Battelle
Columbus Laboratories
505 King Avenue
Columbus, Ohio 43201-2693
Telephone (614) 424-6424
Telex 24-5454

February 20, 1985

Ms. Jocelyn Mitchell
U.S. Nuclear Regulatory Commission
Willste Building - P-822
7915 Eastern Avenue
Silver Spring, Maryland 20910

Dear Jocelyn:

As discussed during last month's meeting in Columbus, we have reviewed the MARCH results for the Surry and Peach Bottom sequences in order to quantify the noble gas releases that would be expected in each of these cases. As you are well aware, MARCH is not designed to address questions of fission product transport and deposition; however, for purposes of fission product decay heat distribution to be used in the thermal hydraulic analyses MARCH does incorporate an approximate tracking of the various fission product groups. The MARCH model is quite appropriate for the behavior of the noble gases. The noble gas release results obtained are discussed below.

Surry Sequences

AB-BETA

The BMI-2104 analyses included two variations on the treatment of the AB-BETA sequences. The first, labeled 2-volume, considered the primary as well as the secondary containments, with each modeled as a single separate volume. The second, labeled 4-volume, considered only the primary containment but subdivided it into four compartments. The fractional noble gas leakages to the environment derived from the MARCH analyses for the two cases are 0.89 and 0.82, respectively. These values are at the end of the calculations; it is reasonable to infer that essentially all the noble gases would be released eventually for these cases.

AB-GAMMA

The results for the AB-GAMMA sequence indicate release of 0.83 of the noble gases at the end of the calculation; complete release would be expected eventually.

AB-EPSILON

For this sequence, the fractional noble gas release at the end of the calculation was 0.15. This value was relatively low because the analysis took into account the hydrostatic pressure outside the containment basemat;

since the containment pressure at the time of predicted meltthrough is relatively low, only a fraction of the containment atmosphere is predicted to be released. Since the generation of noncondensables is quite low, further leakage to the environment would be limited.

S2D-GAMMA

The fractional noble gas release for this sequence at the end of the calculation is 0.46. The operation of the containment sprays in this sequence keeps the containment pressure low, except for the large hydrogen burn that is postulated to lead to failure of containment; the low noncondensable gas generation following containment failure limits the total release.

S2D-EPSILON

The MARCH calculation for this sequence was not carried out to the point of containment meltthrough, thus leakage to the environment must be inferred. The operation of the containment sprays during this sequence keeps the containment pressure low. At the time of expected meltthrough the containment pressure was calculated to be near atmospheric; thus little leakage to the environment would be indicated even at the time of basemat penetration. The principal leakage to the environment would take place relatively early in the sequence when the containment pressure is somewhat elevated. This leakage is estimated to release on the order of 0.01 of the noble gases to the environment.

TMLB-BETA

Complete release of the noble gases was calculated for this sequence; this particular MARCH calculation was carried out for a longer time than a number of the other sequences.

TMLB-DELTA

The fractional noble gas release at the end of the calculation for this sequence was found to be 0.85; complete release would be expected eventually.

TMLB-EPSILON

The fractional release of the noble gases for this sequence at the end of the calculation was 0.82. The large release in this case compared to the other basemat meltthrough cases is due to the combination of higher containment pressure and the assumption of depressurization down to atmospheric pressure.

V SEQUENCE

The fractional gas release for this sequence at the end of the calculation was 0.95; complete release would be expected eventually.

Peach Bottom Sequences

Complete release of the noble gases was indicated for all three of the Peach Bottom sequences analyzed in BMI-2104. The relatively small free volume of this containment together with higher noncondensable generation from concrete decomposition in comparison with the Surry results leads to little or no retention of the noble gases in any of these sequences.

I trust that the above will be of benefit in your preparation of NUREG-0956.

Sincerely,

Peter Cybulskis
Nuclear Systems Section

cc: R. Meyer, NRC

PC:dem