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Central Files

D. F. Ross, Chief, Core Performance Branch, TR

STATUS OF CSB REVIEW OF METHODS USED "O DETERMINE MASS AND ENERGY RELEASE FOR CONTAINMENT ANALYSES

As you requested, this memo presents the status of our review of applicants' methods used to determine mass and energy release rates for containment analyses for PWE plants and our recommendations on what might be done in the transfer of this responsibility to CPB. The review of GE's code is already the responsibility of CPB.

We have reviewed the following computer codes used to calculate the mass and energy release to the containment following a LOCA for PWR-type plants. As you will note one architect/engineer, Stone and Webster, has developed its own blowdown code, LOCTIC, which we have approved for the initial blowdown phase only:

COMPANY		COMPUTER CODE USED			
	Blowdown	Reflood	Post Reflood		
B&W	CRAFT	CRAFT	CRAFT		
CE	CEFLASH-4	FLOOD-2	Unnamed Code		
M	SATAN-V	W REFLOOD	FROTH		
S&W	LOCTIC	[Input from W	estinghouse]		

These codes are principally for ECCS analysis with certain modified assumptions for containment analyses. We also performed confirmatory calculations using RELAP-3 and FLOOD 1 & 2. The assumptions used in these codes are intended to be conservative for containment analysis in that they account for the removal of all the available stored energy in the primary system and steam generators; therefore, average core conditions rather than local effects are amphasized. Quenching of steam by ECCS water is assumed during the blowdown period and non-equilibrium of steam and ECCS water is considered following blowdown. The time to refill the reactor lover plenum after blowdown is not considered for containment analysis.

We have accepted analytical models for steam line breaks from several architect/engineers and the three PWE vendors. With the exception of CE, we believe that these are bounding analyses since it is assumed that all secondary fluid enters the containment as steam. CE uses the SGN-III code which accounts for liquid entrainment based on comparisons with experimental D. F. Ross

FEB 2 6 1875

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With respect to possible future tasks which would be assumed by CPB, we believe that modifications to the existing codes might be requested by vendors or A/E's; however, we don't foresee a significant effort in the near future in this respect. However, you may consider the development of better staff models for the prediction of mass and energy data to the containment so that some of the uncertainty and perhaps over-conservatisms in the vendor's and A/E's models can be evaluated in the following areas:

- 1. Blowdown
 - a. Short-term mass and energy release could be studied and correlated with experimental data for use in subcompartment analysis.

-2-

- b. RELAP could be modified to account for optimized heat transfer from the core, steam generators, and primary metal structures.
- 2. Reflood
 - a. A computer analysis method could be developed to predict mass and energy to the containment with consideration given to two-phase carryout from the core and energy balance calculations in the steam generators and primary system. This code may not require the complexity of an ECCS analysis code.
 - b. Mixing of steam and ECCS water could be studied based on comparisons with experimental data.

2. Post-Refloud

Post-reflood boiling could be investigated experimentally to determine the extent that water enters the steam generators after the core has become recovered. These data could be used to develop a post-reflood computer model to enable us to better predict containment mass and energy release for long-term containment analysis.

I hope the above will assist in an orderly transfer of responsibilities in this area.

Signed FT Gus Lainas

cc: See next page

Gus C. Lainss, Chief Containment Systems Branch Minister of Technical Review D. F. Ross

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cc: R. Tedesco

V. Stello

P. Norian

L. Beltracchi

W. Jensen

Central Files CSB - Reading

OFFICE	TR:CSB	PR:CSB						
BURNAME D	WJenson : 1mt	Bolanas						
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