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

April 27, 2016

Mr. Brian D. Boles
Site Vice President
FirstEnergy Nuclear Operating Company
Mail Stop A-DB-3080
5501 North State, Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT REVISING EMERGENCY DIESEL GENERATOR MINIMUM VOLTAGE AND FREQUENCY ACCEPTANCE CRITERIA (CAC NO. MF6060)

Dear Mr. Boles:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 291 to Renewed Facility Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, Unit No. 1. The amendment is in response to your application dated April 1, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15091A143), as supplemented by letters dated October 14, 2015, and February 19, 2016 (ADAMS Accession Nos. ML15287A251 and ML16050A409, respectively).

The amendment revises certain technical specification minimum voltage and frequency acceptance criteria for emergency diesel generator testing.

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

Sincerely,

Blake Purnell, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosures:
1. Amendment No. 291 to NPF-3
2. Safety Evaluation

cc w/encls: Distribution via Listserv

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

FIRSTENERGY NUCLEAR OPERATING COMPANY

AND

FIRSTENERGY NUCLEAR GENERATION, LLC

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

DOCKET NO. 50-346

Amendment No. 291
Renewed License No. NPF-3

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

   A. The application for amendment filed by FirstEnergy Nuclear Operating Company (FENOC, the licensee) dated April 1, 2015, as supplemented by letters dated October 14, 2015, and February 19, 2016, 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-3 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 291, are hereby incorporated in the renewed license. FENOC shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented by June 15, 2016.

FOR THE NUCLEAR REGULATORY COMMISSION

Justin C. Poole, Acting Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

Date of Issuance: April 27, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 291

RENEWED FACILITY OPERATING LICENSE NO. NPF-3

DOCKET NO. 50-346

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

Remove	Insert
License NPF-3	License NPF-3
Page L-5	Page L-5
TS pages	TS pages
3.8.1-5	3.8.1-5
3.8.1-6	3.8.1-6
3.8.1-9	3.8.1-9
3.8.1-11	3.8.1-11
3.8.1-12	3.8.1-12

2.C. This renewed license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I: Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; 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

FENOC is authorized to operate the facility at steady state reactor core power levels not in excess of 2817 megawatts (thermal). Prior to attaining the power level, Toledo Edison Company shall comply with the conditions identified in Paragraph (3) (o) below and complete the preoperational tests, startup tests and other items identified in Attachment 2 to this license in the sequence specified. Attachment 2 is an integral part of this renewed license.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 291, are hereby incorporated in the renewed license. FENOC shall operate the facility in accordance with the Technical Specifications.

(3) Additional Conditions

The matters specified in the following conditions shall be completed to the satisfaction of the Commission within the stated time periods following the issuance of the renewed license or within the operational restrictions indicated. The removal of these conditions shall be made by an amendment to the renewed license supported by a favorable evaluation by the Commission:

(a) FENOC shall not operate the reactor in operational Modes 1 and 2 with less than three reactor coolant pumps in operation.

(b) Deleted per Amendment 6

(c) Deleted per Amendment 5

SURVEILLANCE REQUIREMENTS

	SURVEILLANCE	FREQUENCY
SR 3.8.1.1	Verify correct breaker alignment and indicated power availability for each offsite circuit.	7 days
SR 3.8.1.2	----------NOTES---------- 1. All EDG starts may be preceded by an engine prelube period and followed by a warmup period prior to loading. 2. A modified EDG start involving idling and/or gradual acceleration to synchronous speed may be used for this SR as recommended by the manufacturer. When modified start procedures are not used, the time, voltage, and frequency tolerances of SR 3.8.1.8 must be met. ----------	
	Verify each EDG starts from standby conditions and achieves steady state voltage ≥ 4088 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	31 days
SR 3.8.1.3	----------NOTES---------- 1. EDG 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 EDG at a time. 4. This SR shall be preceded by and immediately follow, without shutdown, a successful performance of SR 3.8.1.2 or SR 3.8.1.8. ----------	
	Verify each EDG is synchronized and loaded and operates for ≥ 60 minutes at a load ≥ 2340 kW and ≤ 2600 kW.	31 days
SR 3.8.1.4	Verify each day tank contains ≥ 4000 gal of fuel oil.	31 days

SURVEILLANCE REQUIREMENTS (continued)

	SURVEILLANCE	FREQUENCY
SR 3.8.1.5	Check for and remove accumulated water from each day tank.	31 days
SR 3.8.1.6	Verify interval between each sequenced load block is within ± 10% of design interval for each emergency load sequencer and each emergency time delay relay.	31 days
SR 3.8.1.7	Verify the fuel oil transfer system operates to transfer fuel oil from fuel oil storage tank to the day tank.	92 days
SR 3.8.1.8	----------NOTE---------- All EDG starts may be preceded by an engine prelube period. ---------- Verify each EDG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 4070 V and frequency ≥ 59.5 Hz; and b. Steady state voltage ≥ 4088 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	184 days

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.11	----------NOTES---------- 1. All EDG starts may be preceded by an engine prelube period. 2. This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal: a. De-energization of essential buses; b. Load shedding from essential buses; and c. EDG auto-starts from standby condition and: 1. Energizes permanently connected loads in $\leq$ 10 seconds; 2. Energizes auto-connected shutdown loads through individual time delay relays; 3. Maintains steady-state voltage $\geq$ 4088 V and $\leq$ 4400 V; 4. Maintains steady-state frequency $\geq$ 59.5 Hz and $\leq$ 60.5 Hz; and 5. Supplies permanently connected and auto-connected shutdown loads for $\geq$ 5 minutes.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.14	----------NOTES---------- 1. This Surveillance shall be performed within 5 minutes of shutting down the EDG after the EDG has operated ≥ 1 hour loaded ≥ 2340 kW and ≤ 2600 kW. Momentary transients outside of load range do not invalidate this test. 2. All EDG starts may be preceded by an engine prelube period. --- Verify each EDG starts and achieves: a. In ≤ 10 seconds, voltage ≥ 4070 V and frequency ≥ 59.5 Hz; and b. Steady state voltage ≥ 4088 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.	24 months

SURVEILLANCE REQUIREMENTS (continued)

SURVEILLANCE		FREQUENCY
SR 3.8.1.15	----------NOTES---------- 1. All EDG starts may be preceded by an engine prelube period. 2. This Surveillance shall not normally be performed in MODE 1, 2, 3, or 4. However, portions of the Surveillance may be performed to reestablish OPERABILITY provided an assessment determines the safety of the plant is maintained or enhanced. Credit may be taken for unplanned events that satisfy this SR. ---------- Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated SFAS actuation signal: a. De-energization of essential buses; b. Load shedding from essential buses; c. EDG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds; 2. Energizes auto-connected emergency loads through load sequencer and individual time delay relays; 3. Achieves steady-state voltage ≥ 4088 V and ≤ 4400 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.	24 months

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO

AMENDMENT NO. 291 TO RENEWED FACILITY OPERATING LICENSE NO. NPF-3

FIRSTENERGY NUCLEAR OPERATING COMPANY

FIRSTENERGY NUCLEAR GENERATION, LLC

DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1

DOCKET NO. 50-346

1.0 INTRODUCTION

By application dated April 1, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15091A143), as supplemented by letters dated October 14, 2015, and February 19, 2016 (ADAMS Accession Nos. ML15287A251 and ML16050A409, respectively), FirstEnergy Nuclear Operating Company (FENOC, the licensee) submitted a license amendment request for the Davis-Besse Nuclear Power Station (Davis-Besse), Unit No. 1. The supplemental letters dated October 14, 2015, and February 19, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC, the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on July 7, 2015 (80 FR 38759).

The proposed amendment would revise certain surveillance requirements (SRs) for Technical Specification (TS) 3.8.1, "AC [Alternating Current] Sources – Operating." Specifically, the changes would revise the minimum voltage and frequency acceptance criteria for emergency diesel generator (EDG) testing. The proposed amendment is intended to resolve a non-conservative TS. The application states that the acceptance criteria for TS 3.8.1 are being administratively controlled per NRC Administrative Letter 98-10, "Dispositioning of Technical Specifications that are Insufficient to Assure Plant Safety" (ADAMS Accession No. ML031110108).

2.0 REGULATORY EVALUATION

2.1 System Description

The onsite Class 1E ac and direct current (dc) electrical power distribution systems are divided by train into two redundant and independent systems. The ac electrical power system for each train consists of a primary 4.16 kilovolt (kV) essential bus and secondary 480 volt (V) and 120 V

buses, distribution panels, motor control centers, and load centers. Each 4.16 kV essential bus has at least one separate and independent offsite source of power as well as a dedicated onsite EDG. Each 4.16 kV essential bus is normally connected to a preferred offsite source. After a loss of the preferred offsite power source to a 4.16 kV essential bus, a fast transfer to the alternate offsite source is accomplished. If all offsite sources are unavailable, the onsite EDG supplies power to the 4.16 kV essential bus.

The normal offsite power source consists of two 345 kV overhead lines to two 345 kV to 13.8 kV startup transformers that are capable of supplying all essential loads for safe shutdown of the plant. The safety-related buses are supplied from two bus tie transformers which step down the voltage from 13.8 kV to 4.16 kV. Each bus tie transformer normally supplies one essential and one nonessential 4.16 kV bus and is available as a reserve source for the other two 4.16 kV buses.

Two redundant EDGs, each rated at 2,600 kilowatt (continuous), are provided as onsite standby power sources to supply their respective essential buses upon loss of the normal and reserve power sources. In the event of loss of offsite power, bus load shedding, isolation and bus transfer to the EDG and pickup of critical loads is automatic. The EDGs are capable of attaining rated frequency and voltage in approximately 10 seconds after the engine start signal is received. The application states that each of the two EDGs has the capability to:

- Supply continuously the sum of the loads on the essential 4.16 kV bus needed to be powered at any one time.

- Start and accelerate to rated speed in the required sequence its dedicated engineered safety features loads. At no time during the loading sequence, will the frequency and voltage decrease to less than 95 percent of nominal (0.95 x 60 Hz [hertz] = 57 Hz) and 75 percent of nominal (0.75 x 4160 V = 3120 V), respectively, except that during the first step in the required loading sequence there may be a voltage dip below 75 percent of nominal lasting for a few cycles due to the essential unit substation transformer excitation inrush.

2.2 Description of Proposed Changes to Technical Specifications

The licensee proposes to change SRs 3.8.1.8.a and 3.8.1.14.a by increasing the EDG minimum voltage acceptance criteria from 4031 V to 4070 V and by increasing the EDG minimum frequency acceptance criteria from 58.8 Hz to 59.5 Hz. SRs 3.8.1.8.a and 3.8.1.14.a are related to the minimum voltage and frequency required for a permissive signal for closure of EDG output breaker. The licensee also proposes to change SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3 by increasing the EDG steady state minimum voltage acceptance criteria from 3744 V to 4088 V, with no change in the frequency criteria.

The licensee proposes to change the wording of these SRs in TS 3.8.1 as follows:

Current SR 3.8.1.2	Verify each EDG starts from standby conditions and achieves steady state voltage ≥ 3744 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.

Revised SR 3.8.1.2	Verify each EDG starts from standby conditions and achieves steady state voltage ≥ 4088 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.
Current SR 3.8.1.8	Verify each EDG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 4031 V and frequency ≥ 58.8 Hz; and b. Steady state voltage ≥ 3744 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.
Revised SR 3.8.1.8	Verify each EDG starts from standby condition and achieves: a. In ≤ 10 seconds, voltage ≥ 4070 V and frequency ≥ 59.5 Hz; and b. Steady state voltage ≥ 4088 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.
Current SR 3.8.1.11	Verify on an actual or simulated loss of offsite power signal: a. De-energization of essential buses; b. Load shedding from essential buses; and c. EDG auto-starts from standby condition and: 1. Energizes permanently connected loads in ≤ 10 seconds; 2. Energizes auto-connected shutdown loads through individual time delay relays; 3. Maintains steady-state voltage ≥ 3744 V and ≤ 4400 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.
Revised SR 3.8.1.11	Verify on an actual or simulated loss of offsite power signal: a. De-energization of essential buses; b. Load shedding from essential buses; and c. EDG auto-starts from standby condition and:

1. Energizes permanently connected loads in ≤ 10 seconds;

2. Energizes auto-connected shutdown loads through individual time delay relays;

3. Maintains steady-state voltage ≥ 4088 V and ≤ 4400 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.

Current SR 3.8.1.14

Verify each EDG starts and achieves:

a. In ≤ 10 seconds, voltage ≥ 4031 V and frequency ≥ 58.8 Hz; and

b. Steady state voltage ≥ 3744 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.

Revised SR 3.8.1.14

Verify each EDG starts and achieves:

a. In ≤ 10 seconds, voltage ≥ 4070 V and frequency ≥ 59.5 Hz; and

b. Steady state voltage ≥ 4088 V and ≤ 4400 V, and frequency ≥ 59.5 Hz and ≤ 60.5 Hz.

Current SR 3.8.1.15

Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated SFAS actuation signal:

a. De-energization of essential buses;

b. Load shedding from essential buses;

c. EDG auto-starts from standby condition and:

1. Energizes permanently connected loads in ≤ 10 seconds;

2. Energizes auto-connected emergency loads through load sequencer and individual time delay relays;

3. Achieves steady-state voltage ≥ 3744 V and ≤ 4400 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.

Revised SR 3.8.1.15 Verify on an actual or simulated loss of offsite power signal in conjunction with an actual or simulated SFAS actuation signal:

a. De-energization of essential buses;

b. Load shedding from essential buses;

c. EDG auto-starts from standby condition and:

1. Energizes permanently connected loads in ≤ 10 seconds;

2. Energizes auto-connected emergency loads through load sequencer and individual time delay relays;

3. Achieves steady-state voltage ≥ 4088 V and ≤ 4400 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.

2.3 Regulatory Review

The NRC staff used the following licensing and regulatory requirements in its review of the application.

Appendix 3D of the Davis-Besse updated final safety analysis report (UFSAR) (ADAMS Accession No. ML14339A821) states that Davis-Besse meets the intent of the Appendix A, "General Design Criteria [GDC] for Nuclear Power Plants," in Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, as published in the *Federal Register* on February 20, 1971, and as amended in the *Federal Register* on July 7, 1971.

GDC 17, "Electric power systems," states, in part, that nuclear power plants shall have onsite and offsite electric power systems to permit the functioning of structures, systems, and components that are important safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a single failure. In addition, this criterion requires the inclusion of provisions to minimize the probability of losing electric power from the remaining electric power supplies as a result of loss of power generated by the nuclear power unit, the offsite transmission network, or the onsite power supplies.

GDC 18, "Inspection and testing of electric power systems," states, in part, that electric power systems that are important to safety must be designed to permit appropriate periodic inspection and testing.

The regulations in 10 CFR 50.36(c)(3) require 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.

NRC Safety Guide 9, "Selection of Diesel Generator Set Capacity for Standby Power Supplies," dated March 1971 (ADAMS Accession No. ML12305A251), [1] describes an acceptable basis for the selection of diesel generator sets of sufficient capacity and margin to implement GDC 17. This Safety Guide has been used by the licensee to develop the acceptance criteria for EDG voltage and frequency requirements.

The Davis-Besse UFSAR Section 9.5.4.2 states that the diesel oil system meets or exceeds all requirements of the Institute of Electrical and Electronics Engineers Standard 308, "Criteria for Class 1E Electric Systems for Nuclear Power Generating Stations," 1971 Edition, and that the system meets American National Standards Institute (ANSI) proposed standard N195, "Fuel Oil Systems for Standby Diesel Generators," 1974 Draft, with exceptions. However, for this review, the NRC staff considered the more recent guidance in Regulatory Guide (RG) 1.137, Revision 2, "Fuel Oil Systems for Emergency Power Supplies" (ADAMS Accession No. ML12300A122), as it describes methods acceptable to the NRC staff for complying with the Commission's regulations regarding fuel oil systems for EDGs. Specifically, RG 1.137 sets forth acceptable methods for calculation of fuel oil storage requirements based on ANSI/American Nuclear Society Standard 59.51-1997, "Fuel Oil Systems for Safety-Related Emergency Diesel Generators."

3.0 TECHNICAL EVALUATION

The licensee's application states that during a review of operating experience, potentially non-conservative parameters were identified in EDG SRs in TS 3.8.1. The licensee determined that:

1. the minimum voltage limit in SRs 3.8.1.8.a and 3.8.1.14.a was insufficient to ensure automatic closure of the EDG output circuit breaker and should be increased to 4070 V;

2. the minimum steady state voltage specified in SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3 should be increased to 4088 V to ensure, by meeting Safety Guide 9 criteria, that the EDG provides adequate voltage to start safety-related equipment during the loading sequence for a design-basis event; and

3. the minimum required frequency for EDG operability in SRs 3.8.1.8.a and 3.8.1.14.a should be increased to 59.5 Hz to be consistent with the minimum steady state frequency requirement.

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[1] Superseded by NRC Regulatory Guide 1.9, "Selection, Design, Qualification, and Testing of Emergency Diesel Generator Units Used as Class 1E Onsite Electric Power Systems at Nuclear Power Plants."

The licensee performed a detailed analysis of the Davis-Besse electrical system to demonstrate that the EDGs, used as a standby power supply, have the capability to: (1) start and accelerate a number of large motor loads in rapid succession, and be able to sustain the loss of any such load, and (2) continuously supply power to all the loads needed at any one time. This analysis forms the basis for the EDG voltage and frequency limits specified in the SRs for TS 3.8.1. The licensee stated that the proposed minimum EDG voltage and frequency parameters are adequate to start and run equipment that is energized immediately after closure of EDG output breaker and also envelope the allowable minimum and maximum voltage and frequency deviations recommended in NRC Safety Guide 9.

Attachments D and E to the application provided excerpts from the licensee's "AC Power System Analysis" which evaluated the Davis-Besse ac power system when powered from the offsite power system via the start-up transformers or the unit auxiliary transformer. Attachment D to the application summarizes the acceptable operating limits for plant equipment that is energized via the ac power system. Attachment E to the application provides bus voltage acceptance criteria and summary result tables. The licensee summarized the operational requirements (limits) for EDG voltage and frequency during transient loading in Attachment H to the application. This summary documents the EDG transient loading analysis that is based on equipment operability limits.

3.1 Voltage and Frequency Analysis for EDG Steady State Operation

The licensee proposes to change the EDG minimum steady state voltage acceptance criteria specified in SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3 from 3744 V to 4088 V. The licensee stated that the more restrictive minimum steady state voltage ensures that during EDG loading, the voltage response recommendations of Safety Guide 9 can be satisfied. No changes are proposed to the maximum steady state voltage or minimum and maximum steady state frequency values specified in SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3.

A transient analysis computer model was used by the licensee to analyze the voltage and frequency response of the EDGs during the loading sequence associated with the design-basis loss-of-coolant accident (LOCA) with coincident loss of offsite power (LOOP). The electrical system response was evaluated with the EDG frequency operating at its allowed minimum and maximum steady state frequency setpoints (59.5 Hz and 60.5 Hz) and the EDG voltage setpoint at its minimum allowable voltage (4088 V) to validate Safety Guide 9 recommendations for acceptable voltage and frequency variations. Regulatory Position C.4 of Safety Guide 9 states that voltage should be restored to within 10 percent of nominal and frequency should be restored to within 2 percent of nominal in less than 40 percent of each load sequence time interval. The analysis concluded that the EDGs are capable of starting the dedicated engineered safety feature loads in the required sequence and satisfy Regulatory Position C.4 of Safety Guide 9.

The EDG loading tables (UFSAR Table 8.3-1) provide the sequence for starting and energizing engineered safety feature loads following a loss of power. There are several large motors that are started during EDG sequencer loading steps 1 and 1a. By letter dated October 14, 2015, the licensee summarized the results of the design-basis LOOP/LOCA analyses, and provided acceleration times for large motors and assumptions made for voltage and frequency

parameters at the point of EDG breaker closure. The NRC staff reviewed the acceleration times for component cooling water pumps 1 and 2 and make-up pumps 1 and 2; the lists of the motor-operated valves that are required to operate during load sequencer steps 1 and 1a; and the analysis for manually starting the 800 horsepower (hp) motor-driven feedwater pump (MDFP). The licensee stated that the operating procedure requires a voltage between 4200 V and 4250 V on the bus prior to manually starting the MDFP. The analysis evaluated starting the MDFP motor with a nominal voltage of 4200 V and concluded that the EDGs are capable of starting the MDFP without dropping the bus voltage below 75 percent of nominal and the frequency below 95 percent of nominal, which meets the minimum Safety Guide 9 criteria.

The NRC staff finds that the evaluations performed for additional loading for the large MDFP demonstrate that the voltage drop due to the loading of large motors on the EDG will not adversely impact safety-related equipment and is therefore acceptable.

By letter dated January 20, 2016 (ADAMS Accession No. ML16019A397), the NRC staff requested information on the operating mode (droop or emergency) of the EDG required to facilitate voltage variation, since the operating procedure has specific voltage requirements for starting the MDFP. In its letter dated February 19, 2016, the licensee stated that the MDFP operating procedure does not provide steps to vary the EDG output voltage if the bus voltage is outside the 4200 V to 4250 V range. The plant procedures for monthly surveillances of the EDGs require the operators to verify that the EDG output voltage is set within 4200 V to 4250 V. The licensee also stated:

> Inconsistencies were identified between the MDFP normal operating procedure and the emergency procedure that would start the MDFP. Requirements for loading the MDFP onto a diesel powered bus are being evaluated to ensure appropriate changes are made to the procedures. This issue was entered into the FENOC corrective action program.

The NRC staff acknowledges that the licensee will address any issues regarding its MDFP procedures using its corrective action program.

By letter dated September 21, 2015 (ADAMS Accession No. ML15222A179), the NRC staff requested that the licensee explain how the maximum postulated loading evaluated in its analysis considered the worst-case combination of allowable voltage and frequency coupled with large pumps operating at runout conditions. In its October 14, 2015, response to this request, the license stated that the EDG transient loading analysis, which is based on equipment operability limits, evaluated three cases: minimum voltage, minimum frequency, and maximum voltage and frequency. For these cases, the large motors that operated at an elevated level during a LOOP/LOCA event were the low pressure injection/decay heat pump motor, the containment spray pump motor, the high pressure injection pump motor, and the make-up pump motor. The staff reviewed the results of the system analysis that determined the percent operating load for the large motors that start during loading with a LOOP/LOCA and finds that Safety Guide 9 criteria are met.

The NRC staff's September 21, 2015, letter also requested the licensee to explain how fuel oil consumption for EDG operation was evaluated after establishing the maximum EDG loading. In its October 14, 2015, response, the licensee stated:

> FENOC evaluated the EDG steady state loading condition with a maximum voltage of 4400 V and a frequency of 61.2 Hz and determined the loading to be ... 3236 [hp].... This loading condition is less than the EDG 100 percent full rated loading condition of 3600 [hp]. Useable fuel inventory was evaluated based on a 100 percent full load consumption rate. The evaluation shows that TS Surveillance requirement SR 3.8.3.1 for minimum fuel oil storage tank volume and SR 3.8.1.4 for minimum EDG day tank volume are met for EDG operation for 7 days at full load.

The licensee's evaluation of the maximum EDG loading is based off the maximum allowed steady state voltage and frequency; therefore, it bounds the proposed change to the minimum steady state voltage. In addition, the EDG fuel consumption rate was determined based on 100 percent full load, which is greater than the maximum EDG loading. Based on this, the NRC staff determined that Davis-Besse will continue to have sufficient fuel inventory to operate the EDG for 7 days at full load with the proposed changes to the EDG minimum steady state voltage.

The NRC staff has reviewed the licensee's application, as supplemented, as it relates to the proposed change to the EDG minimum steady state voltage acceptance criteria specified in SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3 from 3744 V to 4088 V. The licensee has demonstrated that with this change the EDGs are capable of starting the dedicated engineered safety feature loads in the required sequence and satisfy Safety Guide 9 regulatory positions regarding voltage and frequency response. The licensee discussed the worst-case loading conditions it considered during a LOOP/LOCA and the starting of the MDFP, and determined that Safety Guide 9 criteria were met under these conditions. The licensee also has a procedural requirement to verify monthly that the EDG output voltage is set within 4200 V to 4250 V, which provides additional margin for equipment operability and assurance that the safety bus voltage is adequate for the EDG emergency mode of operation. The licensee also explained how EDG fuel inventory requirements will continue to be met. Based on this, the staff finds that increasing the EDG minimum steady state voltage criteria to 4088 V is acceptable.

3.2 Voltage and Frequency Analysis for EDG Breaker Close Permissive

The licensee proposes to change SRs 3.8.1.8.a and 3.8.1.14.a by increasing the EDG minimum voltage acceptance criteria from 4031 V to 4070 V and by increasing the EDG minimum frequency acceptance criteria from 58.8 Hz to 59.5 Hz. The licensee's application describes the purpose of these SRs as follows:

> Surveillance requirement 3.8.1.8.a demonstrates that the EDG can start from standby conditions and achieve the required voltage and frequency within 10 seconds. Surveillance requirement 3.8.1.14.a demonstrates that the diesel engine can restart from a hot condition (such as subsequent to shutdown from normal surveillances), and achieve the required voltage and frequency within 10 seconds.

The application states that the minimum acceptable starting output voltage of 4070 V is based on the minimum voltage value required to close the EDG output breaker. The licensee's October 14, 2015, letter states that the Safety Guide 9 acceptance criterion is satisfied with the

EDG breaker closing at its permissive setpoint of 3990 V with a voltage set point of 4088 V. The proposed allowable voltage of 4070 V considers a setpoint of 3990 V with a maximum relay setting tolerance of 2 percent. In its letter dated February 19, 2016, the licensee provided further clarification on the method used to establish the breaker closure setpoint. The licensee stated:

> The analysis evaluates the transient voltage and frequency response while the EDG voltage regulator is trying to maintain 4088 VAC [volts-ac] at the EDG terminals during the load sequencing process. However, the EDG voltage is still building in the analysis to its setpoint of 4088 VAC when its output breaker closes at its nominal permissive setpoint of approximately 3990 VAC.

According to UFSAR Table 8.3-1, EDG sequencer loading step 1 includes loads that do not trip on a loss of power and a 400 hp component cooling water pump that starts as soon as the EDG output breaker closes. The large make-up pump motor starts within 2.5 seconds of breaker closure. By letter dated September 21, 2015, the NRC staff requested information about EDG voltage response associated with the sequencing of these large motors. In its October 14, 2015, letter, the licensee provided excerpts from its "EDG Transient Response Analysis" to demonstrate how the Safety Guide 9 acceptance criterion is satisfied with the EDG breaker closing at 3990 V and the EDG voltage regulator set to 4088 V.

The intent of Safety Guide 9 guidance for voltage and frequency recovery time during load sequencing is to provide reasonable assurance that: (1) loads can start and accelerate as soon as they are connected, (2) loads that are running are not adversely impacted by perturbations resulting from large motor starts, and (3) there is minimal overlap of voltage and frequency oscillations between successive sequencer steps. The NRC staff reviewed the information that the licensee provided regarding its "EDG Transient Response Analysis," and notes that an initial EDG voltage of 3990 V (after considering measurement errors) corresponding to the breaker closure permissive, is adequate for starting the large motors. In addition, an initial EDG voltage of 3990 V is greater than the minimum allowable EDG voltage of 3850 V required to maintain adequate starting and steady state voltage conditions for safety-related equipment (Section 3.4 of the application). Based on this, the NRC staff has determined that 3990 V is an adequate setpoint for the EDG output breaker closure permissive. The staff has determined that the proposed EDG minimum acceptance criteria of 4070 V for SRs 3.8.1.8.a and 3.8.1.14.a is adequate to account for tolerances in the EDG output breaker closure permissive and, therefore, will ensure that the EDG output breaker will close within 10 seconds of the EDG starting.

The licensee proposes to increase the existing minimum frequency acceptance criteria in SRs 3.8.1.8.a and 3.8.1.14.a of 58.8 Hz to a more restrictive minimum frequency of 59.5 Hz. The licensee stated that this revised value was chosen to be consistent with the minimum steady state frequency requirement. The licensee provided a summary of the results of the EDG transient analysis calculation in Attachment H of the application. The calculation does not explicitly evaluate the response time of individual components sequenced on the EDG. The licensee used the acceptance criteria in Safety Guide 9 to establish the minimum allowable frequency. Safety Guide 9 states that the frequency shall not fall below 95 percent of nominal (i.e., 57 Hz) and should be restored to within 2 percent of nominal (i.e., 58.8 Hz) in less than 40 percent of each load sequence time interval. The licensee's evaluation concludes:

> The minimum EDG frequency setpoint required to meet the Safety Guide 9 requirements is 59.17 Hz (887.5 rpm [revolutions per minute]). At this frequency, the EDG frequency recovers to 98% of nominal (58.8 Hz) within 40% of the each load sequence time interval. The frequency does not drop below 95% of nominal.

The NRC staff reviewed the summary of results depicted in graphs in Attachment H of the application and agrees that the frequency transients observed during load sequencing will not adversely impact equipment starting and accelerating during the initial EDG loading period. Based on the licensee's statements and graphical data provided in Attachment H to the application, the staff has determined that increasing the minimum frequency acceptance criteria in SRs 3.8.1.8.a and 3.8.1.14.a to 59.5 Hz is acceptable, as the engineered safety feature equipment will not be adversely impacted by frequency variations during large motor starts.

3.3 Technical Conclusion

The NRC staff has reviewed the licensee's application and supplemental information for the proposed revision of the EDG minimum starting voltage and frequency acceptance criteria in SRs 3.8.1.8.a and 3.8.1.14.a and the EDG minimum steady state voltage acceptance criteria in SRs 3.8.1.2, 3.8.1.8.b, 3.8.1.11.c.3, 3.8.1.14.b, and 3.8.1.15.c.3. The proposed minimum steady state EDG voltage of 4088 V is adequate to ensure proper operation of the safety-related electrical systems. The proposed minimum EDG starting voltage of 4070 V is adequate to ensure that the EDG output circuit breaker will close and permit satisfactory operation of connected equipment. The proposed minimum output frequency of 59.5 Hz is adequate to ensure that engineered safety feature equipment will not be adversely impacted by frequency variations during large motor starts. Based on this review, the staff concludes that the proposed changes meet Safety Guide 9 criteria and that the Davis-Besse electrical systems design will continue to meet the requirements of GDCs 17 and 18. In addition, with the proposed changes, the SRs will meet 10 CFR 50.36(c)(3). Therefore, the licensee's proposed amendment to the SRs is acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Ohio State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes SRs. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluent 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 amendment involves no significant hazards consideration and there has been no public comment on such finding published in the *Federal Register* on July 7, 2015 (80 FR 38759). Accordingly, the amendment meets 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 amendment.

6.0 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 this amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Date of issuance: April 27, 2016

April 27, 2016

Mr. Brian D. Boles
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Mail Stop A-DB-3080
5501 North State, Route 2
Oak Harbor, OH 43449-9760

SUBJECT: DAVIS-BESSE NUCLEAR POWER STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT REVISING EMERGENCY DIESEL GENERATOR MINIMUM VOLTAGE AND FREQUENCY ACCEPTANCE CRITERIA (CAC NO. MF6060)

Dear Mr. Boles:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 291 to Renewed Facility Operating License No. NPF-3 for the Davis-Besse Nuclear Power Station, Unit No. 1. The amendment is in response to your application dated April 1, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15091A143), as supplemented by letters dated October 14, 2015, and February 19, 2016 (ADAMS Accession Nos. ML15287A251 and ML16050A409, respectively).

The amendment revises certain technical specification minimum voltage and frequency acceptance criteria for emergency diesel generator testing.

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

Sincerely,
/RA/
Blake Purnell, Project Manager
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-346

Enclosures:
1. Amendment No. 291 to NPF-3
2. Safety Evaluation

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ADAMS Accession No: ML16083A481 ***by email dated**

OFFICE	DORL/LPL3-2/PM	DORL/LPL3-2/LA	DE/EEEB/BC*	DSS/STSB/BC
NAME	BPurnell	SRohrer	JZimmerman	(*MHamm for*) AKlein
DATE	4/27/2016	4/06/2016	4/06/2016	4/08/2016
OFFICE	OGC	DORL/LPL3-2/BC (A)	DORL/LPL3-2/PM	
NAME	JWachutka	JPoole	BPurnell	
DATE	4/15/2016	4/27/2016	4/27/2016	

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