



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

March 23, 2015

Dr. Robert A. Leishear  
205 Longleaf Court  
Aiken, SC 29803

Dear Dr. Robert Leishear:

Thank you for your submittal of October 27, 2014, which contained a proposed issue for evaluation in the U.S. Nuclear Regulatory Commission's (NRC's) Generic Issues (GI) program. In that submittal, you postulated that an auto-ignition of a hydrogen-oxygen mixture can occur in the reactor coolant system (RCS) piping of nuclear power plants due to a sudden compression of the mixture during a fluid transient. You further postulated that the auto-ignition can cause a pressure increase that lifts a safety valve or ruptures the RCS, which can expel a flame that causes a hydrogen burn or explosion inside containment under severe accident conditions. Enclosure 1 contains a detailed description of the proposed GI.

The GI Program staff have completed an initial review of the proposed GI in accordance with the NRC's Management Directive 6.4, "Generic Issues Program." The purpose of an initial review is to determine whether the proposal clearly meets all of the seven screening criteria required for it to continue in the GI process. Based on the initial review, the staff determined that the proposed GI did not meet all seven screening criteria, and therefore will not continue to be assessed in the GI program. Enclosure 2 summarizes the results of the staff's initial review.

In summary, the staff evaluated the proposed GI and determined that existing requirements for hydrogen control and mitigation in the containments of nuclear power plants are sufficient to ensure that the concentration of combustible gases in any part of the containment is below a level that supports combustion or detonation that could cause loss of containment integrity in realistic scenarios. Specifically, the NRC established requirements in Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.44, "Combustible Gas Control for Nuclear Power Reactors," for licensees to analyze their plants for this phenomena and ensure that their plants can prevent and mitigate the consequence of hydrogen production. The analyses ensure that ignition sources, regardless of their cause, would not result in unacceptable consequences. Therefore, a postulated ignition source of water hammer in the RCS is bounded by these plant analyses. Enclosure 3 contains a discussion of the control of hydrogen during severe accidents.

In addition, the industry and the NRC staff have implemented the appropriate actions to minimize the accumulation of gas in the RCS during normal operations, which would reduce the risk of auto-ignition during accident conditions. Enclosure 4 contains a summary of industry and NRC's actions to control hydrogen during normal operations.

Nonetheless, in response to the accident that occurred at Fukushima, Japan, in March 2011, the NRC established a task force to identify any other safety enhancements for hydrogen control and mitigation inside containment and other reactor buildings that might be required. The study falls under the scope of Recommendation #6 from the report by the Near-Term Task

Force, "Recommendations for Enhancing Reactor Safety in the 21<sup>st</sup> Century."<sup>1</sup> The scope of the staff's review includes generation, transport, distribution, and combustion of hydrogen gas. This task has been prioritized as a Tier 3 item in SECY-11-0137.<sup>2</sup> The staff provided updates to this item in SECY-15-0137<sup>3</sup> and a draft White Paper (publicly available)<sup>4</sup>. Therefore, the NRC already has a program in place that will evaluate whether any additional regulatory requirements are necessary for combustible gas control during a Fukushima type event.

We appreciate your concern for the safe operation of nuclear power plants. Thank you again for proposing this issue for review.

Enclosures: As stated

Sincerely,

**/RA/**

Thomas H. Boyce, Chief  
Regulatory Guidance and Generic Issues Branch  
Division of Engineering  
Office of Nuclear Regulatory Research

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<sup>1</sup> SECY-11-0093, "Recommendations for Enhancing Reactor Safety in the 21st Century," July 12, 2011, [Agencywide Documents Access and Management System (ADAMS) Accession No. ML111861807].

<sup>2</sup> SECY-11-0137, "Prioritization of Recommended Actions to be taken in response to Fukushima Lesson Learned," [ADAMS Accession No. ML113490055].

<sup>3</sup> SECY-15-0137, "Proposed Plans for Resolving Open Fukushima Tier 2 and 3 Recommendations," [ADAMS Accession No. ML15254A006].

<sup>4</sup> NRC draft White Paper titled "Closure Of Fukushima Tier 3 Recommendations Related To Containment Vents, Hydrogen Control, And Enhanced Instrumentation," February 2, 2016 [ADAMS Accession No. ML16020A245].

Force, "Recommendations for Enhancing Reactor Safety in the 21<sup>st</sup> Century."<sup>1</sup> The scope of the staff's review includes generation, transport, distribution, and combustion of hydrogen gas. This task has been prioritized as a Tier 3 item in SECY-11-0137.<sup>2</sup> The staff provided updates to this item in SECY-15-0137<sup>3</sup> and a draft White Paper (publicly available)<sup>4</sup>. Therefore, the NRC already has a program in place that will evaluate whether any additional regulatory requirements are necessary for combustible gas control during a Fukushima type event.

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