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Regulation of Advanced Nuclear Power Plants; Statement of Policy

AGENCY: Nuclear Regulatory Commission.

ACTION: Final Policy Statement.

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 a revision of the final policy statement titled "Regulation of Advanced Nuclear Power Plants, Statement of Policy" that was published on July 8, 1986. The purpose of this revision is to update the Commission's policy statement on advanced reactors to reference the Commission's metrication policy.

EFFECTIVE DATE: July 12, 1994.

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SUPPLEMENTARY INFORMATION:

Background

On July 8, 1986 (51 FR 24643), the Commission published its final policy statement on 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 August 10, 1988, Congress passed the Omnibus Trade and Competitiveness Act [the Act], (19 U.S.C. 2901 *et seq.*), which amended the Metric Conversion Act of 1975, (15 U.S.C. 205a *et seq.*). Section 5164 of the Act (15 U.S.C. 205a) designates the metric system as the preferred system of weights and measures for U.S. trade and commerce.

In an effort to effect an orderly change to the metric system, the Act requires that all Federal agencies convert to the metric system of measurement in their procurement, grants, and other business-related activities by the end of fiscal year 1992, "except to the extent that such use is impractical or is likely to cause significant inefficiencies or loss of markets to U.S. firms, such as when foreign competitors are producing competing products in non-metric units," Section 5614(b)(2).

In response to the Act, the NRC published its metrication policy statement for comment in the *Federal Register* on February 10, 1992 (57 FR 4891). The purpose of the metrication policy statement was to inform NRC licensees and the public how the Commission intended to meet its obligations under the Act. Comments on the draft statement were submitted by 12 responders, including 5 power reactor licensees, 3 standards organizations, a reactor vendor, a materials licensee, the Nuclear Management and Resources Council, and a joint letter submitted by three individuals. All commenters supported the Commission's position and the final policy statement was published on October 7, 1992 (57 FR 46202).

The Commission supports and encourages the use of the metric system of measurement by NRC licensees and applicants. However, Commission experience to date in design certification reviews is that it is impracticable and uneconomical to convert a design to the metric system late in the design process and that applicants should consider metrication early in the design process. Therefore, the Commission is revising the advanced reactor policy statement to incorporate its policy on metrication to

encourage licensees and license applicants to employ the metric system of measurement wherever and whenever its use is not potentially detrimental to the public health and safety or is not economically impracticable.

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. Regarding advanced reactors, the Commission expects, as a minimum, at least the same degree of protection of the public and the environment 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 functions. 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 system.

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 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.

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 aspects. Combination of some or all of the above attributes may help obtain early licensing approval with minimum regulatory burden. 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. However, until such time as conceptual designs are submitted, the Commission believes that regulatory guidance must be sufficiently general to avoid placing unnecessary constraints on the development of new design concepts.

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 characteristics of advanced reactor designs. Such licensing interaction and guidance early in the design process will contribute toward 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 license application. (NRC research is conducted to provide the technical bases for rulemaking and regulatory decisions, to support licensing and inspection activities, and to increase NRC's understanding of phenomena for which analytical methods are needed in regulatory activities.)

During the initial phase of advanced reactor development, the Commission particularly encourages design innovations that enhance safety and reliability (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. To achieve these broad objectives, the Advanced Reactor Projects Directorate (PDAR) was established in the Office of Nuclear Reactor Regulation. This group is the focal point for NRC interaction with the Department of Energy, reactor designers, and potential applicants, and coordinates the development of regulatory criteria and guidance for proposed advanced reactors. In addition, the group maintains knowledge of advanced reactor designs, developments, and operating experience in other countries, and provides guidance on an NRC-funded advanced reactor safety research program to ensure that it supports, and is consistent with, the Commission's advanced reactor policy. The PDAR also provides guidance regarding the timing and format of submittals for review. The Advisory Committee on Reactor Safeguards plays a significant role in

reviewing proposed advanced design concepts and supporting activities.

The NRC believes that conversion to the metric system is important to the national interest. The Commission strongly encourages its licensees and license applicants to employ the metric system of measurement wherever and whenever its use is not potentially detrimental to the public health and safety or is not economically infeasible. In order to facilitate use of the metric system by licensees and applicants, the NRC began publishing, as of January 7, 1993, the following documents in dual units: new regulations, major amendments to existing regulations, regulatory guides, NUREG-series documents, policy statements, information notices, generic letters, bulletins, and all written communications directed to the public. Licensees and applicants should follow the guidance outlined in the Commission's position and final policy statement on metrication published on October 7, 1992 (57 FR 46202).

Dated at Rockville, Maryland, this 5th day of July, 1994.

For the Nuclear Regulatory Commission.
John C. Hoyle,
Acting Secretary of the Commission.