Fil

UNITED STATES
NUCLEAR REGULATORY COMMISSION
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
WASHINGTON, D.C. 20555-0001

Nov. 28, 2001

MEMORANDUM TO: ACRS Members and Staff

MEMORANDUM #: [redacted]-111.2001

FROM: A. W. Cronenberg

SUBJECT: Comparison of FINAL & DRAFT SERs for Duane Arnold Uprate

SUMMARY: This memo briefly summarizes observations related to an assessment of NRR staff review conclusions and associated SER (**S**afety **E**valuation **R**eport) documentation of such conclusions, a revealed from a comparison of the FINAL and DRAFT SERs (Refs. 1,2) for the Duane Arnold-BWR power uprate application. This review stems from ACRS concerns noted in its Oct 17, 2001 letter to the Commission (Ref. 3) on the adequacy of the staff review process and documentation of that review. Although ACRS recommended approval of the Duane Arnold uprate, it expressed concerns regarding the staff review and associated documentation of its conclusions. Specifically the ACRS letter noted that challenges in its review could have been eased if the staff had improved guidance on the detail to be provided in the SER and the criteria used to reach stated SER conclusions. The staff responded that ACRS concerns would be addressed in the FINAL-SER for Duane Arnold. A brief review of the FINAL-SER was therefore initiated, to assess the manner in which ACRS concerns were addressed.

Results indicate little in the way of new supporting documentation of staff conclusions. Several comparative examples of DRAFT and FINAL SER staff conclusions for the Duane Arnold uprate are provided to illustrate this observation. In a limited number of cases however, a more detailed discussion of the basis for staff conclusions is presented. One relates to NRC's audit efforts of licensee's analysis of GE-14 fuel performance at uprated conditions, where a more detailed discussion of NRC audit procedures (e.g. verification that experimental data basis range covered expected uprated conditions) is provided in the FINAL-SER than in the DRAFT-SER. Nevertheless, this reviewer is drawn to the conclusion that the FINAL-SER for the Duane Arnold uprate largely mirrors the prior DRAFT-SER, as far as documentation of the staff basis for its conclusions. In most cases little new technical information is provided in the FINAL-SER to substantiate staff conclusions.

1.0 ACRS Observations/Comments on DRAFT-SER for Duane Arnold Uprate

In the ACRS letter related to the Duane Arnold power uprate (Ref. 3), concerns were expressed regarding the adequacy of the documentation of the staff's review process, as reflected in its Safety Evaluation Report (SER). Specifically ACRS noted that challenges in the Duane Arnold review could have been eased if the staff had improved guidance on the detail to be provided in the SER and the criteria used to reach stated SER conclusions. ACRS noted that many sections of the Duane Arnold DRAFT-SER simply summarize the licensees analysis and then go on to state staff acceptance of that analysis.

Several examples are provided here to more clearly illustrate these concerns. For example, the Duane Arnold DRAFT-SER simply reiterates the licensee analysis of predicted bulk pool temperatures evaluated for uprated DBA-LOCA conditions ad then goes on to state that.....

> " Based on the review of the licensee's evaluation, the staff concludes that the drywell and wetwell air temperature response will remain acceptable after the EPU"

Another example of the rather abbreviated DRAFT-SER documentation of staff conclusions relates to acceptance of the licensee's analysis for Low Pressure Coolant Injection (Section 4.2.2), where the SER simply states that ....."The staff finds the evaluation acceptable". In a similar vain for Core Spray System (Section 4.2.3), the SER says ..."The staff finds this acceptable". Such abridged statements make it difficult for anyone to assess the extent and thoroughness of the staff review. Indeed, one is at a loss to assess the scope of the subject matter reviewed, what organizations were responsible for that review, how the review was accomplished, the acceptance criteria used to reach the stated conclusion, or the use of any benchmarking analysis that may have been used by the staff to check that of the licensee. Similar concerns were expressed to the Commission as far back as the Maine Yankee Lessons Learned report (Ref. 4).

The staff responded to the ACRS concerns on the Duane Arnold DRAFT-SER at a subsequent meeting (487th ACRS meeting) on the Quad Cities and Dresden uprates, and stated that the FINAL-SER would address these concerns. A comparison of the FINAL and DRAFT SERs for the Duane Arnold uprate was therefore initiated and is the subject of this memo. The focus of this comparison centers on an assessment of whether or not new technical information are provided in the FINAL-SER to support staff conclusions. A number of examples are provided, comparing DRAFT and FINAL SER statements of staff conclusions.

2.0 Comparison of DRAFT and FINAL SERs for Duane Arnold Uprate

This section presents a number of comparative examples of staff findings on the Duane Arnold uprate application, as documented in DRAFT and FINAL SERs. The focus of this comparison centers on an assessment of whether or not new technical information are provided in the FINAL-SER to support staff conclusions. Findings indicate in general little in the way of new supporting documentation of staff conclusions. Several comparative examples of DRAFT and FINAL SER staff conclusions for the Duane Arnold uprate are provided to illustrate this observation. Several examples are also presented, reflecting a more detailed discussion of the basis for staff conclusions. Nevertheless, this reviewer is drawn to the conclusion that the FINAL-SER for the Duane Arnold uprate largely mirrors the prior DRAFT-SER, as far as documentation of the staff basis for its conclusions. In most cases little new technical information is provided in the FINAL-SER to substantiate staff conclusions.

2.1 Examples of Similar DRAFT and FINAL SER Conclusions

Example-A: Section 2.5.1 of SER (Control Rod Drive (CRD) and Control Rod Drive Hydraulic System)

Except for minor word and format changes, the FINAL and DRAFT SERs are similar with respect to their discussions of the licensee's analysis of CRD performance at uprated conditions. With regards to SER documentation of NRC findings on CRD performance, the following statements are abstracted from the DRAFT and FINAL SERs:

DRAFT: ....."The licensee has also evaluated the performance of the CRD insert, withdraw, cooling, and drive functions. The staff agrees with the licensee's determination that the CRD system will perform in an acceptable fashion at the EPU conditions."

FINAL: ....."The licensee has also evaluated the performance of the CRD insert, withdraw, cooling, and drive functions. For the reasons set forth above, and consistent with previous NRC staff evaluations, the NRC staff agrees with the licensee's determination that the CRD system will perform in an acceptable fashion at the EPU conditions."

As indicated, no new technical information is provided to support the staff conclusions.

Example-B: Section 3.2 of SER (ASME Code Overpressure Protection)

Both the DRAFT and FINAL SERs specify the allowable (ASME Code limits) peak pressure for the reactor pressure vessel and the RCPB (reactor coolant pressure boundary), which is the same limit for pressurization events, namely 1375 psig (110-% of ASME design limit of 1250psig). Both SERs also describe the licensee analysis indicating that peak pressures will remain below the ASME limit, thus there is no decrease in "safety margin" for the uprate. (Here the licensees define the "safety margin" as margin between "design pressure" and pressure level at which pipe or vessel failure would be expected). Except for minor word and format changes, the FINAL and DRAFT SERs are similar with respect to their discussions of the

licensee's analysis of overpressure protection. The following statements are abstracted from the DRAFT and FINAL SERs:

DRAFT:..."The maximum calculated pressure in the current ASME code overpressure transient analysis meets the ASME Code and TS (Technical Specifications----my insert of definition) pressure limits. Therefore, the staff agrees that the licensee has demonstrated an acceptable plant response to overpressure conditions for EPU operation".

FINAL:...."Therefore, for the current equilibrium core overpressure analysis, the maximum calculated pressure meets both the ASME Code and TS pressure limits. In addition, the most limiting pressurization transient is analyzed on a cycle-specific basis and this approach would not change for the subsequent EPU reload cycle. Therefore, the NRC staff agrees that the licensee has demonstrated an acceptable analysis of the plant response to overpressure conditions".

These statement largely relate the same information, although the FINAL-SER reiterates that the licensee analysis also applies to the EPU reload cycle; which, in any case, was stated in the licensee's submittal analysis.

Example-C: Section 3.7 (Main Steam Isolation Valves-MSIVs)

Except for clarification of acronyms and a few minor word changes, the FINAL and DRAFT SERs are similar with respect to their discussions of the licensee's analysis of MSIV performance at uprated conditions. With regards to SER documentation of NRC findings on CRD performance, the following statements are abstracted from the DRAFT and FINAL SERs:

DRAFT:..."Based on our review of the licensee's rationale and evaluation, we concur with the licensee's conclusion that EPU operation as indicated above remains bounded by the conclusion of the generic evaluation in Section 4.7 of ELTR2 dated September 14, 1998, and that the plant operations at the proposed EPU level will not affect the ability of the MSIVs to perform their isolation function."

FINAL:...."Based on the NRC staff's review of the licensee's rationale and evaluation, the NRC staff concurs with the licensee's conclusion that EPU operation, as indicated above, would remain bounded by the conclusion of the generic evaluation in Section 4.7 of ELTR2, and that the plant operations at the proposed EPU level will not affect the ability of the MSIVs to perform their isolation function.

Example-D: Section 4.2.4 (Automatic Depressurization System-ADS)

The following show essentially the same background discussion of ADS performance and basis for staff conclusions, as given in the DRAFT and FINAL SERs.

DRAFT:..."The ADS uses the SRVs to reduce reactor pressure after a small-break LOCA with HPCI failure, allowing LPCI and core spray to provide cooling flow to the vessel. The plant

design requires the SRVs to have a minimum flow capacity. After a delay, the ADS actuates either on low water level plus high drywell pressure or on low water level alone. The licensee stated that the ability of the ADS to initiate on appropriate signals is not affected by the EPU. However, the EPU decay heat is higher, increasing the required flow capacity. The licensee stated that the increase in the required flow capacity is within the current system design capability. The staff accepts the licensee's evaluation."

FINAL:...." The ADS uses the SRVs to reduce reactor pressure after a small-break LOCA with HPCI system failure, allowing LPCI and core spray to provide cooling flow to the vessel. The ADS actuates on low water level and the licensee stated that the ability of the ADS to initiate on appropriate signals will not be affected by the proposed EPU. However, the proposed EPU decay heat is higher, increasing the required flow capacity. The licensee stated that the increase in the required flow capacity is within the current system design capability. Since the built-in ADS capacity is sufficient to provide the required blow down flow rate and the licensee did perform the LOCA analysis for the proposed EPU conditions in accordance with NRC-approved methods, the NRC staff accepts the licensee's evaluation."

These examples are, but a few of many sections of the Duane Arnold uprate SER, indicting similar documentation of staff conclusions in the FINAL and DRAFT SERs. In a limited number of cases however, a more detailed discussion of the basis for staff conclusions is presented. Examples of expanded SER staff conclusions are provided below.

2.2 Examples of Expanded Staff Basis for SER Conclusions

In a limited number of cases, an expanded discussion of the basis for staff conclusions is presented in the FINAL SER. One such example relates to NRC review efforts on GE-14 fuel performance at uprated conditions, such as the added discussions fuel operating limits.

Example-E: Section 2.2.2 (Maximum Linear Heat-Generation Rate and Maximum Average Planer Operating Limits

The DRAFT and FINAL SER sections on fuel performance are quite similar in scope and subject matter reviewed by the staff and largely relate similar information; nevertheless, some additional comments are provided in the FINAL SER on staff conclusions which were not in the DRAFT SER. The following is an added closing statement added to Section 2.2.2 in the FINAL SER.

Added closing to FINAL SER..... "In general, the licensee must ensure plant operation is in compliance with the cycle-specific thermal limits (SLMCPR, OLMCPR, MAPLHGR, and maximum LHGR) and the licensee will specify the thermal limits in the cycle-specific core operating limits reports as required by Section 5 of DAEC's TS. In addition, while EPU operation may result in a small change in fuel burnup, the licensee cannot exceed the NRC-approved burnup limits. In accordance with Section 5 of the TS, cycle-specific analyses are performed using NRC reviewed and approved methodologies. Therefore, the NRC staff finds that the licensee has appropriately considered the potential effects of the MELLLA/EPU operation on the fuel design limits, and the current thermal limits assessments show that DAEC can operate

within the fuel design limits during steady-state operation, AOOs (anticipated operational occurrences), and accident conditions.

Example-F: Section 2.6 (DAEC EPU On-site Review)

The DRAFT and FINAL SER sections on staff review and audit efforts related to Critical Power Ratio (CPR) are somewhat different. In the DRAFT SER, the staff stated that GE had agreed to withdraw the COBRA-G data from the GEXL-14 data base for assessment of critical power behavior fro fuel reload analysis and revise the analysis consistent with staff approved methods. It was thus concluded in the DRAFT SER that this resolved staff concerns.

The FINAL-SER states that the licensee and GE have agreed to use only experimental data for GE-12 and GE-14 fuel, including additional new GE-14c data. However, unlike the DRAFT-SER indicating resolution of staff concerns, the FINAL SER states that....."The staff is currently reviewing the re-correlation and additional test data conducted by GE-GNF. In the interim, the DAEC (and other similarly situated licensees) can continue to use the revised correlation, as described in and permitted by the approved GESTAR methodology".

CONCLUSIONS: Although some differences in stated staff conclusions in the FINAL and DRAT SERs are noted; this reviewer is drawn to the conclusion that the FINAL-SER for the Duane Arnold uprate largely mirrors the prior DRAFT-SER, as far as documentation of the staff basis for its conclusions. In most cases little new technical information is provided in the FINAL-SER to substantiate staff conclusions. This reviewer is drawn to the conclusion that the FINAL SER does not meet ACRS expectations of SER documentation of the technical basis and criteria used to substantiate staff acceptance of licensee submittal information for uprates.

References

1. U.S. Nuclear Regulatory Commission, *Duane Arnold Energy Center Safety Evaluation Report for Amendment No. 243: Extended Power Uprate,* (Nov. 2001).

2. U.S. Nuclear Regulatory Commission, *DRAFT Safety Evaluation Report for Duane Arnold Energy Center Extended Power Uprate,* (Sept. 5, 2001).

3. Advisory Committee on Reactor Safeguards, Letter to the Richard. A. Meserve, Chairman US Nuclear Regulatory Commission, *Duane Arnold Energy Center Extended Power Uprate,* (Oct. 2001).

4. P. Cota et al, *Report of the Maine Yankee Lessons Learned Task Force,* Internal NRC Report, (Dec. 1996).