NRC-2015-0136 comments from South Carolina Electric & Gas – VC Summer Nuclear Station

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The NRC is seeking comments that address the following questions:

1. Is the proposed collection of information necessary for the NRC to properly perform its functions? Does the information have practical utility?

Some of the requested data is already available to the NRC in each plant's FSAR and correspondence docket. The rest of the information is not needed for NRC to properly perform its safety oversight. Neutron absorbers in the US nuclear fleet are generally performing well. In a few instances, problems have been noted and are being addressed using the existing corrective action programs in place. NRC resident inspectors at each plant are aware of the situation at that plant. NRC headquarters would receive their desired information more quickly and efficiently if they asked each resident inspector about the status of their plant.

Some of the proposed information will not be available for some plants. Licensee executives will not want to send a docketed letter to the NRC saying that information is not available, due to appearances. Licensees will spend limited engineering and licensing resources to assure that the information is not available, or to generate new information. This search will be expensive to perform, but will not provide a significant safety benefit.

2. Is the estimate of the burden of the information collection accurate?

No. The proposed generic letter estimates 170 hours of effort per reactor, in most cases. That number may be approximately correct for the responsible engineers to research the design and licensing history of each plant, assuming it only uses a single neutron absorber. However, the estimate completely ignores all the management and licensing reviews that will be necessary to submit the docketed response to the NRC. Most nuclear plants require a very detailed review of any docketed correspondence. Typically, there is much more supporting material generated. Each statement of fact in the docketed letter needs references and justification. VC Summer will be a Category 4 plant, so 5 pages of information are requested. The response can be expected to be at least 5 times that amount. The supporting reference material can be expected to be at least 5 times the amount of the response material. At least 5 people are going to review the material. Given the amount of material, reviews can be expected to take many hundreds, if not thousands of hours.

3. Is there a way to enhance the quality, utility, and clarity of the information to be collected?

Not without expending substantial engineering resources. It would be more beneficial to expend these limited resources on a topic which would result in a substantial safety benefit.

4. How can the burden of the information collection on respondents be minimized, including the use of automated collection techniques or other forms of information technology?

The NRC can gather most of the needed information by reviewing the FSAR for each plant. For many plants, this will be sufficient. If information is missing from the FSAR description, the information can be requested through the NRC resident inspectors. If the data is not forthcoming, a targeted NRC inspection can be performed.

Summary

The proposed Generic Letter is overly detailed and unnecessary. Given the performance history of the US nuclear fleet, with no incidents of any safety significance that can be attributed to neutron absorbers, the issues presented in the proposed Generic Letter do not have a high safety significance. Generic Letters have traditionally been used to deal with new safety-significant issues. As such, the number of Generic Letters has dropped substantially over the years, as most issues have already been addressed in the US nuclear fleet (as would be expected in a mature industry). Only 1 Generic Letter has been issued since 2009. The issue of neutron absorber performance does not appear to meet the safety criteria to be a Generic Letter.

Specific comments on Appendix A:

Areas of Requested Information
(1) Describe the neutron-absorbing material credited in the spent fuel pool (SFP) nuclear criticality safety (NCS) analysis of record (AOR) and its configuration in the SFP, including the following:

(a) manufacturers, dates of manufacture, and dates of material installation in the SFP

What use is this information to the NRC? How is a particular date going to illuminate the issue? Licensees who obtained neutron absorbers from certain manufacturers with performance problems already know these details, but most licensees with well-performing absorbers will require substantial research to determine them. Some of these manufacturers are no longer in business, so much of the information will no longer be relevant.

(b) neutron-absorbing material specifications

i. materials of construction, including the certified content of the neutron-absorbing component expressed as weight percent
ii. minimum certified, minimum as-built, maximum as-built, and nominal as-built areal density of the neutron-absorbing component
iii. material characteristics, including porosity, density, and dimensions

This detailed information is not always available. At the time of manufacturing, the data was generated and verified to meet limits, but it was probably not retained for long time periods. Since each lot of material was measured to have different parameter values, this question implies that data should be provided for each lot of material. Is that necessary? If so, hundreds of hours of effort will be expended for no safety benefit.

(c) qualification testing approach for compatibility with the SFP environment and results from the testing

At the time of manufacturing, the data was generated and verified to meet limits, but it was

probably not retained for long time periods. The licensee may never have received this information. Since the qualification testing, the absorber has probably spent decades within the spent fuel pool environment. This operating experience is much more relevant and valuable than the initial qualification testing performed decades ago when the absorber was newly introduced.

(d) configuration in the SFP

i. method of integrating neutron-absorbing material into racks (e.g., inserts, welded in place, spot welded in place, rodlets)

Why is this important?

ii. sheathing and degree of physical exposure of neutron-absorbing materials to the SFP environment

Why is this important? Is it asking about the surface area of the absorber which is exposed to water? Many absorber sheaths have vents provided. Is this question asking about the size of the vent?

(e) current condition of the credited neutron-absorbing material in the SFP

i. estimated current minimum areal density
ii. current credited areal density of the neutron-absorbing material in the NCS AOR
iii. recorded degradation and deformations of the neutron-absorbing material in the SFP (e.g., blisters, swelling, gaps, cracks, loss of material, loss of neutron-attenuation capability)

The first item implies that the licensee has some method of tracking areal density in real time. For most absorbers, this is not a moving target, so this question should only be asked of Boraflex licensees. The NRC has the second item available already. The third item will be tracked in the corrective action program, which the NRC resident inspectors have ready access to.

(2) Describe the surveillance or monitoring program used to confirm that the credited neutron-absorbing material is performing its safety function, including the frequency, limitations, and accuracy of the methodologies used.

Many licensees were not required to have a surveillance program. If a new requirement is being imposed, it should undergo a backfit analysis. The backfit analysis is unlikely to proceed, since there is very little safety significance.

(a) Provide the technical basis for the surveillance or monitoring method, including a description of how the method can detect degradation mechanisms that affect the material's ability to perform its safety function. Also, include a description and technical basis for the technique(s) and method(s) used in the surveillance or monitoring program, including:

i. approach used to determine frequency, calculations, and sample size
ii. parameters to be inspected and data collected
iii. acceptance criteria of the program and how they ensure that the material's structure and safety function are maintained within the assumptions of the NCS AOR
iv. monitoring and trending of the surveillance or monitoring program data
v. industry standards used

This question could require large amounts of information to adequately answer, and is not required for many licensees. If a new requirement is being imposed, it should undergo a backfit analysis. The backfit analysis is unlikely to proceed, since there is very little safety significance.

If it was already required by NRC licensing, the NRC already has this information.

(b) For the following monitoring methods, include these additional discussion items:

i. If there is visual inspection of in-service material:

1. Describe the visual inspection performed on each sample.
2. Describe the scope of the inspection (i.e., number of panels or inspection points per inspection period).

These requests are extremely vague. What level of detail is needed?

ii. If there is a coupon-monitoring program:

1. Provide a description and technical basis for how the coupons are representative of the material in the racks. Include in the discussion the material radiation exposure levels, SFP environment conditions, exposure to the SFP water, location of the coupons, configuration of the coupons (e.g., jacketing or sheathing, venting bolted on, glued on, or free in the jacket, water flow past the material, bends, shapes, galvanic considerations, and stress-relaxation considerations), and dimensions of the coupons.
2. Provide the dates of coupon installation for each set of coupons.
3. If the coupons are returned to the SFP for further evaluation, provide the technical justification for why the reinserted coupons would remain representative of the materials in the rack.
4. Provide the number of coupons remaining to be tested and whether there are enough coupons for testing for the life of the SFP. Also provide the schedule for coupon removal and testing.

Radiation exposure levels of the coupons are not measured. Coupons are intended to give a representation of the performance of the absorber, not measure the dose rates or fluence. SFP descriptions are available in the FSAR and other licensing correspondence. If a coupon monitoring program was required by NRC, they already know the requested information. If not, they should not be asking about information that is not required without a backfit analysis.

iii. If RACKLIFE is used:

1. Note the version of RACKLIFE being used (e.g., 1.10, 2.1).
2. Note the frequency at which the RACKLIFE code is run.
3. Describe the confirmatory testing (e.g., in-situ testing) being performed and how the results confirm that RACKLIFE is conservative or representative with respect to neutron attenuation.
4. Provide the current minimum RACKLIFE predicted areal density of the neutron-absorbing material in the SFP. Discuss how this areal density is calculated in RACKLIFE. Include in the discussion whether the areal densities calculated in RACKLIFE are based on the actual as-manufactured areal density of each panel, the nominal areal density of all of the panels, the minimum certified areal density, the minimum as-manufactured areal density, or the areal density credited by the NCS AOR. Also discuss the use of the escape coefficient and the total silica rate of Boraflex degradation in the SFP.

Why would each licensee have to describe how RACKLIFE works? The responsible NRC staff already know this. These detailed questions are more suited to a NRC inspection, rather than a docketed letter from the licensee.

iv. If in-situ testing with a neutron source and detector is used (e.g., BADGER testing, blackness testing):

1. Describe the method and criteria for choosing panels to be tested and include whether the most susceptible panels are chosen to be tested. Provide the statistical sampling plan that accounts for both sampling and measurement error and consideration of potential correlation in sample results. State whether it is statistically significant enough that the result can be extrapolated to the state of the entire pool.
2. State if the results of the in-situ testing are trended and whether there is repeat panel testing from campaign to campaign.
3. Describe the sources of uncertainties when using the in-situ testing device and how they are incorporated in the testing results. Include the uncertainties outlined in the technical letter report titled "Initial Assessment of Uncertainties Associated with BADGER Methodology," September 30, 2012 (Agencywide Access and Management Systems Accession No. ML12254A064). Discuss the effect of rack cell deformation and detector or head misalignment, such as tilt, twist, offset, or other misalignments of the heads and how they are managed and accounted for in the analysis.
4. Describe the calibration of the in-situ testing device, including the following:
a. Describe how the materials used in the calibration standard compare to the SFP rack materials and how any differences are accounted for in the calibration and results.
b. Describe how potential material changes in the SFP rack materials caused by degradation or aging are accounted for in the calibration and results.
c. If the calibration includes the in-situ measurement of an SFP rack "reference panel," explain the following:
    i. the methodology for selecting the reference panel(s) and how the reference panels are verified to meet the requirements
    ii. whether all surveillance campaigns use the same reference panel(s)
    iii. If the same reference panels are not used for each measurement surveillance, describe how the use of different reference panels affects the ability to make comparisons from one campaign to the next.

Why would each licensee have to describe how BADGER works? The responsible NRC staff already know this. These detailed questions are more suited to a NRC inspection, rather than a docketed letter from the licensee.

(3) For any Boraflex, Carborundum, or Tetrabor being credited, describe the technical basis for determining the interval of surveillance or monitoring for the credited neutron-absorbing material. Include a justification of why the material properties of the neutron-absorbing material will continue to be consistent with the assumptions in the SFP NCS AOR between surveillances or monitoring intervals.

If a Generic Letter is needed for Boraflex, Carborundum, and Tetrabor, the Generic Letter should only require responses from licensees who use these materials. The other materials should not be lumped in with the absorbers experiencing performance problems.

(4) For any Boraflex, Carborundum, Tetrabor, or Boral being credited, describe how the credited neutron-absorbing material is modeled in the SFP NCS AOR and how the monitoring or surveillance program ensures that the actual condition of the neutron-absorbing material is bounded by the NCS AOR:
(a) Describe the technical basis for the method of modeling the neutron-absorbing material in the NCS AOR. Discuss whether the modeling addresses degraded neutron-absorbing material, including loss of material, deformation of material (such as blisters, gaps, cracks, and shrinkage), and localized effects, such as non-uniform degradation.

(b) Describe how the results of the monitoring or surveillance program are used to ensure that the actual condition of the neutron-absorbing material is bounded by the SFP NCS AOR. If a coupon monitoring program is used, provide a description and technical basis for the coupon tests and acceptance criteria used to ensure the material properties of the neutron-absorbing material are maintained within the assumptions of the NCS AOR. Include a discussion on the measured dimensional changes, visual inspection, observed surface corrosion, observed degradation or deformation of the material (e.g., blistering, bulging, pitting, or warping), and neutron-attenuation measurements of the coupons.
(c) Describe how the bias and uncertainty of the monitoring or surveillance program are used in the SFP NCS AOR.
(d) Describe how the degradation in adjacent panels is correlated and accounted for in the NCS AOR.

Why is Boral lumped in with the other 3 absorbers in this section? This section seems to overlap with section 2 above. The NRC has reviewed and approved the NCS AOR, so they already have this information available.

(5) For any Boraflex, Carborundum, or Tetrabor being credited, describe the technical basis for concluding that the safety function for the credited neutron-absorbing material in the SFP will be maintained during design-basis events (e.g., seismic events, loss of SFP cooling, fuel assembly drop accidents, and any other plant-specific design-basis events that may affect the neutron-absorbing material).
(a) For each design-basis event that would have an effect on the neutron-absorbing material, describe the technical basis for determining the effects of the design-basis event on the material condition of the neutron-absorbing material during the design-basis event, including:

i. shifting or settling relative to the active fuel
ii. increased dissolution or corrosion
iii. changes of state or loss of material properties that hinder the neutron-absorbing material's ability to perform its safety function

(b) Describe how the monitoring program ensures that the current material condition of the neutron-absorbing material will accommodate the stressors during a design-basis event and remain within the assumptions of the NCS AOR, including:

i. monitoring methodology
ii. parameters monitored
iii. acceptance criteria
iv. intervals of monitoring

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