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**Position Paper on Standardization,  
Nuclear Power Oversight Committee  
(1991)**

**POSITION PAPER  
ON STANDARDIZATION**

**NUCLEAR POWER  
OVERSIGHT COMMITTEE**

April 1991

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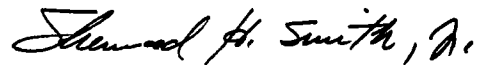
## MESSAGE FROM THE CHAIRMAN

There is a strong conviction within the industry, DOE, NRC, the Congress, and the public that future nuclear power plants should be standardized. The NPOC Strategic Plan\* clearly articulates that "The industry's fundamental objective in these processes is to achieve standardization." This position paper is intended to provide guidance to implement such standardization within families of plants.

Standardization is being pursued from complementary fronts: from the NRC and from the industry. The NRC, through its 10 CFR Part 52 certification, is promoting standardization of the safety-related aspects of nuclear power plants. This certification process allows full and meaningful public participation early in the program. The industry, by its efforts to standardize to the full extent of the guidance provided in this position paper, will also benefit the public through more cost-effective electricity rates.

It is recognized that the industry faces challenges in making this commitment to a high degree of standardization. It is much more difficult to achieve standardization in the United States with its large and diverse industry than in other countries with a monolithic nuclear industry. This standardization position paper is intended to serve as a reference for the work set forth in the NPOC Strategic Plan and as a model to guide the industry in implementing families of standardized plants.

At the same time, we all understand that the owners of a family of plants will make the ultimate decisions and that each company will determine how it participates in such a standardized family approach. Nevertheless, NPOC strongly encourages that you support the guidance provided in this position paper as we move forward.



Sherwood H. Smith, Jr.

*Chairman  
Nuclear Power Oversight Committee  
and  
Chairman, President & Chief Executive Officer  
Carolina Power & Light Company*

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\* "Strategic Plan for Building New Nuclear Power Plants," prepared by the Nuclear Power Oversight Committee, November 1990.

## SECTION 1

### STANDARDIZATION POLICY STATEMENT

#### INTRODUCTION

The "NPOC Strategic Plan for Building New Nuclear Plants"\* creates a framework within which new standardized nuclear plants may be built. The Strategic Plan is an expression of the nuclear energy industry's serious intent to create the necessary conditions for new plant construction and operation. The industry has assembled a comprehensive, integrated list of actions that must be taken before new plants will be built and assigns responsibility for managing the various issues and sets time-tables and milestones against which we must measure progress.

One of the key elements of the Strategic Plan is a comprehensive industry commitment to standardization: through design certification, combined license, first-of-a-kind engineering, construction, operation and maintenance of nuclear power plants. For many years, the U.S. nuclear power industry has recognized the significant economic advantages which would have accrued if it had been possible to build nuclear power plants to standard designs. The most obvious example of the success of standardization can be found in France. We have achieved standardization on a smaller scale in the United States, such as in the SNUPPS, Byron-Braidwood and Palo Verde projects, and recognize the clear advantages of its large-scale implementation in the future.

The NPOC plan proposes four stages of standardization in advanced light water reactors (ALWRs). The first stage is established by the ALWR Utility Requirements Document which specifies owner/operator requirements at a functional level covering all elements of plant design and construction, and many aspects of operations and maintenance. This document provides a major step towards standardization, because it represents a consensus of future customers on design features for ALWRs of both the large-size evolutionary type and the medium-size passive type. Through submission of the document to NRC for review and approval, it is expected that agreement will be reached with the industry on the resolution of generic safety issues that will provide a basis for NRC design certification. The document also describes the owner/operator requirements in design features such as layout, availability goals, instrumentation and control capability, human factors, balance-of-plant design, radiation control and capital and operating costs.

The second stage of standardization is that achieved in the NRC design certification. This certification level includes requirements, design criteria and bases, functional descriptions and performance requirements for systems to assure plant safety. The

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\* "Strategic Plan for Building New Nuclear Power Plants," prepared by the Nuclear Power Oversight Committee, November 1990.

level of detail will vary based on the safety significance of the component or system and includes the design information necessary for the NRC to make its final safety determinations.

The third stage of standardization, commercial standardization, carries the design to a level of completion beyond that required for design certification to enable the industry to achieve potential increases in efficiency and economy. As such, it addresses design decisions beyond the regulations and provides for the design standardization achieved outside of the regulatory scope. Industry commitment to achieve those economic benefits in combination with modern design and construction techniques will permit an economically optimum attainment of commercial standardization.

The final stage of standardization is enhanced standardization beyond design. A standardized approach is being developed in construction practices, operating, maintenance training, and procurement practices. This area creates the ground rules and organizational entities that would maintain standardization throughout the life of the plant. Commitment to such ground rules and organizational entities will ensure that the optimum economical and technical benefits of standardization will be achieved and then maintained during the plant operating life.

This comprehensive standardization program enables the NRC to proceed with design certification with the confidence that standardization beyond the regulations will be achieved. This confidence should answer the question of design detail required for design certification, and demonstrate that the NRC should require no further regulatory review beyond that required by 10 CFR Part 52. The cooperative efforts of NRC and industry to achieve standardization in their respective spheres of responsibility will achieve dramatic savings in time and capital, and permit new nuclear plant operation in time to meet the urgent demands for increased baseload capacity by the year 2000.

#### POLICY STATEMENT

Based on these principles of standardization cited in the NPOC plan, the Ad Hoc Committee for the NPOC Strategic Plan agreed to develop a comprehensive policy statement for standardization. The following policy statement outlines the overall industry commitment to standardization:

Nuclear power plant standardization is a life-cycle commitment to the uniformity in the design, construction and operation of a family of nuclear power plants. Rigorous implementation of standardization is expected to achieve the efficiency and economy typically associated with increases in scale or breakthroughs in technology.

## BENEFITS

The benefits of standardization in this context include the following:

1. Early definition of requirements to ensure regulatory stability and eliminate unnecessary changes.
2. Timely, systematic and thorough resolution of design, construction, operation and related regulatory problems.
3. Optimization of design to improve constructibility, reliability, operability, and maintainability.
4. More simple and uniform designs that are easier to construct and operate leading to more efficient and effective regulatory oversight and enhanced public confidence.
5. Focused and efficient application of technical and financial resources.
6. An expanded resource base that enhances support capabilities for design, manufacturing, construction, installation, inspection, testing, operation, maintenance and replacement parts.
7. Maximized learning from past experience and accelerated experience feedback.

All of the above benefits should make new nuclear power plants viable, cost-competitive sources of electricity as well as contribute to safety.

## UNDERLYING PRINCIPLES

The following principles will be applied for each family of standardized plants:

- Standardization will be maintained throughout the construction and operating life of the family of standardized plants. An owner/operator structure will be established with clear mechanisms for maintaining standardization including a formal process for the review of proposed deviations.
- Standardization within systems, structures and components needed for safety will be subject to regulatory acceptance. Standardization within systems required for reliable power generation will be maintained by all the owner/operators of a family of standardized plants or by the organizational entity established and charged with that responsibility by all the owner/operators of that family.
- The plant design will be transferable, without alteration, to any site within the design envelope for the family of plants.

- Layouts of major systems and components will be identical. Plant layout should preclude the use of any shared equipment between units.
- System functional requirements will be identical, with siting consideration as the only acceptable reason for differences.
- Major structural, mechanical, electrical, or I&C components (including installed spares) essential to nuclear safety or reliable power generation will be identical.
- Functional, physical, and interface requirements for bulk commodities and for other components will be identical. The specifications should identify critical design characteristics to allow selection of the component that best meets the requirements and allow qualified substitutions without modifying essential identical components.
- Each plant within a family will be built to construction drawings and specifications that are identical to the extent noted above. It is recognized that drawing differences will arise due to site-specific requirements and variations within acceptable construction tolerances.
- Permanent modifications to systems, structures, or components essential to nuclear safety or reliable power generation will be made only after review and approval of the organizational entity established and charged with that responsibility by all the owner/operators of a family of standardized plants. Such review and approval by the family of plants may be deferred in the case of an emergency modification. However, modifications to replace failed or obsolete components should maintain standardization or, if necessary, be planned so as to recover standardization as the same components are replaced in the other plants within the family.
- Based on the principles cited above, standardization beyond hardware design will be implemented in such areas as training, maintenance and operating procedures, quality assurance, licensing, spare parts management and outage management.

#### FULL UTILITY PARTICIPATION--THE KEY TO SUCCESS

The benefits of standardization can be maximized by early and broad utility involvement and a life-cycle commitment. The fact that broad utility industry participation will be required throughout the process will help assure strong industry commitment to the detailed design choices that are necessary to achieve standardization. The commitment to standardization, once made, will not be compromised.



Although standardization reduces an individual utility's flexibility, that concern is diminished by the high degree of "buy-in" achieved during the design process. Nevertheless, NPOC believes that the overall benefits of standardization far outweigh the potential disadvantages.

#### SUPPORTING INFORMATION

The following sections expand on the four stages of standardization: Standardization of Utility Requirements (Section 2), Standardization of Design Certification and Standardized Licensing (Section 3), Commercial Standardization (Section 4), and Standardization Beyond Design (Section 5). Each section provides a concise definition, underlying principles and benefits for each phase.