

NUCLEAR REGULATORY COMMISSION

[NRC-2013-0215]

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

AGENCY: Nuclear Regulatory Commission.

ACTION: Interim Staff Guidance; Issuance.

SUMMARY: The U.S. Nuclear Regulatory Commission (NRC) is issuing Japan Lessons-Learned Project Directorate Interim Staff Guidance (JLD-ISG), 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." Agencywide Documents and Management System (ADAMS) Accession No. ML13130A067). This ISG provides guidance and clarifies the requirements in the order to assist the licensees that have Boiling Water Reactors with Mark I and Mark II Containments in the design and Implementation of a containment venting system that is capable of a operation under severe accident conditions. This ISG also endorses, with clarifications, the industry guidance contained in Nuclear Energy Institute (NEI) 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0 (ADAMS Accession No. ML13316A853).

ADDRESSES: Please refer to Docket ID **NRC-2013-0215** when contacting the NRC about the availability of information regarding this document. You may access publicly-available information related to this action by the following methods:

- **Federal Rulemaking Web site:** Go to <http://www.regulations.gov> and search for Docket ID **NRC-2013-0215**. Address questions about NRC dockets to Carol Gallagher; telephone: 301-287-3422; e-mail: Carol.Gallagher@nrc.gov. For technical questions, contact the individual(s) listed in the FOR FURTHER INFORMATION CONTACT section of this document.

- **NRC's Agencywide Documents Access and Management System (ADAMS):**
You may access publicly available documents online in the NRC Library at <http://www.nrc.gov/reading-rm/adams.html>. To begin the search, select "[ADAMS Public Documents](#)" and then select "[Begin Web-based ADAMS Search](#)." For problems with ADAMS, please contact the NRC's Public Document Room (PDR) reference staff at 1-800-397-4209, 301-415-4737, or by e-mail to pdr.resource@nrc.gov. The ADAMS accession number for each document referenced in this notice (if that document is available in ADAMS) is provided the first time that a document is referenced. The JLD-ISG-2013-02 is available in ADAMS under Accession No. ML13304B836.

- **NRC's PDR:** You may examine and purchase copies of public documents at the NRC's PDR, Room O1-F21, One White Flint North, 11555 Rockville Pike, Rockville, Maryland 20852.

- **NRC's Interim Staff Guidance Web site:** JLD-ISG documents are also available online under the "Japan Lessons Learned" heading at <http://www.nrc.gov/reading-rm/doc-collections/#int>.

FOR FURTHER INFORMATION CONTACT: Dr. Rajender Auluck, Japan Lessons-Learned Project Directorate, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001; telephone: 301-415-1025; e-mail: Rajender.Auluck@nrc.gov.

SUPPLEMENTARY INFORMATION:

Background Information

The NRC staff developed JLD-ISG-2013-02 to provide guidance and clarification to assist nuclear power reactor applicants and licensees with the identification of methods needed to comply with requirements to mitigate challenges to key safety functions. These requirements are contained in Order EA-13-109, “Order Modifying Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation under Severe Accident Conditions” (ADAMS Accession No. ML13130A067). This ISG is not a substitute for the requirements in Order EA-13-109, and compliance with the ISG is not a requirement.

On September 18, 2013 (78 FR 57418), the NRC staff issued a *Federal Register* notice (to request public comments on draft JLD-ISG-2013-02 (ADAMS Accession No. ML13247A417)). In response, the NRC received comments from the Pilgrim Watch by letter dated October 18, 2013 (ADAMS Accession No. ML13294A461), Beyond Nuclear by letter dated October 18, 2013 (ADAMS Accession No. ML13295A225), and Nuclear Energy Institute by letter dated October 18, 2013 (ADAMS Accession No. ML13295A494). Several of these comments have been previously submitted to the NRC for staff’s consideration. The resolution of these comments is documented and publicly available (ADAMS Accession No. ML13310B299).

The events at the Fukushima Dai-ichi nuclear power plant following the March 2011, earthquake and tsunami highlight the possibility that events such as rare natural phenomena

could challenge the traditional defense-in-depth protections related to preventing accidents, mitigating accidents to prevent the release of radioactive materials, and taking actions to protect the public should a release occur. At Fukushima Dai-ichi, limitations in time and unpredictable conditions associated with the accident significantly hindered attempts by the operators to prevent core damage and containment failure. In particular, the operators were unable to successfully operate the containment venting system. These problems, along with venting the containments under challenging conditions following the tsunami, contributed to the progression of the accident from inadequate cooling of the core leading to core damage, to compromising containment functions from overpressure and over-temperature conditions, and to the hydrogen explosions that destroyed the reactor buildings (secondary containments) of three of the Fukushima Dai-ichi units. The loss of the various barriers led to the release of radioactive materials, which further hampered operator efforts to arrest the accidents and ultimately led to the contamination of large areas surrounding the plant. Fortunately, the evacuation of local populations minimized the immediate danger to public health and safety from the loss of control of the large amount of radioactive materials within the reactor cores.

The events at Fukushima reinforced the importance of reliable operation of hardened containment vents during emergency conditions, particularly, for small containments such as the Mark I and Mark II designs. On March 12, 2012, the NRC issued Order EA-12-050¹ requiring the Licensees identified in Attachment 1 to this order to implement requirements for a reliable hardened containment venting system (HCVS) for Mark I and Mark II containments. Order EA-12-050 required licensees of BWR facilities with Mark I and Mark II containments to install a reliable HCVS to support strategies for controlling containment pressure and preventing core damage following an event that causes a loss of heat removal systems (e.g., an extended loss

¹ "Order Modifying Licenses With Regard To Reliable Hardened Containment Vents (Effective Immediately)," EA-12-050 (March 12, 2012) (ADAMS Accession No. ML12056A043).

of electrical power). The NRC determined that the issuance of Order EA-12-050 and implementation of the requirements of that order were necessary to provide reasonable assurance of adequate protection of the public health and safety.

While developing the requirements for a reliable HCVS in Order EA-12-050, the NRC acknowledged that questions remained about maintaining containment integrity and limiting the release of radioactive materials if the venting systems were used during severe accident conditions. The NRC staff presented options to address these issues, including the possible use of engineered filters to control releases, 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" (issued November 26, 2012). Option 2 in SECY-12-0157 was to modify EA-12-050 to require severe accident capable vents (i.e., a reliable HCVS capable of operating under severe accident conditions). Other options discussed in SECY-12-0157 included the installation of engineered filtered containment venting systems (Option 3) and the development of a severe accident confinement strategy (Option 4). In the Staff Requirements Memorandum (SRM) for SECY-12-0157, dated March 19, 2013, the Commission approved Option 2 and directed the staff to issue a modification to Order EA-12-050 requiring licensees subject to that order 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."

The requirements in this order, in addition to providing a reliable HCVS to assist in preventing core damage when heat removal capability is lost (the purpose of EA-12-050), will ensure that venting functions are also available during severe accident conditions. Severe accident conditions include the elevated temperatures, pressures, radiation levels, and combustible gas concentrations, such as hydrogen and carbon monoxide, associated with accidents involving extensive core damage, including accidents involving a breach of the reactor

vessel by molten core debris. This order requires installation of reliable hardened vents that will not only assist in preventing core damage when heat removal capability is lost, but will also function in severe accident conditions (i.e., when core damage has occurred). The safety improvements to Mark I and Mark II containment venting systems required by this order are intended to increase confidence in maintaining the containment function following core damage events. Although venting the containment during severe accident conditions could result in the release of radioactive materials, venting could also prevent containment structural and gross penetration leakage failures due to over pressurization that would hamper accident management (e.g., continuing efforts to cool core debris) and ultimately result in larger, uncontrolled releases of radioactive material.

On November 7, 2013, NEI submitted NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0 (ADAMS Accession No. ML13316A853) to provide specification for the development, implementation, and maintenance of guidance in response to the order regarding reliable hardened containment vents capable of operation under severe accident conditions. This ISG endorses, with clarifications, the methodologies described in the industry guidance document NEI 13-02.

Dated at Rockville, Maryland, this 14th day of November 2013.

FOR THE NUCLEAR REGULATORY COMMISSION.

/RA/

David L. Skeen, Director
Japan Lessons-Learned Project Directorate
Office of Nuclear Reactor Regulation

vessel by molten core debris. This order requires installation of reliable hardened vents that will not only assist in preventing core damage when heat removal capability is lost, but will also function in severe accident conditions (i.e., when core damage has occurred). The safety improvements to Mark I and Mark II containment venting systems required by this order are intended to increase confidence in maintaining the containment function following core damage events. Although venting the containment during severe accident conditions could result in the release of radioactive materials, venting could also prevent containment structural and gross penetration leakage failures due to over pressurization that would hamper accident management (e.g., continuing efforts to cool core debris) and ultimately result in larger, uncontrolled releases of radioactive material.

On November 7, 2013, NEI submitted NEI 13-02, "Industry Guidance for Compliance with Order EA-13-109," Revision 0 (ADAMS Accession No. ML13316A853) to provide specification for the development, implementation, and maintenance of guidance in response to the order regarding reliable hardened containment vents capable of operation under severe accident conditions. This ISG endorses, with clarifications, the methodologies described in the industry guidance document NEI 13-02.

Dated at Rockville, Maryland, this 14th day of November 2013.

FOR THE NUCLEAR REGULATORY COMMISSION.
/RA

David L. Skeen, Director
Japan Lessons-Learned Project Directorate
Office of Nuclear Reactor Regulation

ADAMS Accession No.: ML13303A873

*via email

OFFICE	NRR/JLD/PSB/PM	NRR/JLD/LA*	OGC*	QTE*
NAME	RAuluck	SLent	BHarris	CHsu
DATE	11/ /2013	10/ 30 /2013	11/08/2013	11/04/2013
OFFICE	NRR/JLD/PSB/BC	NRR/JLD/D		
NAME	WReckley	DSkeen		
DATE	11/ /2013	11/ 14 /2013		

OFFICIAL RECORD COPY