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Energy and Ocean Resources
Staff: JJL, SMH—SF
Staff Report: December 17, 1999
Hearing Date: January 11, 2000

STATUS REPORT ON SONGS MITIGATION PROGRAM

Following is a brief status report for the mitigation projects required in Southern California Edison Company's (SCE) coastal development permit for the San Onofre Nuclear Generating Station (SONGS) Units 2 and 3 (permit no. 6-81-330, formerly 183-73). The conditions originally were adopted by the Commission in 1991 to mitigate the adverse impacts of the power plant on the marine environment. In 1993, the Commission added a requirement for the permittee to partially fund construction of an experimental fish hatchery. The Commission has since approved amendments to the conditions in April 1997 and October 1998.

WETLAND RESTORATION MITIGATION

The Project

Condition A of the permit requires the permittee to create or substantially restore a minimum of 150 acres of wetlands to mitigate for impacts to fishes caused by the operation of SONGS. In April 1997, the Commission reaffirmed its 1992 approval of the permittee's choice of the San Dieguito River Valley as the site for the wetland restoration project and allowed for up to 35 acres credit for enhancement at San Dieguito Lagoon.

Progress Report

Following the Commission's November 1997 approval of SCE's preliminary wetland restoration plan, the wetland restoration mitigation project has been undergoing a planning and environmental review process which incorporates the mitigation project into the overall San Dieguito River Valley Regional Open Space Park project and includes additional wetland restoration required under the permittee's settlement agreement with the Earth Island Institute. The lead agencies for the CEQA/NEPA environmental review are the San Dieguito River Valley Regional Open Space Park Joint Powers Authority (JPA) and U.S. Fish and Wildlife Service.

The permit conditions require SCE to submit a final restoration plan that substantially conforms to the preliminary restoration plan unless the CEQA/NEPA review concludes that an alternative plan that meets the conditions for minimum standards and objectives is the environmentally superior alternative. The permit conditions, as amended by the Commission in October 1998, contain specific due dates for SCE's

submittal of the final restoration plan and coastal development permit application based on a completion of the CEQA/NEPA environmental review process around August 1999. The EIR/S team has worked diligently and cooperatively to resolve the many significant issues raised during this process; however, the additional detailed analyses that have been undertaken to address these issues have significantly delayed completion of the EIR/S. Notwithstanding the specific due dates, the permit requires SCE to submit the final restoration plan within 60 days following the JPA's certification of the EIR and the U.S. Fish and Wildlife Service's record of decision adopting the EIS.

The draft EIR/S is expected to be released for public review by January 21, 2000. The staff will then work with SCE to determine a more precise schedule for SCE's submittal of the final restoration plan and coastal development permit application.

KELP REEF MITIGATION

The Project

Condition C of the permit requires construction of an artificial reef that will consist of an experimental reef and a larger mitigation reef. The experimental reef must be a minimum of 16.8 acres and the mitigation reef must be of sufficient size to sustain 150 acres of medium to high density kelp bed community. The purpose of the experimental reef is to determine what combination of substrate type and substrate coverage will best achieve the performance standards specified in the permit. The design of the mitigation reef will be contingent on the results of the experimental reef.

In April 1997, the Commission added the requirement for a payment of $3.6 million to the State's Ocean Resource Enhancement and Hatchery Program (OREHP) to fund a mariculture/marine fish hatchery to provide compensation for resources not replaced by the artificial mitigation reef. SCE has fully satisfied this requirement.

Progress Report

Following completion of the environmental review and permitting processes for the reef mitigation, SCE began construction of the artificial reef on August 18, 1999, and completed the 56-module reef on September 29, 1999.

Shortly after construction, the physical dimensions of each module were monitored on the surface using differential GPS. In addition, the outline (also termed the "footprint") and the percent cover of reef material on each module was monitored with high-resolution side scanning sonar. As a final check, each module was inspected by divers to estimate vertical relief and the degree of overlapping or piling up. SCE presented the results of construction monitoring of the first 24 modules to the staff in September. The staff found that the footprints and percentage covers of the modules conformed very closely to the design specifications. Construction monitoring for the remaining modules has been completed; staff will review those results shortly.

The staff has been conducting field and analytical work to determine the locations of reference sites in nearby natural kelp forests. This work has resulted in a list of seven likely reference sites in the San Mateo, San Onofre, and Barn kelp beds. The staff has forwarded the locations of these sites to SCE's consulting biologists and hopes to gain consensus on the appropriateness of these reference sites. The staff began installing permanent transect lines on each module in mid-October. The staff continued assembling the materials, equipment and personnel necessary for post-construction monitoring of the experimental reef and reference sites.

FISH BEHAVIORAL MITIGATION

The Project

Condition B requires the permittee to install and maintain behavioral barrier devices at SONGS to reduce fish impingement losses.

Progress Report

Following the permittee's experiments on light and sound devices, the permittee considered fish guidance lights to be more effective in preventing fish from being trapped and killed. In October 1998, the Executive Director approved the permittee's installation plan for the lights and the lights were installed in December 1998.

Monitoring to evaluate the effectiveness of the fish guidance lights began in March 1999 and is continuing. Initial data seems to indicate that rather than attracting fish to the fish return system the lights are repelling the fish. The staff is working with SCE to design and implement additional experiments on the lighting system.

COMMISSION OVERSIGHT AND INDEPENDENT MONITORING

Condition D of the permit requires SCE to fund the Commission's oversight of the mitigation and independent monitoring functions identified in and required by Conditions A through C. The Commission retains contract scientists and technical staff to assist in carrying out its oversight and monitoring functions, and retains a scientific advisory panel to provide advice on the design, implementation, monitoring and remediation of the mitigation projects. The staff has operated under Commission-approved work programs and budgets since 1993.

On December 8, 1999, the Commission unanimously approved a new two-year work program for 2000 and 2001 and funding in the amount of $2,293,162 to cover the monitoring and oversight program costs for the Commission's contract scientists, monitoring field assistants, science advisory panel, consultants, administrative support, and operating expense. The staff will be focusing primarily on (1) completing the environmental review, planning and permitting for the wetland restoration project and conducting pre-restoration monitoring to collect baseline data, and (2) conducting monitoring and process studies for the experimental kelp reef and seven natural reference kelp reefs.

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December 23, 1999

MEMO

To: Coastal Commissioners

From: Susan Hansch, Chief Deputy Director, and
Dr. Stephen Schroeter, SONGS Mitigation Program Scientific Team

Subject: Mortality of Marine Mammals and Entrainment of Sea Turtles at the San Onofre Nuclear Generating Station (SONGS)

Item 13, Tuesday, January 11, 1999
Information Only — No Commission Action Scheduled

Background

After the Commission's April 9, 1997, action on the SONGS Mitigation Program, staff received a phone inquiry from a Sacramento Bee reporter asking whether SONGS draws in and kills marine mammals through its intake system. This information prompted an investigation by the Coastal Commission staff and resulted in a memorandum to the Commission in May 1997. That memorandum explained the scope of the problem and outlined steps to insure that the Commission would be apprised of any changes in the biological status of marine mammal deaths caused by the SONGS operating system.[1] An issue raised in May 1997 was the role of the Marine Review Committee (established by the Commission as a part of the original 1974 permit for SONGS Units 2 and 3), which carried on an extensive study to determine SONGS impacts to the marine environment. The Marine Review Committee (MRC) studies did not address marine mammal losses at SONGS because based on the information available at that time, the MRC scientists were not aware that there were any biologically significant impacts to marine mammals.

[1] Mortality of Marine Mammals Caused by the Operation of the San Onofre Nuclear Generating Station (SONGS) Units 1,2, and 3. Memorandum to the California Coastal Commission from Susan Hansch, Deputy Director, and the SONGS Mitigation Program Scientific Team. May 14, 1997.

The issue of marine mammal deaths associated with the operation of SONGS has again come to the attention of the public. In 1998, the number of harbor seals and California sea lions entrained and died in the power plants cooling system was much higher than in previous years (a total of 63 animals entrained, 36 of which were dead). In addition, it has come to staff's attention that 27 sea turtles have also been entrained (4 were dead, but probably not killed in the cooling system) during the operational history of SONGS.

In this memo we provide the Commission with an update on the status of the issue entrainment of marine mammals and sea turtles, and advise the Commission on the next steps that staff believes appropriate.

Summary of Marine Mammal Entrainment at SONGS

From 1978 through 1998, San Onofre Nuclear Generating Station Units 1[2], 2, and 3 has entrained, on average, about 17 marine mammals per year. These consisted of California sea lions (*Zalophus californicus*) and harbor seals (*Phoca vitulina*). About 60% of these animals (an average of about 10 per year) were dead upon discovery in the plant cooling system and the remainder were captured and released.

San Onofre paramedics are trained to capture and rescue mammals entrained at the plant. They respond on a 24-hour basis. Animals that are injured or appear in ill health are sent to veterinarians for rehabilitation before release to the ocean. (K. Herbinson, SCE, pers. comm., December 1999)

The plant operators have kept records of entrainment and entrainment mortalities since 1978. From 1978 through 1998, a total of 370 animals have been entrained by the intake systems of the three units. Of those, 144 California sea lions and 55 harbor seals were dead. The remainder were taken in alive and either rescued and released or treated and released. There is no record of an observed live marine mammal having died once it was observed in the plant cooling systems. All live animals were rescued by Edison San Onofre paramedics. Those animals that were dead are presumed to have died during the transit through the system, but examination of the animals shows that at least 10 had external injuries or were partially decomposed and were likely dead or dying before they entered the cooling systems of the plants. Others may have died from internal injuries, parasites or disease not detectable without performing necropsy. Fifteen animals were dead at Unit 1; the remaining 184 deaths occurred at Units 2 and 3 (Table 1). As we reported in 1997, most of the animals found dead in the SONGS cooling system were yearlings.

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[2] Unit 1 was permanently shutdown in 1992.

Table 1. Deaths of California sea lions and harbors seal in the SONGS cooling system from 1978 through 1998.

	Number Dead			
	SONGS Units			
Species	1	2	3	Total
California Sea Lions	9	51	84	**144**
Harbor Seals	6	15	34	**55**
	15	**66**	**118**	**199**

If one examines the data for each year from 1978 through 1998 there are two notable patterns. First, as noted in the 1997 memo, there is evidence of an increasing trend in the number of marine mammal deaths (Fig. 1). Considered separately, the deaths of both California sea lions and harbor seals tend to increase over time and both trends are statistically significant (Fig. 1). The rate of increase in harbor seal deaths is less than 1/3 the rate increase in sea lion deaths (Fig. 1). This trend over time for all marine mammals accounts for the differences in deaths during and after the Commission's MRC studies which were completed in 1988 (3.5 versus 28.0 annual deaths, respectively).

The cause for the secular trend is not known. One likely candidate is a general increase in marine mammal populations. As is the case for fish populations, SONGS may be acting as a sampling device and the number of marine mammals entrained and killed by the power plant may be an index reflecting an increase in the surrounding marine mammal populations.

A second pattern also apparent from the graphs in Fig. 1 is the tendency for mortality in some years to be much higher that that predicted by the simple linear relationship of mortality versus time. These positive deviations are apparent in 1983, 1992, and particularly in 1998 and correspond to years El Nino years. There have been anecdotal reports of many sea lion pups in poor condition during the El Nino years. Although an exact mechanism is unknown, it may be that lower food supplies during El Nino periods result in poorer health and a higher number of marine mammals at risk to being entrained by the SONGS cooling system.

Significance of Marine Mammal Losses at SONGS

As we pointed out in 1997, there are three questions that relate to the possible significance of the marine mammal deaths caused by SONGS. (1) How does SONGS

cause the deaths of seals and sea lions? (2) Are these deaths biologically significant? and (3) What, if anything, might be done to reduce the number of deaths? According to Kevin Herbinson of Southern California Edison, little is known about the causes of death of the seals and sea lions found in the SONGS cooling system. Drowning is the presumed cause of death for animals without obvious signs of trauma. The data shows a small number of animals with various wounds, including gunshot wounds.

In May, 1997, Jim Lecky of the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce (personal communication, May 7, 1997) deemed the deaths caused by SONGS to have no significant impact on populations of seals and sea lions. This assessment is based on the fact that California sea lion and harbor seal populations in California are rapidly increasing and that statewide losses from power plant entrainment are a small fraction of the net annual production for each species.[3]

SCE has developed and implemented procedures for rescuing live animals trapped in the cooling system and returning them safely to the open ocean. In addition, SCE biologists and NMFS officials have discussed the possibility of placing structures on the intakes of the cooling system to prevent seals and sea lions from entering the 18' diameter intake pipes. At present, there are "velocity caps" on the intakes to create a horizontal current designed to allow fish and mammals to avoid the area. In the opinion of the plant operators/engineers, additional structures that would further restrict access to the intake pipes would impose unacceptable safety risks to plant operations by increasing the chances of serious fouling by debris (kelp, etc.) resulting in loss of cooling waters. This could pose both a safety hazard and reduce the efficiency of the plant.

Although the deaths of marine mammals by the SONGS cooling system have been deemed not to pose a threat to populations, there is a concern on the part of the agencies and Edison about any deaths and there is a desire to reduce entrainment and deaths as much as possible. Since our report to the Commission in May, 1997, several steps have been taken to address the problem. In addition to removing navigation buoys that provided haul-out opportunities for sea lions near the intakes, SCE met with marine mammal experts at Sea World in San Diego to discuss possible exclusion technologies, especially sonic devices. SCE also participated in a Seal Deterrent Workshop in Seabrook, New Hampshire in January 1999. The New Hampshire workshop brought together marine mammal experts and ocean engineering and operations specialists from around the country to discuss possible deterrents. Edison is continuing to explore technologies raised in the workshop, such as sonic devices,

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[3] Barlow, J., K.A Forney, P.S. Hill, R.L Brownell, Jr., J.V. Carretta, D.P. DeMaster, F. Julian, M.S. Lowry, T. Ragen, and R.R. Reeves. 1996. U.S. Pacific Marine Mammal Stock Assessments. NOAA Technical Memorandum, NOAA-TM-NMFS-SWFSC October 1996.

electric fields, and lights, but most are thought to either attract animals or potentially harm mammals or other marine organisms.

Authorizations by National Marine Fisheries Services Under the Marine Mammal Protection Act

The regulatory status of marine mammal deaths caused by power plants has not changed since our memorandum to the Coastal Commission in May, 1997 and is as follows. Marine mammals are federally protected under the Marine Mammal Protection Act. NMFS and the Marine Mammal Commission are involved in implementing the federal law and regulating the "take" of marine mammals. Evaluation of the significance of marine mammal mortalities caused by human intervention falls under the Marine Mammal Protection Act and is the responsibility of NMFS.

Evaluation of the biological significance of the marine mammal deaths in all coastal power plant cooling systems in California, including SONGS, is done by NMFS under a letter of authorization for marine mammal stranding, Section 112-C of the Marine Mammal Protection Act. Beginning in 1983, the SONGS owners applied for and received a letter of authorization from NMFS, which allowed for mortality incidental to the operation of the power plant.

An alternative to the letter of authorization is a take permit. The take permits differ from letters of authorization by requiring general review outside of NMFS and the implementation of mitigation measures for mortality caused by the permittee. At present all of the coastal power plants in California, including SONGS, are operating under letters of authorization and not take permits.

The National Marine Fishery Service has begun the process to institute an umbrella small take permit for marine mammals that will include all coastal power plants in California. It will use the permit from the Seabrook Nuclear generating station as a model and will consider if there are any other appropriate mitigation measures (Joseph Cordaro, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, personal communication, December 20, 1999).

SCE reports the number of captures and mortalities to NMFS each month. NMFS annually evaluates the status of marine mammal populations and the possible significance of a variety of human-related losses, including the losses due to SONGS and other power plants. NMFS has evaluated these losses since 1983 and has concluded that the deaths of marine mammals caused by the SONGS cooling system are not statistically significant to California sea lion and harbor seal populations (Jim Lecky, National Marine Fishery Service, Asst. Administrator for Protected Resources, Southwest Region, personal communication, December 20, 1999).

Summary of Entrainment of Sea Turtles at SONGS

Since our report to the Commission in May 1997 we have become aware of the entrainment and mortality of sea turtles by SONGS. Records of sea turtle entrainment began in 1977. Since 1983, a total of 27 sea turtles comprising 3 species, Greens (*Chelonia mydas*), Loggerheads (*Dermochelys coriacea*), and Leatherbacks (*Caretta caretta*), have been entrained in the cooling systems of SONGS Units 2 and 3. No sea turtles have been entrained by SONGS Unit 1. All three species of sea turtles are protected under the Endangered Species Act of 1973. Most (23) of the sea turtles were removed from the cooling system and released into the wild uninjured. Four individuals were found dead, but all were all in an advanced state of decomposition, and since the cooling system is checked at least twice a day, it is unlikely that they were killed in the cooling system (Table 2).

Although sea turtle strandings in the SONGS cooling system are not explicitly covered under the Letter of Authorization that applies to marine mammals, they are nevertheless reported to the National Marine Fishery Service a form titled "Marine Mammal and Marine Turtle Stranding Report". In the rare event of a dead turtle, a phone call was made to NMFS to see if the animal or parts of it were needed for research organizations. Because monitoring indicates that the cooling system is not killing sea turtles, NMFS at present requires no other type of authorization (Joseph Cordaro, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, personal communication, December 20, 1999).

Table 2. Condition of sea turtles entrained by the cooling systems of SONGS Units 2 and 3 system from 1983 through August, 1999. All dead animals were in an advanced state of decomposition and were probably not killed in the cooling system. No sea turtles have been entrained by the cooling system of SONGS Unit 1.

Species	Released Uninjured	Dead
Greens	21	2
Loggerheads	2	0
Leatherbacks	0	2

Summary

- The problem of entrainment losses to marine mammal populations (California sea lions and harbor seals) associated with the operation of SONGS Units 2 and 3 has been addressed by the permittee and NMFS since 1983 by a letter of authorization for marine mammal stranding under Section 112-C of the Marine Mammal Protection Act.
- Beginning in 1978 and on an on-going basis, SCE has each month reported to NMFS the deaths of marine mammals in the SONGS cooling system.
- There have been statistically significant increases in losses since SONGS Units 2 and 3 came on line in 1983 and 1984. This secular trend likely reflects a similar increase in marine mammal populations regionally.
- Numbers of marine mammals entrained and killed by the SONGS cooling system are higher during El Nino that during non-El Nino years. The mechanism for this pattern is not clearly understood. A reasonable hypothesis is that animals are weakened and more susceptible to entrainment during El Nino years due to lack of food.
- Total losses of marine mammals (California sea lions and harbor seals) during the MRC's studies from 1978 to 1988 were rare events, averaging 3.5 per year.
- Harbor seal and California sea lion populations in California are increasing rapidly. The most recent estimates of annual rates of population increase are 8.3% for harbor seals and 11.3% for California sea lions.[4]
- Even though total losses of marine mammals in the SONGS cooling system have increased since MRC studies, these losses are at present not regarded to be biologically significant by the National Marine Fishery Service.
- SCE has reduced marine mammal deaths in the SONGS cooling system by developing and implementing techniques for rescuing live animals in the cooling system. SCE has also considered and rejected structural barriers on the intakes to prevent entrainment of marine mammals on the SONGS intake structures.
- Additional structural barriers on the SONGS' intakes have been deemed too risky to the safe operation of the plant because of the possibility that such barriers might clog and increase the chances of loss in cooling waters.
- Beginning in 1977 and on an on-going basis, SCE has recorded entrainment and death of sea turtles in the SONGS cooling system.
- A total of 27 sea turtles comprising three species have been entrained in the cooling systems of SONGS Units 2 and 3 since 1977. Most (23) have been removed from

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[4] *Ibid.*

the cooling system and returned uninjured to sea. There was no evidence linking the four deaths to the cooling system.

Next Steps

- The issue of marine mammal deaths at SONGS is currently being dealt with by NMFS under the provisions of the Marine Mammal Protection Act. NMFS evaluates the biological significance of marine mammal deaths caused by SONGS each year under the provision of the Act.
- From 1983 to the present, NMFS has concluded that the deaths of marine mammals caused by the SONGS cooling system do not constitute a significant biological impact to California sea lion and harbor seal populations.
- Any mitigation required in the future would be mandated by NMFS under the Marine Mammal Protection Act.
- Using the permit for the Seabrook nuclear power plant in New Hampshire as a model, NMFS is overseeing a process to institute an umbrella small take permit for marine mammals that will cover all coastal power plants in California. Sea turtles will be covered by this permit as well.
- Commission staff will evaluate these annual NMFS reports and apprise the Commission of any change in the biological status of the deaths caused by the SONGS cooling system. Commission staff is working actively with SCE and NMFS to determine if additional mitigation to reduce marine mammal losses is feasible.
- Commission staff is currently evaluating the role of the Commission in a potential federal consistency review of the marine mammal entrainment issue under the federal Coastal Zone Management Act.

Figure 1. Annual deaths of marine mammals caused by the operation of SONGS. Solid lines are predicted values from linear regression.