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

March 25, 2011

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear
P.O. Box 236, N09
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - ISSUANCE OF AMENDMENT RE: EMERGENCY DIESEL GENERATORS A AND B ALLOWED OUTAGE TIME EXTENSION (TAC NO. ME3597)

Dear Mr. Joyce:

The Commission has issued the enclosed Amendment No. 188 to Facility Operating License No. NPF-57 for the Hope Creek Generating Station. This amendment consists of changes to the Technical Specifications (TSs) and Facility Operating License in response to your application dated March 29, 2010, as supplemented by letters dated May, 28, and September 30, 2010, and two letters dated February 14, 2011.

The amendment revises the TSs to extend the allowed outage time for the A and B emergency diesel generators from 72 hours to 14 days.

A copy of our safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosures:
1. Amendment No. 188 to License No. NPF-57
2. Safety Evaluation

cc w/encls: Distribution via Listserv

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

PSEG NUCLEAR LLC

DOCKET NO. 50-354

HOPE CREEK GENERATING STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 188
License No. NPF-57

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

   A. The application for amendment filed by PSEG Nuclear LLC dated March 29, 2010, as supplemented by letters dated May, 28, and September 30, 2010, and two letters dated February 14, 2011, 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 set forth in 10 CFR Chapter I;

   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 Facility Operating License No. NPF-57 is hereby amended to read as follows:

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 188, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into the license. PSEG Nuclear LLC 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 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION

Harold K. Chernoff, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the License
and Technical Specifications

Date of Issuance: March 25, 2011

ATTACHMENT TO LICENSE AMENDMENT NO. 188

FACILITY OPERATING LICENSE NO. NPF-57

DOCKET NO. 50-354

Replace the following page of the Facility Operating License with the revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

Remove	Insert
3	3

Replace the following pages of the 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.

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

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

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

(6) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Parts 30, 40 and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility. Mechanical disassembly of the GE14i isotope test assemblies containing Cobalt-60 is not considered separation.

(7) PSEG Nuclear LLC, pursuant to the Act and 10 CFR Part 30, to intentionally produce, possess, receive, transfer, and use Cobalt-60.

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

(1) Maximum Power Level

PSEG Nuclear LLC is authorized to operate the facility at reactor core power levels not in excess of 3840 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A, as revised through Amendment No. 188, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated into the license. PSEG Nuclear LLC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) Inservice Testing of Pumps and Valves (Section 3.9.6, SSER No. 4)*

This License Condition was satisfied as documented in the letter from W. R. Butler (NRC) to C. A. McNeill, Jr. (PSE&G) dated December 7, 1987. Accordingly, this condition has been deleted.

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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.

3/4.8 ELECTRICAL POWER SYSTEMS

3/4.8.1 A.C. SOURCES

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, and

b. Four separate and independent diesel generators, each with:

1. A separate fuel oil day tank containing a minimum of 360 gallons of fuel,

2. A separate fuel storage system consisting of two storage tanks containing a minimum of 44,800 gallons of fuel, and

3. A separate fuel transfer pump for each storage tank.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, and 3.

ACTION:

Note: LCO 3.0.4.b is not applicable to DGs.

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. Restore the inoperable offsite circuit to OPERABLE status within 72 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. With one diesel generator of the above required A.C. electrical power sources inoperable,

1. 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 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 diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 separately for each diesel generator within 24 hours* unless the absence of any potential common mode failure for the remaining diesel generators is demonstrated.

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* This test is required to be completed regardless of when the inoperable diesel generator is restored to OPERABILITY.

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

2. For the inoperable A or B diesel generator, if continued operation is permitted by LCO 3.7.1.3:

   a) Restore the inoperable diesel generator to OPERABLE status within 72 hours, or

   b) Verify the Salem Unit 3 gas turbine generator (GTG) is available within 72 hours and once per 12 hours thereafter#, and restore the inoperable diesel generator to OPERABLE status within 14 days.

   Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

3. For the inoperable C or D diesel generator, if continued operation is permitted by LCO 3.7.1.3, restore the inoperable diesel generator to OPERABLE status within 14 days, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

c. With one offsite circuit of the above required A.C. sources and one diesel generator 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. If a diesel generator became inoperable due to any causes other than an inoperable support system, an independently testable component, or preplanned preventive maintenance or testing, demonstrate the OPERABILITY of the remaining OPERABLE diesel generators separately for each diesel generator by performing Surveillance Requirement 4.8.1.1.2.a.4 within 16 hours unless the absence of any potential common mode failure for the remaining diesel generators is demonstrated*. If continued operation is permitted by LCO 3.7.1.3, restore at least two offsite circuits and all four of the above required diesel generators to OPERABLE status within 72 hours from time of the initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. A successful test(s) of diesel generator OPERABILITY per Surveillance Requirement 4.8.1.1.2.a.4 performed under this ACTION statement for the OPERABLE diesel generators satisfies the diesel generator test requirements of ACTION Statement b.

d. With both of the above required offsite circuits inoperable, restore at least one of the above required offsite circuits to OPERABLE status within 24 hours or be in at least HOT SHUTDOWN within the next 12 hours. With only one offsite circuit restored to OPERABLE status, restore at least two offsite circuits to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

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* This test is required to be completed regardless of when the inoperable diesel generator is restored, to OPERABILITY.

\# After the initial verification period, the GTG may be unavailable for a single period of up to 24-hours and the once-per 12-hour requirement to verify that the GTG is available may be suspended during this period.

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

e. With two diesel generators of the above required A.C. electrical power sources 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 either of the diesel generators 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 diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 separately for each diesel generator within 8 hours* unless the absence of any potential common mode failure for the remaining diesel generators is demonstrated. Restore at least one of the inoperable diesel generators to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. A successful test(s) of diesel generator OPERABILITY per Surveillance Requirement 4.8.1.1.2.a.4 performed under this ACTION statement for the OPERABLE diesel generators satisfies the diesel generator test requirements of ACTION Statement b.

f. With two diesel generators of the above required A.C. electrical power sources inoperable, in addition to ACTION e., above, verify within 2 hours that all required systems, subsystems, trains, components, and devices that depend on the remaining diesel generators as a source of emergency power are also OPERABLE; otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

g. With one offsite circuit and two diesel generators 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. If either of the diesel generators 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 diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 separately for each diesel generator within 8 hours* unless the absence of any potential common mode failure for the remaining diesel generators is demonstrated. Restore at least one of the above required inoperable A.C. sources to OPERABLE status within 2 hours or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Restore the inoperable offsite circuit and both of the inoperable diesel generators to OPERABLE status within 72 hours from time of initial loss or be in at least HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours.

h. With the buried fuel oil transfer piping's cathodic protection system inoperable for more than 30 days, prepare and submit a Special Report to the Commission pursuant to Specification 6.9.2 within the next 10 days outlining the cause of the malfunction and the plans for restoring the system to OPERABLE status.

i. With one fuel oil transfer pump inoperable, realign the flowpath of the affected tank to the tank with the remaining operable fuel oil transfer pump within 48 hours and restore the inoperable transfer pump to OPERABLE status within 14 days, otherwise declare the affected emergency diesel generator (EDG) inoperable. This variance may be applied to only one EDG at a time.

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* This test is required to be completed regardless of when the inoperable diesel generator is restored to OPERABILITY.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 188 TO FACILITY OPERATING LICENSE NO. NPF-57

PSEG NUCLEAR LLC

HOPE CREEK GENERATING STATION

DOCKET NO. 50-354

1.0 INTRODUCTION

By letter dated March 29, 2010, as supplemented by letters dated May, 28, and September 30, 2010, and two letters dated February 14, 2011 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML100900458, ML101590514, ML102870101, ML110450312, and ML110460135, respectively), PSEG Nuclear LLC (PSEG or the licensee) submitted a request for changes to the Hope Creek Generating Station (HCGS) Technical Specifications (TSs). The proposed amendment would revise TS 3/4.8.1 to extend the allowed outage time (AOT) for the A and B emergency diesel generators (EDGs) from 72 hours to 14 days.

The supplements dated May 28, and September 30, 2010, and February 14, 2011 (two letters), provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the Nuclear Regulatory Commission (NRC or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* (FR) on June 29, 2010 (75 FR 37476).

2.0 REGULATORY EVALUATION

2.1 HCGS Electrical Power System Description

As discussed in Sections 8.1 and 8.2 of the HCGS Updated Final Safety Analysis Report (UFSAR), three physically independent 500 kilo-Volt (kV) lines from the grid network supply offsite power to HCGS through the 500 kV switchyard. There are two physically independent connections from the 500 kV switchyard to a 13.8 kV ring bus. The 13.8 kV ring bus is the preferred source of power for the plant and it supplies both Class 1E and non-Class 1E loads during startup, normal operation, shutdown, and post-shutdown.

As discussed in Sections 8.1 and 8.3 of the UFSAR, the onsite Class 1E power system is divided into four independent channels. Each channel supplies power to its dedicated load group. Any three of the four load groups (A, B, C, and D) can safely shut down the plant and maintain the plant in a safe shutdown condition. Each channel consists of independent 4.16 kV,

480 volt alternating current (VAC), 208/120 VAC and 125 V direct current (VDC) power supplies. There are also two 250 VDC systems (one associated with Channel A and the other with Channel B).

Each of the four Class 1E 4.16 kV buses is provided with connections to two offsite power sources via Station Service Transformers 1AX501 and 1BX501. One of these sources is designated as the normal source and the other as the alternate source for the bus. In addition to these two connections to offsite power, each 4.16-kV Class 1E bus is connected to its dedicated EDG. These four EDGs (A, B, C, and D) serve as the standby electric power source for their respective channels in case both the normal and alternate power supplies to a bus are lost.

Each Class 1E 4.16 kV bus is normally energized by the offsite normal power supply. If the normal power is not available at the 4.16 kV bus due to source transformer or transformer feeder protective relay actuation, automatic fast transfer occurs to the alternate source. If the normal power supply is lost due to degraded grid conditions or a loss of voltage, a slow or dead bus transfer takes place to the alternate source. If both the normal and the alternate power sources are unavailable, the loads on each bus are picked up automatically by the EDG assigned to that bus in a predetermined sequence.

Each EDG is rated at 4430 kilo-Watts (kW) for continuous operation and at 4873 kW for 2 hours of short time operation in any 24-hour period.

As discussed on page 12 of Attachment 1 of the licensee's supplement dated September 30, 2010, the size of the EDGs and the loads assigned among them is such that any combination of three out of four EDGs is capable of mitigating the consequences of loss of offsite power (LOOP) concurrent with a loss-of-coolant accident (LOCA), or an LOOP event while operating at full power. However, to support plant operation in an extended hot or cold shutdown condition, only two EDGs are required; one of which has to be the A or B EDG to support use of the A or B residual heat removal (RHR) pumps in RHR shutdown cooling mode operation. The continuous rating of the EDGs is adequate based on the maximum total load required at any one time. Each of the four Class 1E power supply channels feed loads in its own dedicated load group. No provisions exist for parallel operation of an EDG of one channel with the EDG of a redundant channel.

As defined in Section 50.2 of Title 10 of the *Code of Federal Regulations* (10 CFR), station blackout (SBO) means the complete loss of AC power to the essential and non-essential switchgear buses in a nuclear power plant (i.e., loss of offsite electric power system concurrent with turbine trip and unavailability of the onsite emergency ac power system). SBO does not include the loss of availability of AC power to buses fed by station batteries through inverters or by alternate ac (AAC) sources, nor does it assume a concurrent single failure or design-basis accident (DBA). As also defined in 10 CFR 50.2, an AAC source means an AC power source that is available to and located at or nearby a nuclear power plant and meets the following requirements:

- Is connectable to but not normally connected to the offsite or onsite emergency AC power systems;

- Has minimum potential for common mode failure with offsite power or the onsite emergency AC power sources;

- Is available in a timely manner after the onset of SBO; and

- Has sufficient capacity and reliability for operation of all systems required for coping with SBO and for the time required to bring and maintain the plant in safe shutdown (non-DBA).

The regulatory requirements regarding SBO are contained in 10 CFR 50.63, "Loss of all alternating current power." Regulatory Guide (RG) 1.155, "Station Blackout," dated August 1988 (ADAMS Accession No. ML003740034), describes a method acceptable to the NRC staff for meeting the requirements in 10 CFR 50.63. In RG 1.155, the NRC states that Nuclear Management and Resources Council (NUMARC) 87-00, "Guidelines and Technical Bases for NUMARC Initiatives Addressing Station Blackout at Light Water Reactors" dated November 1987 provides guidance acceptable for meeting the requirements of 10 CFR 50.63, except when RG 1.155 takes precedence over NUMARC 87-00 as indicated in Table 1 of RG 1.155.

The HCGS licensing basis for SBO is discussed in UFSAR Section 1.15.1. Further details regarding how HCGS meets the SBO requirements was provided in Section 3.2 of Attachment 1 of PSEG's application dated March 29, 2010. HCGS does not credit an AAC source to meet the requirements of 10 CFR 50.63. Instead, the plant uses the "AC-independent" approach outlined in NUMARC 87-00 for its SBO event coping capability. In this approach, plants rely on available process steam, DC power, and compressed air to operate equipment necessary to achieve and maintain hot shutdown. The required coping duration for HCGS was calculated as 4 hours in accordance with the guidance in NUMARC 87-00. The licensee's coping analysis credits the high-pressure coolant injection (HPCI) and reactor core isolation cooling (RCIC) systems, which operate independently of AC power, for decay heat removal for an SBO event.

As discussed in Section 3.3 of Attachment 1 of PSEG's application dated March 29, 2010, the licensee stated that EDG performance and reliability are monitored and evaluated consistent with guidance provided in NUMARC 87-00. Based on SBO studies and coping criteria, the EDG reliability target for HCGS is 0.95. This value represents the underlying unit EDG reliability values for the purposes of the SBO coping duration of 4 hours, with subsequent restoration of AC power.

2.2 Proposed TS Changes

TS 3/4.8.1, "A.C. Sources," requires, as a minimum, that the following AC power sources be operable in Operational Conditions 1 (power operation), 2 (startup), and 3 (hot shutdown): (1) two physically independent circuits between the offsite transmission network and the onsite Class 1E distribution system; and (2) four separate and independent EDGs.

Currently, with one EDG inoperable, Limiting Condition for Operation (LCO) 3.8.1.1, Action b, requires that the inoperable EDG be restored to operable status within 72 hours for EDG A or B and within 14 days for EDG C or D. The proposed amendment would revise Action b to extend

the AOT for the A and B EDGs from 72 hours to 14 days. The specific TS changes are shown below.

LCO 3.8.1.1, Action b, currently reads as follows:

> b. With one diesel generator of the above required A.C. electrical power sources 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 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 diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 separately for each diesel generator within 24 hours* unless the absence of any potential common mode failure for the remaining diesel generators is demonstrated. If continued operation is permitted by LCO 3.7.1.3, restore the inoperable diesel generator to OPERABLE status within 72 hours for diesel generators A or B, or within 14 days for diesel generators C or D, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

As shown in Attachment 2 of PSEG's letter LR-N11-0045 dated February 14, 2011 (ADAMS Accession No. ML110460135), LCO 3.8.1.1, Action b, would be revised to read as follows:

> b. With one diesel generator of the above required A.C. electrical power sources inoperable,
>
> 1. 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 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 diesel generators by performing Surveillance Requirement 4.8.1.1.2.a.4 separately for each diesel generator within 24 hours* unless the absence of any potential common mode failure for the remaining diesel generators is demonstrated.
>
> 2. For the inoperable A or B diesel generator, if continued operation is permitted by LCO 3.7.1.3:
>
> a) Restore the inoperable diesel generator to OPERABLE status within 72 hours, or
>
> b) Verify the Salem Unit 3 gas turbine generator (GTG) is available within 72 hours and once per 12 hours

thereafter#, and restore the inoperable diesel generator to OPERABLE status within 14 days.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

3. For the inoperable C or D diesel generator, if continued operation is permitted by LCO 3.7.1.3, restore the inoperable diesel generator to OPERABLE status within 14 days, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

After the initial verification period, the GTG may be unavailable for a single period of up to 24-hours and the once-per 12-hour requirement to verify that the GTG is available may be suspended during this period.

As shown in the above proposed changes to LCO 3.8.1.1, Action b, the TSs would allow the AOT for EDG A or B to extend from 72 hours to 14 days provided the availability of the GTG is verified within the initial 72-hour period and once per 12 hours thereafter. After the initial verification period, the GTG may be unavailable for a single period of up to 24-hours and the once-per 12-hour requirement to verify that the GTG is available may be suspended during this period.

The licensee provided the following discussion in Section 3.6 of Attachment 1 of its application dated March 29, 2010, regarding the reasons the proposed amendment is being requested:

> Planned EDG outages, including preventive maintenance to ensure EDG availability, elective maintenance activities, and surveillances, routinely require more than 72 hours to complete. As such, iterative maintenance windows of shorter duration are scheduled to accomplish appropriate maintenance for the A and B EDGs. In addition emergent maintenance and subsequent testing could be completed in the AOT. Replacement of equipment such as bearings and pistons require significant run in time and surveillance testing, challenging the ability to complete maintenance activities within the current AOT. Typically these longer duration activities, including diesel overhauls, have had to be scheduled during refueling outages. Performing these activities on-line allows the focus of the maintenance organization and site management on these critical tasks.
>
> The extended AOT for EDGs also improves effectiveness of the allowed maintenance period. A significant portion of on-line maintenance activities is associated with preparation and return to service activities, such as, tagging, fluid system drain down, fluid system fill and vent, and cylinder block heat-up. The duration of these activities is relatively constant. Longer required AOT durations allows more maintenance to be accomplished during a given on-line maintenance period and therefore would improve maintenance efficiency. Thus, the total EDG unavailability is expected to be reduced with this proposed change.

2.3 Regulatory Requirements and Guidance Documents

The regulatory requirements and guidance documents the NRC staff considered in its review of the proposed amendment are discussed below.

In 10 CFR 50.36, the Commission established its regulatory requirements related to the content of the TSs. Pursuant to 10 CFR 50.36, TSs are required to include items in the following five specific categories related to station operation: (1) safety limits, limiting safety system settings, and limiting control settings; (2) LCOs; (3) surveillance requirements; (4) design features; and (5) administrative controls. The rule does not specify the particular requirements to be included in a plant's TSs.

As stated in 10 CFR 50.36(c)(2)(i), the "Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility. When a limiting condition for operation of a nuclear reactor is not met, the licensee shall shut down the reactor or follow any **remedial action** permitted by the technical specifications until the condition can be met [emphasis added]." The LCO Action requirements establish those remedial actions that must be taken when the requirements of an LCO are not met. There are two basic types of Action requirements. The first type specifies a time limit (referred to as an AOT or a Completion Time, during which the LCO may not be met. This time limit provides for restoration of an inoperable system or component to operable status or to restore variables to within specified limits. If this type Action requirement is not completed within the specified AOT, a shutdown may be required to place the unit in a mode or condition in which the LCO is not applicable. The second type of Action requirement specifies the remedial measures that permit continued operation of the unit that is not further restricted by the AOT. In this case, compliance with the Action requirements provides an acceptable level of safety for continued operation.

General Design Criterion (GDC) 17, "Electric power systems," of Appendix A to 10 CFR Part 50, states, in part, that nuclear power plants have onsite and offsite electric power systems to permit the functioning of structures, systems, and components that are important to safety. The onsite system is required to have sufficient independence, redundancy, and testability to perform its safety function, assuming a single failure. The offsite power system is required to be supplied by two physically independent circuits that are designed and located so as to minimize, to the extent practical, the likelihood of their simultaneous failure under operating and postulated accident and environmental conditions.

GDC-18, "Inspection and testing of electric power systems," of Appendix A to 10 CFR Part 50, states, in part, that electric power systems that are important to safety must be designed to permit appropriate periodic inspection and testing of important areas and features, such as insulation and connections to assess the continuity of the systems and the condition of their components.

10 CFR 50.65, "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," requires that preventive maintenance activities must not reduce the overall availability of the systems, structures, and components. It also requires that before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities.

RG 1.93, "Availability of Electric Power Sources," dated December 1974 (ADAMS Accession No. ML003740292), provides guidance with respect to operating restrictions (i.e., AOTs) if the number of available AC sources are less than that required by the TS LCO. In particular, this RG prescribes a maximum AOT of 72 hours if the available AC power sources are one less than required by the LCO.

As discussed above in Safety Evaluation (SE) Section 2.1, RG 1.155, "Station Blackout," dated August 1988 (ADAMS Accession No. ML003740034), describes a method acceptable to the NRC staff for meeting the requirements in 10 CFR 50.63.

RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 1, dated November 2002 (ADAMS Accession No. ML023240437), describes a risk-informed approach, acceptable to the NRC, for assessing the nature and impact of proposed permanent licensing-basis changes by considering engineering issues and applying risk insights. This RG also provides risk acceptance guidelines for evaluating the results of such evaluations.

RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," dated August 1998 (ADAMS Accession No. ML003740176), describes an acceptable risk-informed approach for assessing proposed changes to TS AOTs. This RG also provides risk acceptance guidelines for evaluating the results of such assessments. RG 1.177 identifies a three-tiered approach for the licensees evaluation of the risk associated with a proposed AOT change, as discussed below.

- Tier 1 assesses the risk impact of the proposed change in accordance with acceptance guidelines, consistent with the Commission's Safety Goal Policy Statement, as documented in RG 1.174 and RG 1.177. The first tier assesses the impact on operational plant risk based on the change in core damage frequency (ΔCDF) and change in large early release frequency (ΔLERF). It also evaluates plant risk while equipment covered by the proposed AOT is out-of-service, as represented by incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP). Tier 1 also addresses probabilistic risk assessment (PRA) quality, including the technical adequacy of the licensee's plant-specific PRA for the subject application. Cumulative risk of the present TS change in light of past related applications or additional applications under review are also considered along with uncertainty/sensitivity analysis with respect to the assumptions related to the proposed TS change.

- Tier 2 identifies and evaluates any potential risk-significant plant equipment outage configurations that could result if equipment, in addition to that associated with the proposed license amendment, is taken out-of-service simultaneously, or if other risk-significant operational factors, such as concurrent system or equipment testing, are also involved. The purpose of this evaluation is to ensure that there are appropriate restrictions in place such that risk-significant plant equipment outage configurations will not occur during the AOT.

- Tier 3 addresses the licensee's overall configuration risk management program (CRMP) to ensure that adequate programs and procedures are in place for identifying risk-

significant plant configurations resulting from maintenance or other operational activities and appropriate compensatory measures are taken to avoid risk significant configurations that may not have been considered when the Tier 2 evaluation was performed. Compared with Tier 2, Tier 3 provides additional coverage to ensure risk-significant plant equipment outage configurations are identified in a timely manner and that the risk impact of out-of-service equipment is appropriately evaluated prior to performing any maintenance activity over extended periods of plant operation. Tier 3 guidance can be satisfied by the Maintenance Rule (10 CFR 50.65), which requires a licensee to assess and manage the increase in risk that may result from activities such as surveillance testing and corrective and preventive maintenance, subject to the guidance provided in RG 1.177, Section 2.3.7.1, and the adequacy of the licensee's program and PRA model for this application. The CRMP is to ensure that equipment removed from service prior to or during the proposed extended AOT will be appropriately assessed from a risk perspective.

RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 1, dated January 2007 (ADAMS Accession No.: ML070240001), describes an acceptable approach for determining whether the quality of the PRA, in total or the parts that are used to support an application, is sufficient to provide confidence in the results, such that the PRA can be used in regulatory decision-making for light water-reactors.

General guidance for NRC staff evaluation of the technical basis for proposed risk-informed changes is provided in NRC Standard Review Plan (SRP), NUREG-0800, Section 19.2, "Review of Risk Information Used to Support Permanent Plant-Specific Changes to the Licensing Basis: General Guidance," dated June 2007 (ADAMS Accession No. ML071700658). Section 19.2 of the SRP states that a risk-informed application should be evaluated by the NRC staff to ensure that the proposed changes meet the following key principles discussed in RG 1.174:

- The proposed change meets the current regulations, unless it explicitly relates to a requested exemption.
- The proposed change is consistent with the defense-in-depth philosophy.
- The proposed change maintains sufficient safety margins.
- When proposed changes increase core damage frequency or risk, the increase(s) should be small and consistent with the intent of the Commission's Safety Goal Policy Statement (reference, "Safety Goals for the Operation of Nuclear Power Plants; Policy Statement; Correction and Republication," 51 FR 30028, dated August 21, 1986).
- The impact of the proposed change should be monitored using performance measurement strategies.

Guidance for NRC staff evaluation of PRA technical adequacy is provided in SRP Section 19.1, "Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 1, dated September 2006 (ADAMS Accession No. ML062510220).

More specific NRC staff guidance related to risk-informed TS changes is provided in SRP Section 16.1, "Risk-Informed Decisionmaking: Technical Specifications," Revision 0, dated August 1998, (ADAMS Accession No. ML042520260), which includes AOT changes as part of risk-informed decision-making.

NUREG-1784, "Operating Experience Assessment - Effects of Grid Events on Nuclear Power Plant Performance," dated December 2003 (ADAMS Accession No. ML033530400), provided an assessment to identify changes to electric grid performance, relative to nuclear power plants, which could impact safety. The assessment found that major changes related to LOOPs after deregulation compared to before include the following: (1) the frequency of LOOP events at nuclear power plants has decreased; (2) the average duration of LOOP events has increased; (3) where before LOOPs occurred more or less randomly throughout the year, for 1997-2001, most LOOP events occurred during the summer; and (4) the probability of a LOOP as a consequence of a reactor trip has increased.

NUREG/CR-6890, Volumes 1-3, "Reevaluation of Station Blackout Risk at Nuclear Power Plants," dated December 2005 (ADAMS Accession Nos. ML060200477, ML060200479, and ML060200510), analyzed LOOP events and associated SBO core damage risk at U.S. commercial nuclear power plants. The analyses documented in Volume 1 indicated that, on average, LOOP events lasted longer in 1997 - 2004 than in 1986 - 1996.

NRC internal memorandum from Paul Gill to Roy K. Mathew, "Electrical Engineering Branch - Technical Position on Onsite (Emergency Diesel Generator) and Offsite Power Sources Allowed Outage Time Extensions," (ADAMS Accession No. ML102290012, non-public) dated August 20, 2010, provides guidance to the NRC staff in reviewing license amendment requests for licensee's proposing a permanent TS change to extend an EDG AOT beyond 72 hours.

NRC Commission Paper SECY-00-0045, dated February 22, 2000 (ADAMS Accession No. ML003679799), informed the Commission that Nuclear Energy Institute (NEI) guidance document NEI 99-04, "Guidelines for Managing NRC Commitments," offered an acceptable way to manage commitments. SECY-00-0045 also stated that the definitions and other guidance in NEI 99-04 are consistent with the principles described in SECY-98-224. NRC Commission Paper SECY-98-224, "Staff and Industry Activities Pertaining to the Management of Commitments Made by Power Reactor Licensees to the NRC," dated September 28, 1998 (ADAMS Accession No. ML992870043), stated that "[t]he imposition of obligations (sometimes referred to as regulatory requirements) during routine interactions with licensees should be reserved for matters that satisfy the criteria of 10 CFR 50.36 or are otherwise found to be of high safety or regulatory significance." The major distinction between obligations and other parts of the licensing bases is that changes generally cannot be made without prior NRC approval.

3.0 TECHNICAL EVALUATION

3.1 Deterministic Evaluation

3.1.1 Defense-in-Depth

Consistent with the discussion in Regulatory Position 2.2.1 of RG 1.177, as part of a license amendment request proposing an AOT change, the licensee should assess whether the change

is consistent with the defense-in-depth philosophy. The defense-in-depth philosophy has traditionally been applied in reactor design and operation to provide multiple means to accomplish safety functions and prevent the release of radioactive material.

On August 1, 1995, the NRC approved a HCGS Amendment No. 75 that, in part, extended the AOT for the C and D EDGs from 72 hours to 14 days (ADAMS Accession No. ML011770266). As discussed on page 5 of the NRC staff's SE for this amendment:

> Under loss of offsite power (LOOP) conditions, either EDG A or B and any other diesel generator would be required to mitigate the consequences of a LOOP. This is because residual heat removal (RHR) pumps A (powered from [EDG A]) or B (powered from [EDG B]) would be required to facilitate desired residual heat removal during a LOOP.
>
> Because of the greater importance of EDGs A and B, the staff is concerned with extending the AOT for these EDGs. As a result, the staff informed the licensee that a maximum of 14 days (rather than 30 days) AOT will be allowed for EDGs C and D only, provided certain conditions are met. EDGs A and B will continue to have a 72-hour AOT.

The RHR system consists of four independent loops (loops A, B, C, and D). However, only loops A and B are utilized for shutdown cooling. As discussed in UFSAR Section 7.4, the RHR shutdown cooling mode is considered a system required for safe shutdown of the plant. In the event of a LOOP, EDGs A and B would provide power to RHR pumps A and B, respectively.

The licensee has re-evaluated the asymmetry among the EDGs (i.e., greater importance of A and B EDGs as a power source for the RHR pumps) based on a revised PRA model and concluded that the asymmetry is not considered significant from a risk perspective for the extension of the AOT. However, as discussed in SE Section 2.1, in an extended hot or cold shutdown condition, two EDGs are required; one of which has to be the A or B EDG to support use of the A or B RHR pumps in shutdown cooling operation. As such, from a deterministic perspective, the NRC staff finds that, the A and B EDGs continue to be of greater importance than the C and D EDGs. Note, consistent with the licensee's amendment request, the scope of the staff's review was limited to the A and B EDGs.

Several studies have been performed (e.g., NUREG-1784 and NUREG/CR-6890, discussed in SE Section 2.3) which concluded that the average duration of LOOP events has increased from the durations assumed at the time of issuance of the SBO rule. Based on this issue, as well as the reliance on the A and B EDGs to support the RHR shutdown cooling mode of operation, the NRC staff concluded during its review that additional defense-in-depth in the form of an AAC power source was warranted if an extension of the A or B EDGs AOT was to be considered.

In the application dated March 29, 2010, the licensee initially proposed regulatory commitments similar to those for EDGs C and D. None of these commitments addressed the use of an AAC source. In a request for additional information (RAI), the NRC staff asked the licensee to consider modifying the proposed amendment to reduce over-reliance on the programmatic activities (i.e., the commitments), and consider enhancing defense-in-depth by crediting an AAC

source, with the capability of handling SBO and LOOP loads, to supplement the existing EDGs during the proposed extended 14-day AOT.

The licensee responded to the RAI in its letter dated May 28, 2010. As discussed on page 2 of Attachment 1 of the May 28, 2010 letter, the licensee agreed to credit the existing onsite GTG (designated as Salem Unit 3) as an AAC source in the event of a LOOP concurrent with failure of the EDGs (i.e., for SBO conditions). The licensee indicated that the AAC source is not needed to meet the requirements for SBO; however, the AAC source is being credited for defense-in-depth.

As shown in Attachment 4 of the PSEG's supplement dated September 30, 2010, the licensee provided a commitment that the availability of the GTG would be checked before entering into any A or B EDG extended 14-day AOT. The licensee proposed to incorporate this commitment into the TS Bases. However, the NRC staff, in an RAI, stated that from a deterministic perspective, the staff considers that the compensatory measures associated with ensuring that the GTG is available before entering and during the extended 14-day AOT is of high regulatory significance (i.e., associated compensatory measures are important with respect to NRC's determination on acceptability of proposed amendment). As such, consistent with the statements in SECY-98-224 regarding imposition of obligations (see SE Section 2.3), the NRC staff stated that this type of commitment warrants inclusion in the TSs or the license to ensure NRC approval prior to any change to this provision. In response to this RAI, the licensee, in its letter LR-N11-0045, dated February 14, 2011, agreed to incorporate the actions associated with the GTG into TS LCO 3.8.1.1. The specific TS changes are discussed above in SE Section 2.2.

The GTG, consists of two gas turbine engines driving an electric generator which can provide approximately 38 MW to the 13 kV North bus via the gas turbine switchyard. The GTG can be synchronized to the grid, paralleled with other electric generators already on the line, or operated alone as an isolated power source. Battery power for the GTG makes it completely independent of an external power source for starting. The GTG can be automatically synchronized and loaded to full output in approximately 3 minutes after a manual start. The initial conditions for use of the GTG during the A and B EDG AOT extension period would be a complete LOOP concurrent with a failure of the HCGS EDGs, resulting in all emergency AC power being lost to HCGS. The GTG is dead bus bootstrap start capable and is periodically tested in this configuration.

The licensee provided the following additional information regarding the GTG in its letters dated September 30, 2010, and February 14, 2011 (PSEG letter LR-N11-0007):

- The total time required to enable the GTG to supply power to the HCGS vital buses is estimated to be three hours. The NRC staff finds this timeframe is acceptable since the GTG would be available, in sufficient time, to provide power to the required loads to bring the plant to cold shutdown, if needed.

- The GTG is started periodically under the Salem Nuclear Generating Station maintenance plan. This activity verifies the ability to start and load the GTG on a monthly frequency. The NRC staff finds that this maintenance activity provides reasonable assurance that any problems with GTG performance will be identified and corrected to ensure reliable GTG performance.

- The licensee completed an analysis to study the capability of GTG to start and run large loads at the HCGS buses during an SBO, and to cope with inrush currents associated with energization of large transformers during black-start conditions. The analysis concluded that the GTG can start and run all 4.16 kV motors attached to a typical 4.16 kV Class 1E station bus with total loading of approximately 200% (8.9 mega volt-amps (MVA)) of the nameplate rating of a single EDG, without separating the bus from the GTG power source. In this scenario, the start of the largest motor (1250 horse power RHR pump motor) results in a voltage drop to 91.58% nominal which recovers to 96.00% within 3 seconds. The nominal time delay of the station 4.16 kV degraded voltage relays (which are set at 92%) is 20 seconds. Thus, the degraded voltage relays will not separate the 4.16 KV bus from the GTG. The analysis also concludes that the GTG is capable of energizing the Salem T2 station power transformer (13.8 kV/500 kV, 60 MVA), Salem-HCGS 500 kV transmission line, and the HCGS station power transformer (500 kV/13.8 kV, 42 MVA, T2 or T4) under the worst-case transformer residual flux when the GTG output voltage is ramped up over a period of at least 8 seconds starting from 50% nominal using the soft-start capability of the GTG digital voltage regulation system. The NRC staff finds that the results of the licensee's analysis provide reasonable assurance that the GTG has sufficient capability to start and run the required loads at HCGS.

Based on above, the NRC staff concludes that there is reasonable assurance that the GTG can be used to bring the plant to cold shutdown if needed. As such, the staff further concludes that the GTG provides an alternate means of accomplishing the safety functions provided by the EDGs. Therefore, the proposed change is consistent with the defense-in-depth philosophy.

3.1.2 Safety Margins

Consistent with the discussion in Regulatory Position 2.2.2 of RG 1.177, as part of a license amendment request proposing an AOT change, the licensee should assess whether the change is consistent with the principle that sufficient safety margins are maintained. As discussed in the RG, sufficient safety margins are maintained when:

- The proposed TS change is not in conflict with approved Codes and standards relevant to the subject system.

- Safety analysis acceptance criteria in the UFSAR are met, or proposed revisions provide sufficient margin to account for analysis and data uncertainties (i.e., the proposed TS change does not adversely affect any assumptions or inputs to the safety analysis, or, if such inputs are affected, justification is provided to ensure sufficient safety margins will continue to exist). For TS AOT changes, an assessment should be made of the affect of the UFSAR acceptance criteria assuming the plant is in the AOT (i.e., the subject equipment is inoperable) and there are no additional failures. Such an assessment should result in the identification of all situations in which entry into the proposed AOT could result in failure to meet an intended safety function.

With respect to the first consideration discussed above, the proposed AOT extension is not in conflict with any Codes and standards relevant to the EDGs.

With respect to the second consideration discussed above, if it is assumed that the A or B EDG is in the 14-day AOT and there are no additional failures, three EDGs would still be available. As discussed in HCGS UFSAR Section 8.3.1.1.3, any combination of three out of four EDGs is capable of shutting down the plant safely, maintaining the plant in a safe shutdown condition, and mitigating the consequences of accident conditions.

Based on the above considerations, the NRC staff concludes that the proposed change maintains sufficient safety margins.

3.1.3 Performance Measurement Strategies

As discussed in Regulatory Position 3.2 of RG 1.177, to ensure that extension of a TS AOT does not degrade operational safety over time, the licensee should ensure, as part of its Maintenance Rule program (10 CFR 50.65), that when equipment does not meet its performance criteria, the evaluation required under the Maintenance Rule includes prior related TS changes in its scope. If the licensee concludes that the performance or condition of TS equipment affected by a TS change does not meet established performance criteria, appropriate corrective action should be taken, in accordance with the Maintenance Rule. Such corrective action could include consideration of another TS change to shorten the revised AOT, or imposition of a more restrictive administrative limit, if the licensee determines this is an important factor in reversing the negative trend.

As discussed in Section 3.4 of Attachment 1 of the licensee's application dated March 29, 2010:

> The Maintenance Rule (MR) requires that an evaluation be performed when equipment covered by the MR does not meet its performance criteria. The reliability and availability of the EDGs are monitored under the MR program. If the pre-established reliability or availability performance criteria are not achieved for the EDGs, they are considered for 10 CFR 50.65 (a)(1) actions. These actions would require increased management attention and goal setting in order to restore their performance to an acceptable level. The actual out of service time for the EDGs is minimized to ensure that the reliability and availability performance criteria are met.

The NRC staff finds that the licensee's performance measurement strategies: (1) provide reasonable assurance that appropriate correction actions will be taken if EDG performance does not meet its reliability or availability criteria and; (2) are consistent with the requirements in 10 CFR 50.65. As such, the NRC staff concludes that the performance measurement strategies are acceptable.

3.1.4 Compliance with Current Regulations

As discussed in Regulatory Position 2.1 of RG 1.177, the proposed TS change must meet the current regulations.

The NRC staff has reviewed the licensee's proposed amendment. The NRC staff finds that the proposed TS changes provide acceptable remedial actions associated with inoperability of either

the A or B EDG. As such, the proposed change meets the requirements of 10 CFR 50.36(c)(2)(i). As discussed in SE Section 3.1.3, the NRC staff concluded that the proposed change is consistent with the requirements in 10 CFR 50.65. The NRC staff also concludes that the proposed changes do not impact compliance with GDCs 17 and 18.

Based on the above, the NRC staff concludes that the proposed amendment meets current regulations.

3.1.5 Deterministic Evaluation Conclusion

Based on the considerations in SE Sections 3.1.1 through 3.1.4, the NRC staff concludes that the proposed amendment is acceptable from a deterministic perspective.

3.2 Risk-Informed Evaluation

3.2.1 Background

The key information used in the NRC staff's risk-informed evaluation is contained in Attachments 1 and 4 of the licensee's application dated March 29, 2010, as well as supplemental information provided in PSEG's letters dated May 28, 2010, September 30, 2010, and February 14, 2011 (PSEG letter LR-N11-0045).

Using the guidance in SRP Sections 19.2 and Section 16.1, the NRC staff reviewed the proposed amendment using the three-tiered approach discussed in RG 1.177 and the five key principles of risk-informed decision making discussed in RGs 1.174 and RG 1.177. As discussed in these RGs, risk-informed applications should meet the following key principles:

1. The proposed change meets the current regulations, unless it explicitly relates to a requested exemption.

2. The proposed change is consistent with the defense-in-depth philosophy.

3. The proposed change maintains sufficient safety margins.

4. When proposed changes increase core damage frequency or risk, the increase(s) should be small and consistent with the intent of the Commission's Safety Goal Policy Statement (reference, "Safety Goals for the Operation of Nuclear Power Plants; Policy Statement; Correction and Republication," 51 FR 30028, dated August 21, 1986).

5. The impact of the proposed change should be monitored using performance measurement strategies.

As discussed in RG 1.177, some of these key principles can be addressed through traditional (i.e., deterministic) engineering considerations. For the proposed HCGS amendment, the deterministic evaluation discussed above in SE Section 3.1 addressed key principles 1, 2, 3, and 5 as summarized below in SE Section 3.2.2. Key principle 4 is evaluated below in SE Section 3.2.3.

3.2.2 Key Principles 1, 2, 3, and 5

Key Principle 1 - Current Regulations

As discussed in SE Section 3.1.4, the NRC staff concludes that the proposed change meets current regulations. Therefore, the proposed amendment meets the first key principle of RG 1.177.

Key Principle 2 - Defense-in-Depth

As discussed in SE Section 3.1.1, the NRC staff concludes that the proposed change is consistent with the defense-in-depth philosophy. Therefore, the proposed amendment meets the second key principle of RG 1.177.

Key Principle 3 - Safety Margins

As discussed in SE Section 3.1.2, the NRC staff concludes that the proposed change maintains sufficient safety margins. Therefore, the proposed amendment meets the third key principle of RG 1.177.

Key Principle 5 - Performance Measurement Strategies

As discussed in Section 3.1.3, the NRC staff concludes that the performance measurement strategies associated with the proposed change are acceptable. Therefore, the proposed amendment meets the fifth key principle of RG 1.177.

3.2.3 Key Principle 4 - Risk is Consistent with Commission's Safety Goal Policy Statement

The evaluation presented below addresses the NRC staff's philosophy of risk-informed decision making, that when the proposed changes result in a change in CDF or risk, the increase should be small and consistent with the intent of the Commission's Safety Goal Policy Statement (Key Principle 4).

3.2.3.1 Tier 1: PRA Capability and Insights

The first tier evaluates the impact of the proposed changes on plant operational risk. The Tier 1 NRC staff review involves two aspects: (1) evaluation of the validity of the HCGS PRA models and their application to the proposed changes, and (2) evaluation of the PRA results and insights based on the licensee's proposed application.

PRA Quality – Internal Events Model

The objective of the PRA quality review is to determine whether the HCGS PRA used in evaluating the proposed changes is of sufficient scope, level of detail, and technical adequacy for this application. The NRC staff review evaluated the PRA quality information provided by the licensee in their submittals, including industry peer review results and self-assessments performed by the licensee.

The HCGS PRA model, designated by the licensee as HC108B, addresses both CDF and LERF for internal events at full power. The model has been updated to reflect power uprate conditions.

The licensee has processes for configuration control of the HCGS PRA model to reflect plant modifications and procedure changes. No outstanding changes, not yet incorporated into the PRA model or dispositioned as not relevant to the model, were identified by the licensee that would have a significant impact on the model.

The HCGS internal events PRA model was subject to an industry peer review in October 2008, using the American Society of Mechanical Engineers (ASME) PRA Standard ASME RA-S-2002, Addenda RA-Sb-2005, which was the version of the PRA standard for internal events endorsed by the NRC in RG 1.200 Revision 1, which was in effect at the time of the licensee submittal. The HC108B HCGS PRA model resolved many of the findings from this review. There are currently four unresolved (open) findings ("gaps") from this review where the internal events model was found not to conform to capability category II of the standard for certain supporting requirements (SR). The licensee identified and dispositioned these four findings to support this license amendment application as shown in the table below.

SR	Description of Gap	Disposition - Importance to Application
DA-D1	Plant-specific data was not collected and applied to the most recent PRA update for reliability data.	The licensee identified that recent plant-specific data are used for the EDGs, and that a review of recent HCGS experience indicated no anomalous behavior for other systems. Therefore, the licensee concluded that this finding is judged to have negligible impact on the conclusions of the application.
QU-E4	Plant-specific sources of uncertainty are not addressed in the baseline PRA model documentation.	The licensee states that the peer review found SR QU-E4 was satisfied at capability category II, but that not all of the specific guidance for uncertainty evaluation was completed. The licensee has provided additional information on uncertainty relevant to this specific application.
SY-A6	Documentation of system boundaries are not defined in the system notebooks.	This is a documentation issue which has no impact on this application.
SY-C2	Improvements to the documentation in system notebooks are not defined in the system notebooks, such that this SR is not fully met.	This is a documentation issue which has no impact on this application.

Based on consideration of the gaps to capability category II of the PRA standard and their disposition for this application, the NRC staff finds that the quality of the HCGS internal events

PRA is sufficient to support the risk evaluation provided by the licensee in support of the proposed license amendment.

PRA Quality – Internal Fires Model

HCGS used a PRA analysis to evaluate internal fires. The fire PRA model is an update of the Individual Plant Examination of External Events (IPEEE).

Internal fires were addressed by a combination of the Fire-Induced Vulnerability Evaluation (FIVE) methodology and fire PRA techniques described in NUREG/CR-4840, "Procedures for the External Event Core Damage Frequency Analyses for NUREG-1150," dated November 1990 (ADAMS Accession No. ML063460465). The approach taken for the fire PRA was to perform a scenario-by-scenario analysis of unscreened compartments accounting for the relative location of ignition sources and targets. Fire damage calculations were performed to determine the extent of potential damage from each postulated fire source. Since the IPEEE, an update to the fire PRA was completed in 2003 which incorporated more recent initiating event data and reassessed the impact of fires on the plant to reduce conservatism and to use the current system and accident sequence models. The licensee also identified that a conservative assumption of a LOOP due to a fire in an EDG room, applied in the IPEEE fire analysis, was investigated and eliminated based on adequacy of fire barriers protecting offsite power bus ducts.

Only a small fraction of core damage sequences due to a fire involve a LOOP and a demand for the EDGs. Therefore, the contribution of fires to risk associated with the proposed TS change is relatively small.

Since the IPEEE was completed, no internal or external reviews or updates were routinely conducted (except as described above in 2003). The licensee stated that a new fire PRA is currently under development, and no significant changes in assessed fire risk have been identified.

The licensee assessed the IPEEE fire model against the technical elements identified in RG 1.200 (Section 1.2.4), and provided the results of this assessment in Table 2-1 of Attachment 2 to the supplement dated May 28, 2010. The assessment was provided both for the baseline PRA and for the application-specific case of the EDG outage. The NRC staff reviewed the licensee assessment of their fire model. The licensee assessment demonstrates that the high level technical elements, described in RG 1.200, are satisfied by the HCGS IPEEE fire PRA model.

The licensee also addressed specific issues relevant to its fire PRA model:

Multiple Spurious Operations (MSOs): The fire PRA does not fully address MSOs in accordance with current industry guidance. A generic list of MSOs applicable to boiling-water reactors was reviewed by the licensee for items which could impact the EDG analysis. The licensee dispositioned these items as not significantly impacting the risk assessment results. In most cases, rooms associated with a fire-induced LOOP event were found not to involve MSOs. Sensitivity analyses conducted for the remaining rooms demonstrated a negligible impact on risk results even when a conservative treatment of the effects of the MSOs was applied.

Fire Suppression: No credit was taken for any fire suppression, except as permitted in the FIVE Methodology for defining room boundaries for fire propagation. This is a conservative treatment of the expected plant response to a fire.

Offsite Power Recovery: Post-fire repairs are not credited in the HCGS fire PRA, including recovery of offsite power caused by a fire. In addition, no credit was taken in the risk analysis for aligning an AAC power source (i.e., the GTG) for fire scenarios.

Cable Selection: The licensee identified that some cable location data was unknown, and that "exclusion" assumptions were made for this risk assessment. Cable routing information was determined by a combination of plant data management systems, cable drawings, and walkdowns.

Screening Criteria: A compartment CDF screening value of 1E-6 was applied in the IPEEE. Compartments with AC power impacts and the EDG rooms were not screened.

Control Room Fires: The HCGS design of the remote shutdown panel provides controls only for one train of equipment. Plant procedures include directions for local operation of the other train if necessary for ex-control room shutdown.

Based on the licensee evaluation of the IPEEE fire analyses using the current high level guidance of RG 1.200, and the disposition of issues identified, the NRC staff finds that the licensee's scope of analysis and methodology applied is acceptable for this application, and has satisfied the intent of RG 1.177 (Sections 2.3.1, 2.3.2, and 2.3.3), RG 1.174 (Sections 2.2.3 and 2.5), and that the quality of the fire risk analyses and methods applied is sufficient to support the risk evaluation provided by the licensee in support of the proposed license amendment.

PRA Quality – Seismic Event Model

The licensee used a seismic PRA analysis to evaluate seismic events. The seismic PRA model is an update of the IPEEE, which was incorporated directly into the internal events at-power model.

A seismic PRA analysis approach was taken to identify potential seismic vulnerabilities at HCGS, based on the methods of NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," dated June 1991 (ADAMS Accession No. ML063550238), and includes the following elements: seismic hazard analysis, seismic fragility assessment, seismic systems analysis, and quantification of seismically-induced CDF, recovery actions under seismic conditions, relay chatter, soil liquefaction, settlement, and slope stability effects, and containment performance. The contribution of seismic events to the baseline CDF is relatively small, approximately 3% (6.9E-7/year).

The licensee assessed the IPEEE seismic model against the technical elements identified in RG 1.200 (Section 1.2.6), and provided the results of this assessment in Table 2-2 of Attachment 2 to the supplement dated May 28, 2010. The assessment was provided both for the baseline PRA and for the application-specific case of the EDG outage. The NRC staff reviewed the licensee assessment of their seismic model. The licensee assessment

demonstrates that the high level technical elements, described in RG 1.200, are satisfied by the HCGS IPEEE seismic PRA model.

There is no contribution of seismically-induced EDG failure on the delta-risk estimates for this application. This is due to the assumption of correlation of failures for similar equipment in similar plant locations. That is, a seismic event of sufficient magnitude to fail an EDG would fail all EDGs. Therefore, the out-of-service status of the EDG is not relevant to a seismic evaluation. The dominant contributor from seismic events is a non-recoverable LOOP where the EDGs are undamaged. The licensee has included this event in its risk assessment. The NRC staff did not perform detailed review of the seismic PRA quality, since seismic risk other than LOOP is demonstrated as not significant to the regulatory decision.

Other Hazards

The licensee provided a qualitative evaluation of the external hazards, such as high winds, tornadoes, external floods, or transportation and nearby facility accidents, which were examined in the IPEEE. The purpose of this qualitative evaluation was to determine whether the prior IPEEE analysis remains consistent with the as-built and operated facility, and to assess any impact on the EDG AOT extension evaluation. The PRA model does not explicitly address other external hazards. In the IPEEE, these hazards were screened using the progressive screening methodology described in NUREG-1407. Based on conformance of the HCGS design with the 1975 SRP criteria, the licensee determined that there was no significant contribution from these hazards. Since these hazards are demonstrated not significant to the regulatory decision, the NRC staff does not require a quantitative PRA evaluation of these hazards.

PRA Risk Results and Insights

The EDGs are modeled in the PRA as impacting mitigation of initiating events, and therefore the EDG outage can be directly modeled in the PRA by assuming it is unavailable and unrecoverable. The licensee assumed that each EDG would incur an additional 14 days of unavailability each 2 years, representing one major maintenance (overhaul) activity. Although additional unavailability due to the extended AOT was not assumed, the risk analysis results provide margin to accommodate additional unavailability.

The licensee did not credit compensatory measures identified in their submittal, except that unavailability of multiple EDGs is not assumed since a different (more restrictive) AOT would apply per TS LCO 3.8.1.1.

The ICCDP and ICLERP are based on the entire 14-day duration of the proposed extended AOT.

The licensee's methodology is consistent with the guidance of RG 1.177, Section 2.3.4 and Section 2.4 and is, therefore, acceptable to the NRC staff.

The licensee presented the quantitative risk metric results (Table 1.b-1 of Attachment 1 of PSEG letter LR-N11-0045, dated February 14, 2011), which summarize the risk-informed licensing basis for the proposed amendment as follows:

Risk Metric	Risk Metric Results	Acceptance Guidelines
ICCDP	2.34E-7 (EDG A) 4.26E-7 (EDG B)	< 5.0E-7 (RG 1.177)
ICLERP	1.27E-9 (EDG A) 4.41E-8 (EDG B)	< 5.0E-8 (RG 1.177)
ΔCDF	3.44E-7/year	< 1.0E-6/year (RG 1.174)
ΔLERF	2.36E-8/year	< 1.0E-7/year (RG 1.174)

The calculated risk metrics demonstrate that the acceptance guidelines of RG 1.174 (for very small changes in ΔCDF and ΔLERF) and RG 1.177 (for ICCDP and ICLERP) are met.

Uncertainty and Sensitivity Analysis

The licensee followed the process outlined in NUREG-1855, "Guidance on the Treatment of Uncertainties Associated with PRAs in Risk-Informed Decision Making," dated March 2009 (ADAMS Accession Nos. ML090970525 and ML090930698), to identify, screen, and evaluate uncertainties in the PRA models. The sources of uncertainty were related to model or data assumptions, operating philosophy, and plant modifications. No equipment performance issues were identified as a source of uncertainty.

The licensee performed sensitivity studies which confirmed the results being insensitive to reasonable variations in LOOP (including fire-induced LOOP) frequency and EDG reliability. The scope of the evaluations and the results demonstrate the risk results are robust with respect to sources of uncertainty in the PRA model.

Shutdown Risk

The licensee conservatively does not credit the avoidance of additional risk during plant shutdowns on the assumption that significant EDG maintenance would now be performed during plant operations rather than during outage periods.

3.2.3.2 Tier 2: Avoidance of Risk-Significant Plant Configuration

The licensee identified that concurrent EDG outages should be avoided during any EDG extended outage. This is specifically controlled by TS LCO 3.8.1.1, Action e, which provides a 2-hour AOT when two EDGs are inoperable.

The licensee also identified other equipment restrictions to be administratively controlled related to availability of high pressure injection sources, avoidance of testing or maintenance activities which are considered "Production Risk" in that there is some increased likelihood of a plant transient, and restrictions on voluntary entry into the LCO action if adverse weather conditions are expected. The risk analysis which is the basis for the EDG 14-day AOT does not credit any of these compensatory measures, which are not incorporated into the TS requirements, but are treated as commitments as discussed below in SE Section 3.4. The licensee considers these measures to be prudent procedural restrictions, but does not consider them to be Tier 2 restrictions per RG 1.177. The licensee presented its assessment of the potential risk improvement obtained by crediting these measures. While the NRC staff does not necessarily agree with the assumptions and basis for these calculations, since no credit is taken for these measures to satisfy the acceptance guidelines, the NRC staff is satisfied that the tier 2 evaluation of RG 1.177 has been met.

3.2.3.3 Tier 3: Risk-Informed Configuration Risk Management

The licensee identified its Configuration Risk Management Program (CRMP) which ensures that the risk impact of equipment out-of-service is properly evaluated prior to performing any work activity. The program provides for proceduralized risk-informed assessment of equipment unavailability using a blended approach of defense-in-depth and PRA insights, and requires assessment for both planned and unplanned activities, including emergent conditions resulting in configurations not previously assessed. The NRC staff concludes that the CRMP provides an acceptable process per RG 1.177 for evaluation of configuration risk during an extended EDG outage to satisfy the Tier 3 requirements.

3.2.3.4 Risk-Informed Evaluation Conclusion

The risk impact of the proposed 14-day AOT for EDGs A and B, as reflected in ΔCDF, ΔLERF, ICCDP, and ICLERP, is consistent with the acceptance guidelines specified in RG 1.174, RG 1.177, and NRC staff guidance outlined in SRP Section 16.1. The Tier 2 evaluation identified the applicable risk-significant plant equipment outage configurations controlled by TSs during any extended EDG outage. The licensee's CRMP satisfies the CRMP requirements of RG 1.177. Therefore, the NRC staff finds that the risk analysis methodology and approach used by the licensee to estimate the risk impacts and manage configuration risk during the extended EDG outage are reasonable and of sufficient quality.

Based on the above, the NRC staff concludes that the proposed change satisfies the fourth key principle of RG 1.177 by assuring that any increase in risk is small and consistent with the intent of the Commission's Safety Goal Policy Statement.

3.3 Technical Evaluation Conclusion

Based on the considerations in SE Sections 3.1 and 3.2, the NRC staff concludes that the proposed amendment is acceptable.

3.4 Licensee Commitments

The licensee made the following regulatory commitments related to the proposed amendment as shown in Attachment 3 to PSEG letter LR-N11-0045, dated February 14, 2011:

1. When either the A or B EDG is removed from service for an extended 14-day AOT, both HPCI and RCIC shall be operable.

2. Any component testing or maintenance that increases the likelihood of a plant transient shall be avoided during the extended 14-day AOT. This encompasses work activities categorized as Production Risk.

3. Voluntary entry into this extended 14-day AOT should not be scheduled if adverse weather conditions are expected.

4. Operating crews will be briefed on the EDG work plan and procedural actions regarding LOOP and SBO, prior to entering the extended 14-day EDG AOT.

The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitments are provided by the licensee's administrative processes, including its commitment management program. The NRC staff has determined that the commitments do not warrant the creation of regulatory requirements which would require prior NRC approval of subsequent changes. The NRC staff may choose to verify the implementation and maintenance of these commitments in a future inspection or audit.

4.0 STATE CONSULTATION

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

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves 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 amendment involves no significant hazards consideration, and there has been no public comment on such finding (75 FR 37476). 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) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: V. Goel
A. Howe
R. Ennis

Date: March 25, 2011

March 25, 2011

Mr. Thomas Joyce
President and Chief Nuclear Officer
PSEG Nuclear
P.O. Box 236, N09
Hancocks Bridge, NJ 08038

SUBJECT: HOPE CREEK GENERATING STATION - ISSUANCE OF AMENDMENT RE: EMERGENCY DIESEL GENERATORS A AND B ALLOWED OUTAGE TIME EXTENSION (TAC NO. ME3597)

Dear Mr. Joyce:

The Commission has issued the enclosed Amendment No. 188 to Facility Operating License No. NPF-57 for the Hope Creek Generating Station. This amendment consists of changes to the Technical Specifications (TSs) and Facility Operating License in response to your application dated March 29, 2010, as supplemented by letters dated May, 28, and September 30, 2010, and two letters dated February 14, 2011.

The amendment revises the TSs to extend the allowed outage time for the A and B emergency diesel generators from 72 hours to 14 days.

A copy of our safety evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,
/ra/
Richard B. Ennis, Senior Project Manager
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-354

Enclosures:
1. Amendment No. 188 to License No. NPF-57
2. Safety Evaluation

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OFFICE	LPL1-2/PM	LPL1-1/LA	ITSB/BC	APLA/BC
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DATE	3/25/11	3/3/11	3/4/11	3/3/11

OFFICE	EEEB/BC (A)	OGC	LPL1-2/BC	
NAME	RMathew	DRoth	HChernoff	
DATE	3/3/11	3/10/11	3/25/11	

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