

February 23, 2000

FOR: The Commissioners
 FROM: William D. Travers /RA/
 Executive Director for Operations
 SUBJECT: DRAFT REGULATORY GUIDE PROVIDING GUIDANCE AND EXAMPLES FOR IDENTIFYING 10 CFR 50.2 DESIGN BASES

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PURPOSE:

To obtain the Commission's approval to publish Draft Regulatory Guide DG-1093 ([Attachment 1](#) ) for public comment.

SUMMARY:

The staff recommends that the Commission approve publication of DG-1093, "Guidance and Examples for Identifying 10 CFR 50.2 Design Bases." DG-1093 endorses, with clarifications, Appendix B of the industry guideline document developed by the Nuclear Energy Institute (NEI), NEI 97-04, "Design Bases Program Guidelines," dated November 17, 1999 ([Attachment 2](#) ). Appendix B of NEI 97-04 presents guidance and examples that, with the clarifications set forth in DG-1093, are acceptable to the staff for determining what constitutes design bases information in accordance with 10 CFR 50.2.

BACKGROUND:

10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," Section 50.2, "Definitions," contains a definition of "Design Bases." Although the staff and the nuclear industry have agreed that it is important to understand what constitutes the design bases of a plant, there has not always been agreement about the implementation of the definition in 10 CFR 50.2. The staff, in fact, has not been consistent in its implementation of the definition; rather, there is variation in the amount of information contained in licensee final safety analysis reports. In the mid-1980s, the staff conducted many system-specific engineering inspections and developed inspection findings that demonstrated that some licensees had not adequately maintained their design bases information as required by NRC regulation. In response to the problems identified during the NRC inspections and those identified by licensees, most reactor licensees initiated design bases reconstitution programs. These programs sought to identify incomplete design documentation and to selectively regenerate missing documentation.

In October 1990, the Nuclear Management and Resources Council (NUMARC) published its "Design Bases Program Guidelines," NUMARC 90-12. The staff concluded that these guidelines provided a useful standard framework for implementing design reconstitution programs. The guidelines briefly discussed the definition of design bases information but did not focus on it.

In 1996, the staff's findings during inspections and reviews began to identify programmatic weaknesses that resulted in design and configuration deficiencies at some plants, which could affect the operability of required equipment, raise unreviewed safety questions, or indicate discrepancies between the plant's updated final safety analysis report (UFSAR) and the as-built or as-modified plant or plant operating procedures. As a result of these findings, the staff issued a letter in accordance with 10 CFR 50.54(f) to all power reactor licensees requesting information to provide the NRC added confidence and assurance that the plants were operated and maintained within the design bases and any deviations were reconciled in a timely manner.

In addition to the § 50.54(f) letters and the inspection activities, the staff conducted lessons-learned reviews regarding Millstone and Maine Yankee. One of the conclusions of these reviews was that the definition of design bases should be clarified. In [SECY-97-205](#), dated September 10, 1997, the staff provided the Commission with several options for an integrated approach to solving the problems identified during the lessons-learned reviews. In the staff requirements memorandum on [SECY-97-205](#), dated March 24, 1998, the Commission directed the staff to continue to develop guidance regarding design bases issues, such as specifying the type of information to be considered as design bases information. This effort was subsequently included in the staff's response to the Chairman's tasking memorandum of August 7, 1998. The draft regulatory guide ([Attachment 1](#) ) provides the guidance requested by the Commission.

DISCUSSION:

Objective

The staff's objective is to develop guidance that provides a clearer understanding of what constitutes design bases information. A clearer understanding will help the staff and the industry implement the regulations that use the term "design bases."

10 CFR 50.2 Definition

For reference purposes, the definition from 10 CFR 50.2 is provided here:

Design bases means that information which identifies the specific functions to be performed by a structure, system, or component of a facility and the specific values or ranges of values chosen for controlling parameters as reference bounds for design. These values may be (1) restraints derived from generally accepted "state-of-the-art" practices for achieving functional goals or (2) requirements derived from analysis (based on calculations and/or experiments) of the effects of a postulated accident for which a structure, system, or component must meet its functional goals.

Industry Guideline, NEI 97-04

In October 1997, NEI submitted NEI 97-04, which is an update to NUMARC 90-12, also titled "Design Bases Program Guidelines." NEI 97-04 gave additional examples of design bases information and directly addressed the reportability of conditions outside the design bases of the plant. This submittal prompted the staff to consider endorsing industry guidance as a means of achieving the objective of a clear common understanding of what constitutes design bases information. The staff conducted a series of public meetings and exchanged many letters with NEI in an attempt to develop clear guidance. Many significant issues were resolved and NEI agreed to submit a portion of NEI 97-04 (Appendix B) for endorsement by the staff ([Attachment 2](#) )

The guidance in Appendix B of NEI 97-04 clarifies some of the terms used in the 10 CFR 50.2 definition of design bases, including design bases functions and design bases values, but does not attempt to change the text of the definition. For reference purposes, the NEI general guidance is provided here:

10 CFR 50.2 design bases consist of the following:

- Design bases functions: Functions performed by SSCs that are (1) required to meet regulations, license conditions, orders or technical specifications, or (2) credited in safety analyses to meet NRC requirements.
- Design bases values: Values or ranges of values of controlling parameters established by NRC requirement, established or confirmed by safety analyses, or chosen by the licensee from an applicable code, standard or guidance document as reference bounds for design to meet design bases functional requirements.

Staff review of NEI 97-04

The term "design bases" is defined in 10 CFR 50.2 because it is used in several regulations in Part 50. Specifically, it is currently found in §§ [50.34\(a\)](#) and (b), [50.72](#), [50.73](#), and [Appendices A](#) and [B](#). The staff considered how the implementation of the proposed guidance would affect each of these applications. This is discussed below.

Guidance Discussion

Consistent with the rule definition, the guidance focuses on functions and values. However, in implementing the regulation, it is necessary to bound the scope of the functions considered to be design bases because the rule itself does not specifically define those functions. The NEI guidance specifies that design bases functions are those required by regulation, license condition or order, and functions credited in the safety analysis. In recent years, the staff's consideration of functions in implementing the definition of design bases has been broader than that proposed in the guidance. Accordingly, many individual component functions recently considered in implementing the definition of "design bases" will no longer be so considered under the guidance. Nonetheless, the staff agrees that the regulations, license conditions, orders, and safety analysis provide an appropriate bound for defining the functions considered in establishing design bases, and are consistent with the rule language.

The staff notes that its implementation of the design bases definition has been inconsistent over the years. When considering applications for licenses to operate nuclear power plants in the mid-to-late 1960s, the staff had, in general, a narrow view of what information constituted design bases. This view was reflected in the initial version of Regulatory Guide 1.70, "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants," published in February 1972. The scope of design bases information, however, is not consistent among systems in this guidance. In addition, subsequent revisions to this Regulatory Guide have increased the scope of information that is labeled as design bases. Although the scope of information has evolved, the staff did not intend to include the functions of every structure, system, or component within the scope of

design bases functions. As stated earlier, there has been considerable discussion within the industry and within the staff about what constitutes design bases information.

Using the auxiliary feedwater system as an example, under the proposed guidance, the required flow delivered by the system will be part of the design bases; however, the flow delivered by each individual pump will not. This will likely be the same for other component level functions and values.

This interpretation has been a point of difficulty because the rule does not specifically define the functions to which it refers. The staff believes that, in general, regulations, license conditions, orders and safety analyses focus on system-level functions. There are obviously exceptions, such as the reactor pressure vessel and containment (note: these are frequently considered "systems" and/or "structures"), which have specific regulation-defined functions. However, the staff concludes that design bases functions may also be defined in terms of functions specified by NRC requirements or credited in safety analyses.

The staff acknowledges that the definition has been read by some to mean that all functions described in the UFSAR are design bases functions. In addition, the definition does not, by its terms, specify the functions considered in establishing design bases, therefore it does not limit the scope of components having design bases to those that have a bearing on system function or have their own independent function. The staff believes, however, that since there is regulatory precedent for evaluations at the system level, and there has been substantial variation in the implementation of the definition, this clarification of functions is warranted.

With regard to values, the guidance focuses on reference bounds for design necessary to meet design bases functional requirements as defined above. The rule, however, does not directly link the values solely to the "functional requirements" since the rule also refers to "controlling parameters as reference bounds for design" and, in the next sentence, states that these values "**may** be derived from. . . practices for achieving functional goals." Thus whether the entire set of bounding values (which may be derived from a number of considerations) are "design bases," or only those values directly corresponding to the design bases functions has also been a point of controversy in the past.

The extent of reference values is illustrated by an example presented in the guidance, relating to the pressure integrity of the auxiliary feedwater system piping. Some in the staff have historically considered the maximum system design pressure chosen for a safety-related system, like auxiliary feedwater (AFW), as being a "design bases" value, holding that it was the bounding value for piping integrity chosen to assure that the "functional goal" of the system is met (holding water). However, the proposed guidance would not consider this value (maximum system design pressure) as a design bases value. This is because the design bases function or required function for this system is to deliver sufficient water to the steam generators against the pressure in the steam generators, consistent with the accident analysis. The maximum system design pressure, in this case, is not a value needed to achieve this required function (delivering water into the steam generators at a minimum pressure). Rather, the design bases values for this function would be a certain AFW flow rate at the given minimum pressure. In contrast, the maximum system design pressure (used to evaluate piping integrity) is derived from the design bases pressure into which the AFW system must deliver its minimum flowrate.

To summarize this point, only values directly corresponding to design bases functions will be considered as design bases values under the proposed guidance. For the AFW example, only the flow rate and the steam generator pressure into which that flow rate must be delivered would be considered design bases values under the proposed guidance. The maximum system design pressure would not be so considered. Although certain values may no longer be considered as design bases information under this guidance, these values are retained in UFSARs (e.g., as design descriptions as required by 10 CFR 50.34) and supporting design documents, thus ensuring that important safety information is maintained up-to-date and easily accessible.

The NEI guidance does not specifically address the treatment of designed defense-in-depth. Therefore, in the draft regulatory guide, the staff planned to include a brief discussion on this subject, as summarized below. The staff considers aspects of the designed defense-in-depth strategies like redundancy, diversity, and independence to be important aspects of the plant's principal design criteria, as specifically required by several regulations, especially the General Design Criteria. These criteria require that such capabilities are then implemented for individual structures, systems, or components (SSCs) through plant design features, such as multiple components, independent power supplies, and physical separation. These criteria provide part of the standard for judging the adequacy of the plant's design bases.

10 CFR 50.34

The importance of understanding what constitutes design bases information with regard to its use in § 50.34 is that the design bases are required to be included in the final safety analysis report (FSAR) and, through § 50.71(e), the updated FSAR (UFSAR). The staff has worked closely with the industry and has endorsed, through Regulatory Guide 1.181, NEI 98-03, "Guidelines for Updating Final Safety Analysis Reports." This document describes a method for complying with the requirements of § 50.71(e) and also gives suitable guidance for modifying the content and format of the updated FSAR. Note that this document also clarifies our interpretation of a regulation that has been subject to varying implementation approaches by the staff and the industry over the years.

The guidance in NEI 98-03 states that UFSARs should contain (1) design bases, (2) safety analyses, and (3) a facility description sufficient to permit understanding of the design bases, safety analyses, and facility operation. Clarifying the implementation of the definition of design bases will help licensees understand what information should be included in FSAR updates. The staff does not believe that the clarification will result in less information being included in the UFSAR since the design bases are only one portion of the information required. In other words, the contents of the UFSAR can be divided into

different categories (e.g., design bases and supporting information) but the same information will still be contained in the UFSAR regardless of how it is categorized. In addition, the treatment of information in the UFSAR does not depend on whether the information is treated as design bases or supporting design information. For example, any changes to the plant as described in the UFSAR will still need to be evaluated under 10 CFR 50.59. Degraded or nonconforming conditions are also treated in a manner independent of whether the information describing the SSC is classified as design bases information.

10 CFR 50.72 and 50.73

The current reporting requirements of §§ 50.72 and 50.73 specify that licensees must notify the NRC following the occurrence of any event or condition that results in the nuclear power plant being in a condition that is outside of the design basis of the plant. One possible outcome of this clarification is that licensees may make fewer reports for such conditions under the current reporting requirements.

The issue of when a plant is outside its design basis and when and why the NRC should be notified has been the subject of much discussion between the industry and the staff. The staff has published a proposed rule that would, among other things, delete the requirement for reporting a condition that is outside the design basis of the plant. A condition outside the design basis of the plant would still be reportable if it is significant enough to qualify under other existing criteria. In addition, a new criterion was proposed that would capture an event or condition that requires corrective action for a single cause or condition in order to ensure the ability of more than one train or channel to perform its specified safety function. The staff believes that the proper forum for deciding what level of information the staff needs to receive is this rulemaking effort on §§ 50.72 and 50.73 and not the definition of design bases.

10 CFR 50.59

A recent revision to § 50.59 added a criterion to require prior NRC approval if a change, test, or experiment would result in a departure from a method of evaluation used in establishing the design bases or in the safety analyses. This rule change will become effective in late 2000. The staff believes that the clarification of the definition of design bases may help licensees determine which methods are included in the scope of this new criterion. The staff also believes that, because most methods currently described in the UFSAR establish design values that are consistent with the NEI guidance for design bases values, few UFSAR methods will be excluded by this clarification.

Other Applications

The term "design bases" is used in some of the criteria in Appendix A to 10 CFR Part 50 in defining the principal design criteria. The definition of design bases is also used in the quality assurance requirements in Appendix B to 10 CFR Part 50, such as Criterion III for design control. Although the scope of design bases information will likely be reduced, the guidance will have no effect on the scope of SSCs designated as safety-related. Therefore, the staff does not believe this guidance will affect the implementation of these regulations.

The definition is also sometimes used by the NRC staff in the inspection process. Recent efforts among staff and other stakeholders to develop a new reactor oversight process have highlighted the importance of inspections in evaluating licensees' engineering programs. When the task forces working on the new reactor oversight process developed a set of performance indicators they determined that design issues are difficult to assess and that added emphasis on inspection will be required. However, for these design engineering inspections the NRC is moving away from inspections focused on designations like "design bases" and moving more in the direction of inspections focused on risk-significant systems. As a result, the staff has found that the proposed scope of design bases is appropriate.

NRC Reactor Arena Performance Goals

With regard to the four NRC Reactor Arena Performance Goals, the staff has evaluated this guidance against each and provided a discussion below. The staff has reviewed the effect of this guidance on the regulations where the definition of design bases is used and has determined that this interpretation acceptably defines the scope of design bases. As a result, the staff believes the implementation of this guidance will maintain safety. Additionally, because the staff believes the guidance defines a clearer scope of design bases, there may be a reduction in unnecessary regulatory burden. Where some licensees may currently be interpreting the design bases to be very large, there will likely be a reduction in unnecessary burden. Although this effort of providing guidance on the existing rule was not intended to reduce burden, the staff is confident that burden to the licensees has not increased, and in some cases has been reduced.

The staff believes that the guidance is clearer and easier to implement than the rule alone. As a result, the staff believes that effectiveness and efficiency have been improved. The staff also believes that there are still some ambiguities in the guidance, however. For example, how functions credited in the safety analysis are included in the design bases and the scope of safety analyses considered are not fully addressed. The staff is anticipating that there will be input from stakeholders on these issues during the public comment period for the draft regulatory guide. Additionally, although the guidance does not conflict with the rule definition, the guidance does narrow the scope of the rule as recently implemented.

As noted above, the staff believes that the guidance is clearer and easier to implement than the rule alone. The staff also believes that the guidance will provide a more appropriate safety focus to design bases issues. From this standpoint, public confidence should be improved. However, since the scope of information currently considered "design bases" will most likely be reduced, there will likely be fewer required 10 CFR 50.72 and 50.73 reports. This aspect of the guidance may not increase public confidence. As a result, some aspects of the guidance should increase public confidence and others may not.

The staff does recognize that the text in the 10 CFR 50.2 definition of design bases permits substantial latitude in the interpretation of what constitutes design bases information. The staff has considered a rule change but has not done an analysis of the costs and benefits. The staff believes that there may be some benefit in proceeding to rulemaking in an effort to add specificity to the rule definition. (Note that resources for rulemaking on the design bases definition during Fiscal Year 2000 have not been budgeted.) In the staff's view, the draft regulatory guide, however, does provide guidance for specifying the type of information to be considered as design bases information, as directed by the Commission in its staff requirements memorandum on SECY-97-205.

CONCLUSIONS:

NEI 97-04, "Design Bases Program Guidelines," was developed to help utilities organize and collate design bases information and supporting design information. The staff has concluded that these guidelines provide a useful standard framework for implementing design reconstitution programs; however, the industry has not requested staff review and endorsement of the entire document. This regulatory guide only applies to Appendix B, "Guidelines and Examples for Identifying 10 CFR 50.2 Design Bases," of NEI 97-04.

Appendix B of NEI 97-04 was updated by the industry and submitted for staff review and endorsement. The staff has concluded that the November 17, 1999, version of Appendix B of NEI 97-04 provides guidance and examples that, with the clarifications set forth in DG-1093, are acceptable to the staff for providing a clearer understanding of what constitutes design bases information.

In summary, the staff believes that this guidance reflects an acceptable clarification of the 10 CFR 50.2 definition of design bases and will be useful to the staff and the industry in specifying the type of information to be considered as design bases information.

RESOURCES:

The resources necessary to complete the activities related to issuing the draft regulatory guide, resolving public comments, and issuing a final regulatory guide are currently budgeted for Fiscal Year 2000.

COORDINATION:

The Office of the General Counsel has no legal objection to this paper or to publication of the draft regulatory guide, provided that it is understood that (1) design bases information is required by 10 CFR 50.34 to be in the FSAR, and (2) all values or ranges of values chosen for controlling parameters are reference bounds for design regardless of the basis on which they were chosen.

The Office of the Chief Financial Officer has reviewed this Commission paper for resource implications and has no objections to its contents.

The Advisory Committee on Reactor Safeguards was briefed on October 1, 1999, and on November 5, 1999, and provided a letter recommending publication of the draft regulatory guide on November 12, 1999. The Committee to Review Generic Requirements (CRGR) deferred its review until the final regulatory guide has been drafted.

RECOMMENDATION:

The staff recommends that the Commission approve publication of the draft regulatory guide, DG-1093, for public comment.

/RA/

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Attachments:

1. [Draft Regulatory Guide DG-1093](#) 
2. [Appendix B of NEI 97-04](#) 