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

March 11, 2016

Mr. Thomas J. Palmisano
Vice President and Chief Nuclear Officer
Southern California Edison Company
San Onofre Nuclear Generating Station
P.O. Box 128
San Clemente, CA 92674-0128

SUBJECT: SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3 - ISSUANCE OF AMENDMENTS MODIFYING LICENSES TO ALLOW CHANGES TO SPECIFIC REGULATORY GUIDE COMMITMENTS (CAC NOS. L53073 AND L53074)

Dear Mr. Palmisano:

The U.S. Nuclear Regulatory Commission (NRC) has issued the enclosed Amendment No. 233 to Facility Operating License No. NPF-10 and Amendment No. 226 to Facility Operating License No. NPF-15 for San Onofre Nuclear Generating Station (SONGS), Units 2 and 3, respectively. The amendments are in response to a letter from Southern California Edison (SCE or the licensee) dated August 20, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML15236A018), as supplemented by letters dated November 19, 2015, and January 12, 2016 (ADAMS Accession Nos. ML15327A410 and ML16014A376, respectively).

The enclosed amendments allow for revision of the Updated Final Safety Analysis Report (UFSAR) to reflect the significant reduction of decay heat loads in the SONGS Units 2 and 3 spent fuel pools resulting from the time that has elapsed since the permanent shutdown of the units in 2012. The revisions support design basis changes associated with implementing the "cold and dark" plant status described in the Post-Shutdown Decommissioning Activities Report.

A copy of the related safety evaluation is provided in Enclosure 3. The Notice of Issuance will be included in the Commission's next regular biweekly *Federal Register* notice.

Sincerely,

/RA/

Marlayna Vaaler, Project Manager
Reactor Decommissioning Branch
Division of Decommissioning, Uranium Recovery,
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Docket Nos.: 050-361 and 050-362

Enclosures:
1. Amendment No. 233 to NPF-10
2. Amendment No. 226 to NPF-15
3. Safety Evaluation

cc w/Enclosures: Distribution via Listserv

A copy of the related safety evaluation is provided in Enclosure 3. The Notice of Issuance will be included in the Commission's next regular biweekly *Federal Register* notice.

Sincerely,

/RA/

Marlayna Vaaler, Project Manager
Reactor Decommissioning Branch
Division of Decommissioning, Uranium Recovery,
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Docket Nos.: 050-361 and 050-362

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ADAMS Accession No.: **ML16055A522** ***by memo dated** ****by e-mail**

OFFICE	NMSS/PM	NMSS/LA	NRR/DSS/SBPB	NMSS/BC	OGC	NMSS/DD(A)
NAME	M. Vaaler	C. Holston	G. Casto*	B. Watson	H. Benowitz** NLO	M. Norato
DATE	2/22/16	2/24/16	2/18/2016	2/26/16	3/11/2016	3/11/16

OFFICE	NMSS/PM
NAME	M. Vaaler
DATE	3/11/16

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

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

DOCKET NO. 50-361

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 233
License No. NPF-10

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

   A. The application for amendment by Southern California Edison Company, et al. (SCE or the licensee), dated August 20, 2015, as supplemented by letters dated November 19, 2015, and January 12, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. By Amendment No. 233, Facility Operating License No. NPF-10 is hereby amended to authorize revision to the San Onofre Nuclear Generating Station Updated Final Safety Analysis Report, as set forth in the Southern California Edison Company application dated August 20, 2015, as supplemented by letters dated November 19, 2015, and January 12, 2016, and as evaluated in the NRC staff's associated safety evaluation.

3. Accordingly, the license is amended by changes to paragraph 2.C(2) of Facility Operating License No. NPF-10, and is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 233, are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

4. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Michael A. Norato, Ph.D., Acting Deputy Director
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Attachment:
Change to Facility
Operating License No. NPF-10

Date of Issuance: March 11, 2016

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

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

DOCKET NO. 50-362

SAN ONOFRE NUCLEAR GENERATING STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 226
License No. NPF-15

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

   A. The application for amendment by Southern California Edison Company, et al. (SCE or the licensee), dated August 20, 2015, as supplemented by letters dated November 19, 2015, and January 12, 2016, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's regulations set forth in 10 CFR Chapter I;

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

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

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

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

2. By Amendment No. 226, Facility Operating License No. NPF-15 is hereby amended to authorize revision to the San Onofre Nuclear Generating Station Updated Final Safety Analysis Report, as set forth in the Southern California Edison Company application dated August 20, 2015, as supplemented by letters dated November 19, 2015, and January 12, 2016, and as evaluated in the NRC staff's associated safety evaluation.

3. Accordingly, the license is amended by changes to paragraph 2.C(2) of Facility Operating License No. NPF-15, and is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 226, are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

4. This license amendment is effective as of the date of its issuance and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Michael A. Norato, Ph.D., Acting Deputy Director
Division of Decommissioning, Uranium Recovery
and Waste Programs
Office of Nuclear Material Safety
and Safeguards

Attachment:
Change to Facility
Operating License No. NPF-15

Date of Issuance: March 11, 2016

ATTACHMENT TO LICENSE AMENDMENT NO. 233

TO FACILITY OPERATING LICENSE NO. NPF-10

AND LICENSE AMENDMENT NO. 226

TO FACILITY OPERATING LICENSE NO. NPF-15

DOCKET NOS. 50-361 AND 50-362

Replace the following pages of the Facility Operating License Nos. NPF-10 and NPF-15 with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Facility Operating License No. NPF-10

REMOVE	INSERT
3	3

Facility Operating License No. NPF-15

REMOVE	INSERT
3	3

Attachment

(3) SCE, pursuant to the Act and 10 CFR Part 70, to possess at any time special nuclear material that was used as reactor fuel, in accordance with the limitations for storage, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) SCE, 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 sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required; and possess any byproduct, source and special material as sealed neutron sources that was used for reactor startup;

(5) SCE, 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) SCE, 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 San Onofre Nuclear Generating Station, Units 1 and 2 and by the decommissioning of San Onofre Nuclear Generating Station Unit 1.

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 al; 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) Deleted

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 233, are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

(3) SCE, pursuant to the Act and 10 CFR Part 70, to possess at any time special nuclear material that was used as reactor fuel, in accordance with the limitations for storage, as described in the Final Safety Analysis Report, as supplemented and amended;

(4) SCE, 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 sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required; and possess any byproduct, source and special material as sealed neutron sources that was used for reactor startup;

(5) SCE, 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) SCE, 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 San Onofre Nuclear Generating Station, Units 1 and 2 and by the decommissioning of San Onofre Nuclear Generating Station Unit 1.

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 al; 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) Deleted

(2) Technical Specifications

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 226, are hereby incorporated in the license. Southern California Edison Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 233 TO FACILITY OPERATING LICENSE NO. NPF-10

AMENDMENT NO. 226 TO FACILITY OPERATING LICENSE NO. NPF-15

SOUTHERN CALIFORNIA EDISON COMPANY

SAN DIEGO GAS AND ELECTRIC COMPANY

THE CITY OF RIVERSIDE, CALIFORNIA

SAN ONOFRE NUCLEAR GENERATING STATION, UNITS 2 AND 3

DOCKET NOS. 50-361 AND 50-362

1.0 INTRODUCTION

By letter dated June 12, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML 131640201), Southern California Edison (SCE, the licensee) submitted a certification to the U.S. Nuclear Regulatory Commission (NRC) indicating its intention to permanently cease power operations at the San Onofre Nuclear Generating Station, Units 2 and 3 (SONGS) as of June 7, 2013, pursuant to section 50.82(a)(1)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR) . By letters dated June 28, 2013 (ADAMS Accession No. ML13183A391), and July 22, 2013 (ADAMS Accession No. ML13204A304), SCE submitted certifications of permanent removal of fuel from the Unit 3 and Unit 2 reactor vessels as of October 5, 2012, and July 18, 2013, respectively, pursuant to 10 CFR 50.82(a)(1)(ii). Upon docketing of these certifications, and pursuant to 10 CFR 50.82(a)(2), the SONGS Units 2 and 3 facility operating licenses no longer authorize operation of the reactors or emplacement or retention of fuel into the reactor vessels. Spent fuel is currently stored onsite in the spent fuel pools (SFPs) and in the onsite independent spent fuel storage installation (ISFSI).

By letter dated August 20, 2015, as supplemented by letters dated November 19, 2015, and January 12, 2016 (ADAMS Accession Nos. ML15236A018, ML15327A410, and ML16014A376, respectively), SCE requested an amendment to the facility operating licenses for SONGS. The proposed amendments would revise the Updated Final Safety Analysis Report (UFSAR) for SONGS Units 2 and 3 to reflect the significant reduction of decay heat loads in the SONGS SFPs resulting from the time that has elapsed since the permanent shutdown of the units in 2012. The revisions support design basis changes associated with implementing the “cold and dark” plant status described in the Post-Shutdown Decommissioning Activities Report (PSDAR) (ADAMS Accession No. ML14272A121).

The supplemental letters dated November 19, 2015, and January 12, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the NRC staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on November 10, 2015 (80 FR 69715).

2.0 REGULATORY EVALUATION

2.1 Regulatory Criteria

General Design Criterion (GDC) 61, "Fuel Storage and Handling and Radioactivity Control," of Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50, "Domestic Licensing of Production and Utilization Facilities," states in part that fuel storage facilities shall be designed to prevent a significant reduction in fuel storage coolant inventory under accident conditions, and with a residual heat removal capability that reflects the importance to safety of decay heat and other residual heat removal.

In addition, GDC 2, "Design Basis for Protection against Natural Phenomena," requires in part that structures, systems, and components (SSCs) important to safety be designed to withstand the effects of natural phenomena such as earthquakes and tornadoes, and the design bases of these SSCs should reflect the importance of the safety function to be performed.

The portion of GDC 61 specifying prevention of a significant reduction in coolant inventory under accident conditions has been incorporated in the SONGS license as Technical Specification (TS) 4.3.2, "Drainage," which states:

> The spent fuel storage pool is designed and shall be maintained to prevent inadvertent draining of the pool below Technical Specification 3.1.1 value (23 feet above the top of irradiated fuel assemblies seated in the storage racks).

The capability to prevent a significant reduction in fuel storage coolant inventory under accident conditions prevents exposure of irradiated fuel cladding to air, which could result in significant offsite radiological consequences under certain conditions. In addition, the coolant inventory provides shielding for the fuel and appropriate filtering of radioactive materials that may be released as a result of damage to the fuel. These shielding and filtering functions provided by the coolant inventory are also specified in GDC 61.

The NRC issues Regulatory Guides (RGs) to describe and make available to the public methods that the NRC staff considers acceptable for use in implementing specific parts of the agency's regulations. Appendix 3A to the SONGS UFSAR, "Comparison of Design with NRC Regulatory Guides," lists a brief description of the degree of conformance between the SONGS design and the recommendations of selected RGs. The following RGs provide specific recommendations applicable to the SFP cooling and make-up water system design described in the SONGS UFSAR:

- RG 1.13, "Spent Fuel Storage Facility Design Basis," Revision 1, December 1975
- RG 1.26, "Quality Group Classifications and Standards," Revision 2, June 1975
- RG 1.29, "Seismic Design Classification," Revision 1, August 1973

- RG 1.76, "Design-Basis Tornado for Nuclear Power Plants," Revision 0, April 1974

Regulatory Guide 1.13

RG 1.13 included specific design information regarding the SFP make-up system in Regulatory Position C.8, which specified:

> A seismic Category I makeup system should be provided to add coolant to the pool. Appropriate redundancy or a backup system for filling the pool from a reliable source, such as a lake, river, or onsite seismic Category I water-storage facility, should be provided. If a backup system is used, it need not be a permanently installed system. The capacity of the makeup systems should be such that water can be supplied at a rate determined by consideration of the leakage rate that would be expected as the result of damage to the fuel storage pool from the dropping of loads, from earthquakes, or from missiles originating in high winds.

Section 9.1.2.3 of the SONGS UFSAR, Revision 38, stated the following with respect to SFP leakage:

> The cask loading area of the spent fuel storage pool is designed to withstand the impact loading of a dropped fuel shipping cask from a maximum height of 28 feet 6 inches. Any leakage caused by localized damage shall be within the limits of the spent fuel pool makeup water supply, and shall be confined to the leak chase system.

And:

> Control of liquid leakage from the spent fuel pool is maintained by a system of leak chases which are placed behind the spent fuel pool liner plates. The leak chases are connected to drain lines that terminate in the leak detection sump. Observance of leakage from a drain line will allow identification of the general location of the leak.

Section 9.1.3.3 of the SONGS UFSAR, Revision 36, stated that the previously existing safety-related and Seismic Category I make-up capacity of 150 gal/min exceeded normal leakage and evaporation losses.

Regulatory Guide 1.26

RG 1.26 included specific design information regarding the quality standards applicable to the SFP residual heat removal system in Regulatory Position C.2, which specified in part:

> The Group C quality standards given in Table 1 of this guide should be applied to water-, steam-, and radioactive-waste-containing pressure vessels, heat exchangers (other than turbines and condensers), storage tanks, piping, pumps, and valves not part of the reactor coolant pressure boundary or included in quality Group B but part of:

a. Cooling water and auxiliary feedwater systems or portions of these systems important to safety that are designed for (1) emergency core cooling, (2) post-accident containment heat removal, (3) post-accident containment atmosphere cleanup, or (4) residual heat removal from the reactor and from the spent fuel storage pool (including primary and secondary cooling systems).

Table 1 of RG 1.26 specified that Quality Group C components be designed to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section III, "Nuclear Power Plant Components," Class 3.

On July 17, 2015, the NRC issued an amendment to the operating licenses for SONGS Units 2 and 3 (ADAMS Accession No. ML15139A390) that approved changes to the operating license and technical specifications reflecting the permanently shutdown and defueled status of the units. The license amendment included deletion of TS 5.5.2.10, "Inservice Inspection and Testing Program," and associated changes to equipment design code classifications. The safety evaluation report for this amendment determined that these changes were acceptable because there were no longer any ASME Code Class 1, 2, or 3 pumps and valves that continue to operate and perform a specific function in mitigating the consequences of a reactor accident due to the permanently shutdown and defueled status of the plant. Therefore, deviation from the design code classification specified by RG 1.26 would be acceptable as they relate to the requirements of 10 CFR 50.55a.

Regulatory Guide 1.29

RG 1.29 included specific design information regarding the SFP cooling system and associated support systems in Regulatory Position C.1, which specified in part:

> The following structures, systems, and components of a nuclear power plant, including their foundations and supports, are designated as Seismic Category I and should be designed to withstand the effects of the [safe-shutdown earthquake] and remain functional. The pertinent quality assurance requirements of Appendix B to 10 CFR Part 50 should be applied to all activities affecting the safety-related functions of these structures, systems, and components.
>
> …
>
> (d) Systems or portions of systems that are required for (1) reactor shutdown, (2) residual heat removal, or (3) cooling the spent fuel storage pool.
>
> …
>
> (g) Cooling water, component cooling, and auxiliary feedwater systems or portions of these systems, including the intake structures, that are required for (1) emergency core cooling, (2) post-accident containment heat removal, (3) post-accident containment atmosphere cleanup, (4) residual heat removal from the reactor, or (5) cooling the spent fuel storage pool.

…

(r) The Class 1E electrical systems, including the auxiliary systems for the onsite electric power supplies, that provide the emergency electric power needed for functioning of plant features included in items 1.a through 1.q above.

Regulatory Guide 1.76

With respect to tornado protection, UFSAR Appendix 3A stated that an alternative to RG 1.76 was used for SONGS. Table 3.5-12 of the SONGS UFSAR states that the SFP and other critical equipment in the fuel handling building would be protected from tornado missiles by the fuel handling building and fuel pool wall.

2.2 System Description

The licensee proposed a change to the regulatory commitments outlined above that would support the following design changes:

- a transition from a safety-related, Seismic Category I, and tornado-protected spent fuel pool cooling system (SFPCS) to a Seismic Category III (California Building Code) independent spent fuel pool cooling system (ISFPCS) that is not fully protected from tornado missiles

- a transition from a safety-related, Seismic Category I make-up water system to a non-safety-related, augmented quality make-up water system with Seismic Category I piping and water storage tank

- a transition from a safety-related, Seismic Category I, and tornado-protected electrical distribution system backed by emergency diesel generators to a Seismic Category III electrical distribution system for the ISFPCS and makeup water system that is not fully protected from tornado missiles

The purpose of these design changes is to implement a “cold and dark” (site repowering) plant status with SFP islanding, as noted for Decontamination Period 2 in the SONGS PSDAR (ADAMS Accession No. ML14269A033). These plant changes improve safety during decommissioning by reducing the potential for interaction with energized electrical equipment and in-service piping systems while the plant is being dismantled and decontaminated.

SFP Cooling System

The original SFPCS for each unit consists of two full capacity pumps and heat exchangers in parallel that are connected to common suction and return headers. The heat exchangers reject heat to the component cooling water system, which in turn rejects heat to the salt water cooling system. The SFPCS includes a purification loop that has already been administratively removed from service.

The ISFPCS for each unit consists of a primary and secondary loop. The primary loop draws water from the transfer canal area adjacent to the SFP using one of two full capacity pumps and

passes the water through a single heat exchanger before returning the water to the SFP through the original system return piping. The secondary loop uses one of two full capacity pumps to circulate secondary loop water through the ISFPCS heat exchanger and reject the heat to atmosphere via two chillers. The chillers may be cross-connected with the secondary loop of the other unit so that the two chillers associated with one unit may cool both SFPs, relying in part on excess chiller capacity.

Make-Up Water Systems

The original make-up water supply was safety-related and seismically qualified. The system delivered water from the refueling water storage tank to the SFP. In addition, alternative non-safety-related sources of water were available for make-up.

The licensee proposed a revised make-up water system consisting of multiple, diverse methods of adding make-up water to the SFP. The primary means of providing SFP make-up water would be a permanently installed system for the delivery of water from the re-purposed primary water make-up storage tank. The mechanical components of the system would be seismically qualified. The system would have two normal capacity pumps and a new, high capacity pump. The SFP make-up system would be classified as Quality Group D, which is characterized as important to safety.

The licensee also maintains equipment in support of mitigating strategies to ensure spent fuel cooling in the event of damage to large areas of the facility. This equipment includes a 150,000 gallon tank in the northern part of the site, a dedicated, high-capacity, diesel-driven pump, and dedicated hoses to connect the tank to the pump suction and the pump discharge to a seismically qualified fire riser. Hose connections to the fire riser in the fuel buildings provide for delivery of the water to the SFPs.

In addition to the seismically qualified primary make-up system and the primary mitigating strategies equipment, SCE identified the following additional make-up sources among others:

- Delivery of water from the fire water tanks using one of the station fire pumps, which consist of one diesel-driven and two motor-driven pumps, through the permanently installed fire water system piping to two fire hose cabinets located on the SFP operating level

- Delivery of water from the demineralized water tanks at the south end of the site via a skid mounted pump through hoses to the fuel building seismic standpipe and on to the spent fuel pool

- Delivery of water from a Seismic Category I demineralized water storage tank at the North end of the site using a portable diesel-driven pump using pre-staged hoses to the fuel building seismic standpipe and on to the SFP

Electrical Distribution

The original electrical distribution system serving the SFP cooling and make-up systems was safety-related and seismically qualified. The system distributed power from off-site sources and

the on-site emergency diesel generators to safety-related and important to safety components. The licensee stated that this system will remain in operation until a replacement electrical distribution with a manually started back-up diesel generator is available. The replacement electrical distribution system will be powered from off-site sources with the manual back-up diesel generator available on-site. The replacement electrical distribution system will be non-safety-related and Seismic Category III.

3.0 TECHNICAL EVALUATION

The design bases and quality assurance applied to SSCs reflect the importance of the safety functions to be performed. Consistent with the requirements of GDC 61, fuel storage systems must be designed with a residual heat removal capability that reflects the importance to safety of decay heat and other residual heat removal. Also, the requirements of GDC 2 consider the importance of the safety function in establishing the degree of protection from the effects of natural phenomena. The guidance in NRC Regulatory Guides 1.13, 1.26, 1.29, and 1.76 reflect the potential for high decay heat in the SFP associated with an operating reactor. Since SONGS Units 2 and 3 have been permanently defueled, the maximum potential decay heat in the SFP has significantly decreased. Therefore, the safety importance of functions affected by decay heat levels that are performed by SFP related systems has also decreased.

3.1 SFP Cooling System

The NRC staff reviewed the proposed design of the ISFPCS and its support systems to identify changes that may affect the reliability of the system. The staff identified the following significant design changes:

- the proposed design of the ISFPCS and the supporting electrical distribution system would be Quality Group D (i.e., ASME B31.1, “Power Piping,” is the design code for piping), Quality Class III-AQ (Augmented Quality, which means that most criteria of the quality assurance program apply), and Seismic Category III rather than ASME Code Class 3, safety-related, and Seismic Category I

- the proposed design of the ISFPCS places some secondary cooling loop piping and the chillers outside the tornado protection provided by the fuel handling building

- the proposed design of the ISFPCS relocates the suction for the primary loop to a pipe drawing flow vertically from the fuel transfer pool area, which introduces the potential for inadequate suction head for the pumps at high SFP temperature and separation of the primary loop suction from the fuel storage area

The safety importance of decay and residual heat removal is related to the magnitude of the decay heat produced by the stored fuel. Since power operation of the SONGS units was permanently stopped in January 2012, the decay heat rate of the stored fuel has decreased significantly. The design basis maximum normal heat removal rate of the SFPCS, as described in Revision 36 of the SONGS UFSAR, was to remove 24.7 million British Thermal Units (BTUs) per hour with a single SFPCS pump from the SFP at a temperature no higher than 140°F. That decay heat rate, which was associated with a partial core discharge for refueling 150 hours after

reactor shutdown, would heat the normal inventory of coolant in the SFP from 140 degrees Fahrenheit (°F) to 212°F in 7.9 hours.

The decay heat rate in the SONGS Units 2 and 3 SFPs is now much lower than the design decay heat rate when the reactors were operating and continues to decrease with time. Table 9.1-1B, "SFP Heat Loads," in Revision 38 to the SONGS UFSAR lists the projected decay heat rates in the two SFPs at various dates following permanent shutdown. The Unit 2 SFP has the higher decay heat rate due to differences in fuel inventory and a slightly later final shutdown date. The licensee estimated that the Unit 2 decay heat rate would be 2.43 million BTUs per hour on December 31, 2015, and projected the decay heat rate would decrease to 2.30 million BTUs per hour as of December 31, 2016. Thus, the current calculated decay heat rate is estimated to be less than approximately one-tenth the design basis maximum normal heat rate.

The NRC staff evaluated the ISFPCS design with respect to capacity and redundancy, and determined that the system design is appropriate for the reduced decay heat rate. The licensee stated that the nominal capacity of the ISFPCS heat exchanger is 3 million BTUs per hour, which significantly exceeds the projected decay heat rates. The redundant primary and secondary loop pumps of the ISFPCS, as well as chiller sets with excess capacity and cross-connect capability, protect against an extended loss of forced cooling due to failure of an active major component.

The staff also evaluated the ISFPCS design for potential loss of function resulting from other causes. System operation may be interrupted by failure of control systems or a loss of power. Similarly, the ISFPCS would no longer be designed to withstand the effects of certain natural phenomena, including tornados and earthquakes. However, the staff found that ample time would be available to correct loss of forced cooling events resulting from these causes.

In the event of a sustained loss of forced cooling, the licensee determined that over 7 days would be necessary for the decay heat to increase the SFP coolant temperature from nominal conditions (i.e., coolant temperature of 72°F with the SFP, cask loading pool, and transfer pool inter-connected) to 212°F. Since the heat capacity of water is nearly constant within that temperature range, the staff estimated that the time for the coolant temperature to increase from the design limit of 140°F to 212°F would exceed 80 hours. This time exceeds the allowance of 72 hours for crediting of non-safety-related systems for essential safe shutdown functions at passive light water reactors (see Section 19.3, "Regulatory Treatment of Non-Safety Systems (RTNSS) for Passive Advanced Light Water Reactors," of NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition"). Table 15.7.8, "Radiological Consequences of Spent Fuel Pool Boiling," of the SONGS UFSAR presents the consequences of a SFP boiling event when the reactors were operating and shows that the calculated dose would be well below applicable dose limits. This event bounds the consequences of an extended loss of SFP forced cooling during decommissioning, so a boiling SFP does not immediately challenge safety limits, provided that coolant inventory is maintained.

The NRC staff also evaluated the quality assurance measures applied to the design and operation of the ISFPCS and determined that the measures were appropriate. The licensee classified the ISFPCS as Quality Class III-AQ. In Attachment 4 to the letter dated November 19, 2015, the licensee provided Table I of the decommissioning Quality Assurance Plan Q-list, which designates the applicability of the quality assurance criteria of Appendix B,

"Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants," to 10 CFR Part 50. The table indicates that the quality assurance criteria applicable to the SFP cooling and make-up systems include the following key criteria:

- Design Control
- Instructions, Procedures, and Drawings
- Corrective Actions

These criteria provide reasonable assurance that the design basis of the ISFPCS will be appropriately translated into instructions, procedures and drawings; that those documents will be appropriately used in the operation and maintenance of the ISFPCS; and that any issues with the system will be tracked and corrected. Furthermore, decommissioning Technical Specification 5.5.1, "Procedures," continues to require the maintenance of the applicable procedures recommended in Appendix A of Regulatory Guide 1.33, "Quality Assurance Program Requirements (Operation)," Revision 2, which addresses procedures for operation and maintenance of the fuel storage pool purification and cooling system, as well as procedures to address abnormal or alarm conditions.

Lastly, the NRC staff evaluated the capability of the system to restore design SFP conditions following an extended loss of cooling. The staff noted that the configuration of the ISFPCS would limit the ability to recover cooling under certain conditions because the primary loop suction draws vertically upward from the transfer pool. The vertical orientation would result in a loss of adequate suction head if the local water temperature approached the saturation temperature, which could result following an extended loss of forced cooling. In addition, the location of the primary loop suction in the transfer pool area could result in a loss of forced cooling if the transfer pool was separated from the fuel storage pool for conditions such as leakage from the transfer pool volume.

In the Attachment to the letter dated January 12, 2016, SCE addressed these concerns regarding the reliable capability to restore cooling following an extended loss. The licensee concluded the pool would be unlikely to reach temperatures that would challenge the operation of the primary loop pump due to the low decay heat rate, but this concern was addressed by establishing temperature limits for restart of the primary loop pumps and adding provisions in procedures to add cold water via the make-up system before pump restart, if required. To address the location of the suction, the licensee stated that provisions in the design of the ISFPCS would allow the suction to be moved to the fuel storage area using flanged connections in the suction piping. Therefore, the staff concluded the system has reasonable capability to restore forced cooling following an extended loss of cooling.

The NRC staff concluded that the proposed design of the ISFPCS is acceptable for operation as the sole cooling system for the SFPs of SONGS Units 2 and 3. The system is designed with acceptable redundancy to minimize the frequency of sustained loss of forced cooling events. If a sustained loss of cooling occurs, ample time would be available to effect repairs as a result of the very low decay heat rates during this period of the decommissioning process at SONGS. In the unlikely event that the repairs are not successful before the onset of boiling, the consequences of SFP boiling do not challenge safety limits. In addition, the quality assurance measures applied to the design provide reasonable assurance that procedures to recover cooling will be both available and effective.

3.2 SFP Make-up System

The NRC staff reviewed the proposed design of the SFP make-up water system to identify changes that may affect the reliability of the system. The staff identified the following significant design changes:

- the proposed design of the primary make-up water system and the supporting electrical distribution system would be Quality Group D (i.e., ASME B31.1, "Power Piping," is the design code for piping), Quality Class III-AQ (Augmented Quality, which means that most criteria of the quality assurance program apply), and Seismic Category I for mechanical portions of the system only rather than ASME Code Class 3, safety-related, and Seismic Category I

The safety importance of the SFP make-up water system is related to the potential for a substantial loss of SFP coolant inventory during or following a design basis event. The primary concerns are loss of coolant inventory due to leakage and evaporation. The licensee described that the protection against leakage would not be altered by the ISFPCS installation. As described in Section 3.1 above, the decay heat rate of the stored fuel has decreased significantly; consequently, the maximum rate of evaporation has decreased as well. Therefore, potential for a substantial loss of coolant inventory by evaporation has decreased following the permanent shutdown of SONGS Units 2 and 3.

The SFPs also remain protected against leakage due to design-basis accidents and events. The design-basis fuel handling accident does not result in damage to the SFP liner or result in any leakage because the liner plate is in direct contact with the pool floor. The SONGS UFSAR states that leakage from the SFP would be controlled by a system of leak chases located behind the SFP liner plates. The leak chases are connected to drain pipes, which terminate in the leak collection sump. The licensee determined that leakage into the leak chases would be limited to about 50 gallons per minute based on the cross-sectional area of the chases and drain piping. The licensee determined that a non-mechanistic 50 gallon per minute leak would require about 70 hours to drain the SFP and connected cask pool and transfer pool water levels to an elevation 10 feet above the stored fuel, which still provides ample shielding and cooling of the stored fuel. Furthermore, liner leaks can be mitigated by shutting the leak chase drain valves if and when appropriate. Therefore, liner leakage would not require immediate availability of make-up water to maintain safe storage of the fuel.

The potential for a substantial loss of coolant inventory from the SFP through connected systems is also limited. The SONGS Units 2 and 3 SFPs contain no drains and the bottom of the gate opening to adjacent pools is about two and a half feet above the top of stored fuel. The lowest piping penetration through the SFP liner is the SFPCS suction line, which is over 21 feet above the top of the stored fuel. The licensee stated that this piping will no longer be used once the ISFPCS is fully in service. The ISFPCS will use a vertical suction line that terminates at approximately the same elevation in the SFP, so its operation would not change the potential inventory loss associated with failure of connected piping. The SFPCS discharge piping will remain in service as the ISFPCS discharge, and, although the piping extends lower in the SFP than the suction line, it contains a siphon break approximately 26 feet above the top of the stored fuel. Therefore, the SFP is well protected against coolant inventory loss through

connected systems, and the installation and use of the ISFPCS would not change the potential coolant inventory loss associated with failure of connected piping.

As discussed in Section 3.1, the decay heat rate in the SONGS Unit 2 and Unit 3 SFPs is now much lower than the design decay heat rate when the reactors were operating and continues to decrease with time. The licensee estimated that the Unit 2 SFP decay heat rate, which has the limiting decay heat rate of the two pools, would be 2.43 million BTUs per hour on December 31, 2015. At that decay heat rate, the licensee determined that there is sufficient inventory in the SFP and connected pools to maintain the coolant inventory more than three feet above the stored fuel for over one month with no forced cooling and no make-up water addition. Therefore, evaporation at current and future decay heat rates would have a minimal effect on make-up water requirements.

The NRC staff evaluated the coolant make-up capability with respect to capacity and redundancy, and the staff determined that the system design is appropriate for the reduced make-up water demands associated with the lower decay heat rate in the SFPs. The staff evaluation focused on the primary make-up system (i.e., the repurposed primary make-up water tank, two repurposed primary make-up water pumps, a new high-capacity make-up water pump, and associated piping and valves) and the make-up capability required by the Mitigation Strategy License Conditions (i.e., SONGS Unit 2 License Condition 2.C (26) and SONGS Unit 3 License Condition 2.C(27)). The redundant primary make-up pumps and the new high-capacity make-up pump, combined with the make-up capability provided to satisfy the Mitigating Strategy License Conditions, which include multiple and diverse means of delivering make-up from protected sources of water to the SFP, constitute the make-up capacity for the SFPs. The make-up capacities of all identified paths exceed the required make-up to compensate for potential liner leakage and evaporation, and some paths greatly exceed that rate of make-up. Although no one make-up path is designed and qualified for operation through the full spectrum of potential design-basis accidents and events considered in the SONGS UFSAR, the variety of power sources (i.e., electric motor and diesel engine driven pumps) and flow paths (i.e., seismic Category I primary make-up path and hose connections in other make-up paths) provide reasonable assurance of timely make-up following those events.

The NRC staff also evaluated the quality assurance measures applied to the design and operation of the primary make-up path and determined that the measures were appropriate. The licensee classified the primary make-up path as Quality Class III-AQ. As discussed in Section 3.1, the quality assurance criteria applicable to the SFP cooling and make-up systems include the following key criteria:

- Design Control
- Instructions, Procedures, and Drawings
- Corrective Actions

These criteria provide reasonable assurance that the design basis of the primary make-up path will be appropriately translated into instructions, procedures and drawings; that those documents will be appropriately used in the operation and maintenance of the primary make-up path; and that issues with the system will be tracked and corrected.

The NRC staff concluded that the proposed make-up capabilities are acceptable, considering the reduced decay heat rate present in the SFPs at SONGS Units 2 and 3. The normal SFP coolant inventory provides the capacity to withstand long periods of leakage or evaporation related to design basis accidents or events without substantial degradation of the key fuel cooling and shielding safety functions. The multiple and diverse make-up paths provide reasonable assurance that adequate make-up would be provided well before a substantial loss of SFP coolant inventory that could challenge the key safety functions. The quality assurance measures applied to the design provide reasonable assurance that procedures to recover primary make-up capability will be both available and effective.

3.3 Electrical Distribution System

The electrical distribution system provides an essential support function for both the ISFPCS and the primary make-up capability. The proposed design of the replacement decommissioning power ring as a Safety Class III (i.e., non-Class 1E electrical system), Quality Class III-AQ, and Seismic Category III electrical distribution system would be consistent with the design of the ISFPCS and the primary make-up capability. The proposed off-site power feed combined with an on-site diesel generator source provides redundancy of power sources consistent with the safety significance of the ISFPCS and primary make-up capability. Therefore, the staff concludes the proposed decommissioning power ring is acceptable for SONGS Units 2 and 3.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the California State officials were notified by email on February 24, 2016, of the proposed issuance of the amendments. The State officials had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change 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 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 NRC has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding as published in the *Federal Register* on November 10, 2015 (80 FR 69715). 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 NRC staff 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

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