July 21, 1981

Docket Nos. 50-528, 50-529, 50-530

Arizona Public Service Company
P. O. Box 21666
Phoenix, Arizona 85036

Attention: Mr. E. E. Van Brunt, Jr.
Vice President, Nuclear Projects

Gentlemen:

The enclosed Information Notice is provided as an early notification of a possibly significant matter. It is expected that recipients will review the information for possible applicability to their facilities. No specific action or response is requested at this time. If further NRC evaluations so indicate, an IE Circular or Bulletin will be issued to recommend or request specific licensee actions. If you have questions regarding this matter, please contact this office.

Sincerely,

Original signed by
R. H. Engelken

R. H. Engelken
Director

Enclosure:
IE Information Notice No. 81-21

cc w/enclosure:
F. W. Hartley, APS

OFFICE	RV/dot						
SURNAME	FAULKENBERRY	ENGELKEN					
DATE	7/21/81	7/21/81					

SSIN No.: 6835
Accession No.:
810330402
IN 81-21

UNITED STATES
NUCLEAR REGULATORY COMMISSION
OFFICE OF INSPECTION AND ENFORCEMENT
WASHINGTON, D.C. 20555

July 21, 1981

IE INFORMATION NOTICE NO. 81-21: POTENTIAL LOSS OF DIRECT ACCESS TO ULTIMATE HEAT SINK

Description of ircumstances:

IE Bulletin 81-03, issued April 10, 1981, requested licensees to take certain actions to prevent and detect flow blockage caused by Asiatic clams and mussels. Since then, one event at San Onofre Unit 1 and two events at the Brunswick Station have indicated that situations not explicity discussed in Bulletin 81-03 may occur and result in a loss of direct access to the ultimate heat sink. These situations are:

1. Debris from shell fish other than Asiatic clams and mussels may cause flow blockage problems essentially identical to those described in the bulletin.

2. Flow blockage in heat exchangers can cause high pressure drops that, in turn, deform baffles, allowing bypass flow and reducing the pressure drop to near normal values. Once this occurs, heat exchanger flow blockage may not be detectable by pressure drop measurements.

3. Change in operating conditions. (A lengthy outage with no flow through seawater systems appears to have permitted a buildup of mussels in systems where previous periodic inspections over more than a ten year period showed no appreciable problem.)

We are currently reviewing these events and the responses of the licensees to IEB 81-03. We expect licensees are performing the actions specified in IEB 81-03 such that cooling water flow blockage from any shell fish is prevented or minimized, and is detected before safety components become inoperable.

On June 9, 1981, San Onofre Nuclear Generating Station Unit No. 1 reported that as a result of a low saltwater coolant flow rate indication and an apparent need for valve maintenance, a piping elbow on the saltwater discharge line from component cooling heat exchanger E-20A was removed by the licensee just upstream of butterfly valve 12"-50-415 to permit visual inspection. An examination revealed growth of some form of sea mollusk such that the cross-sectional diameter of the piping was reduced. The movement of the butterfly valve was impaired and some blockage of the heat exchanger tube sheet had occurred. Evaluation of the event at San Onofre is continuing. However, the prolonged (since April 1980) reactor shutdown for refueling and steam generator repair is believed to have caused the problem since previous routine inspections conducted since 1968 at 18 month intervals had not revealed mollusks during normal periods of operation.

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Two events at Brunswick involved service water flow blockage and inoperability of redundant residual heat removal (RHR) heat exchangers, primarily due to oyster shells blocking the service water flow through the heat exchanger tubes. On April 25, 1981, at Brunswick Unit 1, while in cold shutdown during a maintenance outage, the normal decay heat removal system was lost when the single RHR heat exchanger in service failed. The failure occurred when the starting of a second RHR service water pump caused the failure of a baffle in the waterbox of the RHR heat exchanger, allowing cooling water to bypass the tube bundle. The heat exchanger is U-tube type, with the service water inlet and outlet separated by a baffle. The copper-nickel baffle which was welded to the copper-nickel tubesheet deflected and failed when increased pressure was produced by starting the second service water pump. The redundant heat exchanger was inoperable due to maintenance in progress to repair its baffle which had previously deflected (LER 1-81-32, dated May 19, 1981). The licensee promptly established an alternate heat removal alignment using the spent fuel pool pumps and heat exchangers.

As a result of the problems discovered with Unit 1 RHR heat exchangers, a special inspection of the Unit 2 RHR heat exchangers was performed while Unit 2 was at power. Examination of RHR heat exchanger 2A using ultrasonic techniques indicated no baffle displacement but flow testing indicated an excessive pressure drop across the heat exchanger. This heat exchanger was declared inoperable. Examination of the 2B RHR heat exchanger using ultrasonic and differential pressure measurements indicated that the baffle plate was damaged. The licensee initiated a shutdown using the 2A RHR heat exchanger at reduced capacity (LER 2-81-49, dated May 20, 1981).

The failure of the baffle was attributed to excessive differential pressure caused by blockage of the heat exchanger tubes. The blockage was caused by the shells of oysters with minor amounts of other types of shells which were swept into the heads of the heat exchangers since they are the low point in the service water system. The shells resulted from an infestation of oysters growing primarily in the 30" header from the intake structure to the reactor building. As the oysters died their upper shells detached and were swept into the RHR heat exchangers where they collected. Small amounts of shells were found in other heat exchangers cooled by service water. Most of the operating BWRs use U-tube heat exchangers in the RHR system. (The heat exchangers used at Brunswick were manufactured by Perflex Corporation and are identified as type CEU, size 52-8-144.)

The observed failures raise a question on the adequacy of the baffle design to withstand differential pressures that could reasonably be expected during long term post accident operation. However, it should be noted that since the baffles at Brunswick are solid copper-nickel as are the tubesheets and the water boxes are copper-nickel clad, the strength of the baffles and the baffle welds is somewhat less than similar heat exchangers made from carbon steel. Therefore, heat exchangers in other BWR's may be able to tolerate higher differential pressure than that at Brunswick without baffle deflection. (Brunswick opted for copper-nickel due to its high corrosion and fouling resistance in a salt water environment.)

The use of differential pressure (dp) sensing between inlet and outlet to determine heat exchanger operability should consider that baffle failure could give an acceptable dp and flow indications and thereby mask incapability for heat removal. However, it is noted that shell blockage in a single-pass, straight-through heat exchanger can readily be detected by flow and dp measurement.

Evaluation of the events at Brunswick is still continuing. Under conditions of an inoperable RHR system, heat rejection to the ultimate heat sink is typically through the main condenser or through the spent fuel pool coolers. This latter path consists of the spent fuel pool pumps and heat exchanger with the reactor building closed cooling water system as an intermediate system which transfers the heat to the service water system via a single pass heat exchanger. These two means (i.e., main condenser or spent fuel pool) are not considered to be reliable long term system alignments under accident conditions.

This information is provided as a notification of a possibly significant matter that is still under review by the NRC staff. The events at Brunswick and San Onofre emphasize the need for licensees to initiate appropriate actions as requested by IEB 81-03 for any credible type of shell fish or other marine organisms; e.g., fresh water sponges, (not only asiatic clams and mussels). In case the continuing NRC review finds that specific licensee actions would be appropriate, a supplement to IEB Bulletin 81-03 may be issued. In the interim, we expect that licensees will review this information for applicability to their facilities.

No written response to this information is required. If you need additional information regarding this matter, please contact the Director of the appropriate NRC Regional Office.

Attachment:
Recently issued IE Information Notices

Attachment
IN 81-21
July 21, 1981

RECENTLY ISSUED
IE INFORMATION NOTICES

Information Notice No.	Subject	Date of Issue	Issued to
81-20	Test Failures of Electrical Penetration Assemblies	7/13/81	All power reactor facilities with an OL or CP
81-19	Loose Parts in Primary Coolant System	7/6/81	All power reactor facilities with an OL or CP
81-18	Excessive Radiation Exposures to the Fingers of Three Individuals Incurred During Cleaning and Wipe Testing of Radioactive Sealed Sources at a Sealed-Source Manufacturing Facility	6/23/81	Specified licensees holding Byproduct licenses
81-16	Control Rod Drive System Malfunctions	4/23/81	All BWR facilities with an OL or CP
81-15	Degradation of Automatic ECCS Actuation Capability by Isolation of Instrument Lines	4/22/81	All power reactor facilities with an OL or CP
81-14	Potential Overstress of Shafts on Fisher Series 9200 Butterfly Valves with Expandable T Rings	4/17/81	All power reactor facilities with an OL
81-13	Jammed Source Rack in a Gamma Irradiator	4/14/81	Specified irradiator licensees
81-12	Guidance on Order Issued January 9, 1981 Regarding Automatic Control Rod Insertion on Low Control Air Pressure	3/31/81	All BWR facilities with an OL or CP
81-11	Alternate Rod Insertion for BWR Scram Represents a Potential Path for Loss of Primary Coolant	3/30/81	All BWR facilities with an OL or CP

OL = Operating Licenses
CP = Construction Permits