

From: Ralph Caruso ) NRR  
To: Yuri Orechwa )  
Date: Tue, Jan 8, 2002 8:10 AM  
Subject: Re: Strawman for graphite core vs. structure classification

Yuri,

I think we are in agreement on this. As you say, the purely structural aspects, such as the "permanent side reflector" seem to be more of a DE function. I don't know enough about how this machine works to be able to discuss all of its aspects, so please bear with me. In some cases, we may have to work together with DE to get the job done - they may have talents that we need, and vice versa. I certainly don't want to build an empire. I just want to make sure that whoever does the review knows which questions to ask, and that important issues don't fall into a crack because the reviewer did not know why something was important. That is why, in current LWRs, we have assumed responsibility for all mechanical aspects of the core that affect T/H, reactivity, and power. We don't generally get involved in vessel internals issues that are purely structural, but DE does consult with us about the consequences of structural failures. I think we can follow a similar path for the PBMR, and I am trying to avoid a situation where the material that is used for a component defines the review responsibility.

Regarding tools, if you need something, let me know. We have money available to buy software, and we can always charge it back to the licensee...

Ralph

>>> Yuri Orechwa 01/07/02 02:49PM >>>  
Ralph,

NRR

I tried to point out that to a great extent functionality correlates with the grade of graphite chosen by the designers for the PBMR. They try to get away as cheaply as possible given the environment to which the graphite blocks/components are subjected. Leaving aside the case of the pebbles which is obvious, let us consider the case of the side reflectors. The replaceable side reflector, for example, has specific functionality - coolant and control channels, predictable reflection for reactivity prediction. (The Japanese mispredicted initial criticality by quite a bit because they underestimated the Li content of their reflectors.) This reflector sees a high fast flux, high temperature gradients; not a promising environment; therefore, expensive graphite. Further radially outward, the permanent side reflector which contains the inlet coolant gas channels, and, thereby, cools the pressure vessel sees much lower flux levels and temperature gradients. The environmental conditions are less harsh, and, thereby, the designer can go the cheap route and leave the stuff in the reactor the life of the plant. I agree with you completely (it might not have been clear in my proposal) that the replaceable reflector is part of the "core" and SRXB territory.

I think we must keep in mind that, as always, the territorial boundaries will be murky. I would argue that all analysis for the pebble bed and the replaceable reflector is SRXB territory. This, however, will entail some detailed structural analysis of the reflector. (I predict the residence time technical specification for the replaceable reflector will be the most contentious issue with the licensee.) Have you ordered ABACUS yet? Certainly we shall supply, as now, the fluence estimate wherever a neutron reaches a reactor component. On the other hand, the permanent components, which require more structural code type analyzes can be relegated to DE. (Unless you want to build an empire and go to the mat with them)

I don't think the LWR analogy is that helpful; I thought we might start with a clean sheet of paper.

Thanks for the comments. I am sure we shall ferret everything out.

Yuri

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>>> Ralph Caruso 01/07/02 01:49PM >>>  
Yuri,

*NRC*

This is a good start. I have some additional thoughts, though, which may lead to a slightly different conclusion, though. If the side reflectors are designed with particular coolant flow paths in mind, and if they affect reactor physics/power, by serving as a reflector, or the location of the scram system components, then I would argue that the side reflectors are really part of the core structure. I would make the analogy to existing reactor designs, where the reactor coolant pressure boundary function is the responsibility of DE, while core internals that have an effect on T/H or physics are in the domain of SRXB. Some graphite, such as the bottom supports, which do not perform any function other than structural support, or perhaps shielding, may(should) not fall into SRXB responsibility.

What do you think about using functionality as the basis for this sort of determination?

Ralph

>>> Yuri Orechwa 01/07/02 09:31AM >>>  
Jerry,

*NRC*

Attached is a "Strawman" for the issue of defining PBMR core vs. structure graphite.

Yuri

CC: Undine Shoop