

From: Glenn Kelly, *NRR*
To: Anthony Uises, Joseph Staudenmeier, Laurence Kop...
Date: Wednesday, November 03, 1999 10:38 AM
Subject: Criticality

Per our discussion, please provide a table and write up on the following issues:

1. separately discuss possibility of criticality in spent fuel pools for BWRs and PWRs, with PWRs further broken down by high and low density storage.
2. discuss what fuel failure means (e.g., fuel dispersal, centerline melting, cladding failure, development and expulsion of fission products from the fuel pellet) and whether it is expected for any of the scenerios postulated.
3. discuss differences between BWR and PWR spent fuel pools and the implications for accident scenerios (e.g., easier to have criticality in a BWR because it already has non-borated water surrounding the spent fuel.)
4. Evaluate the impact criticality would have on fuel that has been out of the reactor for 7, 10, and 20 years with respect to how long would the fuel need to be critical before it was capable of developing a self-sustaining zirconium fire if coolant were lost.
5. Determine whether a spray of water from a fire nozzle on exposed fuel could cause criticality. Is there a chance for fire hoses versus sprays causing criticality? Does the type of nozzle make a difference?
6. Determine how fuel would heat up in a return to criticality if it were reflooded with non-borated water at a slow rate (say a couple of hundred gpm. Would there be any chance for an explosion or a dispersal of fuel? Would it go prompt critical?
7. What is the build up of iodine in spent fuel after it goes critical again? Will it be enough to change the offsite consequences significantly?
8. On a slow reflood with non-borated water, does it make a difference if some of the fuel cladding has pin holes or there is some other failed fuel? Check with 50% failed and 50% intact fuel.
9. As we did in our meeting yesterday (Tony and Larry), we will need to continue to refine the scenerios we have to address (e.g., seismic events, load drops, and loss of inventory followed by reflood with non-borated water)

Schedule - I will need to know if criticality makes a significant difference to worker or offsite doses by the end of November/early December. The draft final report needs to go into concurrence by Mid-December

Please respond with an indication of your ability to address the issues above (Tony, Larry, and Joe should specifically indicate which issues they will address.) I also need to hear whether you can or cannot meet the deadline above. Thanks for the good discussion the other day.

Glenn Kelly

CC: Diane Jackson

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Criticality

10/27/99

Why do we care if it goes critical.
^{expect}

Slow approach to criticality
Not like rod ejection so no rapid fuel damage.

Different level of consequences

zirc fire - most concern

does criticality have anything to do w/ it.

what if just criticality

boiling in pool

local fuel damage

scumming of water

Don't have to
keep to 10^{-6}

We will

① limit zirc fire

②. New way to get zirc fire due to
criticality

③. Can criticality cause a zirc fire > 5 yrs.

④. criticality when post zirc

Concern

C. PWR ~~loss~~

They will come up w/ buildup of iodine.

C. lose inventory, fuel heats up, boraflex or borol melts + is no longer effective as an ~~swell~~ absorber. Reflood w/ non-coated water.
No gase fire.

D. Same but... have ~~fire~~ ~~criticality~~ (+) gase fire.