UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

June 6, 2013

EA-13-109

All Operating Boiling-Water Reactor
Licensees with Mark I and
Mark II Containments

SUBJECT: ISSUANCE OF ORDER TO MODIFY LICENSES WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Order (EA-13-109) modifying the current license for your facility. This Order requires that all licensees listed in Attachment 1 to implement requirements for reliable hardened containment vents capable of operation under severe accident conditions at their facilities.

The accident at the Fukushima Dai-ichi nuclear power station reinforced the importance of reliable operation of containment vents for plants with Mark I and Mark II containments. As part of its response to the lessons learned from the accident, the NRC issued Order EA-12-050 (Agencywide Documents and Management System (ADAMS) Accession No. ML12054A694), requiring licensees to install a reliable hardened containment venting system (HCVS) for Mark I and Mark II 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 the venting systems were used during severe accident conditions. The NRC 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." (ADAMS Accession No. ML12326A370). In the staff requirements memorandum (SRM) for SECY-12-0157 (ADAMS Accession No. ML13078A017), the Commission directed the staff to issue a modification to Order EA-12-050 requiring licensees with Mark I and Mark 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." The NRC staff is scheduling a series of public meetings to begin following the issuance of this Order to engage stakeholders on developing guidance for implementation of this Order.

Order EA-13-109 (Enclosure 1) rescinds the requirements imposed in Section IV and Attachment 2 of Order EA-12-050 and replaces them with the requirements contained in Section IV and Attachment 2 of Order EA-13-109. Licensees are no longer expected to comply with the requirements of Order EA-12-050, including applicable schedule deadlines for additional submittals or implementation. Likewise, the NRC staff does not plan to issue safety evaluations related to the integrated plans submitted in accordance with Order EA-12-050 or take any additional actions related to that Order.

The NRC staff has determined that continued operation does not pose an imminent risk to public health and safety; however, the additional requirements outlined in Order EA-13-109 are necessary in light of insights gained from the events at Fukushima Dai-ichi. The requirements of this Order are immediately effective and the NRC expects them to remain in place until superseded by order or rule.

Pursuant to Section 223 of the Atomic Energy Act of 1954, as amended, any person who willfully violates, attempts to violate, or conspires to violate, any provision of this Order shall be subject to criminal prosecution as set forth in that section. Violation of this Order may also subject the person to civil monetary penalty.

The enclosed Order requires responses and actions within specified timeframes. Please contact your NRC licensing project manager or Dr. Rajender Auluck, senior project manager, Japan Lessons-Learned Project Directorate (Rajender.auluck@nrc.gov or 301-415-1025), regarding any issues related to compliance with the requirements in the enclosed Order, or if you have other questions.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that the NRC can make it available to the public without redaction. The NRC also includes significant enforcement actions on its Web site at http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/. The NRC has forwarded the enclosed Order to the Office of the Federal Register for publication.

Sincerely,

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Enclosures:
1. Order (EA-13-109)
2. Licensees Addresses List

cc: Listserv

ENCLOSURE 1

Order EA-13-109
Order to Modify Licenses with Regard to Reliable Hardened Containment Vents Capable of Operation Under Sever Accident Conditions

7590-01-P

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
ALL OPERATING BOILING-WATER	)	Docket Nos. (as shown in Attachment 1)
REACTOR LICENSEES WITH	)	License Nos. (as shown in Attachment 1)
MARK I AND MARK II CONTAINMENTS	)	EA-13-109
	)	

ORDER MODIFYING LICENSES WITH REGARD TO RELIABLE HARDENED CONTAINMENT VENTS CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS (EFFECTIVE IMMEDIATELY)

I.

The Licensees identified in Attachment 1 to this Order hold licenses issued by the U.S. Nuclear Regulatory Commission (NRC or Commission) authorizing operation of nuclear power plants in accordance with the Atomic Energy Act of 1954, as amended, and Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, "Domestic Licensing of Production and Utilization Facilities." Specifically, these Licensees operate boiling-water reactors (BWRs) with Mark I and Mark II containment designs.

II.

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, with venting the containments under the 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-12-050[1] 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 of electrical power). The NRC determined that the issuance of EA-12-050 and implementation of

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

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 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" (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 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.

Ensuring that the venting functions are available under severe accident conditions will support the strategies in the Mark I and Mark II severe accident management guidelines for the protection or recovery of the containment, which serves as a barrier to the release of radioactive materials. This Order will ensure that this additional severe accident venting capability is provided while also achieving, with minimal delays, the purpose of EA-12-050 – to provide a reliable HCVS to control containment pressure and prevent core damage following the loss of heat removal functions.

This Order rescinds the requirements imposed in Section IV and Attachment 2 of EA-12-050 and replaces them with the requirements in Section IV and Attachment 2 of this Order. Because the requirements in EA-12-050 are now reflected in this Order, licensees are no longer expected to comply with the requirements in EA-12-050, including applicable schedule deadlines for submittals or implementation.

This Order defines requirements related to containment venting before and during severe accident conditions, which is a subset of the issues related to containment performance during severe accidents outlined in SECY-12-0157. Other issues include improving licensees' severe accident management capabilities and filtering strategies to limit the release of radioactive materials when venting is necessary. For example, the importance of drywell flooding to prevent core debris that has breached the reactor vessel from causing containment failure by drywell liner melt-through in Mark I containments was discussed in SECY-12-0157 and during the related Commission meeting held on January 9, 2013. The remaining issues related to filtering strategies and severe accident management of BWR Mark I and II containments will be

addressed through the rulemaking process, as directed by the Commission in its SRM for SECY-12-0157. The rulemaking process will commence in June 2013 when the NRC staff begins a series of public meetings to support developing the regulatory basis for the proposed rulemaking.

III.

The purpose of requiring reliable hardened vents in EA-12-050 was to prevent core damage when heat removal capability is lost due to conditions such as an extended loss of electrical power. In EA-12-050, the Commission determined that, in light of the events at Fukushima Dai-ichi and consistent with the NRC's defense-in-depth strategy, installation of reliable hardened containment vents to help prevent core damage in BWRs with Mark I and Mark II containments was necessary to provide reasonable assurance of adequate protection of public health and safety.

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 overpressurization that would hamper accident management (e.g., continuing efforts to cool core debris) and ultimately result in larger, uncontrolled releases of radioactive material.

Under the backfit provisions of 10 CFR 50.109, "Backfitting," the NRC may require plant improvements beyond those needed to provide reasonable assurance of adequate protection of public health and safety when engineering approaches are available to provide a cost-justified substantial safety improvement. The staff performed a detailed regulatory analysis of possible improvements to Mark I and Mark II reliable hardened containment vents, including the option of installing severe accident capable vents. That analysis is available in the NRC's Agencywide Documents Access and Management System (ADAMS) at Accession No. ML12312A456. A summary of the staff's cost-benefit evaluation was provided in SECY-12-0157.

As discussed in SECY-12-0157, the NRC's determination that a venting system should be available during severe accident conditions considered both quantitative assessments of costs and benefits, as well as, various qualitative factors. Among the qualitative factors, one of the more important is enhancing the defense-in-depth characteristics of Mark I and Mark II containments by addressing the relatively high probabilities that those containments would fail should an accident progress to melting the core. Other qualitative factors supporting installation of severe accident capable vents include addressing uncertainties in the understanding of severe accident events, supporting severe accident management and response, improving the control of hydrogen generated during severe accidents, improving readiness for external and multi-unit events, and reducing uncertainties about radiological releases and thereby improving emergency planning and response. The installation of a reliable, severe accident capable containment venting system, in combination with other actions such as ensuring drywell flooding capabilities, reduces the likelihood of containment failures and thereby enhances the defense-in-depth protections for plants with Mark I and Mark II containments.

The Commission has determined that requiring BWR facilities with Mark I and Mark II containments to make the necessary plant modifications and procedure changes to provide a reliable hardened venting system that is capable of performing under severe accident conditions is a cost-justified substantial safety improvement. These modifications are needed to protect health and to minimize danger to life or property because they will give licensees greater capabilities to respond to severe accidents and limit the uncontrolled release of radioactive materials. In such situations, the Commission may act in accordance with its statutory authority under Section 161 of the Atomic Energy Act of 1954, as amended, to require Licensees to take appropriate action to reduce the risks posed to the public from the operation of nuclear power plants.

For Mark I containments, the preferred venting path is from the wetwell portion of containment because the water in the suppression pool provides a degree of decontamination before release to the environment. The benefits of the suppression pool in the scrubbing of possible releases when using the wetwell vents for pressure control were described in Generic Letter 89-16, "Installation of a Hardened Wetwell Vent." In addition, the wetwell venting path has been incorporated into other parts of the mitigating strategies to address lessons learned from the Fukushima Dai-ichi accident. During severe accidents involving molten core debris breaching the reactor vessel, mitigating strategies include injecting water into the containment to help prevent drywell liner melt-through, which would result in a release pathway directly into the reactor building. However, water injection can eventually increase the water level in the suppression pool to a point where venting from the wetwell would no longer be possible. Without venting, containment pressure would continue to increase, threatening containment failure. For this reason, current severe accident management guidelines for Mark I containments include

provisions for venting from the drywell for containment pressure control if the capability of venting from the wetwell is not available. Because water injection in Mark II containments could similarly impede the ability to vent from the wetwell, the Mark II severe accident management guidelines also currently include provisions for use of both wetwell and drywell containment vents.

In general, wetwell venting for Mark II containments provides similar benefits to Mark I containments in terms of scrubbing of possible releases. However, for Mark II containments, in the unlikely event of core debris melting through the reactor vessel, there is a potential for the core debris to cause a failure of drain line or downcomer pipe penetration in the floor, resulting in direct communication between the drywell and the wetwell volume above the water in the suppression pool. This condition, which is referred to as suppression pool bypass, is described in more detail in SECY-12-0157. In a suppression pool bypass scenario, the primary concern is the loss of the suppression pool as a means of filtering the release from the vents. This loss of filtering capability is an issue that will be resolved as part of the NRC rulemaking addressing broader severe accident management and filtering strategies, previously described.

For the reasons discussed above, this Order requires Mark I and Mark II containments to have a wetwell venting system that remains functional during severe accident conditions. This Order 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. Although not required by this Order, licensees with Mark II containments may propose to provide the necessary containment venting capability and resolve concerns about suppression pool bypass scenarios by developing alternate approaches such as the installation of a containment drywell vent with an installed engineered filter. Licensees

wishing to propose this or other alternatives may do so by requesting relaxation in accordance with Section IV of this Order.

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 EA-12-050. Phase 1 involves upgrading the venting capabilities from the containment wetwell to provide reliable, severe accident capable hardened vents to assist in preventing core damage and, if necessary, to provide venting capability during severe accident conditions. Phase 2 involves providing additional protections for severe accident conditions through installation of a reliable, severe accident capable drywell vent system 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.

Following the issuance of this Order, the NRC staff will work with stakeholders to develop detailed guidance on specific capabilities and other aspects of implementing the requirements defined in Attachment 2 to this Order within the schedules defined in Section IV of this Order. This guidance will more fully define functional requirements (e.g., equipment specifications) as well as acceptable approaches to technical requirements such as designing the containment venting system to minimize the reliance on operator actions. The NRC anticipates issuing the final interim staff guidance (ISG) for Phase 1 of this Order by October 31, 2013, to support licensees preparing and submitting integrated plans in accordance with the schedule defined in Section IV. The NRC staff plans to subsequently review the integrated plans and document those reviews in safety evaluations. The NRC anticipates issuing the final ISG for Phase 2 of this Order by April 30, 2015, to support licensees preparing and submitting integrated plans related to the installation of severe accident containment drywell vents or implementing 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 NRC has concluded that (1) the requirement to provide a reliable HCVS to prevent or limit core damage upon loss of heat removal capability is necessary to ensure reasonable assurance of adequate protection of public health and safety, and (2) the requirement that the reliable HCVS remain functional during severe accident conditions is a cost-justified substantial safety improvement under 10 CFR 50.109(a)(3). The NRC is therefore requiring Licensee actions. In addition, pursuant to 10 CFR 2.202, the NRC finds that the public health, safety and interest require that this Order be made immediately effective.

IV.

Accordingly, pursuant to Sections 161b, 161i, 161o, and 182 of the Atomic Energy Act of 1954, as amended, and the Commission's regulations in 10 CFR 2.202, "Orders," and 10 CFR Part 50, IT IS HEREBY ORDERED, EFFECTIVE IMMEDIATELY, THAT ALL LICENSES IDENTIFIED IN ATTACHMENT 1 TO THIS ORDER ARE MODIFIED AS FOLLOWS:

A. The requirements in Section IV and Attachment 2 of EA-12-050 are hereby rescinded. Licensees are no longer required to comply with those requirements.

B. All Licensees shall, notwithstanding the provisions of any Commission regulation or license to the contrary, comply with the requirements described in Attachment 2 to this Order except to the extent that a more stringent requirement is set forth in the license. These Licensees shall promptly start implementation of the requirements in Attachment 2 to this Order upon issuance of the associated final interim staff guidance (ISG) for each phase, and shall complete the two phases of implementation by the following dates:

- Phase 1 (severe accident capable wetwell venting system): no later than startup from the second refueling outage that begins after June 30, 2014, or June 30, 2018, whichever comes first.
- Phase 2, (severe accident capable drywell venting system): no later than startup from the first refueling outage that begins after June 30, 2017, or June 30, 2019, whichever comes first.

C. 1. All Licensees shall, within twenty (20) days of the issuance date of the final ISG for Phase 1, notify the Commission (1) if they are unable to comply with any of the Phase 1 requirements described in Attachment 2, (2) if compliance with any of the Phase 1 requirements is unnecessary in their specific circumstances, or (3) if implementation of any of the Phase 1 requirements would cause the Licensee to be in violation of the provisions of any Commission regulation or the facility license. The notification shall provide the Licensee's justification for seeking relief from or variation of any specific requirement.

2. Any Licensee that considers that implementation of any of the Phase 1 requirements described in Attachment 2 would adversely affect the safe and secure operation of the facility must notify the Commission, within twenty (20) days of the issuance date of the final ISG for Phase 1, of the adverse safety impact, the basis for the Licensee's determination that the requirement has an adverse safety impact, and either a proposal for achieving the same objectives specified in the requirement in question, or a schedule for modifying the facility to address the adverse safety condition. If neither approach is appropriate, the Licensee must supplement its response to Condition C.1 of this Order to identify the condition as a

requirement with which it cannot comply, with attendant justifications as required in Condition C.1.

3. All licensees shall, within twenty (20) days of the issuance date of the final ISG for Phase 2, notify the Commission (1) if they are unable to comply with any of the Phase 2 requirements described in Attachment 2, (2) if compliance with any of the Phase 2 requirements is unnecessary in their specific circumstances, or (3) if implementation of any of the Phase 2 requirements would cause the Licensee to be in violation of the provisions of any Commission regulation or the facility license. The notification shall provide the Licensee's justification for seeking relief from or variation of any specific requirement.

4. Any Licensee that considers that implementation of any of the Phase 2 requirements described in Attachment 2 would adversely affect the safe and secure operation of the facility must notify the Commission, within twenty (20) days of the issuance date of the final ISG for Phase 2, of the adverse safety impact, the basis for the Licensee's determination that the requirement has an adverse safety impact, and either a proposal for achieving the same objectives specified in the requirement in question, or a schedule for modifying the facility to address the adverse safety condition. If neither approach is appropriate, the Licensee must supplement its response to Condition C.3 of this Order to identify the condition as a requirement with which it cannot comply, with attendant justifications as required in Condition C.3.

D. 1. All Licensees shall, by June 30, 2014, submit to the Commission for review an overall integrated plan including a description of how compliance with the Phase 1 requirements described in Attachment 2 will be achieved.

2. All Licensees shall, by December 31, 2015, submit to the Commission for review an overall integrated plan including a description of their approach to the Phase 2 requirements described in Attachment 2 and how compliance will be achieved within the required schedule.

3. All Licensees shall provide status reports at six (6)-month intervals following submittal of the Phase 1 integrated plan, as required in Condition D.1, which delineates progress made in implementing the requirements of this Order.

4. All Licensees shall report to the Commission when full compliance with the requirements for Phase 1 and Phase 2, as described in Attachment 2, are achieved.

Licensee responses to Conditions C.1, C.2, C.3, C.4, D.1, D.2, D.3 and D.4 above shall be submitted in accordance with 10 CFR 50.4, "Written Communications." The Director, Office of Nuclear Reactor Regulation may, in writing, relax or rescind any of the above conditions upon demonstration by the Licensee of good cause.

V.

In accordance with 10 CFR 2.202, the Licensee must, and any other person adversely affected by this Order may, submit an answer to this Order, and may request a hearing on this Order, within twenty (20) days of the date of this Order. Where good cause is shown, consideration will be given to extending the time to answer or to request a hearing. A request for

extension of time in which to submit an answer or request a hearing must be made in writing to the Director, Office of Nuclear Reactor Regulation, U.S. Nuclear Regulatory Commission, Washington, DC 20555, and include a statement of good cause for the extension. The answer may consent to this Order. Licensees that consent to this Order and waive their right to a hearing pursuant to 10 CFR 2.202(d) may submit their answers in accordance with 10 CFR 50.4 instead of following the requirements of the NRC E-filing Rule described below.

If a hearing is requested by a Licensee or a person whose interest is adversely affected, the Commission will issue an Order designating the time and place of any hearings. If a hearing is held, the issue to be considered at such hearing shall be whether this Order should be sustained. Pursuant to 10 CFR 2.202(c)(2)(i), the licensee or any other person adversely affected by this Order, may, in addition to demanding a hearing, at the time the answer is filed or sooner, move the presiding officer to set aside the immediate effectiveness of the Order on the ground that the Order, including the need for immediate effectiveness, is not based on adequate evidence but on mere suspicion, unfounded allegations, or error.

All documents filed in NRC adjudicatory proceedings, including a request for hearing, a petition for leave to intervene, any motion or other document filed in the proceeding prior to the submission of a request for hearing or petition to intervene, and documents filed by interested governmental entities participating under 10 CFR 2.315(c), must be filed in accordance with the NRC E-Filing rule (72 FR 49139, August 28, 2007). The E-Filing process requires participants to submit and serve all adjudicatory documents over the internet, or in some cases to mail copies on electronic storage media. Participants may not submit paper copies of their filings unless they seek an exemption in accordance with the procedures described below.

To comply with the procedural requirements of E-Filing, at least ten (10) days prior to the

filing deadline, the participant must contact the Office of the Secretary by e-mail at hearing.docket@nrc.gov, or by telephone at (301) 415-1677, to (1) request a digital identification (ID) certificate, which allows the participant (or its counsel or representative) to digitally sign documents and access the E-Submittal server for any NRC proceeding in which it is participating; and (2) advise the Secretary that the participant will be submitting a request or petition for hearing (even in instances in which the participant, or its counsel or representative, already holds an NRC-issued digital ID certificate). Based upon this information, the Secretary will establish an electronic docket for the hearing in this proceeding if the Secretary has not already established an electronic docket.

Information about applying for a digital ID certificate is available on NRC's public Web site at http://www.nrc.gov/site-help/e-submittals/apply-certificates.html. System requirements for accessing the E-Submittal server are detailed in NRC's "Guidance for Electronic Submissions," which is available on the NRC's public Web site at http://www.nrc.gov/site-help/electronic-sub-ref-mat.html. Participants may attempt to use other software not listed on the Web site, but should note that the NRC's E-Filing system does not support unlisted software, and the NRC Meta System Help Desk will not be able to offer assistance in using unlisted software.

If a participant is electronically submitting a document to the NRC in accordance with the E-Filing rule, the participant must file the document using the NRC's online, Web-based submission form. In order to serve documents through the Electronic Information Exchange System, users will be required to install a Web browser plug-in from the NRC's Web site. Further information on the Web-based submission form, including the installation of the Web browser plug-in, is available on the NRC's public Web site at http://www.nrc.gov/site-help/e-submittals.html.

Once a participant has obtained a digital ID certificate and a docket has been created, the participant can then submit a request for hearing or petition for leave to intervene. Submissions should be in Portable Document Format (PDF) in accordance with NRC guidance available on the NRC's public Web site at http://www.nrc.gov/site-help/e-submittals.html. A filing is considered complete at the time the documents are submitted through the NRC's E-Filing system. To be timely, an electronic filing must be submitted to the E-Filing system no later than 11:59 p.m. Eastern Time on the due date. Upon receipt of a transmission, the E-Filing system time-stamps the document and sends the submitter an e-mail notice confirming receipt of the document. The E-Filing system also distributes an e-mail notice that provides access to the document to the NRC's Office of the General Counsel and any others who have advised the Office of the Secretary that they wish to participate in the proceeding, so that the filer need not serve the documents on those participants separately. Therefore, applicants and other participants (or their counsel or representative) must apply for and receive a digital ID certificate before a hearing request/petition to intervene is filed so that they can obtain access to the document via the E-Filing system.

A person filing electronically using the NRC's adjudicatory E-Filing system may seek assistance by contacting the NRC Meta System Help Desk through the "Contact Us" link located on the NRC Web site at http://www.nrc.gov/site-help/e-submittals.html, by e-mail at MSHD.Resource@nrc.gov, or by a toll-free call to (866) 672-7640. The NRC Meta System Help Desk is available between 8 a.m. and 8 p.m., Eastern Time, Monday through Friday, excluding government holidays.

Participants who believe that they have good cause for not submitting documents electronically must file an exemption request, in accordance with 10 CFR 2.302(g), with their initial paper filing requesting authorization to continue to submit documents in paper format.

Such filings must be submitted by: (1) first class mail addressed to the Office of the Secretary of the Commission, U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, Attention: Rulemaking and Adjudications Staff; or (2) courier, express mail, or expedited delivery service to the Office of the Secretary, Sixteenth Floor, One White Flint North, 11555 Rockville Pike, Rockville, Maryland, 20852, Attention: Rulemaking and Adjudications Staff. Participants filing a document in this manner are responsible for serving the document on all other participants. Filing is considered complete by first-class mail as of the time of deposit in the mail, or by courier, express mail, or expedited delivery service upon depositing the document with the provider of the service. A presiding officer, having granted an exemption request from using E-Filing, may require a participant or party to use E-Filing if the presiding officer subsequently determines that the reason for granting the exemption from use of E-Filing no longer exists.

Documents submitted in adjudicatory proceedings will appear in the NRC's electronic hearing docket, which is available to the public at http://ehd1.nrc.gov/ehd/, unless excluded pursuant to an order of the Commission or the presiding officer. Participants are requested not to include personal privacy information, such as social security numbers, home addresses, or home phone numbers in their filings, unless an NRC regulation or other law requires submission of such information. With respect to copyrighted works, except for limited excerpts that serve the purpose of the adjudicatory filings and would constitute a Fair Use application, participants are requested not to include copyrighted materials in their submission.

In the absence of any request for hearing, or written approval of an extension of time in which to request a hearing, the provisions specified in Section IV above shall be final twenty (20) days from the date of this Order without further order or proceedings. If an extension of time for requesting a hearing has been approved, the provisions specified in Section IV shall be final when the extension expires if a hearing request has not been received. AN ANSWER OR A REQUEST FOR HEARING SHALL NOT STAY THE IMMEDIATE EFFECTIVENESS OF THIS ORDER.

FOR THE NUCLEAR REGULATORY COMMISSION

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Dated this 6th day of June, 2013

ENCLOSURE 2
OPERATING BOILING-WATER REACTOR LICENSEES
WITH MARK I AND MARK II CONTAINMENTS
ML13143A331

OPERATING BOILING-WATER REACTOR LICENSEES
WITH MARK I AND MARK II CONTAINMENTS

Browns Ferry Nuclear Plant — BWR-Mark I
Tenessee Valley Authority
Docket Nos. 50-259, 50-260 and 50-296
License Nos. DPR-33, DPR-52 and DPR-68

Mr. Preston D. Swafford
Chief Nuclear Officer and Executive Vice President
Tennessee Valley Authority
3R Lookout Place
1101 Market Street
Chattanooga, TN 37402-2801

Brunswick Steam Electric Plant — BWR-Mark I
Carolina Power & Light Co.
Docket Nos. 50-325 and 50-324
License Nos. DPR-71 and DPR-62

Mr. Michael J. Annacone
Vice President
Carolina Power & Light Company
Brunswick Steam Electric Plant
P. O. Box 10429
Southport, NC 28461

Columbia Generating Station — BWR-Mark II
Energy Northwest
Docket No. 50-397
License No. NPF-21

Mr. Mark E. Reddemann
Chief Executive Officer
Energy Northwest
MD 1023
North Power Plant Loop
P.O. Box 968
Richland, WA 99352

Cooper Nuclear Station BWR-Mark I
Nebraska Public Power District
Docket No. 50-298
License No. DPR-46

Mr. Oscar A. Limpias
Vice President - Nuclear and Chief Nuclear Officer
Nebraska Public Power District
72676 648A Avenue
P.O. Box 98
Brownville, NE 68321

Dresden Nuclear Power Station BWR-Mark I
Exelon Generation Co., LLC
Docket Nos. 50-237 and 50-249
License Nos. DPR-19 and DPR-25

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Duane Arnold Energy Center BWR-Mark I
NextEra Energy Duane Arnold, LLC
Docket No. 50-331
License No. DPR-49

Mr. Rich Anderson
Site Vice President
NextEra Energy
Duane Arnold Energy Center
3277 DAEC Road
Palo, IA 52324-9785

Edwin I. Hatch Nuclear Plant BWR-Mark I
Southern Nuclear Operating Co.
Docket Nos. 50-321 and 50-366
License Nos. DPR-57 and NPF-5

Mr. Dennis R. Madison
Vice President
Southern Nuclear Operating Company, Inc.
Edwin I. Hatch Nuclear Plant
11028 Hatch Parkway North
Baxley, GA 31513

Fermi BWR-Mark I
Detroit Edison Co.
Docket No. 50-341
License No. NPF-43

Mr. Joseph H. Plona
Senior Vice President and Chief Nuclear Officer
Detroit Edison Company
Fermi 2 – 210 NOC
6400 North Dixie Highway
Newport, MI 48166

Hope Creek Generating Station BWR-Mark I
PSEG Nuclear, LLC
Docket No. 50-354
License No. NPF-57

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear LLC - N09
P. O. Box 236
Hancocks Bridge, NJ 08038

James A. FitzPatrick Nuclear Power Plant BWR-Mark I
Entergy Nuclear Operations, Inc.
Docket No. 50-333
License No. DPR-59

Mr. Lawrence Coyle
Site Vice President
Entergy Nuclear Operations, Inc.
James A. FitzPatrick Nuclear Power Plant
P.O. Box 110
Lycoming, NY 13093

LaSalle County Station BWR-Mark II
Exelon Generation Co., LLC
Docket Nos. 50-373 and 50-374
License Nos. NPF-11 and NPF-18

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Limerick Generating Station — BWR-Mark II
Exelon Generation Co., LLC
Docket Nos. 50-352 and 50-353
License Nos. NPF-39 and NPF-85

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Monticello Nuclear Generating Plant — BWR-Mark I
Northern States Power Company
Docket No. 50-263
License No. DPR-22

Mr. Timothy J. O'Connor
Chief Nuclear Officer
Northern States Power Company - Minnesota
Monticello Nuclear Generating Plant
2807 West County Road 75
Monticello, MN 55362-9637

Nine Mile Point Nuclear Station — BWR-Mark I & II
Nine Mile Point Nuclear Station, LLC
Docket Nos. 50-220 and 50-410
License Nos. DPR-63 and NPF-69

Mr. Christopher Costanzo
Vice President Nine Mile Point
Nine Mile Point Nuclear Station, LLC
P. O. Box 63
Lycoming, NY 13093

Oyster Creek Nuclear Generating Station — BWR-Mark I
Exelon Generation Co., LLC
Docket No. 50-219
License No. DPR-16

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Peach Bottom Atomic Power Station — BWR-Mark I
Exelon Generation Co., LLC
Docket Nos. 50-277 and 50-278
License Nos. DPR-44 and DPR-56

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Pilgrim Nuclear Power Station Unit No. 1 BWR-Mark I
Entergy Nuclear Operations, Inc.
Docket No. 50-293
License No. DPR-35

Mr. John Dent, Jr.
Vice President and Site Vice President
Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360-5508

Quad Cities Nuclear Power Station BWR-Mark I
Exelon Generation Co., LLC
Docket Nos. 50-254 and 50-265
License Nos. DPR-29 and DPR-30

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

Susquehanna Steam Electric Station BWR-Mark II
PPL Susquehanna, LLC
Docket Nos. 50-387 and 50-388
License Nos. NPF-14 and NPF-22

Mr. Timothy S. Rausch
Senior Vice President and Chief Nuclear Officer
PPL Susquehanna, LLC
769 Salem Boulevard
NUCSB3
Berwick, PA 18603-0467

Vermont Yankee Nuclear Power Station
Entergy Nuclear Operations, Inc.
Docket No. 50-271
License No. DPR-28

BWR-Mark I

Mr. Christopher J. Wamser
Site Vice President
Entergy Nuclear Operations, Inc.
Vermont Yankee Nuclear Power Station
320 Governor Hunt Road
Vernon, VT 05354

ATTACHMENT 1
OPERATING BOILING-WATER REACTOR LICENSES
WITH MARK I AND MARK II CONTAINMENTS

OPERATING BOILING-WATER REACTOR LICENSES
WITH MARK I AND MARK II CONTAINMENTS

Browns Ferry Nuclear Plant, Units 1, 2, and 3	BWR-Mark I
Brunswick Steam Electric Plant, Units 1 and 2	BWR-Mark I
Columbia Generating Station	BWR-Mark II
Cooper Nuclear Station	BWR-Mark I
Dresden Nuclear Power Station, Units 2 and 3	BWR-Mark I
Duane Arnold Energy Center	BWR-Mark I
Edwin I. Hatch Nuclear Plant, Units 1 and 2	BWR-Mark I
Fermi	BWR-Mark I
Hope Creek Generating Station	BWR-Mark I
James A. FitzPatrick Nuclear Power Plant	BWR-Mark I
LaSalle County Station, Units 1 and 2	BWR-Mark II
Limerick Generating Station, Units 1 and 2	BWR-Mark II
Monticello Nuclear Generating Plant	BWR-Mark I
Nine Mile Point Nuclear Station, Units 1 and 2	BWR-Mark I & II
Oyster Creek Nuclear Generating Station	BWR-Mark I
Peach Bottom Atomic Power Station, Units 2 and 3	BWR-Mark I
Pilgrim Nuclear Power Station	BWR-Mark I
Quad Cities Nuclear Power Station, Units 1 and 2	BWR-Mark I
Susquehanna Steam Electric Station, Units 1 and 2	BWR-Mark II
Vermont Yankee Nuclear Power Station	BWR-Mark I

ATTACHMENT 2
REQUIREMENTS FOR RELIABLE HARDENED VENT SYSTEMS
CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS
AT BOILING-WATER REACTOR FACILITIES WITH
MARK I AND MARK II CONTAINMENTS

REQUIREMENTS FOR RELIABLE HARDENED VENT SYSTEMS CAPABLE OF OPERATION UNDER SEVERE ACCIDENT CONDITIONS AT BOILING-WATER REACTOR FACILITIES WITH MARK I AND MARK II CONTAINMENTS

Boiling-Water Reactors (BWRs) with Mark I and Mark II containments shall have a reliable, severe accident capable hardened containment venting system (HCVS)[1]. This requirement shall be implemented in two phases. In Phase 1, licensees of BWRs with Mark I and Mark II containments shall design and install a venting system that provides venting capability from the wetwell 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. In Phase 2, licensees of BWRs with Mark I and Mark II containments shall design and install a venting system that provides venting capability from the drywell under severe accident conditions, or, alternatively, those licensees shall 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.

A. PHASE 1 (reliable, severe accident capable wetwell venting system)

The BWRs with Mark I and Mark II containments shall design and install a HCVS, using a vent path from the containment wetwell to remove decay heat, vent the containment atmosphere (including steam, hydrogen, carbon monoxide, non-condensable gases, aerosols, and fission products), and control containment pressure within acceptable limits. The HCVS shall be designed for those accident conditions (before and after core damage) for which containment venting is relied upon to reduce the probability of containment failure, including accident sequences that result in the loss of active containment heat removal capability or extended loss of alternating current (AC) power. The HCVS shall meet the requirements in Sections 1, 2, and 3, below.

1. <u>HCVS Functional Requirements</u>

1.1 The design of the HCVS shall consider the following performance objectives:

1.1.1 The HCVS shall be designed to minimize the reliance on operator actions.

1.1.2 The HCVS shall be designed to minimize plant operators' exposure to occupational hazards, such as extreme heat stress, while operating the HCVS system.

1.1.3 The HCVS shall also be designed to account for radiological conditions that would impede personnel actions needed for event response.

---

[1] Unless otherwise specified in this attachment, HCVS refers to a reliable, severe accident capable hardened containment venting system. The HCVS includes a severe accident capable containment wetwell venting system and may also, depending on the approach taken for Phase 2, include a severe accident capable containment drywell venting system.

1.1.4 The HCVS controls and indications shall be accessible and functional under a range of plant conditions, including severe accident conditions, extended loss of AC power, and inadequate containment cooling.

1.2 The HCVS shall include the following design features:

1.2.1 The HCVS shall have the capacity to vent the steam/energy equivalent of one (1) percent of licensed/rated thermal power (unless a lower value is justified by analyses), and be able to restore and then maintain containment pressure below the primary containment design pressure and the primary containment pressure limit.

1.2.2 The HCVS shall discharge the effluent to a release point above main plant structures.

1.2.3 The HCVS shall include design features to minimize unintended cross flow of vented fluids within a unit and between units on the site.

1.2.4 The HCVS shall be designed to be manually operated during sustained operations from a control panel located in the main control room or a remote but readily accessible location.[2]

1.2.5 The HCVS shall, in addition to meeting the requirements of 1.2.4, be capable of manual operation (e.g., reach-rod with hand wheel or manual operation of pneumatic supply valves from a shielded location), which is accessible to plant operators during sustained operations.

1.2.6 The HCVS shall be capable of operating with dedicated and permanently installed equipment for at least 24 hours following the loss of normal power or loss of normal pneumatic supplies to air operated components during an extended loss of AC power.

1.2.7 The HCVS shall include means to prevent inadvertent actuation.

1.2.8 The HCVS shall include means to monitor the status of the vent system (e.g., valve position indication) from the control panel required by 1.2.4. The monitoring system shall be designed for sustained operation during an extended loss of AC power.

1.2.9 The HCVS shall include a means to monitor the effluent discharge for radioactivity that may be released from operation of the HCVS. The monitoring system shall provide indication from the control panel required by 1.2.4 and shall be designed for sustained operation during an extended loss of AC power.

---

[2] For the purposes of these technical requirements, "sustained operations" means until such time that alternate reliable containment heat removal and pressure control is reestablished, independent of the HCVS, (e.g., suppression pool, torus, or shutdown cooling) using installed or portable equipment.

1.2.10 The HCVS shall be designed to withstand and remain functional during severe accident conditions, including containment pressure, temperature, and radiation while venting steam, hydrogen, and other non-condensable gases and aerosols. The design is not required to exceed the current capability of the limiting containment components.

1.2.11 The HCVS shall be designed and operated to ensure the flammability limits of gases passing through the system are not reached; otherwise, the system shall be designed to withstand dynamic loading resulting from hydrogen deflagration and detonation.

1.2.12 The HCVS shall be designed to minimize the potential for hydrogen gas migration and ingress into the reactor building or other buildings.

1.2.13 The HCVS shall include features and provisions for the operation, testing, inspection and maintenance adequate to ensure that reliable function and capability are maintained.

2. HCVS Quality Standards

The HCVS shall meet the following quality standards:

2.1 The HCVS vent path up to and including the second containment isolation barrier shall be designed consistent with the design basis of the plant. Items in this path include piping, piping supports, containment isolation valves, containment isolation valve actuators and containment isolation valve position indication components.

2.2 All other HCVS components shall be designed for reliable and rugged performance that is capable of ensuring HCVS functionality following a seismic event. These items include electrical power supply, valve actuator pneumatic supply and instrumentation (local and remote) components.

3. HCVS Programmatic Requirements

3.1 The Licensee shall develop, implement, and maintain procedures necessary for the safe operation of the HCVS. Procedures shall be established for system operations when normal and backup power is available, and during an extended loss of AC power.

3.2 The Licensee shall train appropriate personnel in the use of the HCVS. The training curricula shall include system operations when normal and backup power is available, and during an extended loss of AC power.

B. PHASE 2 (reliable, severe accident capable drywell venting system)

Licensees with BWRs with Mark I and Mark II containments shall either:

(1) design and install a HCVS, using a vent path from the containment drywell, that meets the requirements in Section B.1 below, or

(2) develop and implement a 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.

1. HCVS Drywell Vent Functional Requirements

1.1 The drywell venting system shall be designed to vent the containment atmosphere (including steam, hydrogen, non-condensable gases, aerosols, and fission products), and control containment pressure within acceptable limits during severe accident conditions.

1.2 The same functional requirements (reflecting accident conditions in the drywell), quality requirements, and programmatic requirements defined in Section A of this Attachment for the wetwell venting system shall also apply to the drywell venting system.

2. Containment Venting Strategy Requirements

Licensees choosing to develop and implement a reliable containment venting strategy that does not require a reliable, severe accident capable drywell venting system shall meet the following requirements:

2.1 The strategy making it unlikely that a licensee would need to vent from the containment drywell during severe accident conditions shall be part of the overall accident management plan for Mark I and Mark II containments.

2.2 The licensee shall provide supporting documentation demonstrating that containment failure as a result of overpressure can be prevented without a drywell vent during severe accident conditions.

2.3 Implementation of the strategy shall include licensees preparing the necessary procedures, defining and fulfilling functional requirements for installed or portable equipment (e.g., pumps and valves), and installing the needed instrumentation.

The NRC staff has determined that continued operation does not pose an imminent risk to public health and safety; however, the additional requirements outlined in Order EA-13-109 are necessary in light of insights gained from the events at Fukushima Dai-ichi. The requirements of this Order are immediately effective and the NRC expects them to remain in place until superseded by order or rule.

Pursuant to Section 223 of the Atomic Energy Act of 1954, as amended, any person who willfully violates, attempts to violate, or conspires to violate, any provision of this Order shall be subject to criminal prosecution as set forth in that section. Violation of this Order may also subject the person to civil monetary penalty.

The enclosed Order requires responses and actions within specified timeframes. Please contact your NRC licensing project manager or Dr. Rajender Auluck, senior project manager, Japan Lessons-Learned Project Directorate (Rajender.auluck@nrc.gov or 301-415-1025), regarding any issues related to compliance with the requirements in the enclosed Order, or if you have other questions.

In accordance with Title 10 of the *Code of Federal Regulations* (10 CFR) Section 2.390, "Public Inspections, Exemptions, Requests for Withholding," of the NRC's "Rules of Practice," a copy of this letter and its enclosure will be made available electronically for public inspection in the NRC Public Document Room or from the NRC's document system (ADAMS), accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html. To the extent possible, your response should not include any personal privacy, proprietary, or safeguards information so that the NRC can make it available to the public without redaction. The NRC also includes significant enforcement actions on its Web site at http://www.nrc.gov/reading-rm/doc-collections/enforcement/actions/. The NRC has forwarded the enclosed Order to the Office of the Federal Register for publication.

Sincerely,

/RA/

Eric J. Leeds, Director
Office of Nuclear Reactor Regulation

Enclosures:
1. Order (EA-13-109)
2. Licensees Addresses List

cc: Listserv

DISTRIBUTION:
See next page

ADAMS Accession No.: ML13143A334 (Pkg.); ML13143A321 (Letter); ML13130A067 (Order); ML13143A331 (Licensees Addresses List) *concurrence via e-mail

OFFICE	NRR/JLD/PSB	NRR/DORL/LPL3-2	QTE*	NRR/JLD/PSB
NAME	RAuluck	SRohrer	CHsu	WReckley
DATE	5/29/2013	5/29/2013	5/28/2013	5/4/2013
OFFICE	OE*	OGC*	NRR/JLD	NRR
NAME	RFretz	MSimon	DSKeen	ELeeds
DATE	5/30/2013	5/30/2013	6/4/2013	6/ 6/2013

OFFICIAL RECORD COPY