From: Ralph Caruso <rxc@nrc.gov> /NRR
To: <tom.michener@pnl.gov> PNL
Date: Tue, Jul 25, 2000 7:29 AM
Subject: RE: Spent Fuel Pool Heatup calculations

Tom,

This sounds good. Use option 2 for the steam flow. What we want here is some idea of how long it would take for the water to clear the flow path to allow air flow up from the lower plenum, and with a steam flow value for one bundle, and the cross sectional area of the bundle, we can estimate how fast the water level would be dropping.

I am in the office now (7:30), and will be here till 9:00, when I have to go to another meeting. If I don't hear from you before the meeting, I will call at lunch.

Ralph

> Ralph,
>
> I understand from Judi Cuta that the two of you have corresponded and she has
> started working on the model alterations. She should have an estimate on the
> computational time requirements very soon.
>
> I have a question about your comment on the steam flow upward in the fuel
> bundle. We have 3 options on how to handle this:
>
> 1) We can shut off all of the axial flow (turn off cross flow in the
bundles)
> and the computational time will be the least possible. We have evidence from
> prior calculations that this is very close to the results we get when we solve
> for cross flows. (allowing for recirculation within each bundle)
>
> 2) We can assume a fixed axial (vertical) flow rate based on the steam
> generation and set it as a constant. The calculated flow rates provided
earlier
> by Joe S. made very little impact on the solution, since the magnitudes were
so
> small. It turns out that you need ~ 2 Kw per assembly just to generate the
> amount of flow that would be required to cool the assemblies to 700 C at
> steady-state conditions. (for a case where the real decay heat is closer to
0.5
> Kw/assembly)
>
> 3) If we model cross flows, the computational time may be a factor of 10
> higher, without changing the answers very much.
>
>
> In any case, we are going from a starting point of 100 C, as if the pool is
> full of boiling water, to a condition where all of the water (except from 2
> inches below the fuel on down) is gone in an instant. From that point on we
are
> tracking the time to reach a maximum clad temperature of 800 C.
>
> NOTE: we are NOT modeling the water level being lowered as time progresses.

9/223

> This is treated as a catastrophic loss of fluid, with the exception of the last
> 6 inches or so.
>
>
> I hope this makes sense. I will call you in the morning to make sure we are
> both on the same page.
>
> ----------
> From: Ralph Caruso
> Sent: Monday, July 24, 2000 11:57 AM
> To: Cuta, Judith M; Michener, Thomas E
> Cc: CGT.twf5_po.TWFN_DO@nrc.gov; CXB5.twf5_po.TWFN_DO@nrc.gov;
> DTJ.owf2_po.OWFN_DO@nrc.gov; FMA.owf2_po.OWFN_DO@nrc.gov;
> GBK.owf2_po.OWFN_DO@nrc.gov; GTH.owf2_po.OWFN_DO@nrc.gov;
> JLS4.owf2_po.OWFN_DO@nrc.gov; JNH.owf4_po.OWFN_DO@nrc.gov;
> JSW1.owf2_po.OWFN_DO@nrc.gov; LCR.owf2_po.OWFN_DO@nrc.gov;
> MPR.owf2_po.OWFN_DO@nrc.gov
> Subject: Spent Fuel Pool Heatup calculations
>
> Tom,
>
> The purpose of this note is to document our discussion this afternoon
> concerning the SFP heatup claculations. As I explained, our goal is to
> determine what decay power level(in Kw/bundle) will cause the fuel to heat up
> from 100C to 800C in 10 hours. PNL should use the existing BWR fuel model with
> the following boundary conditions: (1) assume the water level is constant, 2
> inches below the bottom of the fuel, (2) assume that all of the bundles in the
> model are the same power level, (3) assume the initial temperature of the fuel
> and the water is 100C.
>
> The PNL calculations will iterate on the bundle power level to determine
> which particular bundle power level will cause the fuel to heatup to 800C (peak
> clad temperature) in 10 hours. NRC will use this bundle power level to
> determine the corresponding fuel burnup and time since discharge.
>
> PNL should also provide NRC with the steam mass flow rate up through the
> bundle during this time period, so that NRC can estimate the rate at which the
> water level is dropping in the bottom of the bundle during the transient.
>
>
> I understand that PNL will contact me within the next few days with your
> estimate of the time that it will take to perform these calculations.
>
> Thanks in advance for your help. If you have any questions, give me a
> call - 301-415-1813.
>
> Ralph Caruso
>

CC: <judith.cuta@pnl.gov>, <jls4@nrc.gov>, <cgt@nrc.go...