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Beaver Valley-NRC-WOG  
Meeting On Risk-informed In-service Inspection  
(ISI)  
Augmented High Energy Line Break  
(HELB)

September 19, 2001

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# Agenda



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- Introduction and Opening Remarks
- Lead Plant, Scope, and Approach
- Current Results
- Treatment of Other High Energy (HE) Piping and Downstream Tasks
- Plans for Future Meetings

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# Introduction



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## Introduction and Opening Remarks

To discuss and to obtain NRC feedback and direction on issues related to extending the risk-informed ISI application to High Energy (HE) piping at FirstEnergy Nuclear Operating Company Beaver Valley Unit 2 - the WOG lead plant

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# Lead Plant, Scope, and Approach

# Lead Plant, Scope, and Approach



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- Lead Plant
  - FirstEnergy Corporation Beaver Valley Unit 2 (FENOC BVPS2)
  
- Scope
  - RI-ISI Base Program ASME Class 1/Class 2 RI-ISI Piping
  - All BVPS2 High Energy (HE) Piping including Break Exclusion Zones (BEZ)
  
- Approach
  - WOG RI-ISI Methodology defined in Addendum to WCAP-14572, Revision 1-NP-A dated May 2000
  - Consistent with the philosophy of overall WOG Risk-Informed ISI Process
  - Takes advantage of new plant specific information
  - Offers potential to enhance safety while reducing unnecessary regulatory burden
  - Regulatory Review

# Definition of High Energy Lines BVPS2 Design Basis vs. WOG RI-ISI



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- BVPS2 HE Design Basis Criteria
  - High Energy Lines
    - Temperature > 200F, or Pressure > 275 psig, and Operation Time >2%
  - Separation of HE Lines from Essential Systems and Components
  - Break Postulation Criteria
    - Stress > 80% for various combinations of DW, TH, P, Dynamic Loads
    - Terminal Ends
    - Arbitrary Intermediate Breaks – Relieved
    - Break Exclusion Zones
    - Operational Time < 2% does not require break postulation
    - MEB 3-1/NUREG-0800
- WOG RI-ISI HE Criteria
  - Temperature  $\geq$  200F and/or Pressure  $\geq$  275 psig per the SAR for any mode/period of time
- References
  - BVPS2 UFSAR
  - NUREG-0800 (SRP 3.6.1, 3.6.2, Branch Technical Positions ASB 3-1, MEB 3-1)
  - 10CFR50, Appendix A GDC 4
  - Regulatory Guide 1.46

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# Current Criteria

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- SRP 3.6.2; MEB 3-1 Branch Excursion Requirements
  - (1) Design stress and fatigue limits should not be exceeded.
  - (2) Welded attachments for any purpose should be avoided in the area except where detailed stress analysis is performed.
  - (3) Minimize the number of welds
  - (4) Piping lengths should be reduced to the minimum length practical
  - (5) Pipe anchors or restraint design should not require welding to the outer piping surface except where welds are 100% volumetrically examinable in service and supported by a detailed stress evaluation.
  - (6) Guard pipes should be constructed in accordance with the rules of Class MC, subsection NE of the ASME Code
  - (7) A 100% volumetric inservice examination of all pipe welds should be conducted during each inspection interval as defined in IWA-2400, ASME Code, Section XI
  
- Risk-Informed Insights to Break Exclusion Requirements
  - Meets the intent of Item (7) using new PRA and structural reliability information
  - Approach demonstrates "...that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping" per GDC-4

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# Current Results

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# Current Results

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- HE line scope identified using UFSAR system list and plant piping line list
  
- Indirect Effects Walkthrough
  - A walkthrough per WOG RI-ISI Methodology defined in addendum to WCAP-14572 Revision 1-NP-A (May 2000) was completed for all HE piping outside of containment
  
- Results
  - Existing plant design reflects full train separation
  - Systems required to perform safety related functions concurrently or consecutively were physically isolated
  - Current inspection locations have isolated or redundant impacts on safety in the event of a piping failure
  - Locations identified other than those currently inspected that would result in enhanced margin to safety in the event of a piping failure

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# Segment Definition



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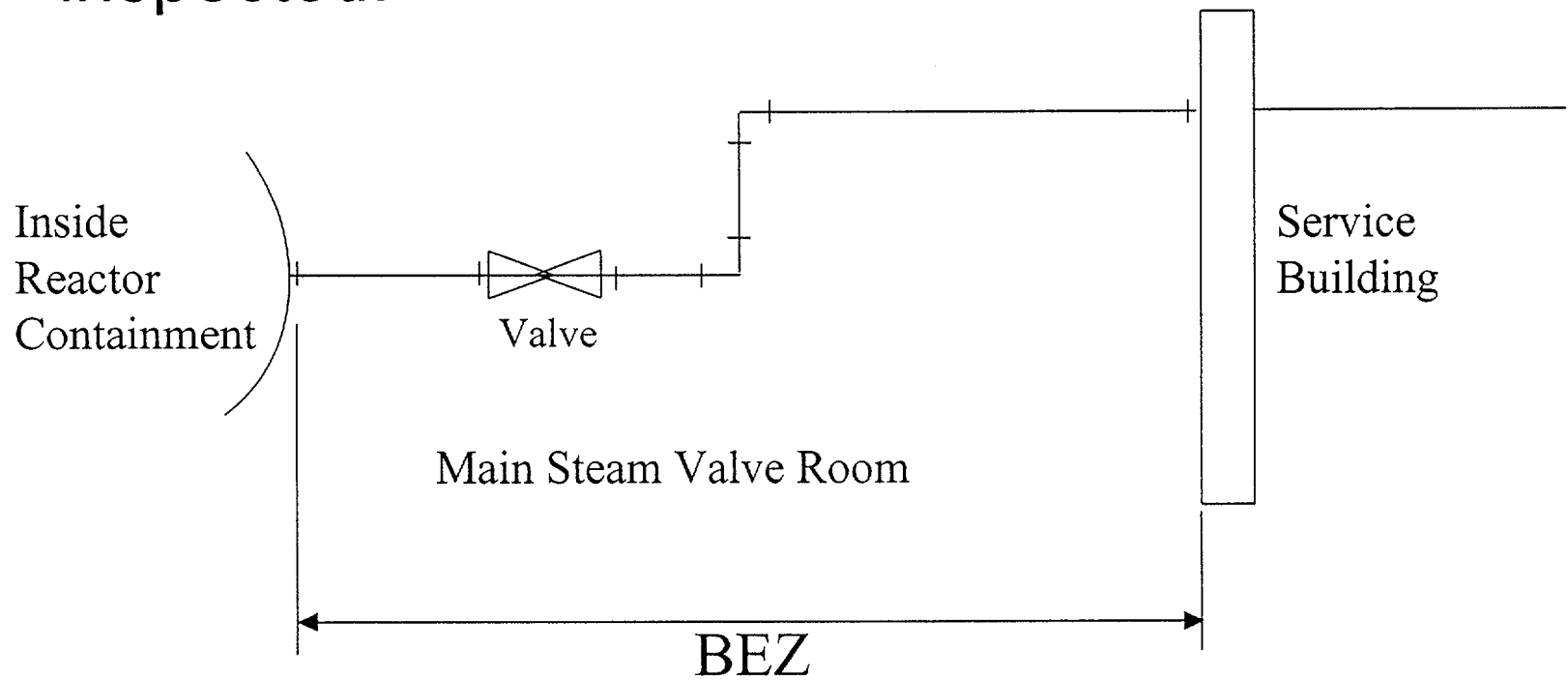
- Segments are defined based on Indirect Consequences as determined by plant walkthrough investigations



# Current Inspections

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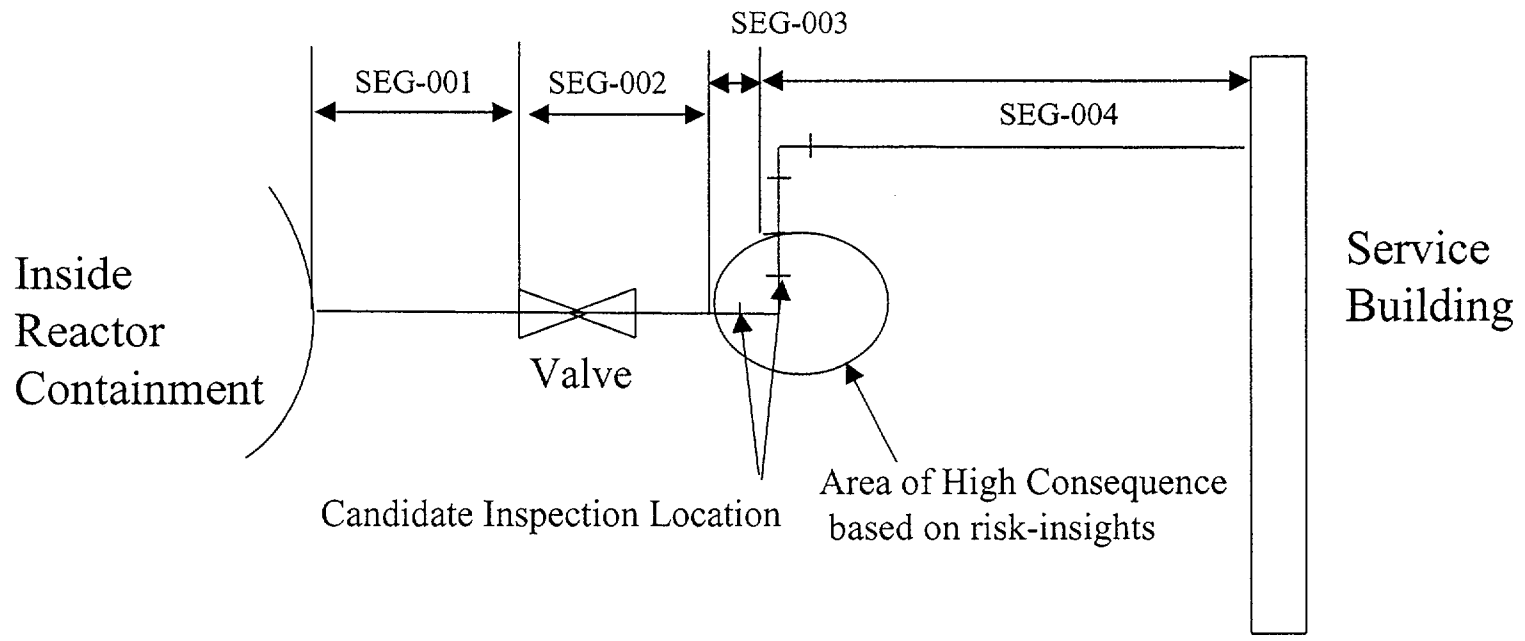
- All Break Exclusion Zone (BEZ) welds are inspected.



# RI-ISI Inspections



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# Structural Element Selection Matrix



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HIGH FAILURE IMPORTANCE SEGMENT	OWNER DEFINED PROGRAM	(a) SUSCEPTIBLE LOCATIONS (100%) ----- (b) INSPECTION LOCATION SELECTION PROCESS
	3	1
LOW FAILURE IMPORTANCE SEGMENT	ONLY SYSTEM PRESSURE TEST & VISUAL EXAMINATION	INSPECTION LOCATION SELECTION PROCESS
	4	2
	LOW SAFETY SIGNIFICANT	HIGH SAFETY SIGNIFICANT



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# Treatment of Other HE Piping and Downstream Tasks

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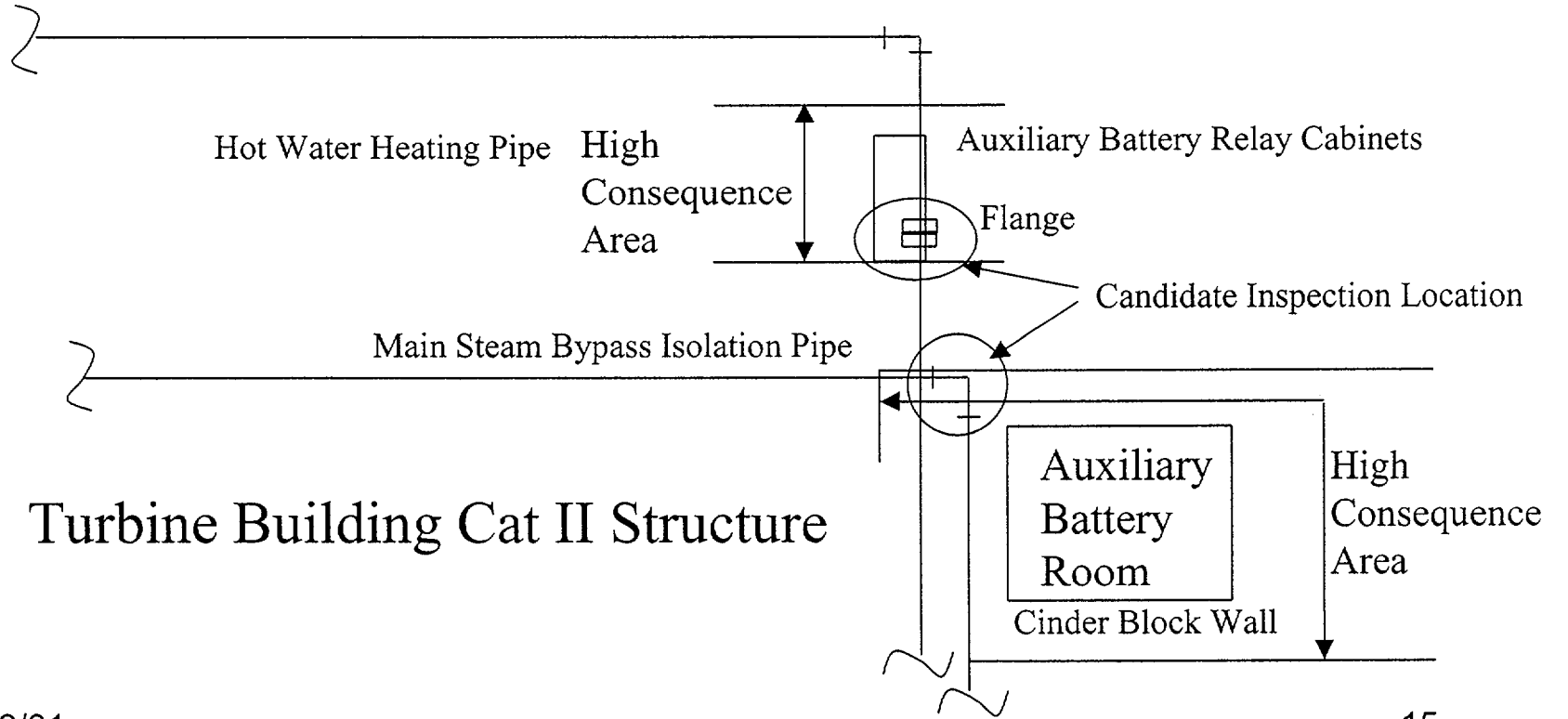
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# Segment Definition Example

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- Proposed Additional HE Segment - Select location (s) and inspect for cause.



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# Downstream Tasks

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- Methodology/Process will be as defined in Addendum to WCAP-14572, Revision 1-NP-A
  - Scope Definition
  - Segment Definition
  - Consequence Evaluation
  - Failure Probability Assessment
  - Risk Evaluation
  - Expert Panel Categorization
  - Structural Element/Non-Destructive Examination (NDE) Selection
  - Risk-Informed ISI Program Implementation
  - Feedback Loop

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## Plans for Future Meetings

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