Exelon Generation.

200 Exelon Way
Kennett Square, PA 19348
www.exeloncorp.com

September 15, 2015

7/17/2015
80 FR 42559
(4)

Ms. Cindy Bladey
Office of Administration
Mail Stop: OWFN–12–H08
U.S. Nuclear Regulatory Commission
Washington, DC 20555–0001

Subject: Comments on Draft Regulatory Issue Summary 2005-29, Revision 1, *"Anticipated Transients That Could Develop Into More Serious Events,"* (Federal Register 80FR42559, dated July 17, 2015, Docket ID NRC-2015-0167)

This letter is being submitted in response to the U.S. Nuclear Regulatory Commission's (NRC's) request for comments concerning the subject draft Regulatory Issue Summary (RIS) 2005-29, Revision 1, *"Anticipated Transients That Could Develop Into More Serious Events,"* published in the *Federal Register* (i.e., 80FR42559, dated July 17, 2015).

Draft RIS 2005-29, Revision 1 would inform addressees of NRC concerns identified during recent reviews of Anticipated Operational Occurrences (AOOs) safety analyses of Updated Final Safety Analysis Reports (UFSARs). Revision 1 to RIS 2005–29 will supersede in its entirety RIS 2005–29, dated December 14, 2005. This draft revision to RIS 2005-29 is being addressed to holders of an operating license or construction permit for a Pressurized Water Reactor (PWR) under 10 CFR 50, except those who have permanently ceased operations and have certified that fuel has been permanently removed from the reactor vessel.

Exelon Generation Company, LLC (Exelon) appreciates the opportunity to comment on the draft RIS and offers the attached comments for consideration by the NRC. Exelon also supports the comments submitted by the Pressurized Water Reactor Owners Group (PWROG) related to the subject RIS.

If you have any questions or require additional information, please do not hesitate to contact Richard Gropp at (610) 765-5557.

Respectfully,

D. P. Helker

David P. Helker
Manager, Licensing and Regulatory Affairs
Exelon Generation Company, LLC

Attachment

Comments Concerning Draft Regulatory Issue Summary 2005-29, Revision 1, *"Anticipated Transients That Could Develop Into More Serious Events"*

As noted in the draft Regulatory Issue Summary (RIS), the U.S. Nuclear Regulatory Commission (NRC) has observed that certain safety analyses, specifically in Chapter 15 of Updated Final Safety Analysis Reports (UFSARs), failed to meet the non-escalation criterion for three mass addition Condition II events, i.e., Anticipated Operational Occurrences (AOOs). These Condition II events are: 1) the Chemical and Volume Control System (CVCS) malfunction; 2) the inadvertent operation of the Emergency Core Cooling System (ECCS) during normal operation; and 3) the inadvertent opening of a Power Operated Relief Valve (PORV) or a Pressurizer Safety Valve (PSV). The NRC is concerned that these Condition II events (i.e., AOOs) could escalate to a Small Break Loss of Coolant Accident (SBLOCA), a Condition III event, in turn violating the non-escalation criterion. Several of these licensing basis safety analyses that failed to meet the non-escalation criterion were identified as having relied upon information from the third-party guidance provided in Nuclear Safety Advisory Letter (NSAL) 93-013 and its supplement. One of the failures resulted in NRC follow-up actions to correct the issue.

Sections A through C of the draft RIS describe the NRC's concerns in regard to meeting the non-escalation criterion for the three licensing basis analyses discussed above (i.e., CVCS malfunction that increases reactor coolant inventory, inadvertent operation of the ECCS, and inadvertent opening of a PORV (or PSV).

Exelon Generation Company, LLC (Exelon) offers the comments in the table below pertaining to the information discussed in Section A of the draft RIS for consideration by the NRC.

Section A - ***CVCS Malfunction that Increases Reactor Coolant Inventory***		
A.1 - *Evaluation of the CVCS malfunction is not required, since it is already analyzed in the licensing basis (i.e., as a reactivity anomaly)*		
Comment 1	*The CVCS malfunction is listed in RG 1.70 as a mass addition event and also as a reactivity anomaly. However, these cases are not equivalent and not interchangeable.* *The licensing basis analysis of a CVCS malfunction as a reactivity anomaly (i.e., boron dilution) event relies on the protection of various neutron flux-based trips and operator actions to end the that the operators have more than 15 minutes to end the boron dilution prior to returning to criticality.* *However, the licensing basis analysis of a CVCS malfunction as a mass addition event does not assume minimum RCS volume, a neutron flux-based trip, or focus on reactivity concerns. Rather, the focus is on the integrity of the RCS. The charging pumps add water to the RCS, and power generation continues until a reactor trip signal is produced by the automatic reactor protection system (e.g., a high pressurizer water level trip signal). However, the charging flow continues to fill the pressurizer and can only be stopped by operator action.* *Because the mass addition licensing basis analysis and the reactivity anomaly licensing basis analysis of the Condition II CVCS malfunction event have different initial conditions and goals, only performing the reactivity anomaly licensing basis analysis does not meet the non-escalation criterion.*	Exelon believes that the second paragraph requires clarification. It appears that there is an editorial issue with the phrase *"...and operator actions to end the that the operators have more than 15 minutes...,"* in that words might be missing. Exelon offers no other specific comments pertaining to A.1.
A.2 - *Evaluation of the CVCS malfunction is not required, since it is not as severe as the IOECCS*		
Comment 2	*A reactor trip signal is generated during the CVCS malfunction, and the event is terminated when the operator shuts off charging flow. The CVCS malfunction could be less limiting (i.e., the pressurizer is predicted to fill at a slower rate) than the IOECCS. The time to fill the pressurizer could be longer, since the coolant shrinks when the reactor is tripped, and the charging flow rate is lower than when the charging pumps are operating as part of the ECCS. However, the IOECCS is a mass addition event that begins with a reactor trip, whereas the CVCS malfunction involves the addition of both mass and heat to the RCS, making a direct comparison between the two events impossible. Therefore, a statement in the licensing basis (usually FSAR or UFSAR) that the CVCS malfunction is not as severe as the inadvertent ECCS evaluation does not meet the non-escalation criterion. The licensing basis analysis of the Condition II CVCS malfunction event is necessary in order to demonstrate that the non-escalation criterion has been met.*	Exelon believes that a licensing basis analysis for a CVCS malfunction event should only be required if sufficient justification, including timing of reactor trip, cannot be provided.

Section B – *IOECCS*		
Comment 3	*The licensing basis postulates IOECCS to occur as the result of a spurious safety injection signal. ECCS is assumed to operate the ECCS pumps at their peak performance level (i.e., no failures are assumed). The shutoff head of most ECCS is greater than the nominal RCS pressure and could lift the PORVS or PSVs. If one or more PORVs open while the pressurizer is water-solid, then the PORV(s) are generally assumed to fail open, since valves that are not qualified to relieve water are conservatively assumed to remain in the fully open position. In this case, a stuck-open PORV could cause a Condition III SBLOCA event and fail to meet the non- escalation criterion. Five of the several alternative approaches suggested by NSAL 93-013, in regards to the IOECCS, failed to meet the non-escalation criterion and are discussed in detail below.*	Exelon suggests that the third sentence be revised to read as follows: *"...If one or more PORVs open while the pressurizer is water-solid, then the PORV(s) are generally assumed to fail open* ***if they have not been qualified to pass water...."***
B.1 - *Closing a block valve to isolate a stuck-open PORV*		
Comment 4	*Licensing basis analyses that predict that the pressurizer fills and water is relieved through the PORVs often cite the following from NSAL 93-013 in their UFSARs, "Water relief through the PORVs is not a concern, because the PORV block valves can be used to isolate the PORVs if they fail to close." The NRC staff noted in the original version of RIS 2005-29 that closing a block valve to isolate a stuck-open PORV is an action that would be taken to respond to a Condition III loss of coolant accident, not to a Condition II IOECCS. This demonstrates that the Condition II IOECCS does in fact become a Condition III event because a stuck open PORV is expected as the result of the event and not as an independent failure. Therefore, this approach does not demonstrate that the Condition II IOECCS meets the non-escalation criterion.*	Exelon believes that justification for PORV function after water relief should be allowed in order to demonstrate that the event will not escalate from Condition II to Condition III.
B.2 - *Application of the PSVs as a protection system*		
Comment 5	*Licensing basis analyses that are based upon the application water-qualified PSVs to mitigate IOECCS require the PSVs to open, relieve water, and reseat. The rationale relies upon the premise that none of the PORVs will open, or if they open and stay open, then they can be closed or isolated citing the same flawed logic as approach B.1 above. The rationale for this licensing basis analysis may also assume that the PORVs are not operable, which the NRC staff has identified as a non-conservative assumption. It is conservative to maximize the rate at which the pressurizer fills during an IOECCS. This is done by assuming that the pressurizer PORVs and sprays are operable since they tend to limit the rate of RCS pressurization, which would permit a relatively higher rate of ECCS delivery. Thus, the pressurizer fills more rapidly as steam is relieved through the PORVs.*	Exelon offers no specific comments pertaining to B.2.

Comment 6	*In general, the NRC staff considers substitution of PSVs for PORVs to be inappropriate for Condition II events[10]. The PORVs, which are part of the automatic pressure control system, along with the pressurizer heaters and spray, are used to maintain the plant within its acceptable operating range. They limit RCS pressurization to levels below the high pressure reactor trip setpoint and prevent unnecessary operation of the PSVs. Condition II events are normally handled by automatic pressure control system (e.g., during load rejections). If the plant conditions exceed the capabilities of the automatic pressure control system during a Condition II event, then the event should be ended with, at most, a reactor shutdown, as specified in the design requirements for Condition II events (AOOs). In contrast, PSVs will not open until after the reactor has been tripped, since the opening set pressure for the PSVs is higher than the high pressure reactor trip set pressure. In other words, PSVs are not expected to open during Condition II events. Furthermore, mass addition events cannot pressurize the RCS to challenge the RCS pressure safety limit. The delivery of ECCS water effectively ends when the RCS pressure reaches the ECCS pump shutoff head (about 2600 psia, which is well below the RCS pressure safety limit of 110 percent of RCS design pressure). Therefore, as stated before in RIS 2005-29, this approach does not adequately demonstrate that IOECCS will meet the non-escalation criterion.*	This discussion appears to state that PSV opening is not expected for all Condition II events and, therefore, should not be assumed to open for all Condition II events. PSV opening is required for Condition II events such as loss of load/turbine trip. Exelon is requesting further clarification regarding this discussion.
B.3 - *A stuck-open PORV or PSV resulting from an IOECCS is already addressed as an inadvertent opening of a PORV or PSV*		
Comment 7	*Some licensing basis analyses claim that an IOECCS that results in a stuck-open PORV need not be considered as an escalation to the Condition III category because an inadvertent opening of a PORV or PSV is already analyzed as a Condition II event in most licensing bases.* *However, the inadvertent opening of a PORV or PSV is often analyzed in the licensing basis to show that adequate, timely protection is provided by an automatic reactor trip, a different Condition II design requirement. The licensing basis analysis typically predicts the reactor trip to occur in a few seconds, which is before the ECCS starts injecting into the RCS. Consequently, the Condition II inadvertent opening of a PORV or PSV licensing basis analysis does not model ECCS injection, which is an initial condition for IOECCS. Therefore, inadvertent opening of a PORV or PSV cannot be used to bound IOECCS and does not meet the non-escalation criterion for a stuck open PORV or PSV resulting from an IOECCS.*	Exelon offers no specific comments pertaining to B.3.

B.4 - *A stuck-open PORV or PSV is not as severe as a SBLOCA*		
Comment 8	*Licensing basis analyses that consider a stuck-open PORV or PSV to be less severe than a SBLOCA do not fit into the classic scheme of event classification, upon which nuclear safety analyses are based, and effectively create a new category of high-frequency, severe-consequence events. Comparing or bounding the licensing basis IOECCS to or with any of the SBLOCA licensing basis analyses does not meet the non-escalation criterion since the IOECCS is a Condition II event and a SBLOCA is a Condition III event.*	Exelon offers no specific comments pertaining to B.4.
B.5 - *RCS inventory that exits through the PORV(s) is made up by ECCS flow*		
Comment 9	*Some licensees have included the following statements from NSAL 93-013 about Condition II events into the licensing basis:* *1. "... a Condition II event as a minor reactor coolant system leak which would not prevent orderly reactor shutdown and cooldown assuming makeup is provided by normal makeup systems only," and* *2. "Since the cause of the water relief is the ECCS flow, the magnitude of the leak will be less than or equivalent to that of the ECCS (i.e., operation of the ECCS maintains RCS inventory during the postulated event and establishes the magnitude of the subject leak)."* *The NRC staff identified two issues with how these two statements were applied in IOECCS licensing basis analyses. First, the charging system, when operated as a part of the ECCS, cannot be considered to be a normal makeup system. Charging flow operated as a part of the ECCS is not controlled by a pressurizer level program or by letdown flow rates. It operates at maximum capacity, and it does not shut down until an operator shuts it down. When the charging system is operated as a part of the ECCS, its purpose is to supply emergency core cooling, not to maintain a programmed pressurizer level. Second, the water relief rate through the PORVs will be critical flow, which is determined by the pressure difference between the pressurizer and the pressurizer relief tank (e.g., about 2300 psi), and ultimately, the containment. In the short term, the flowing out of the RCS, through the failed PORV(s) or PSV(s), far exceeds the rate of water flowing into the RCS from the ECCS, depleting the RCS inventory. As the open PORVs depressurize the RCS, more ECCS flow will be delivered by the ECCS pumps. Eventually, the RCS pressure drops down to a few hundred pounds and the flow leaving the RCS through the PORVs will be equal to the flow entering the RCS from the ECCS. Application of these two statements to the Condition II IOECCS licensing basis analysis does not meet the non-escalation criterion.*	Exelon believes that justification for these statements should be allowed.

Section C - Inadvertent Opening of a PORV or PSV		
Comment 10	*The primary objective of the licensing basis analysis regarding inadvertent opening of a PORV or PSV is to show that the event would not lead to fuel clad damage. The licensing basis analysis typically demonstrates that the automatic reactor trip is demanded by the portion of the reactor protection system that is designed to protect against fuel clad damage (e.g., overtemperature ΔT trip or low pressure trip). Since the reactor trip ends the degradation of thermal margin, licensing basis analyses of this event tend to not extend past the time of reactor trip to show that there would be no fuel clad damage. Although the reactor shutdown protects against fuel clad damage, it does not end the RCS depressurization. Manual action must be taken to close the inadvertently opened PSV, PORV or its block valve before actuation of ECCS could begin. An actuation of the ECCS could lead to a water-solid pressurizer, followed by water relief through PORVs, and ultimately to a Condition III SBLOCA event. Most licensing basis analyses choose to show closure of the PSV, PORV, or its block valve prior to ECCS actuation, in order to avoid the pressurizer filling shortly after ECCS delivery begins. One approach within NSAL 93-013 failed to meet the non-escalation criterion and is described below.*	Pressurizer overfill analysis for this event is not in the licensing basis for some of Exelon's plants. Operators are responding to alarms from the event initiation and, therefore, manual action to close inadvertently opened PSV, PORV, or its block valve can be accomplished promptly. Exelon believes that the NRC should consider this, since other plants within the industry may be similar.
C.1 - *Closure of the PSV, PORV, or block valve after ECCS actuation*		
Comment 11	Failure to close the opened PSV, PORV, or its block valve before the ECCS actuation setpoint is reached could result in a scenario where the ECCS introduces a large quantity of water into a depressurizing RCS, causing the pressurizer to fill rapidly. The spuriously opened PSV or PORV could relieve water and stick open if it is not water qualified. Once the ECCS is in operation, it could be expected to remain in operation for several minutes since the operators need time to follow the procedures governing the shut off of ECCS. After the ECCS flow is terminated, operators could begin closing the PSV, PORV, or its block valve. If the PSV, PORV, or its block valve do not close, then the inadvertent opening of a PSV or PORV could continue as a Condition III SBLOCA and fail to meet the non-escalation criterion for Condition II events.	Exelon offers no specific comments pertaining to C.1.