

REVIEW SCOPE

SPWB has been assigned responsibility for review of the thermal-hydraulic aspects of UFM applications. All other aspects that contribute to uncertainty, such as transducer characteristics, physical dimensions, signal processing, operations other than those that may affect velocity profile, operator-display interfaces, and long-term degradation, are not part of this assigned responsibility. This safety evaluation is limited to the thermal-hydraulic aspects of the Check and CheckPlus UFM's and consideration of uncertainty is limited to those aspects directly associated with SPWB's assigned responsibility. This safety evaluation addresses, for example, assessment of the hydraulic aspects of laboratory test facilities, actual UFM testing, fidelity of the test configuration to the plant installation insofar as potential effect on velocity profile is concerned, in-situ (in-plant) calibration, operational considerations that may change the velocity profile, and use of other independent plant instrumentation to assess the UFM output and hence provide a potential means for identifying a change in velocity profile.

This review has two objectives within the above-described technical scope:

1. Assess the Seabrook request for a measurement uncertainty recapture (MUR) update
2. Provide a generic assessment of the Caldon Check and CheckPlus UFM's.

There is significant duplication in applicable references. During the review, we initially worked with slides provided in meetings with the NRC since the slides provided the best summaries of the material under review and these descriptions were often adequate to cover the review scope. We used other references as appropriate to incorporate more detail.

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1. INTRODUCTION AND CONCLUSIONS

By a letter dated September 22, 2005, FPL Energy Seabrook, LLC requested an amendment to its facility operating license and the plant technical specifications for Seabrook Station (Reference 1). The license amendment request was for a measurement uncertainty recapture (MUR) power uprate to increase the licensed reactor core thermal power level by 1.7 percent from 3587 MW to 3648 MW. In its letter, Seabrook stated that the license amendment request was developed consistent with the Nuclear Regulatory Commission (NRC) guidelines provided in Reference 2. Seabrook further stated that the LEFM design was addressed in Topical Reports ER-80P and ER-157P (References 3 and 4) that were approved by the NRC staff. By memos dated January 24, 2006 and February 1, 2006 (References 5 and 6, respectively), the NRC staff identified additional information to support its review. In response to these communications, supplemental information was provided in Reference 7. Additional information was obtained in meetings with Seabrook and Caldon at NRC (References 8 and 9), from a meeting with Seabrook and Caldon at the Alden Research Laboratories (ARL) (Reference 10), and in additional information submitted in Reference 11.

The NRC staff evaluated the theoretical bases for the CheckPlus, pre-delivery testing at ARL, and the hydraulic aspects associated with the plans for installation and certification at Seabrook and for long-term operation. The NRC staff also audited the hydraulic aspects of the Check and CheckPlus UFM's that have been installed in 44 nuclear power plant feedwater pipes to obtain additional insight into expected behavior when the CheckPlus is installed and operated in the Seabrook plant. With respect to the Seabrook request, the NRC staff finds:

- The CheckPlus hydraulic characteristics as described in the above licensee references are accurately portrayed.
- The hydraulic aspects of the CheckPlus and the claimed associated uncertainties are acceptable for the determination of feedwater flow rate at the Seabrook nuclear power plant in support of the requested measurement uncertainty recapture uprate.

Therefore, the NRC staff finds that the requested measurement uncertainty recapture uprate amendment is acceptable. However, during implementation, the licensee shall complete the activities associated with installation, certification, and long term operation consistent with the descriptions of such activities provided to the NRC and consistent with the information provided in the remainder of this safety evaluation.

A fundamental aspect of the Seabrook review was to address generic issues discussed in Reference 12. The NRC staff has completed a generic re-examination of the hydraulic aspects of Check and CheckPlus operation to address these issues. The NRC staff finds that the hydraulic aspects of Check and CheckPlus systems have been accurately described in applicable Caldon documentation, that there is a firm theoretical and operational understanding of behavior, and, with one exception, there is no further need to re-examine the hydraulic bases for use of the Check and CheckPlus systems in nuclear power plant feedwater applications. The exception, which is considered to be a confirmatory item with respect to the Seabrook review, is to establish the effect of transducer replacement on the Check and CheckPlus system uncertainties.