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## UFM REVIEW STATUS AND ANTICIPATED RESOLUTION PROCESS

The staff approved topical reports that described the use of Caldon and Westinghouse / AMAG ultrasonic flow meters (UFMs) in 1999 and 2000, respectively, to allow reduction of the feedwater flowrate measurement uncertainty in order to reduce the original 10 CFR 50 Appendix K requirement of 2 percent over the licensed thermal power. Many licensees have received amendments for power uprates that relied upon these topical reports. Other licensees have used UFMs under 50.59 for power recovery by correcting for perceived venturi fouling. Several licensees have exceeded licensed thermal power when relying on AMAG UFMs for power recovery. Ft. Calhoun had to withdraw an amendment when it found it could not achieve the claimed uncertainty, and Calvert Cliffs has not explained disagreement between various methods for determining flow rate, including a number of UFMs of two AMAG designs in multiple locations. Further, examination of UFM interactions with flowing water has identified unresolved issues that potentially affect UFM measurement uncertainty.

The PWR Systems Branch has the following four requests under review that involve UFMs:

- A Ft. Calhoun power uprate amendment using the approved AMAG,
- A Calvert Cliffs power uprate amendment using the approved AMAG,
- An advanced design AMAG topical report, and
- A Seabrook power uprate amendment using the most recent Caldon design.

The Branch position is that no UFM reviews will be completed until we have an acceptable understanding of the uncertainties in UFM flow measurement and their interactions with flowing water. Outstanding issues must be fully understood and resolved, and we must be reasonably certain that the basis for an approved uncertainty determination process is correct. In part, we have taken this position because the AMAG vendor / licensees have not historically provided complete information regarding their UFMs, and because of the continuing occurrence of unexplained problems when following processes that were certified to be correct by Westinghouse / AMAG. These processes have been continually modified in response to problems that should not have occurred if the AMAG UFM was fully understood.

The Branch has just initiated a review of the Caldon UFM and has not fully developed an in-depth understanding of the hydraulic interactions. The Branch plan is to follow essentially the same review approach for the Caldon UFM as with Westinghouse / AMAG. We provided a resolution "roadmap" to Westinghouse / AMAG, Ft. Calhoun, and Calvert Cliffs in late August, 2005 that addressed the technical issues that must be resolved. We developed a similar roadmap that is generic to the AMAG and Caldon UFMs on October 20 that we understand is being considered for transmittal to the Seabrook licensee by the Seabrook Project Manager. Both roadmaps address theory,

A-76

testing, transfer of test results to the plants, installation, operation, and reasonable proof that operation is consistent with the claimed uncertainty.

Substantial progress has been achieved with AMAG following provision of the roadmap, but work remains. The most visible issue is failure to understand the Calvert Cliffs problem since its discovery and, until this is understood, we cannot ensure it is not of concern in other applications. Of the unresolved issues, this may be the most serious. The other significant remaining issues involve transfer of AMAG technology (uncertainty) from test facilities to plant applications and some theoretical aspects of AMAG interaction with flowing fluids. No plant-specific RAIs are planned until these issues are resolved. Once resolved, the Calvert Cliffs review is anticipated to be relatively straightforward. We anticipate the Ft. Calhoun review status will be similar following a trip to the site to discuss that application. Further, we, perhaps optimistically, anticipate that few formal RAIs will be needed.

We anticipate the Caldon review will be more straightforward since the theoretical aspects are better understood and we are not aware of application difficulties similar to those encountered with AMAG. There are a number of issues to address and most should be resolved by following the roadmap, with a generic meeting or two, plus a trip to Alden Labs and to Seabrook. Again, formal RAIs should be minimal assuming the above is as productive as we anticipate.