



JAPAN LESSONS-LEARNED DIVISION

JLD-ISG-2015-01

**Compliance with Phase 2 of Order EA-13-109,
Order Modifying Licenses with Regard to Reliable
Hardened Containment Vents Capable of Operation
under Severe Accident Conditions**

Interim Staff Guidance
Revision 0



Japan Lessons-Learned Division

**Compliance with Order EA-13-109, Order Modifying
Licenses with Regard to Reliable Hardened
Containment Vents Capable of Operation under
Severe Accident Conditions**

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OFFICE	NRR/JLD/JPSB/PM	NRR/JLD/LA*	Tech Editor*	NRR/DSS/SCVB/BC*
NAME	RAuluck	SLent	CHsu	RDennig
DATE	04/23/15	04/ 17 /15	04/22/15	04/23/15
OFFICE	NRR/JLD/PSB*	NRR/JLD/JCBB/BC*	RES/DSA/FSCB/BC*	OGC*
NAME	GBowman	SBailey (BTitus)	RLee	SClark
DATE	04/22/15	04/22/15	04/21/15	04/28/15
OFFICE	NRR/JLD/TSD	NRR/JLD/D		
NAME	JMcHale	JDavis		
DATE	04/29/15	04/29/15		

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**COMPLIANCE WITH PHASE 2 OF ORDER EA-13-109, ORDER MODIFYING
LICENSES WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS
CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS**

JLD-ISG-2015-01

PURPOSE

The U.S. Nuclear Regulatory Commission (NRC) staff is providing this Japan Lessons-Learned Division (JLD) interim staff guidance (ISG) to assist nuclear power reactor licensees with the identification of methods that can be used to comply with the requirements of Phase 2 of Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions" (Reference 1). The phase 2 of the order requires licensees of boiling-water reactors (BWRs) with Mark I and Mark II containments to have either a vent path from the containment drywell or a strategy that makes it unlikely that venting would be needed from the drywell before alternate reliable containment heat removal and pressure control is reestablished. This ISG endorses, with exceptions and clarifications, the methods described in the industry guidance document Nuclear Energy Institute (NEI) 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 1 (Reference 2). This ISG provides one acceptable approach for satisfying Phase 2 requirements. Licensees may propose other methods for satisfying these requirements. The NRC staff will review such methods and determine their acceptability on a case-by-case basis.

In addition to addressing Phase 2 of Order EA-13-109, NEI 13-02, Revision 1, includes some clarifications and additions to the guidance related to implementation of Phase 1 of the order. These changes reflect ongoing interactions with the NRC staff (e.g., related white papers) and lessons learned during implementation of Phase 1 of the order. Revision 1 to NEI 13-02 therefore provides acceptable guidance for both phases of Order EA-13-109, with the exceptions and clarifications noted in this ISG and the Phase 1 ISG in JLD-ISG-2013-02 (Reference 3).

BACKGROUND

The accident at the Fukushima Dai-ichi nuclear power station reinforced the importance of reliable operation of containment vents for BWR plants with Mark I and Mark II containments. In response to the accident, the NRC issued Order EA-12-050, "Issuance of Order To Modify Licenses with Regard to Reliable Hardened Containment Vents," dated March 12, 2012 (Reference 4), which required BWR licensees with Mark I and Mark II containments to upgrade or install a reliable hardened containment venting system. The requirements in Order EA-12-050 were intended to increase the reliability of BWR Mark I and II containment venting systems to support decay heat removal from the reactor core and to provide protection against over-pressurization of the primary containments. While developing the requirements for Order EA-12-050, the NRC acknowledged that questions remained about maintaining containment integrity and limiting the release of radioactive materials if licensees used the venting systems during severe accident conditions.

The staff presented options to address these issues for Commission consideration in

SECY-12-0157, "Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments," dated November 26, 2012 (Reference 5). The options presented in SECY-12-0157 included: (1) continuing with the implementation of Order EA-12-050 for reliable hardened vents, (2) requiring licensees to upgrade or replace the reliable hardened vents required by Order EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions, (3) requiring BWR licensees with Mark I and Mark II containments to install an engineered filtered containment venting system intended to prevent the release of significant amounts of radioactive material following the dominant severe accident sequences, and (4) pursuing development of requirements and technical acceptance criteria for performance-based confinement strategies. The staff provided an evaluation considering various quantitative analyses and qualitative factors related to the four options and recommended that the Commission approve Option 3 to require the installation of an engineered filtering system.

In the staff requirements memorandum (SRM) for SECY-12-0157, dated March 19, 2013 (Reference 6), the Commission directed the staff to: (1) issue a modification to Order EA-12-050 to require BWR licensees with Mark I and II containments to upgrade or replace the reliable hardened vents required by Order EA-12-050 with a containment venting system designed and installed to remain functional during severe accident conditions, and (2) develop a technical basis and rulemaking for filtering strategies with drywell filtration and severe accident management for BWRs with Mark I and II containments. After the SRM was issued, the NRC staff held a series of public meetings to solicit stakeholder input on adding requirements related to severe accident conditions to the existing requirements in Order EA-12-050. The resultant Order EA-13-109 was issued on June 6, 2013. This order requires installation of reliable hardened wetwell vents that not only will assist in preventing core damage when normal containment heat-removal capability is lost, but also will function in severe accident conditions (i.e., when core damage has occurred). Severe accident conditions include the elevated temperatures, pressures, radiation levels, and concentrations of combustible gases, such as hydrogen and carbon monoxide that could result from accidents involving extensive core damage, including accidents involving a breach of the reactor vessel by molten core debris. Order EA-13-109 also requires licensees with Mark I and Mark II containments to either install a severe-accident-capable drywell venting system or develop and implement a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions.

In recognition of the relative importance of venting capabilities from the wetwell and drywell, a phased approach to implementation is being used to minimize delays in implementing the requirements originally imposed by Order EA-12-050. Phase 1 involves upgrading the capabilities for venting from the containment wetwell to provide a reliable, severe-accident-capable hardened vent to assist in preventing core damage and, if necessary, to provide venting capability during severe accident conditions. Phase 2 involves providing additional protection for severe accident conditions through either installation of a reliable, severe-accident-capable drywell vent capability or the development of a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions. The revised order contains two distinct schedules for implementation. For Phase 1, all licensees are required to implement the requirements no later than startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first. For Phase 2, all licensees are required to implement the

requirements no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first.

Phase 1 Guidance

After the issuance of the revised order, the NRC issued JLD-ISG-2013-02, Revision 0, for Phase 1 of Order EA-13-109 on November 14, 2013. JLD-ISG-2013-02, Revision 0, endorses, with exceptions and clarifications, the methodologies described in NEI 13-02, Revision 0, "Industry Guidance for Compliance with Order EA-13-109" (Reference 7). All applicable licensees submitted an overall integrated plan (OIP) for NRC review on or before June 30, 2014, which included a description of how compliance with Phase 1 requirements will be achieved. The staff has completed its review of the Phase 1 OIPs and has issued interim staff evaluations to all applicable licensees documenting open items associated with implementation of the Phase 1 OIPs.

In addition to addressing Phase 2 of Order EA-13-109, NEI 13-02, Revision 1, includes some clarifications and additions to the guidance related to implementation of Phase 1 of the order. These changes reflect ongoing interactions with the NRC staff and lessons learned during implementation of Phase 1 the order. Revision 1 to NEI 13-02 provides acceptable guidance for both phases of Order EA-13-109, with the exceptions and clarifications noted in this ISG and JLD-ISG-2013-02.

Phase 2 Guidance

The focus of this ISG is to provide guidance for implementing Phase 2 requirements of the order. The Phase 2 portion of Order EA-13-109 builds on the Phase 1 activities, and is intended to be consistent with the expected outcome of the development of a regulatory basis for the containment protection and release reduction (CPRR) rulemaking. Specifically, the industry described a containment venting approach that includes severe accident water addition (SAWA) and severe accident water management (SAWM) strategies that would preserve the use of a wetwell vent path, in addition to providing other benefits. Evaluations performed in support of the CPRR rulemaking confirmed significant benefits of including SAWA as part of a severe accident management strategy.

Similar to the process followed for Phase 1, an industry working group under NEI auspices developed a guidance document for the implementation of Phase 2 requirements for Order EA-13-109 for NRC staff review and endorsement. The industry working group revised selected sections and added new sections in NEI 13-02, Revision 0, to include and clarify guidance for Phase 2 requirements of the order. The NRC staff held several public meetings and provided questions and comments on the proposed guidance. On December 10, 2014, NEI submitted NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0E2 (Reference 8), incorporating many of the NRC staff's comments. The NRC staff reviewed the guidance document and prepared a draft ISG that endorsed the methodology, with several exceptions, clarifications, and issues to be resolved during continuing discussions. The draft ISG was issued for public comment on March 10, 2015 (Reference 9). The public comment period ended on April 9, 2015. The staff's responses to the comments can be found in *NRC Responses to Public Comments* (Reference 10). Following issuance of the draft ISG, the staff continued to interact with the nuclear industry and other stakeholders to resolve issues.

Additional material provided by the nuclear industry and related NRC staff questions and comments are available in the NRC's Agencywide Documents Access and Management System (ADAMS) (References 11 and 12).

The NRC staff briefed the Advisory Committee on Reactor Safeguards (ACRS) Fukushima sub-committee on March 20, 2015, and the full-committee on April 10, 2015. By letter dated April 23, 2015, NEI submitted a revised guidance document NEI 13-02, Revision 1, incorporating many of the staff's comments, as well as ACRS comments (Reference 13), and requested the NRC endorsement of this guidance document.

As described in Order EA-13-109, the NRC staff is issuing this final ISG to provide details on acceptable approaches for complying with the Phase 2 requirements of Order EA-13-109.

RATIONALE

1. Order EA-13-109 provides a two-phased approach to implement requirements identified in the order. Under Phase 1, licensees of BWR facilities with Mark I and Mark II containment designs shall install a wetwell venting system that remains functional during severe accident conditions. Under Phase 2, licensees of BWR facilities with Mark I and Mark II containment designs shall either install a severe-accident-capable drywell venting system or develop and implement a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during a severe accident. The installed venting system must meet prescribed quality standards.
2. The order requires that licensees develop the necessary procedures and conduct appropriate training of personnel who might be required to operate the system.

APPLICABILITY

This ISG shall remain in effect until it has been superseded, withdrawn, or incorporated into a regulatory guide or the standard review plan (SRP).

PROPOSED GUIDANCE

As discussed above, this ISG is applicable to all operating BWR licensees with Mark I and Mark II containment designs. The NRC staff considers that the design, development, implementation, and testing of severe-accident-capable hardened containment venting systems as described in NEI 13-02, Revision 1, are acceptable means of meeting the Phase 2 requirements of Order EA-13-109. However, the NRC endorsement of NEI 13-02, Revision 1, does not imply the NRC endorsement of references listed in NEI 13-02, Revision 1.

IMPLEMENTATION

Except in those cases in which a licensee proposes an acceptable alternative method for complying with Order EA-13-109, the NRC staff will use the methods described in this ISG to evaluate licensee compliance as presented in submittals required in Order EA-13-109.

BACKFITTING DISCUSSION

Licensees may use the guidance in this document to demonstrate compliance with Order EA-13-109. Accordingly, the NRC staff issuance of this ISG is not considered backfitting, as defined in Title 10 of the *Code of Federal Regulations* (10 CFR) 50.109(a)(1), nor is it deemed to be in conflict with any of the issue finality provisions in 10 CFR Part 52, "Licenses, Certifications, and Approvals for Nuclear Power Plants."

FINAL RESOLUTION

The contents of this ISG may subsequently be incorporated into a regulatory guide, the SRP, or other guidance documents, as appropriate.

ATTACHMENT

1. Guidance for Developing, Implementing, and Maintaining Reliable Hardened Containment Venting Systems at Boiling-Water Reactor Facilities with Mark I and Mark II Containment Designs for Phase 2 of Order EA-13-109.

REFERENCES

1. U.S. Nuclear Regulatory Commission (NRC), "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," Order EA-13-109, June 6, 2013 (ADAMS Accession No. ML13130A067).
 2. Nuclear Energy Institute (NEI) 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 1, (ADAMS Accession No. ML15113B318).
 3. NRC, "Interim Staff Guidance JLD-ISG-2013-02, " Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Vents Capable of Operation under Severe Accident Conditions," November 14, 2013 (ADAMS Accession No. ML13304B836).
 4. NRC, "Order To Modify Licenses with Regard to Reliable Hardened Containment Vents," Order EA-12-050, March 12, 2012 (ADAMS Accession No. ML12054A694).
 5. NRC, "Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments," SECY-12-0157, November 26, 2012 (ADAMS Accession No. ML12325A704).
 6. NRC, "SRM - SECY-12-0157 – Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments," SRM-SECY-12-0157, March 19, 2013 (ADAMS Accession No. ML13078A017).
 7. NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0, November 12, 2013 (ADAMS Accession No. ML13316A853).
 8. NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0E2, December 10, 2014, (ADAMS Accession No. ML14345B045).
 9. NRC, FRN for Draft Interim Staff Guidance JLD-ISG-2015-01, " Compliance with Phase 2 of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Vents Capable of Operation under Severe Accident Conditions," March 10, 2015 (80 FR 12649) ADAMS Accession No. ML15022A019.
 10. NRC, "NRC Response to Public Comments," (ADAMS Accession No. ML15114A051).
 11. NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0F4," (ADAMS Accession No. ML15084A454).
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12. NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109, Revision 0H1," (ADAMS Accession No. ML15111A060).
13. NRC, letter from John W. Stetkar (ACRS) to Mark A Satorius (EDO), "Interim Staff Guidance JLD-ISG-2015-01, Compliance with Phase 2 of Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," (ADAMS Accession No. ML15118A883),

Guidance for Developing, Implementing, and Maintaining Reliable Hardened Containment Venting Systems at Boiling-Water Reactor Facilities with Mark I and Mark II Containment Designs for Phase 2 of Order EA-13-109

1.0 Phased Approach

Order EA-13-109 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML13130A067) requires boiling-water reactors (BWRs) with Mark I and Mark II containments to have a reliable, severe-accident-capable hardened containment venting system (HCVS). The order allows implementation of these requirements in two phases. In Phase 1, the subject licensees are required to design and install a venting system that provides venting capability from the wetwell during severe accident conditions. In Phase 2, licensees for BWRs with Mark I and Mark II containments are required to either install a system for venting from the drywell under severe accident conditions or develop and implement a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the drywell during severe accident conditions.

The timeline for issuing the interim staff guidance (ISG) and for complying with Order EA-13-109 are different for Phase 1 and Phase 2. Specifically, the order allows Phase 2 implementation later than Phase 1 implementation. The U.S. Nuclear Regulatory Commission (NRC) staff issued the ISG for Phase 1 of Order EA-13-109 on November 14, 2013 (ADAMS Accession No. ML13304B836). The purpose for having a phased approach was, in part, to avoid inconsistency with the studies related to the development of a regulatory basis for the containment protection and release reduction (CPRR) rulemaking. Since issuance of Order EA-13-109, significant work has been done on the CPRR rulemaking and the NRC staff is developing an information paper to inform the Commission of the findings and staff's path forward.

On April 23, 2015, Nuclear Energy Institute (NEI) submitted NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109, Revision 1," (ADAMS Accession No. ML15113B318), for NRC review and endorsement. In addition to addressing Phase 2 of Order EA-13-109, NEI 13-02, Revision 1 includes some clarifications and additions to the guidance related to implementation of Phase 1 of the order. These changes reflect ongoing interactions with the NRC staff and lessons learned during implementation of Phase 1. The outcomes of these interactions (e.g. frequently asked questions (FAQs), white papers (WPs)) were consolidated into NEI 13-02, Revision 1. Thus, the submitted document contains implementation guidance for the entire order, both Phases 1 and 2. This ISG addresses the Phase 2 portion of the guidance contained in NEI 13-02, Revision 1.

2.0 Order Requirements and Applicable Guidance

The requirements in Order EA-13-109 and the corresponding sections in NEI 13-02, Revision 1, that contain the applicable guidance for both Phases 1 and 2, are listed in Table B-1 of Appendix B, "Road Map of Order Requirements," to NEI 13-02, Revision 1.

Staff Position: NEI 13-02, Revision 1, provides acceptable method(s) for satisfying the order requirements, with exceptions and clarifications, as noted in Section 4 of this ISG.

3.0 Phase 2 Compliance Methods in NEI 13-02, Revision 1

Phase 2 of Order EA-13-109 requires licensees of BWRs with Mark I and Mark II containments to design and install a reliable venting capability from the drywell under severe accident conditions as described by order requirements B(1) and Section B.1 or alternatively, develop and implement a reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions before alternate reliable heat removal and pressure control is reestablished, as described in order requirements B(2) and Section B.2.

NEI 13-02, Revision 1, provides guidance to licensees for three different methods of complying with Phase 2 of Order EA-13-109. The first method corresponds with order requirements B(1) and Section B.1 (which applies the functional requirements defined in Section A for the wetwell venting system to the drywell venting system), and the other methods correspond to order requirements B(2) and Section B.2.

The first method would provide a severe accident capable drywell vent without additional capabilities for water addition during severe accident conditions. Not adding water to the containment during the accident could result in drywell temperatures well in excess of the 545 degrees Fahrenheit (°F) design temperature boundary condition within Mark I and Mark II containments confirmed by the supporting analyses for the guidance. Therefore, NEI 13-02, Revision 1, states that if this method of compliance is to be selected, licensees would need to submit a plant-specific analysis relative to the design temperature boundary condition for NRC approval because the existing generic plant analysis shows drywell temperatures significantly exceeding 545°F during a severe accident with reactor vessel breach by core debris without water addition to the reactor pressure vessel or drywell.

The second and third methods of compliance rely on water addition to the containment to provide reasonable assurance that drywell temperatures would remain below the 545°F design temperature boundary condition. The second method involves a hybrid approach to the order, where licensees would develop a strategy that includes severe accident water addition (SAWA), but will also install a severe-accident-capable drywell vent that complies with the order requirements B(1) and Section B.1. Under that method, SAWA supports the 545°F design temperature boundary condition for the drywell vent. The third method, referred to as severe accident water management (SAWM), includes SAWA and provisions for controlling the rate of water addition. By using SAWA with SAWM, the capability to vent from the severe-accident-capable wetwell vent could be preserved for an extended period of time, until an alternate means of reliable containment heat removal and pressure control could be established. Thus, the third method could be a reliable containment venting strategy, meeting the requirements of B(2) and Section B.2 of Order EA-13-109, and obviating the need for a drywell vent.

First Method of Compliance

Section 3 of NEI 13-02, Revision 1, states that if the option to install a severe accident drywell vent (SADV) with no water addition were to be selected, the licensees will need to submit plant-specific analysis relative to the design temperature boundary condition for the NRC's approval. In addition, the CPRR rulemaking may result in additional requirements similar to SAWA on a

time table consistent with the rulemaking schedule. No additional guidance on this method is provided in NEI 13-02, Revision 1.

Second Method of Compliance

This method will provide a strategy for SAWA along with a SADV that complies with the order requirements B(1) and Section B.1 (which applies functional requirements from Section A). The temperature boundary condition is achieved by SAWA. The wetwell vent will be used for as long as it is available and when SAWA floods the wetwell vent, the drywell vent will perform the venting function until alternate reliable decay heat removal and pressure control is established. The SADV will comply with the order requirements and the guidance that was developed during Phase 1, including extending the vent design temperature of 545°F agreed to for common portions of the HCVS vent lines during that phase to the remaining portions of the drywell vent system. Under this hybrid approach, the temperature boundary condition for the drywell vent achieved by SAWA provides the added benefit for reducing gross leakage through drywell head seals and other penetrations. NEI 13-02, Revision 1, describes this method as a strategy addressed by the provisions of B(2) in Order EA-13-109 that includes using a Section B.1-compliant drywell vent until alternate reliable heat removal and pressure control can be established. Section B.2.3 of Order EA-13-109 states that “the implementation of the strategy shall include licensees preparing the necessary procedures, defining and fulfilling functional requirements for installed and portable equipment (e.g. pumps and valves), and installing the needed instrumentation.” The functional requirements defined in Section B.1 provide a logical starting point for addressing functional requirements for equipment used in proposed SAWA strategies. The functional, operational, and monitoring guidance specific to SAWA are addressed in Section 4 of NEI 13-02, Revision 1. The quality, procedure, training, and maintenance guidance for SAWA are addressed in Sections 5 and 6 of NEI 13-02, Revision 1. Additional guidance specific to SAWA is provided in Appendix I of NEI 13-02, Revision 1.

The functional requirements and their implementation for SAWA for the most part are reliant on actions taken under Order EA-12-049, “Order To Modify Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events” (ADAMS Accession No. ML12054A736), with certain actions denoted in the guidance as time sensitive actions (TSAs). For example, ensuring electric/pneumatic power to the valves in the injection flow path and any instrumentation required for SAWA will fall under TSAs. The connection will be located in a place that is accessible under severe accident conditions. In the example provided in Appendix I to NEI 13-02, Revision 1, the water addition point can be common for Order EA-12-049 and SAWA supporting Order EA-13-109. NEI 13-02, Revision 1, describes functional requirements for SAWA and information to be provided by licensees in the Phase 2 overall integrated plans (OIPs). The water addition source was validated as 500 gallons per minute by an Electric Power Research Institute (EPRI) technical report (Reference 27 in Reference 2) and related analyses performed by the NRC staff for the analyzed plant. Water addition could be established approximately 8 hours from the onset of the loss of all injection sources and still avoid containment failure, based on the worst case scenario presented in NUREG/CR-7110, Volume 1, “State-of-the-Art Reactor Consequence Analyses Project,” for a short-term station blackout without reactor core isolation cooling (RCIC) black start. For all other severe accident sequences analyzed to support the CPRR rulemaking, the SAWA can be provided much later than 8 hours, keying on when RCIC failure is assumed, and the containment could still be successfully protected from overpressurization. Equipment used to satisfy the requirements of

Order EA-12-049 can be credited as a SAWA source. All actions necessary to deploy and sustain the equipment will be shown capable of being performed under the temperature and radiological conditions that could exist during a severe accident as defined by Order EA-13-109.

The functional requirements proposed by the NEI 13-02, Revision 1, for the SAWA/SADV strategy is acceptable to the NRC staff. The overall hybrid approach for this method is acceptable to the NRC staff subject to the discussions in Section 4.0, "Staff Clarifications and Exceptions to NEI 13-02, Revision 1."

Third Method of Compliance

This method controls the water addition in SAWA using SAWM and extends the capability to vent from the wetwell for a longer period of time until alternate decay heat removal and pressure control can be established. The guidance states that this method qualifies as a reliable containment venting strategy meeting the order requirements in B(2) and Section B.2. As an alternative to installing a severe-accident-capable drywell vent, order requirement B(2) allows licensees to:

.... develop and implement reliable containment venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell before alternate reliable containment heat removal and pressure control is reestablished and meets the requirements in Section B.2 below. Section B.2 of the order provides additional requirements for the containment venting strategy.

The order does not establish any limiting metric for the duration of the loss of alternating current power, just as Order EA-12-049 does not. However, in Phase 1 guidance development, the NRC staff and the industry agreed that the HCVS could be considered capable of sustained operations if it could remain functional for at least 7 days, because 7 days was thought to be a reasonably conservative period of time. An acceptable approach for Phase 2 is for licensees to develop procedures and functional requirements for installed and portable equipment, including instrumentation, supporting SAWM and venting from the wetwell for the same 7-day period previously agreed upon for Phase 1. The guidance for SAWM and alternate heat removal and pressure control is provided in Appendix C of NEI 13-02, Revision 1. The guidance states that additional components, such as instrumentation, that may be required for SAWM will meet the functional requirements discussed under SAWA for the second method of compliance. With respect to establishing alternate containment heat removal function, NEI 13-02, Revision 1, provides guidance to the licensees to submit for staff review a discussion of the potential success paths to establish such a system within the desired time period by proposing a three tiered approach.

The first approach is to demonstrate that SAWM strategy can be successfully implemented for the 7-day sustained period by controlling water addition and using the containment wetwell vent. Licensees taking this approach need not provide any procedures or details concerning modifications necessary to implement an alternate containment heat removal system.

The second approach is to demonstrate that the SAWM strategy can be implemented for greater than or equal to 72 hours, but for less than a 7-day sustained period of operation. The guidance states that a drywell vent would not be necessary under this approach. Licensees

taking this approach will describe how alternate containment heat removal might be established before a need arises for drywell venting. Licensees will describe in the OIPs the possible means of containment heat removal and pressure control, such as information related to equipment needed (e.g., heat exchangers and pumps); general locations of the equipment, including power and piping connections; evaluation of accessibility to those areas; common tools and equipment needed to install the proposed method; and if applicable, special equipment needed that would not be typically available on site.

The third approach is to demonstrate that the SAWM strategy can be implemented for less than 72 hours before a transition to alternate containment heat removal is needed to prevent containment pressure from subsequently reaching the primary containment pressure limit or design pressure, whichever is lower. Under this approach, licensees will describe in their OIPs specific plant modifications necessary to implement an alternate containment heat removal and pressure control and will also develop implementation procedures for placing the system in service.

The functional requirements proposed by the NEI 13-02, Revision 1, for this method and the proposed procedural requirements for establishing alternate containment heat removal system are acceptable to the NRC staff, subject to the discussions in Section 4.0 of this ISG.

4.0 Staff Clarifications and Exceptions to NEI 13-02, Revision 1

The NRC staff's endorsement of NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 1, is subject to the following exceptions and clarifications.

4.1 Emergency Operating Procedures, Severe Accident Management Guidelines, and Emergency Preparedness Procedures.

NEI 13-02, Revision 1, contains references to the Boiling Water Reactor Owners Group (BWROG) generic Emergency Procedure Guidelines/Severe Accident Guidelines (EPGs/SAGs) and plant-specific Emergency Operation Procedures (EOPs), Severe Accident Management Guidelines (SAMGs), and Emergency Preparedness procedures. The discussion extends beyond the scope of Order EA-13-109 and the staff's endorsement of the technical and quality requirements of severe-accident-capable vents. The discussion relates to using the wetwall and drywell vents when plant-specific EPGs/SAMGs are revised to incorporate post-Fukushima revisions recommended by the BWROG EPGs/SAGs. This discussion is informational and the NRC staff is not providing a general endorsement for the contents, including, but not limited to, the BWROG generic EPGs/SAGs or plant-specific EOPs/SAMGs. The staff will review the procedural requirements on the operation and use of the drywell portion of the HCVS during review and audit of licensee submittals of OIPs related to Phase 2.

4.2 Appendix E - Interface with the Requirements of Generic Letter 89-16, "Installation of a Hardened Wetwell Vent"

The stated purpose of Appendix E to NEI 13-02, Revision 1, is to provide a clear understanding of the interface between Generic Letter (GL) 89-16, "Installation of a Hardened Wetwell Vent," and Order EA-13-109, "Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions." Appendix E also clarifies administrative housekeeping, in that it

provides a basis for the licensee use of changing commitments to GL 89-16 in accordance with NEI 99-04, "Guidelines for Managing NRC Commitment Changes" (ADAMS Accession No. ML003680088). The appendix contains no information on the guidance related to the design and implementation of the HCVS required by Order EA-13-109. Therefore, the staff did not review Appendix E of NEI 13-02, Revision 1, and it is not within the scope of this ISG.

4.3 References in NEI 13-02, Revision 1

NEI 13-02, Revision 1, and its appendices cite a number of other documents (including Reference 27 to NEI 13-02, EPRI Technical Report 3002003301). The references are generally acceptable to the NRC staff when they are the source document for the information provided in NEI 13-02, Revision 1. However, in some cases these references also provide alternate methods and choices for designing the HCVS, provide information beyond support for Order EA-13-109, or address other issues related to severe accidents. The NRC staff has not reviewed and is not endorsing the references beyond their general support for this guidance. The staff will conduct additional reviews, if necessary, if a licensee's submittals provide details on the specific application and methods identified in the references to support confirmation of or deviations from the generic guidance in NEI 13-02, Revision 1.

4.4 Appendix A – Glossary of Terms

In Appendix A to NEI 13-02, Revision 1, NEI provided definitions for a number of key terms used in the guidance. To avoid causing conflicts and confusion with definitions in other documents in the regulatory infrastructure, such as Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.2, "Definitions," the NRC staff is not endorsing these definitions. The staff emphasizes that the definitions in Appendix A to NEI 13-02, Revision 1, are intended only for use within NEI-13-02, Revision 1, and acknowledges that some terms are used in other contexts with a different meaning than in NEI 13-02, Revision 1.