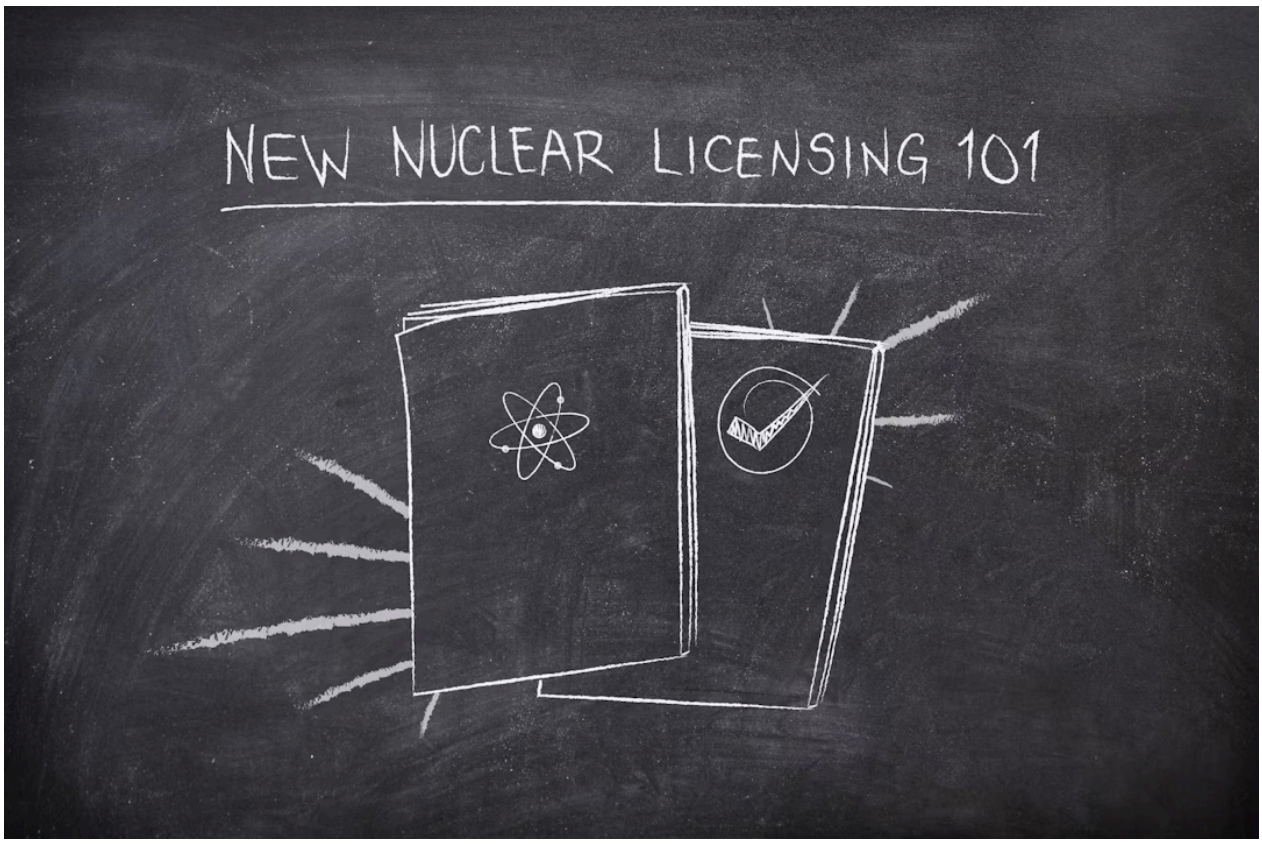
THIRD WAY

BLOG *Published November 18, 2024 • 8 minute read*

New Nuclear Reactor Licensing 101



Ryan Norman, *Senior Policy Advisor, Climate and Energy Program*

The Nuclear Regulatory Commission (NRC) is responsible for licensing and oversight of all US nuclear reactors. It is the successor to the Atomic Energy Commission and has licensed all operating US reactors since 1975. The NRC draws its primary regulatory authority from the Atomic Energy Act of 1954 (AEA) and the Energy Reorganization Act of 1974 (ERA). In recent years, Congress has passed a suite of federal legislation aimed at making the NRC more modern, accessible, and efficient in its responsibilities.

Third Way's 20x35 initiative calls for the deployment of 20 new advanced nuclear reactor projects domestically by 2035—enabling commercialization of up to four advanced reactor technologies and adding up to 20 GW of clean firm energy to the American power grid. To achieve this, many federal and regulatory policy shifts are needed, including within our national regulator. This blog provides an overview of the NRC's structure, regulatory tools, and the new reactor licensing process [1] . For

more information about advanced reactors and answers to frequently asked questions, check out 20x35.

The US Nuclear Regulatory Commission

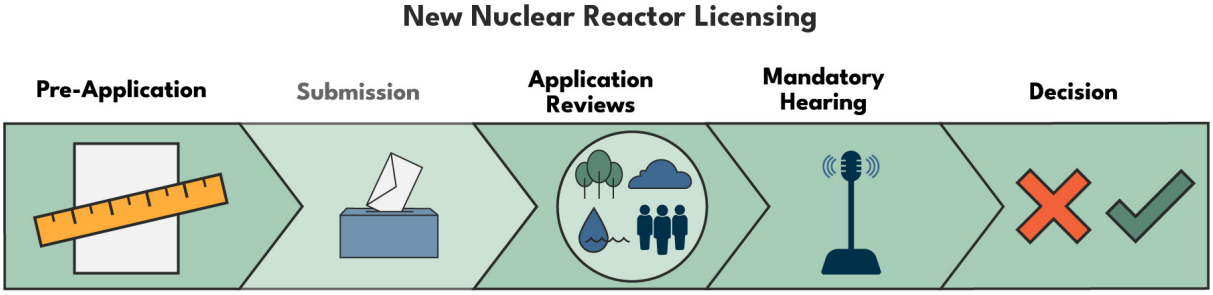
Who Leads the NRC?

The NRC is led by a 5-member bipartisan body, known as "The Commission" (*I know, it's confusing*). The Commissioners are individually appointed by the President of the US and confirmed by the Senate for staggered five-year terms. The President designates one of the Commissioners (generally a member of the President's party) to be the Chair of the NRC. The Chair assumes added executive responsibilities, such as official spokesperson of the agency and leading the NRC's budget process.

A Note on Rulemakings

This blog exclusively covers the licensing processes at the NRC. However, these processes do not exist in a vacuum and are shaped through the rulemaking process at the agency. The Commission's primary responsibility is the development of NRC policy—the documentation practices, protocols, and priorities that govern the implementation of the NRC's regulatory authority. To learn more about the key NRC rulemakings and policies for advanced reactors, read our blog.

The Licensing Process



New reactors can currently be licensed and constructed using one of two pathways—known as Part 50 and Part 52 under the Code of Federal Regulations (CFR) [2] . Part 50 allows for a two-step process, wherein an applicant can apply for a "construction permit" to build a nuclear reactor and then apply separately for an "operating license" to operate the nuclear reactor facility. Part 52 was designed as a more integrated approach to allow an applicant to receive a "combined license" that encompasses both the construction permit and the operating license.

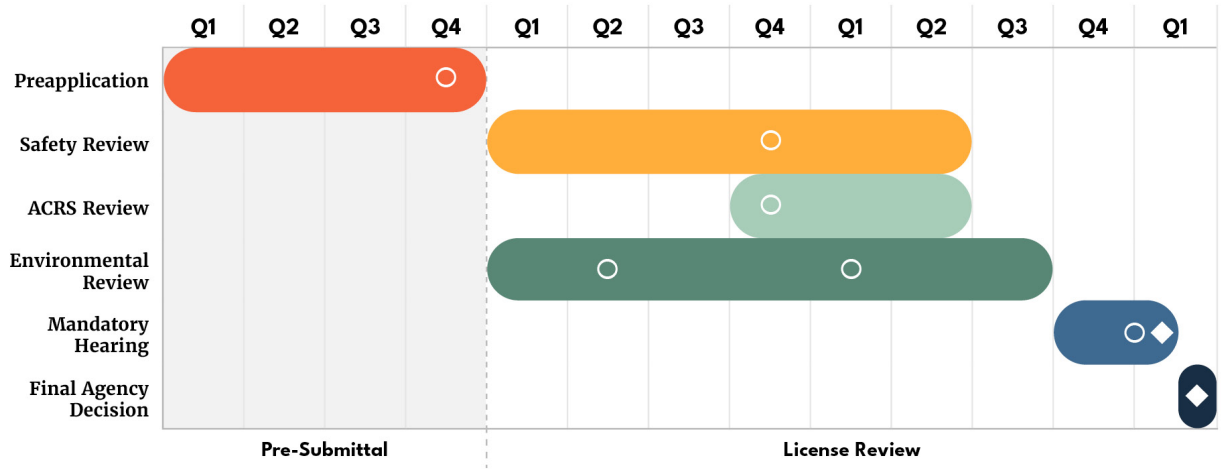
- **Part 50:** Part 50 is the original licensing process for nuclear reactors and has been used to license 98% of all nuclear power plants currently operating in the US.

- **Part 52:** After its own assessment as well as urging from industry, the NRC developed Part 52 as an alternative licensing pathway that could issue a combined licensing including both a construction and operating authorization within a single license application process (similar to the UK model). This pathway was used to license the Vogtle 3 and 4 reactor facilities.

- **Part 53:** The Nuclear Energy Innovation and Modernization Act (NEIMA) passed in 2019 mandated that the NRC develop a Risk-Informed, Technology Inclusive Regulatory Framework for Advanced Reactors, known as Part 53. This licensing pathway is still in the rulemaking process, and will not be available to advanced reactor applicants until late 2025 at the earliest.

Below is a high-level overview of the major milestones in the NRC's new reactor licensing process.

NRC Licensing Process



◆ **Commission Engagement Opportunity**
Commission engagement is defined as the opportunity for the Commission of the NRC to provide input in an application's scope, provide direction on specific process, or deliver a decision on an application's materials (such as a licensing decision). While this engagement is possible, it may not be procedurally required in all stages.

○ **Public Engagement Opportunity**
Public engagement is defined as the opportunity for the participation in public meetings, to access NRC and application documents, and to engage in comment periods, file contentions, or otherwise provide stakeholder feedback. This engagement may not be consistently be solicited in some stages, whereas it is required in others.

Note: Licensing schedules will vary by application; however, the ADVANCE Act mandates that NRC licensing timelines for certain COLs reach a final decision in no longer than 25 months.

Source: U.S. Nuclear Regulatory Commission, "Generic Milestone Schedule" for Combined License Applications (LWR or non-LWR referencing a certified design). Sequencing of Commission and Public Engagement milestones are the author's estimate based on NRC's historic performance in the licensing process. https://www.nrc.gov/about-nrc/generic-schedules.html

THIRD WAY

Preapplication & Submission

While not an official prerequisite, all potential new reactor applicants can interact with the NRC prior to submitting a completed license application in a process known as "preapplication

engagement". These interactions include meetings, reviews of white papers, technical reports, and other pre-application data relevant to design or licensing issues. For an applicant, the goal of pre-application engagement is generally to inform the NRC of a proposed licensing plan that includes specific milestones and a general timeline. This process helps an applicant to start discussion on novel elements of their design and discover potential information gaps in their application before they submit. For the NRC, this process helps to prepare future applicants—especially first-time applicants—to submit a quality application and enhances understanding of new technologies that the nuclear industry is pursuing.

Preapplication engagement has increased significantly in recent years as multiple advanced reactor developers seek to license and build new reactors over the next decade. As of 2024, the NRC has noted ongoing preapplication engagement with at least 12 companies. [3] Once an applicant is ready, they submit their application to the NRC and are placed onto the NRC's docket (after an acceptance review process). Then, the licensing process begins in earnest.

Application Reviews

Safety Review

Regardless of the licensing pathway, the NRC is required to conduct a technical evaluation of a reactor design. This process assesses a reactor's safety features, accident response to potential scenarios, and functionality of related critical systems. Along with other evaluation components, this comprehensive safety review ensures that a nuclear plant is able to be built safely, operate safely, and perform to the standard of regulations. Upon completion of these evaluations, the NRC staff develop a report of their findings which contains recommendations to be considered in the staff's final permitting and licensing recommendation. This report is also provided to the NRC's Advisory Committee for Reactor Safeguards (ACRS), for an additional technical evaluation of the reactor's safety profile (See: The Advisory Committee on Reactor Safeguards below).

Environmental Review

Many plant design discussions and technical evaluations can be conducted independently from the environmental analysis that is required under the National Environmental Policy Act (NEPA). These NEPA required environmental evaluations, often referenced under the umbrella of "site-specific" application components, are the focus of an environmental review that results in an Environmental Impact Statement (EIS). As part of this process, the NRC staff develops a report of their findings which contains an assessment of the expected environmental impacts of the proposed nuclear plant. This draft report is also made available for public comment prior to finalization. If members of the public have issues with elements in an application's draft environmental report, they may have the opportunity to contest the specific environmental matters in a hearing.

Mandatory Hearing

Upon completion of the safety and environmental reviews, which may include individual hearings on contested matters in an application, NRC staff will have concluded nearly all licensing work and reached a staff recommendation on whether the Commission should approve the license. Next, the NRC begins administrative processes to finalize staff's recommendation by scheduling a Commission-level hearing to discuss the staff's findings. Such hearing is considered the "mandatory hearing" as the AEA statutorily requires the NRC to hold a hearing on each application to build a reactor, in addition to any hearings held during the safety and environmental reviews, even if no one contests the application. The hearing typically includes staff and applicant written submittals, oral presentations, and a panel of witnesses who may answer questions. In 2024, the NRC implemented new procedures that allow for mandatory hearings to be conducted via written submission.

Permitting & Licensing Decision

After concluding the mandatory hearing, the staff and applicant may submit post-hearing filings and the Commission votes to issue a decision on an application. If the Commission votes to issue the permit or license, the applicant has completed the licensing process and can begin construction of the nuclear power plant. If an application is disapproved, the applicant may make the necessary revisions to their materials and resubmit an application to the NRC. Generally, previously reviewed white papers, topical reports, and other design data are referenceable in a new application, and an applicant is able to build off of their previous licensing experience to get back on track.

The Advisory Committee on Reactor Safeguards

The Advisory Committee on Reactor Safeguards (ACRS) was established as a statutory committee by the AEA and serves as an independent technical review committee within the NRC that reports directly to the Commission. The advisory committee is composed of experienced individuals with a wide range of relevant technical experience including nuclear, civil, and mechanical engineers, chemists, materials scientists, and many other backgrounds. These members are appointed by the Commission for 4-year terms. The ACRS may advise the NRC on a wide range of safety and safeguards related matters, but their primary role has been to review reactor license applications (both for new and existing reactors) and report on safety studies. Under the AEA, the ACRS is required to conduct an additional technical review of every application for a commercial license for new reactors and fuel development facilities.

Conclusion

The US Nuclear Regulatory Commission plays a pivotal role in safeguarding the public but also in enabling our national interests in security and public health. The US has made bold commitments to expand new nuclear energy capacity to reach net-zero by 2050 and promote global energy security. As rapid energy demand propels a new stage of growth for America's nuclear energy industry, the ability of the NRC to enable these goals through efficiency and global partnership is a critical pillar of our global competitiveness.

TOPICS

ALL TOPICS | NUCLEAR 246

ENDNOTES

1. Note: This blog only covers commercial (or Section 103 of the AEA) licenses. Processes for research and test reactor licenses (Section 104 of the AEA) will vary in some respects. Additionally, the information in this piece pertains to nuclear fission reactors (both light water and non-light water) and does not address fusion energy systems, which are permitted and licensed under an entirely different process.

2. Under Part 52, new reactor designs can also be certified independent from a license application for a reactor at a specific site through a process called "Design Certification" or DC. With a DC rulemaking process, a reactor developer must show specific tests, analyses, and design data to demonstrate how a proposed reactor design would comply with NRC regulations. If successfully completed, a new federal rule is issued certifying the technical analysis for the reactor design and this certification can be referenced in a license application as the basis for the safety review. A DC is valid for 15 years from the date of issuance, but can be renewed for up to an additional 15 years.

3. TerraPower, LLC submitted their application to the NRC on March 28, 2024. https://www.nrc.gov/reactors/new-reactors/advanced/who-were-working-with/applicant-projects/terrapower.html