Tasks A-3, 4, 5 7/27/79

These are background informations for some of the topics I would like to discuss during the July 30 meeting.

Kris Parczewski
x 28166

POOR ORIGINAL

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EG&G Idaho

Kris: Please use as a comm, interpret this as a ... If you decide you want the work done, we can then discuss manpower availability and a firm look at cost, etc. C

INTEROFFICE CORRESPONDENCE

date July 23, 1979

to C. F. Obenchain

from J. L. LaChance JLL

subject STEAM GENERATOR TUBE RUPTURE TASK PRELIMINARY PROPOSAL - LaC-1-79

TASK:

Determine the number of steam generator tube ruptures during a LOCA which will result in elevated peak cladding temperatures in Westinghouse 2 and 3 loop plants, Combustion Engineering, and Babcock and Wilcox plants. The core thermal response is to be examined in this window regime.

ASSUMPTIONS:

The tube ruptures will be assumed to occur at the beginning of reflood during the worst LOCA - a 200% cold leg break. The tube ruptures will be assumed to occur at the inlet plenum of the intact loop steam generator(s). For the Westinghouse 3 loop plant, the tube ruptures will be assumed to occur equally in the 2 intact loop steam generators so as to maximize the time period in which secondary-to-primary flow occurs.

METHODS:

1. Blowdown calculations will be performed for the CE and B&W plants using RELAP4/MOD6. No RELAP4 input decks are available for Westinghouse 2 and 3 loop plants. If no acceptable blowdown calculations can be located, a blowdown calculation for a W 4 loop plant could be used.

2. Refill calculations for the plants will be performed using the FLOOD4 code with a heat transfer coefficient of 5 Btu/hr-ft^2-^oF. This has been shown to be a realistic heat transfer coefficient during the refill period. A conservative alternative would be to assume adiabatic heat up by using a heat transfer coefficient of 0. The refill time period will be calculated by hand.

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PRELIMINARY

PRELIMINARY

3. The FLOOD4 code will be used to calculate the reflood portion of the transients including simulated steam generator tube ruptures. The FLOOD4 code will require some modification in order to calculate transients in the CE 2 by 4 plant. Several assumptions will be required in setting up the FLOOD4 models that will significantly affect the calculated results. They are:

   (a) The number of rods that can be top-down quenched has to be specified. Recommend allowing the whole core with exception of the hot fuel bundle to be capable of being top-down quenched if liquid in the upper plenum is available. This should result in maximum steam production in the system and the highest peak cladding temperature.

   (b) A minimum heat transfer coefficient is required for the input model. In the window regime (stagnant or near stagnant core flow) the heat transfer in the core is determined by this parameter. Recommend using 5 Btu/hr-ft^2-^{o}F since this is considered a reasonable value for a heat transfer coefficient during refill.

   (c) The amount of secondary liquid vaporized in the primary has to be specified in the FLOOD4 model and drastically affects the calculated results in the negative core flow regime. Fortunately the calculated results in the positive core flow and stagnant core flow regimes are insenstive to this parameter. Recommend using a secondary-to-primary flow quality of 1.0. This represents the worst case since secondary liquid will not be available for top-down quenching of the core and also since steam binding will be maximized.

PROCEDURE:

The steps required to perform this task and the labor and cost are summarized in the following table. The numbers presented are preliminary and considered conservative. Better estimates can be made once the task is better defined.

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PRELIMINARY

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	Task Step	Labor Months/Cost (K$)	Computer Cost (K$)	Total Cost (K$)	Accumulated Cost (K$)
1.	Run best estimate blowdown calculations for CE and B&W plants[a]	3/14.5	10	24.5	24.5
2.	Update FLOOD4 code (Rex Shumway)	0.5/2.8	0.5	3.3	27.8
3.	Create FLOOD4 input decks for plants [b]	1.5/7.2	---	7.2	35
4.	Perform refill calculations	.5/2.4	---	2.4	37.4
5.	Perform reflood calculations with tube ruptures assumed to occur[c]	2/9.6	8	17.6	55
6.	Write report	2/9.6	---	9.6	64.6
	TOTAL	9.5/46.1	18.5	64.6	

a Existing EM decks will be modified and blowdown calculations performed. Plants modeled are: CE-Calvert Cliffs, B&W-Oconee. An existing Westinghouse blowdown calculation for Zion plant will be used for W 2 and 3 loop plants. Modification of EM decks requires 2/3 of the time!

b FLOOD4 input data consists primarily of loop resistance values and system volume numbers. We have loop resistance information for the following plants:
CE - Millstone
B&W - Crystal River & Davis-Besse
W 2 loop - Kewaunee
W 3 loop - Surry
Hopefully the CE and B&W plants are similar to those modeled in blowdown calculations.

c One base case (no tube ruptures) and approximately 6 tube rupture transients for each plant will be run.

jd

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cc: C. A. Dobbe
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Central Files

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