

RS-16-134

10 CFR 50.109

June 2, 2016

Mr. Victor M. McCree
Executive Director for Operations
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555-0001

Braidwood Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. 50-456 and 50-457

Byron Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. 50-454 and 50-455

Subject: 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

- References:
- 1) Letter from Anne T. Boland (U.S. NRC) to Bryan Hanson, "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
 - 2) Letter from J. Bradley Fewell (Exelon Generation Company, LLC) to William M. Dean, "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
 - 3) Letter from William M. Dean (U.S. NRC) to J. Bradley Fewell, "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

In Reference 1, the NRC concluded that the Braidwood and Byron stations are not in compliance with 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 15, "Reactor Coolant System Design," GDC 21, "Protection System Reliability and Testability," and GDC 29, "Protection Against Anticipated Operational Occurrences." The NRC also found that Braidwood and Byron are not in compliance with 10 CFR § 50.34(b) and the plant-specific licensing basis regarding the prohibition of Condition II events propagating into Condition III events.

Specifically, based on the NRC's review of the Braidwood and Byron Updated Final Safety Analysis Report (UFSAR), Chapters 15.5.1, "Inadvertent Operation of Emergency Core Cooling System during Power Operation [IOECCS]," 15.5.2, "Chemical and Volume Control System [CVCS] Malfunction that Increases Reactor Coolant Inventory," and 15.6.1, "Inadvertent

Opening of a Pressurizer Safety or Relief Valve [IOPORV]," the NRC concluded that the UFSAR predicts water relief through a valve that is not qualified for water relief. The NRC determined that the UFSAR does not contain analyses that demonstrate the structures, systems, and components will meet the design criteria for Condition II faults as stated in the Braidwood and Byron UFSAR. The NRC therefore concluded that the UFSAR analyses do not demonstrate compliance with GDCs 15, 21, and 29.

The NRC acknowledged that its position regarding Exelon Generation Company, LLC's (EGC) compliance with GDCs 15, 21, and 29, and 10 CFR § 50.34(b) is a change in NRC position constituting a backfit under 10 CFR § 50.109(a)(1). However, the NRC concluded that the backfit analysis required by 10 CFR § 50.109(a)(2) is not necessary because the backfit is covered by the compliance exception in 10 CFR § 50.109(a)(4)(i).

EGC disagreed with the NRC's conclusion that the compliance exception applies in this case, and appealed the imposition of this backfit to the Director of Nuclear Reactor Regulation (NRR) in Reference 2. EGC also presented its case to the Backfit Appeal Panel appointed by the Director of NRR at a March 7, 2016 public meeting.

The Director of NRR (and the Backfit Appeal Panel) concluded that the application of the compliance exception is appropriate in this case, as described in Reference 3. The letter states that the basis for the compliance exception is a "mistake of fact" that occurred in prior NRC approvals of this technical issue. EGC continues to disagree with the NRC's reliance on the compliance exception, and by this letter, appeals the May 3 decision to the Executive Director for Operations. The attached Enclosure describes EGC's appeal.

As described in the Enclosure, the NRC has twice approved the IOECCS analysis underlying the Braidwood and Byron licensing bases. The NRC now states that those approvals are based on a "mistake of fact," which is a necessary element for invoking the compliance exception. The NRC's analysis is flawed in two primary respects.

First, the NRC misidentifies the "known and established standard" at issue as the prohibition of Condition II events progressing to Condition III events. However, the standard in question concerns what is necessary to "qualify" valves for anticipated operational occurrences involving water discharge. The applicable known and established standard for valve water qualification is the Electric Power Research Institute testing and analysis (described in detail in the Enclosure). On multiple occasions, the NRC has agreed that Braidwood and Byron meet this standard, and therefore, the event would remain a Condition II event.

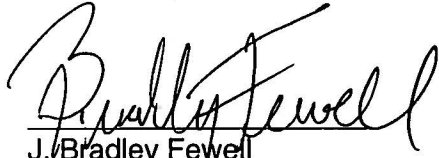
Second, the NRC concludes that the "mistake of fact" justifying the compliance exception is that prior NRC staff should have required the valves to be water qualified, but EGC did not demonstrate the valves to be water qualified. Contrary to the staff's characterization, this change in staff position underlying those prior approvals is not a "mistake of fact" as intended by the backfit rule. Rather, it represents a new or modified interpretation of compliance with NRC requirements, which does not fall under the compliance exception.

For these reasons, the compliance exception is not applicable and the NRC must conduct a cost-justified, substantial safety backfit analysis.

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Thank you for your consideration. If you have any questions, please contact David Gullott at (630) 657-2807.

Respectfully,



J. Bradley Fewell
Senior Vice President Regulatory Affairs
Exelon Generation Company, LLC

Encl.

cc: NRC Director, Office of Nuclear Reactor Regulation
NRC Director, Division of Operating Reactor Licensing
NRC Regional Administrator – Region III
NRC Senior Resident Inspector – Braidwood Station
NRC Senior Resident Inspector – Byron Station
NRC Project Manager – Braidwood Station
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Appeal of NRC Response to Appeal of Backfit Determination Regarding
Braidwood and Byron Compliance with GDCs 15, 21, 29, and 10 CFR § 50.34(b)

EXECUTIVE SUMMARY

By letter dated May 3, 2016, the Nuclear Regulatory Commission (NRC) Director of Nuclear Reactor Regulation (NRR) informed Exelon Generation Company, LLC (EGC) that its December 8, 2015 appeal of a backfit dated October 9, 2015, had been denied. This appeal also was the subject of a March 7, 2016 Backfit Appeal Panel meeting. The May 3, 2016 letter to EGC focused on two bases for the denial: (1) the "known and established standard" at issue was the prohibition on progressing from Condition II to Condition III events, and (2) the "mistake of fact" justifying the compliance exception was that the prior staff should have required the PSVs to be water qualified, and EGC did not demonstrate the pressurizer safety valves (PSVs) to be water qualified. As discussed further herein, the NRC's first basis is erroneous because the prohibition on the progression of events, in and of itself, is not the issue. Rather, the backfit hinges on what is required to demonstrate compliance with the non-progression prohibition, *i.e.*, what is required for valve water qualification in order for the event to remain a Condition II event. The second basis for the denial is also wrong in that it is clear from licensing basis documents that the NRC was acutely aware of the PSVs' water qualification. The record is unmistakable in this regard, and therefore, the basis for claiming a "mistake of fact" is not adequately supported by the NRC in its appeal denial.

NRC BACKFIT DETERMINATION BACKGROUND

On October 9, 2015, the NRC staff imposed a compliance backfit on EGC regarding compliance with 10 CFR Part 50, Appendix A, General Design Criteria (GDC) 15, "Reactor Coolant System Design," GDC 21, "Protection System Reliability and Testability," GDC 29, "Protection Against Anticipated Operational Occurrences," and 10 CFR § 50.34(b) for Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2.¹ The NRC concluded that, based on its review of the Braidwood and Byron Updated Final Safety Analysis Report (UFSAR), Chapters 15.5.1, "Inadvertent Operation of Emergency Core Cooling System during Power Operation [IOECCS]," 15.5.2, "Chemical and Volume Control System [CVCS] Malfunction that Increases Reactor Coolant Inventory," and 15.6.1, "Inadvertent Opening of a Pressurizer Safety or Relief Valve [IOPORV]," the UFSAR predicts water relief through a valve that is not qualified for water relief. Primarily based on these factors, the NRC concluded that the UFSAR does not contain analyses that demonstrate the structures, systems, and components will meet the design criteria for Condition II faults as noted in the Braidwood and Byron UFSAR, Chapter 15.0.1.2. The chapter states:

Condition II - Faults of Moderate Frequency:

These faults, at worst, result in the reactor trip with the plant being capable of returning to operation. By definition, these faults (or events) do not propagate to cause a more serious fault, *i.e.*, Condition III or IV events. In addition, Condition II events are not expected to result in fuel rod failures or reactor coolant system or secondary system overpressurization.

¹ Letter from A. Boland (NRC) to Bryan Hanson, "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)."

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The NRC further concluded in the October 9, 2015 letter that because UFSAR Chapters 15.5.1, 15.5.2, and 15.6.1 do not demonstrate compliance with GDCs 15, 21, and 29, the UFSAR does not comply with 10 CFR § 50.34(b), which requires, in part, a UFSAR to include:

...a description and analysis of the structures, systems, and components of the facility, with emphasis upon performance requirements, the bases, with technical justification therefor, upon which such requirements have been established, and the evaluations required to show that safety functions will be accomplished. The description shall be sufficient to permit understanding of the system designs and their relationship to safety evaluations.

At the center of the NRC's conclusion is its position that "water relief through a valve that is not qualified for water relief will cause that valve to stick in its fully open position" and that a stuck-open valve would lead "to a more serious Condition III event, similar to a small-break-loss-of-coolant accident (SBLOCA)."² The NRC recognized that its current position on the acceptability of the IOECCS analysis that underlies the Braidwood and Byron licensing bases and its conclusion regarding compliance with the GDCs and regulatory requirements is a change in staff position. The NRC asserted that the prior acceptance "was based, among other things, on the use of water qualified PSV's [sic] which upon further review, during the 2011 measurement uncertainty recapture update, was found to be unsubstantiated."³ Based on this logic, the NRC determined that the compliance exception to the backfit rule was appropriate because it was necessary to bring the facilities into compliance with NRC requirements.

EGC APPEAL OF BACKFIT DETERMINATION

On December 8, 2015, EGC appealed the backfit determination on the basis that the compliance exception was inappropriate because the NRC had not identified an "omission" or "mistake of fact" causing it to be out of compliance with a known and established NRC standard (among other reasons).⁴ As detailed in that letter, the Commission has explicitly stated that the compliance exception:

...is intended to address situations in which the licensee has failed to meet known and established standards of the Commission because of omission or mistake of fact. It should be noted that new or modified interpretations of what constitutes compliance would not fall within the exception and would require a backfit analysis and application of the standard.⁵

² "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Condition II Events that Could Generate More Serious Events at Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2, Docket Nos.: STN 50-456 and STN 50-457 and STN 50-454 and STN 50-455," at 4 (2015 Backfit SE).

³ *Id.* at 12.

⁴ Letter from J. Bradley Fewell (Exelon Generation Company, LLC) to William M. Dean, "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" (EGC Appeal).

⁵ "Revision of Backfitting Process for Power Reactors," Final Rule, 50 Fed. Reg. 38,097, 38,103 (Sept. 20, 1985).

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As explained in EGC's appeal and acknowledged by the NRC, the NRC has approved the IOECCS analysis multiple times in the past – the same analysis it now claims is inadequate.⁶ EGC noted that as part of the review for those prior approvals, the NRC specifically and explicitly reviewed the very issues it now challenges in the 2015 backfit determination. Based on the comprehensive reviews conducted in the prior approvals (described below), EGC's appeal explained that the change in staff position regarding compliance was not based on an "omission" or "mistake of fact," but rather, due to the current staff's new (or modified) interpretation of what is necessary for compliance (*i.e.*, known and established standard). In fact, in its 2015 Backfit SE, the staff never identified any specific "omission" or "mistake of fact" (or indeed, even use those terms).

EGC presented its case to the Backfit Appeal Panel at a public meeting on March 7, 2016.

NRC RESPONSE TO EGC APPEAL

On May 3, 2016, the Director of NRR issued a decision regarding EGC's backfit appeal.⁷ The NRR Director (and the Backfit Appeal Panel) concluded that the compliance exception was appropriate. The decision reached two main conclusions: (1) the "known and established standard" at issue was the prohibition on progressing from Condition II to Condition III events, and (2) the "mistake of fact" justifying the compliance exception was that the prior staff should have required the PSVs to be water qualified, and EGC did not demonstrate the PSVs to be water qualified. As detailed below, EGC disagrees with both conclusions.⁸

The NRC Response to EGC's Appeal stated:

The licensee argued that approval of the PSVs, first in 2001, was not a deviation from an NRC position, but application of it; pointing to specific RAIs [Requests for Additional Information] and SE report text that appears to specifically recognize the basis the licensee provided for its analyses as acceptable, even though the licensee's RAI responses did not demonstrate water qualification of the PSVs. However, the Panel determined that the October 9, 2015, backfit showed that the approvals at issue for Braidwood and Byron were inconsistent with the Agency's general position on the known and established standard at issue, in this case the progression of Condition II events. The fact that, at the time, the NRC staff appeared to have some awareness of an approach inconsistent with the requirements discussed here, in this case references to EPRI [Electric Power Research Institute] reports on the ability of these non-water qualified PSVs to reseal in certain circumstances, is not sufficient to support the licensee's position. NRC requirements at the time provided that the valves should have

⁶ See EGC Appeal at 3-6.

⁷ Letter from William M. Dean (U.S. NRC) to J. Bradley Fewell, "U.S. Nuclear Regulatory Commission Response to Backfit Appeal – Braidwood Station, Units 1 and 2, and Byron Station, Units 1 and 2" (NRC Response to EGC's Appeal).

⁸ The NRC Response to EGC's Appeal quoted the portion of the 1985 Backfit Rule Statements of Consideration (SOC) stating that the compliance exception is intended to address situations where there is an omission or mistake of fact. However, it notably omitted the subsequent statement in the SOC that the compliance exception is not appropriate where there are new or modified interpretations of compliance. NRC Response to EGC's Appeal at 5-6.

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been water qualified, and EGC did not demonstrate that they were. As discussed in the NRC staff's backfit analysis, this is the mistake of fact.⁹

The NRC Response to EGC's Appeal quoted the 2015 Backfit SE's statement regarding the necessity of certain information – set forth in the American Society of Mechanical Engineers Boiler and Pressure Code (ASME Code) – to support PSV water qualification. It concluded that "but for the mistake of fact that the PSVs were thought to be water qualified, the NRC would not have approved UFSAR analyses that do not demonstrate compliance regarding the prohibition of progression of Condition II events."¹⁰

EGC APPEAL OF NRC RESPONSE

The 2015 Backfit SE, as well as the NRC Response to EGC's Appeal, continue to misapply the compliance exception to the Backfit Rule. Although the NRC in its May 3 Response to EGC's Appeal for the first time attempts to identify a "mistake of fact" to support reliance on the compliance exception, the NRC still does not identify any true "mistake of fact." In fact, the May 3 Response's characterization of a "mistake of fact" runs contrary to the purpose of the compliance exception, and indeed, allows the exception to consume the backfit rule. Additionally, the NRC incorrectly identifies the "known and established standard" at issue, and fails to recognize the scope and intent of the EPRI testing.

NRC Posits an Incorrect "Known and Established Standard"

As explained above, the compliance exception applies when a licensee does not meet "known and established standards" because of an omission or mistake of fact. The NRC Response to EGC's Appeal characterizes the known and established standard as the prohibition on Condition II events progressing to Condition III events.¹¹ The NRC correctly states that EGC acknowledged that the NRC's "position on the unacceptability of Condition II events transitioning to Condition III events has not changed."¹² However, the NRC's characterization of this issue as the known and established standard in question is incorrect. As recognized in the 2015 Backfit SE and the NRC Response to EGC's Appeal, the crux of the matter is what constitutes water "qualification" and whether the PSVs are water qualified. The NRC's position is that PSV water qualification is necessary for the events to remain Condition II events. Thus, PSV water qualification – not the prohibition on the progression from Condition II to Condition III events – is the subject of the known and established standard at issue.

NRC Misidentifies the Standard for Water Qualification

The NRC's primary basis for the backfit is that the UFSAR predicts water relief through valves that are not qualified for water relief. According to the NRC, water relief through a valve that is not qualified for water relief is assumed to result in the valve sticking fully open; effectively producing a Condition III SBLOCA. The 2015 Backfit SE cites two bases for this conclusion:

⁹ *Id.* at 5.

¹⁰ *Id.* at 6.

¹¹ *Id.* at 4, 5.

¹² *Id.* at 4.

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Standard Review Plan, Rev. 2, Sections 15.5.1-15.5.2, and Regulatory Issue Summary 2005-29, Rev. 0.¹³ Both of these documents state that to be credited in the specified anticipated operational occurrences (AOOs), the valves need to be qualified for water relief. The SRP carries this presumption one step further, noting that valves may be assumed to reseal following water relief if closure is demonstrated via qualification.¹⁴

The SRP and RIS 2005-29 post-date the prior approvals and reflect positions on compliance developed after the approvals at issue in this backfit. More importantly, the positions articulated in these documents are not requirements, but simply guidance. Despite stating that "NRC requirements at the time provided that the valves should have been water qualified," the staff fails to identify the requirement underlying that conclusion.¹⁵ Certainly, even if the SRP and RIS existed at the time of the prior approvals, neither sets forth legally binding requirements.

Neither the SRP nor RIS 2005-29 on which the NRC rely prescribe a known or established standard for what constitutes water qualification.¹⁶ The NRC also does not reference any applicable standards, codes, or evaluation methods describing what would have been necessary to water qualify valves at the time of the prior approvals, or provide any parameters or acceptance criteria. The NRC cannot now, for the first time, specify the ASME Code as the standard to support its admitted change of mind.

The 2015 Backfit SE and the NRC Response to EGC's Appeal incorrectly invoke the ASME Code as the standard for water qualification.¹⁷ The ASME Code Section III, Article NB-7000 is for device functions required for protection against overpressure. However, for the AOOs in question, the PSVs are not required for reactor coolant system (RCS) overpressure protection, as supported by SRP Sections 15.5.1-15.5.2. The PSVs at issue are not required for RCS overpressure protection because the pumps that cause the RCS pressure increase are not

¹³ NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition," Rev. 2, March 2007 (SRP); Regulatory Issue Summary 2005-29, "Anticipated Transients That Could Develop into More Serious Events," Rev. 0, Dec. 14, 2005 (RIS 2005-29).

¹⁴ SRP at 15.5.1-15.5.2-6.

¹⁵ NRC Response to EGC's Appeal at 5 (emphasis added).

¹⁶ The NRC states that the SRP "provides the NRC staff with guidance that describes methods or approaches that the NRC staff has found acceptable for meeting NRC requirements." NRC Response to EGC's Appeal at 2. The requirements at issue, according to the NRC are GDCs 15, 21, and 29. Specifically, the 2015 Backfit SE and NRC Response to EGC's Appeal state that the analyses contained in UFSAR Chapters 15.5.1, 15.5.2, and 15.6.1 do not demonstrate compliance with these GDCs. But SRP Sections 15.5.1-15.5.2 cited by the NRC only address GDC 15 – they do not address GDCs 21 or 29. Therefore, satisfying the SRP guidance alone would not demonstrate meeting GDCs 21 or 29.

¹⁷ As discussed further below, the NRC did not invoke the ASME Code in its prior reviews of this issue. The application of the ASME Code as the qualification method, in lieu of what the NRC previously approved through the EPRI testing and subsequent analyses, represents a new interpretation of what constitutes compliance. New interpretations of compliance do not fall under the compliance exception.

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capable of developing sufficient head to over-pressurize the RCS.¹⁸ Therefore, the ASME Code-described overpressure function, testing, and associated qualification of the PSVs on which the NRC relies do not apply for the specified AOOs and have no bearing on the backfit.

Applicable Standard for Water Qualification

Despite the NRC's references to the ASME Code in the 2015 Backfit, the NRC previously recognized the limitations of applying the ASME Code to qualify a PSV-type valve in NUREG-0578, "TMI-2 Lessons Learned Task Force Status Report and Short Term Recommendations."¹⁹ Section 2.1.2 of this NUREG concluded that some RCS transients and accidents can result in water solid or two-phase steam-water flow through the valves, and that "[p]resent ASME qualification requirements for safety valves include only flow under saturated steam conditions." The NUREG recommended that licensees demonstrate "qualification of relief and safety valves under expected operating conditions, which would include solid-water and two-phase flow conditions."²⁰ It was incumbent upon the licensee to determine the expected valve operating conditions through analyses of AOOs referenced in Regulatory Guide 1.70, Revision 2.²¹ This included AOOs that result in water solid and two-phase flow conditions. Byron and Braidwood met – and continue to meet – this standard.

The safety and relief valve testing to establish "qualification" was further described in NUREG-0737, "Clarification of TMI Action Plan Requirements," Section II.D.1. There, the NRC stated that as part of performance testing of safety and relief valves, licensees must provide "[e]vidence supported by test of safety and relief valve functionality for expected operating and accident (non-ATWS) conditions ... The testing should demonstrate that the valves will open and reclose under the expected flow conditions."²² NUREG-0737 also described the type of NRC reviews to be performed. These included review of the pre-implementation of the EPRI test program with respect to qualification of relief and safety valves, the proposal for qualification of pressurized water reactor valves, and post-implementation review of the test data and test results applied to plant-specific situations. The EPRI testing cited in EGC's previous submittals and in its backfit appeal is the relief and safety valve qualification testing which was performed in support of the referenced NUREGs.

In summary, the NRC recognized the limitations of the ASME Code in "qualifying" the valves for certain accident and AOO operating conditions, including events that result in water or steam-water flow conditions. Through the NUREGs described above and the resultant EPRI testing, the NRC set forth the applicable water qualification standard, which is not the ASME

¹⁸ The shutoff head of the high head safety injection (*i.e.*, Centrifugal Charging) pumps (approximately 2620 psi combined with about 40 psig suction pressure from the Refueling Water Storage Tank) results in a maximum discharge pressure of 2660 psig, which is significantly less than the RCS Safety Limit of 2735 psig (*i.e.*, 110% of the RCS design pressure).

¹⁹ July 1979.

²⁰ NUREG-0578 at A-6.

²¹ "Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, LWR Edition," dated Sept. 1975.

²² NUREG-0737 at II.D.1-1.

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Code that the NRC currently posits. The NRC's hindsight position does not support the use of the compliance exception.

Byron & Braidwood Meet the Applicable Water Qualification Standard

Given that the EPRI testing program was the known and established standard for valve water qualification, the NRC-endorsed EPRI testing and the analyses provided in the staff's 2001 and 2004 license amendment approvals formed the basis for the NRC's approvals of the current UFSAR AOO analyses. Specifically, the NRC found that the valves were qualified for water relief and subsequent closure under conditions that bounded the AOOs in question, and therefore, the AOOs do not progress to a Condition III event.

In the NRC Response to EGC's Appeal, the NRC states that "NRC requirements at the time provided that the valves should have been water qualified, and EGC did not demonstrate that they were."²³ This statement, which underlies the NRC's rejection of EGC's appeal and the NRC's use of the compliance exception, is factually incorrect and fundamentally mischaracterizes the NRC's prior reviews. The established standard for water qualification was set forth in the referenced NUREGs and demonstrated by the EPRI testing and subsequent analyses. As explained below, the NRC reviewed and approved this position multiple times. The NRC accepted the EPRI testing and analyses, and agreed with EGC's conclusion that the valves have been shown to close following water relief. The NRC's current position that the EPRI testing is not sufficient to demonstrate the PSVs' water qualification is clearly a change in interpretation of the known and established NRC standard – not a failure to meet a known and established standard. Unless the NRC can demonstrate a "mistake of fact" invalidating prior approvals, this new interpretation of compliance does not support the use of the compliance exception.

There Is No Mistake of Fact

NRC Draws Conflicting Conclusions on the Mistake of Fact

Even if the NRC had identified the correct known and established standard for PSV water qualification, it has not identified a mistake of fact causing EGC to be out of compliance with that standard. In fact, the NRC Response to EGC's Appeal contains two conflicting descriptions of the alleged mistake of fact:

The fact that, at the time, the NRC staff appeared to have some awareness of an approach inconsistent with the requirements discussed here, in this case references to EPRI reports on the ability of these non-water qualified PSVs to reseal in certain circumstances, is not sufficient to support the licensee's position. NRC requirements at the time provided that the valves should have been water qualified, and EGC did not demonstrate that they were. As discussed in the NRC staff's backfit analysis, this is the mistake of fact.²⁴

...

²³ NRC Response to EGC's Appeal at 5.

²⁴ *Id.* at 5 (emphasis added).

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Thus, as discussed in detail in the NRC staff's backfit analysis, but for the mistake of fact that the PSVs were thought to be water qualified, the NRC would not have approved UFSAR analyses that do not demonstrate compliance regarding the prohibition of progression of Condition II events.²⁵

Although the NRC for the first time attempts to identify a "mistake of fact" underlying its reliance on the compliance exception, it fails to do so. As explained below, the PSVs were tested to reseal such that the Condition II event will not progress – the NRC staff were fully cognizant of the PSVs' water qualification under the applicable EPRI testing program. The fact that the NRC Response to EGC's Appeal makes two completely contradictory statements about the alleged mistake of fact is strong evidence that the compliance exception is being misapplied. In either case, neither of the NRC's characterizations of the mistake of fact is correct nor consistent with the compliance exception.

The NRC attempts to wholly downplay the extensive review history and the staff's actual knowledge of the PSVs' water qualification by contending that the prior staff merely had "some awareness" that its position on compliance differed from an alleged agency "general policy." To the contrary, on multiple occasions, the NRC has performed detailed reviews and approved the same IOECCS analysis that it now claims to be inadequate.

2001 Power Uprate Approval

In 2001, the NRC approved a stretch power uprate for Braidwood and Byron. During its review of the uprate request, the NRC issued RAIs to Commonwealth Edison Company²⁶ (ComEd) regarding the IOECCS analysis to confirm that the pressurizer would not reach water solid conditions during an IOECCS event. The RAI stated:

The results of the analysis for an inadvertent operation of the emergency core cooling system (ECCS) during power operation indicate that the pressurizer will reach water solid during this event. The NRC staff has generally not accepted a solid pressurizer for this accident in order to avoid the potential for all three pressurizer safety valves to be stuck open (a SBLOCA) due to liquid relief through these safety valves. Please propose necessary plant modifications and provide the results of your reanalysis of this event to confirm that the pressurizer will not reach water solid conditions during this event.²⁷

ComEd responded as follows:

ComEd has compared the temperatures from the EPRI subcooled water relief testing against the lowest temperature expected during a spurious [safety injection] SI event^[28] at Byron and Braidwood Stations, and has concluded that

²⁵ *Id.* at 6 (emphasis added).

²⁶ Commonwealth Edison Company (ComEd) was the Braidwood and Byron licensee prior to a corporate restructuring and indirect license transfer approved by the NRC in January 2001.

²⁷ Letter from G.F. Dick (NRC) to O.D. Kingsley, "Byron and Braidwood – Request for Additional Information Regarding the Power Uprate Request," dated Oct. 19, 2000.

²⁸ Spurious SI event is synonymous with Inadvertent Operation of ECCS.

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some valve chatter may occur; however, the resultant valve degradation will be less than the damage seen in the EPRI test. Since the EPRI tested valves were capable of closing in response to system depressurization, we have concluded that Byron and Braidwood Station valves would also be capable of closing in response to system depressurization.

...

Since all Condition II acceptance criteria are met, modifications and additional analyses are unnecessary.²⁹

The NRC issued a second RAI regarding the EPRI tests applicable to the IOECCS event.³⁰ EGC responded with information regarding the EPRI tests, the temperature of water passed by the PSVs, and the length of time the PSVs are expected to pass water during an IOECCS event. In this response EGC again demonstrated how the EPRI testing supported the conclusion that the IOECCS event would not progress to a Condition III event:

The lowest water temperature predicted for the expected duration (i.e., 20 minutes) of the Spurious SI transient at Byron Station and Braidwood Station is significantly higher (i.e., 590°F) than the lowest temperature (i.e., 530 °F) for the EPRI tests. Consequently, although stable valve operation cannot be assured, any valve damage would be expected to be less than the damage experienced during the EPRI testing. In any case, the safety valve will close upon system depressurization.

More importantly, it can be concluded that the Spurious SI event does not progress into a higher Condition transient (i.e., LOCA, Condition III). All three PSVs may lift in response to the event, but they will close and the resulting leakage from up to three PSVs is bounded by flow through one fully open PSV.³¹

Subsequently, the NRC approved the power uprate. In the accompanying Safety Evaluation, the NRC affirmed EGC's conclusions and stated that:

. . . the EPRI tests adequately demonstrate the performance of the valves for the expected water temperature conditions and that there is reasonable assurance that the valves will adequately reseal following the spurious SI event....

²⁹ Letter from R. M. Krich (ComEd) to NRC, "Response to Request for Additional Information Regarding the License Amendment Request to Permit Uprated Power Operations at Byron and Braidwood Stations," dated Nov. 27, 2000.

³⁰ Letter from G.F. Dick (NRC) to O.D. Kingsley, "Byron and Braidwood – Request for Additional Information Regarding the Power Uprate Request," dated Nov. 21, 2000.

³¹ Letter from R. M. Krich (EGC) to the NRC, "Response to Request for Additional Information Regarding the License Amendment Request to Permit Uprated Power Operations at Byron and Braidwood Stations," dated Jan. 31, 2001.

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Therefore, the staff finds the licensee's crediting of the PSVs to discharge liquid water during the spurious SI event to be acceptable.³²

It is clear from the foregoing that in 2000-2001, the NRC staff specifically reviewed and approved the details of the very analyses it now argues are insufficient, without identifying a factual mistake that supports its conclusion.

2004 PSV Setpoint Amendment Approval

In 2003, EGC submitted a license amendment request for a PSV setpoint change. As part of its review, the NRC issued an RAI requesting that EGC perform a quantitative analysis regarding PSV water cycles and relief/discharge water temperature:

The information discussed on pages 11 and 12 of Reference I for a qualitative evaluation indicated that the spurious SI event would have similar results from the LOAC with the RCP seal injection event in terms of the change in the number of PSV water cycles and PSV discharge water temperature. The information is not sufficient for the staff to determine the accuracy of the results of the qualitative evaluation. Perform a quantitative analysis using the approved methods and provide the results to show the accuracy of the qualitative evaluation results.³³

EGC performed a confirmatory calculation and concluded that the spurious SI event would not progress to a Condition III event:

Based on this confirmatory calculation, it is concluded that the results of the spurious SI at power event, considering the proposed PSV lift setting and increased tolerance, are similar to the results of the existing spurious SI evaluation relative to pressurizer water temperature, number of PSV steam and water relief cycles, and pressurizer fill time. Therefore, the spurious SI transient does not progress into a higher condition transient (i.e., a Condition III loss of coolant accident) consistent with the conclusion of the existing evaluation.³⁴

The NRC subsequently approved the PSV setpoint change and once again concurred with EGC's IOECCS analysis. The staff's Safety Evaluation specifically affirmed EGC's conclusion that an IOECCS event would not progress to a Condition III event. The NRC stated, "[t]herefore, the staff concludes that the reanalysis is acceptable to assure that the PSVs will

³² "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 119 to Facility Operating License No. NPF-37, Amendment No. 119 to Facility Operating License No. NPF-66, Amendment No. 113 to Facility Operating License No. NPF-72, Amendment No. 113 to Facility Operating License No. NPF-77, Exelon Generation Company, LLC, Byron Station, Unit Nos. 1 and 2, Braidwood Station, Unit Nos. 1 and 2, Docket Nos. STN 50-454, STN 50-455, STN 50-456, and STN 50-457," dated May 4, 2001 at 12.

³³ Email from M. Chawla (NRC) to J. Bauer, "Request for License Amendment to Revise the PSV Lift Settings – Byron/Braidwood Units 1 and 2," dated Oct. 2, 2003.

³⁴ Letter from K. A. Ainger (EGC) to NRC, "Request for Additional Information Regarding a License Amendment Request to Revise the Pressurizer Safety Valves Lift Settings," dated Jan. 29, 2004.

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remain operable following a spurious SI event."³⁵ The NRC's response to EGC's appeal has not identified any "mistake of fact" invalidating this prior conclusion.

The "Mistake of Fact" Is Actually a New Interpretation of Compliance

The correspondences between EGC and the NRC in 2001 and 2004 demonstrate that the NRC was fully cognizant of the EPRI qualification testing and the PSVs' ability to relieve water and reclose in an IOECCS event. Applying the standard applicable at the time – water qualification via EPRI testing and analysis – the NRC concluded that EGC's analysis demonstrated compliance with NRC requirements and therefore approved EGC's license amendments.

The NRC Response to EGC's Appeal claims that the "mistake of fact" is that the prior staff should have required the PSVs to be water qualified, when (in the current staff's opinion), they were not.³⁶ But, as described above, to the extent that water qualification is necessary for the Braidwood and Byron IOECCS event to remain a Condition II event, EGC has met the applicable standard (i.e., the NUREG/EPRI testing described previously). Indeed, the SRP and the RIS cited by the staff post-date the multiple Braidwood and Byron approvals on this issue. The NRC cites the current version of the SRP Sections 15.5.1-15.5-2 (Revision 2), which was issued after the analyses of record were performed as part of the 2001 power uprate amendment. Revision 1 of the SRP (dated July 1981) applied during the NRC's 2001 and 2004 reviews of this issue. That revision does not contain any discussion of the valves being water "qualified."

Similarly, RIS 2005-29 did not exist at the time of the 2001 and 2004 approvals. The 2015 Backfit SE was grounded, in part, on the premise expressed in the underlying non-concurring opinion that the IOECCS analysis "has been unacceptable *since* [RIS 2005-029] was issued (2005)".³⁷ But by this logic, the 2001 and 2004 NRC approvals were sound, and only *after* RIS 2005-29 was issued did those prior NRC approvals become unacceptable. If the IOECCS analysis became unacceptable after the 2005 RIS, then that same analysis was acceptable when previously approved by the NRC in 2001 and 2004. If the IOECCS analysis was acceptable in 2001 and 2004, then there is no mistake of fact that led the NRC to erroneously approve that analysis on those two occasions. The Statements of Consideration for the backfit rule make clear that the NRC cannot use the compliance exception simply because the NRC has changed its mind on compliance. It is clear in this instance that the NRC has done just that.

³⁵ "Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment No. 138 to Facility Operating License No. NPF-37, Amendment No. 138 to Facility Operating License No. NPF-66, Amendment No. 131 to Facility Operating License No. NPF-72, Amendment No. 131 to Facility Operating License No. NPF-77, Exelon Generation Company, LLC, Byron Station, Unit Nos. 1 and 2, Braidwood Station, Unit Nos. 1 and 2, Docket Nos. STN 50-454, STN 50-455, STN 50-456, and STN 50-457," dated Aug. 26, 2004 at 5.

³⁶ NRC Response to EGC's Appeal at 5.

³⁷ Memorandum from C. Jackson to S. Miranda, "Making Non-Concurrence NCP-2013-014 Public," dated Feb. 28, 2014, at Encl. 1 (emphasis added).

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The applicability of the RIS was discussed during the March 7 meeting with the Backfit Appeal Panel.³⁸ In that exchange between EGC and the Backfit Appeal Panel, a Panel member expressed agreement with EGC's position that the RIS does not support the staff's claim of a mistake of fact in the prior approvals. However, the NRC Response to EGC's Appeal conspicuously fails to mention the RIS. It is unclear whether the NRC has abandoned its argument that the RIS supports its use of the compliance exception. If so, the NRC is left solely with its argument that Revision 2 of the SRP sets forth the acceptance criteria for Condition II events. But, with respect to accidents and transients, this revision of the SRP differs significantly from the version in effect at the time of the prior NRC approvals.

The NRC has not previously referenced the ASME Code as the applicable standard for water qualification for these events. Indeed, it was not referenced at the time of the NRC's prior approvals. This shift represents a new staff interpretation of what is required for compliance. Specifically, in its prior reviews of this issue (detailed above), the staff did not take the position that satisfying these ASME Code provisions was necessary to demonstrate water qualification, and therefore, the ASME Code was not necessary to comply with the prohibition on Condition II events progressing to Condition III events. But now, well after multiple previous approvals, the staff has decided that satisfying the ASME Code is a necessary element of demonstrating water qualification, which, in turn, is necessary for compliance. The NRC characterizes this as a mistake of fact, when, in fact, it is a new interpretation of compliance.

Based on the extensive history of the prior approvals, it is clear that prior NRC staff concluded that EGC demonstrated compliance with applicable NRC requirements at the time of the approvals. The NRC now states that the prior staff approvals were "inconsistent with the Agency's general position with the known and established standard at issue."³⁹ It concludes that those prior approvals were inadequate, and therefore a "mistake of fact," because they did not require EGC to demonstrate PSV water qualification. Notwithstanding the disagreement regarding the known and established standard at issue, the NRC's logic is flawed because prior staff interpreting compliance differently than the current staff's interpretation of compliance is not itself a "mistake of fact."

³⁸ MS. REDDICK (EGC): ...I think sort of the logic in the discussion about the role of the RIS, it doesn't square with the use of the compliance exception, but I'll -- I'll let the technical folks...

MR. GODY (NRC): And I do understand that. As a matter of fact, you can twist it around the other way and say that the previous staff approvals in 2001 and 2004 occurred before the NRC's position or realization occurred in 2005 and make an argument the actually opposite way and say that the previous NRC approvals were done without this realization of information in this RIS.

MS. REDDICK: And even if that were the case, though, that would not support the idea that there was an omission or mistake of fact at the time of the previous approvals.

MR. GODY: That is correct. I agree with that.

Transcript of Public Meeting to Discuss Exelon Generating Company, LLC's Appeal of Compliance Backfit Affecting Braidwood and Byron Generating Stations, March 7, 2016, at 41-43.

³⁹ NRC Response to EGC's Appeal at 5.

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Under the NRC's logic, any time prior staff interprets compliance in a manner that is not acceptable to current staff – regardless of the thoroughness of the prior review, and regardless of whether there was any factual error (*e.g.*, an erroneous calculation) underlying the prior staff's position – the NRC could claim that the prior interpretation is a mistake of fact justifying the compliance exception. Taken to its extreme, this overly-broad application of a "mistake of fact" would mean that a licensee could never rely on a prior staff approval, no matter how explicit and comprehensive, because the NRC could always later rationalize the prior approval as a "mistake of fact" as long as it claimed that the prior position was "inconsistent" with the NRC's "general position" at the time. But whether or not that decision was "inconsistent" with the NRC's "general position" is irrelevant, so long as it was not based on an omission or mistake of fact.

This rationale in the NRC Response to EGC's Appeal ignores the facts of this case, in which prior staff thoroughly reviewed the issue and made a conscious decision based on factually accurate information that Braidwood and Byron had satisfied NRC requirements and the applicable known and established standard. The NRC is now simply decreeing the prior staff's review and conclusions to be insufficient. This new finding is not based on a mistake of fact, but rather on the current staff's position on what constitutes compliance. As explained above, the NRC has not pointed to any mistake of fact that renders the prior approvals invalid. The NRC's rationale plainly contradicts the purpose of the compliance exception, which, as the Commission has made clear, is not intended to encompass "new or modified interpretations of what constitutes compliance."⁴⁰

Conclusion

The NRC's tortured path to reach the compliance exception and avoid performing the necessary backfit analysis is inconsistent with the reliability and clarity elements of the Principles of Good Regulation. Sound regulatory policy is not advanced when the NRC misidentifies the known and established standard at issue and then creates a "mistake of fact" that simply did not exist to support their conclusion. EGC's appeal should be granted and the NRC should conduct a backfit analysis in accordance with 10 C.F.R. § 50.109(a)(2).

⁴⁰ 50 Fed. Reg. 38,097, 38,103.