

From: Ralph Caruso *NRR*
To: Undine Shoop *NRR*
Date: Thu, Jun 14, 2001 4:21 PM
Subject: Re: PBMR technical areas

Undine,

Good thoughts. Thanks.

Ralph

>>> Undine Shoop 06/14/01 12:52PM >>>

NRR

Could add:

issues associated with burnup - control of pebbles to assure that they do not exceed bu limits
how duty affects the material characteristics of the pebbles
potential for localized runaway criticality (this could be a subnote under physics reactor criticality)
air ingress problems with oxidizing the graphite
under system bullet - add water and air elimination system
And something brought up by an interventor though it is not our area is dose from activated dust.

That's all I can immediately think of.

Undine

>>> Ralph Caruso 06/14/01 11:55AM >>>

NRR

I have been asked to put together some input on staffing for upcoming advanced reactor reviews. As part of that effort, I thought it would be a good idea to list the review areas, and the associated skills. I would like you to take a look at the attached list - a draft - and let me know whether you think that there are any technical areas that I may have missed. This is a brainstorming exercise, so don't be inhibited. I did not include the liquid metal reactors or ESBWR or IRIS, because they seem to be more speculative than PBMR, but I would not doubt that the list might be extended, so start thinking about it.

Thanks in advance.

Ralph

Q/10

PBMR Technical Issues

Fuels

Material behavior

- Fission product behavior and retention
- Graphite behavior at high temperature
- Graphite behavior in air
- Graphite behavior in water
- Heatup of fuel
- Breakage issues
- Geometry changes on heatup/cooldown

Decay heat

- Extension of decay heat curves
- Variation of decay heat with different enrichment/burnup

Physics

- Modeling of criticality in random pile of pebbles
 - In reactor
 - In storage
 - Accidents that allow piles of pebbles to accumulate
 - Ability to use random geometry
 - Breaks in transfer lines
- Helium moderation
- Water moderation
 - Use of water in fire suppression systems
 - Intercoolers
 - Seals
- Air moderation(?)
- Differences in enrichment
- Criticality of balls with some broken pieces
- Reactivity control
 - Redundant/diverse shutdown capability?
- Fuel/inert ball distribution effects

Definition of DBAs

- Reactivity insertion
- Loss of cooling
- Loss of flow
- Changes of geometry

Cooling of fuel

- In reactor
- In storage
- In transit between "tanks"
- Packed bed cooling
- Radiation heat transfer between balls in bed
 - Variable configurations of balls - decay heat

- Numerical methods for analyses
- Fuel QA for fabrication outside US
 - Fabrication requirements history from Germany
- Testing
 - History in Germany
 - Range of Applicability - same conditions as proposed PBMR?

Systems

- Decay heat removal
- Fuel handling
 - Criticality control
 - Broken balls
- Water ingress
 - How precluded
 - Effects of water ingress

System T/H

Accident Analyses

- T/H
- Criticality
- Fission Product behavior
- Fuel behavior