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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Subject: Brunswick Steam Electric Plant, Unit Nos. 1 and 2
Renewed Facility Operating License Nos. DPR-71 and DPR-62
Docket Nos. 50-325 and 50-324
Response to Request for Additional Information (Probabilistic Risk Assessment and Human Performance Branches) Regarding Request for Risk-Informed Exigent License Amendment - Technical Specification 3.8.1, *AC Sources – Operating,* One-Time Extension of Emergency Diesel Generator Completion Times and Suspension of Surveillance Requirements

References:

1. Letter from William R. Gideon (Duke Energy) to the U.S. Nuclear Regulatory Commission Document Control Desk, *Request for Risk-Informed Exigent License Amendment - Technical Specification 3.8.1, AC Sources – Operating, One-Time Extension of Emergency Diesel Generator Completion Times and Suspension of Surveillance Requirements*, dated November 28, 2017, ADAMS Accession Number ML17332B024

2. NRC E-mail Capture, *Brunswick Unit 1 and Unit 2 Request for Additional Information Related [to] the Exigent Amendment Request for One-Time Extension of EDG Completions Times - PRA (EPID: L-2017-LLA-0398)*, dated December 4, 2017, ADAMS Accession Number ML17339A073

3. NRC E-mail Capture, *Brunswick Unit 1 and Unit 2 Request for Additional Information Related [to] the Exigent Amendment Request for One-Time Extension of EDG Completion Times - Human Factors (EPID: L-2017-LLA-0398)*, dated December 5, 2017, ADAMS Accession Number ML17339A913

Ladies and Gentlemen:

By letter dated November 28, 2017 (i.e., Reference 1), Duke Energy Progress, LLC (Duke Energy), submitted a one-time, risk-informed exigent license amendment request (LAR) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed license amendment would extend the current Completion Time of Technical Specification (TS) 3.8.1, Required Action D.5, from the original 14 days to 44 days, and a commensurate change to extend the maximum Completion Time associated with discovery of failure to meet TS 3.8.1.a or b (i.e., from the original 17 days to 47 days). These changes are being requested in order to avoid an unnecessary shutdown of both Unit 1 and Unit 2. In addition, consistent with defense-in-depth philosophy, Duke Energy also requested to suspend monthly testing of Emergency Diesel

Generators (EDGs) 1, 2, and 3 per Surveillance Requirement (SR) 3.8.1.2, SR 3.8.1.3, and SR 3.8.1.6 during the proposed extended Completion Times, if applicable.

On December 4, 2017, and December 5, 2017, by electronic mail (i.e., References 2 and 3), the NRC provided requests for additional information (RAIs) regarding the LAR. Duke Energy's response to the RAIs is enclosed.

This document contains no new regulatory commitments.

I declare, under penalty of perjury, that the foregoing is true and correct. Executed on December 6, 2017.

Sincerely,

William R. Gideon

WRM/wrm

Enclosure: Response to Request for Additional Information

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Response to Request for Additional Information

By letter dated November 28, 2017, Duke Energy Progress, LLC (Duke Energy), submitted a one-time, risk-informed exigent license amendment request (LAR) for the Brunswick Steam Electric Plant (BSEP), Unit Nos. 1 and 2. The proposed license amendment would extend the current Completion Time of Technical Specification (TS) 3.8.1, Required Action D.5, from the original 14 days to 44 days, and a commensurate change to extend the maximum Completion Time associated with discovery of failure to meet TS 3.8.1.a or b (i.e., from the original 17 days to 47 days). These changes are being requested in order to avoid an unnecessary shutdown of both Unit 1 and Unit 2. In addition, consistent with defense-in-depth philosophy, Duke Energy also requested to suspend monthly testing of Emergency Diesel Generators (EDGs) 1, 2, and 3 per Surveillance Requirement (SR) 3.8.1.2, SR 3.8.1.3, and SR 3.8.1.6 during the proposed extended Completion Times, if applicable.

On December 4, 2017, and December 5, 2017, by electronic mail, the NRC provided requests for additional information (RAIs) regarding the LAR. Those questions, and Duke Energy's responses, are provided below.

NRC PRA RAI 1 – Fire PRA Methods:

Regulatory Position 6.3.1 of Regulatory Guide (RG) 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" states that a summary of the risk assessment methods used should be submitted to provide confidence that the risk assessment is adequate to support the proposed change.

The licensee stated that the change to credit for incipient detection originally in FAQ 08-0046, "Incipient Fire Detection Systems" (Agencywide Document Access and Management System (ADAMS) Accession No. ML093220426) and now in NUREG-2180, "Determining the Effectiveness, Limitations, and Operator Response for Very Early Warning Fire Detection Systems in Nuclear Facilities (DELORES-VEWFIRE) Final Report" (ADAMS Accession No. ML16343A058), developed for Bin 15 (electrical enclosures) fires, has no effect on the Brunswick Steam Electric Plant (BSEP) fire probabilistic risk assessment (FPRA). However, the licensee did credit in-cabinet incipient detection for Bin 4 (main control board) fires and referenced the NRC staff discussion in Section 3.2.6 of the safety evaluation for its National Fire Protection Association (NFPA) 805 license amendment (ADAMS Accession No. ML14310A808). Upon further review of the FPRA analysis in license amendment request (LAR) Attachment 8, Section 1.0 and Section 3.4 of the NFPA 805 license amendment safety evaluation, which addresses the credit taken for incipient detection for Bin 4, it appears that the conclusions in the NFPA 805 license amendment regarding the acceptability of the application of credit for in-cabinet incipient detection for Bin 4 fires remain valid.

Please confirm that any credit for incipient detection in the model that supports this LAR remains unchanged from the credits used in the NFPA-805 submittal and that the credit is limited exclusively to Bin 4 fires.

Response to PRA RAI 1:

Credit for incipient detection in the BSEP Fire PRA model is confirmed to be unchanged from the credit used in the NFPA-805 submittal and to be limited exclusively to Bin 4 fires.

NRC PRA RAI 2 – High Winds:

Consistent with Regulatory Position 2.3.2 of RG 1.177, Revision 1, the scope of the analysis should include all hazard groups (e.g., high winds in this case) unless it can be shown that the contribution from specific hazard groups does not affect the decision. The licensee indicated in LAR Section 3.2.2.3 that the potential increase in risk from high winds "is negligible due to the plant's design and expected weather during the exposure period".

The licensee has a PRA model for high winds, which it used to quantify delta Core Damage Frequency (CDF), Incremental Conditional Core Damage Probability (ICCDP), delta Large Early Release Frequency (LERF), and Incremental Conditional Large Early Release Probability (ICLERP) in this one-time Technical Specification change LAR. LAR Section 1.0 states that the High Winds PRA model was peer reviewed in 2012. LAR Section 1.0 also states that the licensee employed the Facts and Observations (F&O) independent assessment process in July 2017 to close-out all open F&Os. The LAR does not specify the peer review process used to perform this peer-review. Nuclear Energy Institute (NEI) 12-13, "External Hazards PRA Peer Review Process Guidelines" (ADAMS Accession No. ML122400044) provides guidance for use in conducting and documenting External Hazards PRA peer review. While NEI 12-13 follows a process similar to NRC endorsed peer review processes, NEI 12-13 has not been endorsed by the NRC in 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). Therefore, the NRC staff has not reviewed the acceptability of the licensee's High Winds PRA to support this application or the licensee's closure of the associated F&Os from the 2012 peer review via the recent closure effort in support of LAR.

Please provide the qualitative arguments (e.g. that the diesel generators and SSCs required for safe shutdown are protected from high winds and associated missiles), the bounding analyses, or the compensatory measures (e.g. measures are in place to protect diesels and SSCs required for safe shutdown from tornado missiles) to demonstrate that the risk contribution from high winds would not affect the LAR conclusions.

Response to PRA RAI 2:

The EDGs and core cooling systems (i.e., HPCI, RCIC, et. al.) required for safe shutdown equipment are located in Class I structures and are considered fully protected from high winds and wind-generated missiles. The Condensate Storage Tank (CST) is located outside the power block building, but has a high wind capacity and has been upgraded with missile barriers for response to high wind missile events.

The SUPP-DG is a permanently installed backup power source located inside the plant protected area outside the existing power block building. The SUPP-DG and associated equipment are primarily housed in a set of outdoor weather enclosures mounted on elevated foundations to protect the SUPP-DG system from flood and storm surge. The 4160 V cable from the SUPP-DG to the Turbine Building is also flood-resistant. The outdoor weather enclosures

are able to withstand wind speeds up to 155 mph (i.e., 3-second gust). Additional FLEX equipment is also available in a protected storage building.

Under nominal conditions, the dominant contributors to high wind and external flooding risk at BSEP are related to hurricane events. However, hurricane season has ended for 2017 and there are currently no hurricane or tropical storm threats in the Atlantic nor other extreme weather predicted across the East Coast. Therefore, high wind and external flooding risk is considered negligible for the specific limited time period for the requested one-time Completion Time extension.

It is noted that certain compensatory actions taken for internal events also provide risk reductions for other events including high winds or external flooding. These actions are listed below.

- EDGs 1, 2, and 3 shall be protected during the extended EDG Completion Times.
- The SUPP-DG, FLEX diesel generators, station batteries, battery chargers, switchyard, and transformer yard shall be protected, as defense-in-depth, during the extended EDG Completion Times.
- Component testing or maintenance of safety systems in the off-site power systems and important non-safety equipment in the off-site power systems which can increase the likelihood of a plant transient or LOOP, as determined by plant management, will be avoided during the extended EDG Completion Times.
- Discretionary switchyard maintenance shall not be allowed during the extended EDG Completion Times
- The High Pressure Coolant Injection (HPCI) pump, Reactor Core Isolation Cooling (RCIC) pump, and the Residual Heat Removal (RHR) pump associated with the operable EDGs will not be removed from service for elective maintenance activities during the extended EDG Completion Times.
- During the extended EDG Completion Times, weather conditions shall be monitored each shift to determine if forecasts are predicting severe weather conditions (i.e., thunderstorm or tornado warnings). If severe weather is expected, station managers will assess the conditions and determine the best course for the plant.
- During the extended EDG Completion Times authorized by the proposed license amendment, designated non-licensed operators (NLOs) shall be briefed, each shift, regarding cross tying the 4160 V and 480 V power buses per plant procedures.

PRA-RAI 3 – Facts and Observations (F&O) Closure:

On May 3, 2017, the NRC staff transmitted its review results of Appendix X to NEI 05-04, NEI 07-12 and NEI 12-13, "Close-out of Facts and Observations" (F&Os) (ADAMS Accession No. ML17079A427). Based on the NRC staff review, the NRC approved Appendix X for use by licensee's to close F&Os that were generated during a peer review process. While the NRC has not officially endorsed the guidance in Appendix X, it plans to consider it as part of the upcoming revision to Regulatory Guide 1.200 (estimated notice for public comments 2018 and publication 2019).

LAR Attachment 8, Section 2.2 states that the licensee employed the F&O closure process for the F&Os associated with Internal Events, Internal Flood, High Winds, and Fire models. The NRC staff has identified three primary issues based on recent observations of industry's

implementation of the closure process: 1) closure with respect to Capability Category (CC)-II for the supporting requirement (SR); 2) written justification of basis for why closure is determined to be maintenance or upgrade; and 3) independence of reviewers.

Please summarize how the August 2017 F&O closure process fulfilled each of guidelines below.

a) The documented licensee justification and associated F&O closure team assessment about whether each F&O finding resolution constitutes a PRA upgrade or maintenance update, as defined in the ASME/ANS RA-Sa-2009 PRA Standard, endorsed by RG 1.200, Revision 2

b) The review team's confirmation that the underlying supporting requirements of each closed F&O are now met at CC II, or met if there is no separate CC II

c) The review team's summary rationale for determining the adequacy for closure of each finding in relation to the affected portions of the associated SR for every SR and weakness identified in the F&O

d) The description of remote reviews participation (if used) confirming web and teleconference connection between any remote reviewers and the on-site review team and host utility to support full participation of the remote reviewers

e) The confirmation that every weakness in each F&O has been addressed, that a closed finding has been achieved, and that the documentation has been formally incorporated in the PRA Model of Record before closure in the final F&O closure report

Response to PRA RAI 3a:

Duke Energy's F&O closure documentation includes an assessment and justification of whether each F&O finding resolution constitutes a PRA upgrade or maintenance update as defined by the ASME/ANS-RA-Sa-2009 PRA Standard, endorsed by RG 1.200, Revision 2. The closure team's basis for closure of each finding included an assessment of the resolution being an upgrade versus update, and is documented in the final report.

Response to PRA RAI 3b:

The review team considered the specific requirements in the PRA Standard (ASME/ANS-RA-Sa-2009) to meet CC-II or met if there was no separate CC-II grade for the supporting requirement (SR). For a finding to be a candidate for closure, the SR had to be met at CC-II. Upon closure of all F&Os associated with a given SR, the SR is now met at CC-II, or met if there is no separate CC-II.

Response to PRA RAI 3c:

The primary and secondary reviewers on the review team assessed the utility resolution to the finding to determine if the finding had been adequately addressed. The reviewers considered the specific requirements in the PRA Standard (i.e., ASME/ANS-RA-Sa-2009) to meet CC-II or met if there was no separate CC-II grade for the SR. If the resolution was deemed adequate to meet CC-II, or met where applicable, the review team was then consulted via a consensus

process to deem the resolution adequate for closure. If consensus amongst the team was reached for closure, then finding was considered closed and SR capability category updated.

Response to PRA RAI 3d:

One remote reviewer was utilized only for the Brunswick High Winds model closure and focused scope peer review in 2017. All reviewers effectively utilized teleconference and online meeting software to confer throughout each day of the review. Reviewers convened to discuss progress, questions, comments, etc. several times per day throughout the review similar to all on-site reviews. The host utility was present with the review team throughout the reviews to answer questions as they were asked. The review team and host utility agreed the remote participation was thorough. There were observations by Duke Energy management during the process to ensure there was strong engagement with the remote reviewer and it was judged to be very effective.

Response to PRA RAI 3e:

Reviewers addressed the finding in its entirety. For a finding to be considered for closure, the reviewers also confirmed resolution in the appropriate documentation and incorporation into the current working model. For items where the documentation was inadequate or the entirety of the finding was not addressed, the finding remained open.

PRA-RAI 4 - F&O 1-36:

Regulatory Position 2.3.3.4 of RG 1.177 states that truncation levels should be used appropriately to ensure that significant underestimation, caused by truncation of cutsets, does not occur. Additional precautions relevant to the cutset manipulation method of analysis are needed to avoid truncation errors in calculating risk measures.

In its disposition to F&O 1-36 related to supporting requirement (SR) QU-B2, QU-F2, QU-B3, FQ-B1 and FQ-F1, the licensee stated that the truncation approach scenarios "now run at an effective truncation of 1E-09/yr [year] for CDF and 1E-10/yr for LERF." Based on the licensee's response to NRC RAI 4.c dated August 15, 2016 (ADAMS Accession No. ML16238A152) in support of relocating specific surveillance frequencies to a licensee controlled program (ADAMS Accession No. ML17096A129), the use of the truncation value 1E-09/yr would lead to changes of CDF at each unit (23% at Unit 1 and 16% at Unit 2). Using appropriate truncation levels for the fire CDF and LERF (i.e., truncation to a level such that neither the fire CDF nor LERF changes by more than 5%) would imply an effective truncation of 1E-11/yr based on the table provided in response to RAI 4.c, with CDF being the governing metric since it changes more than LERF for successive truncation levels.

Describe the truncation levels used in analyses that support this application and explain the impact of the effective truncation levels on the ICCDP and ICLERP. Alternatively, demonstrate that the selected truncation level does not have an impact on this application.

Response to PRA RAI 4:

The truncation levels used in the analyses that support this application were 1E-11/yr, or lower, and are sufficient to achieve convergence. The discussion of effective truncation levels in F&O 1-36 concerned the quantification of the fire PRA to examine fire impacts and is not

applicable to the quantification of fire risk for this application. Consequently, those effective truncation levels have no impact on ICCDP and ICLERP.

PRA-RAI 5 - F&O 4-1:

Regulatory Position 6.3 of RG 1.174 states that the licensee's resolution of the findings of the peer review should be submitted since the response could indicate whether the PRA was modified following the peer review or could justify why no change was necessary to support decision making for the licensing basis change under consideration.

In its disposition to F&O 4-1 related to SR FSS-A1, the licensee implied that the use of the breaching factor of 0.23 from FAQ 14-0009, "Treatment of Well Sealed MCC Electrical Panels Greater than 440V" (ADAMS Accession Number ML15118A810), minimally impacts Motor Control Center fires for the EDG 4 risk assessment. It is not clear whether the licensee has implemented the breaching factor specified in FAQ 14-0009 or performed a sensitivity on the breaching factor in the development of this LAR.

Please clarify whether the breaching factor of 0.23 was used in the FPRA model used to support this application. Alternatively, describe the impact of using the factors in BSEP FPRA in the quantification of the ICCDP and ICLERP using sensitivity analysis.

Response to PRA RAI 5:

A breaching factor of 0.1 was originally utilized for quantification of the BSEP fire models. Sensitivity runs were conducted with a breaching factor of 0.23 in order to determine any impacts. The results with EDG 4 failed were used to quantify the resultant impacts. There is minimal impact on CDF and LERF results for either unit. For the 44 day Completion Time, the results of changing the breaching factor is less than 3E-8 for ICCDP and less than 2E-9 for ICLERP.

PRA-RAI 6 - Scope of Internal Flooding Focused-Scope Peer Review:

Regulatory Position 1 of RG 1.200 addresses the technical acceptability of a PRA. Regulatory Position 2 further states that one acceptable approach to demonstrate conformance with regulatory position 1 is to use a national consensus PRA standard or standards that address the scope of the PRA used in the decisionmaking and that a peer review is needed to determine if the intent of the requirements in the standard is met.

The licensee submitted in Section 4.2 of Attachment 7 to the LAR, the history of peer reviews for the internal events and internal flooding PRA. In June 2010, a full-scope peer review was performed on the internal events and internal flood PRAs in accordance with the ASME/ANS PRA Standard RA-Sa-2009 PRA Standard, as clarified by RG 1.200, Revision 2. In December 2016, the internal flood PRA was subjected to a focused-scope peer review for 28 SRs.

Describe the scope of the focused-scope peer review performed in December 2016 (e.g. the high level requirements within the scope, and modeling change that triggered upgrade and subsequent peer review).

Response to PRA RAI 6:

The December 2016 internal flooding probabilistic risk assessment (IFPRA) review consisted of a focused peer review of the updated IFPRA sections that pertained to the supporting requirements (SR) identified in the F&Os generated in the 2010 peer review. The technical elements of the review were based on the extent of modeling enhancements made since the 2010 peer review. The modeling changes included an update to the pipe break frequency methodology and to the HRA methodology. There were no upgrades in methodology that required a focused scope review. The review was done to support submittal of the BSEP license amendment request for relocation of specific surveillance frequency requirements to a licensee-controlled program (i.e., ADAMS Accession No. ML17096A129).

The IFPRA SRs were evaluated to determine if they met Capability Category II (CC-II) of the 2009 ASME PRA Standard. It was noted by the peer review team that, although the previous F&Os were used in part to identify the SRs on which to focus, the review was considered a stand-alone peer review that will become the document of record for the IFPRA. All F&Os from 2010 peer review are considered closed, with new F&Os having been generated from the 2016 review. The 2016 focused review is now considered the peer review of record for the IFPRA, and the scope of the review (i.e., the high level requirements (HLRs) and the SRs within the HLRs that received focus) are shown in Table 1.

Table 1: 2016 Review Scope for the BSEP Internal Flooding PRA

High Level Requirement	SRs Receiving Focus
IFPP	IFPP-B1
IFSO	IFSO-A1 IFSO-A4 IFSO-A5 IFSO-B1 IFSO-B2*
IFSN	IFSN-A2 IFSN-A3 IFSN-A6 IFSN-A8 IFSN-A11 IFSN-A13 IFSN-A14 IFSN-A15 IFSN-A16 IFSN-A17 IFSN-B2
IFEV	IFEV-A1 IFEV-A4 IFEV-A5 IFEV-A6

High Level Requirement	SRs Receiving Focus
IFQU	IFQU-A1 IFQU-A2 IFQU-A5 IFQU-A6 IFQU-A9 IFQU-A10 IFQU-B1 IFQU-B2

* IFSO-B2 was added to the original scope by the peer team.

PRA-RAI 7 – PRA Model of Record:

Regulatory Position 2.3.4 of RG 1.174 states that the PRA results used to support an application are derived from a PRA model that represents the as-built and as-operated plant to the extent needed to support the application. Consistent with this regulatory position, the PRA should realistically reflect the risk associated with the plant at the time of the application.

Attachment 8, Section 1.0, states that, "since completion of previous NRC reviews, Duke Energy has issued a routine Model of Record (MOR) update of the Brunswick Units 1 and 2 full power internal events (FPIE) PRA model. The model designation is updated from MOR13 to MOR16 per the PRA Standard and Duke Energy procedures." Changes between MOR13 and MOR16 are also provided. LAR Attachment 8, Section 2.1, further states that, “the working model for the BSEP represents the most up-to-date versions of the constituent PRA internal and external hazard models. The September 2017 working model is used for this analysis of the EDG 4. The latest version of the internal events model is Model of Record 16 issued in June 2017. The other PRA models are built on internal event MORs with enhancements to resolve findings from the 2017 F&O close-out review.”

a) Confirm that the BSEP PRA model of record (MOR16) was used to support the quantitative risk assessments provided in the LAR.

b) Describe any changes between the June 2017 MOR16 update and the September 2017 working model. Discuss the impact of those changes on results of risk assessments provided in LAR using sensitivity analyses.

c) Changes between MOR13 and MOR16 are also provided in Attachment 8, Section 1.0 of the LAR. One change involves the, "added additional post-initiator action for the Supplemental Diesel for EDG failures not related to planned maintenance." Provide a description of this change and how this change impacts the EDG 4 risk assessment.

Response to PRA RAI 7a:

The BSEP PRA model of record (i.e., MOR16) was used to support the quantitative risk assessments provided in the LAR.

Response to PRA RAI 7b:

There is no change between the June 2016 MOR16 update and the September 2017 working model. In September 2017, the working model calculation was created for the purpose of providing a single document containing (i.e., or pointing to, as in the case for fire) the latest revision of all of the internal and external event hazard models. The working model calculation is a convenient starting point for plant support evaluations, such as the proposed exigent license amendment request.

Response to PRA RAI 7c:

MOR16 includes two operator actions, one for aligning the SUPP-DG for a planned EDG maintenance, and a second for an unplanned EDG failure on demand, when no EDGs were in maintenance. For the exigent license amendment request evaluation, given unavailability of EDG 4, the probability associated with the operator action given no EDGs are in maintenance could have been set to zero. However, this modeling refinement was not pursued. This represents an analysis conservatism.

PRA-RAI 8 – Test and Maintenance:

Regulatory Position 2.3.4 of RG 1.177 states that the change in average CDF should be estimated using the mean outage times (or an appropriate surrogate) for the current and proposed CTs when calculating the risk impacts. This regulatory position further states that if a licensee chooses to use the zero maintenance state as the base case, an explanation stating so should be part of the submittal. Assumptions concerning changes in maintenance practices under the extended CT regime should be discussed and their impact on the results of the analysis characterized.

LAR Attachment 7, Section 3.0, states that, "the supplemental diesel generator is assumed to be protected during the extended completion time and that is reflected in the model by setting the test and maintenance of the supplemental diesel generator to 0.0." As part of the Tier 2 evaluation, Section 5.0 describes high risk equipment test and maintenance configurations and compensatory measures that are in place to mitigate those configurations.

Confirm that nominal test and maintenance, except for the supplemental diesel generator, is used for all PRA model calculations. Alternatively, specify if zero test and maintenance is assumed or that zero test and maintenance is used only for a subset of high risk equipment for which supplemental controls are in place. If zero test and maintenance is used only for a subset of equipment configurations, specify those configurations.

Response to PRA RAI 8:

Nominal test and maintenance values were used for all PRA model calculations as presented in the LAR except for the SUPP-DG. The SUPP-DG test and maintenance basic event was set to 0.0, reflective of it being protected during the extended Completion Time. No additional adjustments were made to the nominal test and maintenance values in the analysis.

PRA-RAI 9 – Supplemental Equipment and Compensatory Actions:

Regulatory Position 2.3.6 of RG 1.177 states that certain compensatory measures that balance the calculated risk increase caused by the changes may be considered. This consideration should be made in light of the acceptance guidelines given in RG 1.174.

LAR Attachment 7, Section 3.0, provides information regarding changes made to the baseline model to form the application-specific model configuration. This section included discussion of the credits or treatment of the supplemental and temporary diesels. Later, LAR Attachment 8, Section 3.3, and Attachment 7, Section 4.2.4, provide specific discussion of quantitative credit for the seismic hazards and high winds analyses, respectively. However, credit assumptions for supplemental equipment and compensatory measures are not discussed in detail for all the models (e.g. internal events, fire). For example, for the FPRA, it is not clear whether any quantitative credit is taken for the installation of a continuous fire watch that will be established for the Unit 1 and Unit 2 Cable Spread Rooms and for the Balance of Plant busses in the Unit 1 and Unit 2 Turbine Building 20 foot elevations. It is also not clear, if or how diverse and flexible coping strategies (FLEX) equipment is quantitatively credited in all models.

a. Please summarize the supplemental equipment and compensatory actions, including FLEX strategies, that have been quantitatively credited for each of the PRA models used to support this application.

b. If quantitative credit is taken for any of the models, please describe the associated PRA assumptions such as data and human reliability analyses in applying that credit. For example, confirm that PRA failure probabilities are representative of equipment current performance.

Response to PRA RAI 9a:

Summary of LAR-Credited Equipment and Compensatory Actions (Note 1)

PRA Model	Supple-mental DG	FLEX DGs	Other FLEX Equipment	Other Compensatory Measures (Note 2)	Offsite FLEX equipment
Internal Events	Quantitative: T&M set to 0.	Quantitative; nominal values	Portable Pumps, Air Compressors	Qualitative Defense-in-Depth	Not considered
Internal Flood	Not Credited	Quantitative; nominal values	Not Credited	Qualitative Defense-in-Depth	Not considered
Fire	Not Credited	Quantitative; nominal values	Not Credited	Qualitative Defense-in-Depth	Not considered
Seismic	Not Credited	Not Credited	Not Credited	Qualitative Defense-in-Depth	Not considered
High Winds	Not credited	Quantitative; nominal values	Not Credited	Qualitative Defense-in-Depth	Not considered

Notes:

1. LAR-credited equipment is also credited in the baseline models.
2. Compensatory measures include fire watches and procedure briefings.

Response to PRA RAI 9b:

In quantification of the LAR models, no equipment or human actions were added to the baseline model. In the baseline model, PRA assumptions pertaining to data development and human reliability analyses (HRA) for diverse and FLEX equipment are consistent with those used throughout the PRA. For example, failure rates for the SUPP-DG and the FLEX-DGs are based on the same generic diesel generator failure rates. Additionally, the FLEX Air Compressors and the FLEX portable pumps are based on the generic data for engine driven compressors and engine driven pumps, respectively. Generic unavailability data was used for the SUPP-DG and FLEX equipment because there is not enough maintenance history to develop plant-specific distributions. All generic data is from the Industry Average Parameter Estimates update to NUREG/CR-6928. The use of generic data for these FLEX components is appropriate because they do not have a record of failures that would indicate that the generic failure rates would not be representative of their current performance. Modeled failure modes include failure to start, failure to run, and common cause failures, consistent with the requirements of RG 1.200 and the PRA standard.

The SUPP-DG and FLEX equipment HRAs were developed using the same methods as other modeled human events using the EPRI HRA Calculator. Considerations included station procedures for mitigation for loss of AC events, timing information from operator interviews, walkthroughs, and performance shaping factors (PSFs) for each action assuming High Stress and adequate procedures. The modeled FLEX human actions in the baseline model include:

- Staging and aligning FLEX air compressors
- Aligning FLEX Diesel Generators to battery chargers
- Refueling FLEX Diesel Generators during mission time
- Staging and aligning FLEX portable pump for reactor pressure vessel (RPV) Injection

Additionally, the HRA dependency analysis was revised to include these FLEX human actions. For External events, the HRA PSFs were adjusted to account for plant-specific environmental conditions in completing the actions as well as increased stress.

For the LAR model, no credit is taken for dedicated operators or briefings. Thus, PRA failure probabilities for diverse and FLEX equipment are judged to be representative of current equipment performance and remain set at their nominal values.

APHB-RAI 1 – Temporary Diesel Generator Response Time:

Regulatory Bases: Regulatory Position 6.3.1 of Regulatory Guide (RG) 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis"

Section 3.1, "Deterministic Evaluation," of the submittal lists the SUPP-DG as an available method to extend station battery capacity to a four hour coping duration by connecting to and powering the station battery chargers. Section 3.1 of the BSEP exigent amendment also states

that a temporary diesel generator system has been provided as additional defense-in-depth. The temporary diesel generator system consists of two 480 V, 2000 kw diesel generators with synchronization capability that can be tied into the 4160 V electrical distribution system connections at the SUPP-DG electrical enclosure. Existing approved station procedures and flow charts direct the connection of the SUPP-DG to a 4160 V emergency buss and Section 3.2.3.4, "Safety Margin," confirms that the required connections can be accomplished in one hour.

In order to credit the above temporary diesel generator system for the PRA review, please confirm that the work instructions for aligning the temporary diesel system to the BSEP electrical distribution system support completion of this activity in one hour

Response to APHB-RAI 1:

There are two Temporary Diesel Generators (DGs) that are each rated for 2000 kW, 480 V. The Temporary DGs are not credited for RG 1.174 defense-in-depth and were added for additional safety margin. The Temporary DGs were not credited in the PRA analysis, and the Temporary DGs are no longer credited as a defense-in-depth measure.

Connection of the Temporary DGs will only be made if needed in an emergency event as directed by Operations and Engineering. This contingency planning assumes that the SUPP-DG has failed and 2C/2D bus has experienced a loss of normal power. The method to connect the Temporary DGs to the 4160 V electrical distribution system is provided in Work Instructions in accordance with Work Order Task 20202226-78.

Each of the Temporary DGs outputs to a step up transformer to increase voltage to 4160 V. There are three methods provided in the WO Instructions to accomplish the tie-in to the Brunswick electrical distribution system. The option will be made by Operations on which method to use.

This equipment has been load bank tested following set-up on site. Materials to support this hook-up are staged, if needed. Instructions have been provided to start and tie one Temporary diesel generator to the de-energized plant electrical distribution once final tie-in is complete. In the event the full 4000 kW is needed, vendor support would be required to parallel the second temporary generator to the plant electrical distribution. The connection of the Temporary DGs to the plant’s electrical distribution system can be performed in a timely manner, but is expected to take longer than one hour.