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BV EPU I&C Questions

- (1) During the period of an inoperable LEFM, the plant Licensing Requirement Manual LR 3.8 (Leading Edge Flow Meter), action 1b, requires performing the calorimetric heat balance measurement(calculation) using the feedwater flow venturis and RTD indications and maintain Thermal Power at $\leq 98.6\%$ of RTP steady state until the LEFM is restored to operable status.

An extended in-operability of the LEFM (beyond the time for the next required daily calorimetric heat balance calculation) and the consequential continued use of venturi for the feedwater flow measurement, raises concerns regarding the accuracy of the venturi measurements. The staff concerns are based on the following.

- (A) The LEFMs in both units of the Beaver Valley Power Station (BVPS) are manufactured and installed by Caldon. In a July 8, 2004, ACRS meeting to consider the proposed generic communication on the use of ultrasonic flow measurement devices for measuring feedwater flow in nuclear plants, Caldon representative publically stated that there is a preponderance of data showing that in general nozzles(venturi) can only be counted on to measure accurately within an uncertainty of $\pm 1.5\%$ or so.

- (B) Summary of September 17, 2004 staff and licensees meeting regarding use of

UFM devices for feedwater measurement states that BVPs, units 1 and 2 are essentially identical, but most of its life unit 2 has produced about 1.5% more power than unit 1. The licensee concluded that with both units measuring feedwater flow with venturi, unit 2 was at overpower by about 1.5%. Relying on the UFM's for feedwater flow measurement resulted in comparable power production for both units and the unit 2 balance of plant indicators (notable plant conditions) were consistent with the expected design values.

The licensee representative (PKMJ Technical Services) further clarified these statements in a December 17, 2004 Fax (from Ciocca to Ahmed) stating that the LEFM system installed on BVPS, unit 1 provided readings that were essentially the same as the unit 1 feedwater venturi meters. However, a pre-installation of LEFM system review for BVPS, unit 2 revealed that each of the listed five balance of plant indications, although not a very precise measurement of reactor power, fell between 1.1% and 1.7% beyond the predicted values. The venturis used for measuring feedwater flow were laboratory calibrated and reported the plant was at the licensed power level. After installation, the LEFM measurement identified that the venturi indications were low by 40 MW thermal, approximately 1.5% power. It is also stated that the calibration of a venturi provides the accuracy for a venturi D/P, which then must incorporate additional instrumentation uncertainties to obtain a mass feedwater flow whereas UFM provides an accuracy that can not be achieved with a venturi and the associated instrumentation.

- (C) Calibrated venturi essentially has the same uncertainty as that of the laboratory calibration uncertainty of 0.25% or better and repeatable. ASME standards PTC 6 and 19.1 explain the minimum uncertainty requirements and are followed by the industry to achieve the required flow measurement uncertainty of a calibrated instrument.

Staff Concerns

- (1) The first two underlined statements in section B above indicate that venturis in both units were laboratory calibrated and their measurement uncertainty should essentially be same as identified in section C. Licensee has not identified the cause of different measurement values as to why one unit venturi measured correct while the other did not. The five listed balance of plant indicators do not identify the cause of different measurement results.
- (2) If Caldon statement in section A and PKMJ representative's last underlined statement in section B are credible to prove statements in section C wrong, then the licensee is requested to provide justifications for using venturi to measure flow with an acceptable accuracy at 98.6% of RTP. Our concern is that the reduced power is essentially the one that was to be measured by venturi if an LEFM was not installed to be credited for better accuracy. Venturis that met the standards and accuracy value mentioned in section C are used with an

expectation that their measurement uncertainty will remain within the 10CFR appendix K 2.0% uncertainty allowance and no overpower will be experienced. With the uncertainty as stated by Caldron, the staff needs assurance that appendix K allowance will not exceed when venturi is measuring flow.