

November 11, 2002

MEMORANDUM TO Dr. Sher Bahadur, Associate Director  
for Technical Support  
Advisory Committee for Reactor Safeguards  
Advisory Committee for Nuclear Waste

FROM: Michael R. Johnson, Branch Chief/**RA**  
Probabilistic Safety Assessment Branch  
Division of Systems Safety and Analysis  
Office of Nuclear Reactor Regulation

SUBJECT: EXAMPLES OF RISK-INFORMED LICENSING ACTIONS

During a meeting with the Advisory Committee for Reactor Safeguards (ACRS) Subcommittee on Probabilistic Risk Assessment (PRA) on September 9, 2002, it was suggested that the ACRS would benefit from being able to examine and discuss examples of risk-informed licensing actions completed by the Office of Nuclear Reactor Regulation (NRR). Therefore, attached are various examples of staff risk reviews of license applications that requested to implement: 1) a risk-informed inservice testing (RI-IST) program for selected valves, 2) a risk-informed inservice inspection (RI-ISI) program, 3) a risk-informed technical specification (RI-TS) change to extend the allowed outage time (AOT) for the emergency diesel generators (EDGs), and 4) a RI-TS change to extend the integrated leak rate test (ILRT) interval. In addition, attached is the risk-related portion of an extended power uprate (EPU) license application and the staff review. Although EPU applications are not identified as "risk-informed licensing actions," licensees address, and the staff reviews, the risks associated with the EPU. Note that the EPU Safety Analysis Report (ADAMS Accession # ML010080145) contains GE proprietary information and thus, should not be released to the public and should only be provided to those with a need-to-know to conduct official business. This document, which was provided previously to the ACRS during the Dresden EPU license amendment review, is identified in the attached summary, but is not enclosed with this transmittal. A copy of this document will be made available upon request.

The aim of providing these examples is to provide the ACRS with a sense of the information provided in the original licensee submittals, the level and focus of staff reviews, and how the staff has implemented the guidance contained in Regulatory Guide (RG) 1.174 and the associated Chapter 19 of the Standard Review Plan (SRP), as well as the application-specific regulatory guides and SRP sections. We would appreciate the opportunity to discuss these examples with the ACRS PRA subcommittee at a time that is convenient.

CONTACT: Donald Harrison, SPSB/DSSA/NRR  
415-3587

Dr. S. Bahadur

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If you or your staff have any questions, require additional information, or would like to arrange a meeting time to discuss these examples, please feel free to contact me at 415-3183 or Donnie Harrison of my staff at 415-3587.

ATTACHMENT: Enclosures (5)

Dr. S. Bahadur

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If you or your staff have any questions, require additional information, or would like to arrange a meeting time to discuss these examples, please feel free to contact me at 415-3183 or Donnie Harrison of my staff at 415-3587.

ATTACHMENT: Enclosures (5)

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SUMMARY OF ENCLOSURES

<b><i>Sequoyah Nuclear Plant Units 1 &amp; 2 RI-IST</i></b>		
<p>This license amendment is an example of a request to implement a risk-informed inservice testing (RI-IST) program, in which the staff did not grant the request. Although the licensee did provide some quantitative risk information, the staff determined that the information provided was not complete and did not address some important elements of an acceptable RI-IST program, as presented in Regulatory Guide 1.175. The licensee formally withdrew their application following discussions with the staff regarding the information that would be needed to complete and grant the application. Since the licensee withdrew their application, the staff requests for additional information (RAIs) were not formally issued. However, the staff did document their initial review effort through a Safety Evaluation (SE) that identified the areas in the original submittal that were incomplete. The SE identifies a number of issues with the licensee's submittal that would need to be resolved to grant the application, including: 1) providing additional information, such as the determination of the safety significance of the selected valves, 2) performing additional quantitative risk calculations, such as the calculation of the aggregate risk due to implementing the proposed RI-IST program and the impact of various plant/system operating configurations, 3) explaining differences in the materials available to the staff, such as the differences in the operating descriptions and configurations of some of the systems in the individual plant examination (IPE) versus this application, and 4) addressing tradition engineering considerations, such as defense-in-depth and safety margins. Without resolving the numerous issues identified in the SE, the staff could not determine if the supporting PRA was of adequate quality, scope, and detail for this specific application and thus could not accept the licensee's quantitative results.</p>		
<b>ADAMS Accession #</b>	<b>Subject</b>	<b>Date</b>
ML003718350	Licensee Submittal	April 27, 2000
ML011000080	Licensee Withdrawal	March 30, 2001
ML011240271	Safety Evaluation	May 4, 2001

<b><i>Dresden Station Units 2 &amp; 3 RI-ISI</i></b>		
<p>This license amendment is an example of a request to implement a risk-informed inservice inspection (RI-ISI) program. The licensee submitted relief requests for Dresden, Braidwood, Byron, and Quad Cities. In the Dresden submittal, the licensee was the first to use the Monti-Carlo method (i.e., Markov model), but they did not use it exactly as provided for in the Safety Evaluation approving the Electric Power Research Institute (EPRI) methodology, which is documented in EPRI TR-112657, Revision B-A. Thus, this departure from the approved methodology, and its risk impacts, became a main focus of the staff's review. During the review, it was also noted that the report on the Monti-Carlo method that is referenced in the EPRI topical report did not include a clear description of the equations to be used and only discussed it as part of the method development. The licensee identified the Monti-Carlo techniques used in the submittal and, following staff review of the licensee's approach, the use of the analysis as requested by the licensee was eventually approved. The licensee's process for evaluating the potential change in risk was determined to be acceptable because it accounted for the change in the number and location of elements inspected, recognized the differences in degradation mechanisms related to failure likelihood, and considered the synergistic effects of multiple degradation mechanisms within the same piping segment. Further, the calculated increase in risk associated with the implementation of the RI-ISI program was small and consistent with the guidelines of RGs 1.178 and 1.174.</p>		
<b>ADAMS Accession #</b>	<b>Subject</b>	<b>Date</b>
ML003762371	Licensee Submittal	October 18, 2000
ML010570133	RAI Response	February 19, 2001
ML012050103	Safety Evaluation	September 5, 2001

**Arkansas Nuclear One Unit 2 RI-TS EDG AOT**

This license amendment is an example of an one-time risk-informed technical specification (RI-TS) allowed outage time (AOT) extension request. The licensee requested to extend the AOT from 3 days to 10 days for an emergency diesel generator (EDG) to provide the licensee with needed flexibility in performing maintenance during power operation. In addition to the EDGs, the licensee had previously installed an alternate ac diesel generator (AACDG) that is completely independent from offsite power and the EDGs, except for the bulk fuel oil storage system. The one-time AOT extension for the EDGs is conditioned on the availability of the AACDG. The licensee addressed the risks associated with the one-time AOT extension, as well as the quality of their probabilistic risk assessment (PRA). However, at the time of the submittal, the licensee had not had a peer review of their PRA. The staff determined that the AOT extension was acceptable due to the licensee's requirement that the AACDG be available, the licensee's risk management program, and the low risk results.

<b>ADAMS Accession #</b>	<b>Subject</b>	<b>Date</b>
ML011690265	Licensee Submittal	June 12, 2001
ML012190033	RAI Response	July 31, 2001
ML012640398	RAI Response	September 19, 2001
ML012700225	Follow-up Submittal	September 25, 2001
ML012880265	Safety Evaluation	October 15, 2001

**Sequoyah Nuclear Plant Unit 2 RI-TS ILRT**

This license amendment is an example of a RI-TS request to extend the integrated leak rate test (ILRT) from a 10-year interval to a 15-year interval. However, in this case, the staff did not grant the requested extension to a 15-year interval, but instead, granted an extension of one operating cycle, approximately an 11.4-year interval. The shorter interval was justified since the risk analysis results indicated that the increase in large early release frequency (LERF) was in the range of  $10^{-7}$  to  $10^{-6}$ /year, which was due to the fact that not as much of the containment is visually inspectable due to the ice beds. RG 1.174 states that when the calculated increase in LERF is in the range of  $10^{-7}$  to  $10^{-6}$ /year proposed changes will be considered if the total LERF, including external events, is less than  $10^{-5}$ /year. The licensee did not have a full scope probabilistic risk assessment (PRA) that addressed external events and they were unable to demonstrate that the total LERF was less than  $10^{-5}$ /year. However, the extension to an 11.4-year interval was determined to be acceptable per the RG 1.174 acceptance guidelines since it could be shown by the licensee that allowing this interval would not increase the LERF value by more than  $10^{-7}$ /year, indicating that this is only a very small increase.

<b>ADAMS Accession #</b>	<b>Subject</b>	<b>Date</b>
ML012890474	Licensee Submittal	October 9, 2001
ML020530292	RAI Response	February 14, 2002
ML020870238 ML012530113	RAI Response Referenced RI-ISI RAI Response	March 13, 2002 August 31, 2001
ML021010066	RAI Response	April 9, 2002
ML021140405	Follow-up Submittal	April 11, 2002
ML021280455	Safety Evaluation	May 7, 2002

**Dresden Station Units 2 & 3 EPUs**

This license amendment is an example of an extended power uprate (EPU) request. Though not identified as a risk-informed licensing action, these submittals do address the risks associated with implementing the EPU. The licensee submitted EPU license amendments for Dresden and Quad Cities, requesting a 17 to 18 percent increase in their original licensed power levels. Through the staff review, a number of issues were identified that resulted in the licensee providing additional information and performing additional analyses. In particular, the licensee performed some simplistic seismic risk analyses to ensure that the conditions and modifications credited in their seismic margins analysis, though not implemented, were not risk-significant. Since this issue had the potential to raise a question regarding adequate protection, this area became a main focus of the staff review.

Note that the EPU Safety Analysis Report (ML010080145) contains GE proprietary information and thus, should not be released to the public and should only be provided to those with a need-to-know to conduct official business. It is not enclosed with this transmittal, but will be made available upon request.

<b>ADAMS Accession #</b>	<b>Subject</b>	<b>Date</b>
ML010080047	Licensee Submittal (Letter & Selected Attachments)	December 27, 2000
ML010080145 <b>(Sensitive - Contains GE Proprietary Information)</b>	Licensee Submittal of Extended Power Uprate Safety Analysis Report (Attachment E to ML010080047)	December 31, 2000
ML010470076	RAI Response	February 12, 2001
ML012330383	RAI Response	August 14, 2001
ML012550410	RAI Response	September 5, 2001
ML012640178	RAI Response	September 14, 2001
ML012680224	RAI Response	September 19, 2001
ML012760060	RAI Response	September 26, 2001
ML020140022	RAI Response	November 30, 2001
ML013510595	NRC Approval (Letter with Enclosures 1 & 2)	December 21, 2001
ML013540187	Safety Evaluation (Enclosure 3 to ML013510595)	December 21, 2001