

U.S. NUCLEAR REGULATORY COMMISSION

10 CFR Part 50

Regulation of Advanced Nuclear Power Plants; Statement of Policy

AGENCY: U.S. Nuclear Regulatory Commission.

ACTION: Policy Statement: Final Revision.

SUMMARY: The Nuclear Regulatory Commission (NRC) intends to improve the licensing environment for advanced nuclear power reactors to minimize complexity and uncertainty in the regulatory process. This statement gives the Commission's policy regarding the review of, and desired characteristics associated with, advanced reactors. This policy statement is the second revision of the policy statement titled "Regulation of Advanced Nuclear Power Plants, Statement of Policy." The purpose of this revision is to update the Commission's policy statement on advanced reactors to integrate the Commission's expectations for security and preparedness with the current expectations for safety. This revised policy statement supercedes the earlier version of the policy statement.

EFFECTIVE DATE: (published date of the final revision).

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SUPPLEMENTARY INFORMATION:**Background**

On July 8, 1986 (51 FR 24643), the Commission published a policy statement on regulation of advanced reactors in the *Federal Register*. The Commission's primary objectives in issuing the advanced reactor policy statement were threefold:

- First, to maintain the earliest possible interaction of applicants, vendors, and government agencies with the NRC;
- Second, to provide all interested parties, including the public, with the Commission's views concerning the desired characteristics of advanced reactor designs; and
- Third, to express the Commission's intent to issue timely comment on the implications of such designs for safety and the regulatory process.

On July 12, 1994 (59 FR 35461), the Commission revised the 1986 advanced reactor policy statement by addressing the Commission's policy on metrication (57 FR 46202, October 7, 1992).

Since the events of September 11, 2001, the NRC has assessed potential threats and their possible impacts on the Nation's fleet of operating nuclear power reactors and has required upgrades of physical security measures and mitigative strategies through the issuance of a series of security orders and license conditions. For new nuclear power reactors, the Commission considers it prudent to provide expectations and guidance on security matters to prospective applicants so that they can use this information early in the design stage to identify potential mitigative measures and/or design features that provide a more robust and effective

security posture. Therefore, the Commission decided to revise the advanced reactor policy statement to integrate these expectations for security and preparedness with the current expectations for safety.

Commission Policy

Consistent with its legislative mandate, the Commission's policy with respect to regulating nuclear power reactors is to ensure adequate protection of the public health and safety, and the environment; and to promote the Nation's common defense and security. Regarding advanced reactors, the Commission expects, as a minimum, at least the same degree of protection of the public health and safety; the environment; and the common defense and security, that is required for current-generation light water reactors. Furthermore, the Commission expects that advanced reactors will provide enhanced margins of safety and/or utilize simplified, inherent, passive, or other innovative means to accomplish their safety and security functions.

The Commission expects designers of advanced reactors to perform rigorous assessments of the design functional capabilities and strategies that could provide additional inherent protection to avoid or mitigate, to the extent practicable, the effects of a large, commercial aircraft impact. The Commission believes that reactors designed with such considerations would be more robust than current reactors with regard to potential aircraft impact without the need for mitigative measures.

Among the attributes that could assist in establishing the acceptability or licensability of a proposed advanced reactor design, and that therefore should be considered in advanced designs, are:

- Highly reliable and less complex shutdown and decay heat removal systems. The use of inherent or passive means to accomplish this objective is encouraged (negative temperature coefficient, natural circulation, etc.).
- Longer time constants and sufficient instrumentation to allow for more diagnosis and management before reaching safety systems challenge and/or exposure of vital equipment to adverse conditions.
- Simplified safety systems that, where possible, reduce required operator actions, equipment subjected to severe environmental conditions, and components needed for maintaining safe shutdown conditions. Such simplified systems should facilitate operator comprehension, reliable system function, and more straightforward engineering analysis.
- Designs that minimize the potential for severe accidents and their consequences by providing sufficient inherent safety, reliability, redundancy, diversity, and independence in safety systems.
- Designs that provide reliable equipment in the balance of plant (BOP) (or safety-system independence from BOP) to reduce the number of challenges to safety systems.
- Designs that provide easily maintainable equipment and components.
- Designs that reduce potential radiation exposures to plant personnel.
- Designs that incorporate the defense-in-depth philosophy by maintaining multiple barriers against radiation release, and by reducing the potential for, and consequences of, severe accidents.
- Design features that can be proven by citation of existing technology, or that can be satisfactorily established by commitment to a suitable technology development program.
- Designs that include considerations for safety and security requirements together in the design process such that security issues (e.g., newly identified threats of terrorist

attacks) can be effectively resolved through (a) facility design and engineered security features and (b) formulation of mitigation measures, with reduced reliance on human actions.

- Designs with features to prevent a simultaneous loss of (a) containment integrity (including situations where the containment is by-passed) and (b) ability to maintain core cooling as a result of an aircraft impact, or identification of system designs that would provide inherent delay in radiological releases (if prevention of release is not possible).
- Designs with features to prevent loss of spent fuel pool integrity as a result of an aircraft impact.

If specific advanced reactor designs with some or all of the above foregoing attributes are brought to the NRC for comment and/or evaluation, the Commission can develop preliminary design safety evaluation and licensing criteria for their safety-related and security-related aspects. Combination of some or all of the above attributes may help obtain early licensing approval with minimum regulatory burden. However, the listing of a particular attribute does not necessarily mean that specific licensing criteria will attach to that attribute. Designs with some or all of these attributes are also likely to be more readily understood by the general public. Indeed, the number and nature of the regulatory requirements may depend on the extent to which an individual advanced reactor design incorporates general attributes such as those listed above.

In addition, the Commission expects that the safety features of these advanced reactor designs will be complemented by the operational program for Emergency Planning (EP). This EP operational program, in turn, must be demonstrated by inspections, tests, analyses, and acceptance criteria to ensure effective implementation of established measures.

The Commission also expects that advanced reactor designs will comply with the Commission's safety goal policy statement, and the policy statement on conversion to the metric measurement system.

To provide for more timely and effective regulation of advanced reactors, the Commission encourages the earliest possible interaction of applicants, vendors, other government agencies, and the NRC to provide for early identification of regulatory requirements for advanced reactors and to provide all interested parties, including the public, with a timely, independent assessment of the safety and security characteristics of advanced reactor designs. Such licensing interaction and guidance early in the design process will contribute towards minimizing complexity and adding stability and predictability in the licensing and regulation of advanced reactors.

While the NRC itself does not develop new designs, the Commission intends to develop the capability for timely assessment and response to innovative and advanced designs that might be presented for NRC review. Prior experience has shown that new reactor designs—even variations of established designs—may involve technical problems that must be solved in order to ensure adequate protection of the public health and safety. The earlier such design problems are identified, the earlier satisfactory resolution can be achieved. Prospective applicants are reminded that, while the NRC will undertake to review and comment on new design concepts, the applicants are responsible for documentation and research necessary to support a specific application. Research activities would include testing of new safety features that differ from existing designs for operating reactors, or that use simplified, inherent, passive means to accomplish their safety function. The testing shall ensure that these new features will perform as predicted, provide collection of sufficient data to validate computer codes, and show effects

of system interactions are acceptable.

During the initial phase of advanced reactor development, the Commission particularly encourages design innovations that enhance safety, reliability, and security (such as those described above) and that generally depend on technology that is either proven or can be demonstrated by a straightforward technology development program. In the absence of a significant history of operating experience on an advanced concept reactor, plans for innovative use of proven technology and/or new technology development programs should be presented to the NRC for review as early as possible, so that the NRC can assess how the proposed program might influence regulatory requirements.

Finally, the NRC also believes that it will be in both the design vendors' and the prospective license applicants' interest to address security issues early in the design stage to achieve a more robust and effective security posture for future nuclear power reactors.

Dated at Rockville, Maryland, this ____ day of _____ 2007.

For the Nuclear Regulatory Commission.

Annette L. Vietti-Cook,
Secretary of the Commission