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Date: 5/11/01 7:50PM
Subject: RESULTS OF PHASE I DEVELOPMENT

Attached is the BWROG Comments On Risk-Based Performance Indicators: Results of Phase 1 Development.

<<bwr01032.doc>>

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Project No. 691

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SUBJECT: **BWROG COMMENTS ON RISK-BASED PERFORMANCE INDICATORS: RESULTS OF PHASE-1 DEVELOPMENT**

The BWR Owners' Group (BWROG) appreciates the opportunity to comment on the subject report. These comments, unfortunately, do not reflect a thorough review of the appendices to the subject report due to the review time allowed and the unavailability of the appendices electronically. The comments in this letter were approved by a vote of both the Integrated Risk Informed Regulation Committee and the BWROG Primary Representatives.

At the outset, we want to recognize that substantial work was applied to develop the risk-based performance indicators (RBPIs) methodology, to exercise the methodology, and to document the results in the subject report. This work has provided the basis for discussion of the future direction of the revised reactor oversight program. It is, however, not clear to the BWROG that the performance indicators provide a tool which will add sufficient value to outweigh the additional burden to implement the program.

The BWROG believes that consideration of the unintended consequences of the suggested RBPIs be evaluated. Such unintended consequences include, but is not restricted to, redefining Technical Specification AOTs, redefining Maintenance Rule implementation, and impacting plant operations.

General Comments are contained in this letter. These comments are organized into four categories. The four categories are General, At-Power, Shutdown, and External Events. Specific Comments are contained in Attachment 1.

General

1. The RBPIs must be consistent with and take credit for other risk informed initiatives. If the RBPIs are not integrated with existing risk informed regulations such as technical specifications, then they will in effect become another layer of regulation.

2. Table 3.1.2-1, Candidate Mitigating Systems RBPIs, includes MOVs and AOVs as component classes. Component failures that are not PRA functional failure should not be included in the calculation of unreliability.
3. The unavailability indicator at the train/system level is not relevant because plant configuration is controlled by other means such as 10CFR50.65 (a)(4). It is the high risk combinations of equipment that are most important to risk, not planned unavailability of a single train. The actual risk of equipment unavailability due to planned maintenance is generally less than calculated because contingency actions are usually not credited in performance indicator calculations of risk.
4. A single event should not cause multiple indicators to change color which could result in one event leading to degraded cornerstones. One event at a plant should not impact a performance indicator (PI) and at the same time have a significance determination process (SDP) performed for the event.
5. We agree with other stakeholder comments stating that additional PIs should result in less inspections. But it is not clear from the subject report how the inspection scope identified in document, as being impacted by the new RBPIs, will be reduced.
6. We agree with previous stakeholder comments stating that the action matrix will need to be revised if additional PIs are added.
7. The discussion in Section 2 regarding risk and NRC safety goals is a good discussion that places the risk associated with nuclear reactors in perspective compared to other societal risk. An implication of this discussion is that there will be no need to reduce any thresholds in future.
8. It is important that the benefit should be weighed against additional data collection effort for each RBPI that is added to the reactor oversight program.
9. The BWROG endorses switching the green to white threshold basis from the 95th percentile to the recommended 1E-6 delta CDF contingent upon reasonable calculation and uncertainty of parameter being monitored.
10. The review of this document would have been much more convenient if the Appendices would have been available electronically. The confusion in how to obtain copies of the appendices has resulted in very limited time for the BWROG to review the appendices.

<u>At Power</u>

1. It appears that BWR General Transient (GT) & Loss of Heat Sink Conditional Core Damage Probability are at least an order of magnitude too high in Table 3.1.1-1, Initiating Event RBPIs. For example, using the numbers in the table, it appears that the CCDP of GT for BWR Plant 18 is about 1.5E-6. It also seems like there is an inconsistency between the General Transients for BWRs and PWRs. The baseline frequencies are 1.3 (BWR) and 1.0 (PWR).
2. The data in Table 3.1.2-2, BWR Mitigating System RBPIs, does not look realistic for majority of BWR's. Also, the green to white threshold for emergency AC power reliability is a change of 5%. This small change does not seem reasonable to monitor against, i.e., it is within the uncertainty range of the number being calculated.
3. Regarding the data in Table 3.1.2-2, it is not clear what the basis is of the assumed number of

demands for these systems/components or from where the values came. There may be discrepancies between the number of estimated demands and the actual number of demands. Actual demands are typically greater than estimated demands.

5. It is the position of the BWROG that there should be no Level 2 PI. The basis for this position is to maintain consistency with the ASME PRA standard and other risk informed initiatives that allow simplified LERF calculations.

Shutdown

1. It is the position of the BWROG that the shutdown indicators should be delayed until more experience is gained with the on-line RBPIs. The remaining comments regarding shutdown are given for use when the decision is made to go ahead with the shutdown RBPIs.
2. An unintended consequence of the level of detail in Tables 3.2.2-2 and 3.2.2-4 is that they in effect tell the plant how to run an outage. Although a plant might be able to show that a given configuration is low risk after putting in place contingency actions, the plant management may feel obligated to follow the table and avoid the configuration even though it is a safe configuration. The tables should be constructed at a higher level such as at the level of key safety functions. The current level of detail is not consistent with NEI 91-06.
3. Regarding Table 3.2.2-1 and Table 3.2.2-2, the basis for the numbers is not clear. It is also not clear why there is such a large difference between the PWR and BWR durations. Some of the durations appear to be short, e.g., the duration allowed for emergency diesel generator out of service is less than allowed by typical BWR Technical Specification. This would have the unintended consequence of redefining Technical Specification AOTs.
4. Guidance on implementation for Table 3.2.2-2 should address taking credit for contingencies. It also should allow for a SDP Phase 3 type of plant specific evaluation to be used when the simplified table gives an overly conservative result.

External Events

1. External events RBPIs at the plant specific level will have little value and should not be developed. Seismic events can not be predicted and would not have a higher probability of occurring for reasons that are under control of the plant.
2. It is recognized that fire events can be prevented and a frequent occurrence of small fires or single occurrence of fire sufficient to result in loss of safety function or plant scram may indicate degradation in reactor safety due to reduction of fire prevention/mitigation capability. However, fires of risk significant consequence would generally result in an increase in an indicator of safety systems or at the plant level, thus fire is captured already in existing PI and need not be developed independently. Also plant administrative procedures require compensatory actions when mitigation equipment is unavailable, so the position applies even if there is "hot" work being performed.

We believe that these comments need to be resolved, and that following their resolution, an additional period is necessary for public review and comment, prior to piloting any of the phase 1

RBPIs.

If you have any questions regarding these comments, please contact Greg Krueger (Exelon Nuclear), BWROG Integrated Risk Informed Regulation Committee Chairman at (610) 640-6574 or Rick Hill (GE) Project Manager at (408) 925-5388.

Regards,

Original Signed By

J. M. Kenny
BWR Owners' Group Chairman

Attachment: BWROG Specific Comments

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BWROG SPECIFIC COMMENTS ON
RISK-BASED PERFORMANCE INDICATORS:
RESULTS OF PHASE-1 DEVELOPMENT

1. Important information that is required to understand the PIs and their thresholds is not included in the body of the report, but is buried in footnotes in the appendices. Sometimes the footnote directly contradicts the information presented in the text. The following are some examples of this:

   Table A.1.1.1-1 – The footnote indicates that BWR general transients do not meet the 1E-6 CCDP criterion for being included in the risk based initiators but are included anyway because their frequency is high. This goes against the text that explains the criteria for including initiating events. This type of information should be included in the text rather than being buried in a footnote in an appendix.

   Page A-9 – A footnote indicates the LOFW and LOHS initiators include loss of offsite power events. This information needs to be included in the body of the report. Loss of offsite power events have very different CCDPs and inpact than LOFW and LOHS events with power available. By combining these initiators, it effectively applies a LOOP CCDP to LOFW and LOHS initiator frequencies. This information should be incorporated into the review of the main document.

   Table A.1.4 series of tables – These tables contain footnotes that indicate general transients include the LOHS and LOFW events. Once again, this effectively applies the higher CCDP from LOHS and LOFW to the higher initiating event frequency of a general transient. This information is essential for the review of the main document. The thresholds in the tables do not make sense without this information.

   Table A.2.4 series of tables contain important information in the footnotes. It states that the unreliability value also includes unavailability. These should not be combined, because these two parameters have different affects on model results. This information is necessary to understand the tables in the main part of the report.

2. On page A-51, one of the LERF multipliers is stated to be 10. This can't be correct since the multipliers must range from 0 to 1.

3. Table A.3.1-1 contains two BWR Mark I rows.

Attachment

4. On page A-58, the author provides a "reformulation" of LERF. This should not be done in this paper. The reformulation introduces a "large" definition that is different than is typically used at BWRs. Most BWRs use 10% of the CsI released to the environment as the threshold for "large". It is also different than the definition in the ASME Standard (draft) on PRA applications for both "large" and "early". The standard defines "early" as prior to effective offsite actions. The definition of "early" in this appendix would indicate that TW sequences are early releases. This is not typical. The definition needs to be left to the standard and not reformulated for the PIs.

5. Section B totally mischaracterizes the shutdown risk contributors for BWRs. The risk is high in the first two days of cold shutdown because decay heat is high and the model probably did not credit steam driven systems. It is not directly a result of POS 5 (cold shutdown with the head on). In fact, risk follows decay heat level. If the head is replaced later in the outage, CDF is extremely low due to the long time to boil. Also, if steam driven systems are not properly credited in the model, CDF is over predicted. For POS 5 (as defined in the appendix), it is likely that CDF has a high contribution from loss of AC power events (other initiators tend to be lower). In LOOP events, the reactor can re-pressurize so that high pressure systems can be used for injection. It is suggested that the shutdown PIs be deferred until the risk drivers during shutdown are properly understood and can be reflected appropriately in performance indicators.

6. In the section of fire events, there is an inconsistency with the way plants treat fire mitigating system impairments. Most plants put compensatory measures in place when detection/suppression systems are impaired. In nearly all cases, these measures are just as reliable as the automatic systems, so unavailability has very little meaning as a PI. In addition, many plants' fire systems are only licensed for automatic containment of the fire, rather than suppression. Manual suppression means are typically required even if the automatic systems are available.

7. In many of the sections in Appendix F, the reader is referred to F.6 for the calculation that was performed. F.6 only contains the calculation for one of the PIs. It then says that a later table will cover the others. We could not find this "later" table.

8. The process that was used in Appendix F to create data to validate the thresholds is not valid. Duplicating and recombining existing data points does not create any new information, and cannot be used to increase the statistical significance of that data set. This evaluation needs to be performed by identifying plants that have both good and bad performance, and then taking actual data from those plants

9. Abbreviations and Acronyms – page xix – LPI and LPR are both defined as Low Pressure Injection.

10. Page 2-8 – Fourth paragraph in Step 4, first sentence – It seems like the sentence

should read "Some elements under the initiating events cornerstone and mitigating systems cornerstone affect CDF as well as LERF."

12. Paragraph 3.2.2 – Without the benefit of having Appendix B, the methodology in the subject paragraph seems somewhat suspect.

13. The method uses time in a configuration in excess of the baseline as metric of risk. The numerator in the cited equation is ΔCDP threshold. This paragraph states that the thresholds are the standard thresholds for G/W, W/Y, and Y/R. However, the threshold established in Section 2 is based on core damage frequencies per year not changes in core damage probabilities.

14. Configuration CCDF, is assumed to be calculated for each plant. The frequency of the CCDF expressed here is per day. If one assumes the average CDF for operation, 1E-5 per year, the CDF per day is 2.7E-8. This means the outage configuration needs to be 36 times more likely to yield core damage than the normal operating configuration just to have a CCDF of 1E-6, which is low. Using the listed thresholds and CCDFs the threshold Δt's will range from .01 to 100 days. Hence, a color change can occur when .01 of a day is exceeded and when, 0.1 of a day is exceeded, etc. Having short time limits is relatively meaningless since outage delays typically will exceed 2.4 hours.

14. Section 5 Validation and Verification: It appears that V&V is for the data (failure rates) being used. It seems more appropriate to pick a plant with declining performance and apply the RBPI methodology to it to determine if the indicators would predict declining performance.