

August 26, 1993

Docket No. 52-001

Mr. Patrick W. Marriott, Manager  
Licensing & Consulting Services  
GE Nuclear Energy  
175 Curtner Avenue  
San Jose, California 95125

Dear Mr. Marriott:

SUBJECT: GUIDANCE ON THE FORM AND CONTENT OF A DESIGN CONTROL DOCUMENT

The purpose of this letter is to respond to several informal inquires from design certification applicants concerning the form and content of a design control document (DCD). Enclosed you will find a presentation of current staff views concerning the DCD. The guidance has not been fully evaluated by the Nuclear Regulatory Commission's senior management and the Office of General Counsel; however, I am providing this guidance in advance to stimulate discussions with you and other industry representatives on this material.

In order to preclude substantial iterations and amendments of the DCD, I recommend that the DCD should be submitted following issuance of the final version of the GE Nuclear Energy (GE) advanced boiling-water reactor final safety evaluation report (FSER). This will permit review and comments from the Commission and the Advisory Committee on Reactor Safeguards to be incorporated in the staff's FSER in accordance with the prescribed schedules of SECY-93-097, "Integrated Review Schedules for the Evolutionary and Advanced Light-Water Reactor Projects." However, the staff believes that it is essential that the ground rules be established prior to development of the DCD, and the staff welcomes GE's perspective on this subject.

Sincerely,

(Original signed by)

Dennis M. Crutchfield, Associate Director  
for Advanced Reactors and License Renewal  
Office of Nuclear Reactor Regulation

Enclosure:  
As stated

cc w/enclosure:  
See next page

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## FORM AND CONTENT OF A DESIGN CONTROL DOCUMENT

The purpose of this paper is to provide guidance for preparation of a design control document (DCD). This paper supplements DCD provisions already discussed in Commission paper SECY-92-287, "Form and Content for a Design Certification Rule," and serves to integrate and clarify the role of the DCD under 10 CFR Part 52.

As defined in SECY-92-287, the DCD is the master document that contains the information that is referenced by the design certification rule (DCR). The DCD will contain integrated information extracted from the design certification application, design-related information that complies with staff positions reflected in the final safety evaluation report, and any Commission directives stipulated during the rulemaking process. The DCD contains both Tier 1 and Tier 2 material. All applicants referencing the certified design must conform with the information in the DCD that is certified and approved by the design certification rule. The DCD should not be misconstrued as the entire basis for the agency's safety findings on the applicant's design. The standard safety analysis report (SSAR) will serve as the basis for said findings.

### DCD VOLUME 1: Introduction

Each vendor should provide an introductory section in the DCD. The DCD introduction should describe the purpose, content overview, and combined license (COL) applicant or licensee uses of the DCD. An introductory statement that Volume 1 of the DCD contains Tier 1 information, and Volumes 2 and onward contain Tier 2 information should be provided. The definition of COL action items (to be defined in greater detail later) and their role in licensing would also be appropriate for the introduction. In addition, the introduction should identify the information that needs to be considered by an applicant or licensee as part of the design change process specified in the DCR. NRC staff will work with the vendors and industry in developing the standard language for the DCD introduction.

The main objective of the introduction is to serve as an explanation to future users of the DCD including COL applicants or licensees, NRC staff, and the public. The staff believes that the DCD should be a self-contained document, and should not rely on the DCR's Statement of Considerations to serve this purpose. It is not expected that future users of the DCD be required to research the Statement of Considerations to gain an understanding of the purpose of the DCD and its role in future licensing actions.

### DCD VOLUME 1: Tier 1 Information

In addition to the introductory material discussed previously, Volume 1 of the applicant's DCD should contain all material certified by the rule and deemed as Tier 1 information. Tier 1 information consists of the design descriptions, inspections, tests, analyses, and acceptance criteria (ITAAC), site parameters, interface requirements, and definitions. The staff also notes that the DCD should not contain any conceptual design information for interfaces. COL applicants are not required to comply with conceptual design information, and therefore, this information must not be included in the DCD.

Proprietary information should not be included in the DCD, as set forth in the Commission's April 30, 1993, staff requirements memorandum on Commission paper, SECY-92-381, "Rulemaking Procedures for Design Certification." Secondary references which are not explicitly referenced in and incorporated into the design certification rule should not be included in the DCD. As stated in SECY-92-287, information that is not included in the design certification rule or the DCD because it cannot be published or referenced in the Federal Register, may not have issue preclusion in accordance with 52.63(a)(4).

DCD VOLUMES 2, 3, 4, etc.: Tier 2 Information

Volumes 2 and onward of the DCD should contain all material approved by the rule and deemed as Tier 2 information. Tier 2 consists, essentially, of the entire SSAR submitted for the staff's final design approval submitted in accordance with the requirements of 10 CFR 52.47. Secondary references not explicitly incorporated by the rule and proprietary information must not be included in the DCD. As in the Tier 1 case, conceptual design information shall not be included in the DCD.

Proprietary Information and Secondary References

In order to comply with the requirements of the Office of the Federal Register (OFR) for publishing a rule, proprietary information will not be part of the DCD. DCD secondary references not directly incorporated by the rule shall also be deleted from the DCD. Secondary references are defined as documents such as topical reports, industry studies and standards (ASME, ASTM, ANS, IEEE, etc.), computer codes, regulatory guides, and other documents that are not explicitly part of the SSAR but are referenced in the SSAR.

Based on discussions with the OFR, these DCD secondary references would need to be identified in the design certification rule and approved by the Director of the Federal Register for incorporation by reference. The staff proposes that a section of the DCR entitled, "Codes, Standards, and Other Information Incorporated By Reference," will contain a list of secondary references that are cited in the DCD. The specific code, edition, revision, etc., will need to be identified in the list. A copy of this material (all codes, standards, computer programs (non-proprietary version), topical reports (non-proprietary version), etc.) will have to be provided to the OFR.

Each vendor shall provide a list of DCD secondary references that are to be "incorporated by reference" and includes identification of secondary references cited in both Tier 1 and Tier 2. The list of references must contain, at a minimum, those references necessary to support Tier 1 implementation that are definable during certification. References not captured by the list may not be cited in the DCD.

In general, each vendor should strive to maintain readability, continuity, and technical substance when generating the Tier 2 information without secondary references that have not been identified in the DCR. The staff requests that a complete listing of secondary references identified in the SSAR be provided along with justification for those references that are not to be referred to

in the DCD. Such a listing of SSAR references should assist the staff and applicants in determining the appropriate set of references to be identified in the DCD and the rule itself.

Enclosure 2 to this letter contains several examples of secondary references from GE's advanced boiling water reactor (ABWR) SSAR. For Example 1, the applicant should provide a copy of the ASME Code Section III to the staff for transmittal to the OFR. Submitting the entire Section III would allow for a specific reference to Paragraph NB-2580. For Example 2, the applicant would need to provide copies of ASTM A614 to the staff. For Example 3, the staff will make arrangements to provide a copy of the standard review plan (SRP) (NUREG-0800) to the OFR. This would permit specific SRP information to be referenced in the DCD.

In order to facilitate obtaining OFR approval for incorporation by reference, the applicant should provide microform copies of all material classified as "incorporated by reference" to the staff for transmittal to the OFR. The applicant should provide sufficient copies of this material to satisfy the OFR's filing requirements (currently 2 copies). This means the DCD itself and the DCD secondary references should be provided in microform to the staff.

TIER 2 CHAPTER 19: "Design and Operational Related Insights"

A modified SSAR Chapter 19 should also be provided in Tier 2. This DCD chapter will contain deterministic analyses (severe accident analyses) and the probabilistic risk assessment (PRA) related information necessary for certification. Risk-based design descriptions and issue resolutions should be retained. Design and operational-related insights necessary to support the technical specifications, Tier 1 information, design-reliability assurance program (D-RAP), operational reliability assurance program (O-RAP), and other related DCD material must also be retained.

A PRA report should be placed into Tier 2 minus the detailed methodology, supporting event trees and fault trees, and cutsets (i.e., delete detailed Level 1 PRA information). The PRA report should contain the key assumptions, results, insights, sensitivity study results, and importance rankings. Key assumptions include operator actions and procedures, success criteria, equipment and structures performance, event initiation frequencies, assumptions about equipment availability (e.g., technical specifications or administrative controls), etc. A list of risk-significant structures, systems, and components should also be provided in the DCD that are definable at the time of certification.

The PRA report should contain sufficient detail to assist COL applicants or licensees to achieve the objectives of the D-RAP and O-RAP, and maintain adequate identification of risk-significant design features.

Design-specific analyses to resolve SECY-93-087, "Policy, Technical, and Licensing Issues Pertaining to Evolutionary and Advanced Light-Water Reactor (ALWR) Design," type issues (e.g., shutdown risk, external events, severe accidents, inter-system loss-of-coolant accident) should also be retained within Chapter 19 or other sections of the SSAR and Tier 2, since this

analysis transition between the deterministic analysis and PRA. These sections also contain necessary information to demonstrate compliance with the DCR's "applicable regulations."

Each vendor's evaluation of potential design modifications documented to comply with 50.34(f)(1)(i) and severe accident mitigation design alternatives (SAMDAs) requirements should remain in their entirety in Chapter 19. The staff believes that the 50.34(f)(1)(i) and SAMDAs evaluation should be retained in the DCD in order to preserve a baseline of alternatives investigated and dispositioned during the design review process. Providing SAMDAs within the DCD provides a means to maintain closure of the SAMDAs, preserve standardization, and prevent a reevaluation of the issues at the COL application stage.

In addition, this baseline evaluation relies heavily upon the results of the applicants' design-specific PRA. Accordingly, a licensee's proposed design change that impacts the baseline PRA results may also subsequently impact the alternatives evaluated in the SAMDAs arena. Therefore, an applicant or licensee would need to be cognizant of the potential impact and investigate any substantial and adverse effects on the original cost-benefit evaluation. Bearing in mind that the purpose of the DCD is to control the design of all plants that reference the certification, it appears prudent to maintain the baseline design alternatives (SAMDAs) within the DCD.

For design changes, a COL applicant's or licensee's proposed design modification under the §50.59-like process would be evaluated, in part, with Chapter 19 information provided in the DCD, thereby, maintaining the design and operation of the facility within acceptable safety margins. This level of design and operational related insights in the DCD will augment a licensee's retention of plant design control and conformance with the DCR during the 50.59-like change process.

### Roadmaps

The retention of "cross-references" or "roadmaps" was addressed in a letter dated June 20, 1993 (D. Crutchfield to W. Rasin), from the NRC to the Nuclear Management and Resources Council. In that letter, roadmaps were characterized as providing a primary set of design and safety analysis related information that the staff, COL applicant, or licensee must consider as part of the 50.59-like evaluation process. Roadmaps will provide reasonable assurance that the design basis and key design analyses are adequately considered during the 50.59-like change process for the entire lifetime of the facility.

As stated in the letter, the staff believes that the roadmaps should reside in the SSAR and Tier 2 of the DCD. The specific format and content of roadmaps were discussed in Enclosure 2 of the June 20, 1993, letter. Roadmaps should be placed in Chapter 19 as part of information to be considered during 50.59 evaluations.

In the interim between the June 20, 1993, letter and issuance of this DCD guidance, the roadmap issue has been resolved for the ABWR. The first piece of the resolution is that GE will provide a discussion in Section 14.3 of the

SSAR describing the process and the rationale that was utilized to identify Tier 1 design certification information. The process will be illustrated using specific examples from selected safety analyses.

The second piece of the resolution is that GE will provide a listing in Chapter 19 of the SSAR of the specific insights and key assumptions from various safety analyses that were identified as Tier 1 information by this process, without giving specific references to where the insights and analysis assumptions are verified by the ITAAC. The safety analyses were previously agreed upon with GE, and include PRA, severe accident analyses, and integrated plant safety analyses (e.g., design basis accidents, core cooling, shutdown risk). For the PRA and severe accident analyses only, the listing should show where each of the key assumptions and insights had been captured in the design in either the Tier 1 design information, the technical specifications (including administrative controls), the D-RAP, O-RAP, emergency procedures guidelines, and COL action items.

Both the discussion in Chapter 14.3 and the listing in Chapter 19 would be retained in the SSAR and subsequently in the DCD. The staff will review both the process description and examples, and write an SER for Chapter 14.3 which will describe the process and its results. The SER will also describe the NRC Tier 1 review process and the basis for the staff's conclusion that the ABWR ITAAC meet the "necessary and sufficient" standard of 10 CFR Part 52.

In a separate submittal, GE will provide a matrix of assumptions and insights from key analyses, with a cross reference to the specific ITAAC which verify them. This separate submittal would not be included in either the SSAR or DCD.

### Technical Specifications

Suggestions have been made to remove the standard technical specifications (STS) from the DCD. Essentially, this proposal would decouple the STS approval from design certification. The staff requires that the STS remain in Tier 2, because the STS are an integral part of the staff's design review and approval process. Approval of the STS during design certification affords a high degree of assurance that the as-built facility will be operated within the bounds of the SSAR.

Removal of the STS from Tier 2 may jeopardize the concept of issue preclusion since the STS would not be approved by the design certification rule. Even though plant-specific STS will be issued for the COL, the staff believes that retaining the STS within the DCD would prevent a de novo review of the SSAR used for the agency's safety finding. Review of STS changes from the STS approved in the DCD by the rule would limit the scope of the review and expedite plant licensing.

Also, some of the vendors' resolutions to selected issues from Commission papers, such as SECY-93-087, hinge on operational constraints defined in the technical specifications. For example, the shutdown risk resolution for the ABB-CE System 80+ design relies, in part, on the STS requirement to have two sources of onsite emergency power operable during reactor coolant system reduced inventory conditions (including midloop operations). This limiting

condition for operation reflects a key assumption and insight from the shutdown risk PRA and has been interpreted as necessary to meet the single failure criteria during these critical windows of plant operation.

If approval of the STS were deferred to the COL application stage, a very real possibility exists that the valuable insights gained during the design certification process would be lost for the COL licensing process and nearly impossible to reproduce. The staff believes that approval of the STS at the time of certification would ensure that the same staff and acceptance criteria that were used to the certified design have also been used to approve the conditions for plant operations that are definable at the time of design certification.

**EXAMPLE 1**

In regards to regulatory position C.2.b, the bolting materials are ultrasonically examined in accordance with ASME Code Section III, Paragraph NB-2580 after final heat treatment and prior to threading as specified. The requirements for examination according to ASME Code Section II, SA-388 and ASTM A614 were met. The procedures approved for use in practice are judged to insure comparable material quality and are considered adequate on the basis of compliance with the applicable requirements of ASME Code Subarticle NB-2580.

**EXAMPLE 2**

The straight-beam examination is performed on 100% of cylindrical surfaces and from both ends of each stud using a 19 mm maximum diameter transducer. The reference standard for the radial scan contains a 12.7 mm diameter flat bottom hole with a depth of 10% of the thickness. The end scan standard is per ASTM A614. Surface examinations are performed on the studs and nuts after final heat treatment and threaded as specified in the guide, in accordance with ASTM A614. Any indication greater than the indication from the applicable calibration feature is unacceptable. The distance/amplitude correction curve for the straight beam end scan of main closure studs, nuts, and washers are established as follows:

For cylinders having a length (L) to O.D. ratio or 7 or less, the distance/amplitude curve is established by a minimum of three test points along the test distance. For cylinders having length to O. D. ratios larger than 7, the minimum number of test points is four. The test points are nearly equally spaced along the test distance. One calibration hole is located at a test distance equal to L/2.

**5.3.2 Pressure/Temperature Limits****5.3.2.1 Limit Curves**

The pressure/temperature limit curves in Figure 5.3-1 are based on the requirements of 10CFR50 Appendix G. The pressure/temperature limits look different than SRP Section 5.3.2 because the ABWR temperature limits are based on a more recent revision of Regulatory Guide 1.99.

All the vessel shell and head areas remote from discontinuities plus the feedwater nozzles were evaluated, and the operating limit curves are based on the limiting location. The boltup limits for the flange and adjacent shell region are based on a minimum metal temperature of  $RT_{NDT}$  plus 33°C. The maximum throughwall temperature gradient from continuous heating or cooling at 55.5°C per hour was considered. The safety factors applied were as specified in ASME Code Appendix G and Reference 5.3-2.

The material for the vessel will be provided with the following requirements of  $RT_{NDT}$  as determined in accordance with Branch Technical Position MTEB 5-2, shell and

**EXAMPLE 3**