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Office of Administration
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U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

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Subject: Comments on Draft Regulatory Guide (RG) DG-1327, "Pressurized Water Reactor Control Rod Ejection and Boiling Water Reactor Control Rod Drop Accidents" (Federal Register 81FR83288, dated November 21, 2016, Docket ID NRC-2016-0233)

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 Guide (RG) DG-1327, "Pressurized Water Reactor Control Rod Ejection and Boiling Water Reactor Control Rod Drop Accidents," published in the *Federal Register* (i.e., 81FR83288, dated November 21, 2016).

DG-1327 proposes new guidance and describes methods and procedures that the NRC considers acceptable when analyzing a postulated Control Rod Ejection (CRE) accident for Pressurized-Water Reactors (PWRs) and a postulated Control Rod Drop (CRD) accident for Boiling-Water Reactors (BWRs). This draft RG defines fuel cladding failure thresholds for ductile failure, brittle failure, and Pellet-Clad Mechanical Interaction (PCMI) and provides radionuclide release fractions for use in assessing radiological consequences. The draft RG also describes analytical limits and guidance for demonstrating compliance with applicable regulations governing reactivity limits.

Exelon Generation Company, LLC (Exelon) appreciates the opportunity to comment on the subject draft RG and offers the attached comments for consideration by the NRC. Exelon also supports the comments submitted by the Nuclear Energy Institute (NEI) on behalf of the industry related to this draft RG.

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

Respectfully,

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

SUNSI Review Complete
Template = ADM - 013
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Comments Concerning Draft Regulatory Guide DG-1327, "Pressurized Water Reactor Control Rod Ejection and Boiling Water Reactor Control Rod Drop Accidents"

Draft Regulatory Guide (RG) DG-1327, "Pressurized Water Reactor Control Rod Ejection and Boiling Water Reactor Control Rod Drop Accidents," proposes new guidance and describes methods and procedures that the NRC considers acceptable when analyzing a postulated Control Rod Ejection (CRE) accident for Pressurized-Water Reactors (PWRs) and a postulated Control Rod Drop (CRD) accident for Boiling-Water Reactors (BWRs). This draft RG defines fuel cladding failure thresholds for ductile failure, brittle failure, and Pellet-Clad Mechanical Interaction (PCMI) and provides radionuclide release fractions for use in assessing radiological consequences. The draft RG also describes analytical limits and guidance for demonstrating compliance with applicable regulations governing reactivity limits.

Exelon Generation Company, LLC (Exelon) appreciates the opportunity to comment on DG-1327 and offers the following comments for consideration by the NRC.

I. General Comments

1. Exelon believes further clarification is needed since it is difficult to determine how to perform an acceptable analysis. Statements taken from Regulatory Guide (RG) 1.77, "Assumptions Used for Evaluating a Control Rod Ejection Accident for Pressurized Water Reactors," may no longer mean what they meant when RG 1.77 was developed. For example, Section 2.1.1 of the DG-1327 states:

"Accident analyses should be performed using NRC approved analytical models and application methodologies that account for calculational uncertainties. The analytical models and computer codes used should be documented and justified, and the conservatism of the models and codes should be evaluated both by comparison with experiment and with more sophisticated spatial kinetics codes. In particular, the importance of two- or three dimensional flux characteristics and changes in flux shapes should be investigated, and the conservatism of the flux shapes used for reactivity input and feedback, peak energy deposition, total energy, and gross heat transfer to the coolant should be evaluated. Also, sensitivity studies on variations of the Doppler Effect, power distribution, fuel element heat transfer parameters, and other relevant parameters should be included."

In the past, a suite of codes may have been used to perform different aspects of the analysis. Uncertainty for discrete aspects may have been quantified, but often, the overall approach was deemed "conservative enough." Exelon believes that further clarification is needed to determine whether it will be sufficient to qualitatively state, "conservative enough" or if something additional and specific will be required.

More "sophisticated spatial kinetics codes" may exist today, but may not be available for a particular plant/vendor combination. Exelon is requesting further clarification as to whether a vendor will be required to develop the more sophisticated codes and methods.

2. Previous methods may have used an ejected rod worth that was much higher than those realized during plant operation. Smaller ejected rod worths cause the accident to behave more like an uncontrolled Control Element Assembly (CEA) withdrawal. Exelon is requesting further clarification regarding what method is applicable for this event. Should artificially high ejected rod worths be employed to assess the inherent fuel reactivity feedbacks in a near prompt critical situation, or should more realistic and seemingly less limiting ejected rod worths be employed to assess the possible fuel failure mechanisms, with an associated fuel failure that is likely to be less than that previously analyzed to?
3. If the NRC is pursuing a revision to RG 1.183, "*Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors*," in the relatively near future, Exelon believes it would not be prudent to provide guidance related to the radiological inventory in the gap region and dose consequences associated with fuel failure. The guidance in Sections 4 and 5 of DG-1327 should be relocated to the next revision of RG 1.183 and RG 1.195, "*Methods and Assumptions for Evaluating Radiological Consequences of Design Basis Accidents at Light-Water Nuclear Power Reactors*."

II. Specific Comments

1. Section 2.2.2

This section discusses accident analyses at Cold Zero Power (CZP) and Hot Zero Power (HZP) conditions. Exelon suggests that the NRC clarify that CZP is required for BWRs only.

2. Section 2.2.4

Exelon is unsure that a bounding type analysis can be successful, or how it can be performed. Section 2.2.4 seems to imply that burnup/corrosion/failure threshold/rod worth combinations need to be exhaustively searched. Exelon believes that further clarification is necessary to provide some assurance that fuel management changes do not result in a combination that was not previously evaluated. Due to the event being an accident, and due to what appears to be an expensive analysis to perform, Exelon believes that there needs to be a way to perform an acceptable analysis once that covers the extremes.

Perhaps some objectives to consider might be: "How much fuel can be failed, and can more fuel be failed than that with a CEA ejection event?" and "Is a coolable geometry (230 cal/gm) maintained?"

3. Section 2.2.5

Exelon recommends deleting the phrase "...both expected and unexpected..." in order to avoid confusion. The rod worth calculation requirement is already defined at beginning of Section 2.2.5. In addition, Exelon requests clarification as to whether calculational uncertainties need to be applied beyond those required by approved neutronics methods.

4. Section 2.2.10

Exelon requests clarification as to whether the phrase "*If applicable*" applies to "account for monitoring uncertainties" by itself. PWRs have MTC limits but they do not include monitoring uncertainties.

5. Section D

If an analysis is updated based on cycle-specific parameters, which is routine for BWRs and not so routine for PWRs, it is typically performed under the 10 CFR 50.59 process. Exelon requests further clarification as to whether the change would be considered a change to the current licensing basis.