Progress on Industry Guidance for Phase 2
NEI 13-02 Rev 1 Draft

NRC Public Meeting

September 11, 2014

BWR OWNERS' GROUP

NEI
NUCLEAR ENERGY INSTITUTE

BWR Vent Order Phase 2 Options

Phase 1 – Severe Accident Wetwell Vent; Plans submitted June 30, 2014

Phase 2 – (1) Severe Accident Drywell Vent (SADV) OR **(2) Water Strategy that precludes the need for a SADV Implementation Due: 2017-19**

Order Option 2

Water Addition and Management

Plans Due: Dec 2015

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Water Addition and SADV (545F)

Plans Due: Dec 2015

Order Option 1

SADV (≈1000F)

Plans Due: Dec 2015

CPRR Rulemaking

EA-13-109 Phase 2 Scope

	EA-13-109 Phase 2

HARDWARE	Severe Accident Water Addition (SAWA)
	• Water addition path – RPV or Drywell
	• Water addition pump – delivery pressure and flow and timing
	• Utilization
	  • Motive force
	  • Instrumentation
	• Severe accident deployment considerations
	  • Temperature
	  • Radiation

STRATEGY	Severe Accident Water Management (SAWM)
	• Sustained operational strategy using SAWA/WW vent
	  • Mitigate drywell temperature extremes
	  • Protect containment from over pressure failure
	• Preserve wetwell vent path until personnel and equipment resources are available to establish alternate decay heat removal and pressure control

Estimated Phase 2 Guidance Schedule

Date	Action
Jun – Jul 2014	NEI working group develop draft 13-02 Phase 2 scope (complete)
Jul – Sep 2014	NRC/NEI review draft 13-02 Phase 2 scope – public meetings
Oct 2014	NEI/BWROG industry comment and feedback
Nov 2014	NEI Phase 2 draft revision provided to NRC for reference in ISG
Dec 2014	NRC publish draft ISG for public comment
Feb 2015	NRC public comment period closed
Mar 2015	**NRC issues approved ISG**
Apr – May 2015	NRC/NEI OIP template structure and content without pilots
May – Jul 2015	NRC/NEI OIP template pilots
Aug 2015	NEI/BWROG draft OIP to industry for comment for workshop
Sep 2015	NEI/NRC OIP workshop on pilots and template use
Oct 2015	NEI OIP finalized and included in a revision to NEI 13-02
Dec 2015	**Station OIPs submitted to NRC**

Recap of August 7, 2014 Meeting

- As discussed in the August 7th meeting, NEI submitted a letter on September 10, 2014, requesting NRC Staff endorsement of the industry proposal for meeting EA-13-109 Phase 2 Option B.2, including:
  - BWR Vent Order Phase 2 Scope
  - Phase 2 Compliance
  - Schedule
- Industry has begun development of Phase 2 guidance through revision of NEI 13-02

NEI 13-02 Revision Overview

- Section 1 – Changes to account for Phase 2 approach at the Introductory level.
- Section 2 – Expand boundary conditions to include all of HCVS system including drywell vent design temperature of 545°F when SAWA is included as part of Phase 2 implementation.
- Section 3 – Add boundary conditions for drywell vent temperature if SAWA is not included as part of Phase 2 implementation.

Objective – complete initial draft of Section 1, 2 and 3; and, provide for staff review one week from 09/11/14 meeting, with NRC feedback by 9/23/14

NEI 13-02 Revision Overview

- Appendix C – Strategy for using Phase 2 B.2
  - Strategy that assumes SAWA hardware is available
  - Add guidance for SAWM
- Appendix I – New Appendix on SAWA guidance
  - Hardware that assures that SAWA is available
  - SAWA supports the 545°F vent without SAWM
  - SAWA supports SAWM without a Severe Accident capable DW vent

Objective – complete initial draft of Appendix C and I; and, provide for staff review one week from 09/25/14 meeting, with NRC feedback by 10/10/14

NEI 13-02 Revision Overview

- Sections 4, 5 and 6 will also require revision as needed to support Phase 2 implementation.
- Revisions to these sections will be completed on a schedule consistent with the need to complete NEI 13-02 Rev 1
- HCVS-FAQ-01 through HCVS-FAQ-09 will be included in NEI 13-02 Rev 1 in new Appendix J
- HCVS-WP-01 and HCVS-WP-02 and HCVS-WP-03 will be incorporated by reference in NEI 13-02 Rev 1

Objective – complete draft of NEI 13-02 Revision 1 for staff review by one week from 10/30/14 meeting, with NRC feedback by 11/10/14

NEI 13-02 Revision Schedule

- Industry working group meeting planned for October 15th and 16th to review guidance development and incorporate industry feedback
- 85% complete following 10/30 public meeting
- 90% complete following 11/4 through 11/6 BWROG meeting
- 98% complete following 11/19 public meeting
- Submit to NRC staff for endorsement as Rev 1 by 12/10/14

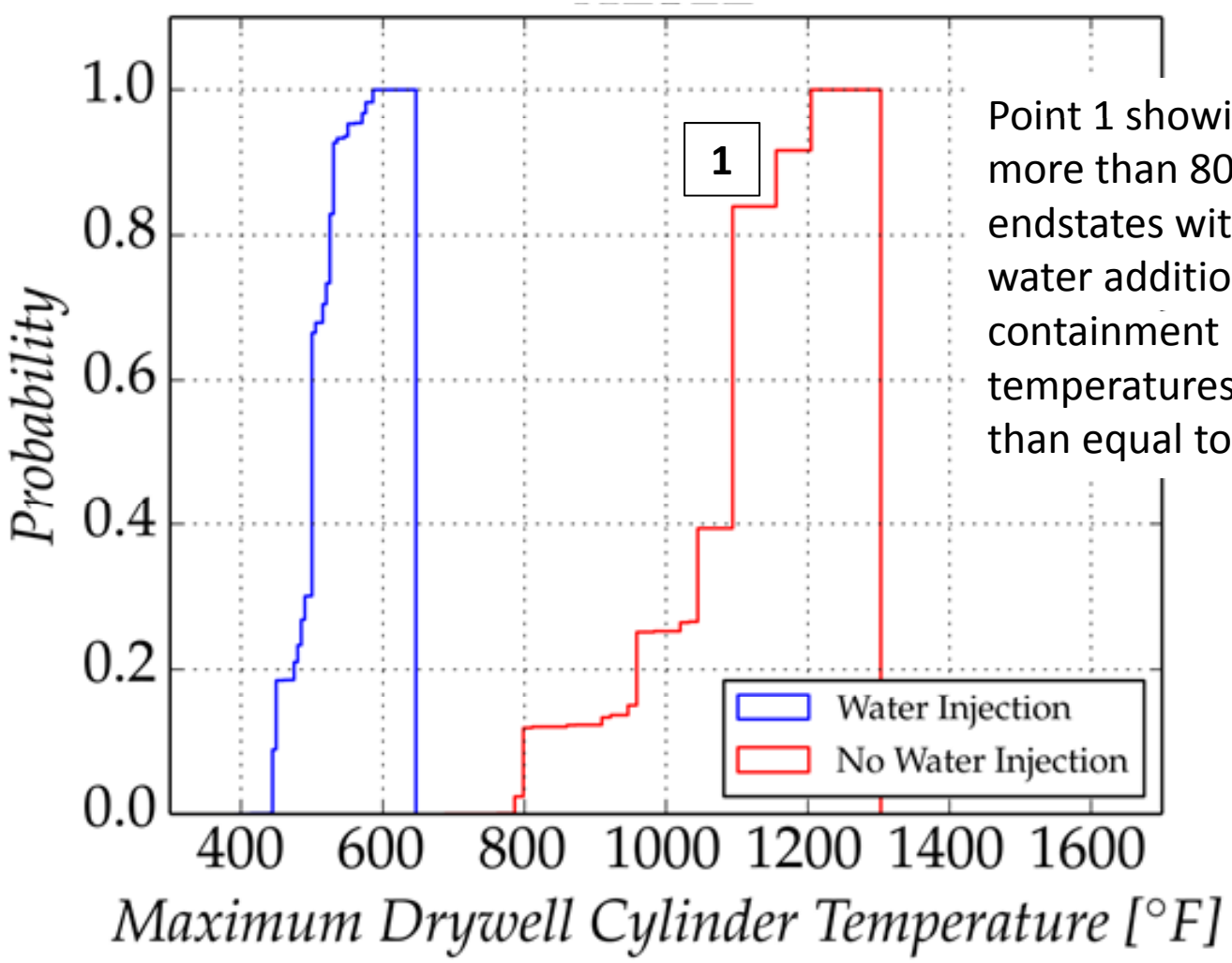
Section 2 Changes

- Expands boundary conditions to the entire HCVS system including use of the 545°F for the drywell vent with SAWA
  - Includes supporting information for the 545°F drywell vent design temperature boundary condition as presented by the NRC staff during the August 7th meeting
  - Drywell vent boundary conditions without SAWA will be contained in Section 3 (Phase 2 Option 1 of Order)
- Other parameters in Section 2 remain unchanged for WW, instrumentation, etc.

Section 3 Content

- Added drywell vent boundary conditions without SAWA
- Establishes 1100°F as the temperature boundary condition as a failure point not a design value
  - More than 80% of end states without water addition provide results with maximum containment temperatures below 1100 °F
- Licensees choosing this option should evaluate the impact of the elevated temperatures
  - on the drywell components (head seal) and
  - show how system design and use of operating procedures provide reasonable confidence against drywell gross leakage at temperatures less than or equal to 1100°F
  - Licensees may provide justification for lower temperature boundary conditions using plant specific analysis

Section 3 Changes



Point 1 showing that more than 80% of endstates without water addition have containment temperatures less than equal to 1100°F

Appendix C (Preliminary)

- This Appendix will define the strategy for compliance with Phase 2 Option B.2
  - Key elements of the strategies
    - The strategy under Phase 2 of Order EA-13-109 is a means to preserve the wetwell vent path as long as possible by providing sufficient water flow to remove heat generated by the core debris and venting that water, in the form of steam, to atmosphere using the Severe Accident capable wetwell vent installed under Phase 1 of the Order
  - Aspects necessary to support SAWM including:
    - Preservation of the wetwell vent path
    - Length of time that the wetwell vent path is to be preserved
    - Transition from severe accident stabilization to recovery
    - Sources and depth of water on drywell floor prior to vessel breach
    - SAWA flow rates as a function of heat sources
    - Licensee actions that may prolong use of the wetwell vent path

Appendix C – Length of Time for Wetwell Vent Preservation

- The length of time that the wetwell vent must be preserved will be sufficient to ensure that on-site staffing and equipment necessary to ensure transition to an alternate decay heat removal mechanism can be made
  - The minimum length of time that the wetwell vent must be preserved for a successful SAWM strategy is 48 hours

Appendix C – Transition to Containment Stability

- To achieve stability of containment and long term decay heat removal, a combination of installed and portable equipment may be used
- Site specific mitigation planning and use of off-site resources do not need to be extended past 72 hours

Appendix C – Sources and depth of water on drywell floor prior to vessel breach

- The initial source of water on the drywell floor comes from
  - Condensation caused by containment heat sinks in contact with the steam environment
  - Reactor Recirculation pump seal leakage
- The Drywell floor is the most likely accumulation area for core debris, the configuration is not a limiting condition of or cause for a revision to the SAWA or SAWM strategies

Appendix C – SAWM Directed Flow Rates

- Determination of the water addition flow rate needed to support the SAWM strategy to protect the containment function
  - The initial water addition rate should be the maximum addition rate possible given the capacity of the water addition source. In no case does the water addition rate have to exceed 500 GPM
  - Containment pressure monitoring should be used to determine when to throttle back the water addition flow rate.
  - Suppression Pool water level monitoring will indicate when the proper balance of water addition and containment heat removal by venting is achieved

Appendix I - Severe Accident Water Addition

- This Appendix defines the hardware requirements necessary to support SAWA including:
  - Single Water addition point
  - RPV Pressure Control
  - Water addition source
  - Motive force
  - Instrumentation
  - Severe accident considerations
- Leverage criteria in Sections 2, 4, & 5 in NEI 13-02

Appendix I Severe Accident Water Addition

- The hardware requirements necessary to support SAWA were discussed by the industry during the August 7th meeting, and guidance will be included in Appendix I of NEI 13-02.
- complete initial draft of Appendix C and I; and, provide for staff review one week from 09/25/14 meeting, with NRC feedback by 10/10/14

Key Dates for NEI 13-02 Revision 1

- Complete initial draft of Section 1, 2 and 3; and, provide for staff review one week from 09/11/14 meeting, with NRC feedback by 9/23/14
- Complete initial draft of Appendix C and I; and, provide for staff review one week from 09/25/14 meeting, with NRC feedback by 10/10/14
- Complete draft of NEI 13-02 Revision 1 for staff review by one week from 10/30/14 meeting, with NRC feedback by 11/10/14
- 98% complete following 11/19 public meeting for submittal to NRC staff for endorsement as Revision 1 by 12/10/14