March 7, 2013

The Honorable Edward J. Markey
United States House of Representatives
Washington, D.C. 20515

Dear Congressman Markey:

On behalf of the U.S. Nuclear Regulatory Commission (NRC), I am responding to your letter dated February 7, 2013, voicing support for the addition of engineered filters to venting systems for boiling water reactors with Mark I and Mark II containments, and expressing concern regarding certain statements made by NRC staff.

Responses to your specific questions are enclosed with this letter. The Commission appreciates receiving your views regarding filtered vents. The Commission understands the important decision before us and is giving the matter careful consideration. We asked the staff to solicit input from a wide range of stakeholders and requested expert opinion from the Advisory Committee on Reactor Safeguards in preparing to consider this issue. The information provided in the paper, along with other information gathered by the Commission, will be reviewed during our deliberations.

If you have any additional questions, please contact me or Ms. Rebecca Schmidt, Director of the Office of Congressional Affairs, at (301) 415-1776.

Sincerely,

/RA/

Allison M. Macfarlane

Enclosure:
As stated

Responses to Information Requests from Representative Edward J. Markey
Letter Dated February 7, 2013

1. Contrary to the statements cited above by Mr. Borchardt and Mr. Virgilio, is it true that both Japanese and U.S. Mark I BWRs had similar hardened vents installed prior to the Fukushima disaster and that these vents would likely be inoperable under the severe accident conditions in which they are most needed (e.g., due to long-term loss of electrical power)? If not, please fully explain your response.

There are a total of 37 boiling water reactors (BWRs) worldwide that have a Mark I-type pressure suppression containment. Twenty-three are licensed by the NRC to operate in the U.S. and eight are located in Japan (the remaining six are located in Europe and Asia). The original design of the Mark I containment focused on meeting requirements associated with design-basis accidents, such as a significant loss of coolant. Subsequent evaluations highlighted possible issues with the performance of pressure suppression containments, such as the Mark I, during beyond-design-basis or severe accident conditions. Operational features such as containment vents were identified to help mitigate challenges to Mark I containments. In recognition of possible improvements in responding to severe accidents, the NRC issued a generic letter in 1989 that encouraged licensees operating Mark I containments to upgrade the venting systems to enhance their reliability during beyond-design-basis events. Although the "hardened vent" features were not incorporated into NRC regulatory requirements, all BWR Mark I licensees have installed hardened vents and have included the use of the hardened venting system in their emergency operating and severe accident management procedures.

While all U.S. and Japanese BWRs with Mark I containments have a hardened vent capability, the designs of those systems vary from plant to plant. The varied approach to the design and installation of "hardened vents" at U.S. and Japanese plants complicates any comparisons of the specific systems at Fukushima and other BWR Mark I plants. The statements referenced in your letter were made by NRC staff immediately following the Fukushima Dai-ichi accident while the agency was still gathering and evaluating information about the plant and the accident and therefore the extent of the differences were not fully known at that time.

The events at Fukushima Dai-ichi highlight the possibility that extreme natural phenomena could challenge the defense-in-depth layers associated with prevention, mitigation, and emergency preparedness. At Fukushima, conditions associated with the accident significantly challenged attempts by the responders to preclude core damage and containment failure. In particular, the operators were unable to successfully operate the containment venting systems due to harsh environments (temperatures and radiation levels) inside the reactor building. In response to the lessons learned from the Fukushima Dai-ichi accident, and in recognition that venting operations might be hampered at U.S. plants during similar conditions, the NRC issued Orders on March 12, 2012, to specify requirements for the design and operation of reliable hardened venting system for Mark I and Mark II containments. The requirements set forth in the Orders were intended to help prevent core damage during events such as an extended loss of power and address conditions such as elevated temperatures. The Orders did not require the reliable hardened venting system be designed and installed to support operations following core damage (i.e., severe accident conditions that might also include high radiation levels). However, the NRC initiated an evaluation to determine if the requirements for venting systems for Mark I and Mark II containments should be further revised to address severe accident conditions and possibly include an engineered filtering system. The NRC staff described various options and its recommendation related to containment venting systems for BWRs with Mark I and Mark II containments in a policy paper to the Commission dated November 26, 2012. This matter remains before the Commission. Therefore, a final agency position has not yet been determined.

Enclosure

2. Is it true that hydrogen recombiners that are currently installed in the Indian Point reactors would be unable to cope with the rate of hydrogen production expected in a severe accident?

- **a. If yes, what actions has or will the NRC take to correct the inaccurate statements made by Mr. Nappi, cited above?**
- **b. If not, why not?**

The NRC requires that Indian Point be fully capable of withstanding the design-basis accident as described in the regulations. The passive autocatalytic recombiners at Indian Point 2 and the thermal recombiners at Indian Point 3 are capable of controlling hydrogen following a design-basis accident.

Any postulated accident that exceeds the NRC's design-basis accident is referred to as a severe reactor accident. The NRC has previously acknowledged that hydrogen recombiners for large dry containments, such as Indian Point, would not be capable of controlling hydrogen production following a severe reactor accident. However, control room operators have procedures that would mitigate hydrogen production during a severe reactor accident.

Concerns similar to yours regarding hydrogen control and containment pressures during a severe accident at Indian Point are currently under review as part of our 2.206 petition process. The documents related to the petitions are available on our public website.

a. / b.) NRC regulations and policies do not directly address the adequacy of licensee information provided only to the public and not to the NRC. We cannot comment on the intent of Mr. Nappi's statements.

3. Is it true that hydrogen igniters are not installed at the Indian Point reactors and that the containment vents present are not designed to withstand the pressures likely to be present in a severe nuclear accident?

- **a. If yes, what measures have or will be taken to avoid future inaccurate statements about this issue or future nuclear safety issues by NRC staff, such as those cited above by Mr. Sheehan?**
- **b. If no, please describe how the statements cited above by Mr. Sheehan are justified.**

Hydrogen igniters are not installed at the Indian Point reactors. However, Mr. Sheehan's statement that plant operators would have the option of initiating controlled burns to manage hydrogen concentrations within containment is accurate. The statement referred to the Severe Accident Management Guidelines (SAMGs), which provide Indian Point operators with multiple options to control hydrogen, including controlled burns in containment by starting motors and initiating sparks.

Containment venting is an additional option in the SAMG to reduce hydrogen concentrations. The containment venting system is designed to withstand pressures up to 150 pounds per square inch, which exceeds the pressures expected during a severe accident.