the probability of financial catastrophe for industry participants due to liability resulting from a nuclear accident. The structured payment system of billions of dollars created to meet the two objectives stated in the Price-Anderson Act has assured that significant funds are available to the public to satisfy claims if a nuclear event were to occur, enabled private sector participation in atomic energy, and operated for over 60 years with minimal cost to the taxpayer.*[99]

Similarly, DOE's report indicated that it fully supports continuation of PAA coverage. It stated:

> *The Department strongly believes that continuation of the PAA and the DOE indemnification without substantial modification is vitally important to the achievement of DOE's statutory missions, protection of the public and injured persons in the event of a nuclear incident, and promotion of American leadership and a strong domestic industry in nuclear exports with continuation of the PAA in a manner compliant with the [Convention on Supplementary Compensation for Nuclear Damage].*[100]

These many reasons support amending the AEA to extend the PAA coverage past the upcoming 2025 deadline.

97. NUREG/CR-7293, The Price-Anderson Act: 2021 Report to Congress, Public Liability Insurance and Indemnity Requirements for an Evolving Commercial Nuclear Industry (Dec. 2021), *available at* https://www.nrc.gov/docs/ML2133/ML21335A064.pdf ("NRC 2021 PAA Report"); Price-Anderson Act Report to Congress (Jan. 2023), *available at* https://www.energy.gov/sites/default/files/2023-02/PAA%20Report%20January%202023_0.pdf ("DOE 2023 PAA Report").

98. NRC 2021 PAA Report at 4-2.

99. *Id.* at 4-1.

100. DOE 2023 PAA Report at 30.

The support raises the question about the length of the extension of the PAA coverage. Based on the favorable experience with the PAA over the past 65 years of coverage with many decades of reactor operating experience, there is no reason to place a deadline on the PAA coverage. Furthermore, there is no apparent reason for expecting the needs and benefits associated with the PAA to change in the future, and therefore no reason to have to revisit the PAA in the future on a defined schedule. This continuous renewal process creates uncertainty over the applicability of the PAA coverage for the nuclear industry, which is particularly significant for projects that can last for many decades. It also creates additional administrative burden for Congress, the NRC, and DOE. For these reasons, the AEA should be revised to remove any timelines related to its applicability.[101] If any circumstances change in the future, then Congress can revisit the PAA requirements, similar to other laws. Section 302 of the ADVANCE Act would extend the PAA by 20 years, until December 31, 2045. Although definitely preferable to no extension, the extension discussed above without a specific end point would better advance the needs of the nation and NRC-licensed advanced reactors.

Finally, in addition to PAA extension, DOE made two key recommendations which would expand coverage outside the United States. First, DOE stated that it "supports expanding the DOE indemnification to cover contractual activity that is for or on behalf of DOE outside the United States, without the condition that the nuclear materials involved in the activity must be owned by the United States."[102] Second, DOE recommended increasing the amount of that indemnification from $500M to $2B.[103] Although these changes would most directly impact DOE contractors, those contractors are often NRC licensees and may be undertaking activities related to advanced reactors. These recommendations from DOE appear reasonable and may benefit those NRC licensees.

101. Although DOE did not provide a specific recommendation on the length of extending PAA coverage, the NRC recommended a 10-year extension "to allow Congress to be better able to consider substantial changes related to trends in decommissioning and in advanced reactor technologies that are anticipated to continue within the nuclear power industry." NRC 2021 PAA Report at 4-2. However, there is no apparent reason that technology advancements would have any effect on the need for the protections to the public and industry provided by the PAA, especially within the next 10 years. If anything, the developing technologies with smaller and newer companies will need those protections even more.

102. DOE 2023 PAA Report at 27.

103. *Id.* at 27–28.