



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

June 2, 2016

MEMORANDUM TO: Cynthia D. Pederson, Regional Administrator
Region III

FROM: Thomas Boyce, Chief */RA Harriet Karagiannis for/*
Regulatory Guidance and Generic Issues Branch
Division of Engineering
Office of Nuclear Regulatory Research

SUBJECT: CLOSE OUT LETTER FOR GENERIC ISSUE 193, THE
EFFECTS ON EMERGENCY CORE COOLING SYSTEM LOW
PRESSURE PUMPS FOLLOWING BLOWDOWN OF
CONTAINMENT GAS INTO TORUS

The purpose of this memorandum is to inform Region III of the close-out of Generic Issue (GI) 193. A Generic Issue Review Panel (GIRP) has performed an assessment and on April 19, 2016, issued its results,¹ concluding that the proposed issue did not present a significant safety hazard to warrant any new or revised regulatory requirements or guidance. Therefore, in accordance with Management Directive (MD) 6.4, "Generic Issues Program," the proposed GI will be not proceed further in the GI program. This memorandum serves to officially document the close out of GI-193.

The issue was proposed on May 10, 2002,² by a Region III inspector, who identified a potential concern for the emergency core cooling system (ECCS) for boiling-water reactors (BWRs) during loss-of-coolant accidents (LOCAs). The concern focused on the force of the escaping steam from the reactor coolant system causing a blowdown of containment gases into the suppression pool/torus, where the ECCS pumps are designed to take suction. The proposed generic issue hypothesizes that these gases could impair operation of the low-pressure ECCS pumps if a large quantity of gas is drawn into their suctions.

A GIRP evaluated the proposed GI, and on October 16, 2003,³ issued a screening report stating that the issue met the screening criteria defined in MD 6.4. The panel recommended the issue continue into the assessment stage as described in MD 6.4. Following the panel's screening review, RES staff conducted extensive testing and using computational fluid dynamic analyses, the staff was able to define an "exclusion zone" around the downcomers and a time dependent void fraction distribution for the large gas bubbles that formed in the torus following a large break LOCA. Based upon these results, the RES staff produced the technical report,

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¹ "Results of Generic Issue Review Panel Assessment of Generic Issue 193, BWR ECCS Suction Concerns," Agencywide Documents Access and Management System (ADAMS), ML16063A452

² "Potentially Generic Safety Issue-BWR ECCS Suction Concerns," ADAMS, ML021340802

³ "Results of Initial Screening of Generic Safety Issue 193, BWR ECCS Suction Concerns," ADAMS, ML032940708

NUREG-2196, "BWR ECCS Pump Suction Concerns following a LOCA,"¹ providing the basis for resolving GI-193.

Following completion of the RES technical study, a new GIRP was formed in September 2015 to assess the results to determine whether the issue presented a significant safety hazard that merited further regulatory action. Based on the information provided in the RES technical study, the new GIRP concluded that the influx of noncondensable gas into the torus immediately following a large break LOCA was very unlikely to adversely affect the ability of the low-pressure ECCS pumps to perform their safety function. The new GIRP based their conclusion on the existing safety margin resulting from the combination of the following factors. (1) The short-lived characteristics of the bubbles and their rapid dissipation. (2) The reduction of gas flow to ECCS pumps' suction inlet piping due to obstruction from the physical configuration of strainers, piping, and torus geometry. (3) The low approach velocity of the fluid at the suction inlet piping due to ECCS pumps operating in a minimum flow recirculation mode. (4) The high survivability of ECCS pumps after short-term gas ingestion. On April 19, 2016,² the new GIRP issued the results of its assessment, concluding it could not identify any credible combination of physical and operational conditions that would jeopardize the ECCS safety function due to air entrainment following a large break LOCA. Therefore, the panel recommended no further regulatory action was warranted for the proposed issue.

The GI Program staff wanted to thank you and the Region III staff for submitting this proposed GI. Recognizing that significant time has elapsed since the initial submittal, please convey our appreciation to any appropriate staff. If you have any questions regarding this matter, please don't hesitate to contact me or Stanley Gardocki, the Project Manager for the GI program.

NUREG-2196, "BWR ECCS Pump Suction Concerns following a LOCA,"¹ providing the basis for resolving GI-193.

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ACRS: Attention M. Banks

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