UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

APR 1 1 1988

Mr. David Nulton, Deputy Director
Office of Advanced Reactor Programs
Office of Nuclear Energy
United States Department of Energy
Washington. D.C. 20545

Dear Mr. Nulton:

The NRC staff and its consultant (BNL) met with the DOE staff, contractor (RI) and consultant (ANL) on March 25, 1988 to discuss concerns regarding the SAFR (Project 673) PRA and Bounding Events. Enclosures 1 and 2 provide the list of attendees and agenda, respectively, for the March 25 meeting with RI. It is requested that RI document their responses to the questions resulting from this meeting as documented in Enclosure 3.

The Bounding Events (BEs) have been the subject of several discussions with both the GE (PRISM) and RI (SAFR) design teams during the last four months. The latest list of BEs is attached as Enclosure 4. In order to meet our Safety Evaluation Report schedule, any comments on these events should be provided by April 15, 1988. Analyses of the PRISM and SAFR conceptual designs for these events should be provided by May 15, 1988. The analyses should include assessments of the thyroid and whole body doses at the site boundary for 36 hours and 30 days.

We also require an assessment, by May 15, 1988, of the enhanced Safety of these designs in accordance with Enclosure 5. If there are further questions regarding any of the enclosures or dates, feel free to contact Dr. Ralph Landry (492-3735) of my staff.

Sincerely,

Zoltan R Rosztoczy, for
Bill M. Morris, Director
Division of Regulatory Applications
Office of Nuclear Regulatory Research

Enclosures
As stated

8804150231 880411
PDR PROJ PDR
673A

Enclosure 1

SARF PRA MEETING
March 25, 1988
Attendees

R. Landry	NRC/RES	(301) 492-3735
M. Dey	NRC/RES	(301) 492-3730
J. Flack	NRC/RES	(301) 492-3741
T. King	NRC/RES	(301) 492-3765
J. Wilson	NRC/RES	(301) 492-3729
G. VanTuyle	BNL	(516) 282-7960
T. Chu	BNL	(516) 282-2389
T. Ginsberg	BNL	(516) 751-6765
G. Slovik	BNL	(516) 282-7983
J. R. Humphreys	DOE	(301) 353-3588
G. Sherwood	DOE	(301) 353-4162
D. Pedersen	ANL	(312) 972-3335
R. Lancet	RI	(818) 718-3462
R. Amar	RI	(818) 718-3410
D. Rogers	RI	(818) 718-3410
P. Rutherford	RI	(818) 718-3393

Enclosure 2

SAFR PRA MEETING
March 25, 1988
Agenda

8:30 am	Introduction	T. King (NRC) R. Lancet (RI)
8:45 am	Event Probabilities	R. Lancet (RI)
11:15 am	Energetics	D. Pedersen (ANL)
12:00 Noon	Lunch	
1:00 pm	Pump Questions	D. Rogers (RI)
1:30 pm	Combined Vessel Leaks	R. Lancet (RI)
3:00 pm	Summary	R. Lancet (RI)
4:00 pm	Adjourn	

Enclosure 3

SAFR PRA Meeting
March 25, 1988
Summary

A letter was sent on March 10, 1988 from B. Morris (NRC) to D. Nulton (DOE) noting areas of concern which had arisen from the SAFR PRA review. The SAFR design team identified several questions in that letter and additional questions, or points of clarifications, in succeeding telephone conversations. The following is the list of questions as discussed at the meeting.

1. The following two events have been identified as potentially dominant contributions to the SAFR risk:

   - LOF with failure to scram compounded by failure of inherent shutdown capability.

   - Large earthquake which triggers pump trips while causing the control rods to become stuck thereby defeating both scram and the inherent feedbacks due to control rod driveline expansions.

   Provide the bases for estimation of the probabilities of these events. This assessment should include the probability of failure to scram and the conditional probabilities for consequential failure.

2. What is the probability that the second primary pump would fail soon after the first pump seizes?

3. For internal events analysis, what is the conditional probability of stuck rods given that a reactor trip signal has been generated? (Substantiate quantifications with as much information and/or references as possible.)

4. For internal events analysis and given stuck rods, what is the failure probability of the inherent reactivity feedback? (Substantiate quantification with as much information and/or references as possible.

5. For the inherent reactor response, explain how failure rates and uncertainties were derived.

6. In Figure 7.5 (SAFR PSID, Appendix C) there appears to be no basis for assignments of probabilities because the uncertainties are too large. Explain the bases (including uncertainties) for the core vessel response.

7. For seismic analysis, SAFR assumes a decreasing reliability of the inherent feedbacks for large earthquakes. Presumably, this is due to the increasing likelihood that the control rods would become stuck so that they could not expand freely into the core. Describe how these reliabilities were estimated given that these are risk-dominant sequences.

8. For the decay heat removal system, explain how failure rates and uncertainties were derived.

9. With sodium boiling a 3-sec ramp rate can be achieved. Will the fuel move fast enough to counter this? (TREAT tests have not been conducted at this rate.)

10. Provide an assessment of the accident scenario and consequences assuming a reactor vessel and guard vessel melt through.

11. Provide additional information regarding the following release assumption concerns:

    ° The PRA assumed failure at the fuel melt temperature which leaves Ba and Sr in the fuel matrix. However, at higher temperatures, the Ba

and Sr will be released into the sodium coolant. Explain why these higher temperatures are not possible or factor into your analysis the release of Ba and Sr when the higher temperatures are reached.

- Some assumptions are based on oxide fuel where there is a lot of O_2 available in the sodium to form compounds that hold up in the sodium. This won't happen in the metal fuel, therefore, why are such assump`ions valid?

- For large excursions large bubbles may be created which would transfer releases directly to the cover gas without going through the sodium. How would such an assumption affect your release calculations?

12. Is the SAFR plant protection system designed to delay pump trips until the reactor has been scrammed? If so, how does the system detect and ensure that the reactor has scrammed prior to tripping the pumps?

13. Under seismic events, can the control rods jam such that the thermal response doesn't work?

14. What is the likelihood of having one of the two primary pumps seize during the first minute of coastdown?

15. For large energetics will the reactor head assembly lift, expel sodium and fission products, and then reseat? What is the likelihood it will reseat?

16. Provide information regarding branch tree probabilities and uncertainties associated with those sequences which could lead to energetics events.

Deterministic Events

These events are intended to bound the LMR DBA and BDBA spectrum in order to account for PRA uncertainties and provide conservatism in selecting a SSST and assessing the adequacy of containment and offsite evacuation plans. These events are judged to be bounding for the following categories:

- Reactivity insertion
- Heat removal
- Loss of coolant
- Na/H_2O reaction

Event-1 Inadvertent withdrawal of all control rods without scram for 36 hours (single module):

- forced cooling
- RACS/RVACS cooling only

Event-2 Station blackout for 16 hours.

- loss of all ac power

Event-3 Loss of forced cooling plus DRACS/RACS/RVACS with scram (single module):

- 25% partial unblockage after 36 hours

Event-4 Instantaneous loss of flow from one primary pump (single module);

- coast down flow for other pump
- without scram for 36 hours

Event-5 S.G. tube rupture with failure to isolate or dump water from S.G.:

- justifiable number of tube failures
- defined sequence of ruptures

Event-6 Large Na leaks (single module):

- Double ended guillotine break of IHTS pipe
- RV leak (critical leak)

Event-7 External events consistent with their treatment for LWRs.

Requirements Associated with Enhanced Safety

- Applicant should assess and document enhanced safety characteristics/margins:

  - long response time
  - reduced potential for operator error
  - capability to retain FP
  - highly reliable safety systems (passive/inherent characteristics)
  - simplification (systems/analysis)

- Potential improvements in safety are to be considered when the margins are small or when large improvements in safety can be realized with reasonable cost. These improvements could be selected for analysis and implemented using engineering judgement.

- Demonstrate enhanced safety/margins via testing.

David Nulton, Deputy Director

DISTRIBUTION
RES Circ
Chron
ARGIB R/F
E. Beckjord
T. Speis
B. Morris
Z. Rosztoczy
T. King
J. N. Wilson
R. Landry
P. Williams
J. Flack
B. Hardin
O. Gormley
R. Baer
N. Anderson
F. Cherny
S. Shaukat
R. Johnson
D. Thatcher
J. Hulman
J. Glynn
L. Soffer
J. Read
D. Cleary
G. Arndt
R. Kirkwood
R. Erickson
B. Mendlesohn
E. Chelliah
L. Beltracchi
F. Congel
L. Cunningham
O. Lynch
D. Matthews
F. Kantor
E. Podolak
M. Spangler
G. VanTuyle, BNL
M. El-Zeftawy, ACRS/H-1026
PDR - Project 673
Project File 673 (Central Files)