Q&A: Responses to questions posed by CEP members at March 25 meeting

Q: Please provide a better understanding of the preliminary 20-year schedule to decommission San Onofre, and whether there are activities that can be extended or compressed to alter the schedule.

A: The Nuclear Regulatory Commission is prescriptive about the required regulatory submittals in the first two years and last two years of any decommissioning commercial nuclear facility. Examples are the Post-Shutdown Decommissioning Activities Report required within two years of shutdown and the License Termination Plan, required at least two years before the end of decommissioning. The greatest opportunity to expand or compress the schedule occurs during major decommissioning activities, beginning with decontamination and dismantlement work. Examples of work that can affect the decommissioning schedule include the timetable to select a decommissioning contractor and the schedule for shipping low-level waste off site. We have developed high-level schedules but are in the early stages of detailed decommissioning planning.

Q: What are the design specifications of the dry fuel storage canisters?

A: At the inception of dry fuel storage at San Onofre in 2003, we chose Transnuclear's dual purpose storage and transportation canister technology. Transnuclear's Standardized Advanced NUHOMS® Storage System 24PT1 and 24PT4 design specifications require the design to be dual purpose to meet the NRC storage and transportability requirements. SCE plans to also use Transnuclear's 32PTH2 canister. This canister is currently licensed for storage, and Transnuclear plans to seek a transportation license in 2015. The Transnuclear Dry Shielded Canisters (DSC) and storage modules form a self-contained, independent, passive system, which does not rely on any other systems or components for its operation. The system is designed to withstand credible hazards such as tornadoes, flooding and seismic events. The design criteria satisfy requirements to withstand effects of normal operation, natural phenomena and postulated accidents such as those that involve flammable gas or armor-piercing artillery shells.

Q: What is the seismic capability of the dry fuel storage system, and how does that compare to the design requirements for the plant itself?

A: Every U.S. nuclear plant, including San Onofre, is designed to withstand the maximum potential earthquake for its location without releasing radioactive materials. The commonly known Richter scale is not used to determine earthquake building safety; instead, we use a more accurate value known as "peak ground acceleration," which is based on the anticipated ground movement at the site during the largest potential earthquake. The Standardized Advanced NUHOMS® Storage System at San Onofre is designed to withstand 1.5 g (g refers to the force of gravity) horizontal acceleration and 1.0 g vertical acceleration, which is more than double site licensing requirements.

As approved by the NRC, the San Onofre nuclear plant was built to withstand a peak ground acceleration of at least 0.67 g in the horizontal direction and 0.44 g in the vertical

direction. For comparison, the California Building Code requires any buildings built in the vicinity of San Onofre to be designed to withstand an earthquake motion that has peak ground acceleration of .38 g. (When Units 2 and 3 were under construction in 1970s, that standard for office buildings was 0.2 g horizontal ground motion.)

Q: What is the design life of the canisters?

A: The manufacturer of San Onofre's dry storage system estimates that the casks are designed for about 100 years. NRC regulations currently allow for an initial license period of 20 years for a general license for storage. The NRC has begun to approve license renewals for a maximum license extension period of 40 years. This renewal, when combined with the initial license period, will allow for a maximum storage license period of 60 years. With a proper aging management program, the system's licensed storage period can be extended beyond the maximum 60-year period.

Q: What is the radioactivity level in each canister and the dose measurements outside the canisters?

A: The level of radioactivity in a typical San Onofre canister with 24 fuel assemblies is about 8 million curies; that drops by 50 percent after 18 years of cooling. The radiation dose measurement immediately at the ISFSI fence where plant workers can walk is on average 0.007 millirem per hour, a small part of the average annual background radiation dose of 360 millirem. The hourly exposure attributable to the storage of used fuel in the ISFSI is well below regulatory limits. This information is reported to the NRC annually and available on the NRC website.

Q: How does this compare to other dry fuel storage facilities in the U.S.?

A: The shielding design of the NUHOMS® Storage Modules deployed at San Onofre results in surface dose rates that are two to three times lower when compared to other horizontal dry storage systems in the U.S. Generally, horizontal storage systems also have lower dose rates than vertical storage systems**.**

Q: Please help us understand the steps taken to ensure the integrity and safety of dry storage canisters for an extended period of time

A: The NRC is responsible for inspection of dry cask storage. All casks also undergo a safety review before they are certified for use by the NRC. Dry casks are licensed or certified for 20 years, with possible renewals of up to 40 years. Aging management programs are required as part of the license extension for the spent fuel storage facility, that is, starting at 20 years from the first fuel storage on the site.

Nuclear fuel is designed for service under the temperature, radiation, water flow and accident conditions that form the design basis during operation in the reactor. Additionally, materials test data and demonstration programs for dry storage of low burnup fuel (<45 gigawatt-day/metric ton uranium) indicate no concerns about fuel durability in dry storage. For higher burnup fuel, there is some evidence to suggest that the fuel may become more brittle as it cools down, due to larger amounts of hydrogen

dissolved in the cladding. Current evidence is inconclusive, and testing continues, as well as plans for a DOE demonstration program for dry storage of high burnup fuel. Behavior of fuel during long-term storage is being studied at government laboratories (DOE national labs in the US, the Joint European Research Center Institute for Transuranium Elements at Karlsruhe, Germany, etc.).

Q: What surveillance activities, inspections and plans are in place to ensure any deterioration of the concrete around the canisters will be observed and managed?

A: The dry cask modules at San Onofre include corrosion inhibitors in the concrete mix to mitigate corrosion of the steel reinforcement in the concrete. Because of the climate at San Onofre, freeze/thaw damage noted at other facilities is unlikely. Visual surveillance of the exterior to look for concrete degradation on the exterior vertical surfaces (front wall, door, front edge of roof and shield walls) is performed at regular intervals though a preventative maintenance program schedule. To date, there has been no degradation identified.

Q: What is the proximity of the current pad location to the public?

A: The dry storage system, formally known as the Independent Spent Fuel Storage Installation (ISFSI), is on land that was previously occupied by San Onofre Unit 1, an existing, disturbed industrial site with no on-site biological resources. The storage pad is 180 feet from the beach seawall, about 104 feet from the bluffs and 190 feet from the adjacent San Onofre State Beach. The state beach is the nearest public access to coastal waters or recreation area directly to the north and south of San Onofre. A pathway directly in front of the San Onofre site connects these two beach areas for pedestrian passage. Public access to recreation on San Onofre State Beach is not restricted in any way by the ISFSI.

Q: What information is available about leaks at dry storage casks in the nuclear industry?

A: There are no known instances of commercial spent nuclear fuel dry storage canisters leaking radioactive materials stored inside in the United States. There have been instances of secondary seal leakage on bolted-lid metal casks in which helium used in the pressurized casks escaped: TN-32 at Surry in Virginia in 2000 and TN-68 at Peach Bottom in Pennsylvania in 2010. The bolted-lid casks are sealed by a primary inner metal seal and a secondary outer one. The leakage of the secondary seal does not release radiation to the environment — only small amounts of helium were released from the pressurized space between the seals. A pressure monitor indicated the resulting reduction in the helium pressure between the two seals, and the seals were replaced. These are not the same canister design as the redundant welded-closure canisters used at San Onofre. In addition, the Idaho National Labs reports a bolted cask experienced leakage at a fitting. No radioactive contamination was reported at the leak location.

Q: What is the history of dry cask storage at San Onofre, including high burnup fuel?

A: The first canister was loaded with spent fuel in September 2003 and stored in the ISFSI on Oct. 3, 2003. San Onofre has eight high burnup fuel assemblies in dry storage; these were loaded from 2007 to 2012.

Q: What is the NRC's current contractual obligation to pick up spent fuel?

A: While the NRC licenses and regulates storage of used nuclear fuel, it is not responsible for picking up and transporting the fuel to a designated federal site. The Department of Energy, which does have that responsibility, will inform SCE when it is prepared to pick up the fuel sometime in the future. SCE has a contract with DOE to remove the used fuel -- a contract mandated by statute.

Q: Why was there not an automatic easement/lease extension (knowing that the site would be here beyond 2023)?

A: The easement between the U.S. Department of Navy and SCE was signed in 1964. Recognizing the agreement was looking 60 years into the future, the agreement specifically included a provision allowing the parties to extend the easement by mutual agreement.

Q: What is the NRC standard for releasing a nuclear plant site after decommissioning is completed?

A: San Onofre, like most nuclear plants that decommission, plans to release the site for *unrestricted use*, meaning any residual radiation would be below NRC's limits of 25 millirem annual exposure and there would be no further regulatory controls by the NRC. The NRC also has a release standard for *restricted use*, which is subject to different requirements to enforce land use restrictions after decommissioning. SCE has begun discussions with the U.S. Department of Navy, which owns the San Onofre property, regarding the Navy's future use of the site and related release criteria.

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