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March 10, 2005
WOG-05-119

WCAP-15791-P, Rev. 1
Project Number 694

Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

Subject: Westinghouse Owners Group
Response to the NRC Request for Additional Information (RAI)
Regarding Review of WCAP-15791-P, Rev. 1, (Proprietary), "Risk-
Informed Evaluation of Extensions to Containment Isolation Valve
Completion Times" (PA-LSC-0029) (MUHP-3010)

The purpose of this letter is for the Westinghouse Owners Group to provide a formal response to the Request for Additional Information (RAI) issued by the NRC regarding their review of WCAP-15791-P, Rev. 1, (Proprietary), "Risk-Informed Evaluation of Extensions to Containment Isolation Valve Completion Times". The RAI was received by the WOG December 13, 2004 and contained two questions. The responses to these questions are provided in the attachment in support of finalizing your review and issuing a draft Safety Evaluation. No portion of these RAI responses contain proprietary information.

If you have any questions regarding this information, please feel free to call Mr. Steven DiTommaso of the Westinghouse Owners Group Program Management Office at 412-374-5217.

Very truly yours,

Steven M. DiTommaso for

Frederick P. "Ted" Schiffley, II
Chairman, Westinghouse Owners Group

mjl

Attachment

D048

March 10, 2005
WOG-05-119

cc: WOG Steering Committee
WOG Licensing Subcommittee
G. Shukla, USNRC (via Federal Express)
C. Douth, USNRC (via Federal Express)
WOG Project Management Office
J. Andrachek, Westinghouse
G. Andre, Westinghouse
K. Vavrek, Westinghouse

Attachment to WOG-05-119
Responses to the NRC's RAIs on WCAP-15791-P, Rev. 1

The following two RAI questions were received by the WOG from the NRC on December 13, 2004. Each question is followed by the WOG response.

RAI 1: A Tier 3 program ensures that while a CIV is in an LCO condition, additional activities will not be performed that could further degrade the capability of the plant to respond to a condition the inoperable CIV or system was designed to mitigate, and as a result, increase plant risk beyond that assumed by the Topical Report analysis. Tier 3 programs, as implemented by the maintenance rule of 10 CFR 50.65(a)(4) during CIV maintenance are to: (1) ensure that additional maintenance does not increase the likelihood of an initiating event intended to be mitigated by the out-of-service equipment, (2) evaluate the effects of additional equipment out-of-service during CIV maintenance activities that would adversely impact CIV CT risk such as from redundant systems or components, and (3) evaluate the impact of maintenance on equipment or systems assumed to remain operable by the CIV CT analysis.

The staff is concerned that configuration risk management as implemented under the maintenance rule is inadequate to evaluate the risk impact of CIVs in maintenance or repair such that the assumptions of WCAP-15791 remain valid. The extension of the CTs for CIVs generally does not have a significant impact on CDF but does impact LERF/ICLERP (containment isolation). The TS allow multiple condition entry for CIVs but the topical report analyses are based on a single PCIV CT and therefore cumulative risk must also be evaluated for multiple PCIV LCOs. Plant TIER 3 programs that are based on the maintenance rule generally do not provide a quantitatively or qualitatively assessment of LERF. WCAP-15791 provide limited, if any, guidance on performing a TIER 3 LERF analysis either for single or multiple CIV CTs. Quantitative risk assessment is not required by the maintenance rule and in general the TIER 3 assessment is done with only a level 1 CDF analysis. Since the extension of a CIV CT mainly impacts LERF/ICLERP it is the staff's concern that the evaluation of CIVs in a TIER 3 configuration risk management program is limited in that the configuration risk assessment may be incomplete for CIVs in maintenance or repair (only a quantitative or qualitative CDF assessment with a limited qualitative LERF/ICLERP assessment).

A review of the NEI Guidance 93-01, revision 2, Section 11.3.7.1 as endorsed by RG 1.1821 states that qualitative methods is an acceptable approach for establishing risk management actions for (a)(4) assessments in general. Section 11.3.7.2 provides guidance on establishing action thresholds based in part on the EPRI PSA applications guide EPRI-TR-105396. NEI-93-01 guidance states that an acceptable alternative for (a)(4) implementation would include establishing ICDP and ILERP risk management action thresholds. NEI-93-01 also states that due to differences in plant type and design, there is acknowledged variability in baseline core damage frequency and large early release frequency. Further, there is variability in containment performance that may impact the relationship between baseline core damage frequency and baseline large early release frequency for a given plant or class of plants. Finally 93-01 states that therefore, the determination of the appropriate method or combination of methods as discussed above (as presented in 93-01), and the corresponding quantitative risk management action thresholds are plant unique activities.

The topical report WCAP-15791 implementation of RG 1.177 Tier 3 guidelines generally implies the assessment of risk with respect to CDF. However, the proposed CIV CT impacts containment isolation and consequently LERF as well as CDF. Therefore, a licensee's CRMP, including those implemented under the maintenance rule of 10 CFR 50.65(a)(4), must be enhanced to include a LERF methodology/assessment and must be documented in a licensee's plant-specific submittal. Provide a discussion on the LERF methodology to be employed by WCAP-15791 TIER 3 assessments on a plant specific basis as part of topical report WCAP-15791 implementation.

Response 1:

PRA Quality

All plant PRA models provide the capability to assess Large Early Release Frequency (LERF). As part of the industry's program to peer review each plant PRA model, the modeling to assess LERF was reviewed, and Facts and Observations (F&Os) identified. The F&Os identify deficiencies and strengths in analysis and modeling on different aspects of the PRA model. F&Os with a significance level of A or B are addressed in the short-term since they impact the quality of the PRA model. F&Os with a significance level of C or D are either technical suggestions or editorial. These F&Os are not required to be addressed in the short-term since they are not likely to significantly affect results or conclusions. Licensees are addressing A and B level findings in the short-term and some have already completed this activity.

The peer review of the Level 2/LERF model addressed a number of different areas including:

- Guidance
- Success criteria
- Level 1/Level 2 interface
- Phenomena considered
- Human error probabilities and system performance
- Containment capability assessment
- Endstate definition
- LERF definition
- Containment event tree

Licensees that implement the Containment Isolation Valve (CIV) Completion Time extensions justified in WCAP-15791-P, Rev. 1 will commit to addressing their peer review A and B F&Os that impact the LERF assessment. This will ensure the appropriate level of quality for LERF assessments to meet the Tier 3 requirement in Regulatory Guide 1.177.

LERF Assessment Approach

Licensees implementing the CIV Completion Time extensions will commit to ensuring that the LERF assessments address the following:

- Containment large early releases via containment penetrations
- Containment bypass large early releases via interfacing systems LOCAs
- Containment bypass large early releases via steam generator tube ruptures
- Containment integrity failure due to other plant specific vulnerabilities as identified in the plant specific IPE and follow-up PRA model enhancements

The modeling of each release pathway may be included in the PRA model. For pathways that are not modeled, a surrogate pathway can be used provided it accurately represents the pathway under consideration. An accurate representation will require that the surrogate penetration configuration matches the penetration under consideration including the number and types of CIVs, and the CIV failure rates.

The attachment to this RAI response provides an approach for assessing the large early release frequency impact from inoperable CIVs. This approach addresses:

- inoperable CIVs in penetrations to the containment airspace and in bypass lines
- multiple inoperable CIVs
- inoperable CIVs with other equipment inoperable

Following this approach will enable a licensee to determine when a quantitative, plant specific, large early release assessment will be required, and when the quantitative assessment is already addressed by the analysis contained in WCAP-15791-P, Rev. 1 (“Risk-Informed Evaluation of Extensions to Containment Isolation Valve Completion Times”). The quantitative assessments are only required if the CIV CT extensions justified in WCAP-15791-P, Rev. 1 are implemented.

Guidance to Ensure that LERF Assessments are Performed

Section 11.3.7.2, “Establishing action thresholds based on quantitative considerations,” of NUMARC 93-01, Revision 3 (“Industry Guideline for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”) states: “The thresholds for risk management actions may be established quantitatively by considering the magnitude of increase of the core damage frequency (and/or large early release frequency) for the maintenance configuration.” This provides direction to licensees on the need for LERF assessments.

TSTF-359 requires that licensees adopting the change commit to follow Regulatory Guide 1.182, “Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants,” in the Tech Spec Bases. Regulatory Guide 1.182 endorses NUMARC 93-01, Revision 3, which requires that LERF be assessed. Licensees adopting the CIV Completion Time extensions will commit to follow Regulatory Guide 1.182 in the Tech Spec Bases, which would require that LERF be assessed.

NRC Maintenance Rule Inspection Procedure and Draft Maintenance Rule Significance Determination Process

NRC Inspection Procedure 71111.13, “Maintenance Risk Assessments and Emergent Work Control,” provides inspection guidance on the verification of the performance of maintenance risk assessments, the adequacy of risk assessments, and the management of the resulting risk. Appendix A of NRC Inspection Procedure 71111.13 provides a flow chart for the simplified 50.65 (a)(4) oversight. Block 14 of this chart addresses consideration of containment, external, and internal events. The detailed guidance for Block 14 - Did the RA (Risk Assessment) Consider Containment Integrity, External Events and Internal Flooding and Should They Have Been Considered (11.3.4) states for Containment: “The RA may need to consider circumstances which could affect the ability of the containment to perform its function as a fission product barrier. These would include (1) whether new containment bypass conditions are created, or the probability of containment bypass conditions is increased; (2) whether new containment penetration failures that can lead to loss of containment isolation are created; and (3) if maintenance is performed on SSCs of the containment heat removal system (or SSCs upon which this function is dependent), whether redundant containment heat removal trains should be available.” Block 14 of NRC Inspection Procedure 71111.13 ensures that maintenance activities that could impact containment will be addressed. Section 02.01 (Risk Assessment and Management of Risk) requires the verification of “performance of RAs when required by §50.65(a)(4) and in accordance with licensee procedures, ...” Therefore, licensees that committed to NUMARC 93-01, Rev. 3, via Regulatory Guide 1.182 are required to perform an assessment of LERF impact.

Additionally, Draft Appendix K, “Maintenance Risk Assessment and Risk Management Significance Determination Process,” to NRC Inspection Manual Chapter 0609, “Significance Determination Process,” includes an item, “Licensee risk assessment failed to consider SSCs that prevent containment failure such

as containment isolation valves...,” in Table 1, “Inspector Screening Checklist.” Section 1.0, of Attachment 1 in Draft Appendix K states: “The intent of paragraph (a)(4) is for licensees to appropriately assess the risks of proposed maintenance activities that will be affected by external events, internal flooding, or containment integrity.”

In conclusion, LERF will be adequately assessed for the CIV Completion Time extensions based on the above discussion.

ATTACHMENT TO RAI RESPONSE 1

Approach for Assessing the LERF Impact for an Inoperable Containment Isolation Valve (CIV)

Figure 1 provides the process to assess the LERF/LERP impact of inoperable CIVs. This process addresses the inoperability of 1 or more CIVs that could be in penetrations connected to the containment airspace or in a containment bypass line. Each box in the approach is discussed in the following.

Block 1. This block is the entry point for the approach; a CIV is inoperable.

Block 2. This block sorts on other inoperable components. If there are no other inoperable components, the path leads to block 3. If there are other inoperable components, including other inoperable CIVs, the path leads to block 4, 10, or 12, depending on the other components that are inoperable.

Block 3. If the only inoperable component is a CIV, then the analysis in WCAP-15791-P, Rev. 1 is applicable. The CT listed for this CIV is taken directly from the WCAP analysis which assumed only one inoperable CIV. The WCAP analysis assessed the impact on LERF and ICLERP, therefore, the configuration is acceptable and no additional evaluation is required to meet the Tier 3 requirement.

Block 4. This path is followed if the one CIV in a penetration to the containment airspace is inoperable and other equipment (not another CIV) is also inoperable, such as an auxiliary feedwater pump. In this situation the CDF may be increased due to the additional component inoperability. This additional inoperability, and potentially increased CDF, may not be explicitly covered by the analysis and should be considered.

Block 5. This block sorts on the CIV size. A containment hole size of 2 inches in diameter is the threshold for a large release; a hole size less than or equal to a 2 inch diameter will not result in a large release.

Block 6. If the diameter of the CIV is less than or equal to 2 inches, then a large release is not possible. Therefore, regardless of the potential impact on CDF of the additional inoperable component(s) the WCAP analysis is applicable, the configuration (with regard to large early release) is acceptable, and no additional large early release evaluation is required to meet the Tier 3 requirement.

Block 7. This block sorts on the CDF of the specific plant configuration under consideration. The WCAP generic analysis assumed a total CDF of $1E-04/\text{yr}$. If a plant specific analysis was completed, then this plant specific value needs to be considered in this block.

Block 8. If the configuration specific CDF is less than or equal to the value used in the analysis ($1E-04/\text{yr}$ in the generic analysis or a plant specific CDF if a plant specific analysis was completed), then the WCAP analysis is applicable, the configuration (with regard to large early release) is acceptable, and no additional large early release evaluation is required to meet the Tier 3 requirement.

Block 9. If the configuration specific CDF is greater than the value used in the analysis ($1E-04/\text{yr}$ in the generic analysis or a plant specific CDF if a plant specific analysis was completed), then a large early release assessment for the plant specific configuration will need to be completed to meet the Tier 3 requirement.

Block 10. This path is followed if the CIV is located in a containment bypass line and other equipment (not another CIV) is also inoperable. In this situation, the large early release parameters may be impacted, not by the CIV in the bypass line which is covered by the WCAP analysis, but in conjunction with the increased CDF from the additional inoperable equipment and containment isolation failure.

Block 11. Due to the combination of an inoperable CIV in a containment bypass line and other inoperable equipment impacting the plant CDF, and LERF via containment isolation failure, a large early release assessment for the plant specific configuration will need to be completed to meet the Tier 3 requirement.

Block 12. This path is followed if two or more CIVs are inoperable in difference penetrations. The same path is followed whether or not additional equipment (not CIVs) is also inoperable.

Block 13. This path is followed if all the inoperable CIVs are in penetrations to the containment airspace, with or without additional equipment inoperable. The WCAP analysis only considered one inoperable CIV at a time. Therefore, except for the exception in block 14, large early release assessments are required.

Block 14. This block sorts on the effective CIV size. A containment hole size of 2 inches in diameter is the threshold for a large release; a hole size less than or equal to a 2 inch diameter will not result in a large release.

Block 15. If the effective diameter of the CIV is less than or equal to 2 inches, then a large release is not possible. Therefore, regardless of the potential impact on CDF of the additional inoperable component(s) the WCAP analysis is applicable, the configuration (with regard to large early release) is acceptable, and no additional large early release (a)(4) evaluation is required to meet the Tier 3 requirement.

where: effective diameter = $((\text{diameter hole } 1)^2 + (\text{diameter hole } 2)^2 + (\text{diameter hole } 3)^2 + \dots)^{0.5}$

Block 16. If the effective diameter is greater than 2 inches, then a large release is possible. Since the WCAP analysis only considered single inoperable CIVs, a large early release assessment for the plant specific configuration will need to be completed to meet the Tier 3 requirement.

Block 17. This path is followed if the inoperable CIVs are located in different containment bypass lines, with or without additional equipment inoperable.

Block 18. Since the WCAP analysis only considered a single inoperable CIV, a large early release assessment for the plant specific configuration will need to be completed to meet the Tier 3 requirement.

Block 19. This path is followed if the inoperable CIVs are located in a combination of bypass lines and penetrations to the containment airspace. This could impact one or more bypass lines and one or more penetrations to the containment airspace.

Block 20. This block sorts on the effective diameter for the CIVs in penetrations to the containment airspace. A containment effective hole size of 2 inches in diameter is the threshold for a large release; a containment effective hole size less than or equal to a 2 inch diameter will not result in a large release.

Block 21. This block further sorts on the number of bypass lines impacted by the inoperable CIVs.

Block 22. If only one bypass line is impacted by the inoperable CIVs, and the effective diameter for the CIVs in penetrations to the containment airspace is ≤ 2 inches per block 20, then the WCAP analysis is applicable, the configuration (with regard to large early release) is acceptable, and no additional large early release evaluation is required to meet the Tier 3 requirement.

Block 23. Since the WCAP analysis only considered a single inoperable CIV, a large early release assessment for the plant specific configuration will need to be completed to meet the Tier 3 requirement.

Figure 1
Approach for Assessing LERF for an Inoperable Containment Isolation Valve

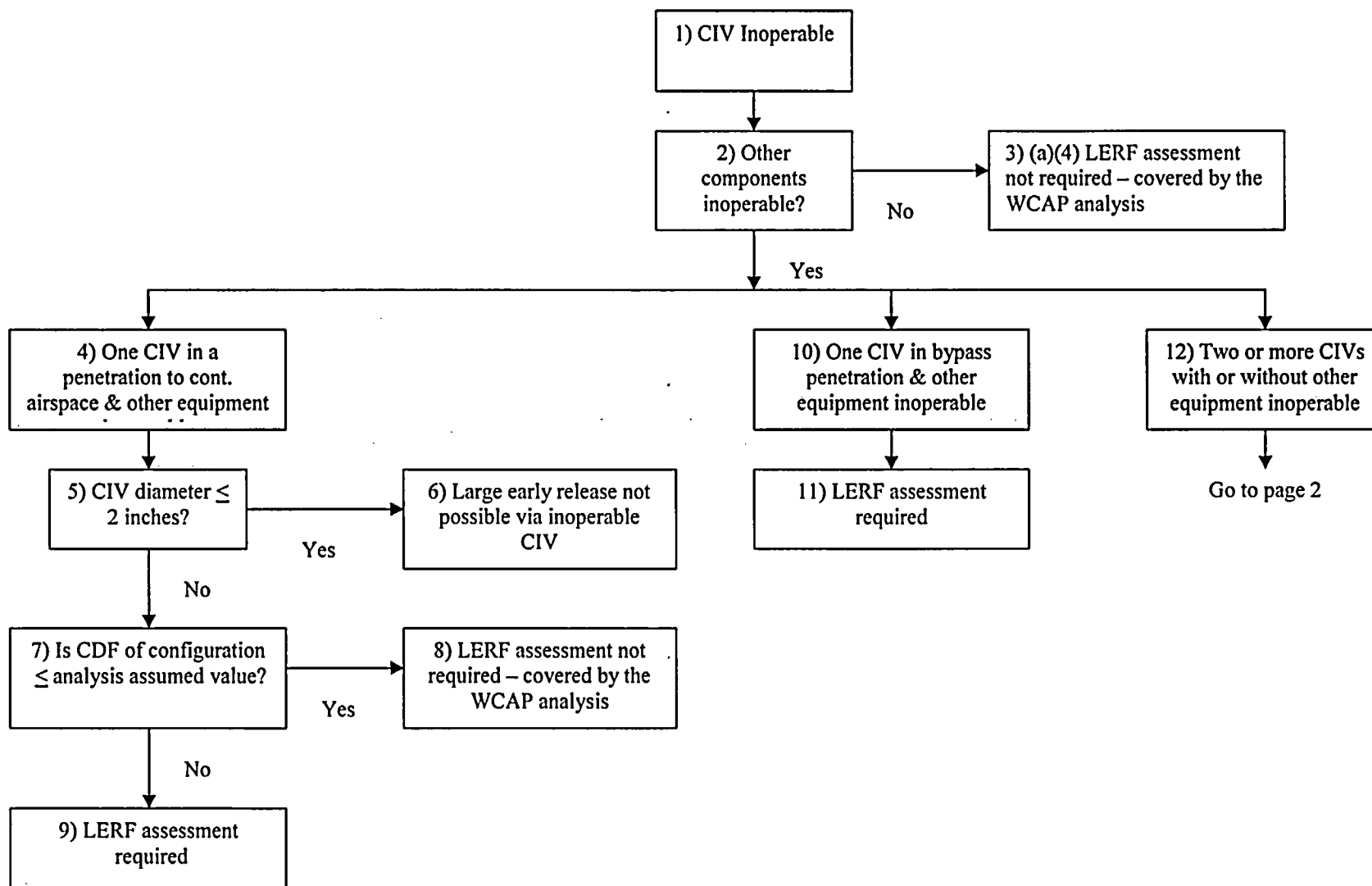
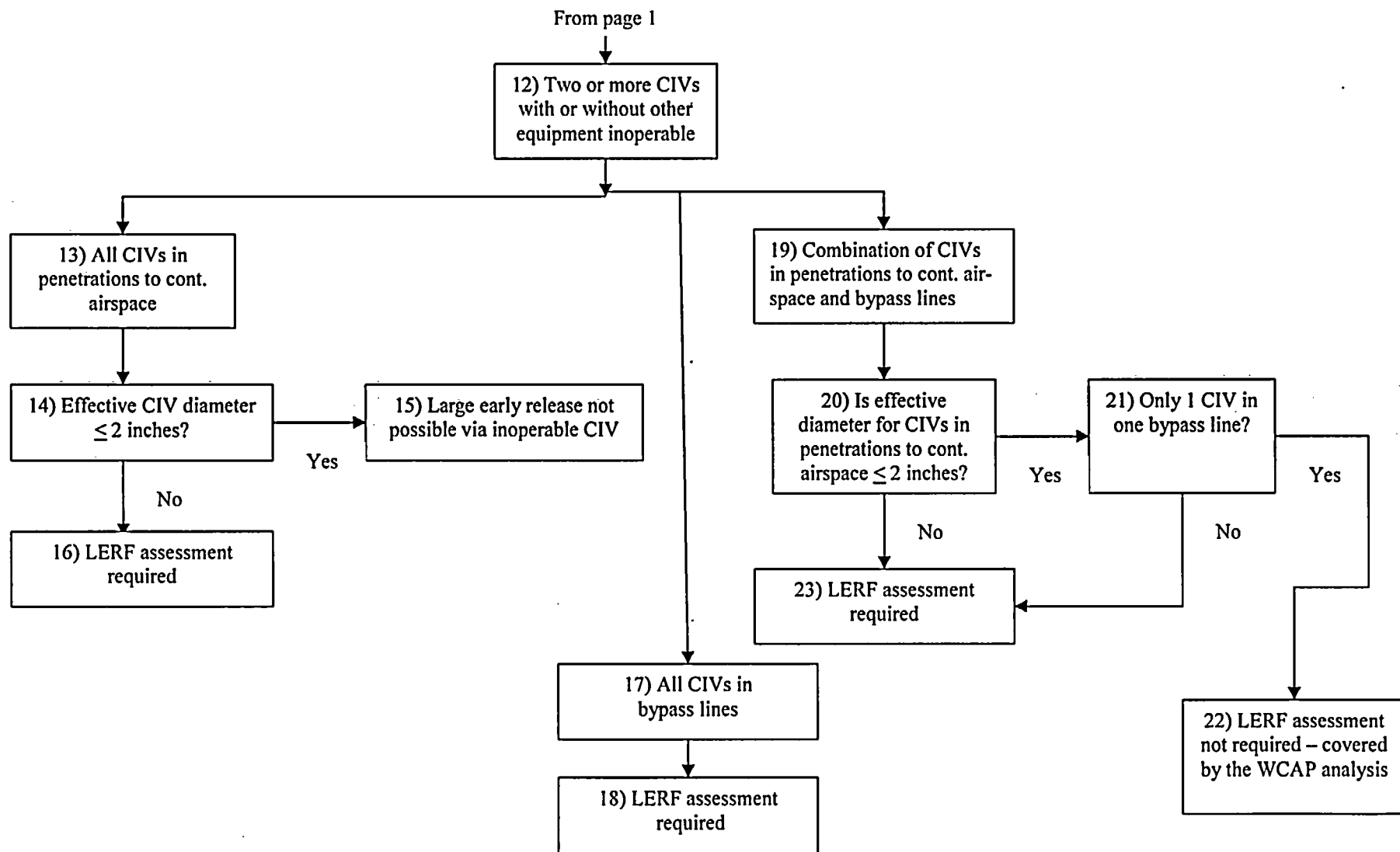


Figure 1 (Cont'd)
Approach for Assessing LERF for an Inoperable Containment Isolation Valve



RAI 2: To ensure the applicability of WCAP-15791 to a licensee's plant, additional information on PRA quality is required by the staff in the following areas.

- i. The plant-specific PRA reflects the as-built, as-operated plant.
- ii. Applicable PRA updates including IPE/IPEEE findings.
- iii. Conclusions of the peer review including any facts and observations (A,B, and C) applicable to the proposed CIV extended CTs.
- iv. PRA quality assurance programs/procedures.
- v. PRA adequacy and completeness with respect to evaluating the proposed CIV CT extension risk and applicability to the plant specific submittal.
- vi. RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," for trial use. Although intended for trial use in a pilot program to finalize staff guidance on PRA quality, guidance is provided to address PRA technical adequacy that licensees may find useful in the application of WCAP-15791.

Provide a discussion on the PRA quality assessment as part of topical report WCAP-15791 implementation for the proposed application and TIER 3 evaluation.

Response 2: This will need to be addressed on a plant specific basis. However, the following is appropriate information that can be provided by the licensees for each area identified by the Staff.

- i. *The plant-specific PRA reflects the as-built, as-operated plant.*

The licensee should provide a statement that the plant specific PRA reflects the as-built, as-operated plant. If it doesn't, then the licensee should identify the discrepancies and identify those differences that may impact the results of any Tier 3 analyses related to the CIV Completion Time (CT) extensions. Identification of these differences is not important in applying the WCAP results to the plant, since a generic analysis was used, but it may be important in conducting Tier 3 analyses.

- ii. *Applicable PRA updates including IPE/IPEEE findings.*

The licensee should provide a concise listing of PRA updates that have been completed since the completion of the IPE and IPEEE. Only major changes in each update are required. Included should be updates to address IPE/IPEEE findings.

- iii. *Conclusions of the peer review including any facts and observations (A,B, and C) applicable to the proposed CIV extended CTs.*

It is only necessary to consider significance level A and B F&Os. Significance level C F&Os are technical suggestions and are not required to be addressed in the short-term since they are not likely to significantly affect results or conclusions. Licensees are addressing A and B level findings in the short-term and some have already completed this activity. It is recommended that only significant level A and B F&Os that have not been addressed and that are applicable to the proposed CIV CT extensions be provided. For each F&O provided, the potential impact on the Tier 3 evaluations supporting the CIV CT extensions should be discussed.

- iv. *PRA quality assurance programs/procedures.*

A discussion of the plant's applicable PRA quality assurance programs/procedures and their relevance to maintaining PRA quality should be provided.

v. *PRA adequacy and completeness with respect to evaluating the proposed CIV CT extension risk and applicability to the plant specific submittal.*

The appropriate approach to address this depends on whether the generic analysis is applied or a plant specific analysis is used. The plant specific analysis is used only if a licensee is interested in extending the CTs beyond those justified in the generic analysis.

Generic Analysis: To demonstrate that the generic analysis is applicable, a licensee will need to compare the plant specific PRA parameters to those used in the WCAP analysis. This includes the parameters listed on Tables 9-1a, 9-1b, 9-1c, and 9-1d of the WCAP which are total CDF, seismic CDF, component random and common cause failure rates, and maintenance unavailability values. A statement, or series of statements, should be provided concerning the quality of the plant specific parameters used in the comparison and why they are adequate. This statement will reference any appropriate Peer Review A and B F&Os.

Plant Specific Analysis: To perform a plant specific analysis, a licensee will rerun the analysis using plant specific input parameters. This is only done by licensees interested in extending the CTs beyond those justified in the generic analysis. The parameters of interest are those provided in Tables 9-1a, 9-1b, 9-1c, and 9-1d of the WCAP. Again, these are values for total CDF, seismic CDF, component random and common cause failure rates, and maintenance unavailability values. A statement, or series of statements, should be provided concerning the quality of the plant specific parameters used in the analysis and why they are adequate. This statement will reference any appropriate Peer Review A and B F&Os.

vi. *RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," for trial use. Although intended for trial use in a pilot program to finalize staff guidance on PRA quality, guidance is provided to address PRA technical adequacy that licensees may find useful in the application of WCAP-15791.*

As noted, RG 1.200 is only available for trial use, therefore, the adequacy of this Regulatory Guide is unknown. The current state-of-the-art quality measure for assessing the technical adequacy of the plant PRA models are the plant Peer Reviews. Item iii above addresses the Peer Review conclusions and A and B F&Os, therefore, it is not necessary for licensees to provide any additional information.