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**TO:** Coastal Commissioners and Interested Parties

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**SUBJECT:** Coastal Development Permit 9-15-0228, Special Condition 7: Inspection and Maintenance Program for fuel storage canisters at San Onofre Nuclear Generating Station

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### Summary of Staff Recommendation

The interim storage of spent nuclear fuel at San Onofre Nuclear Generating Station (SONGS), located on Camp Pendleton in San Diego County, has been a controversial topic for years. Because of the lack of a long-term repository for spent nuclear fuel, SONGS—like other nuclear power plants in the United States—has had to resort to interim storage of spent nuclear fuel on site, in what is termed an Independent Spent Fuel Storage Installation (ISFSI).

Although the Commission has approved two ISFSI installations at SONGS, it also has expressed concern regarding storing spent nuclear fuel at SONGS because of the facility's location adjacent to the Pacific Ocean and Interstate-5, proximity to major population centers, and site topography and potential effects from coastal hazards. In 2015, the Commission approved Coastal Development Permit (CDP) 9-15-0228, which authorized construction of an ISFSI to store spent nuclear fuel from SONGS Units 2 and 3. To address concerns related to coastal hazards and to ensure that fuel storage canisters would remain transportable, the Commission required that Southern California Edison (SCE) submit an Inspection and Maintenance Program (IMP) for Commission review and approval. The IMP was required to ensure that canisters remain in a physical condition sufficient to allow both on-site transfer and off-site transport for the duration of the approval, until October 6, 2035. The IMP specifically required SCE to describe the cask inspection, monitoring, and maintenance techniques, as well as potential canister

remediation measures if necessary, that would be implemented. In its 2019 review and approval of an application for the decommissioning of SONGS (CDP 9-19-0194), the Commission required SCE to fund an independent, third-party review of the IMP, and it set March 31, 2020 as the deadline for submittal of the IMP.

SCE submitted the IMP on March 31, 2020. The engineering consulting firm LPI performed an independent review of the IMP and its supporting documentation provided by SCE, arriving at the following conclusions:

- The canister materials, thickness, and construction will effectively minimize susceptibility to stress corrosion cracking – the most significant potential canister degradation mechanism at the SONGS site.
- The monitoring program is sufficient to detect degradation and effectively observe the ISFSI system and canisters through 2035.
- The IMP presents appropriate and sufficient maintenance actions, using best available technology, to address potential future degradation of the canisters.

The review of the IMP also resulted in four recommendations to enhance the IMP:

1. The IMP should include a flaw depth of 0.0625 as the threshold for fuel canister repairs. Flaws deeper than 0.0625 inches would be repaired.
2. SCE should employ a more appropriate statistical method to model the maximum depth of canister scratches that may occur during insertion and extraction of the canisters into the ISFSI vertical storage modules, and update the statistical analysis in the future to incorporate data from additional canister inspections. The potential depth of canister scratches, derived through modeling, is an important factor in determining the canister inspection schedule. For example, a greater probability of a larger potential flaw depth could indicate the need for more frequent canister inspections. The selection of the appropriate statistical method helps to ensure that depths of canister flaws are not under- or over-predicted in this model.

It should be noted that LPI is not recommending adjustments to the current proposed canister inspection schedule. The LPI recommendation is to update the statistical analysis to model canister scratch depth, using the suggested methodology, once future canister inspection data is obtained, and then adjust the future canister inspection schedule if necessary based on the results of the updated analysis.

3. Assess how future canister unloading operations (i.e., when canisters are moved to a different location) can be optimized to minimize canister wear depths.
4. Correct a typographical or miscalculation error in a supporting document related to the potential scratch or wear mark depths on fuel storage canisters.

SCE has agreed to these recommendations, which are incorporated into the IMP.

The result of the review of the IMP is that it contains the required measures in Special Condition 7 of CDP 9-15-0228: 1) the cask inspection, monitoring and maintenance techniques that will be implemented, including prospective non-destructive examination techniques and remote surface inspection tools; (2) data that will be collected and how often the results of the inspection and maintenance program will be reported to the Commission; (3) all available evidence related to the physical condition of the casks and their susceptibility to degradation processes such as stress corrosion cracking; and (4) remediation measures that will be implemented, including the submission of a coastal development permit amendment if the results of the cask inspection and maintenance do not ensure that the fuel storage casks remain transportable.

Therefore, staff recommends that the Commission find that the IMP will ensure that the subject fuel storage casks will remain in a physical condition sufficient to allow both on-site transfer and off-site transport for the duration of their approval consistent with the requirements of Special Condition 7. Staff therefore recommends that the Commission approve the IMP pursuant to Special Condition 7 of CDP 9-15-0228.

## **TABLE OF CONTENTS**

<b>I. MOTION AND RESOLUTION .....</b>	<b>5</b>
<b>II. BACKGROUND .....</b>	<b>5</b>
<b>III. INDEPENDENT REVIEW OF INSPECTION AND MAINTENANCE PROGRAM .....</b>	<b>10</b>
<b>IV. REVIEW CONCLUSIONS AND RECOMMENDATIONS .....</b>	<b>12</b>
<b>V. CONSISTENCY OF IMP WITH SPECIAL CONDITION 7 OF CDP 9-15-0228 .....</b>	<b>15</b>
<b>VI. SUMMARY .....</b>	<b>16</b>

## **APPENDICES**

Appendix A – Substantive File Documents

Appendix B – LPI Report : Independent Third Party Review of SONGS’ Inspection and Maintenance Program for the Holtec On-site Independent Spent Fuel Storage Installation, dated June 12, 2020

Appendix C – SONGS Inspection and Maintenance Program, prepared by Southern California Edison

## **EXHIBITS**

Exhibit 1 – SONGS Location

Exhibit 2 – Location of ISFSIs on SONGS site

Exhibit 3 – Adopted findings for CDP 9-15-0228

## **I. Motion and Resolution**

### **Motion:**

I move that the Commission approve the Inspection and Maintenance Program submitted by Southern California Edison in accordance with Special Condition 7 of CDP 9-15-0228.

Staff recommends a YES vote on the foregoing motion. Passage of this motion will result in approval of the Inspection and Maintenance Program. The motion passes only by affirmative vote of a majority of Commissioners present.

### **Resolution:**

The Commission hereby approves the Inspection and Maintenance Program on the grounds that it meets the requirements of Special Condition 7 of CDP 9-15-0228, which found that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act. Approval of the permit complied with the California Environmental Quality Act because either 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment, or 2) there are no further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.

## **II. Background**

The San Onofre Nuclear Generating Station (SONGS) is located on U.S. Marine Corps Base Camp Pendleton in San Diego County, approximately 50 miles northwest of the City of San Diego and approximately two miles south-southeast of San Clemente, Orange County (**Exhibit 1**). The U.S. Department of the Navy (Navy) issued a long-term easement for the operation of SONGS in 1964, which is effective through 2024. Operations at SONGS previously included three nuclear reactors, but the plant has not produced electricity since 2012 and is being decommissioned.

In recent years, the Commission has reviewed several activities at SONGS that have been controversial, largely because of the interim storage of spent nuclear fuel on the SONGS site. Spent nuclear fuel has been stored at SONGS for almost twenty years, as the first interim storage facility was approved in 2000 (CDP E-00-014). The Commission approved a second, more recent storage facility in 2015 through CDP 9-15-0028. These actions are described below.

### Commission permitting related to storage of spent nuclear fuel at SONGS

The Commission has consistently voiced its concern that there is no permanent or long-term repository for spent nuclear fuel from SONGS or the other nuclear power plants along the California coast – Diablo Canyon and Humboldt Bay. While the federal government has the responsibility for identifying long-term storage for spent nuclear fuel from nuclear power plants nationwide, which must be securely stored for thousands of years for environmental and public safety reasons, it has not done so to date. Consequently, there are no long-term storage repositories presently, and it is not known when such facilities would be available.<sup>1</sup> As a result, nuclear power plants across the United States have had to develop on-site facilities for interim storage of spent nuclear fuel. At SONGS, such facilities include two Independent Spent Fuel Storage Installations (ISFSI): one incorporating horizontally-oriented storage containers, approved by the Commission in 2000 (CDP E-00-014) and the more recent vertical storage canisters, known as the Holtec UMAX system, approved in 2015 (CDP 9-15-0228).

At SONGS, the Commission's concern and public debate have also focused on the site's geography: its location between the Pacific Ocean and Interstate 5, proximity to major population centers, and the topography and layout of the site. For example, the ISFSI that is the subject of CDP 9-15-0228 is located approximately 100 feet from the existing seawall along the seaward boundary of the SONGS site and is at a top elevation of approximately 32 feet above mean lower low water (**Exhibit 2**). Here the concern was that the canisters, filled with radioactive spent nuclear fuel, would be subject to significant coastal hazards such as sea level rise, tsunami inundation, and seismic hazards. While federal law pre-empts a state from imposing upon operators of nuclear facilities any regulatory requirements concerning radiation hazards and nuclear safety, the Commission retains authority under the Coastal Act to regulate other aspects of development activities at SONGS, including the siting and installation of a dry cask storage facility<sup>2</sup>. Given the potential coastal hazards at the site, the Commission first considered if there was a feasible environmentally preferable alternative to site the dry cask storage facility but

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<sup>1</sup> Two longer-term interim storage facilities have been proposed in New Mexico and Texas, but it is not certain when such facilities could be licensed, constructed, and ultimately made available for spent nuclear fuel storage. Federal action on other potential nuclear waste repositories, such as Yucca Mountain in Nevada, is presently on hold.

<sup>2</sup> The federal NRC has exclusive jurisdiction over radiological aspects of the proposed project. The state is preempted from imposing upon operators of nuclear facilities any regulatory requirements concerning radiation hazards and nuclear safety. The state may, however, impose requirements related to other issues. The U.S. Supreme Court, in *Pacific Gas and Electric Company v. State Energy Commission*, 461 U.S. 190 (1983), held that the federal government has preempted the entire field of "radiological safety aspects involved in the construction and operation of a nuclear plant, but that the states retain their traditional responsibility in the field of regulating electrical utilities for determining questions of need, reliability, costs, and other related state concerns." As a result, the findings in CDP 9-15-0228 and 9-19-0194 address the applicable policies of the Coastal Act and do not evaluate or condition the proposed project with respect to nuclear safety or radiological issues.

concluded that no alternative site is available and feasible. The Commission further found that the site could be affected by the amount of sea level rise predicted to occur in about 20 years and therefore approved the project for only a 20-year term (until 2035). At least 6 months prior to the end of that term, SCE is required to submit a permit amendment to retain, remove or relocate the ISFSI facility, accompanied by an updated evaluation of coastal hazards and potential alternative on-site or off-site storage locations. This condition will ensure that the ISFSI either continues to meet the Coastal Act's requirements to minimize risks from hazards and remain structurally stable, or else is moved to a location that complies with Coastal Act requirements; see the related discussion in the adopted findings for CDP 9-15-0228, which are provided in **Exhibit 3**.

In particular, the Commission recognized that this 2035 evaluation could result in the identification of the need to relocate the spent fuel storage canisters to another location on the SONGS site with a lower risk of coastal hazards. Such a location could become available following the decommissioning of SONGS, presently underway and scheduled to continue through at least 2027. Additionally, the Commission recognized the possibility that before 2035, an off-site repository for spent nuclear fuel could be licensed and operational and thus accept spent fuel from SONGS, provided that the spent fuel could be transferred off-site.

In addition to these issues, during its review of CDP 9-15-0228 the Commission also heard extensive public testimony regarding the proposed thickness of the steel (0.625 inches) used in the manufacturing of the canisters and the potential for the canisters to degrade in the marine environment at SONGS.

These considerations led the Commission to add Special Condition 7 in CDP 9-15-0228 to ensure the "transportability" of the spent fuel canisters by requiring an Inspection and Maintenance Program for the subject ISFSI. Special Condition 7 states:

## **7. Inspection and Maintenance Program.**

- A. As soon as technologically feasible, and no later than October 6, 2022, the Permittee shall provide for Commission review and approval an inspection and maintenance program designed to ensure that the fuel storage casks will remain in a physical condition sufficient to allow both on-site transfer and off-site transport, for the term of the project as authorized under Special Condition 2 (i.e., until October 6, 2035). The program shall include a description of: (1) the cask inspection, monitoring and maintenance techniques that will be implemented, including prospective non-destructive examination techniques and remote surface inspection tools; (2) what data will be collected and how often the results of the inspection and maintenance program will be reported to the Commission; (3) all

available evidence related to the physical condition of the casks and their susceptibility to degradation processes such as stress corrosion cracking, and (4) remediation measures that will be implemented, including the submission of a coastal development permit amendment, if the results of the cask inspection and maintenance do not ensure that the fuel storage casks will remain in a physical condition sufficient to allow on-site transfer and off-site transport for the term of the project as authorized under Special Condition 2.

B. If the Commission determines that the inspection and maintenance program required by Subsection A is not sufficient to assure cask transportability over the term of the project authorized under Special Condition 2, the Applicant shall submit an amendment to this coastal development permit proposing measures to assure cask transportability.

C. The Permittee shall implement the inspection and maintenance program approved by the Commission. If the Permittee wishes to propose changes to the program approved by the Commission, it shall submit the proposed changes to the Executive Director. No changes to the approved program shall occur without an amendment to this coastal development permit unless the Executive Director determines no amendment is legally required.

Following this approval, SCE constructed the ISFSI, which consists of a large concrete pad with space for vertical storage of steel canisters that hold spent nuclear fuel and began transferring spent nuclear fuel in the canisters to the ISFSI. In addition, a legal settlement of a challenge to CDP 9-15-0228 resulted in a change to the due date for the Inspection and Maintenance Program to October 2020.<sup>3</sup>

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<sup>3</sup> In November 2015, CDP 9-15-0228 was challenged in court and resolved by settlement in August 2017 (*Citizens Oversight, Inc. et al. v. California Coastal Commission, Southern California Edison Company, et al.*, Superior Court for County of San Diego Case No. 37-2015-00037137-CU-WM-CTL). Stipulations to the settlement agreement include:

1. *SCE shall retain an "experts team" to advise SCE on issues related to the proposed relocation of SONGS spent nuclear fuel to an offsite storage facility.*
2. *SCE shall develop a "strategic plan" to support the development of a Commercially Reasonable Offsite Storage Facility for spent nuclear fuel.*
3. *SCE shall develop a conceptual transportation plan to transport SONGS spent nuclear fuel to an offsite storage facility assumed to be located in the southwestern U.S.*
4. *SCE will make a written request to solicit an agreement from the owners of Palo Verde Generating Station, a nuclear power plant near Tonopah, Arizona, regarding the development of an expanded ISFSI at the Palo Verde site to store SONGS spent nuclear fuel. If this request is accepted, SCE will engage in discussions with the owners of Palo Verde to evaluate the feasibility of licensing, constructing, and operating such an expanded facility on commercially reasonable terms.*



In summer 2018, fuel transfer to the ISFSI that was approved in 2015 was halted as a result of a loading incident where a canister was being lowered into its vertical storage position and became hung up on a component of the vertical storage structure. This caused a brief period of time where the canister was not being supported by the slings used to lower it into the storage structure. After this misalignment was identified, the slings were raised to support the canister, and it was placed into the storage structure. Fuel loading operations then were halted for approximately 11 months, while the federal Nuclear Regulatory Commission (NRC) reviewed SCE loading procedures, protocols, and responses to this incident. In May 2019, the NRC announced that it would support the resumption of fuel loading at SONGS into the ISFSI, which began again in July 2019.

In October 2019, during the public hearing for the proposed decommissioning of SONGS (CDP application 9-19-0194), the Commission and the public expressed concern about the canisters used to store spent nuclear fuel at SONGS, the need for a long-term spent nuclear fuel storage facility, and removal of spent fuel from SONGS altogether. Additionally, there continued to be public concerns regarding the potential for canister damage to occur during their loading into the vertical holding structures, such as scratches and gouges to their steel walls.

In response to these issues, SCE agreed to Special Condition 19 of CDP 9-19-0194, which requires SCE to: 1) submit the IMP to the Commission by March 31, 2020—sooner than the deadline that had been previously established by the settlement related to CDP 9-15-0228; and 2) fund an independent, third-party review of the IMP to assist the Commission in its consideration of the proposed IMP's compliance with the requirements of Special Condition 7 of CDP 9-15-0228. The findings for CDP 9-19-0194 set forth the qualifications of the independent, third-party review as follows:

1. No current (or within the prior year) direct employment or other direct financial benefit provided by Southern California Edison.
2. Degree in engineering with commercial industry work experience and familiarity with non-destructive examination techniques and weld repairs.
3. Disclosure of work done regarding spent fuel storage or transportation, or related topics, including within California or nationally.

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5. *SCE shall develop the approved ISFSI Inspection and Maintenance Program required as Special Condition 7 under the 2015 CDP by October 6, 2020 (two years earlier than required by the Commission), and a written plan that addresses contingencies for damaged or cracked canisters consistent with NRC regulations and requirements.*

4. Understanding of technical and regulatory aspects of spent nuclear fuel handling and storage systems, including: aging mechanisms, effects, and management, maintenance, or surveillance programs; spent nuclear fuel container transportability; NRC regulations and technical reports (i.e., NUREG-1927 “Standard Review Plan for Renewal of Specific Licenses and Certificates of Compliance for Dry Storage of Spent Nuclear Fuel”) and related publications; American Society of Mechanical Engineers (ASME) standards and requirements; or other related subjects.
5. Prefer familiarity with the types of spent nuclear fuel handling and storage systems used at SONGS.

CDP 9-19-0194 states that the Executive Director of the Commission is responsible for selecting the independent reviewer.

### **III. Independent Review of Inspection and Maintenance Program**

To undertake the independent review, in January 2020 the Executive Director selected LPI, Inc., an engineering consulting firm that has experience with nuclear power facilities across the United States and with projects such as the review of structural issues with the Salesforce Transit Center in San Francisco. On March 31, SCE submitted the IMP to the Executive Director. LPI’s review of the IMP started immediately and occurred during April and May through a methodical process of requesting information and supporting documents from SCE and reviewing related engineering and scientific literature. This process is described in the LPI report provided in **Appendix B**.

#### Inspection and Maintenance Program (IMP)

The IMP, provided in **Appendix C**, describes the proposed inspection and monitoring program, remediation actions SCE will take if a problem is discovered, and reporting procedures. Each of these elements of the IMP is described in more detail below.

The inspection and monitoring program described in the IMP includes three main components:

1. **Inspection and monitoring of the ISFSI structure.** Activities include daily temperature monitoring and inspections of air passageways and vent screens so that they remain free of blockage; monthly inspections of air vent screens to ensure they remain damage-free; annual visual inspections of accessible external surfaces for degradation; and every five years, inspection of the ISFSI structure for settlement.

2. **A canister inspection program.** This includes robotic inspections of the canisters and use of a test canister. SCE has high resolution surface photographs for all of the canisters as a baseline for the canister inspection program. To date, robotic inspections have been employed at eight canisters and use cameras mounted on an aluminum body with radiation-tolerant electronics that can accurately measure canister surface variations to 0.001 inches. The IMP also describes canister inspection intervals (see Table 1) based on application of NRC and Electric Power Research Institute (EPRI). If inspections indicate canister degradation, SCE would determine the appropriate corrective action using the decision-making approach described in the IMP. For example, depending on the depth of an identified flaw, enhanced inspections or repair activities could occur.

In addition to inspections of canisters containing spent nuclear fuel, SCE will use a test canister to simulate site conditions and observe potential mechanisms of degradation on the actual canisters. The test canister is a full-size fuel storage canister that is electrically heated to simulate conditions for a canister containing spent nuclear fuel, but it does not include spent fuel. It is stored under the same conditions as the actual canisters and can be inspected and removed to allow testing of the metallic overlay flaw repair process described below.

3. **Radiation monitoring.** Activities include periodic surveys of loaded canisters using handheld instrumentation, radiation measurements reported to the NRC in annual reports, and a real time radiation monitoring system that provides data to the City of San Juan Capistrano, CA Department of Parks and Recreation, and the CA Department of Public Health.

Year	Description
2022	By April 30, 2022, inspect the test canister
2024	By April 30, 2024, inspect the test canister and two fuel storage canisters
2027	By April 30, 2027, inspect the test canister
2029	By April 30, 2029, inspect the test canister and two fuel storage canisters
2032	By April 30, 2032, inspect the test canister
2034	By April 30, 2034, inspect the test canister and two fuel storage canisters

**Table 1. Canister inspection schedule, using robotic camera technology, through 2034.**

In addition to these inspection and monitoring protocols, the IMP includes a description of response and remediation actions to mitigate or repair a canister if the need to do so is indicated through monitoring and inspection. These actions include application of a robotic-applied, nickel-based metallic spray that would be applied to cover a canister flaw and the use of grinding and sanding to remove a flaw. The IMP also describes considerations related to flaw depth and potential growth in flaw depth that would form the basis for deciding upon the appropriate response method if a flaw is identified. For example, if flaws are discovered that are greater in depth than 0.0625 inches, SCE will repair the flaw through the use of the metallic spray. Detection of flaws more shallow than 0.0625 inches could result in an increased inspection frequency (e.g., enhancing the inspection schedule to every 30 months) or an increase in the number of canisters inspected. Finally, there is a brief summary of ongoing research efforts related to dry cask storage in which SCE continues to participate, such as the EPRI-commissioned Extended Storage Collaboration Program, which is investigating long-term canister aging effects and mitigation options.

The final section of the IMP describes how SCE will report on the implementation of the IMP to the Commission. Reporting is proposed within 180 days of an inspection cycle for the canisters and would include:

- description and location of canisters inspected
- inspection results and analysis
- corrective actions taken as a result of the inspection
- evaluation of inspection intervals and the need for adjusting inspection intervals
- evaluation of inspection data to determine if canister degradation is proceeding at a rate which may impact the transportability of the canister
- summary of the ISFSI system inspections

Additionally, the IMP states that if inspections reveal a need to address an identified canister flaw, the Commission would be notified within 30 days of the decision to do so. This notification would include a plan with the proposed actions to ensure the continued transportability of the canister. The IMP concludes by stating that if the ability of the canisters to remain in a physical condition sufficient to allow on-site transfer and off-site transportation becomes compromised, SCE would seek a CDP amendment from the Coastal Commission in accordance with Special Condition 7 of the 2015 ISFSI CDP.

#### **IV. Review conclusions and recommendations**

LPI's review of the IMP concluded on June 4, 2020. LPI's report summarizing its review is provided in **Appendix B**. The report describes the investigations LPI undertook related to fuel storage canister structural integrity, potential corrosion and compatibility with the

environment at SONGS, the type and frequency of inspections, monitoring and data evaluation, and remediation and repair processes. The report presents the following conclusions:

- The canister materials, thickness, and construction will effectively minimize susceptibility to stress corrosion cracking – the most significant potential canister degradation mechanism at the SONGS site. This conclusion was reached following a review of the canister fabrication methods (including rolling of steel, welding, and peening) and design specifications including canister thickness (0.625 inches), as well as consideration of the types of degradation mechanisms that could affect the canisters.
- The monitoring program is sufficient to detect degradation and effectively observe the ISFSI system and canisters through 2035. This conclusion was reached based on the IMP description of its inspections and monitoring elements for the ISFSI structure, canisters, and radiation monitoring, as well as SCE clarifications provided during the review.
- The IMP presents appropriate and sufficient maintenance actions, using best available current technology, to address potential future degradation of canisters. This conclusion followed review of the description of the proposed remediation and repair measures described in the IMP, and the decision-making approach that SCE will take in determining actions to take as warranted by the monitoring program.

In addition to these overall conclusions, LPI also provided four recommendations to enhance the IMP:

1. The IMP should include a reduced depth limit for flaws that would trigger the need for canister repairs. Specifically, LPI recommended a criterion of 10% of the canister thickness to determine the depth of a flaw that would require repair. Since the canisters are 0.625 inches thick, application of this recommendation would result in a flaw thickness repair threshold of 0.0625 inches; SCE originally had proposed a criterion of 0.175 inches. Review of the canister fabrication techniques resulted in a conclusion that the 0.0625 inch depth would help maintain the benefits provided by canister construction techniques used at welded areas of the canisters. This more conservative criterion

also would match the 10% criterion included in NRC guidance<sup>4</sup> that references related guidance from the American Society of Mechanical Engineers (Code Section XI).

2. SCE should employ a more appropriate statistical method to model the maximum depth of canister scratches that may occur during insertion and extraction of the canisters into the ISFSI vertical storage modules, and update the statistical analysis in the future to incorporate data from additional canister inspections.

The potential depth of canister scratches, derived through modeling, is a key factor for determining the canister inspection schedule. For example, a greater probability of a larger potential flaw depth could be an indicator of the need for more frequent canister inspections, and thus the selection of the appropriate statistical method is important to ensure that the model is not under- or over-predicting the maximum depth that could occur. LPI recommends that SCE incorporate actual inspection data into the model to ground the results in observed measurements obtained through canister inspections.

It should be noted that LPI is not recommending adjustments to the proposed canister inspection schedule at this time. The recommendation is to update the statistical analysis, using the suggested methodology, once future canister inspection data is obtained, and then adjust the canister inspection schedule if necessary based on the results of the updated analysis.

3. Assess how future canister unloading operations can be optimized to minimize canister wear depths. This recommendation was based on the possibility that a canister flaw resulting from a loading operation – i.e., placing a canister into its vertical position in the ISFSI – could be exacerbated during unloading. For example, certain canister flaws appear to be the result of canister contact with the structure of the vertical storage module (specifically, seismic constraints that protrude from the module wall) during placement of the canister. Removal of the canister for future transport (“unloading”) could cause the canister to contact a seismic constraint in the same location, deepening a flaw. To address this potential issue, LPI recommends that SCE analyze its process for unloading canisters to minimize the potential for this type of double contact.

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<sup>4</sup> See the [NRC publication NUREG-2214 “Managing Aging Process in Storage \(MAPS\) Report”](#)

4. Correct a typographical error in documentation used to support modeling flaw depths regarding the reported mean and standard deviation values for flaw depths.

These conclusions and recommendations are described in additional detail in the review report (**Appendix B**). SCE agreed to adopt the four recommendations, which have been incorporated into the Inspection and Maintenance Program (**Appendix C**).

## **V. Consistency of IMP with Special Condition 7 of CDP 9-15-0228**

As described above, Special Condition 7 of CDP 9-15-0228 requires that the IMP include certain components to ensure that the fuel storage casks will remain in a physical condition sufficient to allow both on-site transfer and off-site transport, for the term of the project. For the reasons described below, the IMP satisfies these requirements of Special Condition 7.

First, the IMP describes adequate cask inspection, monitoring and maintenance techniques that will be implemented, including nondestructive examination techniques and remote surface inspection tools. These include inspection and monitoring of the ISFSI structure itself, canister inspections through the use of robotic-mounted cameras, use of a test canister, and radiation monitoring. The independent review concluded that these measures were sufficient to detect degradation and effectively observe the ISFSI system through 2035.

Second, data regarding the results of the monitoring program will be provided to the Commission no later than 180 days following completion of a monitoring cycle, as outlined above and following the schedule in Table 1. As described in Section III, these data will include the results of canister inspections and analysis, the results of any corrective actions that would be taken, and evaluation of the need to adjust inspection intervals. The IMP also describes reporting processes to other agencies that will be undertaken, summarized in Section III.

Third, the IMP (and supporting documentation) descriptions of the canisters, their manufacturing, and materials provide sufficient information related to the physical condition of the casks and their susceptibility to degradation processes such as stress corrosion cracking. The independent review also concluded that the canister materials, thickness, and construction will effectively minimize susceptibility to stress corrosion cracking – the most significant potential canister degradation mechanism at the SONGS site.

Fourth, the IMP describes various remediation measures and the decision-making criteria SCE will implement if results of the cask inspection and maintenance program indicate that one or more casks are damaged or degraded. These actions are intended to ensure that

the fuel storage casks remain in a physical condition sufficient to allow on-site transfer and off-site transport for the term of the project as authorized under Special Condition 2 of CDP 9-15-0228. These measures include application of a metallic overlay, enhanced canister inspection frequency, and an increase in the number of canisters to be inspected. The independent review concluded that these measures were appropriate and sufficient maintenance actions, using best available current technology, to address potential future degradation. In addition, the IMP states that the SCE will submit an application to amend its permit if the conditions resulted an impairment of the ability of the canisters to remain transportable. As described in Special Condition 7 of CDP 9-15-0228, no changes to the approved program shall occur without an amendment to this coastal development permit unless the Executive Director determines no amendment is legally required.

## **VI. Summary**

The IMP includes the elements that were required by Special Condition 7 of CDP 9-15-0228. With the incorporation of the recommendations made by LPI, the Inspection and Maintenance Program has been appropriately designed to ensure that the fuel storage casks will remain in a physical condition sufficient to allow both on-site transfer and off-site transport, for the term of the project (i.e., until October 6, 2035). Therefore, staff recommends that the Commission approve the IMP and find that it meets the requirements of Special Condition 7 of CDP 9-15-0228.



## **Appendix A – Substantive File Documents**

1. Commission-adopted findings for CDP 9-15-0228.
2. Commission-adopted findings for CDP 9-19-0194.
3. SONGS Inspection and Maintenance Program, prepared by Southern California Edison, submitted to the Commission in June 2020.
4. Independent Third-Party Review of SONGS' Inspection and Maintenance Program for the Holtec On-site Independent Spent Fuel Storage Installation. Prepared for the California Coastal Commission by LPI, Inc., June 12, 2020.