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# Congress of the United States
## House of Representatives
## Washington, DC 20515–2107

February 07, 2013

The Honorable Allison M. Macfarlane
Chairman
Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

Dear Chairman Macfarlane:

I write to urge the Commission to follow the recommendations of the Nuclear Regulatory Commission (NRC) staff and require the addition of engineered filters to the severe-accident capable containment vents on certain boiling water reactors (BWRs) in the U.S. Such action is needed in order to facilitate the prevention of the sort of hydrogen explosions that occurred at the Fukushima Daiichi nuclear power plant. I also wish to convey my grave concerns about ongoing inaccurate statements made by some NRC personnel concerning equipment currently installed in U.S. nuclear reactors to prevent a dangerous buildup of hydrogen gas in nuclear containment structures in the event of a nuclear accident.

The tsunami that followed the March 11, 2011 earthquake in Japan led to a loss of power to several of the reactors at the Fukushima Daiichi nuclear power plant. With cooling loss, the fuel rods reached a high enough temperature for the zirconium in the cladding to react with water to produce hydrogen. This hydrogen escaped the containment, accumulated in the reactor building and later exploded, compounding the problems in reactors 1, 2, 3, and 4. The reactor design at Fukushima is common in the United States, and other reactor designs are also susceptible to hydrogen buildup when core cooling fails.

In the wake of the 1979 Three Mile Island nuclear accident, where a hydrogen explosion also occurred, the NRC required nuclear power plants to install equipment to mitigate hydrogen buildup in the containment. Different hydrogen control strategies were used for different reactor types. Mark I BWRs, which have small containments, were required to add hydrogen recombiners (which recombine hydrogen with oxygen to make water) and encouraged to add hardened vents.[1] The hardened vents were recommended in order to provide a high pressure resistant path to relieve pressure in the containment in the event of a severe accident. While never formally required, all reactors with Mark I containment in the U.S. (as well as those in Japan) installed such vents. After implementing these safety regulations, however, NRC quickly began to relax them in response to industry pressure. The requirement for hydrogen recombiners in Mark I containments was eliminated in 1984, for example[2]. The logic of such actions, as

[1] http://www.nrc.gov/reading-rm/doc-collections/gen-comm/gen-letters/1989/gl89016.html
[2] http://www.nrc.gov/reading-rm/doc-collections/gen-comm/gen-letters/1984/gl84009.html

explained by NRC spokesperson Elliot Brenner, was that "they weren't needed for design basis accidents and they didn't help with severe accidents[3]." In addition, the NRC never required that the hardened vents that had been installed to be operable under the severe accident scenarios in which they would be used. For example, many of the hardened vents required electrical power or compressed air to operate, but a likely scenario in which these vents would be needed involves a complete loss of electrical power and reactor core cooling, as happened at Fukushima. Thus the hardened vents would likely not function when they were most needed. It was only after the Fukushima melt-downs that the NRC added reliability standards for hardened vents on small-containment BWRs so that they could be relied upon to operate as required even under extreme accident conditions.

In many of the accident scenarios where venting of hydrogen would be required, there would be a concurrent and potentially significant release of radioactive materials into the environment. The addition of engineered filters that can handle the high pressure venting under accident conditions would significantly reduce the release of radiological materials. The installation of filtered vents would thus facilitate venting of hydrogen to occur at an earlier stage in an accident without fear of exposing members of the public to radiation, and reduce the risk that hydrogen pressures could build up to explosive pressures. Such filters are common on reactors in Canada and are required in many European countries (Sweden, Germany, France). On November 26, 2012, the NRC staff recommended that such filters also be installed on U.S. BWRs[4], and the question of whether to adopt the staff's recommendation is currently pending before the Commission.

After the Fukushima disaster, there were several inaccurate statements from certain NRC personnel concerning the availability of systems in U.S. nuclear power plants that would have prevented the hydrogen explosions that occurred in the Fukushima reactors:

- At a March 11, 2011 hearing before the NRC Commissioners, Bill Borchardt, the Executive Director for Operations at NRC, repeatedly emphasized the utility of "hardened vents" installed in Mark I and Mark II BWRs in the U.S. for preventing containment failure and hydrogen explosions. Mr. Borchardt stated that "hardened vents will allow the primary containment to stay intact and that's probably the single most important thing," and concluded that with the already installed vents and the existing practice of inerting the containment with nitrogen that "I don't know if there's anything that we need to add.[5]" At the time of this hearing, information on the causes and severity of the Fukushima accident were still preliminary, so this broad statement about safety features in U.S. nuclear reactors was premature and turned out to be very short-sighted. It was only a few months later that NRC Near Term Task Force concluded "that the addition or confirmation of a **reliable** hardened wetwell vent in BWR facilities with Mark I and Mark II containment designs would have a significant safety benefit[6]." (Emphasis added.) This was only one of multiple deficiencies in nuclear power plant

[3] http://green.blogs.nytimes.com/2011/03/31/u-s-dropped-nuclear-rule-meant-to-avert-hydrogen-explosions/
[4] http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2012/2012-0157scy.pdf
[5] http://www.nrc.gov/reading-rm/doc-collections/commission/tr/2011/20110321.pdf
[6] http://pbadupws.nrc.gov/docs/ML1118/ML111861807.pdf

equipment and operating procedure and U.S. nuclear regulatory structure that the Task Force identified as placing the U.S. at risk for a Fukushima-like disaster.

- At an April 6, 2011 hearing before the House Energy and Commerce Committee, Martin Virgilio, then Deputy Executive Director for Reactor and Preparedness Program at the NRC, stated that "there is some evidence that we are seeing that the Japanese designs did not keep pace, they did not make the same modifications that we made to install hardened vents…[7]" In fact, my office received an email from NRC staff the day before that hearing indicating that NRC was fully aware that the Fukushima reactors did have hardened vents[8]. Under further questioning, Mr. Virgilio admitted that the NRC regulations did not require that hardened vents be capable of operating under design-basis accident or severe accident conditions.

To have two senior NRC official suggest that "hardened vents" were a safety-feature present in U.S. reactors that would prevent a Fukushima-like disaster when these same vents were installed in the Japanese reactors, when the vents were not required to be operational in U.S. reactors, and when these vents were not likely to function in a severe accident significantly undermines public confidence in the NRC's ability to ensure safe operation of nuclear power reactors.

Inaccurate statements regarding the mitigation of hydrogen buildup during a nuclear accident have continued to this day. In response to a November, 2012 petition[9] from Riverkeeper to NRC asking that the operating license for the Indian Point reactor be revoked, Entergy spokesperson Jerry Nappi stated that "Indian Point is designed with back-up safety equipment to protect the plant, including equipment inside containment that automatically turns hydrogen gas into harmless water in the unlikely event of damage to the nuclear fuel.[10]" NRC spokesperson Neil Sheehan responded as well and described the ability to perform controlled burns of hydrogen inside the containment of these pressurized water reactors or to vent hydrogen to the outside[11]. Unfortunately, none of these assertions appears to be correct. According to analysis by the Natural Resources Defense Council (NRDC), the hydrogen recombiners Mr. Nappi referred to do not have nearly enough capacity to manage the hydrogen that would be produced during a severe accident, or even a design-basis accident[12]. Even more troubling, the reactors at Indian Point are not equipped with hydrogen igniters that could be used to induce the controlled burns Mr. Sheehan referred to. Furthermore, the NRDC concludes that any purge lines available at Indian Point reactors are not hardened to handle the high pressure conditions likely to occur in a severe accident[13]. The public needs clarity about the real risks and the real mitigation strategies

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[7] http://www.gpo.gov/fdsys/pkg/CHRG-112hhrg67399/pdf/CHRG-112hhrg67399.pdf
[8] http://markey.house.gov/sites/markey.house.gov/files/documents/Markey%20E-mail%202%20-%20NRC%20Question%20regarding%20Fukushima%20Unit%202.pdf
[9] http://www.riverkeeper.org/wp-content/uploads/2012/11/Petition-for-IP-Enforcement_Riverkeeper-FINAL-2.206_11-14-2012.pdf
[10] http://www.lohud.com/article/20121114/NEWS02/311140091/Riverkeeper-petition-NRC-should-shut-Indian-Point
[11] http://www.lohud.com/article/20121114/NEWS02/311140091/Riverkeeper-petition-NRC-should-shut-Indian-Point
[12] http://docs.nrdc.org/nuclear/files/nuc_12112801a.pdf
[13] http://docs.nrdc.org/nuclear/files/nuc_12112801a.pdf

that are employed in nuclear power generation. These inaccurate statements cause confusion and lead to public mistrust of both nuclear power plant operators and the NRC.

Following the radiological releases at Fukushima, the NRC's Near-Term Task Force which reviewed the Fukushima accident, produced a prioritized list of reactor modifications, procedure changes, and other regulatory actions that were necessary to reduce the likelihood of a similar disaster here in the U.S. One of the recommendations that rose to the top of the list was the installation of reliable hardened containment vents on BWRs with small containment volumes (e.g. Mark I and Mark II designs). As the struggles to maintain the integrity of the containment at several of the Fukushima reactors show, it is critical to be able to relieve pressure and vent hydrogen during severe accidents in reactors of this design. The NRC staff recommended, and the Commission rightly voted to require, that hardened vents in Mark I BWRs be made operable under accident conditions and reliable, hardened vents be installed in Mark II BWRs[14]. This left unresolved the issue of whether these vents should be filtered to reduce the release of radiological materials in an accident that required venting. The NRC staff recently completed an evaluation of this issue and found that in nearly all severe accident scenarios considered, having a filter on the hardened containment vent would significantly reduce the radiological release[15].

I strongly urge the Commission to follow the NRC staff recommendation and require that engineered filters be installed on BWR containment vents and that these vents be operable under severe accident conditions. This would greatly increase the ability of plant operators to control conditions and maintain the integrity of the containment in a severe accident. In addition, requiring filters would show clearly that the NRC and nuclear power industry are turning away from obfuscation and misleading statements to the public about the risks in a severe accident and are instead honestly trying to implement solutions that protect the public. I additionally request answers to the following questions:

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.
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?

[14] http://pbadupws.nrc.gov/docs/ML1205/ML12054A694.pdf
[15] http://www.nrc.gov/reading-rm/doc-collections/commission/secys/2012/2012-0157scy.pdf

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.

Thank you for your attention to this important matter. Please provide written responses to these questions no later than February 22, 2013. If you have any questions, please have a member of your staff contact Dr. Chris Schaffer or Dr. Michal Freedhoff in my office at 202-225-2836.

Sincerely,

Edward J. Markey

Edward J. Markey