From: Mary Adams
To: ParrNB@Westinghouse.com; WiniarRJ@westinghouse.com
Date: 8/5/05 4:12PM
Subject: Tripp's suggestions for margin of subcriticality demonstration

Hi Ralph & Nancy,

Chris will be in Erwin, TN, next week. We will be able to reach him there some of the time. He assembled this list of things that he expects to find in a procedure demonstrating adequate margin of subcriticality through analysis of k-effective sensitivity to changes in process parameters. You might find it helpful in preparing for his visit the week of Aug 22. The attached document also has some agenda items for the site visit.

I'll call Nancy late Monday morning to set up a call with Chris sometime Tuesday, if that works for you.

Mary

Mary T. Adams, Senior Project Manager
Fuel Cycle Facilities Branch
Division of Fuel Cycle Safety and Safeguards
Office of Nuclear Material Safety and Safeguards
Nuclear Regulatory Commission
Mail Stop T-8-F-42
Washington, DC, 20555
301-415-7249

CC: Christopher Tripp; Craig Hrabal; Donald Stout; Gary Janosko; Julie Olivier; Melanie Galloway; Robert Pierson; Valentina Cheney; W. Schwink

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Subject: Tripp's suggestions for margin of subcriticality demonstration
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westinghouse.com
parrnb (ParrNB@Westinghouse.com)
WiniarRJ (WiniarRJ@westinghouse.com)

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Preparation for Westinghouse On-site Visit 8/22/2005
Criticality Code Validation and Margin of Subcriticality (MoS)

A procedure demonstrating adequate MoS through an analysis of k_{eff} sensitivity to changes in process parameters should do the following:

1. It should explain how applying the procedure relates to acceptability of the MoS. There must be a logical connection between the methodology and the determination of acceptability.

2. It should clearly specify what mathematical condition(s) differentiate situations in which the MoS is acceptable from those in which it is not.

3. It should clearly state any assumptions upon which the procedure is based and any limitations on its use. These assumptions and limitations should be defensible.

4. The procedure should be general and flexible enough to be applied to any process or control systems. It is obvious and unambiguous how to apply the procedure to any given condition or situation that could arise in the plant. These will include (but not be limited to):

   a. Situations in which there are controls on several different controlled parameters.

   b. Situations in which there are two or more controls on a single controlled parameter (such that failure of one control will not result in a change in k_{eff}). There may be one or several different limits associated with controlling the one parameter.

   c. Situations in which the variation of k_{eff} as a function of the parameter is more complex than the mass curves in the previous examples. For instance, as the parameter increases, k_{eff} could: (1) increase or decrease monotonically; (2) show increasing or decreasing slope (i.e., concave upward or downward); (3) have one or more maxima and/or minima over the range; or (4) be constant.

   d. Situations in which k_{eff} is a function of some discrete parameter, such as piece count.

If not obvious, this should include multiple examples showing how it applies in different cases.

5. The procedure should consider all factors, and only those factors, which could result in an error in the calculated k_{eff}. For instance, the type of control used to limit a parameter to a given value is irrelevant in terms of modeling the system, and thus should not be considered. However, if both controlled and un-controlled parameters can result in an error in the calculated k_{eff}, both should be considered. There should be a valid reason that any factors ignored may be considered to not be significant.

6. The procedure (or another document) should state what uncertainties and sources of error the MoS is intended to account for. For instance, the MoS is an allowance for uncertainties that can result in erroneous calculation of k_{eff}, but does not account for operational margin to ensure that a safety limit is not exceeded. This should correlate to the justification in Item #1 above.

Agenda Items for On-site Visit:

The following information should be available for the staff's review upon arrival:

- A well-developed procedure meeting the aforementioned criteria (may be draft, but should be complete).

- Several analyses applying the procedure to actual plant operations, along with any supporting documentation used for the analysis (e.g., criticality safety analyses, calculations). The systems analyzed should meet the following conditions:

    - They are diverse systems representing, at a minimum, one powder, one solution, one pellet/rod, and one fuel assembly system in the facility.

    - They are comparable in complexity to the most complex systems at the facility.

    - They rely on a wide variety of different controlled parameters (e.g., geometry, mass, moderation, density/concentration, neutron absorbers, interaction) that is representative of the spectrum of controls relied on at the facility.

    - They include both single and multiple parameter control schemes.

- Descriptions of facility processes sufficient to understand their theory of operation.

- Any technical references upon which the procedure is based.

In addition, the NRC staff will tour the entire facility. Both operations and criticality safety staff should be available for interview.