Docket Nos. 50-361/362

RPM

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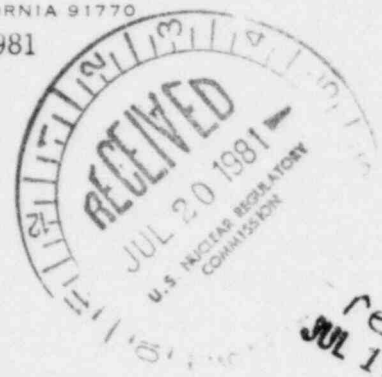
July 7, 1981



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U. S. Nuclear Regulatory Commission
Region V
Suite 202, Walnut Creek Plaza
1990 North California Boulevard
Walnut Creek, California 95696

Attention: R. H. Engelken, Director

Gentlemen:

Subject: IE Bulletin 81-03
Docket Nos. 50-361 and 50-362
San Onofre Nuclear Generating Station
Units 2 and 3

Reference: Letter, SCE to NRC dated June 22, 1981 (subject, LER 81-009)

The subject document, forwarded by NRC letter dated April 10, 1981, describes instances of flow blockage through certain components due to fouling by clams and/or mussels and requires that specific actions be taken for construction permit holders. The numbered responses below correspond to the numbered items for CP holders found in the bulletin.

1. The Pacific Ocean serves as both the source and receiving water body for San Onofre Units 2 and 3. It is known that Mytilus sp. exists in the vicinity of the station while Corbicula sp., a fresh water clam, does not.

   Control measures for marine growth at San Onofre Units 2 and 3 will consist of both heat treatment and chlorination. Chlorine will be used principally for the control of slime in the main condenser and on the heat transfer surfaces, but will also provide the additional effect of inhibiting the growth of Mytilus sp. Heat treatment will be conducted on a frequency determined by an empirical equation (based on mussel growth) in order to prevent Mytilus sp. from growing to a size that could cause equipment plugging. San Onofre Units 2 and 3 are also provided with a separate chlorination system which injects downstream of the Salt Water Cooling (SWC) Pumps and upstream of the Component Cooling Water (CCW) Heat Exchangers for the express purpose of preventing bio-fouling of these heat exchangers.

   The potential for intrusion of Mytilus sp. is limited to the sea water sides of the Circulating Water System (Condensor and Turbine Plant cooling) and Salt Water Cooling System (Component Cooling Water System cooling). The source for the Fire Protection System is fresh water tanks on the plant site which are supplied by domestic water treated by the City of San Clemente. As such, the potential for plugging of the Fire Protection System by Mytilus sp. or Corbicula sp. is considered to be non-existent.

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While San Onofre Units 2&3 has no history of a monitoring program for blockage since they have not operated as yet, San Onofre Unit 1, which is located on the same site, has had a substantial monitoring history.

The Component Cooling Water (CCW) heat exchangers at SO1 have been inspected at least every eighteen months since the plant was placed in service in 1968. This service has included a wide variety of ocean and operating conditions, including seawater temperature associated with warm summer operation, about 65-70°, and with winter operation about 55-60°. It has included extended operating periods during which the main circulating water system was in service continuously for about 218 days and extended shutdown periods of up to one year when the unit was not on line and the circulating water system was operated only intermittently.

Control measures for marine growth at San Onofre Unit 1 consist both of treatment with chlorine and treatment with heat. Chlorination is conducted routinely every eight hours and heat treatment is conducted on a basis determined to prevent growth of Mytilus sp. shells to a size which would cause plugging of the main condenser tubes. Although the exact frequency of heat treatment is determined by an empirical equation representing the growth of these species, heat treating normally occurs between every two and three months.

The history of normal operation of the CCW heat exchangers at San Onofre Unit 1 through the beginning of the extended steam generator sleeving outage had never demonstrated evidence of problems associated with blockage or flow reduction caused by living Mytilus sp. However, upon return to operation, it was discovered that a saltwater arthropod, Pollicipes (Mitella) polymerus (gooseneck barnacle) had grown on the saltwater discharge piping of the component cooling water heat exchanger such that the effective cross sectional area was reduced. This caused low coolant flow and malfunction of the associated butterfly valve. As discussed in the referenced letter, the saltwater cooling system at SO1 had not been treated for over a year due to the recent extended shutdown. As such, the conditions allowing such growth were considered to be abnormal, and are not expected to occur again. Following return to operation and thus the normal heat treatment program, it is expected such growth will be restricted to an acceptable level, typical of past operation.

During the heat treatment cycle, flow is reversed in the intake and discharge tunnels to permit hot discharge water to be recirculated through the intake tunnel. This kills the Mytilus sp. and other fouling organisms in the intake tunnel and normally forces most of the dead shells and other waste material out the intake tunnel, in which the flow is reversed during heat treatment. At the end of the heat treat cycle, flow is returned to normal and it is not unusual for some of the shells of killed Mytilus sp. and other species to be drawn back into the plant.

The majority of these shells drawn back into the plant are trapped by the traveling screens and bar rakes and removed from the circulating water. However, some fraction of these dead shells are drawn into the component cooling water heat exchanger and on several occasions have resulted in some reduction in flow and increased ΔP. The ΔP across the component cooling water heat exchanger is checked periodically and temperature indication and alarm is available in the control room. Consequently, since these occasional flow blockages occur shortly after heat treatment, and personnel frequently monitor the performance of the heat exchangers, SCE has had no difficulty in determining those times when possible flow blockage might occur, detecting that flow blockage, and correcting the problem.

Thus the operating history of SO1 under a variety of plant conditions demonstrates that any potentially affected systems will not be subjected to substantial blockage or flow reduction as a result of growth of Mytilus sp., providing a program of sufficient periodic treatment is implemented. It is expected that such a program of chlorination, heat treatment, and periodic component inspections and CCWS monitoring at SO23 during normal operation (as done at Unit 1) will ensure that problems associated with flow blockage due to Mytilus sp. will be minimized, if not eliminated.

The potential for intrusion of these organisms due to low water level and high velocities in the intake structure is considered to be no different than that which would exist under normal conditions.

2. In February 1981, it was determined that the abnormally high ΔP across the Unit 2 Component Cooling Water (CCW) Heat Exchangers was a direct result of heavy mussel shell accumulation. The investigation of this anomaly revealed that the operation of the seawater side of the CCW heat exchangers in February 1981 was considered to be in an abnormal mode because the pumps and piping system to supply sea water from the Unit 3 forebay (which would provide an additional source of "clean" water) were still under construction. Also, heat treatment of the Sea Water Intake System to prevent mussel growth had not been attempted prior to the startup of this system. This is an abnormal situation due to plant construction which is not expected to occur again after initial plant operation. During power ascension testing the intake and discharge sides of the circulating water systems will be heat treated to eliminate mussel growth and minimize the potential for this type of anomaly. This initial treatment, coupled with the aforementioned SWCS chlorination system and heat treatment throughout plant life will serve to minimize the potential for CCWS Heat Exchanger bio-fouling in the future.

3. San Onofre does not include Mytilus sp. as a specific part of the environmental monitoring program. Further, it is not considered necessary to conduct a monitoring program for Mytilus sp. since it is well known that this genus exists in the station environment and the possible effects of Mytilus sp. on the Salt Water Cooling and Circulating Water Systems have been successfully counteracted at Unit 1. The size increase of Mytilus sp. based on temperature history is well known and predictable; thus, the time interval between successive heat treatments is determined by the temperature history of the circulating water system. This method, and earlier variations, have been successfully employed at San Onofre and will be continued in the future; consequently, a monitoring program for Mytilus sp. is not considered necessary because of the well established and successful control program at San Onofre Unit 1.

Discussions regarding potentially affected systems and components, extent of fouling, discovery of fouling, and preventative actions are provided in Items 1 and 2, above.

Should you have any questions or require additional clarifications, please contact me.

Subscribed on this 7th day of July, 1981.

Very truly yours,
SOUTHERN CALIFORNIA EDISON COMPANY

By K. P. Baskin
K. P. Baskin
Manager of Nuclear Engineering,
Safety, and Licensing

Subscribed and Sworn to before me on this 7th day of July, 1981

Agnes Crabtree
Notary Public in and for the County of Los Angeles, State of California

OFFICIAL SEAL
AGNES CRABTREE
NOTARY PUBLIC - CALIFORNIA
PRINCIPAL OFFICE IN
LOS ANGELES COUNTY
My Commission Exp. Aug. 27, 1982

cc: Director, Office of Inspection and Enforcement, NRC
Washington, D.C. 20555

R. Pate, USNRC
Site Inspector, SO23