NRC FORM 658
(9-1999)

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DATE OF MEETING
10/04/2001

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Docket Number(s)	**PROJECT NO. 669**
Plant/Facility Name	**EPRI**
TAC Number(s) (if available)	
Reference Meeting Notice	**9/21/01**
Purpose of Meeting (copy from meeting notice)	**TO DISCUSS EPRI RISK-INFORMED ACTIVITIES**

NAME OF PERSON WHO ISSUED MEETING NOTICE
L. N. OLSHAN

TITLE
PROJECT MANAGER

OFFICE
NRR

DIVISION
DLPM

BRANCH
PD II-1

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DF03

Break Exclusion Requirements

USNRC/EPRI Meeting
October 4, 2001

EPRI

BER

- Introduction
- Report Review
- Overview Of Feb 2001 Submittal
- Action Items

EPRI

BER

- Feb 2001 Submittal
  - Applicable to BWRs and PWRs
  - Example Applications (BWR and PWR) Provided in Submittal
  - Report Review
    - Internal Review
    - NRC Review

EPRI

BER - Internal Review

- Third Party Review (Scientech)
  - **Methodology Development**
  - **Application to Example Plants**
  - **Reasonableness of Results**
- Utility Review
  - **Licensing Basis**
  - **Methodology Development**
  - **Application to Example Plants**
  - **Reasonableness of Results**
  - **Implementation Considerations**

EPRI

BER - NRC Review

- Options for Expediting Review
  - Additional Meetings
  - Plant Specific Approval
  - Generic Approval

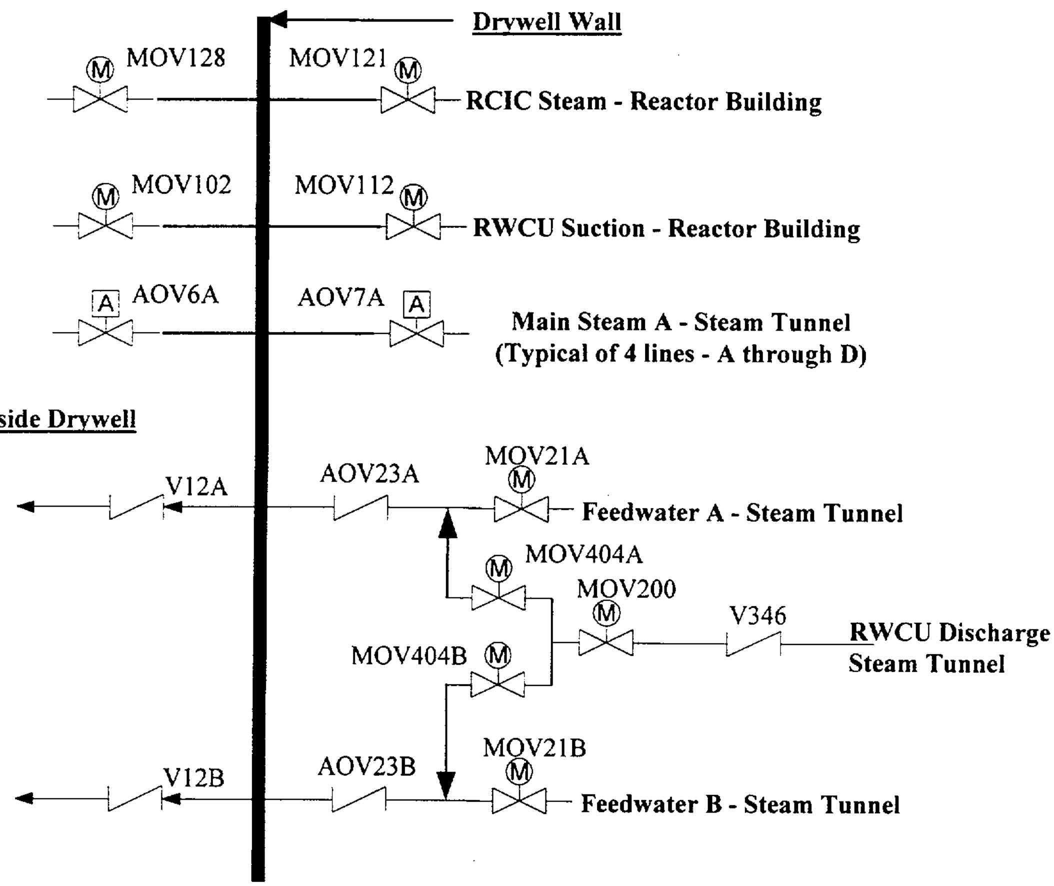
EPRI

BER Methodology

- Scope (Section 3.2)
  - Plant Dependent
  - Plant Type Dependent (BWR vs PWR)
  - Oct 3, 2001 Mtg

EPRI

BWR Pilot Application - Scope



The BER scope at NMP2 includes welds between the inside containment isolation valve and the outside containment isolation valve (the boundary actually extends beyond each of these valves to include welds out to the first pipe rupture restraint) as summarized below:

- Four main steam (MSS) lines
- One RCIC (ICS) steam line
- One reactor water cleanup (WCS) suction line
- Two feedwater (FWS) lines and connected reactor water cleanup (WCS) discharge out to V346

BER Methodology

- Consequence Evaluation (Section 3.3)

Consequence Evaluation Methodology – Adaptation to BER (1 of 2)

Bounding estimates and assumptions where appropriate to reduce the need to conduct resource intensive analyses, computations and their accompanying uncertainty.

By definition, BER piping is normally pressurized ("operating" configuration in Table 3-1), therefore the "Initiating" and "Combination" impact groups in Table 3-1 should be evaluated.

The consequence of failure of each circumferential weld in the BER scope is evaluated (i.e. pipe whip, jet impingement and other impacts).

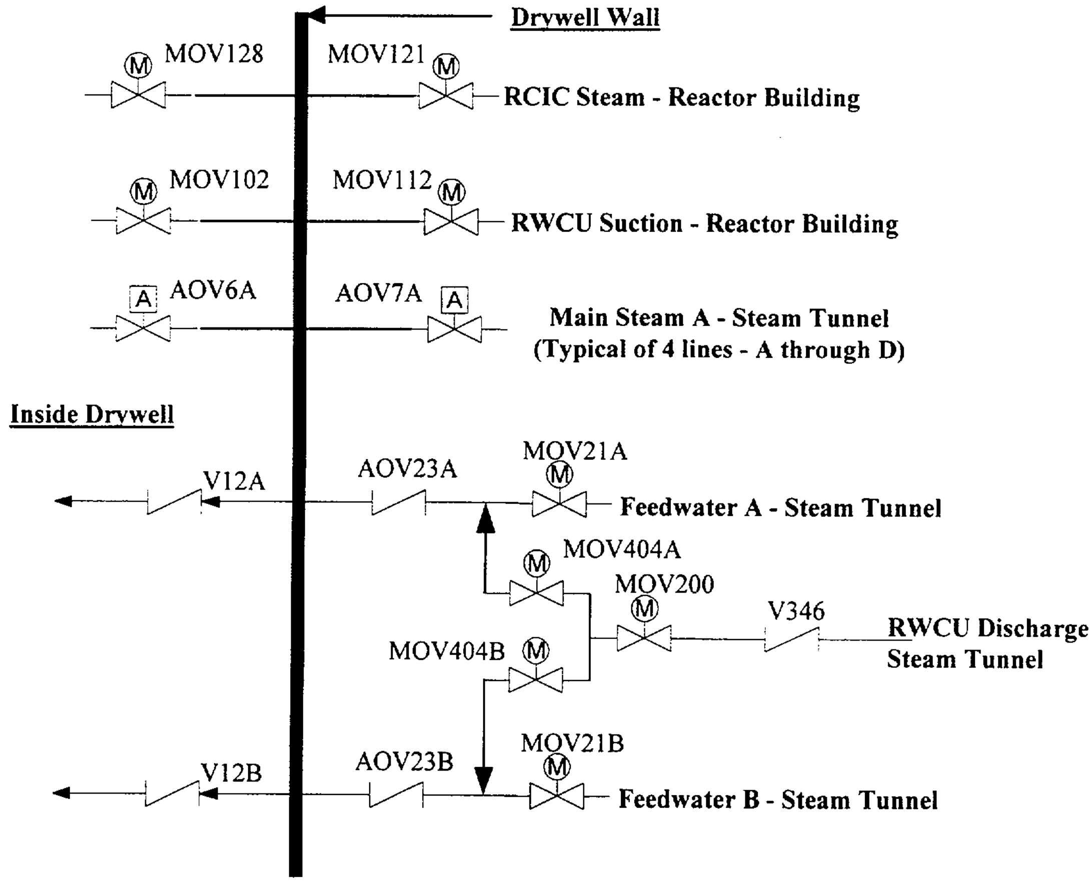
The following issues related to the consequence evaluation process are highlighted in order to assure consistent application.

- Containment performance is an important aspect of having to utilize the BER assumption in design basis (e.g. single failure relative to containment isolation). Postulated breaks outside containment should not take credit for the outside containment isolation valve unless there is plant design and/or engineering analysis that supports equipment operability during the event. Likewise breaks inside containment should not credit equipment inside the containment unless plant design and/or engineering analysis provides justification. The following provides additional guidance:
  - The containment penetration is assumed to fail (containment bypass) if the penetration is not designed and analyzed for a double-ended guillotine pipe break (DEGB). Note that design features may be utilized to preclude DEGB loads on the penetration (e.g. encapsulated pipe designed to preclude a DEGB load on a penetration).
  - A break in a smaller line connected to a larger line that penetrates containment will not cause failure of the larger line or its penetration.
  - A break in a large line can whip and fail a smaller line and its penetration.
  - A break in a small line can not whip and fail a larger line and its penetration.

Consequence Evaluation Methodology – Adaptation to BER (2 of 2)

- Other Spatial Impacts (indirect effects) – Equipment in the area of the break are assumed to fail as a result of the break unless design/analysis justifies otherwise (e.g. see containment isolation above). The following provides additional guidance:
  - Physical separation can usually be credited with regard to the containment structure and isolation. For example, equipment inside containment can be credited with isolating a break outside containment. For high energy line breaks, only automatic isolation can usually be credited.
  - Physical separation must be considered relative to jet impingement and pipe whip impacts that have not been previously analyzed. As an example, a postulated BER break should be assumed to fail a common wall with other rooms unless there is analysis justifying otherwise.
  - Equipment Qualification (EQ) – Equipment in affected areas may have been qualified as part of an EQ program. If this equipment is to be credited in the RI-ISI evaluation, the harsh environment identified as part of the EQ profile (temperature, pressure humidity, jet impingement and pipe whip) will need to envelope (or equal) the environment created by the assumed RI-ISI break. Caution should be applied, in that, the RI-ISI break will always assume that equipment available to isolate the break has an inherent unreliability. That is, the RI-ISI evaluation looks at both successful and unsuccessful isolation (and the resultant environments).

BWR Pilot Consequence Evaluation – Design Review & Assumptions (1 of 2)

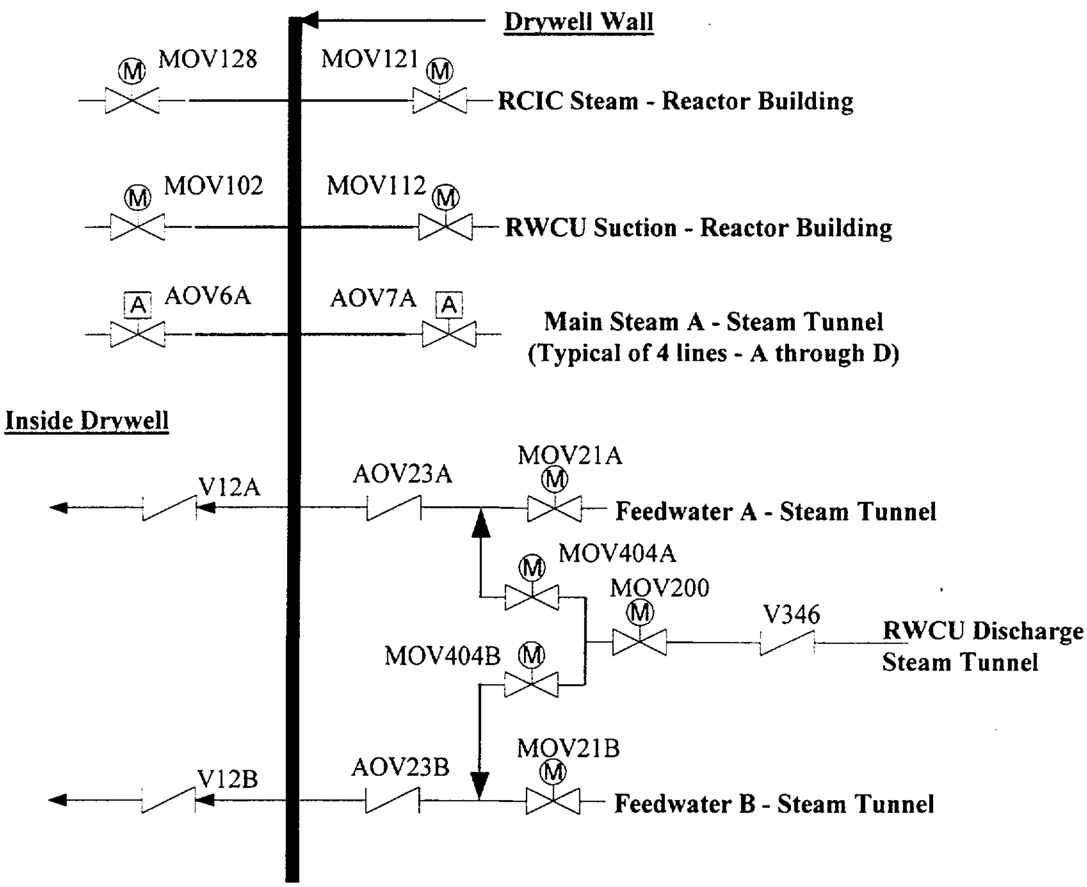


- Piping penetrations have not been evaluated for a beyond design basis BER double-ended guillotine break (DEGB). Therefore, the analysis contained herein conservatively assumes there is the potential that the penetrations could fail as described below.
- Containment isolation valves are not qualified for a beyond design basis BER break in the immediate area. Therefore, no credit is taken for isolation as follows:

– Failure of a BER weld inside the drywell is assumed to prevent the inside drywell isolation valve from working (i.e. it is assumed to fail to close). In effect, welds between the isolation valve and the drywell wall are re-assigned to the consequence category of an unisolable LOCA inside the drywell.

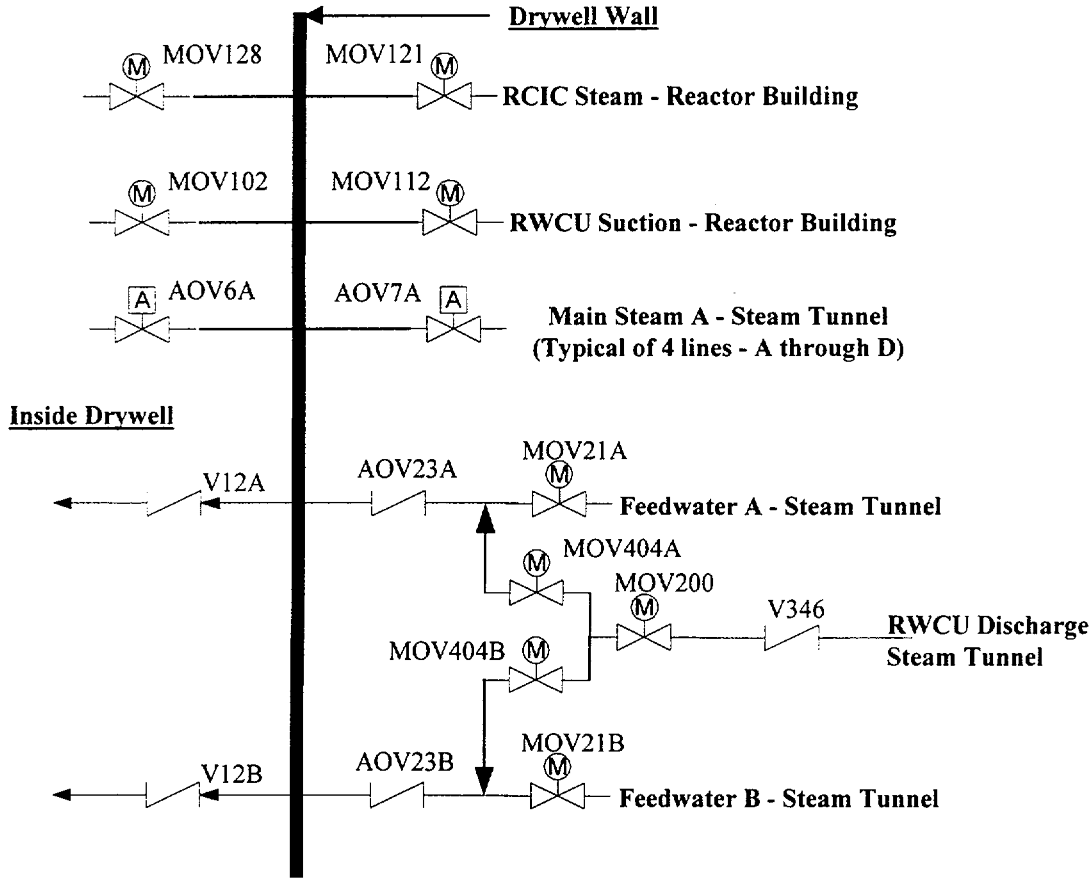
– Failure of a BER weld outside the drywell is assumed to prevent the outside drywell isolation valve from working (i.e. it is assumed to fail to close). In effect, welds beyond the outside drywell isolation valve are re-assigned to the consequence category of welds between the drywell and the outside isolation valve, which are not isolable via the outside isolation valve.

BWR Pilot Consequence Evaluation – Design Review & Assumptions (2 of 2)



- For the design basis, over pressurizing the steam tunnel compartment directly outside the drywell was not explicitly analyzed for a break in this location. However, over pressure failure of the steam tunnel/reactor building structures due to BER breaks are judged unlikely. This is based upon a review of other breaks downstream of the BER scope of piping (vent areas, design, and margins) indicating that the structure could withstand breaks in the unanalyzed area without gross structural failure. Even so, for purposes for this analysis, the spatial impact due to failure of walls and structures on equipment in the local area are assessed.
- Structural design considers jet impingement loads. The immediate steam tunnel/reactor building structures directly outside the drywell are similar in design to structures analyzed for jet impingement. Therefore, jet impingement loads caused by assumed BER breaks are not assumed capable of failing these structures.
- The impact of a pipe whipping into the immediate steam tunnel/reactor building structures has not been analyzed. Therefore, it is assumed that structural failure due to pipe impact will occur for large main steam and feedwater piping. Thus, the likelihood and consequences of this event is considered in this application.

BWR Pilot Consequence Evaluation – RI-ISI Changes (1 of 3)

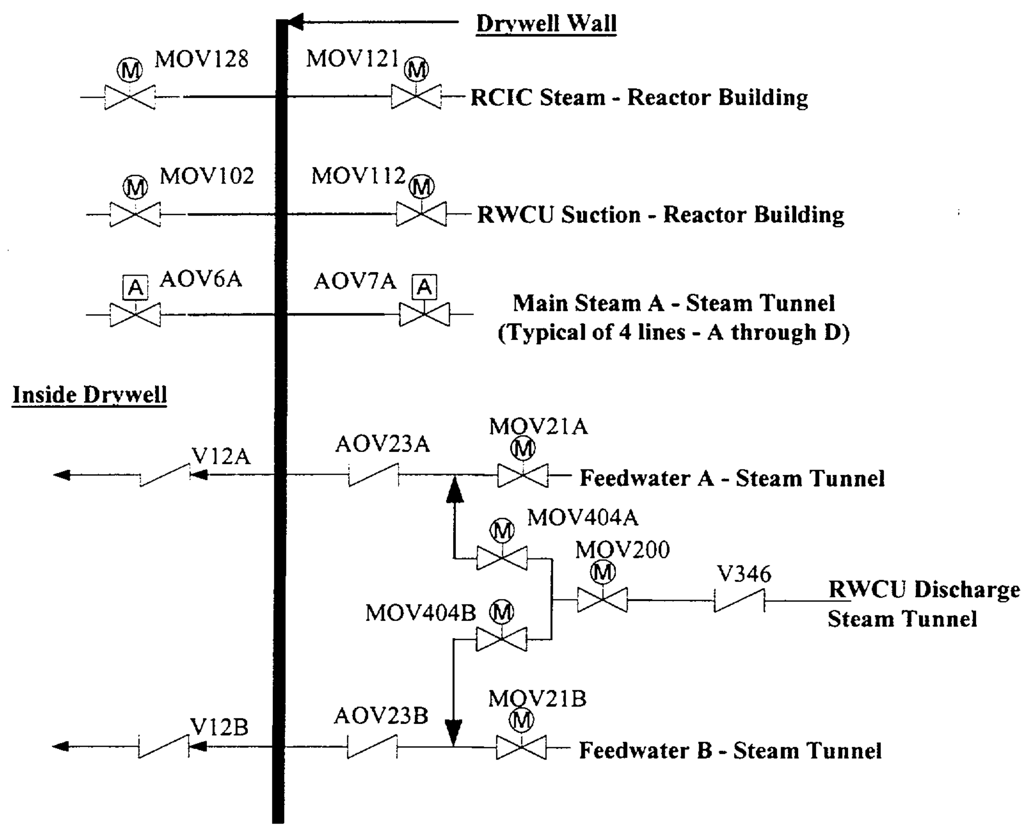


1. Smaller diameter piping inside the Drywell connected to larger diameter piping is not assumed capable of causing penetration or equipment failure (MSS-C-02). These are small 2-inch NPS connections to the main steam lines. Therefore, the CCDP and CLERP values are not changed. Figure A-1 would apply to the evaluation of this small steam piping.

2. Smaller diameter piping outside the Drywell (in the Steam Tunnel) connected to larger diameter piping is not assumed capable of causing penetration, structural, or equipment failure (WCS-C-07). This is 8 inch NPS piping that connects to main feedwater lines (26 inch NPS). Therefore, the CCDP and CLERP values are not changed. Breaks in the Steam Tunnel are less significant in comparison to breaks in the Reactor Building. Two feedwater check valves in series reduce the probability of isolation failure. Figure A-3 applies to the evaluation of this piping when isolation is successful. Figure A-5 applies to the evaluation of this piping when isolation is unsuccessful, but the CCDP must also include the probability that 2 series check valves fail to close.

3. The CLERP values are set equal to the CCDP values for all other BER welds. That is, the BER piping failure (double-ended guillotine break) is assumed to fail its containment penetration. This is conservative for most if not all welds in the BER scope.

BWR Pilot Consequence Evaluation – RI-ISI Changes (2 of 3)

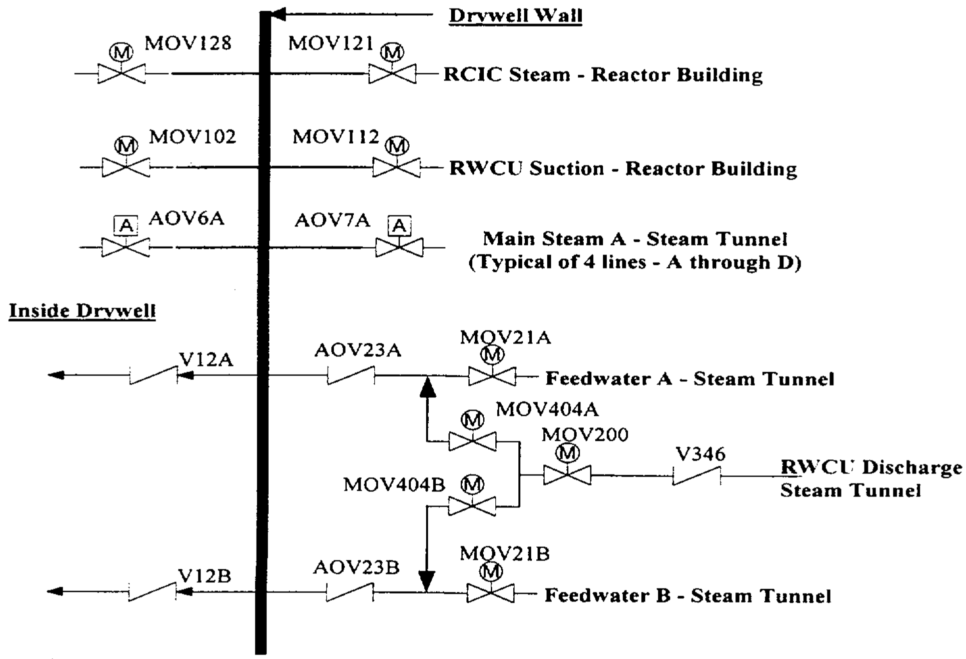


4. No change in the CCDP values is required for welds inside the Drywell beyond the inboard isolation valve that communicate with the Steam Tunnel (FWS-C-01A & 01B and MSS-C-01A through 01D). Leakage from the Drywell to the Steam tunnel would have no additional consequences beyond that assessed in the baseline evaluation. Leakage into the steam tunnel is minor in comparison to a LOCA outside containment. Also, the LOCA inside the drywell CCDP does not credit equipment in the steam tunnel or turbine building. Figure A-2 applies to this evaluation.

5. The CCDP values were increased for welds located inside the Drywell beyond the inboard isolation valve that communicate with the Reactor Building (ICS-C-06 and WCS-C-03). The CCDP value was increased to 0.01 based on engineering judgment. Leakage through a penetration into the reactor building pipe chase is judged to be comparable to a large isolable break in the Reactor Building (pipe chase). This break has been analyzed as part of the design basis. The reactor building is a large open structure allowing significant communication between elevations all the way up to the refueling level. Figure A-4 shows the simplified success criteria and backup trains available for these events. As shown, there are at least 2 backup trains for all functions.

6. The CCDP value was increased for welds located inside the Drywell between the inboard isolation valve and the Drywell (FWS-C-02A & 02B, ICS-C-07, MSS-C-03A through 03D, and WCS-C-04). The CCDP value was set equal to the value beyond the isolation valve in items 4 and 5.

BWR Pilot Consequence Evaluation – RI-ISI Changes (3 of 3)



7. No change in the CCDP value was required for welds between the Drywell penetration and the outboard isolation valve in the Reactor Building (ICS-C-08 and WCS-C-05). Pipe whipping and jet impingement causing core damage for the isolation success case is enveloped by the isolation failure case (piping is close to the Drywell wall within pipe chase). Given successful isolation, any leakage from the Drywell through the penetration is minor (no LOCA) in comparison to the initial break condition, which is considered in design. Figure A-4 applies to the isolation success case (RCIC is unavailable due to break or high area temperature trip). For the isolation failure case, core damage is assumed with CCDP and CLERP set equal to the probability of a MOV failing to close inside the Drywell.

8. The CCDP value was increased for welds between the Drywell penetration and the outboard isolation valve in the Steam Tunnel (FWS-C-03A & 03B and MSS-C-04A through 04D). The CCDP was increased to 0.01. For the case where the inboard isolation valve fails to close this isolation failure probability alone is less than 0.01 (core damage is assumed for the isolation failure case). Even for this case, the probability of structural failure and core damage is less than 1.0 (Figure A-5 would apply). For the isolation success case, even if a structural wall is assumed to fail, the blow down and leakage of steam into the reactor building is limited (i.e., a significant portion is expected to propagate through the steam tunnel). Also, electrical equipment in the reactor building in the vicinity of these walls is not critical to safe shutdown. The building is large on all elevations with large openings, which allows communication all the way up to the refueling level. Electrical equipment critical to safe shutdown in the PRA is not located at these higher elevations. Figure A-3 would apply to this evaluation. Even if it is assumed that one safe shutdown division fails due to the environment, the other division provides a backup train and supports the 0.01 CCDP.

9. The CCDP value was increased for welds beyond the outboard isolation valve (FWS-C-04A & 04B, FWS-C-05A & 5B, ICS-C-09, MSS-C-06, and WCS-C-06). The CCDP value was set equal to the value between the Drywell and outboard isolation valve in items 7 and 8.

BER Methodology

- Degradation Mechanism Evaluation (Section 3.4)
  - Basis - TR-112657
  - Reviewed NUREG/CR-5750 for Applicability
  - Reviewed NUREG/CR-6490 (& April 2001 update) for Applicability
  - Collected Industry Data (LER review) 1995 to 2000
  - NRC/EPRI Agreement to Support OECD Piping Failure Database

BER Methodology

- Risk Ranking & Element Selection (Sections 3.5/6)

EPRI

Risk Ranking & Element Selection Methodology – Adaptation to BER

Although no change to the risk ranking process is required; the results of the application to BER programs may be different with respect to traditional RI-ISI results. Thus, a plant, which applies the RI-ISI process to BER programs after completion of a traditional RI-ISI application, may have to revisit the risk ranking of all welds in the RI-ISI application (e.g. Section XI scope plus BER scope). As a final step, the risk ranking should also be summarized for the "BER Only" scope to support element selection as described in the next section.

While no changes to the element selection process are expected, consideration shall be given to the size of the final sample population size. If a plant is applying RI-ISI to BER programs after completion of the traditional RI-ISI, the risk category population sizes may change for BER systems since some welds may move to higher risk categories (e.g. risk category 6 to 4). In addition, the element selection process must consider the BER scope to ensure that this scope is appropriately covered during the element selection process.

Similar to traditional RI-ISI applications to Class 1 piping, it is expected that BER piping will tend to be grouped into three subsets. The first is brought about by the exceptional performance history of BER piping (see section 3.4) coupled with its typical high consequence of failure which results in the large number of elements being assigned to risk category 4 (10 percent inspection size). There is a second subset were a 25 percent sample is chosen due to a number of elements identified as potentially susceptible to some degradation mechanism (e.g. risk category 2, due to thermal fatigue). The third subset consists of those elements assigned to risk categories 6 or 7, which do not require volumetric NDE. As such, it is anticipated that unless plant specific design features control, inspection populations for BER programs to be approximately 10 percent of the current population.

If a situation occurs where a very large number of elements are assigned to low risk categories (i.e. Risk Categories 6 or 7) to the point that BER inspections fall substantially below 10 percent of the BER piping population, the basis for the low risk ranking should be investigated. Although BER piping is typically highly reliable (i.e. low failure potential), inspection percentages significantly below 10% should not be expected unless plant design features have been incorporated to specifically address assumed breaks in the BER region.

In summary, the element selection process should satisfy the following criteria:

- The percentage requirements for high risk (25%) and medium risk (10%) must be satisfied for the complete RI-ISI Program scope population including BER.
- The percentage requirements for high risk (25%) and medium risk (10%) must be satisfied for the "BER Only" scope population.
- The number of BER inspections should not be significantly less than 10% of the BER scope unless plant design features justify otherwise.

BWR Pilot Risk Ranking & Element Selection (1 of 2)

Figures A-6 through A-8 provide a summary of the risk ranking for three cases:

- Figure A-6 provides a summary of the risk ranking results after completion of the traditional RI-ISI evaluation of the Class 1 and 2 ISI Section XI Program. The number of welds in each risk category for each system is provided. The number in parenthesis indicates how may welds need to be selected per the element selection criteria in Section 3.6 of the main report.
- Figure A-7 provides a summary of the risk ranking results for the same Class 1 and 2 ISI program after completion of the BER evaluation. Figure A-7 replaces Figure A-6 and the element selection process must be adjusted to account for BER evaluation changes. If the RI-ISI evaluation had been initially conducted according to both the traditional and BER evaluation criteria, Figure A-7 would be generated with no need for Figure A-6. The number in parenthesis indicates how may welds need to be selected per the element selection criteria in Section 3.6 of the main report. The following summarizes changes to Figure A-6 in developing Figure A-7:

  - Risk Category 5B FWS: all 17 welds were moved to risk category 2 based on the BER evaluation. Two additional welds must be selected as result of this change. Two of the 17 welds were already selected based on the traditional RI-ISI analysis in Figure A-6. Two more of the total of 48 welds in Figure A-7 must be selected.

  - Risk Category 6B FWS: all 6 welds were moved to risk category 4 based on the BER evaluation. One additional weld must be selected from risk category 4 as result of this change.

  - Risk Category 6B ICS: 2 welds were moved to risk category 4 based on the BER evaluation. No additional welds must be selected from risk category 4 as result of this change.

  - Risk Category 6B MSS: 30 welds were moved to risk category 4 based on the BER evaluation. Three additional welds must be selected from risk category 4 as result of this change.

  - Risk Category 6B WCS: 2 welds were moved to risk category 4 based on the BER evaluation. One additional weld must be selected from risk category 4 as result of this change.

Figure A-8 provides a summary of the risk ranking results when the "BER Only" scope is considered. Again, the number of welds in each risk category for each system is provided. The number in parenthesis indicates how may welds need to be selected per the element selection criteria in Section 3.6 of the main report. If the actual number of welds previously selected to satisfy the selection process above (Figures A-6 and A-7) is different from the one in parenthesis, this value is provided in brackets.

Figure A-6 – Risk Ranking & Element Selection Summary (Traditional Baseline RI-ISI)

NMP2 Risk Ranking Summary		**Consequence Evaluation** *Conditional Core Damage Potential*		
		LOW	**MEDIUM**	**HIGH**
Degradation Mechanism Assessment ***Pipe Rupture Potential***	**HIGH**	**Category 5A – Medium** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – 0** **ICS – 0** **ISC – 0** **MSS – 0** **RCS – 0** **RDS – 0** **RHS – 0** **RPV – 0** **SLS – 0** **WCS – 0** **Total - 0 Elements**	Category 3 – High ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 0 ISC – 0 MSS – 0 RCS – 0 RDS – 0 RHS – 0 RPV – 0 SLS – 0 WCS – 0 Total - 0 Elements	Category 1 – High ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 0 ISC – 0 MSS – 0 RCS – 0 RDS – 0 RHS – 0 RPV – 0 SLS – 0 WCS – 0 Total - 0 Elements
	MEDIUM	Category 6A – Low ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 0 ISC – 0 MSS – 0 RCS – 0 RDS – 0 RHS – 16 RPV – 0 SLS – 0 WCS – 0 Total – 16 Elements	**Category 5B – Medium** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – $\boxed{17\ (2)}$** **ICS – 3 (1)** **ISC – 3 (1)** **MSS – 10 (1)** **RCS – 0** **RDS – 0** **RHS – 225 (23)** **RPV – 0** **SLS – 7 (1)** **WCS – 29 (3)** **Totals** **294 Elements** **Selected (32)**	Category 2 – High ASS – 0 CSH – 11 (3) CSL – 8 (2) DER – 1 (1) BER FWS – 31 (8) 48(12) 23(6)[7] ICS – 9 (3) ISC – 3 (1) MSS – 0 RCS – 0 Had to Add 2 more RDS – 1 (1) RHS – 26 (7) RPV – 21 (6) SLS – 3 (1) WCS – 18 (5) Totals 132 Elements Selected (38)
	LOW	Category 7 – Low ASS – 0 CSH – 4 CSL – 4 DER – 2 FWS – 0 ICS – 1 ISC – 0 MSS – 8 RCS – 0 RDS – 0 RHS – 104 RPV – 0 SLS – 0 WCS – 8 Total – 131 Elements	Category 6B – Low ASS – 4 CSH – 164 CSL – 114 DER – 0 FWS – $\boxed{6}$ ICS – 223 2 ISC – 11 MSS – 238 30 RCS – 0 RDS – 76 RHS – 540 RPV – 1 SLS – 26 WCS – 17 2 Total – 1420 Elements	**Category 4 – Medium** Had to Add 1 **ASS – 0** **CSH – 6 (1)** **CSL – 10 (1)** **DER – 0** **FWS – 47 (5)** 53(6) 6(1) **ICS – 41 (5)** 43(5) 7(1)[3] **ISC – 2 (1)** **MSS – 84 (9)** 114(12) 46(5) **RCS – 106 (11)** **RDS – 1 (1)** Had to Add 3 **RHS – 77 (8)** **RPV – 12 (2)** **SLS – 14 (2)** **WCS – 89 (9)** 91(10) 6(1) **Totals** **489 Elements** **Selected (55)**

Had to Add 1

Figure A-7 – Risk Ranking & Element Selection Summary (Traditional + BER RI-ISI)

NMP2 Risk Ranking Summary		**Consequence Evaluation** *Conditional Core Damage Potential*		
		LOW	**MEDIUM**	**HIGH**
Degradation Mechanism Assessment ***Pipe Rupture Potential***	**HIGH**	**Category 5A – Medium** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – 0** **ICS – 0** **ISC – 0** **MSS – 0** **RCS – 0** **RDS – 0** **RHS – 0** **RPV – 0** **SLS – 0** **WCS – 0** **Total - 0 Elements**	Category 3 – High ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 0 ISC – 0 MSS – 0 RCS – 0 RDS – 0 RHS – 0 RPV – 0 SLS – 0 WCS – 0 Total - 0 Elements	Category 1 – High ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 0 ISC – 0 MSS – 0 RCS – 0 RDS – 0 RHS – 0 RPV – 0 SLS – 0 WCS – 0 Total - 0 Elements
	MEDIUM	Category 6A – Low ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 0 ISC – 0 MSS – 0 RCS – 0 RDS – 0 RHS – 16 RPV – 0 SLS – 0 WCS – 0 Total – 16 Elements	**Category 5B – Medium** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – 0** **ICS – 3 (1)** **ISC – 3 (1)** **MSS – 10 (1)** **RCS – 0** **RDS – 0** **RHS – 225 (23)** **RPV – 0** **SLS – 7 (1)** **WCS – 29 (3)** **Totals** **277 Elements** **Selected (30)**	Category 2 – High ASS – 0 CSH – 11 (3) CSL – 8 (2) DER – 1 (1) FWS – 48 (12) ICS – 9 (3) ISC – 3 (1) MSS – 0 RCS – 0 RDS – 1 (1) RHS – 26 (7) RPV – 21 (6) SLS – 3 (1) WCS – 18 (5) Totals 149 Elements Selected (42)
	LOW	Category 7 – Low ASS – 0 CSH – 4 CSL – 4 DER – 2 FWS – 0 ICS – 1 ISC – 0 MSS – 8 RCS – 0 RDS – 0 RHS – 104 RPV – 0 SLS – 0 WCS – 8 Total – 131 Elements	Category 6B – Low ASS – 4 CSH – 164 CSL – 114 DER – 0 FWS – 0 ICS – 221 ISC – 11 MSS – 208 RCS – 0 RDS – 76 RHS – 540 RPV – 1 SLS – 26 WCS – 15 Total – 1380 Elements	**Category 4 – Medium** **ASS – 0** **CSH – 6 (1)** **CSL – 10 (1)** **DER – 0** **FWS – 53 (6)** **ICS – 43 (5)** **ISC – 2 (1)** **MSS – 114 (12)** **RCS – 106 (11)** **RDS – 1 (1)** **RHS – 77 (8)** **RPV – 12 (2)** **SLS – 14 (2)** **WCS – 91 (10)** **Totals** **529 Elements** **Selected (60)**

Figure A-8 – Risk Ranking & Element Selection Summary (BER Only)

NMP2 Risk Ranking Summary		**Consequence Evaluation** ***Conditional Core Damage Potential*** **LOW**	 **MEDIUM**	 **HIGH**
Degradation Mechanism Assessment ***Pipe Rupture Potential***	**HIGH**	**Category 5A – Medium** **0 BER Welds**	**Category 3 – High** **0 BER Welds**	**Category 1 – High** **0 BER Welds**
	MEDIUM	Category 6A – Low 0 BER Welds	**Category 5B – Medium** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – 0** **ICS – 0** **ISC – 0** **MSS – 0** **RCS – 0** **RDS – 0** **RHS – 0** **RPV – 0** **SLS – 0** **WCS – 29 (3)** **<u>Totals</u>** **29 BER Welds** **Selected 3**	**Category 2 – High** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – 23 (6)[7]** **ICS – 0** **ISC – 0** **MSS – 0** **RCS – 0** **RDS – 0** **RHS – 0** **RPV – 0** **SLS – 0** **WCS – 0** **<u>Totals</u>** **23 BER Welds** **Selected 7**
	LOW	Category 7 – Low 0 BER Welds	Category 6B – Low ASS – 0 CSH – 0 CSL – 0 DER – 0 FWS – 0 ICS – 1 ISC – 0 MSS – 2 RCS – 0 RDS – 0 RHS – 0 RPV – 0 SLS – 0 WCS – 15 <u>Totals</u> 18 BER Welds Selected 0	**Category 4 – Medium** **ASS – 0** **CSH – 0** **CSL – 0** **DER – 0** **FWS – 6 (1)** **ICS – 7 (1)[3]** **ISC – 0** **MSS – 46 (5)** **RCS – 0** **RDS – 0** **RHS – 0** **RPV – 0** **SLS – 0** **WCS – 6 (1)** **<u>Totals</u>** **65 BER Welds** **Selected 10**

BWR Pilot Risk Ranking & Element Selection (2 of 2)

As described in section 3.6 of the main report, the element selection process must satisfy several criteria as summarized below:

- Complete RI-ISI scope (Class 1 and 2 Section XI and BER) - adjustments were made to the traditional element selection process based upon the complete (i.e. larger) RI-ISI program scope and risk ranking (Figure A-7). Section A.3.5 describes the risk ranking changes (development of Figure A-7) and adjustments made to element selection.

- BER Only scope – Figure A-8 summarizes the number of BER welds that must be selected to satisfy the selection criteria when only BER welds are considered (number in parenthesis). If the selection process for the complete scope in Figure A-8 does not include enough BER welds, the selection process for the complete scope (Figure A-7) was adjusted to include a sample of BER welds that satisfies Figure A-8. Another option would be to select additional welds to satisfy Figure A-8. The requirements have been met and due to the nature of the process in a couple of cases more welds were selected than actually required (when different; actual values are provided in brackets).

- Section 3.6.2 of the main report cautions that the inspection population of the BER scope should not be significantly below 10% unless plant design features have been incorporated to specifically address assumed breaks in the BER region. For the NMP2 application, more than 12 % of the BER welds must be selected (Figure A-8, 17 of 135 must be selected based upon the requirements in parenthesis). Based upon the actual selection (number in brackets used when different from requirement), more than 14 % of the BER welds were selected (Figure A-8, 20 of 135 selected).

BER Methodology

- Risk Impact (Section 3.7)

Risk Impact Methodology – Adaptation to BER

The risk impact assessment shall be conducted in a two step fashion. The first is to include the BER scope of piping with the traditional RI-ISI application (e.g. Class 1 and 2 piping). The second step is to assess the changes to the BER program alone. Both cases need to meet the acceptance criteria define in TR-112657.

BWR Pilot Risk Impact

Two types of risk assessments performed:

1. In Section A.3.7.1, a traditional risk assessment of the BER topic is performed to estimate the frequency of core damage and large, early release frequency (CDF and LERF). The purpose of this assessment is to provide a perspective on the relative risk significance of the BER topic irrespective of the inspection sample size.
2. In Section A.3.7.2, a change in risk (delta risk) assessment is performed on the proposed BER inspection program in accordance with Regulatory Guide 1.174 (Reference A5) and the EPRI TR-112657 criteria (Reference A6).

   Delta risk assessment is performed for two cases:

   - The BER program consolidated into the RI-ISI program as a single inspection program
   - The BER program only.

Table A-4 Delta Risk Summary When BER is Included in RI-ISI Program

System	Risk Category	Consequence	Degradation Mechanisms	Inspected		Delta Risk (1/yr)			
						Best Estimate		No POD Improvement	
				SXI + BER	RI-ISI	CDF	LERF	CDF	LERF
FWS – Feedwater	2	High	TASCS	12	10	-2.5E-10	-1.3E-10	4.6E-11	2.4E-11
	4	High	None	2	5	-3.5E-12	-7.5E-14	-3.5E-12	-7.5E-14
	6 to 4	High	None	6	1	2.5E-10	2.5E-10	2.5E-10	2.5E-10
	5 to 2	High	TASCS	11	1	3.0E-09	3.0E-09	7.1E-09	7.1E-09
			TASCS,CC	4	0	2.4E-09	2.4E-09	4.0E-09	4.0E-09
			CC	2	1	1.0E-09	1.0E-09	1.0E-09	1.0E-09
Total						**6.4E-09**	**6.6E-09**	**1.2E-08**	**1.2E-08**
ICS – RCIC	2	High	TT, TASCS	4	3	-6.9E-11	-1.5E-12	2.3E-11	5.0E-13
	4	High	None	12	5	6.2E-11	5.6E-11	6.2E-11	5.6E-11
	6 to 4	High	None	2	0	1.0E-10	1.0E-10	1.0E-10	1.0E-10
	5	Medium	TT, TASCS	0	1	-2.5E-11	-9.0E-13	-1.4E-11	-5.0E-13
Total						**6.8E-11**	**1.5E-10**	**1.7E-10**	**1.6E-10**
MSS – Main Steam	4	High	None	45	12	3.8E-11	1.3E-11	3.8E-11	1.3E-11
	6 to 4	High	None	30	0	1.2E-09	1.2E-09	1.2E-09	1.2E-09
	5	Medium	TASCS	0	1	-2.2E-12	-7.2E-13	-1.2E-12	-4.0E-13
Total						**1.2E-09**	**1.2E-09**	**1.2E-09**	**1.2E-09**
WCS – RWCU	2	High	TASCS	0	5	-2.1E-10	-4.5E-12	-1.2E-10	-2.5E-12
	4	High	None	7	5	3.3E-11	3.1E-11	3.3E-11	3.1E-11
	6 to 4	High	None	2	0	1.0E-10	1.0E-10	1.0E-10	1.0E-10
	5	Medium	TASCS	25	3	9.6E-12	2.8E-13	2.2E-11	8.8E-13
			TASCS,FAC	4	0	2.4E-12	9.6E-14	4.0E-12	1.6E-13
Total						**-6.2E-11**	**1.3E-10**	**4.4E-11**	**1.3E-10**
Non BER Systems						**-5.8E-10**	**3.0E-10**	**9.5E-10**	**3.2E-10**
Total All Systems						**7.1E-09**	**8.4E-09**	**1.5E-08**	**1.4E-08**

Risk category 6 BER welds added to risk category 4 and risk category 5 BER added to risk category 2 based on the BER analysis.

SXI = Section XI

System CDF Criteria = 1E-7
System LERFF Criteria = 1E-8
Plant CDF Criteria = 1E-6
Plant LERF Criteria = 1E-7

Table A-5 Delta Risk Summary for BER Scope Only

System	Risk Category	Consequence	Degradation Mechanisms	Inspected		Delta Risk (1/yr)			
						Best Estimate		No POD Improvement	
				BER	RI-ISI	CDF	LERF	CDF	LERF
FWS – Feedwater	2	High	TASCS	6	5	-1.2E-10	-1.2E-10	2.3E-11	2.3E-11
	6 to 4	High	None	6	1	2.5E-10	2.5E-10	2.5E-10	2.5E-10
	5 to 2	High	TASCS	11	1	3.0E-09	3.0E-09	7.1E-09	7.1E-09
			TASCS,CC	4	0	2.4E-09	2.4E-09	4.0E-09	4.0E-09
			CC	2	1	1.0E-09	1.0E-09	1.0E-09	1.0E-09
Total						**6.6E-09**	**6.6E-09**	**1.2E-08**	**1.2E-08**
ICS – RCIC	2	High	TT, TASCS	0	0	0	0	0	0
	4	High	None	5	3	6.2E-11	6.0E-11	6.2E-11	6.0E-11
	6 to 4	High	None	2	0	1.0E-10	1.0E-10	1.0E-10	1.0E-10
	5	Medium	TT, TASCS	0	0	0	0	0	0
Total						**1.6E-10**	**1.6E-10**	**1.6E-10**	**1.6E-10**
MSS – Main Steam	4	High	None	16	5	1.3E-11	1.3E-11	1.3E-11	1.3E-11
	6 to 4	High	None	30	0	1.2E-09	1.2E-09	1.2E-09	1.2E-09
	5	Medium	TASCS	0	0	0	0	0	0
Total						**1.2E-09**	**1.2E-09**	**1.2E-09**	**1.2E-09**
WCS – RWCU	2	High	TASCS	0	0	0	0	0	0
	4	High	None	4	1	3.5E-11	3.2E-11	3.5E-11	3.2E-11
	6 to 4	High	None	2	0	1.0E-10	1.0E-10	1.0E-10	1.0E-10
	5	Medium	TASCS	25	3	9.6E-12	3.8E-13	2.2E-11	8.8E-13
			TASCS,FAC	4	0	2.4E-12	9.6E-14	4.0E-12	1.6E-13
Total						**1.5E-10**	**1.3E-10**	**1.6E-10**	**1.3E-10**
Total BER Systems						**8.1E-09**	**8.1E-09**	**1.4E-08**	**1.4E-08**

Risk category 6 BER welds added to risk category 4 and risk category 5 BER added to risk category 2 based on the analysis.

System CDF Criteria = 1E-7
System LERFF Criteria = 1E-8
Plant CDF Criteria = 1E-6
Plant LERF Criteria = 1E-7

BWR Pilot Risk Impact Sensitivity Evaluation

From a sensitivity perspective, the low risk conclusion is most sensitive to the 0.01 CCDP/CLERP value used for a DEGB in the Steam Tunnel. For example, if the CCDP/CLERP value is reduced to 1E-3 (i.e., a more realistic probability), the total change in risk decreases from 8E-9/year to 8E-10/year. Also, as this value is increased, risk increases linearly as shown in the following table.

	Best Estimate		CCDP Increase		CLERP Increase	
	CCDP = 0.01 CLERP = 0.01		CCDP=0. 1	CCDP=1	CLERP=0. 1	CLERP=1
BER System	CDF	LERF	CDF	CDF	LERF	LERF
FWS – Feedwater	6.6E-09	6.6E-09	6.6E-08	6.6E-07	6.6E-08	6.6E-07
ICS – RCIC	1.6E-10	1.6E-10	1.5E-09	1.5E-08	1.5E-09	1.5E-08
MSS – Main Steam	1.2E-09	1.2E-09	1.2E-08	1.2E-07	1.2E-08	1.2E-07
WCS – Reactor Water Cleanup	1.5E-10	1.5E-10	1.0E-09	1.0E-08	1.0E-09	1.0E-08
Total BER Systems	**8.1E-09**	**8.1E-09**	**8.1E-08**	**8.1E-07**	**8.1E-08**	**8.1E-07**

Even if the CCDP value is increased to 0.1, the acceptance criterion is met at the system level. If the CCDP value is increased to 1.0, the plant level (total) acceptance criterion is met, but the system level criterion is exceeded for FWS and MSS. If the CLERP value is increased to 0.1, the plant level (total) acceptance criterion is met, but the system level criterion is exceeded for FWS and MSS. If CLERP value were increased to 1.0, the plant level acceptance criterion would not be met.

The above demonstrates that the key assumption (CCDP/CLERP=0.01 for DEGB in the steam tunnel) does not effect the basic conclusion that the risk acceptance criteria are met after consolidating the BER Program into the RI-ISI program.

System CDF Criteria = 1E-7
System LERFF Criteria = 1E-8
Plant CDF Criteria = 1E-6
Plant LERF Criteria = 1E-7

BER Methodology

- Plant Specific Submittals (Section 3.8)
  - Oct 3, 2001 Meeting
  - 50.59 Process

BER

- Action Items

NRC FORM 659
(10-2000)

U.S. NUCLEAR REGULATORY COMMISSION

NRC PUBLIC MEETING FEEDBACK

Meeting Date: October 4, 2001

Meeting Title: MEETING TO DISCUSS EPRI RISK-INFORMED ACTIVITIES

The NRC recognizes the public's interest in the proper regulation of nuclear activities and is committed to understanding and including public input into our decisions. The NRC seeks to elicit public involvement early in the regulatory process so that safety concerns that may affect a community can be resolved in a timely and practical manner. This process is considered vital to assuring the public that the NRC is making sound, balanced decisions about nuclear safety. If you would like more information about NRC, please visit our web site at www.nrc.gov.

1. Why did you attend this meeting?
   - [ ] a. I am a local resident
   - [x] b. I work for an interested organization
   - [ ] c. I am concerned about environmental issues
   - [ ] d. I am concerned about economic issues
   - [ ] e. Other

2. Were you familiar with the meeting topic prior to coming today?
   - [ ] a. Very [x] b. Somewhat [ ] c. Not at all

3. How did you find out about this meeting?
   - [ ] a. NRC mailing list
   - [ ] b. Newspaper
   - [ ] c. Radio/TV
   - [ ] d. Internet
   - [x] e. Other RP; (EPRI)

4. Have you attended an NRC meeting before?
   - [ ] a. Never
   - [ ] b. 1 or 2 times
   - [x] c. 3 to 5 times
   - [ ] d. More than 5 times

5. Was sufficient notice given in advance of the meeting?
   - [x] a. Yes [ ] b. No

6. How well do you feel you understand the NRC's role with regard to the issues discussed today?
   - [x] a. Very well [ ] b. Somewhat [ ] c. Not at all

7. Were you able to find all of the supporting information you wanted prior to the meeting?
   - [x] a. Yes
   - [ ] b. I did not try to find any information
   - [ ] c. No

8. Was the purpose of the meeting made clear in the preliminary information you received?
   - [x] a. Yes [ ] b. No

9. In your opinion, were people's questions answered clearly, completely and candidly?
   - [x] a. Yes [ ] b. No

10. Was the written material useful in understanding the topic?
    - [x] a. Very [ ] b. Somewhat [ ] c. Not at all

11. Were NRC's presentations and material presented in clear, understandable language?
    - [x] a. Yes [ ] b. No

12. In your opinion, did the meeting achieve its stated purpose?
    - [x] a. Yes [ ] b. No

13. Has this meeting helped you with your understanding of the topic?
    - [x] a. Greatly [ ] b. Somewhat [ ] c. Not at all

14. How well did NRC staff respond to your concerns at this meeting?
    - [x] a. My concerns were directly addressed
    - [ ] b. I was provided an alternate source of information to address my concerns
    - [ ] c. I did not raise my concerns at this meeting
    - [ ] d. I raised my concerns but am not satisfied with the response

15. Was adequate time allotted for discussion with NRC staff on the topic of today's meeting?
    - [x] a. Yes [ ] b. No

16. How satisfied are you overall with the NRC staff who participated in the meeting?
    - [x] a. Very [ ] b. Somewhat [ ] c. Not at all

17. Were the next steps in this process clearly explained, including how you can continue to be involved?
    - [x] a. Yes [ ] b. No

If you would like someone to contact you, please provide your name and phone number or email.

Name: B.L. Montgomery * Telephone: 573-676-8539 E-Mail: blmontgomery@cal.ameren.com

*I don't need anyone to contact me, just providing my name in case you need it.

OMB NO. 3150-0197 Expires: 06/30/2003

Please fold on the dotted lines with Business Reply side out, tape the bottom, and mail back to the NRC.

NRC is striving to improve its communications with the public and would appreciate any additional comments you may have on today's meeting:

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