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

Presented to NRC Staff
October 28, 2004

BWROG

Overview

- *Purpose of Meeting*
- *Scope of Topical Reports*
- *Background*
- *Risk-informed Approach*
- *Risk Impact Measures and Acceptance Criteria*
- *Identification of Potentially High Risk Configurations*
- *Configuration Risk Management*
- *System Evaluation*
- *Risk Results*
- *Summary*
- *Schedule*

Purpose of Meeting

- *Review BWROG Proposed Topical Reports on Initiatives 4a and 6.*
  - *Scope*
  - *Risk-informed Approach*
  - *Schedule*
- *Obtain NRC Feedback on Proposed Plan and Schedule*

Scope of Topical Reports

- *Provide risk-informed analysis to support changes to completion times of selected technical specification (TS) conditions*
- *Selected TS conditions based on recent BWROG survey of plants*
- *Initiative 4a: TSs selected for improved completion times*
  - *One standby gas treatment (SGT) subsystem inoperable: current completion time = 7 days, proposed completion time = 30 days*
  - *One main control room environmental control (MCREC) subsystem inoperable: current completion time = 7 days, proposed completion time = 30 days*

Scope of Topical Report (continued)

- ***Initiative 6 –improved completion times and required actions for TSs leading to exigent plant shutdowns (LCO 3.0.3). TSs selected for improvement are:***
  - *Reactor coolant system (RCS) leakage detection instrumentation: current completion time 1 hour, proposed completion time 7 days and 12 hours to Mode 3 (and 36 hours to Mode 4)*
  - *Standby gas treatment (SGT) system: current completion time 1 hour, proposed completion time 7 days and 12 hours to Mode 3*
  - *Main control room environmental control (MCREC) system: current completion time 1 hour, proposed completion time 7 days and 12 hours to Mode 3*
  - *Main control room air conditioning system: current completion time 1 hour, proposed completion time 7 days and 12 hours to Mode 3*

Background

- *BWROG survey identified those TS changes that have high probability of enhancing plant safety & improving plant operations*
- *TS changes selected for Initiative 6 are a subset of those considered in NRC approved topical reports submitted by the CEOG and WOG*
- *TS improved completion times selected in initiative 4a are a subset of those TSs chosen for Initiative 6*
- *Two topical reports will be prepared for NRC submittal*
  - *Initiative 4a*
  - *Initiative 6*
- *Both BWROG topical reports will follow similar risk-informed methodology applied in the CEOG and WOG initiative 6 topical reports*

Risk-Informed Approach

Risk Impact Measures and Acceptance Criteria (Initiative 6)

- *The CEOG and WOG submittals addressed two types of systems. The failure of the first set of systems had an impact on CDF and LERF values, whereas the failure of the second group of systems had no direct impact on CDF and LERF. The risk impact measures for each group were different.*

- *Systems selected for this BWROG analysis belong to the second group, i.e., they have no direct impact on CDF and LERF*

- *Direct comparison to RGs 1.177 and 1.174 acceptance criteria is not applicable*

- *Risk impact measures adopted for this analysis are similar to those used in the CEOG and WOG approved topical reports*

  - *ICRRP – incremental conditional radiation release (above TS limits) probability*

  - *ΔRRF – change in the radiation release (above TS limits) frequency*

Risk-informed Method and Acceptance Criteria – Initiative 6 (cont'd)

- *For analysis purposes, a high CDF value of 2.5E-05 /yr was assumed for conditional radiation release risk increase*
  - *Conservatively assume selected systems are challenged during core damage (I.e., with a frequency of 2.5E-05/yr)*

- *Assessed ICRRP and ΔRRF values are compared to acceptance criteria similar to the ones reported in RGS 1.177 and 1.174 for core damage and large early release risks*
  - *ICRRP < 5.0E-07 (conservatively assume same value as ICCDP)*
  - *ΔRRF/year < 5.0E-08/year (conservatively assume same value as ICLERP)*

Risk-informed Method and Acceptance Criteria (cont'd)

$$ICRRP = \Delta R_{RRF} \times d = (R_{1,RRF} - R_{0,RRF}) \times d$$

- *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,*

- $R_{1,RRF}$ = *the plant RRF with the system permanently unavailable,*

- $R_{0,RRF}$ = *the plant RRF without the proposed time extension.*

Risk-informed Method and Acceptance Criteria – Initiative 6 (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:*
  ΔRRF = ICRRP x f

- *The assessed ICRRP and ΔRRF values are compared to acceptance criteria similar to the ones reported in RGs 1.177 and 1.174 for core damage and large early release risks, respectively. The results of the risk assessments, in terms of the various risk measures, and their comparison to acceptance criteria*

Risk-informed Method and Acceptance Criteria – Initiative 4a (cont'd)

- *Initiative 6 addresses loss of function, whereas initiative 4a involves loss of redundancy in system*
- *Failure of additional sub-system is required to cause a loss of function. Therefore, another failure probability term is added to evaluation of* ΔR_{RRF}
- *However, value of 'd' increases from 7 days to 30 days*
- *The remaining evaluation and acceptance criteria are same as that for Initiative 6*

Identification of Potentially High Risk Configurations

- *To avoid potentially high risk configurations, specific restrictions to implementation of the proposed changes will be provided*

- *Example – control room AC subsystems are unavailable*

  - *Respiratory and control room pressurization systems are available to ensure leakage pathways are controlled*

  - *Temporary cooling can be established with use of portable fans, propping open doors, or similar actions*

  - *Alternate shutdown panels and local shutdown stations are available*

Configuration Risk Management

- *Objectives of configuration risk management plan (CRMP) are met by plant programs to comply with the Maintenance Rule 10 CFR 50.65 (a)(4)*

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) Tier 2 Restrictions

Radiation Release (non-LER) Risk Impact Initiative 6

System	Proposed Completion Time (CT) (Days)	ΔR_{RRF}/Yr, or Challenge Frequency/Yr. (3)	ICRRP (4)	ΔRRF/Yr (5) (f=1/5)	ΔRRF/Yr (5) (f=1/3)
Standby Gas Treatment (SGT) System	7	2.5E-05	4.8E-07	9.6E-08	1.6E-07
Main Control Room Environmental Control (MCREC) System (1)	7	2.5E-05	4.8E-07	9.6E-08	1.6E-07
Control Room Air Conditioning (AC) System	7	2.5E-05	4.8E-07	9.6E-08	1.6E-07
Reactor Coolant System (RCS) Leakage Detection Instrumentation (2)	7	2.3E-05	4.3E-07	8.6E-08	1.4E-07

NOTES:

(1) For the BWR 6 ISTS, this system is called Control Room Fresh Air (CRFA) System. The MCREC and CRFA Systems both perform the same function.
(2) Challenge Frequency = CDF (2.5E-05) x 30% (LOCA events) x 3 (factor increase to account for LOCAs that could have been avoided if RCS Leakage Detection Instrumentation is operable).
(3) ΔR_{RRF} = Conditional Radiation Release Increase Frequency.
(4) ICRRP = Incremental Conditional Radiation Release Probability. Acceptance criterion: ICRRP < 5.0E-07.
(5) Acceptance criterion: ΔRRF/Yr < 1.0E-07/Yr.

Risk Results: Conservatisms

- *Systems considered in this analysis, have no direct effect on CDF.*
- *Use of a CDF value of 2.5E-05/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 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*

Summary

- *BWROG proposes to submit two topical reports for NRC review for Initiatives 4a and 6*
- *Systems being considered have no direct effect on CDF and LERF*
- *Primarily effect of unavailability is on design basis*
- *Proposed changes*
  - *Initiative 4a – two proposed changes to completion time for one subsystem inoperable – 7 days to proposed 30 days*
  - *Initiative 6 – four proposed changes to the explicit LCO 3.0.3 entry for loss of function*
    - *7 days completion time*
    - *12 hours to Mode 3 (and 36 hours to Mode 4 for RCS leakage detection instrumentation)*

Summary (continued)

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***

Schedule

- *Plan is to submit proposed topical reports for Initiative 4a and 6 during December 2004*
- *Schedule for TSTF submittal March 2005 (two months after topical report)*
- *Request NRC provide review schedule*

Table 8 Radiation Release (Non-LER) Risk Impact (From CEOG SER)

Component/System	Proposed CT (hrs)	ΔR_{RRF}/yr, or Challenge Frequency/yr	ICRRP	ΔRRP/yr (f = 1/5)	ΔRRP/yr (f = 1/3)
Iodine Cleanup System (ICS)	24	1.0E-4	2.6E-7	5.0E-8	8.3E-8
Shield Building Exhaust Air Cleanup System (SBEACS)	24	1.0E-4	2.6E-7	5.0E-8	8.3E-8
Control Room Emergency Air Cleanup System (CR-EACS)	24	1.0E-4	2.6E-7	S.OE-8	8.3E-8
Control Room Emergency Air Temperature Control System (CR EATCS)	24	1.0E-4	2.6E-7	5.0E-8	8.3E-8
Penetration Room Exhaust Air Cleanup System (PR-EACS)	24	1.0E-4	2.6E-7	5.0E-8	8.3E-8
Emergency Core Cooling System Pump Room Exhaust Air Cleanup System (ECCS-PREACS)	24	4.5E-5	1.1 E-7	2.0E-8	3.3E-8
Containment Spray (for plants w/ CARC)	72	1.0E-4	8.0E-7	1.6E-7	2.7E-7
Total			**2.1E-06**	**3.8E-07**	**7.2E-07**

BWR Plant Core Damage Frequencies (CDFs)

Plant	CDF (per year)
Plant A	1.24E-05
Plant B	Similar unit to Plants C and D
Plant C	1.05E-06
Plant D	1.90E-06
Plant E	2.44E-06
Plant F	7.13E-06
Plant G	5.50E-06
Plant H	8.66E-06
Plant I	2.61E-06
Plant J	4.60E-06
Plant K	1.30E-05
Plant L	4.80E-05
Plant M	2.24E-05

Plant	CDF (per year)
Plant N	1.22E-05
Plant O	8.58E-06
Plant P	5.56E-05
Plant Q	5.49E-05
Plant R	5.00E-06
Plant S	4.00E-06
Plant T	3.00E-06
Plant U	4.00E-06
Plant V	2.7 E-7
Plant W	2.7 E-7
Plant X	1.52 E-5
Plant Y	2.84E-05