

## PRECURSOR DESCRIPTION AND DATA

NSIC Accession Number: 166072

Date: May 19, 1981

Title: Damaged RHR Heat Exchangers at Brunswick 1

### The failure sequence was:

1. Oyster shells growing in the service water (SW) piping dislodged and accumulated in the tubing of the B RHR heat exchanger (HX). The shell buildup resulted from the service water chlorination system being out of service for an extended period of time.
2. The blockage in the HX tubes created a high pressure drop which ultimately displaced the baffle plate normally separating the SW inlet and outlet. The displacement allowed the service water to bypass the HX tubes, rendering the heat removal capability unavailable. This was discovered during a special inspection conducted during a cold shutdown April 19, 1981.
3. The 1B HX was removed from service for repair while the 1A RHR HX maintained the cold shutdown condition until April 25, 1981, when the second service water pump for the 1A RHR HX was started.
4. The increased flow caused the 1A HX baffle to displace in the same manner as the 1B HX, resulting in a loss of cooling. Shell buildup in the 1A HX was also responsible for the high pressure drop conditions leading to the baffle displacement.
5. Both RHR HXs for Brunswick 1 were unavailable for heat removal.

### Corrective action:

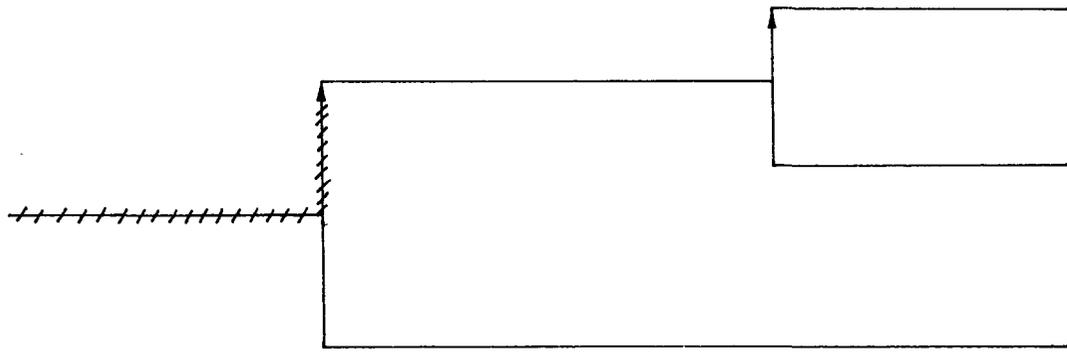
1. An alternate shutdown cooling lineup was established using fuel pool coolers, the condensate storage tank, and the core spray system.
2. Temporary repairs were performed on the 1A heat exchanger and it was returned to service while permanent repairs were still in progress on the 1B heat exchanger. Permanent repairs for the 1A HX were to follow return to service of the 1B HX.
3. Programs were being pursued to monitor safety-related HX performance, clean the HX tubes and SW piping, and resume the SW chlorination operation.
4. Plant procedures were to be revised to vent the RHR service water system regularly.

### Design purpose of failed system or component:

The RHR system provides long-term core cooling for normal shutdown, maintenance of cold shutdown, and heat removal capability for emergency shutdown modes.

Loss of RHR-1B HX from damage due to blockage by oyster shells	Loss of RHR-1A HX on startup of second service water pump due to excessive pressure drop caused by oyster shells	Alternate RHR path success
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Potential  
Severe  
Core  
Damage



No

Possible - however, plant  
in cold shutdown

No

Small Loss of Coolant Accident	Reactor Scram	Standby Liquid Control Initiated	High Pressure Cooling Provided	Automatic Depressurization System Operates	LPCI or CS Response Adequate	Long Term Core Cooling	Potential Severe Core Damage	Sequence No.
							No	1
						(F)	Yes	2
							No	3
						(F)	Yes	4
							Yes	5
							Yes	6
							No	7
						(F)	Yes	8
							Yes	9
							Yes	10

NSIC 166072 - Sequence of Interest for Loss of RHR at Brunswick 1

CATEGORIZATION OF ACCIDENT SEQUENCE PRECURSORS

NSIC ACCESSION NUMBER: 166072

LER NO.: 81-032

DATE OF LER: May 19, 1981

DATE OF EVENT: April 19, 1981

SYSTEMS INVOLVED: Residual heat removal

COMPONENT INVOLVED: RHR heat exchanger

CAUSE: Excessive pressure drop from aquatic growth

SEQUENCE OF INTEREST: LOCA

ACTUAL OCCURRENCE: none

REACTOR NAME: Brunswick Unit 1

DOCKET NUMBER: 50-325

REACTOR TYPE: BWR

DESIGN ELECTRICAL RATING: 821 MWe

REACTOR AGE: 4.5 years

VENDOR: General Electric

ARCHITECT-ENGINEERS: United Engineers & Constructors

OPERATORS: Carolina Power & Light

LOCATION: 3 miles north of Southport, North Carolina

DURATION: 512 h (estimated). This includes half the test interval (360 h) plus the period between the two failure discoveries (144 h) plus 8 additional hours to make the temporary repairs and return the 1A heat exchanger to service.

PLANT OPERATING CONDITION: Cold shutdown

TYPE OF FAILURE: Inadequate performance;  
made inoperable

DISCOVERY METHOD: Special inspection

COMMENT: Further information: NSIC 166019 (Brunswick 1, 50-325, LER 81-0005, April 30, 1981). Feed and bleed using the main feedwater and main steam systems could potentially be an alternative for RHR cooling but may be difficult to implement due to the potential radioactive environment of the containment following a LOCA.