Supplement 4 to the Westinghouse BWR ECCS Evaluation Methodology

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Licensing Pre-submittal Meeting

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Outline

- Objective
- Introduction/Background
- Purpose of Supplement 4
- Proposed Changes
- Impact on Current Results
- Table of Contents for LTR
- Outlook on Timetable

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Objective

- The objective is to present an overview of Westinghouse plans about the BWR LOCA Methodology updates.

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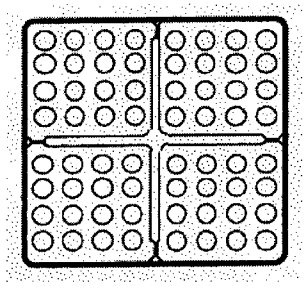
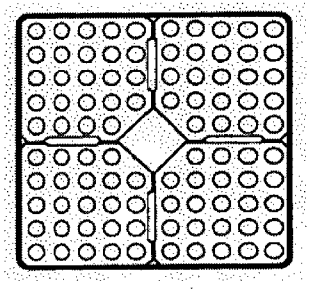
Introduction/Background

- The current methodology was originally approved in 1989 and most recently updated in 2004 for partial rod introduction with Optima2 fuel:
  - USA1
    RPB-90-93-P-A and RPB-90-94-P-A
    SVEA-64



  - USA2
    CENPD-283-P-A and CENPD-293-P-A
    SVEA-96 / SVEA-96+
    Applied to Columbia and Hope Creek



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Background (cont.)

– USA4

WCAP-15682-P-A

relaxation of rod-to-rod touching model

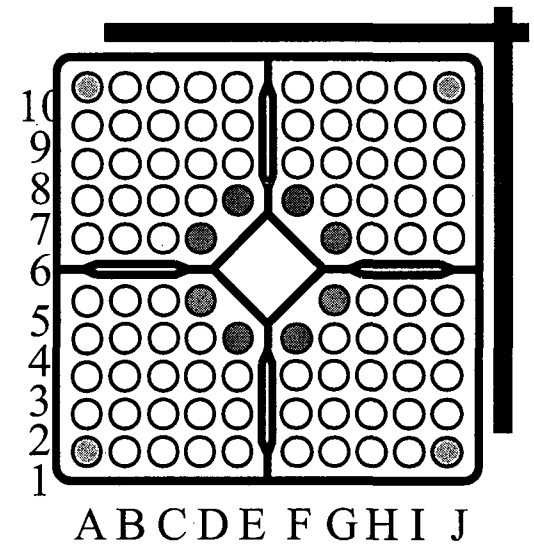
also applied to Hope Creek

– USA5

WCAP-16078-P-A

Optima-2 with partial rods

applied to Quad Cities/Dresden



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Background (cont.)

- The methodology is based on the compliance with 10CFR50 Appendix K:
  - 1.02 times the licensed power
  - ANS '71 decay heat +20%
  - Metal-water reaction using Baker-Just equation
  - Moody break flow
  - consideration of most-limiting single failure
  - **conservative containment pressure**
  - **zero heat transfer from uncovery until rated spray**
  - prescribed spray and reflood HTCs

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Purpose of Supplement 4

- Supplement 4 to the methodology has 4 purposes:
  - Enhance treatment of heat transfer after the end of lower plenum flashing but before the spray cooling period to eliminate excessive conservatism;
  - Make the conservatively calculated containment backpressure part of the documented methodology;
  - Differentiate the treatment of small breaks as part of the evaluation methodology;
  - Clarify and document the details of the methodology in the actual performance of LOCA calculations.

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Purpose of Supplement 4

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Proposed Changes to EM

- The current Westinghouse methodology uses adiabatic convective HTC for the time after the end of lower plenum flashing but before the spray flow reaches the rated conditions, consistent with the recommendation of Appendix K for 7x7 fuel.

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Proposed Changes (cont.)

- 10CFR50 Appendix K Requirement D.6 states:

  Convective Heat Transfer Coefficients for Boiling Water Reactor Fuel Rods Under Spray Cooling. Following the blowdown period, convective heat transfer shall be calculated using coefficients based on appropriate experimental data. For reactors with jet pumps and having fuel rods in a 7×7 fuel assembly array, the following convective coefficients are acceptable:

  a. During the period following lower plenum flashing but prior to the core spray reaching rated flow, a convective heat transfer coefficient of zero shall be applied to all fuel rods.

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Proposed Changes

- Use of zero HTC during the period following lower plenum flashing but prior to core spray reaching rated flow is very conservative.

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Proposed Changes (cont.)

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Proposed Changes (cont.)

- Use of conservatively calculated containment backpressure is acceptable according to Appendix K.
- Westinghouse developed a BWR Containment Methodology using GOTHIC code.
- Upon approval of WCAP-16608-P, the text of the LOCA EM will be modified to reflect this change.

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Proposed Changes (cont.)

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Proposed Changes (cont.)

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Proposed Changes (cont.)

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Additional Clarifications

- Administrative cleanup of references to various topical reports will be documented
- Application of the methodology will be presented more *transparently* using a "road map".
- Clarification on some aspects of the methodology which are not explicitly discussed in current topical reports will be provided.

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Additional Clarifications (cont.)

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Impact on Current Results

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Impact on Current Results (cont.)

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Impact on Current Results (cont.)

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Impact on Current Results (cont.)

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8 REFERENCES

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Outlook on Timetable

- Pre-submittal meeting – 11/08/07
- Submittal of WCAP-16865 – by 12/31/07
- Requested date for SER – December 2008
- First Application – Spring '09 (QC1 Cy21)

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