



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001**

October 18, 2013

Mr. Mark A. Satorius  
Executive Director for Operations  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

**SUBJECT:** INTERIM STAFF GUIDANCE JLD-ISG-2013-02, "COMPLIANCE WITH ORDER EA-13-109, ORDER MODIFYING LICENSES WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS"

Dear Mr. Satorius:

During the 608<sup>th</sup> meeting of the Advisory Committee on Reactor Safeguards, October 2-5, 2013, we completed our review of the draft Interim Staff Guidance (ISG) JLD-ISG-2013-02, dated September 2013, "Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accident Conditions." Our Fukushima Subcommittee also reviewed this matter during a meeting held on September 18, 2013. We had the benefit of discussions with NRC staff, representatives of the industry, and members of the public during these meetings. We also had the benefit of the documents referenced.

#### **CONCLUSION AND RECOMMENDATIONS**

1. Interim Staff Guidance JLD-ISG-2013-02 should be issued.
2. The staff should better define accident scenarios during which drywell venting would be necessary or preferred over wetwell venting.
3. Additional combustible gas control measures should be given higher priority.
4. Venting procedures must be developed that do not compromise long term core cooling which depends on containment accident pressure.

#### **BACKGROUND**

The accident at the Fukushima Dai-ichi nuclear power station demonstrated the importance of reliable operation of hardened vents when containment heat removal capability is lost. The recommendations by the NRC Fukushima Near-Term Task Force (NTTF) in July 2011 (SECY-11-0093) included the proposal to have licensees of operating boiling water reactors (BWRs) with Mark I and Mark II containments provide capable and reliable hardened containment venting systems (HCVS).

Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents," was issued on March 12, 2012, requiring these licensees to install reliable hardened vents capable of removing heat and lowering pressure within containment. In June 2013 this order was rescinded and replaced with a new order, EA-13-109, which included additional requirements to ensure that venting functions be available during postulated severe accident conditions. A phased approach was recommended to ensure implementation with minimal delays. Phase 1 involves upgrading to install a wetwell HCVS that provides capability for reliable heat removal and pressure reduction to prevent core damage or, if necessary, to provide venting capability during severe accident conditions. Phase 2 involves providing additional protection during severe accident conditions using a reliable drywell HCVS or, as an alternate approach, developing a reliable venting strategy that makes it unlikely that a licensee would need to vent from the containment drywell under these conditions.

## **DISCUSSION**

The industry has developed a guidance document, NEI 13-02, to achieve compliance with Order EA-13-109. In parallel, the staff has completed JLD-ISG-2013-02 which endorses the methodologies described in NEI 13-02 with exceptions and clarifications to assure that all Phase 1 objectives are met. The industry guidance in NEI 13-02, along with staff endorsements and clarifications in JLD-ISG-2013-02, provide an acceptable integrated set of considerations and requirements for the design and implementation of a severe accident capable HCVS for wetwell venting. Industry and staff performed technical and quality reviews to assure that implementation of the guidance is achievable. This provided a formal, open approach to identify and resolve issues. JLD-ISG-2013-02 should be issued.

The Phase 2 direction is to choose between two options. Licensees would either implement a containment drywell HCVS design and procedure or develop a reliable strategy in which the requirement to vent from the drywell under severe accident conditions is unnecessary. To examine these options, the staff should better define accident scenarios during which drywell venting would be necessary or preferred over wetwell venting.

Examining the conditions in the drywell which result from these accident sequences will also inform design parameter decisions. One issue identified as a common concern in Phases 1 and 2 is the determination of the appropriate value of temperature for design of the drywell vent and any common or shared portions of the vent piping. The design value proposed by industry, 545 °F, specifies a design choice that industry believes will provide margin to protect the drywell head seal gasket against leakage. This needs to be confirmed by analysis.

The Order requires that the HCVS controls and indications be accessible and functional under a range of plant conditions. The NEI guidance addresses key issues regarding vent routing on source term and personnel dose. Importantly, the extraordinary radiation levels that accompany venting during severe accident conditions should be determined and addressed to ensure habitability and manual operator actions are protected. This should be considered early in the design of the HCVS.

The NEI 13-02 guidance addresses and the staff endorses requirements (1) to ensure that either the lower flammability limits of gases passing through HCVS are not reached or that the vent system is designed to withstand hydrogen deflagration and detonation loading, and (2) to minimize the potential for hydrogen gas migration and ingress into buildings outside of the inerted containment. As stated in our June 19, 2012 letter, we continue to be concerned that the staff approach relies upon improved venting capability to eliminate the need for further hydrogen control measures, but the justification for this approach has not been presented. Analyses performed as a part of Phase 2 tasks and the rulemaking for filtering strategies should examine the influence of HCVS design and operation on hydrogen generation, transport, control, and risk of deflagration or detonation. Additional combustible gas control measures should be given higher priority. Hydrogen behavior analyses in connection with NTTF Recommendation 6 may also yield results pertinent to Phase 2 activities.

Some BWRs rely upon containment accident pressure credit allowed in their licensing bases. Representatives from industry expressed their confidence that containment accident pressure credit can be addressed satisfactorily, but at present the details are being developed. More detail should be provided on the topic of "Anticipatory Venting." Venting procedures must be developed that do not compromise long term core cooling which depends on containment accident pressure.

The substantial work required within the scope of Phase 1 has been completed. In some areas NEI 13-02 incorporates by reference certain procedures regarding HCVS operation. These procedures have yet to be reviewed by the staff since they are considered to be part of the future Phase 2 work or the related rulemaking activities. Additionally, there are key issues now identified to be a part of Phase 2 guidance development and review. These topics include:

- Drywell temperature design value
- Instrument qualification
- Anticipatory venting (related to FLEX)
- Accident management in the Emergency Procedure Guidelines and Severe Accident Management Guidelines
- Disposition of Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," in light of anticipated satisfaction of the Order.

We look forward to working with the staff on further implementation guidance to complete Phase 2 of the Order.

Sincerely,

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J. Sam Armijo  
Chairman

## REFERENCES

1. JLD-ISG-2013-02," Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," Draft for Public Comment, September 2013 (ML13247A417).
2. NRC, Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accidents," June 6, 2013 (ML13143A321).
3. NEI 13-02 [Rev. C2], "Industry Guidance for Compliance with Order EA-13-109 BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," August 2013 (ML13247A403).
4. NRC, SECY-11-0093, "Recommendations for Enhancing Reactor Safety in the 21<sup>st</sup> Century, the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," July 12, 2011 (ML11186A950).
5. NRC, SRM-SECY-12-0025, "Staff Requirements – SECY-12-0025 - Proposed Orders and Requests for Information in Response to Lessons Learned from Japan's March 11, 2011, Great Tohoku Earthquake and Tsunami," March 9, 2012 (ML120690347).
6. NRC, Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents," March 9, 2012 (ML12054A696).
7. NRC, Interim Staff Guidance, JLD-ISG-2012-02, "Compliance with Order EA-12-050, Reliable Hardened Containment Vents," Revision 0, August 29, 2012 (ML12229A475).
8. NRC, SECY-12-0157, "Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I And Mark II Containments," November 26, 2012, (ML12325A704).
9. NRC Staff Requirements - SECY-12-0157, "Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containments," March 19, 2013 (ML13078A017).
10. NRC, Order EA-12-049, "Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events," March 12, 2012 (ML12054A735).
11. ACRS Letter, "ACRS Review of Staff's Draft SECY Paper on Consideration of Additional Requirements for Containment Venting Systems for Boiling Water Reactors with Mark I and Mark II Containment Designs," November 8, 2012 (ML12312A099).
12. ACRS Letter, "NRC Staff's Draft Plans and Status Summaries for Tier 3 Japan Lessons Learned Recommendations," June 19, 2012 (ML12163A268).
13. Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," September 1, 1989.

**REFERENCES**

1. JLD-ISG-2013-02," Compliance with Order EA-13-109, Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," Draft for Public Comment, September, 2013 (ML13247A417).
2. NRC, Order EA-13-109, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Severe Accidents," June 6, 2013 (ML13143A321).
3. NEI 13-02 [Rev. C2], "Industry Guidance for Compliance with Order EA-13-109 BWR Mark I & II Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions," August, 2013 (ML13247A403).
4. NRC, SECY-11-0093, "Recommendations for Enhancing Reactor Safety in the 21st Century, the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," July 12, 2011 (ML11186A950).
5. NRC, SRM- SECY-12-0025, "Staff Requirements – SECY-12-0025 - Proposed Orders and Requests for Information in Response to Lessons Learned from Japan’s March 11, 2011, Great Tohoku Earthquake and Tsunami," March 9, 2012 (ML120690347).
6. NRC, Order EA-12-050, "Order Modifying Licenses with Regard to Reliable Hardened Containment Vents," March 9, 2012 (ML12054A696).
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13. Generic Letter 89-16, "Installation of a Hardened Wetwell Vent," September 1, 1989.

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