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General Comment

See attached file(s)

Attachments

CATF Comments on Fission Part 53

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RE: Comments of Clean Air Task Force in Response to the U.S. Nuclear Regulatory Commission's Proposed Rule on a "Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors," 85 Fed. Reg. 71,002 (Nov. 6, 2020), Docket ID No. NRC-2019-0062

Dear Commissioners:

Clean Air Task Force ("CATF") is pleased to submit these comments in response to the proposed rule on a "Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors," 85 Fed. Reg. 71,002 (Nov. 6, 2020) issued by the Nuclear Regulatory Commission ("NRC"). CATF is a 501(c)(3) environmental organization whose mission includes pressing for transformation in policies and regulations that are needed to decarbonize the global energy system to address climate change. Advanced nuclear technologies are key to this mission and purpose, and it is CATF's position that regulators licensing advanced nuclear fission technologies should support their development while maintaining public health and safety.

Advanced fission reactor technologies that exist today offer great promise in combatting climate change. They are also only the beginning. While these technologies incorporate advanced safety and other features that make them distinct from previous generations of fission for electricity generation, the future holds further technological transformation. The NRC's regulatory scheme in 10 C.F.R. Part 53 ("Part 53") must promote and recognize the differences among reactor technologies expected today, while providing a framework that supports advancement and innovation in the coming decades. These comments therefore propose a transformative approach to the Part 53 rulemaking that would appropriately accommodate future advanced fission technologies.

Our suggested approach aligns with the Congressional mandate to the NRC under the Nuclear Energy Innovation and Modernization Act ("NEIMA") to develop a "risk-informed, technology-inclusive regulatory framework for advanced reactors," while encouraging further innovation in technology

development.[1] This approach envisions a Part 53 rule that establishes a less prescriptive framework than that currently developed by the NRC, while at the same time providing a process that enables advanced reactor developers to propose and the NRC to approve alternative methods to support licensing advanced fission technologies. In sum, Part 53 must provide a pathway to licensing the advanced fission reactors of today, tomorrow, and well into the future.

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These comments are in two parts: a white paper summarizing the proposed alternative Part 53 approach and an appendix outlining a version of Part 53 that would be consistent with the comments provided in the white paper.

Today we are also separately submitting for your consideration CATF's views on the NRC's approach to regulating fusion energy technologies, which are also defined as "advanced reactors" under NEIMA.

We appreciate the opportunity to comment on these efforts, and look forward to the opportunity to engage with the NRC to discuss them further.

Respectfully submitted,

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Attachments:

1) Alternative Approach to Part 53 for Advance Fission Reactors
2) Appendix: Specific Proposed Changes to Part 53 for Advanced Fission Reactors

[1] Nuclear Energy Innovation and Modernization Act, Pub. L. No. 115-439, 132 Stat 5565 (2019) (codified as amended at 42 U.S.C. §§ 2134, 2215).

An Alternative Approach to Part 53 For Advanced Fission Reactors

Executive Summary

Because advanced fission reactors incorporate designs that are quite different from the fission reactors that are deployed in the U.S. today, the current regulatory scheme is ill-suited for licensing them. In particular, the prescriptive approach of Parts 50 and 52 is aimed at safety concerns of the existing fleet, not the varied advanced safety and operational features of the new designs.

Despite this, the NRC's draft Part 53 rule is foundationally based on the same types of requirements as Parts 50 and 52. The draft rule also requires advanced reactor developers to provide a similar level of licensing detail while also relying on specific prescriptive methods, such as probabilistic risk assessment ("PRA"), as the key to establishing a licensing basis. While converting the requirements of Part 50 and 52 into technology-inclusive equivalents may help to fast-track the Part 53 rulemaking, that approach risks the issuance of a rule that may actually fail to promote advanced technologies because it does not reflect the need to continually accommodate newer designs and innovation. We offer here an alternative approach that is more consistent with NEIMA and will better facilitate licensing and large-scale deployment of all potential types of advanced fission reactors going forward.

We set out in this paper an alternative approach to Part 53, summarized as follows:

- The NRC should, as NEIMA requires, develop and implement new strategies for licensing advanced reactors. In particular, the NRC should adopt strategies for early, interim approvals of novel licensing strategies beyond those used today. NEIMA requires the NRC to adopt novel approaches within the current licensing framework; however, this effort should also be incorporated into Part 53 to create a dynamic rule that will continually adapt to technological evolution and transformation.

- The initial text of Part 53 should focus on (1) identifying limited, performance-based, high-level requirements based on desired outcomes; and (2) setting out a process to regularly adapt Part 53 to provide for innovative, flexible, and cost-effective evaluation methods in order to accommodate technological advancements.

The new Part 53 we outline here would establish a process by which an advanced reactor developer could readily propose an alternative method of compliance with the requirements in Part 53.[1] Such an alternative would be reviewed by the NRC Staff independently from the existing requirements and could be approved under the pathways specified in the rule. In addition, any such alternative could be incorporated into the rule either directly or by reference as part of planned annual or biennial updates to the rule. For alternatives already approved by the NRC Staff through other means, such as regulatory guides and approved topical reports, among others, the NRC could utilize expedited rulemaking procedures to incorporate by reference existing approvals and better enable timely and prompt updates.[2]

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[1] The NRC already incorporates alternatives to its existing rules where a rule may be obsolete, simply inapplicable to certain reactors, or where the NRC has chosen to provide additional options for compliance in a rule. A few examples can be found in 10 C.F.R. §§ 50.61, 50.61a, 50.44, and 50.48. Perhaps the most famous optional and alternative rule is 10 C.F.R. Part 52, which provides an optional (non-mandatory) alternative pathway to licensing a reactor versus 10 C.F.R. Part 50.

[2] Expedited rulemaking processes include Direct Final Rulemaking (already used in 10 C.F.R. § 72.214 for Certificates of Compliance) and Interim Final Rulemaking. *See e.g.*, NRC, *Direct Final Rule* (Dec. 29, 2017),

Indeed, for any proposed alternative that "grants or recognizes an exemption or relieves a restriction," the Administrative Procedure Act already provides the agency flexibility with publication requirements for proposed rulemakings.[3]

These alternatives could take the form of criteria, approved methodologies, or even approved aspects of designs not incorporated into Part 53 at the time the alternative is proposed. The NRC could review and even approve many of these alternatives during staged licensing or other processes (both as part of the current Part 50/52 frameworks and the Part 53 rule, once adopted). The alternatives could then be incorporated as options into the Part 53 rule on an ongoing basis. The eventual incorporation of alternative methods, criteria, and design aspects into the Part 53 rule is necessary in order to: (1) allow the rule to adapt to technological advances, (2) provide licensees with regulatory certainty, and (3) expedite licensing processes by eliminating duplicative rounds of review. This would provide future licensees the option to take advantage of applicable pre-approved alternative methods, criteria, and design aspects without being bound by the more limited, initial text of Part 53. Licensees could also use these alternatives without having to repetitively prove their validity either before the Staff or in administrative litigation. For example, alternative criteria applicable to liquid fuel could apply to other applicants with reactor technologies designed for liquid fuel. Such an approach would better achieve the simultaneous goals of regulatory certainty, rule flexibility, and confidence in plant safety.

Evaluating Current NRC Actions against NEIMA Requirements

NEIMA requires the NRC to take two separate sets of actions: (1) develop and implement changes to the licensing process under the existing regulatory framework and (2) "establish a technology-inclusive, regulatory framework for optional use by commercial advanced nuclear reactor applicants for new reactor license applications."[4]

With respect to the first set of actions, no later than 270 days after NEIMA was enacted the NRC was required to develop and implement strategies for "establishing stages in the licensing process for commercial advanced nuclear reactors;" and for "developing procedures and processes for—(i) using a licensing project plan; and (ii) optional use of a conceptual design assessment."[5]

In evaluating these topics, the NRC was required to analyze:

(i) the unique aspects of commercial advanced nuclear reactor licensing, including the use of alternative coolants, operation at or near atmospheric pressure, and the use of passive safety strategies; (ii) strategies for the qualification of advanced nuclear reactor fuel, including the use of computer modeling and simulation and experimental validation; and (iii) for the purposes of predictable, efficient, and timely reviews, any associated legal, regulatory, and policy issues the Commission should address with regard to the licensing of commercial advanced nuclear reactor technologies;[6]

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https://www.nrc.gov/about-nrc/regulatory/rulemaking/rulemaking-process/direct-final-rule.html; OFF. OF THE FED. REG., *A Guide to the Rulemaking Process* (Jan. 2011), https://www.federalregister.gov/uploads/2011/01/the_rulemaking_process.pdf.

[3] 5 U.S.C. § 553(d)(1) ("The required publication or service of a substantive rule shall be made not less than 30 days before its effective date, except-(1) a substantive rule which grants or recognizes an exemption or relieves a restriction;").

[4] NEIMA § 103(a)(4).

[5] NEIMA § 103(a)(1). As described further herein, the NRC reviewed its existing staged licensing strategies in NRC, *Approaches for Expediting and Establishing Stages in the Licensing Process for Commercial Advanced Nuclear Reactors* (July 12, 2019) (ADAMS Accession No. ML19128A319).

[6] NEIMA § 103(b)(4)(A).

The NRC was also required to analyze establishing options for advanced reactor licensing, including "the use of topical reports, standard design approval" and other methods for licensing through stages; "collaboration with standards-setting organizations;" and "the development of a process for, and the use of, conceptual design assessments."[7] In response to these requirements, the NRC has not yet expedited or established any new strategies in the licensing process, but rather reviewed its existing licensing project plan, conceptual design assessment, standard design approval, and topical report system in a brief report for Congress.[8] Therefore, the NRC still needs to at least evaluate the establishment of new strategies and licensing processes (such as perhaps an improved topical report process not bound by existing requirements and regulatory guides) for the benefit of current licensees, and apply the knowledge gained through that evaluation to the development of Part 53.

For the second set of actions—a rulemaking for a "technology-inclusive, regulatory framework"— NEIMA does not require them to be completed until 2027, well after the NRC has reevaluated its licensing *process* under 10 C.F.R. Parts 50 and 52. This framework is defined as "a regulatory framework developed using methods of evaluation that are flexible and practicable for application to a variety of reactor technologies, including, where appropriate, the use of risk-informed and performance-based techniques and other tools and methods."[9] However, to date, the NRC Staff has largely focused their efforts on incorporating initiatives developed prior to the passage of NEIMA, including the licensing modernization project and related initiatives, which use PRA as the basis for licensing.[10]

While advanced reactor designers expect to use PRA to some extent to characterize and quantify safety risks, it is not the sole or even primary tool used by designers. For that reason, relying too much on PRA as the basis of licensing an advanced reactor is neither flexible nor practicable for all present and future reactor technologies. Nor is a mandate to use PRA in all cases consistent with the requirement of NEIMA to adopt "risk-informed and performance-based techniques" "*where appropriate*," or the requirement to also adopt "other tools and methods."[11] Accordingly, relying on PRA to form the licensing basis for advanced fission reactors is not appropriate in all circumstances.[12]

An Alternative Approach to Part 53

Instead of pursuing a rulemaking that codifies the licensing modernization project process and PRA as the basis of advanced reactor licensing (in addition to the significant number of other prescriptive

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[7] NEIMA § 103(b)(4)(B).

[8] NRC, *Approaches for Expediting and Establishing Stages in the Licensing Process for Commercial Advanced Nuclear Reactors* (July 12, 2019) (ADAMS Accession No. ML19128A319).

[9] NEIMA § 3(14).

[10] *See* NRC, *Increasing Use of Risk-Informed and Performance-Based Evaluation Techniques and Regulatory Guidance in Licensing Commercial Advanced Nuclear Reactors* (July 12, 2019) (ADAMS Accession No. ML19128A324); NRC, *Working Draft SECY Paper on Informing Content of Non-LWR Applications* (Oct. 1, 2018) (ADAMS Accession No. ML18270A334).

[11] NEIMA § 3(14).

[12] *See, e.g.*, Letter from Douglas E. True, Chief Nuclear Officer, NEI to Margaret Doane, Executive Director of Operations, NRC (Sept. 28, 2021), https://downloads.regulations.gov/NRC-2019-0062-0136/attachment_1.pdf (Noting that "there is currently little industry support among prospective applicants for the use of Part 53, as drafted."); NRC, *Results of U.S. Nuclear Industry Council 2021 Advanced Nuclear Survey* at 29 (Aug. 26, 2021), https://files.constantcontact.com/14bf1850201/273e2395-f6f9-4b89-9e5a-dce580552faa.pdf (Noting that 59% of advanced reactor companies are somewhat or extremely dissatisfied with the usefulness of the NRC's approach to Part 53 to date).

requirements taken from in Parts 50 and 52), we suggest the NRC should comply with the requirements of NEIMA through a three-pronged approach:

- ***Prong One:*** Develop and implement strategies for early and iterative reviews within the current licensing framework, including strategies to obtain early approvals of alternative methods, criteria, and design aspects beyond the licensing modernization project process and PRA and beyond current methods and criteria. As an example, a modified topical report process could be used to evaluate proposed novel alternatives that might otherwise be stranded in pre-application sufficiency reviews. Such a topical report process could also dispense with the application of prescriptive existing regulations and regulatory guides to topical reports when submitted.

- ***Prong Two:*** Issue initial Part 53 rule text that sets out limited high-level requirements and creates a process to establish multiple flexible and practicable methods of evaluation. This should be done in parallel with Prong One. Establish a pathway for regular and frequent (yearly or every two years) updates of Part 53 to incorporate subsequent developments in the field.

- ***Prong Three:*** Incorporate into Part 53 alternatives developed and verified through the iterative licensing process in Prong One. This would occur after the completion of the work in Prongs One and Two and should be targeted by 2027. This Prong would continue throughout the life of Part 53 and updated alternatives would be incorporated into Part 53 on a yearly basis or once every two years.

As the NRC explained to Congress, early interactions with prospective applicants can allow the NRC Staff to "identif[y] technical and policy issues and work[] to develop and issue final agency positions related to these issues, providing advanced reactor designers with additional confidence in selecting design alternatives."[13] Indeed, "[t]he NRC's ongoing assessment of possible changes to emergency planning requirements for light-water SMRs and other new technologies, including non-LWRs, is an example of such activities."[14] Likewise, it seems apparent that pursuing iterative licensing strategies—such as conceptual design assessment, standard design approvals, and, most often, topical reports—with several of the advanced reactor developers currently engaging with the NRC could reveal additional "methods of evaluation that are flexible and practicable for application to a variety of reactor technologies," including "other tools and methods" that the NRC must consider under NEIMA.[15]

In this vein, the NRC should be evaluating its current staged licensing strategies to see how they could be used to make Part 53 adaptable to the advanced reactors of tomorrow and those developed many years into the future. The NRC should establish a process for frequent updates to Part 53 to adopt alternatives otherwise approved through conceptual design assessments, standard design approvals, or topical reports. In addition, the NRC should eliminate barriers to the use of such strategies and modify the topical report process to evaluate proposed novel alternatives that might otherwise be stranded in pre-application sufficiency reviews while specifically dispensing with the unstated requirement to comply with existing regulatory guides and other guidance. The NRC could also explicitly state in the rule that these alternatives can be used to meet any requirements in the subpart.

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[13] NRC, *Approaches for Expediting and Establishing Stages in the Licensing Process for Commercial Advanced Nuclear Reactors* at 9 (July 12, 2019) (ADAMS Accession No. ML19128A319).

[14] *Id*.

[15] NEIMA § 3(14).

The initial text of Part 53 should establish a set of high-level, technology-inclusive parameters required to maintain plant safety and public health in accordance with the broad authority it has to do so under the Atomic Energy Act of 1954, as amended ("AEA"), while establishing processes for the NRC to continue to develop and add alternatives to Part 53 as time goes on.

Over time, the industry will continue to develop new methods and alternatives for advanced reactors far beyond the state of the art as it exists today, and that process of innovation should be encouraged. Industry-developed innovations—methods and criteria—could be used as alternatives for more widespread use into the Part 53 Rule. Indeed, any prescriptive requirements for advanced reactor design methods should be incorporated into the rule as *alternatives* for the benefit of additional, future advanced reactor designs.[16] Including prescriptive requirements in Part 53 will by contrast result in regulatory ossification, making the rules inflexible and impracticable when applied to some advanced reactor designs both today and as further innovation occurs in the future.

It is important for overall efficiency and clarity of the licensing process that, once proven, NRC-approved methods are ultimately incorporated into rulemakings. Having approved methods in the rules provides certainty to licensees, and reduces repetitive regulatory litigation, and it should be the ultimate goal of Part 53 to incorporate as many of those approved methods as alternatives as possible. It is simply premature, at this point in time, to mandate methods based on today's state-of-the-art, without the benefit of learning from experience with the advanced reactors that are now in development. The NRC could incorporate by reference approved topical reports, guidance documents, or policy documents that set forth approved methodologies within a portion of Part 53. Indeed, the NRC has incorporated Tables and supporting NUREGs into NRC rules before.[17]

Taking an iterative and adaptive approach would also be consistent with approaches taken by other administrative agencies, such as the Department of Transportation, which issues annual iterative updates to its regulations for autonomous vehicles.[18] Other examples of this kind of innovation-supporting regulatory approach include the Federal Aviation Administration's regulation of drones primarily through the publication of advisory circulars.[19] It would also be consistent with the NRC's own continuing rulemaking of standardized cask designs in 10 C.F.R. Part 72. Thus, where the NRC can, it should regularly review, approve, and incorporate new alternatives (either directly or by reference) into the rule itself, making the new rules more adaptive than Parts 50 and 52.

In light of the above, we suggest below several options for incorporating the use of conceptual design assessments, standard design approvals, and topical reports for staged or iterative licensing of advanced reactors into Part 53.

Conceptual Design Assessments

[16] As an example, various NRC rules in 10 C.F.R. Part 50 arose from industry efforts to set standards and establish approved methods over the years (such as the acceptance criteria for emergency core cooling systems). Part 53 should be more adaptive and better able to evaluate and adopt new NRC-approved methods, and alternatives.

[17] *See, e.g.,* 10 C.F.R. § 51.51, Table S-3; 10 C.F.R. § 51, Appendix B (incorporating NUREG-1437, Rev. 1).

[18] *See* Jennifer Huddleston Skees & Trace Mitchell, *Continuing DOT's Automated Vehicle Soft-Law Approach Will Encourage Innovation and Promote Safety*, MERCATUS CENTER (Nov. 30, 2018), https://www.mercatus.org/publications/regulation/continuing-dots-automated-vehicle-soft-law-approach-will-encourage.

[19] FED. AVIATION ADMIN., U.S. DEPT. OF TRANSP., *Small Unmanned Aircraft Systems (SUAS)* (2016), https://www.faa.gov/documentLibrary/media/Advisory_Circular/AC_107-2.pdf ("Use of this AC is intended to assist the remote pilot in meeting the requirements of applicable 14 CFR regulations.").

The incorporation of conceptual design assessments or a "conceptual design process" allows for early consideration and the selection of various key alternative design features. The selection of these design features helps define research and testing programs, appropriate safety analyses, associated fuel cycle and public policy issues, and other matters to be resolved in later phases of the design. The NRC refers to this as a "conceptual design process" rather than a "conceptual design approval" in order to "avoid confusion with the formal processes for licensing, certifications, and approvals defined in NRC regulations" but still refers to it as a potential stage in advanced reactor licensing.[20] The NRC Staff has typically not provided conditional or conclusive findings related to an overall design during the conceptual design process because "the level of design detail available at the conceptual design phase and changing nature of the design during this phase of a project would not support such regulatory decisionmaking."[21] However, the NRC Staff has provided conditional findings and conclusive findings on more specific issues "in response to submittals of white papers and topical reports."[22]

The NRC has used conceptual design assessments in the past with the Department of Energy's Modular High-Temperature Gas-cooled Reactor ("MHTGR"), Sodium Advanced Fast Reactor ("SAFR"), and the Power Reactor Innovative Small Module ("PRISM") reactor. The NRC Staff then made technical evaluations of these conceptual designs and incorporated them into Preapplication Safety Evaluation Reports ("PSER").[23] In the PSERs, the Staff presented their proposed criteria to judge the acceptability of each design—the finality of such criteria being subject to later approval by the Commission.

The NRC was in the process of reviewing the SAFR conceptual design when the DOE terminated the work in 1988, but the NRC Staff documented the review that had been done up to that time in a PSER.[24] The PSER specifically noted, "[t]he staff positions and preliminary conclusions on all matters discussed in this SER are not final" and that the Commission had not endorsed the SER.[25] For the PRISM reactor, the NRC completed a conceptual design review and submitted it to the Advisory Committee on Reactor Safeguards, which then suggested revisions that were made after the review and also reviewed by the NRC Staff. The Staff concluded that there were "no obvious impediments to licensing the PRISM design."[26]

The PSERs developed from these non-LWR conceptual designs were then used as reference documents for NRC Regulatory Guide 1.232, which provides guidance for modifying and supplementing the General Design Criteria in Appendix A of Part 50. Some advanced reactor companies have indicated that they still intend to pursue licensing through 10 C.F.R. Part 50 using Reg Guide 1.232 as a guide. Currently, applicants and designers may use the advanced reactor design criteria in Appendix A of Reg Guide 1.232 to develop all or part of the principal design criteria and may choose among the design criteria, SFR-DC (Appendix B), or MHTGR-DC (Appendix C) to develop their design criteria. The NRC has also engaged

[20] NRC, *A Regulatory Roadmap for Non-Lightwater Reactors* at 13 (Dec. 26, 2017) (ADAMS Accession No. ML17312B567).

[21] *Id.*

[22] *Id.*

[23] *See* NUREG-1338 (Mar. 31, 1989) (ADAMS Accession No. ML052780497); NUREG-1369 (Dec. 31, 1991) (ADAMS Accession No. ML063410547).

[24] *See* NUREG-1369 (Dec. 31, 1991) (ADAMS Accession No. ML063410547).

[25] *Id.* at xv.

[26] NUREG-1368 (Feb.February 28, 1994) (ADAMS Accession No. ML063410561).

with advanced reactor designers in the conceptual design process in its ongoing assessment of emergency planning requirements for advanced reactors.[27]

While the conceptual design process can meaningfully advance in this way, where the NRC Staff incorporates its findings into PSERs, this does not result in definite and final decisions in licensing. However, this could be changed in a Part 53 rulemaking through a process of conceptual design approvals formalized into the regulations in a similar manner as Sodium Fast Reactors or the MHTGR. Here, the NRC can have a high-level set of parameters in Part 53 required to maintain plant safety, with a model similar to that of Appendix A of Part 50 for General Design Criteria, but as applied to advanced reactors at a high level.

In the licensing process, the Staff could commit to reviewing conceptual designs on a case-by-case basis with a goal of producing a Safety Analysis Report ("SAR") for each and could ultimately add them to an appendix to Part 53 (perhaps along with other designs that have also been reviewed). The NRC could publish the appendix in the Federal Register with a notice and comment period similar to the 60-day notice and comment period used for appendices for the SFR-DC and MHTGR Appendices in Reg Guide 1.232, and the Staff could then address or incorporate public comments.[28] This appendix would then represent the Staff's final version of the design criteria, but as derived from the conceptual design process. Then, applicants could use the appendix, similar to Reg Guide 1.232, to develop the design criteria for other facilities. This would afford significant pre-application coordination between the applicant and the Staff while also providing for flexibility in an applicant's development of their design criteria.

Standard Design Approvals

The NRC currently issues Standard Design Approvals ("SDA") under 10 C.F.R. § 52.143, "Staff Approval of Design." To obtain an SDA, a designer may submit either the final design for the entire facility or the final design of major portions of the facility. Like a Design Certification rulemaking, the SDA documents the NRC Staff's conclusive findings as to the submitted design. A potentially useful feature of an SDA is that its scope can include major portions of a nuclear power plant. This differs from the scope of a Design Certification, which consists of a mostly complete nuclear power plant design.[29] Currently an SDA, in combination with other reference documents, can be used to support a license or certification under either 10 C.F.R. Part 50 or 10 C.F.R. Part 52. The ability to limit the scope of an SDA to major portions of a design provides an opportunity for regulatory interactions to focus on those plant features most related to controlling the risks to public health and safety or those plant features whose design has been finalized under a staged design and licensing strategy.

However, an SDA does not provide finality in that issues resolved in the SDA may be reconsidered during a rulemaking for a subsequent Design Certification or during hearings associated with a construction permit or combined license application referencing the SDA. Specifically, "[t]he determination and report by the NRC Staff do not constitute a commitment to issue a permit or license."[30] As a result, while SDAs

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[27] *See* NRC, *Increasing Use of Risk-Informed and Performance-Based Evaluation Techniques and Regulatory Guidance in Licensing Commercial Advanced Nuclear Reactors* (July 12, 2019) (ADAMS Accession No. ML19128A324).

[28] *Guidance for Developing Principal Design Criteria for Non-Light Water Reactors*, 83 FED. REG. 15178 (Apr. 9, 2018).

[29] While power plants with a Design Certification are mostly complete on paper, substantial engineering work remains to be completed during the final design and construction of such facilities.

[30] 10 C.F.R. § 52.145.

provide incremental progress towards licensing or certification of advanced designs, that progress lacks finality and predictability.

In Part 53, the NRC should enable advanced reactor applicants to use SDAs to determine the requirements for specific portions of the plant design and obtain certification for portions a design—thus making them part of the rule. Much like generic Design Control Documents in the Part 52 appendices, the SDAs can then be incorporated by reference into the relevant appendix.

Topical Reports

The NRC has long used a topical report program to increase the efficiency of the licensing process and reduce the burden on applicants and licensees. A topical report is a standalone report containing technical information about a reactor, structure, system, or component, or safety topic that can be submitted to the NRC for its review and approval. Topical reports improve the efficiency of the licensing process and have traditionally been used to obtain NRC Staff approval for the design of key methodologies, computer codes and models, operational requirements, or other subjects for subsequent referencing in licensing applications. Topical reports have been used extensively in the review of LWR designs and are expected to be an important vehicle for obtaining NRC Staff findings (conditional or conclusive) on proposed design features and analysis methodologies for advanced reactor designs.

The NRC's Regulatory Review Map for Non-Light Water Reactors envisioned topical reports being used throughout the licensing process but cautioned they could not be used for final agency determinations—only conditional and conclusive findings.[31] However, Congress specifically directed the NRC to evaluate "the use of topical reports, standard design approval," and other methods for licensing through stages.[32] Indeed, advanced reactor companies are already submitting topical reports to the NRC.[33]

Given this Congressional directive, the NRC should consider adding topical reports, appropriately modified after an NRC review, to the appendix developed for a specific design (discussed in the conceptual design process above). Doing so would better establish developer confidence in the finality of NRC's approval. Another option could be to incorporate approved topical reports setting forth approved analysis methodologies. Both options, once NRC review and approval is complete, could be published in the Federal Register for notice and comment, and incorporated into a final rule as an appendix.

The adoption of additional methods or criteria as an alternative to any existing requirements in Part 53 (developed initially using methods such as topical reports or other interim licensing steps) would enable Part 53 to change and develop along with the state of the art in the nuclear industry. Otherwise, the NRC's proposed rule would be unable to adapt to truly innovative designs. Indeed, members of the industry have already opined that the proposed Part 53 will not work for their advanced reactor designs. We believe that the NRC must prepare a Part 53 that can be adaptable for all future designs, not just those based on the methods of today.

Conclusions

The NRC is continuing to restrict itself in its licensing processes by relying on regulatory procedures and methods with which it is already familiar. However, the agency has a broader mandate under NEIMA to

[31] NRC, *A Regulatory Roadmap for Non-Lightwater Reactors* at 13 (Dec. 26, 2017) (ADAMS Accession No. ML17312B567).

[32] NEIMA § 103(b)(4)(B).

[33] *See* TerraPower, Quality Assurance Topical Report (Dec. 23, 2020) (ADAMS Accession No. ML21005A015).

evaluate *new* options, including incorporating staged or iterative processes into licensing, not only in the preapplication phase, but also to support final agency decisions. This broader mandate should form the building blocks of Part 53 and should enable flexible and iterative approaches to licensing advanced reactor designs that are safe and reliable.

Appendix: Specific Proposed Changes to Part 53 for Advanced Fission Reactors

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General Principles

This appendix outlines a version of Part 53 for Advanced Fission Reactors that would be consistent with the comments provided in CATF's white paper submission. While some portions of the proposed subparts of Part 53 ("Subparts") should be retained, CATF proposes that each Subpart be revised in accordance with the following characteristics:

- Any technical criteria or requirements specified should be high-level and technology-neutral.
- Any Subpart that specifies technical criteria or requirements should also specifically and clearly set forth pathways, potentially using staged or iterative licensing approaches, for licensees to adopt alternative technical criteria or requirements. Upon NRC approval, such alternative technical criteria or requirements should be regularly incorporated into the rule, through incorporation by reference, direct final rulemaking, or an alternative efficient rulemaking process (such as a yearly rulemaking update).
- Any Subpart that specifies *how* to meet the technical criteria or requirements (i.e., methods) should specifically and clearly set forth pathways, potentially using staged or iterative licensing approaches, for licensees to adopt alternative methods. Upon NRC approval, alternative methods should be regularly incorporated into the rule, through incorporation by reference, direct final rulemaking, or an alternative efficient rulemaking process.
- All methods incorporated into Part 53 should be presented as options, with language permitting prospective licensees to submit a request to use alternatives to comply. In sum, Part 53 should provide licensees with the flexibility to choose to submit their own methods during the licensing process.
- For Subparts that contain requirements that may conflict with designs undergoing licensing today, in addition to allowing for alternatives, the NRC Staff should wait to promulgate the rule until closer to 2027 when it has additional information on the approaches taken by the current set of advanced reactor applicants.

Discussion of Proposed Alternative Part 53

In light of the above comments, CATF suggests a general high-level outline of Part 53 consistent with the below proposal.

A. Purpose and Principles Statement and General Provisions
B. Technology-Neutral Design Requirements
C. Design and Analysis Alternatives
D. Licensing, Certification, and Approval Pathways
E. Other Provisions

A more detailed discussion for each of the major Subparts is provided below.

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A. Purpose and Principles Statement and General Provisions

The purpose and principles statement would describe the basis of the rule and its statutory origins including the AEA and NEIMA, and the general provisions would include definitions, and general provisions such as requirements for written communications. We are not proposing a major rewrite of this section from the Staff proposal, although textual changes to definitions and scope may be required.

B. Technology-Neutral Design Requirements

Similar to some of the current requirements in proposed Subpart B, the NRC would use technology-neutral performance-based design requirements.

This subpart should also provide for alternative design requirements as follows:

> Licensees may propose alternative performance-based requirements other than those set forth in [the Technology-Neutral Design Requirements] for incorporation into Part 53 through the use of conceptual design assessments, standard design approvals, or topical reports. Once approved, alternative performance-based requirements shall be incorporated by reference as alternatives into this subpart through a direct final rulemaking or other rulemaking process.

C. Design and Analysis Alternatives

The design and analysis alternatives are ways in which licensee applicants can meet the Technology-Neutral Design Requirements. While Part 53 can and must allow for the use of PRA, licensees, however, should be permitted to suggest and adopt alternatives, such as deterministic methods. As such, the NRC should modify the list of permitted design and analysis methods going forward to incorporate approved analysis methods used by current and future applicants.

This subpart should also provide for alternative methods of meeting design requirements as follows:

> In order to meet the requirements of [the Technology-Neutral Design Requirements], a licensee may: propose and submit new methods in support of its analysis; utilize any methods set forth in any provision of the NRC's existing regulations; or propose and submit new methods in topical reports for incorporation into Part 53. Once approved, alternative methods shall be incorporated by reference as alternatives into this subpart through direct final rulemaking or other rulemaking.

D. Licensing, Certification, and Approval Pathways

In addition to the licensing, certification, and approval pathways already set forth in the proposed Part 53, this subpart should incorporate the following additional details on how conceptual design assessments, standard design approvals, and topical reports can be used to add alternatives to the requirements in Part 53:

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Conceptual Design Assessments – An applicant may seek approval of a conceptual design assessment, in order to assesses preliminary design information for consistency with the NRC's regulatory requirements. The NRC Staff shall review conceptual design assessments at a cost and on a topic and schedule previously agreed to by the applicant and the Staff. Upon review, the NRC Staff shall provide findings and issue any necessary terms and conditions. These findings and terms and conditions shall be deemed final upon publication in the Federal Register. These findings and terms and conditions may be incorporated into Part 53 as an alternative to the requirements of Part 53.

Standard Design Approvals – An applicant may seek approval of an entire nuclear reactor design, portions of a nuclear reactor design, or specific plant features through a request for a standard design approval pursuant to 10 C.F.R. § 52.143. Upon review, the NRC Staff shall provide findings and issue any necessary terms and conditions. These findings and terms and conditions shall be deemed final upon publication in the Federal Register. These findings and terms and conditions may be incorporated into Part 53 as approved portions of a standard design consistent with Part 53 or as an alternative to the requirements of Part 53.

Topical Reports – An applicant or licensee may seek review and approval of proposed methodologies, designs, operational requirements, other safety-related subjects, or technical topics related to nuclear reactor safety or design on a generic basis in topical reports. Topical reports deemed acceptable for use and verified by the NRC Staff shall be incorporated by reference as alternatives into Part 53 through direct final rulemaking or other rulemaking to the greatest extent possible, with the goal of public availability for use by multiple applicants.

E. Other Provisions

Additional subparts, such as Siting Requirements (now subpart D), Operating Requirements (now Subpart F), and Reporting Requirements (now subpart J) may be included in Part 53 in the future. However, those subparts should not be derived wholly from Parts 50 or 52 and should instead be scaled commensurate to the risk anticipated with advanced reactor designs in future versions of the rule. Ideally, the Staff should develop and implement these subparts closer to the 2027 rulemaking deadline, allowing it to incorporate as many options as possible, including criteria and methods, from the current group of pending advanced reactor license applications.

For example, the Staff should adopt a default Emergency Planning Zone ("EPZ") at the site boundary provided that the licensee can meet lower requirements for core damage frequency, dose, and other relevant considerations. For example, the Staff could incorporate aspects of the NuScale methodology used to establish its site boundary at the EPZ in support of this revised criteria.