



THE NUCLEAR POWER PLANT LICENSING PROCESS

History of Regulating Nuclear Energy Technology

The Atomic Energy Act of 1946 established the United States Atomic Energy Commission (AEC), placing nuclear power and nuclear weapon development under civilian control.¹ Eight years later, in response to public concerns about the growing nuclear arms race between the United States and the Soviet Union, the AEC was amended to open the door for private industry and other countries to develop nuclear energy along with a prohibition on issuing patents nuclear energy generation processes.^{2, 3}

The amended AEA also directed the federal government to create a more robust nuclear power plant licensing application process. Known as Part 50, this two-step process, which is still in effect, requires operators to first obtain permission to construct the plant. This includes going through the National Environmental Policy Act (NEPA) environmental permitting process and holding a public hearing. The second step requires obtaining a license to operate and supervise the controls of a nuclear power reactor.⁴

By the end of 1973, there were a total of 42 operable nuclear power reactors in the U.S., with utilities ordering 41 new reactors that year alone.^{5, 6} Opponents of nuclear power began raising concerns that the AEC was not doing enough to ensure safety and the agency's statutory responsibilities to both promote and regulate nuclear power made it an ineffective regulator.⁷ Congress responded by passing the Energy Reorganization Act of 1974 which abolished the AEC and replaced it with the Nuclear Regulatory Commission (NRC). Regulatory functions were assigned to the NRC, while the newly created Energy Research and Development Administration, which later became the Department of Energy, was responsible for nuclear research and development.⁸

Impact of Three Mile Island

On March 28, 1979, Unit 2 of the Three Mile Island nuclear generating station outside Harrisburg, Pennsylvania experienced a series of mechanical and human errors. Within two weeks of the accident, President Jimmy Carter launched an independent committee to investigate and produce recommendations.⁹ This led to structurally reforming the NRC, overhauling plant design and equipment requirements, and expanding the NRC's role in overseeing how plants are managed.¹⁰

Three Mile Island was a death knell for nuclear power. At the time of the accident there were 51 reactors under construction, each facing major regulatory and construction delays. Existing reactors required costly backfits and retrofits, with 35 of the older reactors needing an estimated \$3.2 billion in updates through 1982.¹¹ While costs associated with nuclear power grew significantly, the ever-increasing share of coal and natural gas powering the grid resulted in no new reactors beginning construction between 1978 and 2013.¹²

Today's Nuclear Regulatory Commission

The Energy Policy Act of 1992,¹³ which attempted to reform all areas of U.S. energy supply and demand, directed the NRC to modernize the Part 50 nuclear power plant licensing application process. The new process, known as Part 52, combines the two licensure steps of construction and operating into one with the goal of improving regulatory efficiency and predictability.¹⁴ It also allows pre-approval of standardized designs and early site permits so companies can get approved to build in a specific location and address environmental and health issues without having to commit to a specific nuclear plant design.¹⁵

To encourage new technology in advanced nuclear, the Nuclear Energy Innovation and Moderation Act was signed by President Donald Trump January 2019, directing the NRC to establish an advanced reactor licensing framework by 2027. Congress directed the NRC to develop a “risk-informed,” “technology-inclusive,” and “performance-based” licensure process.¹⁶

After almost a two-year comment period on the draft rule entitled *Risk-Informed, Technology-Inclusive Regulatory framework for Advanced Reactors*,¹⁷ the NRC Commission is considering a 1,173-page proposed rule that is known as Part 53.¹⁸ The rule is twice as long as the existing licensing frameworks in Parts 50 and 52.¹⁹

Policy Solutions

The NRC is not prepared to effectively review and approve the next generation of nuclear reactor technology. The independent regulatory agency needs updates to their mission, processes, and hiring practices in order to prepare for advanced reactors. Some solutions include:

- **H.R.6544, Atomic Energy Advancement Act**²⁰ – This bill updates NRC’s mission, and requires licensing reviews to be “efficient, timely, and predictable.”²¹ It also prepares NRC to review and approve Part 53 applications, including reducing fees charged to certain nuclear license applicants and empowering the agency to hire and retain qualified staff.^{22, 23, 24}
- **H.R. 1042, the Prohibiting Russian Uranium Act**²⁵ - Russia accounts for the 35% of the world’s uranium enrichment²⁶ and is the only country, along with China, that has the infrastructure to produce the type of uranium that many advanced nuclear reactors use.²⁷ This bill bans uranium fuel imports from Russia by 2028, sending market signals to fast-track domestic enriched uranium production.²⁸ The Nuclear Fuel Security Act,²⁹ which requires the Department of Energy to increase supplies of domestic nuclear fuel that would fill the gap created by ending imports, was passed in the FY 2024 National Defense Authorization Act.³⁰
- **Reactor siting reform** - Since new reactor technology is designed to have a smaller footprint than previous generation reactors and be located closer to population centers, the NRC needs to update guidance that currently limits reactor siting to locations where population density does not exceed 500 person per square mile within 20 miles of the site.³¹ The updated guidance is being developed and to be effective should focus on risk-informed and performance-based criteria, rather than a one-size-fits-all standard, along with requiring analysis that identifies and plans for potential accidents and related impact.³²

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¹ H.R. 4905. U.S. House of Representatives 83rd Congress. <https://www.congress.gov/bill/83rd-congress/house-bill/4905/text/pl?overview=closed>

² Hicks, Jesse. Atoms for Peace: The Mixed Legacy of Eisenhower’s Nuclear Gambit. Distillations Magazine. July 20, 2014. <https://sciencehistory.org/stories/magazine/atoms-for-peace-the-mixed-legacy-of-eisenhowers-nuclear-gambit/>

³ H.R. 9757. U.S. House of Representatives 83rd Congress. <https://www.congress.gov/bill/83rd-congress/house-bill/9757?q=%7B%22search%22%3A%22HR+9757%22%7D&s=2&r=4>

⁴ Part 50 – Domestic Licensing of Production and Utilization Facilities. NRC Regulations Title 10, Code of Federal Regulations. <https://www.nrc.gov/reading-rm/doc-collections/cfr/part050/full-text.html>

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- ⁵ Smith, Gene. Industry Report Asserts Nuclear Power ‘Came Into Its Own in 1973’. The New York Times. January 16, 1974. <https://www.nytimes.com/1974/01/16/archives/industry-report-asserts-nuclear-power-came-into-its-own-in-1973.html>
- ⁶ Energy Timelines, Nuclear. U.S. Energy Information Administration. <https://www.eia.gov/kids/history-of-energy/timelines/nuclear.php>
- ⁷ United States Nuclear Regulatory Commission History. <https://www.nrc.gov/about-nrc/history.html>
- ⁸ H.R. 11510. U.S. House of Representatives 93rd Congress. <https://www.congress.gov/bill/93rd-congress/house-bill/11510/titles>
- ⁹ Executive Order 12130—President's Commission on the Accident at Three Mile Island. The American Presidency Project. April 11, 1979. <https://www.presidency.ucsb.edu/documents/executive-order-12130-presidents-commission-the-accident-three-mile-island>
- ¹⁰ Reorganization Plan No. 1 of 1980. 45 F.R. 40561, 94 Stat. 3585. U.S. Code. <https://uscode.house.gov/view.xhtml?req=granuleid:USC-1999-title5a-node78-leaf186&num=0&edition=1999>
- ¹¹ Nuclear Regulation: Process for Backfitting Changes in Nuclear Plants has Improved. U.S. General Accounting Office. December 1985. <https://www.gao.gov/assets/rced-86-27.pdf>
- ¹² Plumer, Brad. Why America abandoned nuclear power (and what we can learn from South Korea). Vox. February 29, 2016. <https://www.vox.com/2016/2/29/11132930/nuclear-power-costs-us-france-korea>
- ¹³ H.R. 776. U.S. House of Representatives 102nd Congress. <https://www.congress.gov/bill/102nd-congress/house-bill/776?q=%7B%22search%22%3A%22Energy+Policy+Act+of+1992%22%7D&s=3&r=1>
- ¹⁴ Part 50 – Licenses, Certifications, and Approvals for Nuclear Power Plants. NRC Regulations Title 10, Code of Federal Regulations. <https://www.nrc.gov/reading-rm/doc-collections/cfr/part052/full-text.html>
- ¹⁵ Early site permit. United States Nuclear Regulatory Commission. February 15, 2023. <https://www.nrc.gov/reading-rm/basic-ref/glossary/early-site-permit-esp.html>
- ¹⁶ Nuclear Energy Innovation and Modernization Act. 115th Congress. <https://www.congress.gov/115/plaws/publ439/PLAW-115publ439.pdf>
- ¹⁷ Risk-Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors – Proposed Rule. Nuclear Regulatory Commission. December 10, 2021. <https://www.regulations.gov/document/NRC-2019-0062-0176>
- ¹⁸ Part 53 – Risk Informed, Technology-Inclusive Regulatory Framework for Advanced Reactors. United States Nuclear Regulatory Commission. March 9, 2023. <https://www.nrc.gov/reactors/new-reactors/advanced/rulemaking-and-guidance/part-53.html>
- ¹⁹ NRC Staff Whiffs on Nuclear Licensing Modernization. The Breakthrough Institute. December 12, 2022. <https://thebreakthrough.org/blog/nrc-staff-whiffs-on-nuclear-licensing-modernization>
- ²⁰ H.R. 6544. U.S. House of Representatives 118th Congress. <https://www.congress.gov/bill/118th-congress/house-bill/6544>
- ²¹ Id.
- ²² Senator Shelley Moore Capito and Congresswoman Cathy McMorris Rodgers. Letter to Comptroller General Gene Dodaro, U.S. Government Accountability Office. February 4, 2022. https://www.epw.senate.gov/public/_cache/files/9/7/977360db-742a-4779-b022-df3ab27d2ebd/8FD158E039F071C455F8DAB8545B13DF.02.04.2022-gao-request-on-advanced-reactors-nrc-preparedness-signed-.pdf
- ²³ Moore, Daniel. Regulators Grapple with Meeting Nuclear’s ‘Now or Never’ Moment. Bloomberg Law. October 12, 2023. <https://news.bloomberglaw.com/environment-and-energy/regulators-grapple-with-meeting-nuclears-now-or-never-moment>
- ²⁴ Nuclear Power – NRC Needs to Take Additional Actions to Prepare to License Advanced Reactors. U.S. Government Accountability Office. July 2023. https://www.epw.senate.gov/public/_cache/files/d/5/d585dc52-21f5-48be-bc4d-3da7bab3c9e3/F6D5AAEB9794E9CB82250DA231773D5A.08-24-2023-capito-cmr-requested-gao-nrc-report.pdf
- ²⁵ H.R. 1042. U.S. House of Representatives 118th Congress. <https://www.congress.gov/bill/118th-congress/house-bill/1042>
- ²⁶ Hiller, Jennifer. U.S. Rethinks Uranium Supply for Nuclear Plants After Russia’s Invasion of Ukraine. Wall Street Journal. March 22, 2022. <https://www.wsj.com/articles/u-s-rethinks-uranium-supply-for-nuclear-plants-after-russias-invasion-of-ukraine-11647941401>
- ²⁷ High-assay low-enriched uranium (HALEU). World Nuclear Association. [https://world-nuclear.org/information-library/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/high-assay-low-enriched-uranium-\(haleu\).aspx](https://world-nuclear.org/information-library/nuclear-fuel-cycle/conversion-enrichment-and-fabrication/high-assay-low-enriched-uranium-(haleu).aspx)
- ²⁸ H.R. 1042. U.S. House of Representatives 118th Congress. <https://www.congress.gov/bill/118th-congress/house-bill/1042>
- ²⁹ H.R. 1086. U.S. House of Representatives 118th Congress <https://www.congress.gov/bill/118th-congress/house-bill/1086?q=%7B%22search%22%3A%22Nuclear+Fuel+Security+Act%22%7D&s=3&r=1>
- ³⁰ H.R. 2670. U.S. House of Representatives 118th Congress. <https://www.congress.gov/bill/118th-congress/house-bill/2670>
- ³¹ Regulatory Guide 4.7 – General Site Suitability Criteria for Nuclear Power Stations. U.S. Nuclear Regulatory Commission. March 2014. <https://www.nrc.gov/docs/ML1218/ML12188A053.pdf>
- ³² SECY-20-0045: Population Related Siting Considerations for Advanced Reactors. U.S. Nuclear Regulatory Commission. May 22, 2020. <https://www.nrc.gov/docs/ML1926/ML19262H055.html>