UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 2, 2021

Mr. David P. Rhoades
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer (CNO)
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2, AND BYRON STATION, UNIT NOS. 1 AND 2 - ISSUANCE OF AMENDMENTS NOS. 221, 221, 224, and 224, REGARDING TECHNICAL SPECIFICATIONS 3.8.1, "AC SOURCES-OPERATING" (EPID L-2020-LLA-0141)

Dear Mr. Rhoades:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 221 to Renewed Facility Operating License No. NPF-72 and Amendment No. 221 to Renewed Facility Operating License No. NPF-77 for the Braidwood Station, Units 1 and 2, respectively, and Amendment No. 224 to Renewed Facility Operating License No. NPF-37 and Amendment No. 224 to Renewed Facility Operating License No. NPF-66 for the Byron Station, Unit Nos. 1 and 2, respectively. The amendments are in response to your application dated June 26, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20178A467) as supplemented by letter dated November 20, 2020 (ADAMS Accession No. ML20325A252).

The amendments revise surveillance requirements in Technical Specification 3.8.1, "AC [Alternating Current] Sources-Operating," to correct nonconservative voltage and frequency requirements.

A copy of the Safety Evaluation is also enclosed. A Notice of Issuance will be included in the Commission's monthly *Federal Register* notice.

Sincerely,

/RA/

Joel S. Wiebe, Senior Project Manager
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. STN 50-456, STN 50-457,
STN 50-454 and STN 50-455

Enclosures:
1. Amendment No. 221 to NPF-72
2. Amendment No. 221 to NPF-77
3. Amendment No. 224 to NPF-37
4. Amendment No. 224 to NPF-66
5. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-456

BRAIDWOOD STATION, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 221
Renewed License No. NPF-72

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 26, 2020, as supplemented by letter dated November 20, 2020, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the renewed license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-72 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 221 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert F. Kuntz

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Date: 2021.04.02 09:39:39 -04'00'

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: April 2, 2021

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-457

BRAIDWOOD STATION, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 221
Renewed License No. NPF-77

1. The U.S. Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 26, 2020, as supplemented by letter dated November 20, 2020, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the renewed license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-77 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 221 and the Environmental Protection Plan contained in Appendix B, both of which are attached to Renewed License No. NPF-72, dated January 27, 2016, are hereby incorporated into the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert F. Kuntz

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Date: 2021.04.02 09:40:03 -04'00'

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License and
Technical Specifications

Date of Issuance: April 2, 2021

ATTACHMENT TO LICENSE AMENDMENT NOS. 221 AND 221

RENEWED FACILITY OPERATING LICENSE NOS. NPF-72 AND NPF-77

BRAIDWOOD STATION, UNITS 1 AND 2

DOCKET NOS. STN 50-456 AND STN 50-457

Replace the following pages of the Renewed Facility Operating Licenses and Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Renewed Facility Operating Licenses

REMOVE	INSERT
License NPF-72	License NPF-72
-3-	-3-
License NPF-77	License NPF-77
-3-	-3-

Technical Specifications

REMOVE	INSERT
3.8.1 – 6	3.8.1 – 6
3.8.1 – 7	3.8.1 – 7
3.8.1 – 8	3.8.1 – 8
3.8.1 – 9	3.8.1 – 9
3.8.1 – 10	3.8.1 – 10
3.8.1 – 11	3.8.1 – 11
3.8.1 – 13	3.8.1 – 13

(2) Exelon Generation Company, pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(3) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. This renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at reactor core power levels not in excess of 3645 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 221 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(2) Exelon Generation Company, LLC, pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Final Safety Analysis Report, as supplemented and amended;

(3) Exelon Generation Company, LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Exelon Generation Company, LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Exelon Generation Company, LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. The renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at reactor core power levels is not in excess of 3645 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 221 and the Environmental Protection Plan contained in Appendix B, both of which are attached to Renewed License No. NPF-72, dated January 27, 2016, are hereby incorporated into the renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

SURVEILLANCE REQUIREMENTS

SURVEILLANCE		FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required qualified circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	----------NOTE---------- A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. Performance of SR 3.8.1.7 satisfies this SR. ---------- Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ 4370 V and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3	----------NOTES---------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This Surveillance shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7. ---------- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 450 gal of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to automatically transfer fuel oil from storage tank(s) to the day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	Verify each DG starts from normal standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ 4370 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify manual transfer of AC power sources from the required normal qualified circuit(s) to the reserve required qualified circuit(s).	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTE---------- This Surveillance shall not be performed in MODE 1 or 2. ---------- Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 64.5 Hz; b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ 4370 V; and c. Following load rejection, the steady state frequency is maintained ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10	----------NOTES---------- 1. Momentary transients above the voltage limit immediately following a load rejection do not invalidate this test. 2. This Surveillance shall not be performed in MODE 1 or 2. 3. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.89. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable. ---------- Verify each DG does not trip and voltage is maintained ≤ 5600 V during and following a load rejection of ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected shutdown loads through the shutdown load sequence timers, 3. maintains steady state voltage ≥ 3950 V and ≤ 4370 V, 4. maintains steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz, and 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.12	Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz; b. Achieves steady state voltage ≥ 3950 V and ≤ 4370 V and frequency ≥ 59.5 Hz and ≤ 60.5 Hz; and c. Operates for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.13	Verify each DG's automatic trips are bypassed on actual or simulated loss of voltage signal on the emergency bus concurrent with an actual or simulated ESF actuation signal except: a. Engine overspeed; and b. Generator differential current.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.14	----------NOTE---------- Momentary transients outside the load range do not invalidate this test. ---------- Verify each DG operates for ≥ 24 hours: a. For ≥ 2 hours loaded ≥ 5775 kW and ≤ 6050 kW; and b. For the remaining hours of the test loaded ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.15	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 4950 kW and ≤ 5500 kW or until operating temperature has stabilized. 2. Momentary transients outside of load range do not invalidate this test. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ 4370 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.19	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through the safeguards sequence timers, 3. achieves steady state voltage ≥ 3950 V and ≤ 4370 V, 4. achieves steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.20	Verify when started simultaneously from standby condition, each DG achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ 4370 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-454

BYRON STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 224
Renewed License No. NPF-37

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 26, 2020, as supplemented by letter dated November 20, 2020, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the renewed license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-37 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 224 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert F. Kuntz

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Date: 2021.04.02 09:40:34 -04'00'

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: April 2, 2021

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

EXELON GENERATION COMPANY, LLC

DOCKET NO. STN 50-455

BYRON STATION, UNIT NO. 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 224
Renewed License No. NPF-66

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Exelon Generation Company, LLC (the licensee) dated June 26, 2020, as supplemented by letter dated November 20, 2020, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance: (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-66 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A (NUREG-1113), as revised through Amendment No. 224, and the Environmental Protection Plan contained in Appendix B, both of which were attached to Renewed License No. NPF-37, dated November 19, 2015, are hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 90 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert F. Kuntz

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Date: 2021.04.02 09:40:54 -04'00'

Nancy L. Salgado, Chief
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility Operating License and Technical Specifications

Date of Issuance: April 2, 2021

ATTACHMENT TO LICENSE AMENDMENT NOS. 224 AND 224

RENEWED FACILITY OPERATING LICENSE NOS. NPF-37 AND NPF-66

BYRON STATION, UNIT NOS. 1 AND 2

DOCKET NOS. STN 50-454 AND STN 50-455

Replace the following pages of the Renewed Facility Operating Licenses and Appendix A, Technical Specifications, with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Renewed Facility Operating Licenses

REMOVE	INSERT
License NPF-37	License NPF-37
-3-	-3-
License NPF-66	License NPF-66
-3-	-3-

Technical Specifications

REMOVE	INSERT
3.8.1 – 6	3.8.1 – 6
3.8.1 – 7	3.8.1 – 7
3.8.1 – 8	3.8.1 – 8
3.8.1 – 9	3.8.1 – 9
3.8.1 – 10	3.8.1 – 10
3.8.1 – 11	3.8.1 – 11
3.8.1 – 13	3.8.1 – 13

(2) Pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Updated Final Safety Analysis Report, as supplemented and amended;

(3) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. The renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at reactor core power levels not in excess of 3645 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A as revised through Amendment No. 224 and the Environmental Protection Plan contained in Appendix B, both of which are attached hereto, are hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Deleted.

(4) Deleted.

(2) Pursuant to the Act and 10 CFR Part 70, to receive, possess and use at any time special nuclear material as reactor fuel, in accordance with the limitations for storage and amounts required for reactor operation, as described in the Updated Final Safety Analysis Report, as supplemented and amended;

(3) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(4) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components; and

(5) Pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility.

C. The renewed license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations, and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

The licensee is authorized to operate the facility at reactor core power levels not in excess of 3645 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications

The Technical Specifications contained in Appendix A (NUREG-1113), as revised through Amendment No. 224 and the Environmental Protection Plan contained in Appendix B, both of which were attached to Renewed License No. NPF-37, dated November 19, 2015, are hereby incorporated into this renewed license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each required qualified circuit.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.2	----------NOTE---------- A modified DG start involving idling and gradual acceleration to synchronous speed may be used for this SR. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.7 must be met. Performance of SR 3.8.1.7 satisfies this SR. ---------- Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ 4370 V and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.3	----------NOTES---------- 1. DG loadings may include gradual loading as recommended by the manufacturer. 2. Momentary transients outside the load range do not invalidate this test. 3. This Surveillance shall be conducted on only one DG at a time. 4. This Surveillance shall be preceded by and immediately follow without shutdown a successful performance of SR 3.8.1.2 or SR 3.8.1.7. ---------- Verify each DG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.4	Verify each day tank contains ≥ 450 gal of fuel oil.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.6	Verify the fuel oil transfer system operates to automatically transfer fuel oil from storage tank(s) to the day tank.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.7	Verify each DG starts from normal standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ 4370 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.8	Verify manual transfer of AC power sources from the required normal qualified circuit(s) to the reserve required qualified circuit(s).	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.9	----------NOTE---------- This Surveillance shall not be performed in MODE 1 or 2. ---------- Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and: a. Following load rejection, the frequency is ≤ 64.5 Hz; b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ 4370 V; and c. Following load rejection, the steady state frequency is maintained ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.10	----------NOTES---------- 1. Momentary transients above the voltage limit immediately following a load rejection do not invalidate this test. 2. This Surveillance shall not be performed in MODE 1 or 2. 3. If performed with DG synchronized with offsite power, it shall be performed at a power factor ≤ 0.89. However, if grid conditions do not permit, the power factor limit is not required to be met. Under this condition the power factor shall be maintained as close to the limit as practicable. ---------- Verify each DG does not trip and voltage is maintained ≤ 5600 V during and following a load rejection of ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected shutdown loads through the shutdown load sequence timers, 3. maintains steady state voltage ≥ 3950 V and ≤ 4370 V, 4. maintains steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz, and 5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.12	Verify on an actual or simulated Engineered Safety Feature (ESF) actuation signal each DG auto-starts from standby condition and: a. In ≤ 10 seconds achieves voltage ≥ 3950 V and frequency ≥ 58.8 Hz; b. Achieves steady state voltage ≥ 3950 V and ≤ 4370 V and frequency ≥ 59.5 Hz and ≤ 60.5 Hz; and c. Operates for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.13	Verify each DG's automatic trips are bypassed on actual or simulated loss of voltage signal on the emergency bus concurrent with an actual or simulated ESF actuation signal except: a. Engine overspeed; and b. Generator differential current.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.14	----------NOTE---------- Momentary transients outside the load range do not invalidate this test. ---------- Verify each DG operates for ≥ 24 hours: a. For ≥ 2 hours loaded ≥ 5775 kW and ≤ 6050 kW; and b. For the remaining hours of the test loaded ≥ 4950 kW and ≤ 5500 kW.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.15	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the DG after the DG has operated ≥ 2 hours loaded ≥ 4950 kW and ≤ 5500 kW or until operating temperature has stabilized. 2. Momentary transients outside of load range do not invalidate this test. ---------- Verify each DG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ 4370 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.16	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify each DG: a. Synchronizes with offsite power source while loaded with emergency loads upon a simulated restoration of offsite power; b. Transfers loads to offsite power source; and c. Returns to ready-to-load operation.	In accordance with the Surveillance Frequency Control Program

(continued)

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.19	----------NOTE---------- This Surveillance shall not be performed in MODE 1, 2, 3, or 4. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal: a. De-energization of ESF buses; b. Load shedding from ESF buses; and c. DG auto-starts from standby condition and: 1. energizes permanently connected loads in ≤ 10 seconds, 2. energizes auto-connected emergency loads through the safeguards sequence timers, 3. achieves steady state voltage ≥ 3950 V and ≤ 4370 V, 4. achieves steady state frequency ≥ 59.5 Hz and ≤ 60.5 Hz, and 5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.	In accordance with the Surveillance Frequency Control Program
SR 3.8.1.20	Verify when started simultaneously from standby condition, each DG achieves: a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3950 V and ≤ 4370 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	In accordance with the Surveillance Frequency Control Program

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 221 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-72, AMENDMENT NO. 221 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-77, AMENDMENT NO. 224 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-37, AND AMENDMENT NO. 224 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-66

EXELON GENERATION COMPANY, LLC

BRAIDWOOD STATION, UNITS 1 AND 2 AND BYRON STATION, UNIT NOS. 1 AND 2

DOCKET NOS. STN 50-456, STN 50-457, STN 50-454, AND STN 50-455

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC, the Commission) dated June 26, 2020 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML20178A467), as supplemented by letter dated November 20, 2020 (ADAMS Accession No. ML20325A252), Exelon Generation Company, LLC (the licensee), requested changes to the surveillance requirements (SRs) for the Braidwood Station, Units 1 and 2, (Braidwood) and Byron Station , Unit Nos. 1 and 2 (Byron). This safety evaluation (SE) uses the term license amendment request (LAR) to refer to both documents.

The proposed changes would revise Technical Specification (TS) 3.8.1, "AC Sources-Operating," SRs to revise the steady-state voltage and frequency acceptance criteria for certain standby diesel generator (DG) surveillance testing. Specifically, the change reduces the tolerance for DG frequency during steady-state operation from ±2 percent (i.e., 58.8 Hertz (Hz) to 61.2 Hz) to ±0.83 percent (i.e., 59.5 Hz to 60.5 Hz) and revises the DG voltage setpoint tolerance during steady-state operation from +10/-5 percent (i.e., 3950 Volts (V) to 4580 V) to ±5 percent (i.e., 3950 V to 4370 V). The change resolves nonconservative SRs.

The November 20, 2020, supplement, contained clarifying information and did not change the NRC staff's initial proposed finding of no significant hazards consideration determination as published in the *Federal Register* on August 11, 2020 (85 FR 48571).

2.0 REGULATORY EVALUATION

2.1 Description of Affected Systems

2.1.1 Emergency Core Cooling System (ECCS)

In the LAR, the licensee states that the purpose of the ECCS is to remove the stored and fission product decay heat from the reactor core during accident conditions. The ECCS includes two high-head pumps, two intermediate-head safety injection (SI) pumps, and two low-head residual heat removal (RHR) pumps. Following a loss-of-coolant accident (LOCA), the ECCS is initiated to provide cooling water to the reactor coolant system (RCS), and the containment spray (CS) system is initiated to provide cooling water to the containment atmosphere through the CS nozzles.

2.1.2 Containment Spray System (CS)

In the LAR, the licensee states that the purpose of the CS system is to remove fission products, primarily iodine, from the containment atmosphere following a design basis LOCA in order to minimize offsite radiological consequences, and to reduce the pressure in the containment atmosphere at a rate which will ensure that the design leakage is not exceeded. The CS system includes the CS pumps and associated valves and components.

2.1.3 Auxiliary Feedwater System (AFW)

In the LAR, the licensee states that the purpose of the AFW system is to provide adequate cooling water to the steam generators in the event of a loss of offsite power (LOOP) and/or plant accident. The AFW system provides enough feedwater to cool the reactor down safely to the temperature at which the RHR system can be utilized. The AFW system includes the pumps and associated valves and components.

2.1.4 Component Cooling Water System (CCW)

In the LAR, the licensee states that the purpose of the CCW system is to provide cooling water to various plant components during normal operation, plant shutdown and after an accident, and to act as an intermediate system between the components being cooled and the essential service water (SX) system, in order to minimize possible leakage of radioactive material into the environment. The CCW system includes the pumps and associated valves and components.

2.1.5 Essential Service Water System

In the LAR, the licensee states that the purpose of the SX system is to ensure that sufficient cooling capacity is available to provide adequate cooling during normal and accident conditions. The SX system includes the pumps and associated valves and components.

2.1.6 Heating, Ventilation, and Air Conditioning System (HVAC)

In the LAR the licensee states that the purpose of the main control room HVAC system is to provide environmental conditions conducive to habitability and long component life in the main control room for both units 1 and 2 under normal and accident conditions.

2.1.7 Onsite Emergency AC Power System

As described in the Braidwood and Byron Updated Final Safety Analysis Report (UFSAR) Section 8.3.1.1.2.2 (ADAMS Accession No. ML19170A336), the onsite (emergency) AC power system for each unit consists of two DGs, one for each engineered safety features (ESF) division. The DGs provide an independent emergency source of power in the event of a complete LOOP. The DG supplies all of the electrical loads which are required for reactor safe shutdown either with or without a LOCA. The DG is designed to attain rated voltage and frequency and be ready to accept loads within 10 seconds after the receipt of an automatic start signal.

Each DG unit consists of a diesel engine, an electrical generator and fuel oil, lubricating oil, combustion air, cooling water and DG room ventilation support systems. The diesel engine, a Cooper-Bessemer KSV-20-T diesel, is rated at 7680 horsepower (hp) at 600 revolutions per minute (rpm) when using a turbocharger. The electrical generator, an Electric Products Model 1160, is rated for 5500 kilowatts (kw) at a 0.8 power factor and produces 4160 V at 60 Hz for 3-phase distribution.

In the LAR, the licensee stated that the electrical output of the DGs is fed to the 4.16 kilovolt (kV) buses that distribute power for the operation of essential safe shutdown equipment. The safety-related function of the DGs is to provide an emergency source of power, in the event that offsite power is not available, to supply all the electrical loads required for safe shutdown of the reactor either with or without a LOCA. A 4.16 kV ESF bus undervoltage or SI an accident signal will start the DGs, which will attain rated frequency and voltage within 10 seconds and energize the ESF buses for a LOOP with or without a LOCA. If a LOCA were to occur without a LOOP, the ESF buses would remain energized by the offsite power source and the DGs would run unloaded.

2.1.8 Other Miscellaneous Systems

In the LAR, the licensee states that the other miscellaneous equipment evaluated includes battery chargers, inverters, heaters, and miscellaneous 120 V loads. The purpose of the battery chargers and inverters is to ensure that safety-related instrument power will be available in the event of a loss of the normal power source. The purpose of the heaters is to maintain a habitable environment in the main control room. The pressurizer heaters ensure sufficient heater capacity is available to stabilize pressurizer pressure and preclude boiling in the RCS following LOOP. The loads fed from the 120 VAC distribution system include solenoids, instrument panels, smoke detectors, level switches, radiation monitoring equipment, damper actuators, HVAC process instruments, main control room chiller devices, post-LOCA hydrogen monitoring panel, relays, and heated junction thermocouple panel.

2.2 Reason for Proposed Change

In the LAR, the licensee stated that in NRC Inspection Report 2011-009 dated July 22, 2011 (ADAMS Accession No. ML11203A081), the NRC identified a finding of very low safety significance deficiency to correctly translate applicable design basis (calculations) into specifications at Byron Station and associated non-cited violation (NCV) of Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR 50), Appendix B, Criterion III, Design Control, for the failure to correctly translate applicable design basis (calculations) into specifications. Specifically, Byron failed to consider fuel oil consumption at an increased frequency of 61.2 Hz in their DG loading calculations, which resulted in nonconservative TS. After the

nonconservative TS surveillance acceptance criteria for DG steady-state frequency was discovered, the procedures containing the applicable surveillance acceptance criteria were revised to protect the assumptions in the licensing and design basis. Corresponding changes to steady-state voltage acceptance criteria were also made. The issue is being tracked in the licensee's corrective action program. As a final corrective action, the licensee is pursuing this LAR to ensure that the design basis requirements for the DG system and supported equipment is protected.

2.3 Description of the Proposed Change

This description is applicable to both Braidwood and Byron TS. TS 3.8.1 currently requires the DGs to maintain a steady-state frequency from 58.8 Hz to 61.2 Hz (± 2 percent). The licensee proposed a revision to TS 3.8.1 to reduce the tolerance for the DG frequency during steady-state operation to ± 0.5 Hz (i.e., 59.5 Hz to 60.5 Hz, or ± 0.83 percent). TS 3.8.1 is also being revised to reduce the DG voltage setpoint tolerance during steady-state operation from 3950 V to 4580 V (+10/- 5 percent) to ± 210 V (i.e., 3950 V to 4370 V, or ± 5 percent). The following proposed changes to SRs within TS 3.8.1 are being requested (changed text is bolded).

SR 3.8.1.2:

Current:

Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Proposed:

Verify each DG starts from standby condition and achieves steady state voltage ≥ 3950 V and ≤ **4370** V and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

SR 3.8.1.7:

Current:

Verify each DG starts from normal standby condition and achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz;
b. Steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Proposed:

Verify each DG starts from normal standby condition and achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz;
b. Steady state voltage ≥ 3950 V and ≤ **4370** V, and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

SR 3.8.1.9:

Current:

Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and:

a. Following load rejection, the frequency is ≤ 64.5 Hz;
b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ 4580 V; and
c. Following load rejection, the steady state frequency is maintained ≥ 58.8 Hz and ≤ 61.2 Hz.

Proposed:

Verify each DG rejects a load greater than or equal to its associated single largest post-accident load, and:

a. Following load rejection, the frequency is ≤ 64.5 Hz;
b. Following load rejection, the steady state voltage is maintained ≥ 3950 V and ≤ **4370** V; and
c. Following load rejection, the steady state frequency is maintained ≥ **59.5** Hz and ≤ **60.5** Hz.

SR 3.8.1.11:

Current:

Verify on an actual or simulated loss of offsite power signal:

a. De-energization of ESF buses;
b. Load shedding from ESF buses; and
c. DG auto-starts from standby condition and:
    1. energizes permanently connected loads in ≤ 10 seconds,
    2. energizes auto-connected shutdown loads through the shutdown load sequence timers,
    3. maintains steady state voltage ≥ 3950 V and ≤ 4580 V,
    4. maintains steady state frequency ≥ 58.8 Hz and ≤ 61.2 Hz, and
    5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.

Proposed:

Verify on an actual or simulated loss of offsite power signal:

a. De-energization of ESF buses;
b. Load shedding from ESF buses; and
c. DG auto-starts from standby condition and:
    1. energizes permanently connected loads in ≤ 10 seconds,
    2. energizes auto-connected shutdown loads through the shutdown load sequence timers,
    3. maintains steady state voltage ≥ 3950 V and ≤ **4370** V,
    4. maintains steady state frequency ≥ **59.5** Hz and ≤ **60.5** Hz, and
    5. supplies permanently connected and auto-connected shutdown loads for ≥ 5 minutes.

SR 3.8.1.12:

Current:

Verify on an actual or simulated ESF actuation signal each DG auto-starts from standby condition and:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58 .8 Hz;
b. Achieves steady state voltage ≥ 3950 V and ≤ 4580 V and frequency ≥ 58.8 Hz and ≤ 61.2 Hz; and
c. Operates for ≥ 5 minutes.

Proposed:

Verify on an actual or simulated ESF actuation signal each DG auto-starts from standby condition and:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58 .8 Hz;
b. Achieves steady state voltage ≥ 3950 V and ≤ **4370** V and frequency ≥ **59.5** Hz and ≤ **60.5** Hz; and
c. Operates for ≥ 5 minutes.

SR 3.8.1.15:

Current:

Verify each DG starts and achieves:
a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and
b. Steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Proposed:

Verify each DG starts and achieves:
a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and
b. Steady state voltage ≥ 3950 V and ≤ **4370** V, and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

SR 3.8.1.19:

Current:

Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal:
a. De-energization of ESF buses;
b. Load shedding from ESF buses; and
c. DG auto-starts from standby condition and:
    1. energizes permanently connected loads in ≤ 10 seconds,
    2. energizes auto-connected emergency loads through the safeguards sequence timers,
    3. achieves steady state voltage ≥ 3950 V and ≤ 4580 V,
    4. achieves steady state frequency ≥ 58.8 Hz and ≤ 61 .2 Hz, and
    5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.

Proposed:

Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated ESF actuation signal:
a. De-energization of ESF buses;
b. Load shedding from ESF buses; and
c. DG auto-starts from standby condition and:
    1. energizes permanently connected loads in ≤ 10 seconds,
    2. energizes auto-connected emergency loads through the safeguards sequence timers,
    3. achieves steady state voltage ≥ 3950 V and ≤ **4370** V,
    4. achieves steady state frequency ≥ **59.5** Hz and ≤ **60.5** Hz, and
    5. supplies permanently connected and auto-connected emergency loads for ≥ 5 minutes.

SR 3.8.1.20:

Current:

Verify when started simultaneously from standby condition, each DG achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and
b. Steady state voltage ≥ 3950 V and ≤ 4580 V, and frequency ≥ 58.8 Hz and ≤ 61.2 Hz.

Proposed:

Verify when started simultaneously from standby condition, each DG achieves:

a. In ≤ 10 seconds, voltage ≥ 3950 V and frequency ≥ 58.8 Hz; and
b. Steady state voltage ≥ 3950 V and ≤ **4370** V, and frequency ≥ **59.5** Hz and ≤ **60.5** Hz.

2.4 Regulatory Requirements

The following regulatory requirements are applicable in the review of the proposed LAR:

GDC 13 (General Design Criterion), “Instrumentation and Control,” of Appendix A, “General Design Criteria for Nuclear Power Plants,” to 10 CFR 50 states, in part, that instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, anticipated operational occurrences, and accident conditions as appropriate to ensure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.

GDC 17, “Electric power systems,” requires, in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components that are important to safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a single failure. The offsite power system is required to be supplied by two physically independent circuits that are designed and located so as to minimize, to the extent practical, the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions. In addition, this criterion requires provisions to minimize the probability of losing electric power

from the remaining electric power supplies as a result of loss of power from the unit, the offsite transmission network, or the onsite power supplies.

GDC 18, “Inspection and Testing of Electric Power Systems,” requires that electric power systems that are important to safety must be designed to permit appropriate periodic inspection and testing.

Regulation 10 CFR 50.36(c)(3), “Technical specifications,” requires that TSs include SRs, which are requirements relating to test, calibration, or inspection to assure that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that the limiting conditions for operation will be met.

The following guidance documents were considered during this review.

WCAP-17308-NP-A, “Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances,” Revision 0, dated July 2017 (ADAMS Accession No. ML17215A231).

Regulatory Guide (RG) 1.9, Revision 2, “Selection, Design, and Qualification of Diesel Generator Units Used as Standby (onsite) Electric Power Systems at Nuclear Power Plants,” Revision 2 (ADAMS Accession No. ML12305A253).

RG 1.239, “Licensee Actions to Address Nonconservative Technical Specifications,” dated November 2020 (ADAMS Accession No. ML20294A510), provides a method acceptable to the NRC staff for licensee actions to address nonconservative TSs. RG 1.239 endorses the Nuclear Energy Institute (NEI) guidance in NEI 15-03, Revision 3, “Licensee Actions to Address Nonconservative Technical Specifications,” issued March 2020 (ADAMS Accession No. ML20100G899). The NRC staff notes that in its LAR, the licensee references Administrative Letter 98-10 (AL 98-10), “Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety,” dated December 29, 1998 (ADAMS Accession No. ML031110108). AL-98-10 was superseded by the issuance of RG 1.239.

3.0 TECHNICAL EVALUATION

In the LAR the licensee discussed the accident analyses of Byron and Braidwood units which assumes that, for events that postulate a LOOP at the station, the DGs provide power to the equipment required for safe shutdown and/or accident mitigation functions at the dual unit plants. The performance of the required equipment is dependent on the DG frequency and voltage. The current analyses assume that the steady-state DG frequency is 60 Hz and the steady-state DG voltage is 4.16 kV.

Plant safety analyses make specific assumptions regarding the ECCS flow to provide the core cooling function following any event that requires an accident signal to mitigate the event. Similarly, other support safety systems that require AC power, such as motor-driven pumps, valves and fans can be adversely impacted by voltage and frequency variations. Resistive loads such as heaters can be impacted by applied low voltage. For the events that assume offsite power is lost, the DGs provide power to the ECCS pumps and other support systems.

The NRC staff notes that steady-state DG operation at the extremes of the frequency and voltage limits would have an impact on system design bases including:

- DG loading
- DG fuel oil consumption
- ECCS equipment performance
- Motor-operated valve (MOV) performance
- Support systems and components such as HVAC fan/blower performance

In the LAR, the licensee stated that Westinghouse developed Topical Report WCAP-17308-NP-A, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," Revision 0, dated July 2017, to address the generic nonconservative concerns. The licensee used WCAP-17308-NP-A, in conjunction with the NRC's SE, "Final Safety Evaluation for Pressurized Water Reactor Owners Group Topical Report WCAP-17308-NP, Revision 0, 'Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances'," dated April 17, 2017 (ADAMS Accession No. ML17074A112), to conduct the calculations that support the licensee's technical evaluation.

In the LAR, the licensee states:

> To evaluate the acceptability of the proposed change, EGC [licensee] evaluated the proposed change in accordance with WCAP-17308-NP-A. Specifically, the following items were evaluated for changes in steady-state voltage and frequency:
>
> - Impact on Safety-Related Functions and other Non-Safety-Related Functions
> - Impact on DG Loading
> - Impact on DG Fuel Oil Consumption Calculations
> - Impact on MOV Performance

The NRC staff evaluated the licensee's application to determine whether the proposed changes are consistent with the regulations and plant's design and licensing bases information discussed in Section 2 of this SE. Specifically, the NRC staff reviewed the impact of the proposed change on the following areas.

3.1 Impact on Plant Instrumentation

The NRC staff reviewed the LAR and its supplement to ensure that the plant's instrumentation, including indications and alarms, maintains its capability to perform the required safety function. The staff determined that, since no changes are made to the plant's instrumentation, the proposed changes do not impact the plant's instrumentation. Therefore, the staff finds that the licensee continues to meet GDC 13.

3.2 Impact on the DG Capacity

In its letter dated November 20, 2020, the licensee stated that, since the DGs are capable of operating at tighter tolerance, new analyses were performed to support the new operating tolerances. Typically, DGs are designed to maintain steady-state voltage within a ± 0.5 percent band and a steady-state frequency within a band of ± 0.25 percent when the load varies between no load and full load at power factors between 0.8 and 1.0 over a prime mover speed range of 4 percent. A larger steady voltage and frequency operating band is acceptable if the loads on the DG can operate successfully. The tolerances proposed in the amendment request are bounded by the current TS frequency and voltage variations for the DG. Since the DGs

were designed to operate within the original tolerances, limiting the tolerances to a tighter band was considered acceptable for DG operation. The DG frequency range was reduced to minimize the impact of frequency variation on the operation of connected loads. The licensee stated that the DG electronic governor is capable of maintaining DG speed within a narrow tolerance and periodic surveillances are performed to verify proper operation of the governor using specified test equipment. The TS surveillances will also verify the capability of the voltage regulator to maintain steady-state voltage within the allowable band.

The NRC staff notes that the proposed DG's steady-state operating voltage and frequency ranges are within the DG rating. Thus, the proposed change will not adversely impact the DG's capability of providing its intended safety function. Therefore, the licensee continues to meet the intent of GDC 17 with respect to equipment capability and GDC 18 with respect to testing. The NRC staff concludes that the proposed voltage and frequency range is acceptable for the DG.

3.3 Impact on DG Loading

In the LAR, the licensee stated that the impacts of frequency and voltage variations on the DG loading calculations were evaluated using the methodology outlined in Section 3.1 of WCAP-17308-NP-A. Calculation revisions related to DG loadings were not required since they already reflect DG operation at a bounding frequency of 60.5 Hz. The total DG load for a LOCA coincident with a LOOP is within the DG's continuous duty rating. The continuous rating for each DG is 5500 kW. The DGs currently must be capable of starting and reaching rated voltage (-5 percent) and rated frequency (-2 percent) within 10 seconds upon receipt of an accident signal.

The impacts of frequency and voltage variations on the DG loading are evaluated below.

3.3.1 Impact of Frequency Variation on DG Loading

Section 3.1.1 of WCAP-17308-NP-A states that an underfrequency should not negatively impact the DG loading calculations. By applying the upper bound of frequency (> 60 Hz) allowed by the DG governor to the maximum inductive loads calculated for the DG, an additional power load can be calculated for the potential variation in frequency allowed by the DG governor operating range.

In the letter dated November 20, 2020, the licensee stated that, for a DG underfrequency, the connected loads were evaluated to be within the DG ratings. The licensee followed the guidance in WCAP-17308-NP-A and considered the consequences of the DG operating at the upper bound allowable frequency because an increase in DG operating frequency will increase the synchronous speed of the connected motors will result in a higher motor load. The licensee stated that, by applying the upper bound of frequency allowed by the DG governor (i.e., 60.5 Hz) to inductive loads, an additional power load can be calculated for the potential variation in frequency. The increase in load associated with the increase in frequency can be determined by cubing the percent increase in frequency above nominal. The increase in loads for operation at 60.5 Hz (0.83 percent speed increase) will result in a 2.52 percent increase in motor load for pumps and fans $((60.5\ Hz/60\ Hz)^3 = [1.0252$ or 2.52 percent]). The licensee concluded that a load increase of 2.52 percent for individual motor loads is a realistic increase

for operation at 60.5 Hz. The DG loading will increase by approximately 2.52 percent when operating at 60.5 Hz and was found to be acceptable.

The NRC staff notes that the licensee used the upper bound of frequency (60.5 Hz) to evaluate the load change. This approach is consistent with guidance in WCAP-17308-NP-A. In addition, according to the LAR, the DG loadings reflect DG operation at a bounding frequency of 60.5 Hz. The staff finds that the proposed change in the DG loading is within the capability of DG operation at steady-state conditions. Therefore, the licensee continues to meet the intent of GDC 17 with respect to equipment capacity and capability and GDC 18 with respect to testing. The NRC staff concludes that the proposed change is acceptable for the DG.

3.3.2 Impact of Voltage Variation on DG Loading

Section 3.1.2 of WCAP-17308-NP-A states that the voltage variation of the DG voltage regulator at steady-state operation should be confirmed to be within the allowable operating voltage range for the motors powered by the DG. The effect of voltage variation from the nominal voltage rating of the DG would cause the current of the motor load circuits to decrease or increase accordingly. The net change in power required by the loads on the DG should be evaluated for lower than nominal voltage and frequency conditions where there is a change in the power factor and real and reactive portions of the current. Since the real power is a function of the governor controls and reactive power is controlled by the DG exciter and voltage regulator, the overall impact of DG output voltage should be considered for real and reactive components of the DG loading evaluation.

In its letter dated November 20, 2020, the licensee stated that voltage variation consideration is inherent to the load flow analytical software by including a voltage range. The voltage range associated with the DGs is design input for the respective DGs and loaded into the program as minimum source voltage. The load flow analytical software model is configured to use the minimum source voltage for all voltage and load flow calculations performed. Therefore, resultant loading is based on operation at the minimum source voltage. The licensee further stated that the low voltage limit was previously changed to ensure that emergency diesel generator (EDG) operation at minimum voltage is above the degraded voltage analytical limit. This limit is not being changed in the LAR.

The NRC staff notes that the licensee used the DG minimum voltage to evaluate the load change. This approach is consistent with the guidance in WCAP-17308-NP-A. The staff also notes that the lower bound of the voltage range is not changed by this LAR. The staff finds that the proposed voltage range does not adversely impact the DG loading. Therefore, the licensee continues to meet the intent of GDC 17 with respect to equipment capability and GDC 18 with respect to testing. Based on the above, the NRC staff concludes that the proposed change is acceptable with respect to this issue.

3.4 Impact on DG Fuel Oil Consumption

Section 3.2 of WCAP-17308-NP-A states that a calculated change in DG loading due to steady-state variation in frequency will also require a commensurate evaluation of the impact on fuel oil consumption and stored fuel requirements as a result of the change in loading.

In the LAR, the licensee stated that the current DG fuel consumption calculation accounts for the DGs operating at 60.5 Hz. The calculation accounts for all continuously operating components powered by the DGs during accident conditions, and the loads for all inductive

motors are increased proportionally to the change in speed cubed to account for the increased DG frequency. As the current analysis already accounts for a DG frequency of 60.5 Hz, no additional analysis is required to account for DG steady-state frequency and voltage variations. According to Chapter 9 of the Braidwood and Byron UFSAR (ADAMS Accession No. ML19170A384), the fuel oil storage and transfer system is to provide each of the dual engine generator sets with sufficient bulk storage for 7 days of operation under post-accident generator loads. The day tank storage provides for approximately 72 minutes running time for each engine when loaded.

In the LAR, the licensee states that, "As the current analysis already accounts for an DG frequency of 60.5 Hz, no additional analysis is required to account for DG steady-state frequency and voltage variations." Based on the information provided by the licensee, the NRC staff concludes that the stored fuel is adequate for supplying fuel oil to each for the required operation at full load for 7 days. Therefore, the staff finds that the proposed change is acceptable with respect to DG fuel oil consumption and fuel oil storage requirements.

3.5 Impact on DG Pumps

The NRC staff reviewed the LAR and its supplement to ensure that the plant's DG-driven pumps maintain their capability to perform their required safety functions.

In response to a request for additional information (RAI) dated November 20, 2020, the licensee provided the DG-driven lube oil (LO) pump and jacket water pump flow rates at 59.5 Hz, 60 Hz, and 60.5 Hz, the associated discharge pressures, the minimum required flow rate, the minimum required discharge pressure, and low-pressure alarm settings for each pump. The table provided in the RAI response indicates that the jacket water pump discharge pressure remains above the low-pressure alarm setpoint with the EDG operating at 59.5 Hz, 60 Hz, and 60.5 Hz. The jacket water pump net positive suction head (NPSH) available remains greater than the NPSH required with the DG operating at 59.5 Hz, 60 Hz, and 60.5 Hz. The jacket water pump flow rate varies by 0.81 percent.

The nominal rating of the LO pump at rated DG speed is 670 gallons per minute (gpm) and 90 pounds per square inch gauge (psig) discharge pressure. System performance is monitored by the pressure delivered to the DG bearings and LO system operating temperatures. A low-pressure alarm is provided at 35 psig and an engine trip/alarm occurs at 30 psig. The engine trip at 30 psig is bypassed during the emergency mode operation of the DG.

Sufficient NPSH for the LO pump is ensured by maintaining oil level in the engine crankcase. This parameter is monitored during DG operation and oil is added if level is one inch below nominal level. An alarm is provided when the engine crankcase level is two inches below nominal level. The LO pump flow rate varies by 0.9 percent at 59.5 Hz and 60.5 Hz.

The NRC staff finds that changes in flow rate of 0.81 percent for the jacket water pump and 0.9 percent for the LO pump are negligible. The NRC staff finds that there is adequate margin in NPSH available for the jacket water pump and LO pump such that the jacket water pump and LO pump can be expected to continue to maintain adequate NPSH for DG operation at 59.5 Hz, 60 Hz, and 60.5 Hz.

In its letter dated November 20, 2020, the licensee provided the diesel oil (DO) transfer pump flow rate at 59.5 Hz, 60 Hz, and 60.5 Hz and the associated discharge pressures. The 2B DO transfer pump at both the Braidwood and Byron stations have the highest discharge pressure

and were listed in the RAI response table. The table indicated that the DO transfer pump flow rate at 59.5 Hz was 33 percent greater than the minimum performance rating of 20 gpm at Braidwood and 36.5 percent greater at Byron.

The licensee also provided a comparison of the required NPSH and available NPSH at 59.5 Hz, 60 Hz, and 60.5 Hz. When the suction line pressure drop is conservatively adjusted for a bounding flow rate of 35 gpm, the resulting pressure drop is 0.4 pounds per square inch differential and the calculated inlet pressure is 5.39 pounds per square inch absolute and adequate pump inlet pressure remains.

The NRC staff finds that there is adequate margin in the pump inlet pressure for the DO transfer pump such that the DO transfer pump can be expected to continue to maintain adequate NPSH for DG operation at 59.5 Hz, 60 Hz, and 60.5 Hz. The NRC staff also finds that there is adequate margin in the DO transfer pump flow rate at 59.5 Hz.

In response to an RAI dated November 20, 2020, the licensee stated that no relief valves on the discharge lines of the DO transfer pump and engine driven LO pump will lift due to the higher pressure when the DG is operating at 60.5 Hz. The licensee stated that for the DO transfer pump, the maximum expected discharge pressure at Braidwood and Byron will be below the relief valve setpoint at a DG speed of 60.5 Hz as the increase in discharge pressure to the higher DG frequency of 60.5 Hz is small. The licensee stated that for the engine driven LO pump, the maximum expected values for LO strainer and LO filter differential pressure will be below the relief valve differential pressure setpoint, as the increase in differential pressure to the higher DG frequency of 60.5 Hz is small. The licensee stated that the engine driven jacket water pump does not have any relief valves downstream of the pump. Additionally, the licensee states that no isolation valves exist in the system that would result in deadheading the pump, and as the pump is a low-head, high flow pump it would not over-pressurize the system in the unlikely event that it was deadheaded.

The NRC staff finds that the pump discharge relief valve set pressures are set with sufficient margin so that the negligible increase in pump discharge pressure due to the higher DG frequency of 60.5 Hz will not cause the relief valves to lift and prevent the DO transfer pump and engine driven LO pump from performing their design functions.

Based on the above, the NRC staff determined that the proposed changes to the DG frequency tolerance do not impact the DG-driven pumps. Therefore, the NRC staff finds that the licensee continues to meet GDC 17.

3.6 Impact on ECCS Equipment

As discussed in WCAP-17308-NP-A, the variation in voltage and frequency can affect the operating temperature, power factor and reactive power needs, and starting torque of a motor. AC motors operate successfully under running conditions at rated load with a variation in the voltage or the frequency up to the following:

a. Plus or minus 10 percent of rated voltage with rated frequency for induction motors.
b. Plus or minus 6 percent of rated voltage with rated frequency for universal motors.
c. Plus or minus 5 percent of rated frequency with rated voltage.
d. A combined variation in voltage and frequency of 10 percent (sum of absolute values) of the rated values, provided the frequency variation does not exceed plus or minus 5

percent of rated frequency, and the voltage variation of universal motors (except fan motors) does not exceed plus or minus 6 percent of rated voltage.

The NRC staff reviewed the LAR and its supplement to ensure that the plant's ECCS and safety-related pumps maintain their capability to perform their required safety functions. The ECCS consists of two high-head centrifugal charging pumps, two intermediate-head SI pumps, two low-head RHR pumps, and two CS pumps.

The licensee used the methods in WCAP-17308-NP-A to generate or revise calculations to address the DG voltage and frequency variances. The calculations conclude that the affected pumps meet the revised acceptance criteria. All affected pumps fall within analytical limits; therefore, they have sufficient flow rate, discharge pressure, and NPSH margin after the proposed frequency and voltage tolerance change. Additionally, the licensee revised calculations to determine the maximum and minimum inservice testing ranges for comprehensive testing of the motor-driven auxiliary feedwater pumps based on the maximum and minimum analytical pump curves. The curves were adjusted based on instrument uncertainty during testing and also for DG voltage and frequency tolerances.

Since the licensee used the NRC-approved methods in WCAP-17308-NP-A to calculate the pumps' flow rates, discharge pressures, and NPSH margins, the NRC staff finds that the ECCS pumps and safety-related pumps discussed above will have adequate flow rate, discharge pressure, and NPSH margin with the revised acceptance criteria after the proposed frequency and voltage tolerance change.

The CCW system, which includes pumps 1(2)CC01PA/B and 0CC01P, is designed to provide 5000 gpm of flow through the RHR heat exchangers. Since the RHR heat exchanger throttle valves are adjusted to approximately 35 percent open in Braidwood and Byron site procedures, significant flow adjustment capability exists for the valves and therefore the CCW system. If flow is less than 5000 gpm through the RHR heat exchanger after the CCW system non-essential loads are isolated per Braidwood and Byron site procedures, operators would be dispatched by those procedures to adjust the RHR heat exchanger throttle valves to achieve the required flow. No procedure revisions or acceptance criteria revisions are required for the CCW system.

The NRC staff finds that the CCW pumps will continue to provide adequate flow to the RHR heat exchanger with the proposed DG voltage and frequency variances, as significant flow adjustment capability exists by adjusting valves in the CCW system.

The SX system, which includes pumps 1(2)SX01PA/B, is designed such that flows are widely adjustable. The reactor containment fan cooler (RCFC) throttle valves are located inside containment and would not be accessible during accident conditions. Therefore, the SX pump flow "As Left" values documented within the Braidwood and Byron site surveillance procedures will be increased by at least 1.4 percent to compensate for the potential 1.4 percent reduction in flow due to DG frequency and voltage variation. This will ensure that the required minimum SX flow to each RCFC would continue to be met at DG minimum steady-state frequency and voltage conditions.

The NRC staff finds that the SX pumps will continue to provide adequate flow to each RCFC with the proposed changes, as the 1.4 percent compensation will ensure the minimum required SX flow to each RCFC at DG minimum steady-state frequency and voltage conditions.

In addition, assuming 3-4 percent voltage drop from the DG output terminals to the input voltage at load terminals and considering the additional margin associated with nominal rated voltage of universal motors, the NRC staff finds the proposed voltage and frequency range to be within the allowable range for safety-related motors at Byron and Braidwood and therefore acceptable.

Based on the above, the NRC staff determined that the proposed changes to DG voltage and frequency tolerance do not adversely impact the ECCS and safety-related pumps. Therefore, the NRC staff finds that GDC 17 is met.

3.7 Impact on MOV Performance

The NRC staff reviewed the LAR and its supplement to ensure that the plant's MOV performance will not be impacted by the proposed changes to DG voltage and frequency variances.

The licensee's calculations addressed the effects of the TS-allowed variation in DG frequency and voltage on MOVs. The allowed frequency and voltage variations are being reduced. The calculations analyze the effects of DG frequency variations of ± 0.5 Hz (± 0.83 percent) and voltage variations of ± 5 percent.

As part of prior evaluations for NRC Generic Letter (GL) 89-10, "Safety-Related Motor-Operated Valve Testing and Surveillance," (including Supplements 1 through 7) (ADAMS Accession Nos. ML20246E191, ML031140169, ML031150307, ML031150326, ML031150330, ML031140103, ML031140111 and, ML031150334, respectively) and NRC GL 96-05, "Periodic Verification of Design Basis Capability of Safety-Related Motor-Operated Valves," (ADAMS Accession No. ML031110010) the MOVs were evaluated for the worst-case degraded voltage conditions. These conditions are lower than the proposed DG low voltage condition of 3950 V. Therefore, the calculations evaluating the worst-case degraded voltage conditions are acceptable and do not need to be revised.

WCAP-17308-NP-A, Section 4.1, states that reduced DG frequency will slow the MOV motor speed and increase valve stroke time. The WCAP concludes that the impact of increased MOV stroke time caused by a decrease in motor speed due to a lower than nominal frequency will not adversely affect MOV performance because the proposed change in DG frequency, and motor speed, is insignificant. An increase in DG frequency would result in a faster MOV stroke time. As the faster stroke time impact is insignificant due to the small increase in DG frequency, WCAP-17308-NP-A also concludes that an increase in motor speed due to a higher than nominal DG frequency will not adversely affect valve performance. Therefore, these were not evaluated further by the licensee.

Reduced DG voltage will decrease the torque / thrust capabilities of the MOVs. As part of calculations performed to comply with GL 96-05, the MOV calculations are based on worst-case degraded voltage conditions. As the proposed DG steady-state undervoltage is greater than the degraded voltage condition analyzed in the MOV calculations, additional analysis is not required.

The licensee stated that increased DG voltage will increase the torque capabilities of the MOVs. As the MOV torque will be limited by either a torque switch or limit switch setting, this will not impact normal MOV operation. Increased DG voltage beyond the nominal voltage rating of the MOV motors would cause the current of the motor load circuits to decrease. Voltage variation of the DG at steady-state operating conditions is confirmed to be within the allowable operating

voltage range of the MOV motors to ensure there is no adverse impact on the MOV motors from the maximum expected steady-state voltage in accordance with WCAP-17308-NP-A, Section 4.3.

Based on pump characteristics, DG over-frequency will increase pump discharge pressure, which will raise the associated piping system line pressure. This increase in line pressure creates a greater differential pressure across an MOV. For the affected systems, the system head calculations that determine the differential pressure were based on the TS minimum and maximum allowable pump curves. The pump inservice testing acceptance criteria and comparison to existing test results were evaluated using the methodology outlined in Section 4.4 of WCAP-17308-NP-A, and it was determined that the maximum allowed pump curves are not being increased. The TS limits are maintained, but the test acceptance criteria are being adjusted for variation in the pump motor frequency so that there is a more limiting acceptance window. Because of this, the design system operating pressures are not being increased.

Therefore, the design differential pressure across the MOVs will not be increased due to increased DG frequency, and the MOVs are not impacted by the reanalysis of the pumps.

The NRC staff finds that the licensee's review of their calculations show that the reduced DG frequency will not adversely affect MOV performance as the change in MOV speed will be negligible, and the design differential pressure across the MOVs will not be increased. This demonstrates that the proposed changes to DG voltage and frequency variances will not impact MOV performance. Therefore, the NRC staff finds that GDC 17 continues to be met.

3.8 Impact on Other Equipment

The licensee reviewed other non-rotating equipment for impact of voltage and frequency variations. In the LAR, the licensee states:

> Other miscellaneous, non-rotating equipment evaluated includes battery chargers, inverters, heaters (including pressurizer heaters) and miscellaneous 120 V loads. The purpose of the battery chargers and inverters is to ensure that Safety-Related instrument power will be available in the event of a loss of the normal power source. The purpose of the heaters is to maintain a habitable environment in the Main Control Room (MCR). The pressurizer heaters ensure sufficient heater capacity is available to stabilize pressurizer pressure and preclude boiling in the RCS following LOOP. The loads fed from the 120 V AC distribution system include solenoids, instrument panels, smoke detectors, level switches, radiation monitoring equipment, damper actuators, HVAC process instruments, MCR chiller devices, Post-LOCA hydrogen monitoring panel, relays, and Heated Junction Thermocouple (HJTC) panel.

In the letter dated November 20, 2020, the licensee provided further clarification on the methodology used for evaluating variations in DG voltage and frequency on miscellaneous loads. The response states:

> The following equipment was listed separately in the licensee letter dated June 26, 2020, to highlight the evaluation of the additional loads consistent with the requirements specified in the SE for WCAP-17308-NP.
>
> - 125 VDC [direct current] Battery Chargers

- UPS Inverters
- Required Heaters (including pressurizer heaters)
- 120 VAC Loads
- Control Room Refrigeration Units and MCR chilled water (WO) pumps
- Containment Hydrogen Monitoring System Sample pumps
- Lighting
- Main Steam and Feedwater Isolation Valves

The licensee evaluated the above equipment for operation under steady-state conditions with DG voltage and frequency at the extremes of allowable bands. The licensee used vendor information to determine the capability of the miscellaneous electrical loads to operate and concluded that the effect of DG frequency and voltage variance was acceptable.

The licensee stated that other non-rotating equipment has been evaluated for adequate capacity and capability to perform the design basis safety functions as specified in the current licensing basis of the Byron and Braidwood units. Based on the licensee's conclusion that design basis requirements will be maintained, the NRC staff finds the proposed change in the DG voltage and frequency tolerances to be acceptable.

4.0 CONCLUSION

The NRC staff reviewed the proposed changes to Braidwood, and Byron, TS 3.8.1 to revise the voltage and frequency acceptance criteria for certain steady-state DG surveillance testing. The changes would reduce the tolerance for DG frequency during steady-state operation from ± 2 percent (i.e., 58.8 Hertz (Hz) to 61.2 Hz) to ± 0.83 percent (i.e., 59.5 Hz to 60.5 Hz) and by modifying the DG voltage setpoint tolerance during steady-state operation from + 10/- 5 percent (i.e., 3950 V) to 4580 V) to ± 5 percent (i.e., 3950 V to 4370 V). Based on the above technical evaluation, the NRC staff finds that the proposed changes will not adversely impact the capacity and capability of the safety-related electrical equipment required for accident mitigation and plant shutdown. The proposed changes meet the requirements of 10 CFR 50.36(c)(3) because the proposed SR test acceptance criteria for DG steady-state frequency and voltage provide reasonable assurance that the necessary quality of systems and components is maintained, that facility operation will be within safety limits, and that Limiting Condition for Operation 3.8.1, "AC Sources – Operating," will be met. The NRC staff also concludes that the proposed TS changes provide reasonable assurance that the Byron and Braidwood licenses will continue to comply with the intent of GDC 13 with regard to the plant's instrumentation; GDC 17 with regard to the equipment capacity and capability; GDC 18 with regard to testing. Based on the licensee's acceptable correction of the nonconservative TS, the NRC staff finds that the guidance in RG 1.239 is met. In conclusion, the NRC staff concludes that the proposed changes described in Section 2.3 of this SE are acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendment on February 19, 2021. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to installation or use of a facility's components located within the restricted area as defined in 10 CFR Part 20 and changes

surveillance requirements. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (85 FR 48571; August 11, 2020). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) there is reasonable assurance that such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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SUBJECT: BRAIDWOOD STATION, UNITS 1 AND 2, AND BYRON STATION, UNIT NOS 1 AND 2 - ISSUANCE OF AMENDMENTS NOS. 221, 221, 224 AND 224, REGARDING TECHNICAL SPECIFICATIONS 3.8.1, "AC SOURCES-OPERATING" (EPID L-2020-LLA-0141) DATED APRIL 2, 2021

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