From: "Szabo, Clinton" <Clinton.Szabo@pgnmail.com>
To: "'rxs2@nrc.gov'" <rxs2@nrc.gov>, "'jjh@nrc.gov'" <jjh@nrc.gov>
Date: 6/6/02 3:18PM
Subject: Sump Volume

Ram,

On our 6/5 phone call, Jack Hayes requested the sump volume that was used in the LOCA RADTRAD runs. The attached file provides the volumes used and a description of how the volumes were determined. As we discussed on the call, it is our intent to include this information in a supplement to the May 10th AST submittal.

Clinton Szabo
Ext. 843-857-1544
Int. 450-1544
<<Additional Info_Sump Volume_2002 06-06.doc>>

CC: "Baucom, Chuck" <chuck.baucom@pgnmail.com>, "Balakhnin, Vladislav" <vladislav.balakhnin@pgnmail.com>, "Statile, Donald" <donald.statile@pgnmail.com>

Sump Volume used In HBRSEP, Unit No. 2, LOCA RADTRAD Runs

Sump volume increases as a function of time as a result of drawdown from the Refueling Water Storage Tank (RWST). Volume from 21 to 40 minutes is 35,850 ft^3 (volume before the initiation of ESF leakage (21 minutes) is irrelevant, since source dilution is not important before ESF release). The volume from 40 to 51.5 minutes is 40,889 ft^3 and from 51.5 minutes to 720 hours is 43,939 ft^3. A total of 3 RADTRAD runs are required to model the changing sump volume, since RADTRAD requires a constant volume definition.

The sump volume was determined as follows. The volume as a function of time consists of contributions from the RWST, three accumulators, and the RCS inventory. This calculation utilizes a RCS volume of 8,254 ft^3. The water in the accumulators and RWST is cold (density of 62.4 lbs/ft^3 used in the volume determination). The RCS is at 575.9 °F and 2235 psig. Based on the Steam Tables, the specific volume of the fluid is 0.02218 ft^3/lb. Per RG 1.183, the density of cold water is 62.4 lbm/ft^3. Thus the volume of the reactor coolant is calculated as follows:

$$RC\ Volume_{COLD} = 8254\ ft^3 * \frac{1\ lbm}{0.02218\ ft^3} * \frac{ft^3}{62.4\ lbm} = 5964\ ft^3$$

Consequently, the volume of the ECCS Inventory is recalculated as follows:

Volume (V) = RCS Volume + three Accumulator Volumes + RWST Volume @ Time Period

$V_{21\text{-}40\ min.}$ = 5,964 ft^3 + (3)*825 ft^3 + (205,050 gallons * 0.13368 ft^3/gallon)
$V_{21\text{-}40\ min.}$ = 35,850 ft^3

$V_{40\ -\ 51.5\ min.}$ = 5,964 ft^3 + (3)*825 ft^3 + (242,743 gallons * 0.13368 ft^3/gallon)
$V_{40\ -\ 51.5\ min.}$ = 40,889 ft^3

$V_{51.5\ min.\ -\ 720\ hrs.}$ = 5,964 ft^3 + (3)*825 ft^3 + (265,557 gallons * 0.13368 ft^3/gallon)
$V_{51.5\ min.\ -\ 720\ hrs.}$ = 43,939 ft^3

From RNP-M/MECH-1740, Rev 0, "Radiological Consequence Analysis of the Loss of Coolant Accident With AST Implementation"