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Point Beach Nuclear Plant
Operated by Nuclear Management Company, LLC

August 22, 2005

NRC 2005-0100
GL 2003-01

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington DC 20555

Point Beach Nuclear Plant Units 1 and 2
Docket Nos. 50-266 and 50-301
License Nos. DPR-24 and DPR-27

Generic Letter 2003-01: Control Room Habitability – Supplemental Information

References: 1) Letter from NMC to NRC dated August 11, 2003 (NRC 2003-0070)
2) Letter from NMC to NRC dated December 5, 2003 (NRC 2003-0116)
3) Letter from NMC to NRC dated September 29, 2004 (NRC 2004-0102)

In Reference 1, Nuclear Management Company, LLC (NMC) provided the 60-day response to Generic Letter (GL) 2003-01, "Control Room Habitability," for the Point Beach Nuclear Plant (PBNP). Reference 2 provided the preliminary results for unfiltered in-leakage into the control room as less than 100 SCFM while the Control Room Ventilation System is operating in the emergency mode assumed in the radiological accident analysis. Reference 3 supplemented the GL 2003-01 response with two commitments, one of which was to supply the final Control Room Envelope (CRE) in-leakage results when available.

NMC has competed evaluation of the CRE in-leakage results; the results are submitted in the enclosure to this letter.

This submittal contains no new or revised regulatory commitments. The commitments in Reference 3 (to provide the final response to GL 2003-01, item 1(a) and to provide technical specification changes in support of GL 2003-01, item 1(c)) remain in effect.

Dennis L. Koehl
Site Vice-President, Point Beach Nuclear Plant
Nuclear Management Company, LLC

A102

6590 Nuclear Road • Two Rivers, Wisconsin 54241
Telephone: 920.755.2321

Enclosure

cc: Administrator, Region III, USNRC
Project Manager, Point Beach Nuclear Plant, USNRC
Resident Inspector, Point Beach Nuclear Plant, USNRC
PSCW

ENCLOSURE

FINAL CONTROL ROOM ENVELOPE IN-LEAKAGE RESULTS
POINT BEACH NUCLEAR PLANT UNITS 1 & 2

The following information is submitted to fulfill a previous commitment of providing the final Control Room Envelope (CRE) unfiltered in-leakage test results.

Final CRE In-leakage Results:

The CRE consists of the main control room, the computer room, and the associated control room ventilation system (VNCR) ductwork. The cable spreading room and mechanical equipment room (MER) are adjacent to the CRE, however, are not included within the CRE. Additional details are contained in the PBNP Final Safety Analysis Report (FSAR).

To assess the amount of unfiltered air in-leakage into the CRE at Point Beach Nuclear Plant (PBNP), tracer gas air in-leakage tests were conducted by a team of test engineers from NCS Corporation (NCS) and Lagus Applied Technology, Inc. (LAT) during September 2003.

When control room ventilation system emergency mode (VNCR mode 4) is actuated, approximately 4950 cfm of makeup air passes through the HEPA/charcoal filter and the emergency fan to the suction of the normal recirculation fan. This maintains a positive pressure of ≥ 1/8 inch water gauge (w.g.) relative to all adjacent spaces in the control and computer rooms to minimize unfiltered in-leakage. The VNCR mode 4 configuration constitutes the control room emergency filtration system (CREFS) and is the only credited configuration in the design basis radiological accident analyses.

Unfiltered air in-leakage rate into the CRE with the VNCR system in mode 4 was determined using a NCS/LAT procedure, which is based on the methodology described in ASTM Standard E741-00, "Standard Test Method for Determining Air Change Rate in a Single Zone by Means of a Tracer Gas Dilution". This test is commonly referred to as the concentration buildup/steady state test, whereby the tracer gas is continuously injected into the outside makeup air stream at a constant rate and is dispersed throughout the CRE.

After waiting for concentration equilibrium to occur, measurement of the tracer gas concentration at the supply side of the main air handling unit of the VNCR system allowed for determination of the total air inflow to the CRE.

Tracer gas flow rate measurements of outside makeup airflow rates were performed using methodology based on ASTM Standard E2029-99, "Standard Test Method for Volumetric and Mass Flow Rate Measurement using Tracer Gas Dilution", simultaneous with the total CRE inflow measurements. Measurement of the outside makeup flow rate

and total CRE air inflow allowed calculation of the amount of unfiltered CRE in-leakage by taking the difference between total CRE air inflow and outside makeup flow.

Sulfur hexafluoride (SF6) was used as the tracer gas. This gas is generally recognized as non-toxic and non-reactive. Since it is easily detectable in minute quantities by means of electron capture gas chromatography, SF6 is an ideal tracer gas for ventilation system performance investigations. In all of the testing performed at PBNP, SF6 concentrations were determined using chromatographic instrumentation manufactured for field use by LAT. On site calibration using certified calibration standards was performed daily prior to initiation of each test to ensure that instrument drift and any sensitivity variations would be minimized.

During testing, four temporary configuration changes were implemented for the reasons discussed below.

1. Small portable mixing fans were placed inside the CRE.
2. The supply air to the mechanical equipment room was ducted to the turbine building.
3. All parting lines on the computer room side of the door connecting the computer room with the mechanical equipment room were taped over.
4. Portable exhaust fans were used within the mechanical equipment room (MER) to exhaust tracer-laden air to the turbine hall that leaked from the VNCR supply (non-hardcasted) ductwork in the MER or due to cross-boundary leakage from the computer room to MER door.

The first temporary configuration change was established to ensure sufficient mixing of the tracer gas. The unfiltered in-leakage will dilute the tracer gas uniformly if the room volumes are well mixed. This test methodology obtains an overall CRE unfiltered in-leakage value for the entire CRE (the control room and computer room). Therefore, adding mixing fans to dilute the injected tracer gas uniformly was required. This prevented non-uniform (localized) dilution of the tracer gas. This test methodology does not result in any knowledge of what local area the unfiltered in-leakage originated from, only that it originated from outside of the CRE.

The last three temporary configuration changes were all completed for the same reason: to reduce the amount of background tracer gas in the MER. Without implementing all three of these temporary configuration changes, the calculated value for VNCR mode 4 unfiltered in-leakage would not fit within the 95 percent confidence level (i.e., the results would not have been statistically significant).

Initially during testing, no portable exhaust fans were used in the MER. This initial test resulted in measurements of background tracer gas in the MER that were larger than the value measured during the final unfiltered in-leakage test (shown in the table below). The initial test (with no portable exhaust fans) made the uncertainty high enough to make the results statistically insignificant. After the last three temporary configuration changes were implemented (including addition of portable exhaust fans), a non-negligible background of tracer gas still remained in the mechanical equipment room,

most likely due to supply duct out-leakage or cross-boundary out-leakage from the computer room (although the background tracer gas was decreased due to use of portable exhaust fans).

With a background amount of tracer gas outside the CRE, a conservative assumption was made that some of this background tracer gas would leak back into the CRE. The background tracer gas that was postulated to leak into the CRE would not dilute the injected tracer gas in the CRE; whereas, the unfiltered in-leakage would dilute the injected tracer gas. Therefore, with a background of tracer gas outside the CRE, a correction factor needed to be applied to the final unfiltered in-leakage results (this has the affect of increasing the mean value and uncertainty band). The amount of background tracer gas in the cable spreading room, turbine hall, and adjacent portion of the primary auxiliary building was significantly less than the amount in the MER. The CRE unfiltered in-leakage calculation assumed that the amount of background tracer gas in all adjacent spaces was equal to the amount in the MER. Therefore, the mean value and the uncertainty band for the in-leakage results (provided below) represent upper bounds, because the background tracer gas was not present in other spaces adjacent to the CRE (except for the MER) in the amounts assumed in the calculation.

Normally, there is a constant supply of ducted VNCR system air to the MER. This supply air cannot add to the amount of unfiltered in-leakage because the supply air to the MER is HEPA/Charcoal filtered in VNCR mode 4. Consequently, if it were possible for this air to penetrate the CRE, it would not add to the amount of unfiltered in-leakage.

The normally leaked VNCR supply air from non-hardcasted supply ductwork in the MER is filtered by the HEPA/Charcoal in VNCR mode 4; therefore, this normally leaked VNCR supply air into the MER cannot add to the amount of unfiltered in-leakage.

Normally, the computer room to MER door parting lines are not taped over. In this normal configuration, the air leakage from this door is completely out-leakage because the boundary between the computer room to the MER is maintained at a positive pressure. Therefore, in the normal configuration, the air leakage from this door cannot add to the amount of CRE in-leakage.

The calculated CRE unfiltered air in-leakage rate with the VNCR system in the emergency mode is summarized as follows:

Item	Value*
VNCR mode 4 Unfiltered Air In-leakage	96 ± 173 scfm

* scfm = standard cubic feet per minute referenced to 70°F and 14.7 psia

The uncertainties were calculated with a 95 percent confidence level. Regulatory Guide (RG) 1.197 regulatory position 1.4 states that, "...it is optional to include the uncertainty for facilities that demonstrate a CRE in-leakage less than 100 cfm." Based on the RG 1.197 position, uncertainties reported above for VNCR mode 4 are provided for reference only.

PBNP personnel measured the differential pressure between the CRE and all surrounding rooms during the tracer gas air in-leakage test. The CRE exhibited greater than 1/8 inch w.g. positive differential pressure in VNCR mode 4 with respect to all surrounding locations. The increase in differential pressure between the computer room and the MER due to taping of all parting lines on the computer room to MER door was insignificant when compared to differential pressure measurements with the tape removed.