REQUEST FOR ADDITIONAL INFORMATION REGARDING LICENSE AMENDMENT REQUEST TO ADOPT 10 CFR 50.69 RISK-INFORMED CATEGORIZATION OF STRUCTURES, SYSTEMS, AND COMPONENTS

DUKE ENERGY PROGRESS, LLC.

H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT 2

DOCKET NO. 50-261

By letter dated April 5, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18099A130), as supplemented by letter dated June 6, 2018 (ADAMS Accession No. ML18162A147), Duke Energy Progress, LLC., (the licensee) submitted a license amendment request (LAR) regarding the H.B. Robinson Steam Electric Plant, Unit 2 (Robinson). The licensee proposed to add a new license condition to the Renewed Facility Operating Licenses to allow the implementation of Title 10 of the Code of Federal Regulations (10 CFR) Section 50.69, "Risk-informed categorization and treatment of structures, systems and components for nuclear power reactors." The provisions of 10 CFR 50.69 allow adjustment of the scope of structures, systems, and components (SSCs) subject to special treatment requirements (e.g., quality assurance, testing, inspection, condition monitoring, assessment, and evaluation) based on a method of categorizing SSCs according to their safety significance. The NRC staff has determined the following request for additional information (RAI) is needed to complete its review.

Regulatory Basis

Nuclear Energy Institute (NEI) 00-04, Revision 0, "10 CFR 50.69 SSC Categorization Guideline" (ADAMS Accession No. ML052910035), describes a process for determining the safety-significance of SSCs and categorizing them into the four RISC categories defined in 10 CFR 50.69. This categorization process is an integrated decision-making process that incorporates risk and traditional engineering insights.

NUREG-1855, Revision 1, "Guidelines on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making" (ADAMS Accession No. ML17062A466), provides guidance on how to treat uncertainties associated with probabilistic risk assessment (PRA) in risk-informed decision making.

Regulatory Guide (RG) 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk Informed Activities" (ADAMS Accession No. ML090410014) describes an acceptable approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision making for light-water reactors. It endorses, with clarifications, the American Society of Mechanical Engineers (ASME)/American Nuclear Society (ANS) PRA Standard ASME/ANS RA-Sa-2009 ("ASME/ANS 2009 Standard" or "PRA Standard") (ADAMS Accession No. ML092870592).

RAI 3.01 Identifying Key Assumptions and Uncertainties that Could Impact the

Application:

The April 5, 2018, LAR states:

> *The process to categorize each system will be consistent with the guidance in NEI 00-04, "10 CFR 50.69 SSC Categorization Guideline," as endorsed by RG 1.201. RG 1.201 states that "the implementation of all processes described in NEI 00-04 (i.e., Sections 2 through 12) is integral to providing reasonable confidence" and that "all aspects of NEI 00-04 must be followed to achieve reasonable confidence in the evaluations required by §50.69(c)(1)(iv)."*

NEI 00-04 references RG 1.200 as the primary basis for evaluating the technical adequacy of the PRA. RG 1.200 references the ASME/ANS RA-Sa-2009 Standard which requires the identification and documentation of assumptions and source of uncertainty during a peer review. RG 1.200 also references NUREG-1855 as one acceptable means of identifying key assumptions and key sources of uncertainty. RG 1.200, Rev. 2 defines a key uncertainty as "one that is related to an issue in which there is no consensus approach or model and where the choice of the approach or model is known to have an impact on the risk profile such that it influences a decision being made using the PRA." RG 1.200, Rev. 2 defines a key assumption as "one that is made in response to a key source of modeling uncertainty in the knowledge that a different reasonable alternative assumption would produce different results." The term "reasonable alternative" is also defined in RG 1.200, Rev. 2.

RAI 3 requested that the licensee clarify how key assumptions and (key) uncertainties that could impact the results are identified and included in the evaluation. In addition to this general RAI, two additional RAIs (RAI 5a and RAI 6) further question specific entries in Attachment 6 of the LAR. RAI 5a referenced entry 10 in Attachment 6 of the LAR, and requested additional information to justify that updated success criteria for feed and bleed would have an insignificant effect on the categorization. RAI 6 referenced entries 1, 2, and 3 in Attachment 6 of the LAR, and requested additional information explaining how the NEI 00-04 sensitivity studies in Tables 5-2, 5-3, 5-4, and 5-5 adequately address uncertainties in reactor coolant pump seal failure models, uncertainties in loss of off-site power frequencies, and uncertainties associated with several fire PRA modelling assumptions respectively.

The licensee's response to RAI 3 (dated November 13, 2018) refers to the integrated risk sensitivity, as described in Section 8 of NEI 00-04. For this integrated risk sensitivity study, the unreliability of all low safety significant (LSS) SSCs is increased by a factor of three (consistent with NEI 00-04) and the subsequent total risk increase is compared to the RG 1.174, "An Approach for Using Probabilistic Risk Assessment In Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (ADAMS Accession No. ML17317A256) acceptable risk increase guidelines. The licensee stated that this integrated risk sensitivity study, and the subsequent performance monitoring of LSS SSCs, could be used directly to address assumptions and sources of uncertainty instead of identifying and evaluating key assumptions and key uncertainties as described in NUREG-1855. The response to RAI 3 also included a table titled "Uncertainties and Assumptions Not Addressed by 10 CFR 50.69 Factor of 3 Sensitivity/Performance Monitoring" with 22 entries and stated that this table supersedes the table in Attachment 6 of the LAR. The licensee responses to RAIs 5a and 6, referred to the proposed methodology in the response to RAI 3 as being sufficient to address all 4 entries in

Attachment 6 of the LAR and, therefore, these entries are no longer key sources of uncertainty and were removed.

The licensee recognized that assumptions and uncertainties that cause SSCs to be excluded from the PRA cannot be addressed by the integrated risk sensitivity. The entries in the Table are apparently identified and included because they cause SSCs to be excluded. The dispositions in the Table include dispositions consistent with the NUREG-1855 options of (1) refining the PRA if needed, (2) redefine the application (e.g., add a sensitivity study), or (3) add compensatory measure and monitoring specific to that assumption of uncertainty. However, the title of the table implies that all the unreported assumptions and uncertainty are evaluated and dispositioned as not being key solely using the factor of 3. Furthermore, most dispositions included in the Table also include the phrase "[a]ny impact of the exclusion of these scenarios on acceptance criteria for categorizations of other components is addressed by the factor of 3 sensitivity and performance monitoring."

The NRC staff determined that the licensee's proposed method is a deviation from the guidance of NEI 00-04 and NUREG-1855, Revision 1 for the following reasons. Figure 1-2 in Section 1.5, Categorization Process Summary, of NEI 00-04 illustrates the available paths through the accepted categorization process. The categorization provides the appropriate LSS/HSS category. The integrated risk sensitivity study is only performed after all steps in the categorization have been completed and it is not intended to be a change in the risk estimate. The study simply verifies that the combined impact of any postulated simultaneous degradation in reliability of all LSS SSCs would not result in significant increases in core damage frequency (CDF) and large early release frequency (LERF). Therefore, the aggregate risk sensitivity study is intended to capture the uncertainty from relaxation of "special treatment" for candidate LSS SSCs. Other assumptions and uncertainties are related to models and methods used in the PRA and the impact of these assumptions and uncertainties is not considered or included in the integrated risk sensitivity study.

NUREG-1855 identifies that one key source of uncertainty is the unknown increase in unreliability associated with the reduced special treatment requirements on LSS SSCs allowed by 10 CFR 50.69. The NUREG states that one acceptable technique to address this specific key source of uncertainty is to increase the unreliability of LSS SSCs by a multiplicative factor in an integrated risk sensitivity study. NEI 00-04 discusses using a factor of 3 to 5 as an acceptable multiplicative factor to address this uncertainty and the licensee selected to use the factor of 3 In contrast, addressing key assumptions and key sources of uncertainty in the PRA might require that SSCs be added to the PRA, might require changes to the model logic, or might require changes in the unreliability (e.g., unreliability increases for unusual uses of SSCs and for consequential failures) greater than the factor of 3 used in the integrated risk sensitivity study. Even for components that are modeled, the integrated risk sensitivity study only addresses the impact of SSCs as they are included in the PRA logic models without addressing any changes to the logic model itself that might be needed to address the key assumption (i.e., because of limitations in scope or level of detail). In addition, the use of the integrated risk sensitivity will result in the licensee identifying potential categorization of a LSS SSC as HSS only if the RG 1.174 risk acceptance guidelines are exceeded. However, addressing key assumptions and source of uncertainty, can result in a change in categorization even if the RG 1.174 guidelines are not exceeded. NEI 00-04 guidance in Tables 5-2 through 5-5 recognizes such occurrences and Figure 7-2 in NEI 00-04, "Example Risk-Informed SSC Assessment Worksheet," captures such a change in categorization due to the sensitivity studies recommended in Tables 5-2 through 5- 5.

The licensee's response simply states and does not justify that the use of the factors in the integrated risk sensitivity study are sufficient to capture the impact of all assumptions and uncertainties on the categorization of SSCs modeled in the current PRA. The approach proposed by the licensee represents a substantial deviation from the endorsed guidance for categorization in NEI 00-04 and the RAI response does not provide sufficient justification for the appropriateness of the deviation. It is unclear to the NRC staff whether the evaluation of assumptions and uncertainties proposed by the licensee can determine the effect of the key assumptions and uncertainties on the categorization of an indeterminate number of components. Therefore, the staff is unable to conclude that the components placed in LSS accurately reflect the approved risk-informed process. Based on the above, provide the following information:

a. Clarify which process is used and is meant by the RAI 5 Table tittle "Uncertainties and Assumptions Not Addressed by 10 CFR 50.69 Factor of 3 Sensitivity/Performance Monitoring." , i.e., which types of uncertainties and assumptions have been addressed by the factor of three.

b. Describe the approach used to identify the assumptions and uncertainties that are used in the base PRA models.

c. Describe the approach(s) used to evaluate each assumption and uncertainty to determine whether each assumption and uncertainty is key or not for this application.

d. Provide a summary of the different types of dispositions used for those assumptions and uncertainties determined not to be key for this application.

e. Provide a summary list of the key assumptions and uncertainties that have been identified for the application, and discuss how each identified key assumptions and uncertainty will be dispositioned in the categorization process. The discussion should clarify whether the licensee is following NEI 00-04 guidance by performing sensitivity analysis or other accepted guidance such as NUREG-1855 Stages A through F.

f. If NEI 00-04 or NUREG-1855 guidance is not used (e.g. completing all the Stages A through F in NUREG-1855, Revision 1) provide justification that the licensee's approach is adequate to identify, capture the impact, and disposition key assumptions and uncertainties to support the categorization process.

RAI 05.01.a Feed and Bleed Success Criteria for loss of secondary heat removal

Attachment 6 of the LAR (page 48) states that the current PRA model of record success criteria for Feed and Bleed includes one high pressure safety injection (HPSI) and two power operated relief valves (PORVs), but the thermal hydraulic analysis concludes that only one PORV is required. The disposition states that this could result in certain SSCs having higher risk significance and, therefore, is considered conservative. The NRC staff is aware that conservative modeling choices have the potential to artificially lower other components risk importance values to below the safety significance threshold criteria (i.e. masking). In the Response to RAI 05.a (submitted in November 13, 2018), the licensee stated that two PORVs are required assuming all loss of secondary cooling at time zero, while only one PORV is needed if all loss of secondary cooling is lost after 50 minutes or more. The response also states that since this assumption does not result in any components being excluded from the PRA, it is addressed by the integrated risk sensitivity study proposed in response to RAI 3a. As

discussed in RAI 3.01 above, the staff disagrees with the position that the integrated risk sensitivity study can be used, unless components are excluded for the PRA. Based on the above, provide the following information:

i. Provide justification, such as a sensitivity study, that the exclusion of the updated success criteria does not affect any of the SSC risk categorizations.

ii. Alternatively, propose a mechanism to incorporate the updated success criteria into the PRA model of record prior to implementation of the 10 CFR 50.69 categorization program.

RAI 06.01 Key Assumptions and Uncertainties Subject to Sensitivity Studies:

In LAR Attachment 6, assumptions 1, 2, and 3 address reactor coolant pump seal failure, loss of offsite power frequencies, and fire modelling respectively. Each of these assumptions is dispositioned with,

> *In accordance with NEI 00-04, sensitivity studies will be used to determine whether other conditions might lead to the component being safety significant. The assessment of the uncertainties, therefore, is appropriately addressed by the sensitivity studies required by this risk-informed application.*

NEI 00-04 sensitivity studies in Tables 5-2, 5-3, 5-4, and 5-5 all include human error probabilities, CCF probabilities, and maintenance unavailabilities. The uncertainties in assumptions 1, 2 and 3 are not related to these issues or parameters and therefore the sensitivity studies in the Tables do not resolve the effect of the assumptions. However, each Table also has provision for "[a]ny applicable sensitivity studies identified in the characterization of PRA adequacy" but these PRA specific studies need to be identified.

The November 13, 2018, response to RAI 06 states, "[t]he updated assessment of key sources of uncertainty and assumptions performed in response to RAI-03.b supersedes the contents of Attachment 6 to the original LAR. That updated assessment summarizes the strategy to address key assumptions and uncertainties for this application."

As discussed in RAI 3.01 above, the NRC staff disagrees with the position that the integrated risk sensitivity study can be used to address the impact of all assumptions and uncertainties on the categorization of SSCs modeled in the current PRA. Based on the above, provide the following information for assumptions 1, 2, and 3:

i. Describe the applicable sensitivity study that will be undertaken to address each uncertainty, or otherwise resolve the effect of the assumption on the categorization process. In addition, propose a mechanism that ensures that the identified sensitivity studies will be included in the categorization evaluations, or

ii. Provide justification, such as a sensitivity study, to support the licensee's claim that not addressing each of the three entries (entries 1, 2, and 3) does not affect any of the SSC risk categorizations.