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

August 20, 2019

Mr. G. T. Powell
President and CEO
STP Nuclear Operating Company
P.O. Box 289
Wadsworth, TX 77483

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT NOS. 216 AND 202 RE: STANDBY DIESEL GENERATOR SURVEILLANCE REQUIREMENTS (EPID L-2018-LLA-0078)

Dear Mr. Powell:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 216 to Renewed Facility Operating License No. NPF-76 and Amendment No. 202 to Renewed Facility Operating License No. NPF-80 for the South Texas Project, Units 1 and 2, respectively. The amendments consist of changes to the technical specifications (TSs) in response to your application dated March 27, 2018, as supplemented by letters dated December 6, 2018, May 16, 2019, and June 25, 2019.

The amendments revise certain minimum voltage and frequency acceptance criteria for steady-state standby diesel generator surveillance requirement testing. Specifically, the amendments revise several subsections of TS 3/4.8.1, "AC [Alternating Current] Sources, Operating," to correct non-conservative acceptance criteria.

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

Sincerely,

G. Edward Miller, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-498 and 50-499

Enclosures:
1. Amendment No. 216 to NPF-76
2. Amendment No. 202 to NPF-80
3. Safety Evaluation

cc: Listserv

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

STP NUCLEAR OPERATING COMPANY

DOCKET NO. 50-498

SOUTH TEXAS PROJECT, UNIT 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 216
Renewed License No. NPF-76

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

   A. The application for amendment by STP Nuclear Operating Company (STPNOC)*, acting on behalf of itself and for NRG South Texas LP, the City Public Service Board of San Antonio (CPS), and the City of Austin, Texas (COA) (the licensees), dated March 27, 2018, as supplemented by letters dated December 6, 2018, May 16, 2019, and June 25, 2019, 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, as amended, 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.

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*STPNOC is authorized to act for NRG South Texas LP, the City Public Service Board of San Antonio, and the City of Austin, Texas, and has exclusive responsibility and control over the physical construction, operation, and maintenance of the facility.

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-76 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 216, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. STPNOC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. NPF-76 and
Technical Specifications

Date of Issuance: August 20, 2019

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

STP NUCLEAR OPERATING COMPANY

DOCKET NO. 50-499

SOUTH TEXAS PROJECT, UNIT 2

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 202
Renewed License No. NPF-80

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

   A. The application for amendment by STP Nuclear Operating Company (STPNOC)*, acting on behalf of itself and for NRG South Texas LP, the City Public Service Board of San Antonio (CPS), and the City of Austin, Texas (COA) (the licensees), dated March 27, 2018, as supplemented by letters dated December 6, 2018, May 16, 2019, and June 25, 2019, 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, as amended, 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.

*STPNOC is authorized to act for NRG South Texas LP, the City Public Service Board of San Antonio, and the City of Austin, Texas, and has exclusive responsibility and control over the physical construction, operation, and maintenance of the facility.

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-80 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 202 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. STPNOC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert J. Pascarelli, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility
Operating License No. NPF-80 and
Technical Specifications

Date of Issuance: August 20, 2019

ATTACHMENT TO LICENSE AMENDMENT NOS. 216 AND 202 TO

RENEWED FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80

SOUTH TEXAS PROJECT, UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

Replace the following pages of the Renewed Facility Operating License Nos. NPF-76 and NPF-80, 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 License No. NPF-76

REMOVE	INSERT
- 4 -	- 4 -

Renewed Facility Operating License No. NPF-80

REMOVE	INSERT
- 4 -	- 4 -

Technical Specifications

REMOVE	INSERT
3/4 8-1	3/4 8-1
3/4 8-2	3/4 8-2
3/4 8-3	3/4 8-3
--	3/4 8-3a
3/4 8-4	3/4 8-4
3/4 8-5	3/4 8-5
3/4 8-6	3/4 8-6
3/4 8-7	3/4 8-7

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 216, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. STPNOC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Not Used

(4) Initial Startup Test Program (Section 14, SER)*

Any changes to the Initial Test Program described in Section 14 of the Final Safety Analysis Report made in accordance with the provisions of 10 CFR 50.59 shall be reported in accordance with 50.59(b) within one month of such change.

(5) Safety Parameter Display System (Section 18, SSER No. 4)*

Before startup after the first refueling outage, HL&P[**] shall perform the necessary activities, provide acceptable responses, and implement all proposed corrective actions related to issues as described in Section 18.2 of SER Supplement 4.

(6) Supplementary Containment Purge Isolation (Section 11.5, SSER No. 4)*

HL&P shall provide, prior to startup from the first refueling outage, control room indication of the normal and supplemental containment purge sample line isolation valve position.

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* The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

**The original licensee authorized to possess, use and operate the facility was HL&P. Consequently, historical references to certain obligations of HL&P remain in the license conditions.

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 202 and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the renewed license. STPNOC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Not Used

(4) Initial Startup Test Program (Section 14. SR)*

Any changes to the Initial Test Program described in Section 14 of the Final Safety Analysis Report made in accordance with the provisions of 10 CFR 50.59 shall be reported in accordance with 50.59(b) within one month of such change.

(5) License Transfer

Texas Genco, LP shall provide decommissioning funding assurance, to be held in decommissioning trusts for South Texas Project, Unit 2 (Unit 2) upon the direct transfer of the Unit 2 license to Texas Genco, LP, in an amount equal to or greater than the balance in the Unit 2 decommissioning trust immediately prior to the transfer. In addition, Texas Genco, LP shall ensure that all contractual arrangements referred to in the application for approval of the transfer of the Unit 2 license to Texas Genco, LP to obtain necessary decommissioning funds for Unit 2 through a non-bypassable charge are executed and will be maintained until the decommissioning trusts are fully funded, or shall ensure that other mechanisms that provide equivalent assurance of decommissioning funding in accordance with the Commission's regulations are maintained.

(6) License Transfer

The master decommissioning trust agreement for Unit 2, at the time the direct transfer of Unit 2 to Texas Genco, LP is effected and thereafter, is subject to the following:

* The parenthetical notation following the title of many license conditions denotes the section of the Safety Evaluation Report and/or its supplements wherein the license condition is discussed.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

OPERATING

LIMITING CONDITION FOR OPERATION

3.8.1.1 As a minimum, the following A.C. electrical power sources shall be OPERABLE.

a. Two physically independent circuits between the offsite transmission network and the onsite Class 1E Distribution System (1), and

b. Three separate and independent standby diesel generators, each with a separate fuel tank containing a minimum volume of 60,500 gallons of fuel, and an automatic load sequencer.

APPLICABILITY: MODES 1, 2, 3, and 4.

ACTION:

a. With one offsite circuit of the above-required A.C. electrical power sources inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. Within 72 hours restore the offsite circuit to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. With a standby diesel generator inoperable, demonstrate the OPERABILITY of the above-required A.C. offsite sources by performing Surveillance Requirement 4.8.1.1.1.a within 1 hour and at least once per 8 hours thereafter. If the standby diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventive maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE standby diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.5) for each such standby diesel generator separately within 8 hours, unless it can be demonstrated there is no common mode failure for the remaining diesel generator(s). Within 14 days restore the inoperable standby diesel generator to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. (12)

c. With one offsite circuit of the above-required A.C. electrical power sources and one standby diesel generator inoperable, demonstrate the OPERABILITY of the remaining A.C. sources by performing Specification 4.8.1.1.1.a. within 1 hour and at least once per 8 hours thereafter; and if the standby diesel generator became inoperable due to any cause other than an inoperable support system, an independently testable component, or preplanned preventive

ACTION (Continued)

maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE standby diesel generator(s) by performing Surveillance Requirement 4.8.1.1.2.a.5) within 8 hours, unless it can be demonstrated there is no common mode failure for the remaining diesel generators; within 12 hours restore at least one of the inoperable sources to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. (12)

d. With one standby diesel generator inoperable in addition to ACTION b. or c. above, verify that:

   1. All required systems, subsystems, trains, components, and devices that depend on the remaining OPERABLE diesel generators as a source of emergency power are also OPERABLE, and

   2. When in MODE 1, 2, or 3, the steam-driven auxiliary feedwater pump is OPERABLE.

   If these conditions are not satisfied within 24 hours, apply the requirements of the CRMP, or be in at least HOT STANDBY within the next 6 hours and In COLD SHUTDOWN within the following 30 hours.

e. With two of the above required offsite A.C. circuits inoperable, within 24 hours restore at least one of the inoperable offsite sources to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT STANDBY within the next 6 hours.

f. With two or three of the above required standby diesel generators inoperable, demonstrate the OPERABILITY of two offsite A.C. circuits by performing the requirements of Specification 4.8.1.1.1.a. within 1 hour and at least once per 8 hours thereafter. With three of the above required standby diesel generators inoperable, within 2 hours restore at least one standby diesel generator to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. (12) With two of the above required standby diesel generators inoperable, within 24 hours restore at least two standby diesel generators to OPERABLE status or apply the requirements of the CRMP, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

4.8.1.1.1 Each of the above required independent circuits between the offsite transmission network and the Onsite Class 1E Distribution System shall be:

a. Determined OPERABLE at a frequency in accordance with the Surveillance Frequency Control Program by verifying correct breaker alignments, indicated power availability, and

b. Demonstrated OPERABLE at a frequency in accordance with the Surveillance Frequency Control Program during shutdown by transferring the unit power supply from the normal circuit to each of the alternate circuits.

4.8.1.1.2 Each standby diesel generator shall be demonstrated OPERABLE: (2)(11)

a. At a frequency in accordance with the Surveillance Frequency Control Program by:

1) Verifying the fuel level in its associated fuel tank,

2) Verifying the diesel starts from standby condition and achieves a voltage and frequency of 4160 ± 416 volts and 60 ± 1.2 Hz (3). The diesel generator shall be started for this test by using one of the following signals:

a) Manual, or

b) Simulated loss-of-off site power by itself, or

c) Simulated loss-of-offsite power in conjunction with a Safety Injection test signal, or

d) A Safety Injection test signal by itself.

3) Verifying the generator is synchronized, loaded to 5000 to 5500 kW, and operates with a load of 5000 to 5500 kW for at least 60 minutes, (4)(6) and

4) Verifying the standby diesel generator is aligned to provide standby power to the associated emergency busses.

5) Verifying the diesel starts from standby conditions and accelerates to 600 rpm (nominal) in less than or equal to 10 seconds. The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the start signal. The steady-state voltage and frequency shall be 4160 ± 208 volts and 60 ± 0.3 Hz. The diesel generator shall be started for this test by using one of the following signals:

a) Manual, or

b) Simulated loss-of-off site power by itself, or

c) Simulated loss-of-offsite power in conjunction with a Safety Injection test signal, or

d) A Safety Injection test signal by itself.

SURVEILLANCE REQUIREMENTS (Continued)

b. At a frequency in accordance with the Surveillance Frequency Control Program and after each operation of the diesel where the period of operation was greater than or equal to 1 hour by checking for and removing accumulated water from its associated fuel tank;

c. Maintain properties of new and stored fuel oil in accordance with the Fuel Oil Monitoring Program.

SURVEILLANCE REQUIREMENTS (Continued)

d. Deleted

e. At a frequency in accordance with the Surveillance Frequency Control Program, during shutdown, by:

1) Deleted

2) Verifying the generator capability to reject a load of greater than or equal to 785.3 kW while maintaining voltage at 4160 ± 416 volts and frequency at 60 ± 4.5 Hz; (4)(5)

3) Verifying the generator capability to reject a load of 5500 kW without tripping. The generator voltage shall not exceed 5262 volts during and following the load rejection; (4)(5)

4) Simulating a loss-of-offsite power by itself, and:

a) Verifying deenergization of the ESF busses and load shedding from the ESF busses, and

b) Verifying the diesel starts on the auto-start signal within 10 seconds, energizes the auto-connected shutdown loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator is loaded with the shutdown loads. After energization, the steady-state voltage and frequency of the ESF busses shall be maintained at 4160 ± 208 volts and 60 ± 0.3 Hz during this test.

5) Verifying that on a Safety Injection test signal, without loss-of-offsite power, the diesel generator starts on the auto-start signal and operates on standby for greater than or equal to 5 minutes. The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the autostart signal; the steady-state generator voltage and frequency shall be maintained at 4160 ± 208 volts and 60 ± 0.3 Hz;

6) Simulating a loss-of-offsite power in conjunction with a Safety Injection test signal, and:

a) Verifying deenergization of the ESF busses and load shedding from the ESF busses;

b) Verifying the diesel starts on the auto-start signal within 10 seconds, energizes the auto-connected ESF (accident) loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator

is loaded with the ESF loads. After energization, the steady-state voltage and frequency of the ESF busses shall be maintained at 4160 ± 208 volts and 60 ± 0.3 Hz during this test; and

c) Verifying that all automatic diesel generator trips, except engine overspeed, generator differential, and low lube oil pressure are automatically bypassed upon loss of voltage on the ESF bus concurrent with a Safety Injection Actuation signal.

7)[10] Verifying the standby diesel generator operates for at least 24 hours. During the first 2 hours of this test, the diesel generator shall be loaded to 5700 to 6050 kW [4][5][6] and during the remaining 22 hours of this test, the diesel generator shall be loaded to 5000 to 5500 kW. [6] The steady-state generator voltage and frequency shall be 4160 ± 208 volts and 60 ± 0.3 Hz during this test. Within 5 minutes after completing this 24-hour test, perform a fast start per Specification 4.8.1.1.2.a.5) [7];

8) Verifying that the auto-connected loads to each standby diesel generator do not exceed the 2000-hour rating of 5935 kW;

9) Verifying the standby diesel generator's capability to:

a) Synchronize with the offsite power source while the generator is loaded with its ESF loads upon a simulated restoration of offsite power,

b) Transfer its loads to the offsite power source, and

c) Be restored to its standby status.

10) Verifying that with the standby diesel generator operating in a test mode, connected to its bus, a simulated Safety Injection signal overrides the test mode by: (1) returning the diesel generator to standby operation, and (2) automatically energizing the ESF loads with offsite power; [5]

11) Verifying that the automatic load sequence timer is OPERABLE with the first sequenced load verified to be loaded between 1.0 second and 1.6 seconds, and all other load blocks within ±10% of its design interval;

12) Verifying that the standby diesel generator emergency stop lockout feature prevents diesel generator starting; and

SURVEILLANCE REQUIREMENTS (Continued)

13) Demonstrating the OPERABILITY of the automatic load shed bypass and the manual load shed reinstatement features of the load sequencer.

f. At a frequency in accordance with the Surveillance Frequency Control Program or after any modifications which could affect standby diesel generator interdependence by starting all standby diesel generators simultaneously, during shutdown, and verifying that all standby diesel generators accelerate to at least 600 rpm in less than or equal to 10 seconds. The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the start signal. The steady-state voltage and frequency shall be maintained at 4160 ± 208 volts and 60 ± 0.3 Hz.

g. At a frequency in accordance with the Surveillance Frequency Control Program by draining each fuel tank, removing the accumulated sediment and cleaning the tank.

4.8.1.1.3 (Not used)

TABLE 4.8-1

DIESEL GENERATOR TEST SCHEDULE

(Not used)

SPECIFICATION NOTATIONS

(1) Loss of one 13.8 kV Standby Bus to 4.16 kV ESF bus line constitutes loss of one offsite source. Loss of two 13.8 kV Standby busses to 4.16 kV ESF bus lines constitutes loss of two offsite sources.

(2) All diesel generator starts for the purpose of these surveillances may be preceded by a prelube period.

(3) The diesel generator start for this surveillance may be a modified start involving reduced fuel (load limit) and/or idling and gradual acceleration to synchronous speed.

(4) Generator loading may be accomplished in accordance with vendor recommendations, including a warmup period prior to loading.

(5) The diesel generator start for this surveillance may be a modified start (see SR 4.8.1.1.2.a.2)).

(6) Momentary transients outside this load range due to changing conditions on the grid shall not invalidate the test.

(7) If Specification 4.8.1.1.2.a.5) is not satisfactorily completed, it is not necessary to repeat the preceding 24-hour test. Instead, the standby diesel generator may be operated at 5000-5500 kW for a minimum of 2 hours or until operating temperature has stabilized.

(8) (Not used)

(9) (Not used)

(10) This test may be performed during power operation provided that the other two diesel generators are operable.

(11) Credit may be taken for events that satisfy any of these Surveillance Requirements.

(12) For the Unit 2 Train B standby diesel generator (SDG 22) failure of December 9, 2003, restore the inoperable standby diesel generator to OPERABLE status within 113 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the next 24 hours.

UNITED STATES
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WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NOS. 216 AND 202 TO

RENEWED FACILITY OPERATING LICENSE NOS. NPF-76 AND NPF-80

STP NUCLEAR OPERATING COMPANY, ET AL.

SOUTH TEXAS PROJECT, UNITS 1 AND 2

DOCKET NOS. 50-498 AND 50-499

1.0 INTRODUCTION

By application dated March 27, 2018 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML18086B761), as supplemented by letters dated December 6, 2018, May 16, 2019, and June 25, 2019 (ADAMS Accession Nos. ML18340A206, ML19136A408, and ML19176A570, respectively), STP Nuclear Operating Company (STPNOC, the licensee) requested changes to the technical specifications (TSs) for South Texas Project, Units 1 and 2. The changes would revise certain minimum voltage and frequency acceptance criteria for steady-state standby diesel generator (SBDG) surveillance requirement (SR) testing. Specifically, the amendments would revise several subsections of TS 3/4.8.1, "AC [Alternating Current] Sources, Operating," to correct non-conservative acceptance criteria.

The supplemental letters dated December 6, 2018, May 16, 2019, and June 25, 2019, 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 31, 2018 (83 FR 36978).

2.0 REGULATORY EVALUATION

2.1 System Description

The South Texas Project, Units 1 and 2, Onsite Standby Power System (Class 1E) is described in Section 8.3.1.1.4 of the facility's Updated Final Safety Analysis Report (ADAMS Accession No. ML18130A044). The Onsite Standby Power System of each unit consists of three independent, physically separated SBDGs supplying power to three associated load groups designated as Train A, Train B, and Train C. Each SBDG has a continuous rating of 5,500 kilowatt (kW) for 8,760-hour operation and is capable of operating at 110 percent of the continuous rating for a period of 2 hours out of any 24 hours of operation. Each load group consists of a 4.16 kilovolt Engineered Safety Features (ESF) bus and the Class 1E electrical loads connected to that bus. The Onsite Standby Power Supply Systems of South Texas Project, Units 1 and 2, operate independently of each other. Each SBDG and load group of

each unit is also physically separated and electrically independent from the other two SBDGs and their load groups. Each train (i.e., Load Group) is independent but is not totally redundant; two trains are necessary to mitigate the consequences of a design-basis accident (DBA).

Each SBDG is automatically started in the event of a loss-of-offsite power or safety injection signal, and the required Class 1E loads for that ESF bus are automatically connected in a predetermined time sequence. Each SBDG is ready to accept load within 10 seconds after the start signal.

2.2 Proposed Technical Specifications Changes

The license amendment request (LAR) dated March 27, 2018, states that the current TS surveillance acceptance criteria for SBDGs allow a ± 2 percent variation in steady-state frequency. The allowable variation in frequency is nonconservative when a combination of component degradation, instrumentation uncertainties, and frequency uncertainties are factored into the performance capabilities of the pumps and motors powered by the SBDGs. The LAR states that the motor-driven auxiliary feedwater (MDAFW) pumps were most sensitive to reduced flow rates when the associated motors operate at lower-than-rated speed. The licensee revised the associated calculations and concluded that a ± 0.5 percent variation in SBDG speed is required for the MDAFW pumps to satisfy the design performance criterion. The licensee has concluded that the current TS surveillance acceptance criteria for SBDG steady-state frequency is nonconservative and should be changed. Since there is a combined effect of both voltage and frequency on components powered by the SBDGs, the licensee is also proposing a change to the steady-state voltage acceptance criteria.

The licensee proposed the following changes (highlighted for clarity) to TS 3.8.1.1:

Current TS Action 3.8.1.1.b.	... demonstrate the OPERABILITY of the remaining OPERABLE standby diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.2) for each such standby diesel generator ...
Change to TS Action 3.8.1.1.b.	... demonstrate the OPERABILITY of the remaining OPERABLE standby diesel generators by performing Surveillance Requirement **4.8.1.1.2.a.5**) for each such standby diesel generator ...
Current TS Action 3.8.1.1.c.	... performing Specification 4.8.1.1.1a. ... demonstrate the OPERABILITY of the remaining OPERABLE standby diesel generator(s) by performing Surveillance Requirement 4.8.1.1.2a.2) within 8 hours ...
Change to TS Action 3.8.1.1.c.	... performing Specification 4.8.1.1.1.a. ... demonstrate the OPERABILITY of the remaining OPERABLE standby diesel generator(s) by performing Surveillance Requirement **4.8.1.1.2.a.5**) within 8 hours ...
Current TS Action 3.8.1.1.f.	... of Specification 4.8.1.1.1a. ...
Change to TS Action 3.8.1.1.f.	... of Specification 4.8.1.1.1.a. ...

New SR 4.8.1.1.2 a.5)	Verifying the diesel starts from standby conditions and accelerates to 600 rpm [revolutions per minute] (nominal) in less than or equal to 10 seconds. The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz [Hertz] within 10 seconds after the start signal. The steady-state voltage and frequency shall be 4160 ± 208 volts and 60 ± 0.3 Hz. The diesel generator shall be started for this test by using one of the following signals: a) Manual, or b) Simulated loss-of-offsite power by itself, or c) Simulated loss-of-offsite power in conjunction with a Safety Injection test signal, or d) A Safety Injection test signal by itself.
Current SR 4.8.1.1.2 e.4) b)	Verifying the diesel starts on the auto-start signal within 10 seconds, energizes the auto-connected shutdown loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator is loaded with the shutdown loads. After energization, the steady-state voltage and frequency of the ESF busses shall be maintained at 4160 ± 416 volts and 60 ± 1.2 Hz during this test.
Change to SR 4.8.1.1.2 e.4) b)	Verifying the diesel starts on the auto-start signal within 10 seconds, energizes the auto-connected shutdown loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator is loaded with the shutdown loads. After energization, the steady-state voltage and frequency of the ESF busses shall be maintained at **4160 ± 208 volts and 60 ± 0.3 Hz** during this test.
Current SR 4.8.1.1.2 e.5)	Verifying that on a Safety Injection test signal, without loss-of-offsite power, the diesel generator starts on the auto-start signal and operates on standby for greater than or equal to 5 minutes. The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the autostart signal; the steady-state generator voltage and frequency shall be maintained within these limits during this test;
Change to SR 4.8.1.1.2 e.5)	Verifying that on a Safety Injection test signal, without loss-of-offsite power, the diesel generator starts on the auto-start signal and operates on standby for greater than or equal to 5 minutes. The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the autostart signal. The steady-state generator voltage and frequency shall be maintained **at 4160 ± 208 volts and 60 ± 0.3 Hz.**

Current SR 4.8.1.1.2 e.6) b)	Verifying the diesel starts on the auto-start signal within 10 seconds, energizes the auto-connected ESF (accident) loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator is loaded with the ESF loads. After energization, the steady-state voltage and frequency of the ESF busses shall be maintained at 4160 ± 416 volts and 60 ± 1.2 Hz during this test; and
Change to SR 4.8.1.1.2 e.6) b)	Verifying the diesel starts on the auto-start signal within 10 seconds, energizes the auto-connected ESF (accident) loads through the load sequencer and operates for greater than or equal to 5 minutes while its generator is loaded with the ESF loads. After energization, the steady-state voltage and frequency of the ESF busses shall be maintained at **4160 ± 208 volts and 60 ± 0.3 Hz during this test;** and
Current SR 4.8.1.1.2 e.7)	(10) Verifying the standby diesel generator operates for at least 24 hours. During the first 2 hours of this test, the diesel generator shall be loaded to 5700 to 6050 kW(4)(5)(6) and during the remaining 22 hours of this test, the diesel generator shall be loaded to 5000 to 5500 kW.(6) The steady-state generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz during this test. Within 5 minutes after completing this 24-hour test, perform a fast start per Specification 4.8.1.1.2a.2)(7);
Change to SR 4.8.1.1.2 e.7)	(10) Verifying the standby diesel generator operates for at least 24 hours. During the first 2 hours of this test, the diesel generator shall be loaded to 5700 to 6050 kW(4)(5)(6) and during the remaining 22 hours of this test, the diesel generator shall be loaded to 5000 to 5500 kW.(6) The steady-state generator voltage and frequency shall be **4160 ± 208 volts and 60 ± 0.3 Hz** during this test. Within 5 minutes after completing this 24-hour test, perform a fast start per Specification 4.8.1.1.**2.a.5**)(7);
Current SR 4.8.1.1.2 f.	At a frequency in accordance with the Surveillance Frequency Control Program or after any modifications which could affect standby diesel generator interdependence by starting all standby diesel generators simultaneously, during shutdown, and verifying that all standby diesel generators accelerate to at least 600 rpm in less than or equal to 10 seconds;
Change to SR 4.8.1.1.2 f.	At a frequency in accordance with the Surveillance Frequency Control Program or after any modifications which could affect standby diesel generator

	interdependence by starting all standby diesel generators simultaneously, during shutdown, and verifying that all standby diesel generators accelerate to at least 600 rpm in less than or equal to 10 seconds. **The generator voltage and frequency shall be 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the start signal. The steady-state voltage and frequency shall be maintained at 4160 ± 208 volts and 60 ± 0.3 Hz.**; and
Current Specification Notation (3) of Table 4.8-1	A diesel generator start in less than or equal to 10 seconds (fast start) shall be at a frequency in accordance with the Surveillance Frequency Control Program. All other diesel generator starts for the purpose of this surveillance may be modified starts involving reduced fuel (load limit) and/or idling and gradual acceleration to synchronous speed.
Change to Specification Notation (3) of Table 4.8-1	**The** diesel generator start **for this surveillance may be a** modified start involving reduced fuel (load limit) and/or idling and gradual acceleration to synchronous speed.
Current Specification Notation (5) of Table 4.8-1	The diesel generator start for this surveillance may be a modified start (see SR 4.8.1.1.2a.2)).
Change to Specification Notation (5) of Table 4.8-1	The diesel generator start for this surveillance may be a modified start (see SR 4.8.1.1.2.a.2)).
Current Specification Notation (7) of Table 4.8-1	If Specification 4.8.1.1.2a.2) is not satisfactorily completed, it is not necessary to repeat the preceding 24-hour test. Instead, the standby diesel generator may be operated at 5000-5500 kW for a minimum of 2 hours or until operating temperature has stabilized.
Change to Specification Notation (7) of Table 4.8-1	If Specification **4.8.1.1.2.a.5)** is not satisfactorily completed, it is not necessary to repeat the preceding 24-hour test. Instead, the standby diesel generator may be operated at 5000-5500 kW for a minimum of 2 hours or until operating temperature has stabilized.

2.3 Regulatory Requirements

The NRC staff determined that the following regulatory requirements are applicable to the safety review of the proposed license amendments.

- General Design Criterion (GDC) 17, "Electric power systems," of Appendix A, "General Design Criteria for Nuclear Power Plants," to Part 50 of Title 10 of the *Code of Federal Regulations* (10 CFR) 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 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.

- Appendix A to 10 CFR Part 50, GDC 18, "Inspection and testing of electric power systems," requires, in part, that electric power systems that are important to safety shall be designed to permit appropriate periodic inspection and testing.

- Appendix A to 10 CFR Part 50, GDC 34, "Residual heat removal," states, in part, that "[a] system to remove residual heat shall be provided. The system safety function shall be to transfer fission product decay heat and other residual heat from the reactor core at a rate such that specified acceptable fuel design limits and the design conditions of the reactor coolant pressure boundary are not exceeded." The GDC requires, in part, that "capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) ... the system safety function can be accomplished, assuming a single failure."

- The regulation at 10 CFR 50.36(c)(3) 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 regulation at 10 CFR 50.46(a)(1)(i) requires, in part, that nuclear power plants "must be provided with an emergency core cooling system (ECCS) that must be designed so that its calculated cooling performance following postulated loss-of-coolant accidents conforms to the criteria set forth in ... this section. ECCS cooling performance must be calculated in accordance with an acceptable evaluation model and must be calculated for a number of postulated loss-of-coolant accidents of different sizes, locations, and other properties sufficient to provide assurance that the most severe postulated loss-of-coolant accidents are calculated.... Comparisons to applicable experimental data must be made and uncertainties in the analysis method and inputs must be identified and assessed so that the uncertainty in the calculated results can be estimated.

The following guidance documents were also considered during this review.

- Westinghouse Electric Company LLC Report WCAP-17308-NP-A, "Treatment of Diesel Generator (DG) Technical Specification Frequency and Voltage Tolerances," Revision 0 (ADAMS Accession No. ML17215A230).

- Regulatory Guide 1.9, Revision 2, "Selection, Design, and Qualification of Diesel-Generator Units Used as Standby (Onsite) Electric Power Systems at Nuclear Power Plants," dated December 1979 (ADAMS Accession No. ML12305A253).

3.0 TECHNICAL EVALUATION

Plant safety analyses make specific assumptions regarding the ECCS flow to provide the core cooling function following any event that requires safety injection (SI) to mitigate the event. For the events that assume offsite power is lost, the SBDGs provide power to the ECCS pumps.

The ECCS flow provided by the ECCS pumps is determined by the pump speed, which in turn is a function of the SBDG frequency and voltage. The primary effect of reduced frequency and voltage on the ECCS safety functions is to decrease the speed of safety-related motors that are powered by the SBDG, which affects, for example, pump performance, motor-operated valve (MOV) stroke times, and cooling fan performance. A higher than normal frequency will result in higher speed of rotating equipment and potential increase in the pressure in the ECCS.

The NRC staff evaluated the licensee's application to determine whether the proposed changes are consistent with the regulations, guidance, and plant-specific design and licensing basis information discussed in Section 2 of this safety evaluation. Specifically, the NRC staff reviewed the proposed changes to TS 3.8.1.1 to restrict the steady-state voltage and frequency limits for SBDG operation to ensure that accident mitigation equipment can perform to satisfy the requirements of 10 CFR 50.46, "Acceptance criteria for emergency core cooling systems for light-water nuclear power reactors."

3.1 SBDG Allowable Steady-State Voltage and Frequency Limits

In Section 3.0, "Technical evaluation," of the LAR, the licensee provided a description of the proposed changes to the SBDG steady-state voltage and frequency values. The licensee stated that, "In January 2000, STPNOC performed an engineering evaluation to show that the [MDAFW] pumps would meet the design performance requirements throughout a frequency range of 60 ± 0.3 Hz (± 0.5 percent). In the evaluation, the uncertainty in MDAFW pump delta head and delta flow at 59.7 Hz was calculated and shown to be within the required tolerances for MDAFW pump flow." Since the TS-required frequency range for the SBDGs is greater than the allowable frequency range for the MDAFW pump, the LAR proposes a new allowable frequency range for the SBDGs. The LAR also proposes a revision to the SBDG steady-state voltage range to be 4160 ± 208 volts (± 5 percent) in order to maintain desired SBDG operating parameters. The LAR further states that "the SBDG Design Specification requires nominal frequency to be 60 Hz and the steady-state frequency variation under any load from 0% to 100% to be within the range of 60 ± 0.15 Hz (± 0.25%)." Hence, the SBDGs are capable of performing at the proposed range of allowable frequency.

In a request for additional information (RAI) by e-mail dated October 10, 2018 (ADAMS Accession No. ML18283B952), the NRC staff requested details on the assumptions and the methodology used for evaluating the allowable voltage tolerance. In response to the RAI by letter dated December 6, 2018, the licensee stated that it had used the methodology outlined in WCAP-17308-NP-A, Revision 0, to address the issue of SBDG frequency and voltage variation in the South Texas Project safety analyses. The licensee stated that, "under worst case conditions, the SBDG voltage regulator regulation accuracy is ± 0.5% of nominal voltage (4160 (V [Volts]). Equation 3 in WCAP-17308-NP-A calculates SBDG voltage uncertainty (U_V), which is a combination of regulator voltage control uncertainty (U_{Reg}) and regulator voltage setting uncertainty ($U_{Reg\text{-}Setting}$)." Using Equation 3 in WCAP-17308-NP-A, the licensee calculated that $U_{Reg\text{-}Setting}$ = 4.975%. In addition, the licensee stated that, "based on steady-state SBDG voltage readings from recent surveillances combined with the worst case ± 0.5% for regulation accuracy, the STP steady-state SBDG voltage allowance of ± 5% is acceptable." The NRC staff

has previously concluded that the methodology outlined in WCAP-17308-NP, Revision 0, is acceptable to evaluate the allowable tolerances in steady-state voltage. The licensee did not identify any adverse impact on motor performance due to the wider range of allowable voltage (± 10 percent) in the current TSs. In the letter dated December 6, 2018, the licensee provided results of SBDG voltages measured during TS-required surveillances in 2017 and 2018. The tabulated values indicate that the "worst case deviation from the nominal SBDG steady-state voltage (4160 V) is approximately 3.03% (4034 V on 4/1/2018 for SBDG 22)." The licensee concluded that based on steady-state SBDG voltage readings from recent surveillances combined with the worst case ± 0.5% tolerance for regulation accuracy, the steady-state SBDG voltage allowance of ± 5% is acceptable. The NRC staff agrees that the proposed voltage range of 4160 ± 208 volts (± 5%) is acceptable for SBDGs to perform their intended safety functions.

3.2 Effect of SBDG Steady-State Voltage and Frequency Variations on ECCS

To evaluate the acceptability of the proposed change, the licensee evaluated the impact of the proposed allowable voltage and frequency range on loads supplied by the SBDGs. The licensee performed the evaluation in accordance with methodology prescribed in WCAP-17308-NP-A, Revision 0, on the following items:

- inservice testing (IST) pump curves for safety-related pumps that are powered by the SBDGs following a loss-of-offsite power;
- impact on SBDG loading;
- impact on SBDG fuel oil consumption;
- impact on MOV operation;
- effect of speed variation on fans and blowers;
- impact on essential chiller operation;
- impact on non-motorized loads; and
- TS SRs.

3.2.1 Impact on Operation of Safety-Related Pumps

In the LAR, the licensee stated that the effects of the proposed changes in steady-state voltage and frequency were evaluated for the following safety-related pumps using the methodology prescribed in WCAP-17308-NP-A:

- spent fuel pool cooling and cleanup system (SFPCCS) pumps;
- residual heat removal (RHR) pumps;
- component cooling water (CCW) pumps;
- chemical volume and control system (CVCS) centrifugal charging pumps (CCPs);
- essential cooling water (ECW) pumps;
- essential chilled water pumps;
- MDAFW pumps; and
- ECCS:
  - low-head safety injection (LHSI) pumps and
  - high-head safety injection (HHSI) pumps.

The licensee stated that the above pumps were evaluated for minimum pump performance (SBDG low frequency and low voltage) and the LHSI and HHSI pumps were also evaluated at maximum allowable pump performance (SBDG high frequency and high voltage).

The licensee stated that the methodology in WCAP-17308-NP-A, Section 2.2, was used to evaluate the impacts of the adjusted frequency and voltage tolerances on the performance of the SFPCCS, RHR, CCW, and essential chilled water pumps. The licensee indicated that the overall uncertainty (conservative steady-state voltage and frequency uncertainties combined with measurement uncertainty) in pump performance has margin to the IST acceptance criteria for the SFPCCS, RHR, CCW, and essential chilled water pumps. Additionally, the CVCS CCPs have considerable margin to IST requirements because they are tested at 142 to 178 gallons per minute (gpm), which is significantly higher than the required 30 gpm for minimum boration.

There are three ECW pumps per unit that are flow balanced to provide adequate cooling to each heat load, so there is not a specific reference flow rate. The licensee performed conservative calculations with a voltage uncertainty of 220 volts and a frequency uncertainty of 0.4 Hz, which is beyond the proposed steady-state tolerance range. The overall uncertainty in ECW pump delta head at various pump flow rates in the tested range were calculated and added to the pump delta head based on accident conditions and the results showed that the design ECW system flow is maintained.

There are three MDAFW pumps per unit that supply water to the steam generators for decay heat removal. The pumps are tested according to TS SR 4.7.1.2.1.a.1 to verify that the developed head is greater than or equal to the required developed head. The flow uncertainty was combined with the degraded pump curve resulting from degraded SBDG performance and the results showed that there is margin to the minimum acceptance criteria in the SR.

The ECCS is made up of three trains per unit. Each train consists of a LHSI pump, HHSI pump, accumulator, and RHR heat exchanger. The licensee stated that the pumps were evaluated according to Section 2.2 of WCAP-17308-NP-A. For both LHSI and HHSI pumps, the licensee evaluated the effects of the SBDG frequency and voltage tolerance changes for the minimum safeguards performance to ensure that the system continues to meet minimum flow requirements and evaluated the tolerance changes on the maximum safeguards performance to ensure that assumptions in the accident analyses for mass and energy releases are not exceeded. The LHSI pumps were evaluated over the tested flow range of 2550 gpm to 2650 gpm and the HHSI pumps were evaluated over the tested flow range of 1470 gpm to 1530 gpm.

For the LHSI pumps, the licensee stated that the overall uncertainty was added to the design requirement and has been included in the American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants (ASME OM Code) IST comprehensive pump test acceptance criteria such that the comprehensive pump test acceptance criteria ensure that all LHSI pumps meet minimum design performance requirements. For maximum LHSI pump performance, the overall uncertainty was subtracted from maximum design performance and the required differential pressure was calculated. Table 4 in the LAR contains the results of the evaluation for maximum LHSI pump performance and shows that the IST upper limits will need to be adjusted for the 2A, 2B, and 2C LHSI pumps.

For the HHSI pumps, using the same methodology, the licensee calculated new acceptance criteria at 1 gpm intervals over the tested flow range for minimum HHSI pump performance to account for the SBDG steady-state voltage and frequency uncertainties. Table 5 in the LAR contains the results of the evaluation for required differential pressure at maximum HHSI pump performance. The licensee determined that the IST upper limits will need to be adjusted for each HHSI pump except for HHSI 1B.

In the response to RAI EMIB 1-1, in the letter dated December 6, 2018, the licensee discussed the effects of the requested voltage and frequency tolerance changes on the available net positive suction head (NPSH) versus required NPSH for the pumps listed above. For the SFPCCS, RHR, CCW, CVCS, ECW, essential chilled water, and MDAFW pumps, the licensee determined that small changes in frequency and voltage would not have significant effects on the NPSH margin during the most limiting conditions for operation of these pumps. For the LSHI and HHSI pumps, the licensee stated that the two most limiting conditions for NPSH margin are during the containment sump recirculation mode. The licensee evaluated NPSH at the centerline of the first stage impeller and at the centerline of the pump suction nozzle located at the top of the barrel. The licensee determined that the available NPSH will be greater than the required NPSH for both the LSHI and HHSI pumps.

The NRC staff reviewed the results of the licensee's evaluations in the LAR and in the response to RAI EMIB 1-1 and concludes that the proposed SBDG steady-state voltage and frequency tolerance ranges will not have an adverse impact on the operation of the safety-related pumps because adequate margin exists between the required and available NPSH, flow, and pressure such that these pumps can perform their design functions during variations within the proposed SBDG steady-state voltage and frequency tolerance ranges.

3.2.2 Impact on Operation of SBDG Skid-Mounted Pumps

In response to RAI EMIB 1-2 in the letter dated December 6, 2018, the licensee discussed how the proposed steady-state frequency and voltage tolerances would affect the operation of the lube oil pumps, jacket water pumps, and fuel oil primary booster pumps, which are mounted on the SBDG skid. The licensee's response is as follows:

> Because the SBDG lube oil pumps, jacket water pumps, and fuel oil primary booster pump are tested as part of the overall diesel generator unit, these pumps are not part of the pump IST program and the methodologies of WCAP-17308-NP-A are not directly applicable. The engine-mounted lubrication system piping and components meet the guidelines described by the Diesel Engine Manufacturers Association (DEMA) standards. From DEMA Standard Practices for Low and Medium Speed Stationary Diesel and Gas Engines, Sixth Edition, 1972, an engine-driven pump "must have sufficient capacity to maintain the minimum allowable pressure when the engine is operated at reduced speeds." This results in auxiliary pumps which may have substantial excess capacity at rated speed. Functional performance of these pumps is verified during SBDG load sequencer surveillance testing with frequency variations larger than the 59.7 Hz to 60.3 Hz steady state tolerance. Additionally, as part of the loading sequence during monthly SBDG operational testing, the governor is manually cycled between 59.5 Hz and 60.5 Hz. Operational problems are not noted when operating the SBDG through this range of engine speeds and output frequency.

3.2.2.1 SBDG Jacket Water Pumps

In response to RAI EMIB 1-2, the licensee stated:

> Performance of both the engine-driven jacket water pump and the redundant motor-driven jacket water pump will vary with engine speed and frequency. The engine-driven jacket water pump, however, will not change with changes in

> SBDG voltage. Using the methods of WCAP-17308-NP-A, the standby motor-driven jacket water pump speed uncertainty will be 14.5 rpm, or 0.82% of the 1,770 rpm rated running speed. Performance of the jacket water pumps, therefore, is bounded using a speed variation of 0.82%. Using the pump affinity laws for centrifugal pumps, pump flow will change proportionally with pump speed changes and pump discharge head will change with the square of pump speed changes.

Based on the evaluation above, the licensee concluded that:

A reduction of about 1.2 feet of pump head will not significantly affect the margin to the standby jacket water pump auto-start. Normal jacket water standpipe level ensures adequate suction head to the jacket water pumps. The small flow change associated with voltage and frequency variations is acceptable to the NPSH margin.

3.2.2.2 SBDG Lube Oil Pumps

For the lube oil pumps, the licensee stated:

> Performance of both the engine-driven lube oil pump and the redundant standby motor-driven lube oil pump will vary with engine speed and frequency. The engine-driven lube oil pump, however, will not change with changes in SBDG voltage. Both oil pumps are positive displacement pumps rated at 670 gpm. Using the methods of WCAP-17308-NP-A, the standby motor-driven lube oil pump speed uncertainty will be 13.9 rpm, or 0.78% of the 1,775 rpm nominal running speed. Performance of the lube oil pumps, therefore, is bounded using a speed variation of 0.78%. Because both pumps are positive displacement pumps, the pump flow rate will vary directly with pump speed changes, or about 5.2 gpm from the nominal 670 gpm pump capacity.

The licensee concluded that the effect of small voltage and frequency variations on the lube oil pumps performance margin is acceptable.

3.2.2.3 SBDG Fuel Oil Booster Pumps

The licensee stated that the performance of both the engine-driven fuel oil booster pump and the redundant motor-driven fuel oil booster pump will vary with engine speed and frequency. Both fuel oil pumps are positive displacement pumps with the engine-driven pump rated at 11 gpm and the motor-driven pump rated at 10 gpm. Since the engine uses about 6 gpm of fuel oil, with the remaining fuel oil returning to the fuel oil storage tank through a relief valve, the licensee concluded that small changes in voltage and frequency will not significantly affect the margin of these pumps.

The NRC staff reviewed the licensee's response to RAI EMIB 1-2 and finds that the proposed voltage and frequency tolerances will not have an adverse impact on the operation of the skid-mounted pumps or the SBDG because there is sufficient margin in the pump flow rates and discharge pressures. There is adequate margin between pump flow rates and discharge pressures when the SBDG is operating at a lower end of the allowable frequency. Pressure regulating valves routinely divert excess flow to maintain required header pressures and thermostatic valves routinely divert flow to maintain required system temperatures. The engine-driven, skid-mounted pumps have redundant motor-driven pumps to compensate for

reduced engine-driven pump performance to maintain normal SBDG operation. Additionally, the SBDGs are routinely tested at frequencies and voltages outside of the proposed tolerance ranges during load sequencer surveillance testing and during monthly operational testing with no noted operational problems with the skid-mounted pumps. Therefore, the NRC staff concludes that the proposed SBDG steady-state voltage and frequency tolerance ranges will not have a negative impact on the operation of these pumps.

3.2.3 Impact on Relief Valves and Trip Setpoints

In response to RAIs EMIB 1-2 and 1-3 in the letter dated December 6, 2018, the licensee discussed whether the variations in SBDG frequency will cause relief valves to lift on ECCS pump discharge piping and whether the frequency variation could cause low pressure alarms to actuate for skid-mounted pumps. The licensee evaluated the LHSI pumps, HHSI pumps, and SBDG skid-mounted pumps. For the pumps that have relief valves or low-pressure alarms, the licensee determined that adequate margin exists so that the relief valves will not lift and the low-pressure alarms will not actuate due to variations in SBDG frequency.

The NRC staff reviewed the responses to RAIs EMIB 1-2 and 1-3 and finds that variations within the proposed steady-state voltage and frequency tolerances will not result in discharge pressures that reach relief valve setpoints on ECCS discharge piping, because the pressure relief valves on the ECCS discharge piping have adequate margin from the maximum pressure to the minimum relief valve lift pressure even during the most limiting operating conditions with flow through the minimum flow path. Similarly, the licensee explained that skid-mounted pumps have relief valves that maintain fluid pressure by recirculating excess fluid as part of normal operation and that the jacket water system pressure is maintained by standpipe level. The lube oil system does have low pressure trip switches to trip the SBDG if pressure falls to 30 pounds per square inch gauge (psig); however, as the licensee discussed in its response to RAI EMIB 1-2, the small variations within the frequency tolerance band are not anticipated to cause pressure to decrease significantly from the normal operating point of 50 psig. Therefore, the NRC staff finds that the proposed voltage and frequency tolerances will not adversely affect skid-mounted pump trips because adequate margin exists between skid-mounted pump trip setpoints and the small variations in pressure due to variations in SBDG steady-state voltage and frequency.

3.2.4 Impact on SBDG Fuel Oil Consumption

In Section 3.0 of the LAR, the licensee evaluated the impact of the proposed frequency and voltage tolerance changes on the SBDG fuel oil consumption rate. The licensee stated that the STP design calculation determined that the total volume of fuel oil required for 7 days of SBDG operation is 49,900 gallons. This volume includes 43,350 gallons for electrical loading, 400 gallons for testing, 370 gallons for unrecoverable leak-off, 1360 gallons for loss to a pipe break, and 4412 gallons for an additional 10 percent margin. The licensee further stated that the increase in inductive power load due to uncertainty in SBDG frequency is approximately 1.8 percent, which would require approximately 900 gallons of additional fuel. The TS requirement for stored fuel is 60,500 gallons, which is substantially more than the 50,800 gallons required at the upper limit of inductive power load due to uncertainty.

As part of the response to RAI EMIB 1-2, the licensee explained that the skid-mounted fuel oil booster pumps are susceptible to variation in speed based on SBDG frequency, but the variation is small and compensated by significant margin within the system. The engine-driven pump provides 11 gpm and the motor-driven pump provides 10 gpm of fuel to the SBDG. The

SBDG requires approximately 6 gpm and any excess fuel is returned to the fuel oil storage tank through a relief valve. A fuel oil consumption uncertainty of 1.8 percent would not significantly reduce the margin between required fuel flow rate and available fuel flow rate to the SBDG.

The NRC staff concludes that the proposed SBDG steady-state voltage and frequency tolerances will not require the licensee to increase fuel oil storage because available stored fuel has substantial margin to the required seven-day supply to compensate for the possible 1.8 percent increase in fuel consumption due to power load uncertainty resulting from frequency and voltage variations within the proposed tolerance ranges. Additionally, there is adequate margin in fuel oil booster pump flow rate to the engine to account for the possible small changes in SBDG fuel oil consumption rate.

3.2.5 Impact on Operation of Motor-Operated Valves

In the NRC staff's safety evaluation of WCAP-17308-NP (ADAMS Accession No. ML17074A112), which is documented in WCAP-17308-NP-A, the staff found that frequency variation can impact MOV stroke times and inertia; however, these effects are small and will not impact valve performance in an adverse manner. Voltage variations, however, can have significant effects on valve torque. Therefore, the staff concluded that the impact of voltage and frequency variation on MOV torque should be evaluated.

In Section 3.0 of the LAR, the licensee evaluated the effects of voltage and frequency variation on MOV operation. The licensee stated that MOV operation at degraded voltage was previously evaluated to comply with Generic Letters (GLs) 89-10, "Safety-Related (1) Motor-Operated Valve Testing and Surveillance Results of the Public Workshops," and 96-05, "Periodic Verification of Design-Basis Capability of Safety-Related Motor-Operated Valves." MOV operability was analyzed at a degraded voltage of 92.35 percent of the 480-volt supply. The LAR-proposed limiting voltage of -5 percent is bounded by the degraded voltage analysis at -7.65 percent of nominal voltage. The licensee further stated that the methodology in WCAP-17308-NP-A, Section 2.5, "Motor Speed/Torque Curve Numerical Approach," was used to analyze the effects of SBDG voltage and frequency variation on MOV actuator motor torque.

The licensee first considered the effect of the degraded switchyard voltage (92.35 percent of the 480-volt supply) used in the evaluation to comply with GLs 89-10 and 96-05. This evaluation results in a degraded torque of 85.29 percent of nominal torque. Second, the licensee considered the combined effects from the highest frequency and lowest voltage within the proposed tolerance ranges, which are the most limiting to MOV torque capability.

The combined limiting conditions of low voltage and high frequency yields a torque reduced to 88.3 percent of nominal torque. This torque is bounded by the 85.29 percent of nominal torque calculated in the analysis for GLs 89-10 and 96-05. Therefore, the NRC staff concludes that MOV torque capability is bounded by the existing analysis and will not be further affected by the most limiting case of SBDG steady-state operation within the proposed tolerance bands.

3.2.6 Impact on SBDG Loading

Section 3.1.2, "Impact of Voltage Variation on Diesel Generator Loading," of WCAP-17308-NP-A provides guidance for the net change in power required by the loads with the SBDG operating at lower than nominal voltage and frequency conditions and the consequential change in the power factor and real and reactive portions of the current and recommends that the overall impact of SBDG output voltage should be considered for real and reactive components of the SBDG loading evaluation.

The licensee used the methodology described in Section 3.1, "Diesel Generator Loading," of WCAP-17308-NP-A. The total SBDG load, including intermittent loads, for a loss-of-cooling accident coincident with a loss-of-offsite power is 4802.9 kW. Using the equation in Section 3.1 of WCAP-17308-NP-A, the total SBDG load associated with a conservative SBDG frequency of 60.36 Hz is 4889.9 kW. The 87 kW increase, which is approximately a 1.8 percent difference, results in a total kW value that is less than the SBDG continuous load rating of 5500 kW and is, therefore, acceptable.

The NRC staff finds that the methodology performed by the licensee is acceptable. The increase in loading is bounded by the capacity of the SBDGs to mitigate the worst-case design-basis event at the proposed steady-state voltage and frequency; therefore, the staff finds it acceptable.

3.3 New TS Surveillance

The existing SR 4.8.1.1.2.a.2) requires verification of voltage and frequency. The licensee proposes to retain the existing wider allowable band for voltage and frequency (i.e., 4160 ± 416 volts and 60 ± 1.2 Hz). As part of the LAR, the licensee proposes a new SR 4.8.1.1.2.a.5) to be performed less frequently to verify that the SBDG starts from standby conditions and achieves generator voltage and frequency of 4160 ± 416 volts and 60 ± 1.2 Hz within 10 seconds after the start signal. The steady-state voltage and frequency shall be 4160 ± 208 volts and 60 ± 0.3 Hz. The intent of the proposed new SR is to demonstrate that the SBDGs remain OPERABLE and would fulfill the intended safety functions during a DBA.

By e-mail dated March 21, 2019 (ADAMS Accession No. ML19081A151), the NRC staff requested the licensee to explain how performance of SR 4.8.1.1.2.a.2 with allowable voltage and frequency band less restrictive than that assumed in the plant's DBA analyses may be used to demonstrate continued OPERABILITY of the SBDG. Specifically, the staff was concerned about voltage and frequency setpoint drift over an extended duration. By letter dated May 16, 2019, the licensee stated that control room instrumentation is used to determine SBDG voltage and frequency during the performance of SR 4.8.1.1.2.a.2. The control room instrumentation does not have the accuracy and readability to determine the SBDG voltage and frequency with the required precision to ensure that the SBDG parameters are within the narrow band proposed for related TS SRs. A temporary test recorder has to be installed to measure the voltage and frequency to the required precision. The response further states that, "Rated surveillance tests are conducted at a frequency (currently six months) in accordance with the Surveillance Frequency Control Program (SFCP) to provide assurance that the SBDG can (1) start from standby conditions and accelerate to 600 rpm within 10 seconds, and (2) provide steady-state voltage and frequency within the proposed narrow band; these surveillance tests do not, however, demonstrate that the ESF busses are properly shed and loaded." Additionally, the licensee proposed a revision to SR 4.8.1.1.2.a.5) as originally proposed in the LAR that adds to it a list of allowable test start signals.

In Section 3 of the LAR, the licensee provided a summary of steady-state frequency readings from recent surveillances performed on each SBDG. The results demonstrate that the SBDG governors control frequency within the range of 60 ± 0.15 Hz (± 0.25 percent). The LAR states that the values are for fast-start surveillance runs where digital recorders were used to measure SBDG steady-state frequency. The NRC staff reviewed the results of frequency variation and observed that there was minimal drift in the "as measured" parameters. Since the results demonstrated that the SBDG frequencies (and voltages) were within the limits proposed in TS SR 4.8.1.1.2.a.5, the NRC staff agrees that the more frequent surveillance requirement (SR 4.8.1.1.2.a.2)) can be performed with the existing allowable tolerances for voltage and frequency. Based on the information provided, the NRC staff agrees with the proposed changes to TS 3.8.1.1 and finds that there is reasonable assurance that the proposed SRs comply with 10 CFR 50.36(c)(3).

3.4 Technical Conclusion

The NRC staff reviewed the proposed changes to South Texas Project, Units 1 and 2, TS 3.8.1.1 to narrow the SBDG steady-state voltage and frequency ranges in the SRs. Based on the above technical evaluation, the NRC staff finds that the proposed TS changes will not adversely impact the capacity and capability of the safety-related electrical equipment required for accident mitigation and plant shutdown. Therefore, the NRC staff finds that the revised SRs provide the appropriate requirements to ensure that the necessary quality of the electrical equipment is maintained and that the associated limiting conditions for operation will be met. The NRC staff concludes that there is reasonable assurance that the requirements of 10 CFR 50.36(c)(3) will continue to be met. Therefore, the NRC staff finds that the proposed TS changes provide reasonable assurance that the licensee will continue to comply with the intent of 10 CFR Part 50, Appendix A, GDC 17, GDC 18, and GDC 34 and 10 CFR 50.46. In conclusion, the NRC staff finds the proposed changes in the LAR, as supplemented, acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Texas State official was notified of the proposed issuance of the amendments on August 1, 2019. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change requirements with respect to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20 and change SRs. 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 published in the *Federal Register* on July 31, 2018 (83 FR 36978), and there has been no public comment on such finding. 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.

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 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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Date: August 20, 2019

SUBJECT: SOUTH TEXAS PROJECT, UNITS 1 AND 2 - ISSUANCE OF AMENDMENT NOS. 216 AND 202 RE: STANDBY DIESEL GENERATOR SURVEILLANCE REQUIREMENTS (EPID L-2018-LLA-0078) DATED AUGUST 20, 2019

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