For Additional Information, Contact:

Office of Public Affairs
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
301-415-8200
opa@nrc.gov

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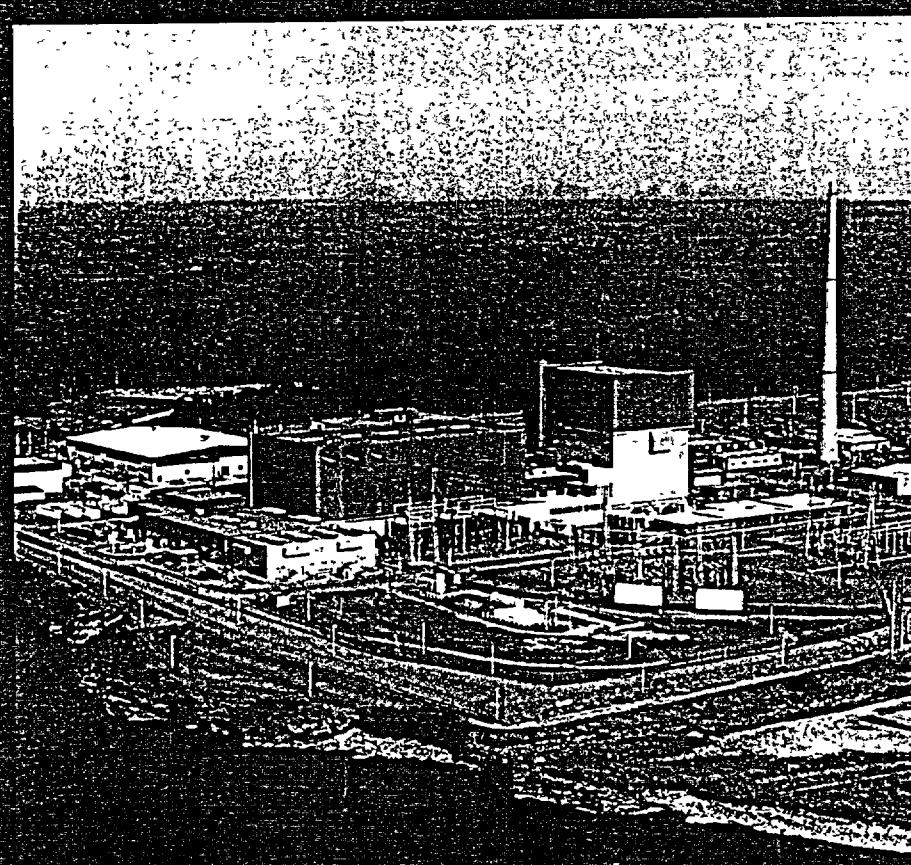
Nuclear Power Plant Licensing Process

United States Nuclear Regulatory Commission



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Cover Photo: James A. Fitzpatrick Nuclear Power Plant

Introduction

In order for a commercial nuclear power plant to operate in the United States, it has to obtain a license from the U.S. Nuclear Regulatory Commission (NRC). Among other things, the NRC is responsible for regulating the licensing and operation of nuclear power plants. In the past five decades, the NRC (formed in 1975) and its predecessor, the Atomic Energy Commission, have issued 126 operating licenses for nuclear power plants. Of these, 103 are currently operating, 1 is temporarily closed, and 22 have been shut down after operating and are in various stages of decommissioning In addition, four plants have NRC-issued permits that would allow them to complete construction. About 100 additional plants began the licensing process, but did not complete it for various reasons.

In the past, nuclear power plants were licensed under a two-step licensing process This process required both a construction permit and an operating license. In 1989, the NRC established an alternative licensing process that essentially combines a construction permit and an operating license, with certain conditions, into a single license. Under either process, before an applicant can build and operate a nuclear power plant, it must obtain approval from the NRC.

Other licensing alternatives established in 1989 are early site permits, which allow an applicant to obtain approval for a reactor site and "bank" it for future use, and certified standard plant designs, which can be used as pre-approved "off-the-shelf" designs.

Public involvement is a key element in all of the NRC's reactor licensing processes. Consequently, the agency holds numerous public meetings during the course of the licensing process, and the law requires that the NRC must hold a public hearing before issuing a construction permit, early site permit, or combined license for a nuclear plant. In addition, all documents and correspondence related to an application are placed in the NRC's Public Document Room (PDR) in Rockville, Maryland, which can be accessed through the Public Electronic Reading Room. Members of the public may access the Electronic Reading Room libraries from computers

with Internet access. NRC documents may also be obtained from public libraries throughout the country, in locations near NRC-licensed facilities. The agency issues press releases announcing receipt of applications, as well as public meetings, opportunities for hearings, and other major actions taken by the NRC. In addition, copies of key documents and notifications are sent to Federal, State, and local officials; published in the *Federal Register* and local newspapers; and made available electronically.

Two-Step Licensing Process (10 CFR Part 50)

Requirements for obtaining an operating license are contained in the NRC's regulations, which prescribe a two-step process involving issuance of a construction permit and an operating license. After the NRC reviews and is satisfied with the safety of the preliminary plant design and the suitability of the prospective site, the agency issues a construction permit that allows an applicant (e.g., utility) to begin building a plant. Sometime during construction, the utility submits an application for an operating license, which the NRC issues only if all safety and environmental requirements are met.

Construction Permit

An application for a construction permit must contain three types of information:
(1) preliminary safety analyses,
(2) an environmental review, and
(3) financial and antitrust statements.

In addition, each application must include an assessment of the need for the power plant.

Upon receiving an application, the NRC performs an acceptance review. If the NRC determines that the construction permit application includes the required information, the agency publishes a notice in the *Federal Register*. The NRC then reviews the application and documents its findings on site safety characteristics and emergency planning in a safety evaluation report.

To encourage public participation in the licensing process, the NRC schedules public meetings near the proposed site to familiarize the public with the safety and environmental aspects of the application, the planned location and type of plant, the NRC's licensing process, and the opportunities for public participation in the proceeding. In addition, the NRC holds frequent public meetings with the applicant throughout the licensing process to discuss the plant's design and construction.

The Advisory Committee on Reactor Safeguards (ACRS) — an independent advisory group of technical experts — reviews each construction permit application and the NRC's related safety evaluation in a public meeting. The ACRS reports the results of its reviews to the NRC's five-member Commission

A mandatory public hearing is conducted by a three-member Atomic Safety and Licensing Board, composed of one lawyer (who acts as chairperson) and two technically qualified persons. Members of the public may submit written or oral statements to the licensing board to be entered into the hearing record, or they may petition for leave to intervene as full parties in the hearing.

The NRC also conducts an environmental review, in accordance with the National Environmental Policy Act (NEPA), to evaluate the potential environmental impacts and benefits of the proposed plant. This includes impacts on air; water; animal life; vegetation; natural resources; and property of historic, archaeological, or architectural significance. Other items evaluated include economic, social, and cultural impacts. After completion of this review, the NRC issues a draft environmental impact statement for comment by the public, including appropriate Federal, State, and local agencies. The agency then issues and makes public a final environmental impact statement (FEIS), which addresses all comments that the agency received.

The NRC may authorize an applicant to do some work at a site before a construction permit is issued. This "limited work authorization" can only be granted after the Atomic Safety and Licensing Board has made all of the environmental findings required for a construction permit and determined that the proposed site is a suitable location for a nuclear power plant of the general size and type proposed.

Operating License

Final design information and plans for operation are developed during the construction of the nuclear plant. The applicant then submits an application to the NRC for an operating license. The application contains a final safety analysis report and an updated environmental report. The safety analysis report describes the plant's final design, safety evaluation, operational limits, anticipated response of the plant to postulated accidents, and plans for coping with emergencies. The NRC reviews the applicant's emergency plans in consultation with the Federal Emergency Management Agency to determine whether the plans are adequate and whether there is reasonable assurance that they can be implemented.

The ACRS reviews each operating license application and the NRC's related final safety evaluation report in a public meeting. A *Federal Register* notice is published to provide an opportunity for any person whose interests might be affected by the proceeding to petition the NRC for a hearing. If a public hearing is held, it is conducted by the Atomic Safety and Licensing Board using the same decision process described for the construction permit hearing.

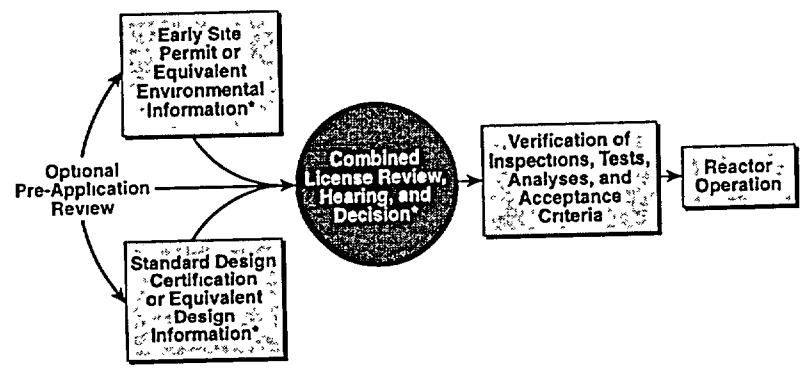
Additional Licensing Processes (10 CFR Part 52)

In 1989, the NRC established new alternatives for nuclear plant licensing under 10 CFR Part 52, which describes a combined licensing process, an early site permit process, and a standard plant design certification process. An application for a combined license may incorporate by reference a standard design certification, an early site permit, both, or neither. This approach allows early resolution of safety and environmental issues. The issues resolved by the design certification rulemaking process and during the early site permit hearing process are not reconsidered during the combined license review These processes are discussed in

Figure 1, which shows the relationship between the three processes.

In addition, the NRC can perform a pre-application review before submittal of a license application. The process for this review is informal and involves the public. Generally, the NRC staff meets publicly with a prospective license applicant and provides early feedback on the licensing issues associated with the proposed design. These early interactions between the NRC and applicants, vendors, and other Government agencies, in a public forum, facilitate the upcoming application review. During 2001, for instance, the NRC and representatives of Exelon Corporation held more than a dozen meetings to discuss the Pebble Bed Modular Reactor design and provide an opportunity for public comment.

Figure 1 - Relationships Between Combined Licenses, Early Site Permits, and Standard Design Certifications



*A combined license application can reference an early site permit, a standard design certification, both, or neither. If an application does not reference an early site permit and/or a standard design certification, the applicant must provide an equivalent level of information in the combined license application.

Early Site Permits

Under the NRC's regulations in 10 CFR Part 52, the agency can issue an early site permit for approval of one or more sites separate from an application for a construction permit or combined license. Such permits are good for 10 to 20 years and can be renewed for an additional 10 to 20 years. They address site safety issues, environmental protection issues, and plans for coping with emergencies, independent of the review of a specific nuclear plant design.

An application for an early site permit must contain the following information:

- the boundaries of the site, including a discussion of the exclusion area for which the applicant has the authority to remove or exclude persons or property
- characteristics of the site, including seismic, meteorologic, hydrologic, and geologic data
- the location and description of any nearby industrial, military, or transportation facilities and routes
- the existing and projected future population of the area surrounding the site, including a discussion of the expected low-population zone around the site and the locations of the nearest population centers
- an evaluation of alternative sites to determine whether there is any obviously superior alternative to the proposed site
- the proposed general location of each plant on the site
- the number, type, and power level of the plants, or a range of possible plants planned for the site
- the maximum radiological and thermal effluents expected
- the type of cooling system expected to be used
- radiological dose consequences of hypothetical accidents
- plans for coping with emergencies

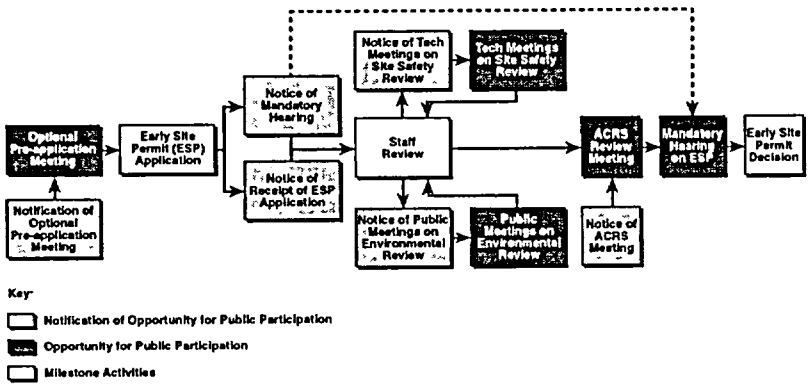
For emergency plans, the application must identify physical characteristics of the site (such as a drawbridge) that could significantly hinder the development of a complete emergency plan The application must also describe contacts and arrangements made with local, State, and Federal government agencies with emergency planning responsibilities, or at least show that the applicant has made a good faith effort to obtain the participation of these organizations in the emergency planning process. The NRC reviews the emergency planning information in consultation with the Federal Emergency Management Agency.

The NRC documents its findings regarding site safety characteristics and emergency planning in a safety evaluation report, and environmental protection issues in draft and final environmental impact statements. The early site permit also has provisions for limited work authorization to perform non-safety-related site preparation activities, subject to redress, before a combined license is issued. After the NRC staff and ACRS complete their respective safety reviews, the NRC issues a *Federal Register* notice announcing a mandatory public hearing.

Although not required, the NRC generally holds an introductory meeting near the proposed site 6 to 12 months before an application is submitted for an early site permit. This meeting is intended to familiarize the public with the safety and environmental aspects of the application, the planned location for the plant(s), the regulatory process, and opportunities for public participation in the licensing process In addition, the agency holds meetings with the public to discuss the scope of the NRC's environmental review. All meetings with the applicant on safety issues are also open to the public

In a public meeting, the ACRS reviews each application for an early site permit, together with the NRC staff's related safety evaluation report. Members of the public may participate in a hearing before an early site permit is issued. Such hearings are conducted by the Atomic Safety and Licensing Board. These opportunities for public involvement are shown in Figure 2.

Figure 2 - Opportunities for Public Involvement During the Review of Early Site Permits



Standard Design Certification

The NRC can certify a reactor design for 15 years through the rulemaking process, independent of a specific site. An application for a standard design certification must contain information and proposed tests, inspections, analyses, and acceptance criteria for the standard design.

The ACRS reviews each application for a standard design certification, together with the NRC staff's safety evaluation report, in a public meeting. If the design is acceptable, the NRC staff can then certify it through a rulemaking. Under this process, the NRC publishes a public notice of the proposed rule in the *Federal Register* seeking public comments The NRC reviews the comments and makes any changes to the final rule, which is then published in the *Federal Register* and becomes an appendix to 10 CFR Part 52 of the regulations.

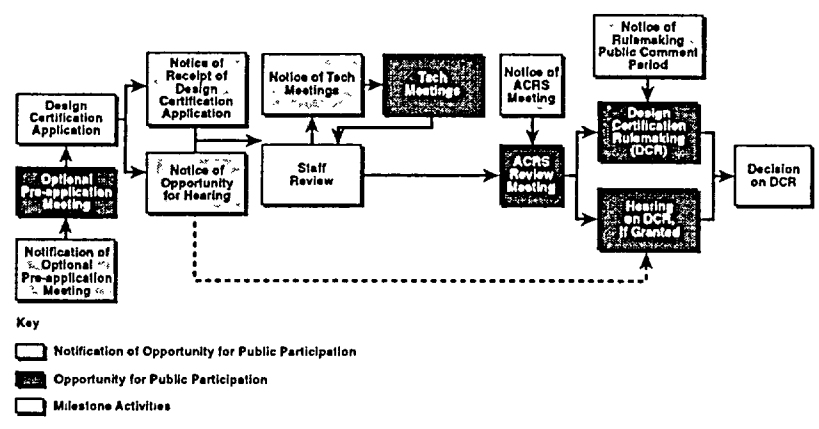
In addition to participating in the design certification rulemaking, members of the public may participate in a hearing conducted by the Atomic Safety and Licensing Board. These opportunities for public involvement are shown in Figure 3. The issues that are resolved in a design certification rulemaking are subject to a more restrictive change process than issues that are resolved through the issuance of a license. The NRC can only change certified design requirements in limited circumstances.

Combined License

A combined license authorizes construction and conditional operation of a nuclear power plant. The application for a combined license must contain essentially the same information required in an application for an operating license issued under 10 CFR Part 50, including financial and antitrust information and an assessment of the need for power. The application must also describe the inspections, tests, analyses, and acceptance criteria (ITAAC) that are necessary to ensure that the plant has been properly constructed and will operate safely.

As stated earlier, an application for a combined license may reference a standard design certification, an early site permit, both, or neither. If the application references a standard design certification, the applicant must perform the inspections, tests, analyses, and acceptance criteria for the certified design and the site-specific design features. If the application does not reference a standard design certification, the applicant must provide complete design

Figure 3 - Opportunities for Public Involvement During the Review of Standard Design Certifications



information, including the information that they would otherwise have submitted, for a standard design certification.

If the application references an early site permit, the applicant must demonstrate that the design of the plant is compatible with the early site permit. The application must also include information on those issues that were not required with the early site permit application, such as the need for power from the proposed plant. If the application does not reference an early site permit, the applicant must provide the site information that would be included in an early site permit and must also include a complete emergency plan.

The ACRS reviews each application for a combined license, together with the NRC staff's safety evaluation report, in a public meeting. After issuing a combined license, the NRC verifies that the licensee has completed the required inspections, tests, and analyses, and that the acceptance criteria have been met before the plant can operate.

The NRC publishes notices of the successful completion of the inspections, tests, and analyses. Then, at least 180 days before the scheduled date for initial loading of nuclear fuel into the reactor, the NRC publishes a notice providing an opportunity for members of the public to participate in a hearing conducted by the Atomic Safety and Licensing Board. The NRC considers a request for a hearing only if the request demonstrates that the licensee has not met the acceptance criteria in the combined license. These opportunities for public involvement are summarized in Figure 4.

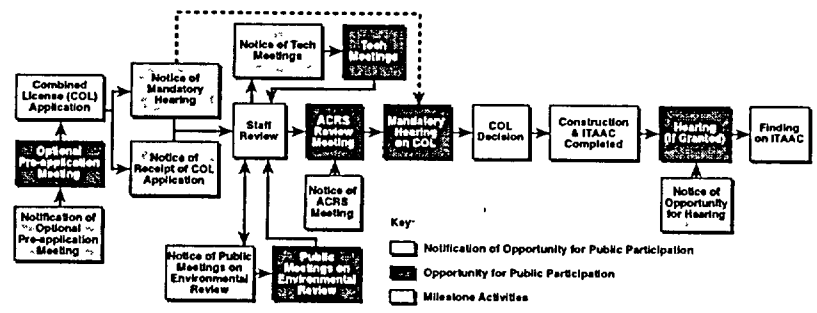
Other Licensing Processes

The Commission's regulations in 10 CFR Part 52 also have several appendices describing the processes for a manufacturing license, a duplicate plant license, preliminary and final design approvals, and site suitability reviews. These appendices are discussed briefly below.

Manufacturing License

The NRC's licensing processes generally assume that a nuclear power plant will be built where it

Figure 4 - Opportunities for Public Involvement During the Review of Combined Licenses



will be operated. Under this assumption, the NRC staff reviews plant design and siting issues during its review of the construction permit application. However, any person may apply for a license to manufacture a nuclear power plant that will be fabricated at one location but sited and operated elsewhere.

Duplicate Plant License

Any person may apply for a license to construct and operate nuclear power reactors of duplicate design at multiple sites, and the NRC's regulations specifically provide for consolidation of licensing hearings for such applications.

Standard Design Approval

Any person may submit a proposed preliminary or final standard design for a major portion of a nuclear power plant to the NRC for review. Unlike a standard design certification, NRC findings do not prevent issues resolved by the design review process from being reconsidered during licensing hearings.

Site Suitability Reviews

Any person may submit a request to the NRC for early review of one or more site suitability issues related to the construction and

operation of a nuclear power plant, independent of the application for a construction permit. NRC staff findings do not prevent these issues from being reconsidered during licensing hearings. In addition, the regulations describe how a hearing may be held by the Atomic Safety and Licensing Board on one or more site suitability issues. Members of the public may participate in the hearing.

More information about public hearing participation is available at http://www.nrc.gov/public-involve.html.

Glossary

Combined license:

Like a construction permit under 10 CFR Part 50, a combined license under 10 CFR Part 52 authorizes construction of a nuclear power plant. The NRC ensures that the licensee has completed the required inspections, tests, and analyses, and authorizes operation after it finds that the acceptance criteria have been met.

Construction permit:

Under 10 CFR Part 50, a construction permit from the NRC authorizes construction of a nuclear power plant. The NRC focuses on the preliminary design of a nuclear plant and the suitability of the site before authorizing construction of the plant

Early site permit:

Under 10 CFR Part 52, an early site permit addresses site suitability issues, environmental protection issues, and plans for coping with emergencies, independent of the review of a specific nuclear plant design.

Geologic data:

Data associated with the history of the earth and its life, especially as recorded in rocks.

Hydrologic data:

Data related to properties, distribution, and circulation of water flow on the surface and land, in the soil and underlying rocks.

Meteorologic data:

Data obtained from the atmospheric phenomenon associated with a region's weather.

Operating license:

Under 10 CFR Part 50, an operating license authorizes operation of the proposed facility. At this stage of the review, the NRC examines the final design of the plant, verifies proper construction of the plant, and inspects the applicant's testing and other operational programs and its plans for coping with emergencies.

Seismic data:

Data obtained from activity caused by an earthquake or the earth's vibration.

Standard design certification:

Under 10 CFR Part 52, the NRC may certify a standard plant design through a rulemaking, independent of the review of a specific site.