

**Pre-Submittal Meeting
BWROG Proposed Topical Reports
For Risk-Informed Technical
Specifications Initiatives 4a and 6**

Presentation to NRC

May 23, 2006

BWROG

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Overview

- Purpose of Meeting
- Background
- Revisions Since October 2004 Meeting
- Initiative 6 Report Summary
- Initiative 4a Report Summary
- Risk-informed Approach
- Risk Impact Measures and Acceptance Criteria
- System Evaluation
- Risk Results
- Summary
- Response to NRC Staff Comments
- Schedule

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Purpose of Meeting

- Review BWROG proposed Topical Reports on Initiatives 4a and 6
 - Scope
 - Risk-informed approach
 - Schedule
- Review earlier staff comments and concerns (from October 28, 2004 meeting) and BWROG responses
- Obtain NRC staff feedback on proposed plan and schedule

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Background

- BWROG survey identified those TS changes that have high probability of enhancing plant safety & improving plant operations
- Two topical reports are being prepared for NRC submittal
 - Initiative 4a
 - Initiative 6
- Scope of topical reports
 - Provide risk-informed analysis to support changes to completion times of selected technical specification (TS) conditions

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Background (continued)

- Selected TS conditions based on BWROG survey of plants
- TS changes selected for Initiative 6 are a subset of those considered in NRC approved topical reports submitted by the PWROG (previously CEOG)
- TS improved completion times selected in Initiative 4a are a subset of those TSs chosen for Initiative 6
- Previous presubmittal meeting with NRC on October 28, 2004
 - BWROG has subsequently addressed staff comments and conducted internal reviews leading to additional revision prior to submittal

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Revisions Since October 2004 Meeting

- Two bounding CDF values ($<2.5E-05/\text{yr}$ and $<1.0E-04/\text{yr}$) were incorporated into the analysis to ensure all BWR plants are covered (Option 1 and Option 2)
- Qualitative compensating provisions for each analyzed system were enhanced
- Proposed end state changes (Mode 4 to Mode 3) have been removed from the reports. End state mode changes are already covered by previous approved BWROG Initiative 1 report and TSTF - 423.
- Other minor changes

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Initiative 6 Summary

- “Technical Justification to Support Risk-Informed Modifications to Selected Technical Specifications for Conditions Leading to Exigent Plant Shutdown for BWR Plants”
- **Applicable Systems**
 - Reactor coolant system (RCS) leakage detection instrumentation
 - Standby Gas Treatment (SGT) system
 - Main Control Room Environmental Control (MCREC) system
 - Main Control Room Air Conditioning system
- **Proposed Changes to CTs:**
 - Current completion time: 1 hour
 - Proposed completion time: 7 days for Option 1 and 1 day for Option 2

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Initiative 4a Summary

- “Technical Justification to Support Risk-Informed Completion Time Extensions for the Standby Gas Treatment (SGT) System and Main Control Room Environmental Control (MCREC) System for BWR Plants”
- **Applicable Systems**
 - One SGT subsystem inoperable
 - One MCREC subsystem inoperable
- **Proposed Changes to CTs:**
 - Current completion time: 7 days
 - Proposed completion time: 30 days for Option 1 and 15 days for Option 2

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Risk-Informed Approach

- Risk Impact Measures and Acceptance Criteria (Initiative 6)
 - The PWROG submittal addressed two types of systems.
 - The failure of systems had an impact on CDF and LERF values
 - The failure of systems had no direct impact on CDF and LERF
 - The risk impact measures for each group were different.
 - Three systems selected for this BWROG analysis belong to the second group, i.e., they have no direct impact on CDF and LERF
 - One system, whose failure could not directly lead to core damage, was conservatively treated as though it could impact CDF and LERF values

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Risk-Informed Approach (continued)

- Risk Impact Measures and Acceptance Criteria (Initiative 6) (continued)
 - These systems are not modeled in the PRA, and therefore CDF and LERF calculations are not possible and direct comparison to RGs 1.177 and 1.174 acceptance criteria is not applicable. Therefore, PRA and LERF calculations are neither relevant nor judged to be needed for CT change submittal
 - However, the following bounding analyses were provided to give some quantitative insight into the change

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Risk-Informed Approach (continued)

- Risk Impact Measures and Acceptance Criteria (Initiative 6) – (cont'd)
 - Risk impact measures adopted for this analysis are similar to those used in the approved WOG topical report. Acceptance criteria similar to the ones reported in RGS 1.177 and 1.174 for core damage and large early release risks
 - ICCDP - incremental conditional core damage probability < 5.0E-7
 - ICLERP - incremental conditional large early release probability < 5.0E-8
 - Δ CDF - change in the core damage frequency < 1.0E-6/yr
 - ICRRP - incremental conditional radiation release (>TS limits) prob. < 5.0E-7
 - Δ RRF- change in the radiation release (>TS limits) frequency < 1.0E-7/yr
 - For analysis purposes, a CDF value of 2.5E-05/yr and 1.0E-04/yr were assumed for conditional radiation release risk increase
 - Conservatively assumed selected systems are challenged during core damage (i.e., with a frequency of 2.5E-05/yr and 1.0E-04/yr)

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Risk-informed Method and Acceptance Criteria (CDF and LERF Impacted)

- $ICCDP = \Delta R_{CDF} \times d = (R_{I,CDF} - R_{O,CDF}) \times d$ where:
 - ΔR_{CDF} = the conditional risk increase, in terms of CDF, caused by the specified system's unavailability
 - d = the proposed extension of the time interval during which the plant is allowed to keep operating at power given the condition
 - $R_{I,CDF}$ = the plant CDF with the system permanently unavailable
 - $R_{O,CDF}$ = the plant CDF without the proposed time extension
- $ICLERP = \Delta R_{LERF} \times d = (R_{I,LERF} - R_{O,LERF}) \times d$
 - Calculated similar to ICCDP above, except with LERF in place of CDF

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Risk-informed Method and Acceptance Criteria (CDF and LERF Not Impacted)

- $ICRRP = \Delta R_{RRF} \times d = (R_{I,RRF} - R_{O,RRF}) \times d$ where:
 - ΔR_{RRF} = the conditional risk increase, in terms of RRF, caused by the specified system's unavailability
 - d = the proposed extension of the time interval during which the plant is allowed to keep operating at power given the condition
 - $R_{I,RRF}$ = the plant RRF with the system permanently unavailable
 - $R_{O,RRF}$ = the plant RRF without the proposed time extension

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Risk-informed Method and Acceptance Criteria - Initiative 6 (CDF and LERF Not Impacted) (cont'd)

- The change in RRF (i.e., ΔRRF) for each system is obtained by multiplying the respective ICRRP value by the yearly frequency, f , the system is expected to be declared inoperable:
$$\Delta RRF = ICRRP \times f$$
- The assessed ICRRP and ΔRRF values are compared to acceptance criteria similar to the ones reported in Reg Guides 1.177 and 1.174 for core damage and large early release risks, respectively

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Risk-informed Method and Acceptance Criteria - Initiative 4a

- Initiative 6 addresses loss of function, whereas Initiative 4a addresses loss of redundant sub-systems
- Failure of an additional sub-system is required to cause a loss of function. Therefore, another failure probability term is included in the evaluation of ΔR_{RRF}
- However, value of "d" increases from 7 days to 30 days for Option 1 and 15 days for Option 2
- The remaining evaluation and acceptance criteria are same as that for Initiative 6

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Systems Evaluation

- Format for Evaluation of Each Selected System
 - a) Description
 - b) Plant Applicability
 - c) Limiting Condition for Operation (LCO)
 - d) Licensing Basis for LCO
 - e) Condition Requiring Entry into Shutdown Action Statement
 - f) Proposed Modification to Shutdown Required Actions
 - g) Basis for Proposed Change
 - h) Defense-in-Depth Considerations
 - i) Compensating provisions
 - j) Tier 2 Restrictions

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**Initiative 6 (CDF and LERF Impacted):
Option 1- Plants Having CDF <2.5E-05/Year
(Option 2 Evaluation Similar But With Different CDF)**

| System | Proposed Completion Time (CT) (Days) | $\Delta R_{CDF}/yr$, or Challenge Freq per year (1) | ICCDP (2) | $\Delta CDF/Yr$ (3) (f=1/5) | $\Delta CDF/Yr$ (3) (f=1/3) |
|--|--------------------------------------|--|-----------|-----------------------------|-----------------------------|
| RCS Leakage Detection Instrumentation System | 7 | 1.0E-05 | 1.9E-07 | 3.8E-08 | 6.4E-8 |

| System | CLERP (4) | $\Delta R_{LERF}/yr$ (5) | ICLERP (6) | $\Delta LERF/Yr$ (7) (f=1/5) | $\Delta LERF/Yr$ (7) (f=1/3) |
|--|-----------|--------------------------|------------|------------------------------|------------------------------|
| RCS Leakage Detection Instrumentation System | 0.1 | 1.0E-06 | 1.9E-08 | 3.8E-09 | 6.4E-09 |

- (1) $\Delta R_{CDF}/yr$ = Conditional Core Damage Frequency Increase
 (2) ICCDP = Incremental Conditional Core Damage Probability, Acceptance criterion: ICCDP < 5.0E-7
 (3) $\Delta CDF/yr$ = Change in Core Damage Frequency, Acceptance criterion: < 1.0E-6/year
 (4) CLERP = Conditional Large Early Release Probability
 (5) $\Delta R_{LERF}/yr$ = Conditional Large Early Release Frequency Increase
 (6) ICLERP = Incremental Conditional Large Early Release Probability, Acceptance criterion: ICLERP < 5.0E-8
 (7) $\Delta LERF/yr$ = Change in Large Early Release Frequency, Acceptance criterion: < 1.0E-7/year

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**Initiative 6 - Radiation Release (non-LER) Risk Impact :
Option 1- Plants Having CDF <2.5E-05/Year
(Option 2 Evaluation Similar But With Different CDF)**

| System | Proposed Completion Time (CT) (Days) | $\Delta R_{RRF}/yr$, or Challenge Freq per year (2) | ICRRP (3) | $\Delta RRF/Yr$ (4) (f=1/5) | Delta RRF/Yr (4) (f=1/3) |
|------------------------------|--------------------------------------|--|-----------|-----------------------------|--------------------------|
| Standby Gas Treatment System | 7 | 2.5E-05 | 4.8E-07 | 9.6E-08 | 1.6E-7 |
| MCREC System (1) | 7 | 2.5E-05 | 4.8E-07 | 9.6E-08 | 1.6E-7 |
| Control Room AC System | 7 | 2.5E-05 | 4.8E-07 | 9.6E-08 | 1.6E-7 |

- 1) For the BWR 6 STS, this system is called Control Room Fresh Air (CRFA) System. The MCREC and CRFA Systems both perform the same function.
 (2) ΔR_{RRF} = Conditional Radiation Release Increase Frequency.
 (3) ICRRP = Incremental Conditional Radiation Release Probability. Acceptance criterion: ICRRP < 5.0E-07
 (4) Acceptance criterion: $\Delta RRF/Yr$ < 1.0E-07/Yr.

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Initiative 4a - Radiation Release (non-LER) Risk Impact:
Option 1- Plants Having CDF <2.5E-05/Year

(Option 2 Evaluation Similar But With Different CDF)

| System | Proposed Completion Time (CT) (Days) | $\Delta R_{RRR}/yr$, or Challenge Freq per year | ICRRP (2) | $\Delta RRF/Yr$ (3) (f=1 per 18 months) | $\Delta RRF/Yr(3)$ (f=1 per year) |
|--|--------------------------------------|--|-----------|---|-----------------------------------|
| Standby Gas Treatment System | 30 | 1.3E-06 | 1.1E-07 | 7.3E-08 | 1.1E-7 |
| Main Control Room Environment Control (MCREC) System (1) | 30 | 1.3E-06 | 1.1E-07 | 7.3E-08 | 1.1E-7 |

- 1) For the BWR 6 STS, this system is called Control Room Fresh Air (CRFA) System. The MCREC and CRFA Systems both perform the same function.
- 2) ICRRP = Incremental Conditional Radiation Release Probability. Acceptance criterion: ICRRP < 5.0E-07
- 3) $\Delta RRF/yr$ is obtained by multiplying ICRRP by the frequency f . Acceptance criterion: $\Delta RRF/Yr < 1.0E-07/Yr$.

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Risk Results: Conservatism

- Systems considered in this analysis have no direct effect on CDF and LERF. PRA models include the systems considered here and it is not possible to calculate the impact on CDF and LERF
- Quantitative risk assessments are not needed to justify these CT changes. However, a conservative quantitative basis is provided to provide some basis.
- Use of a CDF value of 2.5E-05/yr and 1.0E-04/yr in analysis is very conservative since not all core damage events lead to a significant release from containment that challenge systems considered in the analysis
- Use of acceptance criteria for ΔRRF (non LER) as 1.0E-07/yr is the same as for a large early release
- A high value for CDF due to LOCAs (30% of total CDF) and LOCAs avoided (a factor of 3 increase) was used in the analysis of the RCS leakage detection instrumentation

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Summary

- BWROG proposes to submit two topical reports, Initiatives 4a and 6, for NRC review
- Systems being considered have no direct effect on CDF and LERF. However, bounding quantitative calculation provided for gaining insight
- Primary effect of unavailability is on design basis
- Proposed changes
 - Initiative 4a - Change CT for one subsystem inoperable - 7 days to either 30 days or 15 days
 - Initiative 6 - Change CT for explicit LCO 3.0.3 entry - 1 hour CT to either 7 days or 1 day
- Benefits of proposed changes
 - Avoid unnecessary unscheduled plant shutdowns
 - Minimize plant transitions and associated transition and realignment risks
 - Provide for increased flexibility in scheduling and performing maintenance and surveillance activities

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Responses to Staff Comments from Earlier Pre-submittal Meeting

| Staff Comments | BWROG Responses |
|--|-----------------------------------|
| While questions may exist over the exact completion times and the associated justifications, in general, these specific proposed submittals are acceptable, since they are limited in nature and are subsets of previously approved changes. | Agree. No BWROG action needed. |

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Response to Staff Concerns from Earlier Pre-submittal Meeting (continued)

| Staff Comments | BWROG Responses |
|---|---|
| <p>The risk-informed approaches that are intended to extend CTs/AOTs for multiple TS systems.</p> | <p>We presume this issue has been resolved for the PWROG report. Entry into a LCO 3.0.3 is a low probability event. Frequency of entering any LCO 3.0.3 is estimated to be a low frequency event. Entering a second specific LCO 3.0.3, (i.e., with a seven day CT), while already on a seven day LCO 3.0.3 is very remote. Entering a third LCO 3.0.3 is judged to be essentially incredible. The probability of being with one subsystem in multiple system is higher, but none of these systems have any direct impact on CDF or LERF, and are therefore not modeled in PRAs and PRA cannot provide any information to support plant operation.</p> <p>Qualitative considerations which are part of configuration management, carried out to conform to Maintenance Rule a(4), are judged to be adequate to help the plant personnel handle situations with simultaneous multiple entries.</p> |

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Response to Staff Concerns from Earlier Pre-submittal Meeting (continued)

| Staff Comments | BWROG Responses |
|---|---|
| <p>Risk-informed evaluations for systems not specifically modeled for probabilistic reliability assessment (PRA).</p> | <p>Three out of four systems have no impact on CDF or LERF, and therefore PRA results are not relevant for these systems. New figures of merit have been proposed based on the concepts developed in PWROG report and approved by NRC. These metrics are evaluated only to provide some quantitative insight into the effect of the changes when none is available.</p> <p>Even the fourth system has no direct impact on PRA results, and is generally not modeled in a PRA. However, a bounding PRA treatment has been provided and results checked against the limits provided in RG 1.174 and 1.177.</p> <p>Please note that the evaluation includes defense-in-depth considerations and identification of compensating provisions.</p> |

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Response to Staff Concerns from Earlier Pre-submittal Meeting (continued)

| Staff Comments | BWROG Responses |
|--|--|
| Using non-CDF (core damage frequency) and non-LERF (large early release frequency) metrics | Since these systems have no impact on CDF or LERF, and are not modeled in PRAs, PRA evaluations are not relevant. With no change to CDF and LERF, a qualitative evaluation should suffice. However, the BWROG chose to use of the Radiation Risk metrics that have been developed by the PWROG, and has been reviewed and accepted by NRC. These metrics are evaluated only to provide some quantitative insight into the effect of the changes when none is available. The justification for change is based on both quantitative and qualitative risk-informed considerations. |

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Response to Staff Concerns from Earlier Pre-submittal Meeting (continued)

| Staff Concern | BWROG Response |
|---|--|
| The requests must completely follow all aspects and requirements of Regulatory Guide (RG) 1.174 and 1.77, including a thorough presentation of Tier 2 requirements, and a commitment to an adequate Tier 3 configuration risk management process, which for multiple system requests would be similar to the Risk Management Technical Specification (RMTS) Guidance provided for RMTS Initiative 4b, Risk-Informed Completion Times. The level and scope of PRA must be addressed in the submittals. | Agree. Because these systems have no direct impact on CDF and LERF, no Tier 2 requirements are needed and no specific Tier 3 requirements are identified. Compensating provisions have been identified for each system for which increased CT is sought. Also, any emergent situations should be handled by the following the Maintenance Rule a(4) provisions. |
| The requests should include a thorough risk evaluation that addresses all requested changes, a full justification and explanation of the acceptability of and need for the changes. | Agree. However, because these systems have no direct impact on CDF and LERF, and the systems are not modeled in the PRAs, bounding analyses are carried out in lieu of "thorough risk evaluation." The need for the change was identified by a survey of the BWROG as noted in the report. |

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Response to Staff Concerns from Earlier Pre-submittal Meeting (continued)

| Staff Concern | BWROG Response |
|--|--|
| The submittal should be coordinated/submitted through the Risk Informed Technical Specifications Task Force (RITSTF), or equivalent owners group task force, for coordination, assignment of priority, and industry approval. In the case of the subject TRs, the BWROG indicated that it will reflect coordination effort in its submittal cover letters. | Our submittal is coordinated with NEI. |
| Need to evaluate the status of a plant with an increasing number of individual risk-informed CT/AOT extensions that have not proposed an integrated, full scope Tier 3, could be resource intensive and would be a low priority compared to plants implementing a full scope Tier 3 and associated processes. | We presume this issue has been resolved for the PWROG report. As noted earlier, the probability of being in a multiple LCO 3.0.3 conditions with systems having a 7 day CT is very low. Also, since these systems have no impact on CDF or LERF, and are not modeled in PRAs, an PRA evaluation is not realistic. |

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Response to Staff Concerns from Earlier Pre-submittal Meeting (continued)

| Staff Concern | BWROG Response |
|---|-----------------------------------|
| Licensee extension requests for multiple system CT/AOT could potentially enable a licensee, operating with several structures, systems, and components (SSCs) inoperable, to exceed acceptable risk levels. The staff does not believe that, with multiple CT/AOT extensions, all configuration risk management programs used by licensees are adequate to control plant operation with multiple inoperable SSCs. | See response to the last comment. |

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Schedule

- Plan to submit proposed topical reports for Initiative 4a and 6
 - Address further NRC comments from this meeting by June 30
 - BWROG Primary Representative approval expected by July 30
 - Submit to NRC August 10
- TSTF schedule
 - Feedback requested on NRC's preferred date(s) for Traveler submittal
- Request NRC provide review schedule