U.S.NRC
United States Nuclear Regulatory Commission
*Protecting People and the Environment*

# *Order EA-12-050*
# *Reliable Hardened Vents*

U.S. Nuclear Regulatory Commission

May 2, 2012

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# *Introduction*

- Welcome
- Administrative Items
  - Please sign in
  - Telephone bridge line participants
  - Slides available via Go To Meeting
  - Please silence or turn off cell phones
  - Feedback forms
  - Meeting Summary
- Introduction of Meeting Participants

# *Meeting Objective and Purpose*

- Discuss the implementation of Order EA-12-050, regarding reliable hardened containment vents at BWR facilities with Mark I and Mark II containments.
- Obtain input from stakeholders regarding the implementation of order requirements.
- Obtain input from stakeholders relating to the issue of filtered containment vents

# *Agenda*

- Meeting Objective
- Developing Interim Staff Guidance (ISG) on EA-12-050
- Regulated Industry Input
- Discussion
- Stakeholder Input on Filtered Containment Vents
- Public Stakeholders' Comments and Questions
- Wrap-up and Closing Remarks

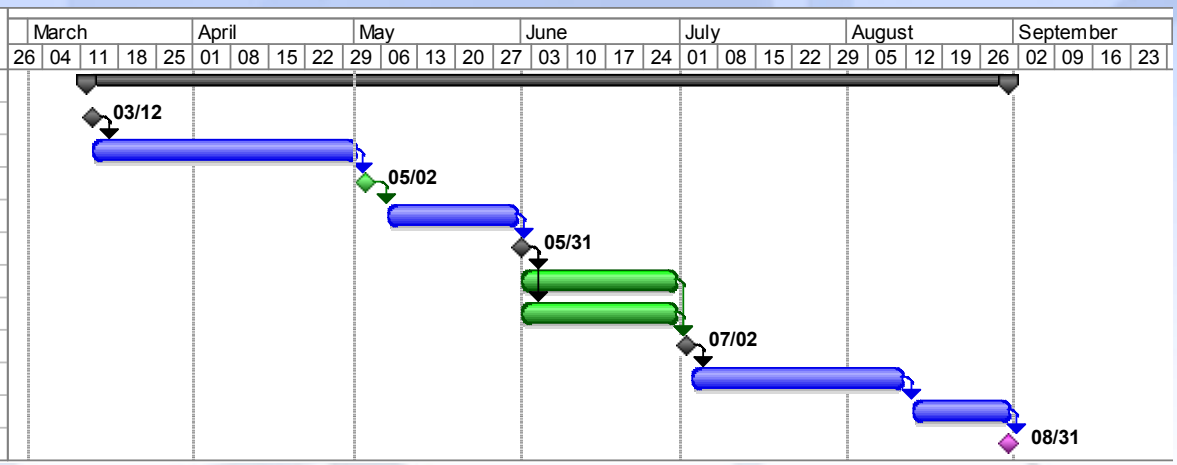
# *Overview*

- Order EA-12-050 issued on March 12, 2012
- Order requires reliable hardened vents at BWR facilities with Mark I and Mark II containments
- Interim Staff Guidance (ISG) to be issued no later than August 31, 2012
- Licensees complete plant modifications no later than December 31, 2016

# Current Schedule

- Proposed ISG Issued May 31, 2012
- Public Comment Period June 1 to June 30, 2012
- Public Comment Period Closes July 1, 2012
- NRC Resolves Comments
- Final ISG Issued on August 31, 2012

| ID | Task Name |
|---|---|
| 1 | **EA-12-050 Reliable Hardened Vents ISG Development** |
| 2 | Order EA-12-050 Issued |
| 3 | NRC Staff Initial Draft of ISG |
| 4 | Public Meeting |
| 5 | NRC Staff Finalize Draft ISG |
| 6 | Issue Proposed ISG (Federal Register Notice) |
| 7 | Public Comment Period |
| 8 | Conduct Public Meetings |
| 9 | Public Comment Period Closes |
| 10 | Resolution of Public Comments/Finalize ISG |
| 11 | NRC Review and Concurrence of Final ISG |
| 12 | EA-12-050 ISG Issued |



# *ISG Overview*

- Overview/Background Sections
- Definitions
- Administrative Requirements
- HCVS Performance Requirements
  - Order Requirement
  - NRC Staff Position
- Reporting Requirements

# *Definitions*

- "Seismically rugged design" – A term used to describe design quality requirements for components beyond the second containment isolation barrier to ensure HCVS functionality following a design basis seismic event. While the design and construction must meet the plant's seismic design requirements, licensees are not required to qualify piping, supports and other related components in accordance with NRC requirements, including Appendix B, "Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants." Routing of pipe through non-seismic structures or under/adjacent to non-seismic systems/components should also be evaluated for impact on "seismically rugged design."

# *Administrative Requirements*

- Section IV.A.
  - Licensees…shall complete full implementation no later than two (2) refueling cycles following the submittal of the overall integrated plan, as required in Condition C.1. … or December 31, 2016, whichever comes first.
- NRC Position:
  - Based on industry feedback and Commission direction
  - Full implementation shall be completed prior to commencement of plant start-up (control rod withdrawal) from the second scheduled refueling outage after submittal of the overall integrated plan required by the Orders.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.1.1
  - The HCVS shall be designed to minimize the reliance on operator actions.
- Staff Position:
  - During the prolonged SBO condition at the Fukushima, operators faced many significant challenges
  - The difficulties faced by the operators related to the location of the HCVS valves, temperature and radiological conditions,
  - The NRC staff recognizes that operator actions will be needed to operate the HCVS valves; however, the licensees shall consider design features for the system that will minimize the need and reliance on operator actions to the extent possible during a variety of plant conditions.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 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.
- Staff Position:
  - During a prolonged SBO, the drywell, wetwell (torus) and areas in the plant where HVCS components are expected to be located will likely experience an excursion in temperatures due to inadequate containment cooling combined with loss of ventilation systems. In addition, lighting in the plant may be significantly reduced.

# *Hardened Containment Venting System (HCVS) Requirements*

- NRC Staff Position (cont.)
  - Licensees should take into consideration anticipated plant conditions expected to be experienced during design basis accidents when locating valves, instrument air supplies, and other components that will be required to safely operate the system. Components required for manual operation should be placed in areas that are readily accessible to plant operators, and not require additional actions, such as temporary scaffolding, to operate the system. .

# Hardened Containment Venting System (HCVS) Requirements

- NRC Staff Position (cont.)
  - When developing a design and system operating strategy, the NRC staff expects licensees to analyze potential plant conditions and use their knowledge, in terms of potential component and ambient temperatures during extended SBO conditions and the adequacy of available lighting. This knowledge also provides an input to system operating procedures, the choice of protective clothing required, tools and equipment, and portable lighting that would be kept in readily accessible nearby storage locations.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.1.3
  - The HCVS shall also be designed to minimize radiological consequences that would impede personnel actions needed for event response.
- Staff Position:
  - Ensure that the design and location of the HCVS does not impede personnel actions to operate the system. Demonstrate that reliable operator action is possible.
  - Ensure that the design and location of HCVS piping (i.e., routing of pipe) does not impact event response from on-site operators or arriving off-site help.
  - Provide permanent shielding to facilitate personnel access to equipment or use alternatives to facilitate operation from remote locations.

# *Hardened Containment Venting System (HCVS) Requirements*

- NRC Staff Position (cont.)
  - Leakage from the HCVS within the plant and the location of the external release from the HCVS could also impact the event response from on-site operators and off-site help arriving at the plant. An adequate strategy to minimize radiological consequences that could impede personnel actions should include the following:
    - The system shall be leak-tight out to the designed discharge point. As such, ventilation duct work (i.e., sheet metal) shall not be utilized for the pressure boundary in the design of the HCVS. Licensees should perform appropriate initial testing, such as hydrostatic or pneumatic testing at design pressure, to establish the leak-tightness of the HCVS and continuous or periodic leak testing thereafter.

# Hardened Containment Venting System (HCVS) Requirements

- NRC Staff Position (cont.)
  - The HCVS release to outside atmosphere shall be at an elevation higher than adjacent plant structures. Release through existing plant stacks is considered acceptable. If the release from HCVS is through a vent stack different than the plant stack, the elevation of the stack should be higher than the nearest building or structure.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.1
  - The HCVS shall have the capacity to vent the steam/energy equivalent of 1 percent of licensed/rated thermal power (unless a lower value is justified by analyses), and be able to maintain containment pressure below the primary containment design pressure.
- Staff Position:
  - Licensees shall have an auditable engineering basis that provides reasonable assurance that the HCVS will have sufficient venting capacity under such conditions. Licensees may also use a venting capacity sized under conditions of constant heat input at a rate lower than 1 percent of thermal power if it can be justified by analysis that containment design pressure would not be exceeded.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.2
  - The HCVS shall be accessible to plant operators and be capable of remote operation and control, or [local] manual operation, during sustained operations.
- Staff Position:
  - The preferred location for remote operation and control of the HCVS is from the main control room.
  - Alternate locations to the control room are also acceptable, provided the licensees take into consideration the following:
    - Sustained operations mean the ability to open/close the valves multiple times during the event.

# *Hardened Containment Venting System (HCVS) Requirements*

- Staff Position:
  - An assessment of temperature and radiological conditions that operating personnel may encounter both in transit and locally at the controls. Licensee may use alternatives such as providing features to facilitate manual operation of valves from remote locations or relocating the valves.
  - During a prolonged SBO, manual operation/action may also become necessary to operate the HCVS. If direct access and local operation of the valves is not feasible due to temperature or radiological hazards, licensees should include design features to facilitate remote manual operation of the HCVS valves
  - The design shall preclude the need for operators to move temporary ladders or operate from atop scaffolding to access the valves or remote operating locations.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.3
  - The HCVS shall include a means to prevent inadvertent actuation.
- Staff Position:
  - The design and operating strategy of the HCVS shall incorporate features, such as control panel key-lock switches, locking systems or methods, including administrative controls, to prevent the inadvertent use of hand operated valves, switches and rupture discs.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.4
  - The HCVS shall include a means to monitor the status of the vent system (e.g., valve position indication) from the control room or other location(s). The monitoring system shall be designed for sustained operation during a prolonged SBO.
- Staff Position:
  - Plant operators must be able to readily monitor the status of the HVCS at all times, including being able to understand whether or not valves are open or closed, system pressure and effluent temperature. Other important information includes the status of supporting systems, such as instrument air (or N2, if used). The means to monitor system status shall support sustained operations during a prolonged SBO.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.5
  - 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 in the control room or other location(s), and shall be designed for sustained operation during a prolonged SBO.
- Staff Position:
  - Licensees shall provide radiation monitors in the HCVS discharge. The monitoring system shall be provided with indication in control room or a remote location. The remote location should be close to the location of manual connections to the portable motive force (N2 or air bottles, air compressor) and electric power for the valves during the event. Electric power for the monitoring system shall be from permanent DC battery sources or from portable power sources.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.6
  - The HCVS shall include design features to minimize unintended cross flow of vented fluids within a unit and between units on the site.
- Staff Position:
  - Licensees shall provide design features to prevent the cross flow of vented fluids to migrate to other areas in the plant or to an adjacent plant at multi-unit sites.
  - The current design of the hardened vent at many plants the U.S. includes a tie in with the Standby Gas Treatment System (SGTS). Licensees shall provide design features to eliminate or minimize the unintended cross flow from the HCVS to other areas within the plant or to another plant on the site. Acceptable means for prevention of cross flow is by not having a cross connection or use of no/low leakage valves.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.7
  - The HCVS shall include features and provision for the operation, testing, inspection and maintenance adequate to ensure that reliable function and capability are maintained.
- Requirement 1.2.8
  - The HCVS shall be designed for pressures that are consistent with maximum containment design pressures as well as dynamic loading resulting from system actuation.
- NRC Staff Position
  - Self explanatory.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 1.2.9
  - The HCVS shall discharge the effluent to a release point above main plant structures.
- Staff Position:
  - The HCVS release to outside atmosphere shall be at an elevation higher than adjacent plant structures. Release through existing plant stacks is considered acceptable. If the release from HCVS is through a stack different than the plant stack, the elevation of the stack should be higher than the nearest building or structure.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 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. These items include piping, piping supports, containment isolation valves, containment isolation valve actuators and containment isolation valve position indication components.
- Staff Position:
  - The design up to and including the second containment isolation barrier shall meet safety related requirements consistent with the design basis of the plant

# *Hardened Containment Venting System (HCVS) Requirements*

- Staff Position (cont.):
  - The staff notes that, in response to GL 89-16, many plants have made a branch connection between two existing containment isolation valves with the HCVS vent valve installed in the branch connection. In such cases, the existing containment isolation valves and the vent valve also become part of the containment isolation barrier. The HCVS system design shall not preclude the containment isolation valves, including the vent valve from performing their intended containment isolation function consistent with the design basis for the plant.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 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.
- Staff Position:
  - All components of the HCVS beyond the second containment isolation barrier shall be designed to ensure HCVS functionality following the plant's design basis seismic event. These components include, in addition to the hardened vent pipe, electric power supply, pneumatic supply and instrumentation.

# *Hardened Containment Venting System (HCVS) Requirements*

- Staff Position (cont.):
  - The design of power and pneumatic supply lines between the HCVS valves and remote locations (if portable sources were to be employed) shall also be designed to ensure HCVS functionality. Licensees shall ensure that the HCVS will not impact other safety related structures and components and that the HCVS will not be impacted by other non-seismic components. The hardened vent shall be designed to conform to the requirements of the applicable American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (ASME Code) and the applicable Specifications, Codes and Standards of the American Institute of Steel Construction (AISC). Beyond the containment boundary, licensees may prefer to use ASME B31.1.

# *Hardened Containment Venting System (HCVS) Requirements*

- Requirement 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 SBO conditions.
- Requirement 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 SBO conditions.
- NRC Staff Position
  - Self explanatory.

# *Reporting Requirements*

- Section IV.C. 1.
  - All Licensees shall, by February 28, 2013, submit to the Commission for review an overall integrated plan including a description of how compliance with the requirements described in Attachment 2 will be achieved.
- Staff Position:
  - The February 28, 2013, submittal shall contain information with the necessary detail to demonstrate compliance with the requirements described in Attachment 2 of EA-12-050. Licensees shall provide a complete description of the system, including important operational characteristics. The level of detail generally considered adequate is consistent to the level of detail contained in the Licensee's Updated Final Safety Analysis Report (UFSAR). UFSAR level of detail varies greatly, and some UFSARs are lacking in any serious detail. Therefore, the information submitted on February 28, 2013 should be more than these plants.

# *Reporting Requirements*

- Staff Position (cont.):
  - In addition, the staff expects the Licensee's submittal will provide the following information:
    - A description of how the design objectives contained in Attachment 2, Requirements 1.1.1, 1.1.2, and 1.1.3 are met.
    - Description of major system components, including applicable quality requirements.
    - Operational characteristics, and a description of how each of the order's technical requirements are being met.
    - A piping and instrumentation diagram (P&ID)
  - The February 28, 2013, submittal shall also include an update of implementation schedule milestones.

# *Reporting Requirements*

- Section IV.C.2.
  - All Licensees shall provide an initial status report sixty (60) days following issuance of the final ISG, and at six (6)-month intervals following submittal of the overall integrated plan, as required in Condition C.1, which delineates progress made in implementing the requirements of this Order.
- Section IV.C.3
  - All Licensees shall report to the Commission when full compliance with the requirements described in Attachment 2 is achieved.
- Staff Position:
  - TBD. Awaiting stakeholder input.

Background

# *FILTRATION OF CONTAINMENT VENTS*

# *Filtration of Containment Vents*

- Fukushima Near Term Task Force (NTTF) developed a comprehensive set of recommendations that were documented in the following Commission Papers:
  - SECY-11-0093, “Near-Term Report and Recommendations for Agency Actions Following the Events in Japan,” dated July 12, 2011
  - SECY-11-0124, “Recommended Actions To Be Taken Without Delay From the Near-Term Task Force Report,” dated September 9, 2011
  - SECY-11-0137, “Prioritization of Recommended Actions To Be Taken in Response to Fukushima Lessons Learned,” dated October 3, 2011.

# *Filtration of Containment Vents*

- In SRM-SECY-11-0137, the Commission directed the staff to take certain actions and provided additional guidance related to reliable hardened vents.
  - Supported recommendation to order licensees to include a reliable hardened vent in BWR Mark I and Mark II containments, and recommendation to perform a long-term evaluation on reliable hardened vents for other containment designs.
  - "…quickly shift the issue of 'Filtration of Containment Vents' from the 'additional issues' category and merge it with the Tier 1 issue of hardened vents for Mark I and Mark II containments such that the analysis and interaction with stakeholders needed to inform a decision on whether filtered vents should be required can be performed concurrently with the development of the technical bases, acceptance criteria, and design expectations for reliable hardened vents."

# *Filtration of Containment Vents*

- The staff concluded in SECY-12-0025 that there were
  - "…technical and policy issues to be resolved before regulatory action can be taken to require licensees to install filtered vents. One policy issue that needs further study is whether containment vents, with or without filters, should be required to operate under severe accident conditions…"
- The staff added in SECY-12-0025 that it planned to provide the Commission a notation vote paper on these policy issues in July 2012.

# *Filtration of Containment Vents*

- NRC Actions To Date
  - Evaluating the merits of filtered venting of BWR Mark I and Mark II Containments
  - Investigating foreign experience with filtered venting
  - Seeking Stakeholder Comments

Stakeholder Input

# *REGULATED INDUSTRY APPROACH*

Order EA-12-050 Interim Staff Guidance

# *DISCUSSIONS*

Stakeholder Input

# PUBLIC COMMENTS AND QUESTIONS FOR NRC STAFF

Next Steps

# *MEETING WRAP UP*