

September 15, 2016

MEMORANDUM TO: William M. Dean, Director
Office of Nuclear Reactor Regulation

FROM: Victor M. McCree */RA/*
Executive Director for Operations

SUBJECT: 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

As you are aware, on June 22, 2016, I established a Backfit Appeal Review Panel (Panel) in accordance with Management Directive (MD) 8.4, "Management of Facility-specific Backfitting and Information Collection," to review the subject appeal and to provide me with recommendations (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16173A311). On August 24, 2016, the Panel transmitted the results of its review to me (ADAMS Accession No. ML16236A202). The memorandum from the Panel responding to my tasking, recommended that the 2015 compliance backfit be withdrawn, and included the Panel's report and the basis for this recommendation (ADAMS Accession No. ML16236A208).

I have reviewed the Panel's report, its recommendations, and its responses to the questions I posed when establishing the Panel. In addition, I met with you on September 12, 2016, to discuss my decision and assure that it reflects the thorough, technically sound, and legally well-founded consideration that this matter merits. Our discussion included my response to the additional perspectives you provided to me in your email dated September 2, 2016, which is enclosed, for reference.

As we discussed, the central question in the Panel's review was whether an adequate basis exists for backfitting using the compliance exception in Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.109(a)4(i) to address potential pressurizer safety valve failures following water discharge. With regard to compliance, the 1985 statement of considerations for 10 CFR 50.109 indicates that "the compliance exception is intended to address situations where the licensee has failed to meet known and established standards of the Commission because of omission or mistake of fact....new or modified interpretations of what constitutes compliance would not fall within the exception...." In answering this question, the Panel focused on the following three related technical and regulatory positions for the pressurizer safety valves (PSVs) described in the staff's October 9, 2015, safety evaluation

imposing the backfit (ADAMS Accession No. ML14225A871, referred to as the Backfit SE), as well as the staff's May 3, 2016, response (ADAMS Accession No. ML16095A204) to the backfit appeal by Exelon Generation Company, LLC (the licensee):

1. American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV Code) water qualification (certification) documentation is required if a PSV is to be assumed to reclose after passing water.
2. Water discharge through a steam-qualified PSV will cause the valve to stick in its fully open position.
3. PSVs are subject to the single-failure criterion.

As the Panel noted in its report, it is important to acknowledge that the PSVs in question were designed for steam service and that water discharge through such valves is undesirable and should be minimized or avoided as a matter of conservative engineering and prudent operations. This perspective is reinforced by several industry positions and testing, as well as operator training and control room procedures intended to terminate a potential pressurizer overfill event before filling the pressurizer. For these reasons, the staff's position described in the NRC's backfit imposition letter and its response to the backfit appeal, represents a well-intentioned and conservative approach that could provide additional safety margin. However, based on my review of the relevant documents and discussions, I agree with the Panel's conclusions and support its recommendations. In particular, I agree with the Panel's assessment of the three relevant technical and regulatory positions.

First, regarding ASME Code water qualification (or certification), when considered in the context of the Byron and Braidwood licensing basis, valve "qualification" implies a general demonstration of capability, such as through the Electric Power Research Institute testing conducted in response to Three Mile Island (TMI) Action Plan Item II.D.1, not ASME BPV Code certification. Thus, when preparing the safety evaluations associated with two license amendments in 2001 and 2004 (referred to as the Uprate SE and the Setpoint SE), the NRC staff exercised reasonable and well-informed engineering judgment to conclude that the PSVs were unlikely to stick in the fully open position. The NRC staff's determination that ASME BPV Code certification is necessary for PSVs first appears in the Backfit SE and is not addressed in any of the final NRC requirements or guidance documents reviewed by the Panel. As such, the NRC staff's position on valve qualification in the Backfit SE represents a new or modified interpretation of what constitutes compliance in addressing potential PSV failures following water discharge.

Second, regarding PSV failure following water discharge, the staff's position in 2001 and 2004, consistent with multiple NRC approvals both before and since, was 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. Without the presumption of PSV failure to reseal, the concerns in the Backfit SE related to event classification, event escalation, and compliance with 10 CFR 50.34(b) and General Design Criteria 15, 21, and 29 are no longer at issue.

Third, the determination that application of the single failure criterion is necessary first appears in the draft Revision 1 to Regulatory Issue Summary 2005-29. This position, which is still under

development, is not included in any final NRC requirement or guidance document reviewed by the Panel.

In sum, none of the three positions were “known and established standards of the Commission” when the NRC issued the Uprate SE and the Setpoint SE in license amendments for Byron and Braidwood in 2001 and 2004, respectively, for determining when it was appropriate to assume a failure of a PSV to reseal. Based on the Panel’s review, they were not “known and established standards of the Commission” in 2005 (when RIS 2005-29 was issued), in 2006 (when the Beaver Valley extended power uprate was approved), in 2007 (when Revision 2 to Standard Review Plan Sections 15.5.1 – 15.5.2 was issued), nor are they “known and established standards of the Commission” at present.

As a result, I do not support the use of the compliance exception to impose the subject backfit. I agree with the Panel’s assessment that the current licensing basis for Byron and Braidwood complies with the applicable regulations and provides adequate protection of public health and safety. I have responded directly to the licensee with my decision on its appeal.

The Panel’s report also identifies two issues that warrant further NRC consideration. The report reveals the need to assess the treatment of the underlying technical issue described in the 1993 Westinghouse Nuclear Safety Advisory Letter (NSAL-93-013) on PSV performance after water discharge at pressurized-water reactors. In addition, given the decision communicated herein, the positions included in RIS 2005-29, as well as its proposed Revision 1, should be (re)assessed through the appropriate generic process to ensure they receive appropriate backfit consideration. You are requested to inform me within 120 days of your plan to respond to these issues.

As you are also aware, I have recently directed the U.S. Nuclear Regulatory Commission (NRC) Committee to Review Generic Requirements (CRGR) to assess the adequacy and currency of existing NRC requirements, guidance, criteria, procedures, and training on the subject of backfitting (ADAMS Accession No. ML16133A575). The Panel members have already been in contact with the CRGR to share insights and perspectives from this review. I believe that the CRGR evaluation of our implementation of the backfit process presents us with a timely opportunity to further enhance our regulatory process.

Finally, I recognize that the technical and regulatory positions used in the staff’s decision-making involved careful, thorough, and technically solid considerations, reflecting their commitment to ensuring safety. Knowing that our people take seriously the responsibility for assuring public health and safety and are willing to pursue backfits, when appropriate, to assure or enhance safety is key to successfully fulfilling our mission. Although expected, I also sincerely appreciate the cooperation and respect evidenced by both your staff and the Panel members as the Panel evaluated the merits of the licensee’s appeal of this technically complex and difficult regulatory issue. Their open, constructive, and collegial interactions reflected the

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best of our agency values and contributed to what I consider to be a sound final regulatory decision.

Enclosure:
As stated

cc: Chairman Burns
Commissioner Svinicki
Commissioner Baran

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**RESPONSE BY EXECUTIVE DIRECTOR FOR OPERATIONS (EDO) TO ADDITIONAL
PERSPECTIVES ON BACKFIT APPEAL REVIEW PANEL FINDINGS PROVIDED IN
SEPTEMBER 2, 2016, EMAIL FROM THE DIRECTOR OF THE
OFFICE OF NUCLEAR REACTOR REGULATION (NRR)**

- 1. NRR appreciates the panel's efforts. However, NRR believes that the panel's perspectives do not provide sufficient basis to overturn the backfit.**

Response: Based on my review, the Panel's perspectives provide a sound basis for supporting the licensee's appeal of the compliance exception backfit. The concerns listed below do not address the specific Panel finding that is a primary basis for overturning the backfit. In particular, the NRC has previously accepted water qualification of pressurizer safety valves (PSVs) and power-operated relief valves (PORVs) based on Electric Power Research Institute (EPRI), Wyle, or vendor testing for nuclear power plants (beyond Byron and Braidwood) as part of Three Mile Island (TMI) action items, Chapter 15 accident analyses, and other evaluations. In those evaluations, the NRC did not require American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV Code) certification for water service.

- 2. NRR Concerns**

- a. The panel has narrowly focused its review on the water qualification question. NRR maintains that the original backfit documents numerous issues with the licensing basis for Byron and Braidwood that have not been addressed in the panel's assessment.**

Response: In the report, I find that the Panel adequately addressed the issues identified as important by NRR in its comments on the preliminary findings. Although NRR raised several issues of concern, I find that the most salient positions and issues associated with the compliance exception backfit question have been appropriately addressed.

- b. With regard to the PSV water qualification question, the panel's position is reliant on its interpretation of the 1977 Information SECY [SECY-77-439, "Single Failure Criterion," dated August 17, 1977]. The panel has provided select quotes from that SECY that it believes supports its position. NRR believes that when the entire SECY is reviewed it becomes clear that the SECY was simply documenting current practices in 1977, some of which were still being researched, and does not provide a "known and established standard." The staff contends that if the 1977 SECY had been intended to provide the "known and established standard" it would have been included in subsequent updates to regulations, regulatory guides, and SRPs [Standard Review Plans] over the following nearly 40 years. It has not.**

Response: In its report, the Panel indicates that it addressed SECY-77-439 in response to NRR's assertion that Exelon had not satisfied the "single failure assumption" for the PSVs at Byron and Braidwood. I find, based on the Panel's evaluation, that there is not sufficient definition regarding the "known and established standards of the Commission" to justify use of the "single failure assumption" to support the compliance backfit exception.

- c. **In numerous places the panel quotes documents that it interprets as describing the treatment of check valves as analogous to PSVs. The panel did not find any definitive documentation that demonstrates that the agency concluded that PSVs are analogous to check valves and, as such, should be considered passive components. This appears to be the panel's judgement, not an NRC position. NRR disagrees with the panel's interpretation and has historically treated PSVs as active components, including designating them as such during license renewal. PSVs are designed to perform a specific [reactor coolant system] overpressure protection safety function critical to protecting one of the key defense-in-depth barriers to protect public health and safety from the release of radioactive materials. The staff believes the panel's comparison is inappropriate and establishes a very concerning precedent.**

Response: The Panel's discussion of check valves in relation to PSVs was provided for context given that PSVs were not explicitly discussed in documents describing passive failures and the application of the single failure criterion (e.g., SECY-77-439; SECY-94-084, "Policy and Technical Issues Associated with the Regulatory Treatment of Non-Safety Systems in Passive Plant Designs," dated March 28, 1994; and SECY-05-0138, "Risk-Informed and Performance-Based Alternatives to the Single-Failure Criterion," dated August 2, 2005). The Panel's discussion highlights that there is no definitive documentation on how PSVs should be treated and that the panel did not intend to establish precedent for treatment of PSVs by providing this context. I find, based on the Panel's evaluation, that there is not sufficient definition regarding the "known and established standards of the Commission" associated with the treatment of these valves as passive or active. As such, the threshold for meeting the compliance backfit exception was not met.

- d. **On page 13, the panel acknowledges the Byron/Braidwood licensing basis as categorizing the PSVs and PORVs as active components. However, the panel, given its reliance on treating PSVs akin to check valves, establishes a new and different position in its own summary when it determines these valves should be treated as passive components for the purposes of considering the single failure criterion.**

Response: Page 13 of the Panel's report discusses several different possibilities for evaluating the PSVs and quotes SECY-94-084. As discussed in the response to item 2c, the Panel did not intend to establish precedent for treatment of PSVs. However, I find, based on the Panel's evaluation, that there is not sufficient definition regarding the "known and established standards of the Commission" associated with the treatment of these valves as passive or active. As such, the threshold for meeting the compliance backfit exception was not met.

- e. **Regarding ASME, [Title 10 of the Code of Federal Regulations (10 CFR), Section] 50.55a requires nuclear power plants to be initially designed and constructed [in accordance with] ASME [BPV Code], Section III and to be tested throughout their service life [in accordance with] ASME OM Code [*Operation and Maintenance of Nuclear Power Plants*]. These codes comprise the qualification standards for ASME Class 1 safety valves such as the pressurizer PSVs with which licensees**

are required to comply unless alternatives have been authorized by the staff [in accordance with] 10 CFR 50.55a.

Response: The ASME BPV Code does indeed provide certification requirements for safety and relief valves for their intended design function. However, as noted in the Panel's report, there are a number of examples where the NRC has accepted qualification of safety or relief valves based on EPRI, Wyle, and vendor testing. The staff's position in the backfit is different from these past approvals. Based on the absence of a "known and established standard of the Commission" requiring ASME BPV Code certification for the water discharge conditions that are the subject of the backfit, I find that the threshold for meeting the compliance backfit exception was not met.

- f. **The panel asserts in its summary that the valves in question were water qualified due to the licensee's reliance on them to pass water during feedline break events. The panel does not appear to acknowledge that feedline breaks are Condition IV events, similar to [loss-of-coolant accidents], which are never expected to occur in the lifetime of the facilities and therefore, given their lower probability of occurrence, are permitted to have more significant consequences. The EPRI testing demonstrated acceptable performance under conditions anticipated during these Condition IV events (higher temperature fluid ~ 650°F), while the EPRI test at the more likely Condition II inadvertent mass addition event conditions (lower temperature fluid ~550°F) was terminated early due to valve chatter on opening. The summary of the EPRI testing indicated that for subcooled water conditions valve chatter and resultant valve damage was generally observed.**

Response: This comment suggests that the EPRI testing did not address water discharge for the Byron and Braidwood PSVs at an acceptable water temperature. Although the issue raised by NRR regarding the adequacy of the EPRI testing may be considered in a future generic review, it is not pertinent to the central issue concerning the existence of a "known and established standard."

3. Path Forward

- a. **If the EDO supports the original backfit, NRR agrees with the panel that risk insights are important considerations in determining how reasonable assurance of compliance can be demonstrated. However, as acknowledged by the panel, consistent with [Regulatory Guide (RG)] 1.174, risk insights must include consideration of defense-in-depth and safety margins. If a PSV were to stick open or significantly leak at Bryon and Braidwood during a licensing basis Condition II event, which is anticipated to occur on an annual frequency, the licensee has not yet demonstrated adequate defense-in-depth. NRR is open to considering risk-informed licensing basis changes, or potential plant modifications, that appropriately consider all 5 elements of RG 1.174.**

Response: I support the recommendations of the Panel. However, I agree that the safety significance of the potential for the PSVs to stick open should be considered as part of a generic resolution of this issue for all pressurized-water reactors.

- b. **If the EDO supports the Backfit Panel's conclusion, NRR requests that the EDO allow the staff to independently assess what path forward is appropriate given the positions documented in the panel's report and EDO's decision. In particular,**

NRR has concerns regarding the recommendations on page 3 of the report that need to be further considered before determining what future course of action is most appropriate.

Response: I agree. The report reveals the need to assess the treatment of the underlying technical issue described in the 1993 Westinghouse Nuclear Safety Advisory Letter (NSAL-93-013) on PSV performance after water discharge at pressurized-water reactors. In addition, given the decision communicated herein, the positions included in Regulatory Issue Summary 2005-29, as well as its proposed Revision 1, should be (re)assessed through the appropriate generic process to ensure they receive appropriate backfit consideration. The Director of NRR should inform me within 120 days of the plan to respond to these issues.