From: Ralph Caruso NRR
To: Nanette Gilles NRR
Date: Tue, Jun 19, 2001 10:24 AM
Subject: Re: Draft FLIRA Report Outline

Nan,

Thanks for the input. I looked at it, and it looks like a good start. One aspect that I think you might want to consider is that there are different resource needs depending on the type of reactor that is ordered - i.e., if W comes in with IRIS, or GE with ESBWR, then the technical expertise that is needed can likely be drawn from existing staff experience, and we do not have to learn a lot of new issues. PBMR or GT-MHR, on the other hand, present us with a very steep learning curve. The Liquid metal reactor (GE?) falls somewhere in between, because we do have some experience for that reactor.

So, I might suggest that you include in the design certification section some discussion about the different designs, and unique technical issues/aspects that might arise. Attached is a draft list of issues that we have been accumulating for PBMR. I think we could generate one for the liquid metal plant, as well, because I have two people on my staff who have dealt with it before. For the GT-MHR, I would not know where to start, although there would be some overlap with PBMR with regard to the behavior of graphite fuel. For IRIS and ESBWR, I can't think of any issues that have not been raised at some point in the past review of either existing reactors or AP600 or SBWR.

Ralph Caruso

>>> Nanette Gilles 06/18/01 03:01PM >>> NRR
Ralph,

Here is the current version of the FLIRA Report outline. I am still incorporating comments from various people. I am expecting an addition to the outline from NMSS this week to address their issues (fuel, transportation, etc.). At least this will give you something to look at on the plane.

Nan

CC: Amy Cubbage; Edward Throm; Jared Wermiel

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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
  - Fuel depletion - how to calculate in changing geometry
- Definition of DBAs
  - Reactivity insertion
  - Loss of cooling
  - Loss of flow
  - Changes of geometry
- Cooling of fuel
  - Fluid flow and heat transfer in porous media with stochastic heat sources
  - 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