



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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May 15, 2019

MEMORANDUM TO: Christopher G. Miller, Director
Division of Inspection and Regional Support
Office of Nuclear Reactor Regulation

FROM: Mirela Gavrilas, Director **/RA by Jane E. Marshall for/**
Division of Safety Systems
Office of Nuclear Reactor Regulation

SUBJECT: WITHDRAWAL OF REGULATORY ISSUE SUMMARY 2005-29
AND DRAFT REVISION 1, "ANTICIPATED TRANSIENTS THAT
COULD DEVELOP INTO MORE SERIOUS EVENTS"

This memorandum withdraws Regulatory Issue Summary (RIS) 2005-29 and its draft Revision 1, "Anticipated Transients that Could Develop into More Serious Events." The U.S. Nuclear Regulatory Commission (NRC) developed RIS 2005-29 and its draft Revision 1 to notify licensees of a concern identified during reviews of power uprate license amendment requests. Specifically, the RIS discusses licensing bases of certain licensees, as described in the plant updated final safety analysis reports, which failed to demonstrate that anticipated transients (i.e., Condition II events) would not progress into more serious events (Condition III or IV events). The NRC staff reviewed the information in the RIS and its draft Revision 1 following the backfit and subsequent appeals for Byron Station and Braidwood Station, which resulted in the staff reassessing its position on this topic. Therefore, the staff is withdrawing RIS 2005-29 and its draft Revision 1. The enclosure summarizes the NRC staff's basis for reaching this conclusion.

Enclosure:
As Stated

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SUBJECT: WITHDRAWAL OF REGULATORY ISSUE SUMMARY (RIS) 2005-29 AND
PROPOSED REVISION 1, "ANTICIPATED TRANSIENTS THAT COULD
DEVELOP INTO MORE SERIOUS EVENTS" Dated: May 15, 2019

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U.S. NUCLEAR REGULATORY COMMISSION STAFF SUMMARY

ANTICIPATED TRANSIENTS THAT COULD DEVELOP INTO MORE SERIOUS EVENTS

1.0 INTRODUCTION AND BACKGROUND

Many licensees have incorporated American Nuclear Society (ANS) 51.1 (Ref. 1), "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants," issued 1983 (replaces American National Standards Institute (ANSI) N18.2-1973 (Ref. 2)), in their updated final safety analysis reports (UFSARs). One of the ANS design requirements, contained in the section that defines Condition II, III, and IV events, is that, "by itself, a Condition II incident cannot generate a more serious incident of the Condition III or IV type without other incidents occurring independently." This requirement, hereafter referred to as the nonescalation criterion, is intended to limit the probability of initiating the more safety-significant Condition III or IV events at the relatively high frequency of Condition II events.

While reviewing licensing-basis analyses of the inadvertent emergency core cooling system (ECCS) actuation event, the U.S. Nuclear Regulatory Commission (NRC) staff identified a concern about whether pressurized-water reactors comply with the nonescalation criterion when they are equipped with ECCSs capable of pressurizing the reactor coolant system (RCS) to levels greater than the opening setpoint pressures of any of their pressurizer relief or safety valves. Such ECCSs typically employ charging pumps in a safety injection mode. In these plants, the inadvertent ECCS actuation event, a Condition II event, can become a small-break loss-of-coolant accident (LOCA), a Condition III event, if the ECCS flow fills the pressurizer and a pressurizer safety valve (PSV) opens, discharges water, and then fails to close.

In Nuclear Safety Advisory Letter (NSAL)-93-013 (Ref. 3), "Inadvertent ECCS Actuation at Power," issued in 1993, Westinghouse noted that, for the inadvertent ECCS actuation event, many Westinghouse plants (more than two dozen in the United States and about the same number in other countries) may have licensing bases that contain nonconservative assumptions. Using revised assumptions may result in this event developing into a small-break LOCA. To remedy this situation, Westinghouse advised its affected customers of the issue and offered them several resolutions. In 1994, Westinghouse issued NSAL-93-013, Supplement 1 (Ref. 4), to provide additional information related to positive displacement pumps and qualification of piping downstream of the pressurizer relief and safety valves.

On December 14, 2005, the NRC issued Regulatory Issue Summary (RIS) 2005-29, "Anticipated Transients that Could Develop into More Serious Events," dated December 14, 2005 (Ref. 5), to notify licensees of the concern identified during reviews of power uprate license amendment requests related to licensing bases of certain licensees failing to demonstrate that anticipated transients will not progress to more serious events. On July 17, 2015, the NRC issued draft RIS 2005-29, Revision 1 (Ref. 6), for public comment. The NRC received seven comment submissions but never formally addressed the comments, as development of Revision 1 was put on hold because of the backfit and subsequent appeals for Braidwood Station and Byron Station, as discussed below.

On October 9, 2015, the NRC issued a backfit imposition (Ref. 7) with regard to compliance with the licensing basis for Braidwood Units 1 and 2 and Byron Units 1 and 2; Title 10 of the *Code of Federal Regulations* (10 CFR) 50.34(b); and the following general design criteria (GDC) from

Enclosure

Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR Part 50, “Domestic Licensing of Production and Utilization Facilities” (Ref. 8):

- GDC 15, “Reactor Coolant System Design”
- GDC 21, “Protection System Reliability and Testability”
- GDC 29, “Protection Against Anticipated Operational Occurrences”

Based upon the NRC staff’s review of the analyses contained in the Braidwood and Byron UFSAR, Chapter 15.5.1, “Inadvertent Operation of Emergency Core Cooling System during Power Operation (IOECCS),” Chapter 15.5.2, “Chemical and Volume Control System (CVCS) Malfunction that Increases Reactor Coolant Inventory (CVCS) Malfunction,” and Chapter 15.6.1, “Inadvertent Opening of a Pressurizer Safety or Relief Valve (IOPORV),” the NRC staff determined that the UFSAR predicts water relief through a valve that is not qualified for water relief. Therefore, the staff concluded that the UFSAR does not contain analyses that demonstrate the structures, systems, and components will meet the design criteria for Condition II faults.

On December 8, 2015, the licensee appealed the NRC staff’s decision to the Director of the Office of Nuclear Reactor Regulation (NRR), stating its disagreement with the NRC’s conclusion that the compliance exception to the backfit rule applied in this case, while noting that the NRC staff had twice approved the underlying analysis (Ref. 9). The Director of NRR chartered a Backfit Review Panel to review the licensee’s appeal of the NRC staff’s determination that a backfit was necessary at Braidwood and Byron, and the NRC staff’s application of the compliance backfit exception. Following the NRR Backfit Review Panel’s evaluation of the issue, the Director of NRR responded to the licensee’s appeal in a letter dated May 3, 2016 (Ref. 10), that reaffirmed the NRC staff’s decision that the backfit in accordance with the compliance exception provisions of 10 CFR 50.109(a)(4)(i) was appropriate.

On June 2, 2016, the licensee again appealed the NRC staff’s decision (Ref. 11), this time to the NRC Executive Director for Operations (EDO). On June 22, 2016, in accordance with NRC Management Directive (MD) 8.4 (Ref. 12), “Management of Facility-Specific Backfitting and Information Collection,” dated October 9, 2013, the EDO established a Backfit Appeal Review Panel to review the appeal by Exelon Generation Company, LLC, of the NRC staff’s determination that a backfit was necessary at Byron Units 1 and 2 and Braidwood Units 1 and 2, as well as the NRC staff’s application of the compliance backfit exception in 10 CFR 50.109, “Backfitting.”

On September 15, 2016, the EDO overturned the backfit (Ref. 13) and stated that the NRC staff’s positions in the 2015 backfit decision represented the staff’s new and different views on how to address PSV performance following water discharge. Furthermore, in the absence of an assumed failure of the PSV to reseal, the concerns articulated in the backfit related to event classification, event escalation, and compliance with 10 CFR 50.34(b) and GDC 15, 21, and 29 were no longer an issue.

In a memorandum to the Director of NRR, dated September 15, 2016 (Ref. 14), the EDO communicated the decision to grant Exelon Generation Co., LLC’s backfit appeal and identified two issues that warranted further NRC consideration: (1) the need to assess the treatment of the underlying technical issue described in NSAL-93-013 on PSV performance after water discharge at pressurized-water reactors and (2) given the decision, the advisability of reassessing the positions included in RIS 2005-29 and its draft Revision 1 through the appropriate generic process to ensure they receive appropriate backfit consideration.

The NRC staff communicated its plan to the EDO in a January 3, 2017, memorandum from the Director of NRR (Ref. 15). The staff identified the underlying technical issue associated with NSAL-93-013 for the inadvertent operation of ECCS event as “the PSRVs [Pressurizer Safety Relief Valves]...must be capable of closing after release of subcooled water.” The staff stated that it would reevaluate the position on this technical issue and provide documentation of what constituted acceptable qualification of PSVs for liquid discharge. The staff also indicated that it would review whether Generic Issue 70, “Power-Operated Relief Valve [PORV] and Block Valve Reliability,” should be reopened or revisited. In completing the actions tasked and discussed in the January 3, 2017, memorandum, the staff identified and reviewed operating experience related to RCS mass addition events, identified and reviewed applicable American Society of Mechanical Engineers code requirements, assessed the potential safety significance of the technical issue, identified where existing staff positions on this issue needed clarification, and identified an existing agency process through which to communicate the information.

2.0 SUMMARY OF STAFF FINDINGS

In its review of RIS 2005-29 and draft Revision 1, the NRC staff identified several regulatory and technical positions that either required clarification, were no longer supported, or were identified as new positions. Several of the public comments received on draft Revision 1 noted that the NRC was establishing new requirements and that an RIS is not the appropriate vehicle for establishing new requirements. In a September 6, 2017, memorandum (Ref. 16), the staff provided supporting information for its recommendations in response to the EDO tasking of the September 15, 2016, Exelon backfit appeal decision. This memorandum summarized the staff positions identified in RIS 2005-29 and draft Revision 1 and whether they should be clarified, carried forward, or removed.

A major finding of the NRC staff review concerned the qualification of PSVs for water relief. NSAL-93-013 raised concerns about the ability of pressurized-water reactor plants to respond to RCS mass addition events such as inadvertent ECCS actuations and chemical and volume control system malfunctions. In response, some plants began crediting PSVs, which were certified for steam service, with a liquid relief function, despite the fact that the PSVs were not designed or certified to relieve liquid. Historically, the NRC has approved use of Electric Power Research Institute (EPRI) test data to demonstrate that the PSVs would reseal following liquid discharge to preclude escalating an RCS mass addition event into a small-break LOCA. However, the staff has reviewed the EPRI test data and determined that test results reveal that valve damage following subcooled liquid discharge is likely. Thus, the staff no longer views the EPRI methodology as a generically acceptable means of justifying that PSVs would reliably reseal and preclude escalation of the RCS mass addition condition. This position is in conflict with the previous staff approvals; however, the staff will not endeavor to backfit this position but will clearly document this amended position for consideration in associated voluntary licensing actions going forward. Variability in the EPRI test results may allow some plants under certain circumstances to acceptably demonstrate PSV performance using that method. However, absent a qualification and inservice testing program to demonstrate the reliability of PSVs to pass subcooled water and reliably reseal, the staff generally does not have a basis to approve credit for qualification of the PSVs for liquid discharge and reliable resealing based on the EPRI test results in new licensing actions.

3.0 DISCUSSION

In March 2007, the NRC staff updated numerous sections of NUREG-0800 (Ref. 17), “Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR

Edition,” commonly referred to as the Standard Review Plan (SRP), including adding topics addressed by RIS 2005-29. Specifically, Section 15.5.1–15.5-2, “Inadvertent Operation of ECCS and Chemical and Volume Control System Malfunction that Increases Reactor Coolant Inventory,” addressed the nonescalation clause and noted, “The pressurizer safety valves, too, may be assumed to reseal properly after having relieved water; but only if such valves have been qualified for water relief.” However, in its August 23, 2016, report (Ref. 18), the Backfit Appeal Review Panel concluded that “the standard in place in 2001 and 2004 and at present is simply that the failures of PSVs need not be assumed to occur following water discharge if the likelihood is sufficiently small, based on well-informed staff engineering judgment.” Therefore, the staff finds that information contained in RIS 2005-29 is no longer consistent with current NRC staff positions.

The draft Revision 1 to RIS 2005-29 significantly expanded and went into greater detail than the original RIS. This draft also included staff positions that were determined to be new requirements. As an example, Revision 1 included a new section titled “Application of the PSVs as a Protection System” and stated, “In other words, PSVs are not expected to open during Condition II events.” The staff does not currently support this position, and as pointed out in one of the public comment submissions, “PSV opening is required for Condition II events such as loss of load/turbine trip.” The September 6, 2017, memorandum summarizes the staff findings from its review of RIS 2005-29 and draft Revision 1.

Management Directive 8.18 (Ref. 19), “NRC Generic Communications Program,” dated December 9, 2015, defines the purpose of each generic communication product, including RISs. It states that an RIS “may NOT...(i) Provide guidance for the implementation of rules and regulations, (ii) Provide guidance to NRC staff on regulatory or technical matters, (iii) Require a response, commitments, or action, or (iv) Be used in lieu of other established agency products.” Upon staff developing a new RIS, it became clear that an RIS is not the appropriate means of communication given the limitations noted in Management Directive 8.18. The staff is therefore withdrawing RIS 2005-29 and its associated draft Revision 1 and plans to summarize the current staff positions in the next update to the appropriate sections of the SRP. The changes to the SRP will be made consistent with Commission Policy on backfitting as well as the overall SRP modernization effort.

4.0 CONCLUSION

Given that the information in RIS 2005-29 and draft Revision 1 is not consistent with current staff positions, the staff is withdrawing RIS 2005-29 and its draft Revision 1 and is planning to update the SRP to be consistent with current staff positions.

5.0 REFERENCES

- (1) American Nuclear Society, ANSI/ANS-51.1-1983, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants," dated 1983.
- (2) American Nuclear Society, ANSI N18.2-1973, "Nuclear Safety Criteria for the Design of Stationary Pressurized Water Reactor Plants," dated 1973.
- (3) Westinghouse Energy Systems Business Unit, Nuclear Safety Advisory Letter NSAL-93-013, "Inadvertent ECCS Actuation at Power," dated June 30, 1993. (Agencywide Documents Access and Management System (ADAMS) Accession No. ML052930330; not publicly available).
- (4) Westinghouse Energy Systems Business Unit, Nuclear Safety Advisory Letter NSAL-93-013, Supplement 1, "Inadvertent ECCS Actuation at Power," dated October 28, 1994. (ADAMS Accession No. ML050320117, pages 9-15 of PDF).
- (5) RIS 2005-29, "Anticipated Transients that Could Develop into More Serious Events," dated December 14, 2005 (ADAMS Accession No. ML051890212).
- (6) NRC, Draft Revision 1 to RIS 2005-29, "Anticipated Transients that Could Develop into More Serious Events," dated July 13, 2015. (ADAMS Accession No. ML15014A469).
- (7) NRC letter from Anne T. Boland to Bryan Hanson, Exelon Generation Company, LLC, "Braidwood Station, Units 1 and 2, and Byron Station, Unit Nos. 1 and 2—Backfit Imposition Regarding Compliance with 10 CFR § 50.34(b), GDC 15, GDC 21, GDC 29, and Licensing Basis (TAC Nos. MF3206, MF3207, MF3208, and MF3209)," dated October 9, 2015 (ADAMS Accession No. ML14225A871).
- (8) Title 10 of the Code of Federal Regulations, "Domestic Licensing of Production and Utilization Facilities," Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," Chapter 1, Title 10, "Energy."
- (9) Exelon Generation Company, LLC, letter from J. Bradley Fewell to William M. Dean, NRC, "Appeal of Imposition of Backfit Regarding Compliance with Title 10 of the Code of Federal Regulations (10 CFR) Section 50.34(b), General Design Criteria (GDC) 15, GDC 21, GDC 29, and Licensing Basis," dated December 8, 2015 (ADAMS Accession No. ML15342A112).
- (10) NRC letter from William M. Dean to J. Bradley Fewell, Exelon Generation Company, LLC, "U.S. Nuclear Regulatory Commission Response to Backfit Appeal—Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2," dated May 3, 2016 (ADAMS Accession No. ML16095A204).
- (11) Exelon Generation Company, LLC, letter from J. Bradley Fewell to Victor M. McCree, NRC, "Appeal of Imposition of Backfit Regarding Compliance with 10 CFR § 50.34(b), General Design Criteria (GDC) 15, GDC 21, GDC 29, and Licensing Basis," dated June 2, 2016 (ADAMS Accession No. ML16154A254).

- (12) NRC, Management Directive MD 8.4, "Management of Facility-Specific Backfitting and Information Collection," dated October 9, 2013. (ADAMS Accession No. ML12059A460).
- (13) NRC letter from Victor M. McCree to J. Bradley Fewell, Exelon Generation Company, LLC, "Response to Appeal of Backfit Imposed on Braidwood and Byron Stations Regarding Compliance with 10 CFR 50.34(b), GDC 15, GDC 21, GDC 29, and the Licensing Basis," dated September 15, 2016 (ADAMS Accession No. ML16243A067).
- (14) NRC memorandum from Victor M. McCree to William M. Dean, "Result of Appeal to the Executive Director for Operations of Backfit Imposed on Byron and Braidwood Stations Regarding Compliance with 10 CFR 50.34(b), GDC 15, GDC 21, GDC 29, and the Licensing Basis," dated September 15, 2016 (ADAMS Accession No. ML16246A247).
- (15) NRC memorandum from William M. Dean to Victor M. McCree, "Response to Request for a Plan to Assess the Treatment of the Underlying Technical Issue in Nuclear Safety Advisory Letter-93-013 and the Positions in Regulatory Information Summary 2005-29 and Proposed Revision 1," dated January 3, 2017 (ADAMS Accession No. ML16334A188).
- (16) NRC memorandum from Eric R. Oesterle, et al. to Mirela Gavrilas et al., "Supporting Information for Staff Recommendations in Response to Executive Director for Operations Tasking in September 15, 2016, Exelon Backfit Appeal Decision," dated September 6, 2017 (ADAMS Accession No. ML17237C035; Non-Publicly Available).
- (17) NRC, NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition."
- (18) NRC, Gary M. Holahan, et al., "Report of the Backfit Appeal Review Panel Chartered by the Executive Director for Operations to Evaluate the June 2016 Exelon Backfit Appeal," dated August 23, 2016 (ADAMS Accession No. ML16236A208).
- (19) NRC, Management Directive MD 8.18, "NRC Generic Communications Program," dated December 9, 2015 (ADAMS Accession No. ML15327A372).