

From: Beasley, Benjamin
Sent: Monday, April 18, 2022 1:14 PM
To: Drew Peebles
Cc: Darrell Gardner; Cuadrado de Jesus, Samuel; Schmidt, Jeffrey
Subject: Questions for Accident Analysis Audit

Drew,

Below are some questions from our review of PSAR Chapter 4 for the Accident Analysis Audit. Jeff may discuss these during his visit to Kairos this week. We would also like to schedule an audit meeting when you have had more time and are ready to discuss these. Since Sam is coordinating the Accident Analysis Audit, please coordinate with him on planning the meeting.

Regards,
Ben

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| 4.2-6  | PSAR Table 4.2-1, Fuel Particle Properties, lists the PyC BAF values as less than or equal to 1.045 which is outside the range of the approved EPRI topical report, EPRI-AR-1-A. As stated in the EPRI topical report, Section 4.3.1, "Sufficiently isotropic PyC layers (BAF $\leq 1.035$ ) are able to perform well out to high fast neutron fluences because the irradiation-induced strains and stresses are relaxed to some extent by irradiation-induced creep." What is the basis for exceeding the EPRI topical report PyC BAF value? |
| 4.2-7  | Does the peak SiC temperature given in PSAR Table 4.2-6 include peaking factors (1.8 total in PSAR Table 4.5-4) and conservative boundary conditions (i.e., maximum coolant outlet temperature)?                                                                                                                                                                                                                                                                                                                                              |
| 4.2-8  | KP-TR-018, Section 3.4.2.1 states, there is negligible failures for peak fuel temperatures up to 1600 C.                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 4.2-8a | Based on PSAR Table 4.2-5, the staff understands the 1600 C to be the SiC coating layer temperature. Is the staff's understanding correct?                                                                                                                                                                                                                                                                                                                                                                                                    |
| 4.2-8b | Figure 7-5 of Reference 1 (EPRI-AR-1) indicates that SiC failures increase for temperatures above 1600 C. Therefore, it's                                                                                                                                                                                                                                                                                                                                                                                                                     |

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|        | unclear to the staff what no incremental transient induced failures up to 1600 C means. Please provide additional clarification regarding no incremental transient induced failures up to 1600 C.                                                                                                                                                                                                                                                             |
| 4.2-8c | KP-TR-018, Section 3.4.2.2 discusses two approaches to determine incremental fuel failures, the transient 1600 C limit and the methodology described in KP-TR-018, Section 4.2 using KP-Bison. PSAR Section 4.2.1 seems to refer only to the KP-Bison methodology where transient induced failures are added to the normal operation in-service failures. Please clarify the intended approach.                                                               |
| 4.2-8d | In KP-TR-018, Tables A1-1 and A4-3 show no increase in postulated event SiC failures. Do Tables A1-1 and A4-3 use the postulated event temperatures as given by Figures A1-2 and A4-1? If not, what temperatures or assumptions are used?                                                                                                                                                                                                                     |
| 4.2-8e | Does Table A4-4 differ from Table A4-3 due to including manufacturing defects (in addition to in-service failures)?                                                                                                                                                                                                                                                                                                                                           |
| 4.2-9  | Are the maximum TRISO temperatures given in KP-TR-018, Figures A1-2 and A4-1 the maximum kernel values? If not, what does the maximum TRISO temperature correspond to?                                                                                                                                                                                                                                                                                        |
| 4.2-10 | The initial maximum TRISO temperature in KP-TR-018, Figure A1-2 is approximately 1030 C. The SiC temperature given in PSAR Table 4.2-5 is less than 830 C. Using the kernel to SiC coating layer delta-T of 45 C from KP-TR-011, Table 3-17, the estimated initial transient temperature would be approximately 875 C which is well below 1030 C. Please provide additional information as to why the Figure A1-2 initial maximum TRISO is higher than 875 C? |
| 4.2-11 | On PSAR page 4-8 the peak SiC temp is described as provided in Figure 4.2-6 but the staff believe this should refer to Table 4.2-6.                                                                                                                                                                                                                                                                                                                           |
| 4.2-12 | No confirmatory destructive testing is documented in the PSAR. Review of KP-TR-011, Section 3.9.3, Fuel Pebble Destructive Examination, notes that destructive confirmatory testing for the KP-FHR fuel will be performed. The staff understood that destructive confirmatory testing was being planned for the Hermes fuel. Is destructive testing of the Hermes fuel still planned? If so, why is it not included as confirmatory testing in the PSAR?      |

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