

LICENSEE EVENT REPORT

EXHIBIT A

CONTROL BLOCK: 1										(PLEASE PRINT OR TYPE ALL REQUIRED INFORMATION)																																																															
01		A L B R F 3										000-000000-000										341111		4		5																																															
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CONT		REPORT SOURCE		L 05000296										707177										80132878		9																																															
7		8		60										61										64										69										74										75										80									
EVENT DESCRIPTION AND PROBABLE CONSEQUENCES 10																																																																									
02		During normal operation, temperature transients were experienced with																																																																							
03		the six charcoal adsorber beds in the offgas system. The stack radiation																																																																							
04		monitor showed no increases during this period. There were no effects																																																																							
05		upon public health and safety; redundancy was not applicable; and there																																																																							
06		were no previous occurrences.																																																																							
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7		8		9																																				30																																	
		SYSTEM CODE		CAUSE CODE		CAUSE SUBCODE		COMPONENT CODE										COMP. SUBCODE		VALVE SUBCODE																																																					
09		M B		11		X		12		X		13		F I L T E R										14		Z		15		Z		16																																									
7		8		9		10		11		12		13		18										19		20		21		22																																											
		LER/RO REPORT NUMBER		EVENT YEAR		SEQUENTIAL REPORT NO.		OCCURRENCE CODE		REPORT TYPE		REVISION NO.																																																													
17		77		21		22		23		24		25		26		27		28		29		30		31		32																																															
7		8		9		10		11		12		13		18										19		20		21		22																																											
		ACTION TAKEN		FUTURE ACTION		EFFECT ON PLANT		SHUTDOWN METHOD		HOURS		ATTACHMENT SUBMITTED		NPRD-4 FORM SUB.		PRIME CORP. SUPPLIER		COMPONENT MANUFACTURER																																																							
18		F		19		A		20		Z		21		0000		22		Y		23		N		24		N		25		G 080																																											
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CAUSE DESCRIPTION AND CORRECTIVE ACTIONS 27																																																																									
10		A drainline on the offgas preheater was found plugged. Without adequate																																																																							
11		preheating, dilution steam condensed on the catalyst preventing the recom-																																																																							
12		bination of hydrogen and oxygen. Ignition of the hydrogen and oxygen in																																																																							
13		the offgas system downstream of the recombiner apparently ignited the char-																																																																							
14		coal. The drainline was unplugged and the charcoal beds were returned to																																																																							
7		8		9																																				30																																	
		FACILITY STATUS		% POWER		OTHER STATUS		METHOD OF DISCOVERY		DISCOVERY DESCRIPTION																																																															
15		E		28		047		29		N/A		30		A		31		Increased heat in adsorber beds																																																							
7		8		9		10		11		12		13		18										19		20		21		22																																											
		ACTIVITY RELEASED		CONTENT OF RELEASE		AMOUNT OF ACTIVITY		LOCATION OF RELEASE																																																																	
16		Z		33		Z		34		N/A		35		N/A		36																																																									
7		8		9		10		11		12		13		18										19		20		21		22																																											
		PERSONNEL EXPOSURES		NUMBER		TYPE		DESCRIPTION																																																																	
17		000		37		Z		38		N/A		39																																																													
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		PERSONNEL INJURIES		NUMBER		DESCRIPTION																																																																			
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		LOSS OF OR DAMAGE TO FACILITY		TYPE		DESCRIPTION																																																																			
19		Z		42		N/A		43																																																																	
7		8		9		10		11		12		13		18										19		20		21		22																																											
		PUBLICATION ISSUED		DESCRIPTION																																																																					
20		44		TVA Press Release dated July 18, 1977.																																																																					
7</																																																																									

*Revision

Cause Description and Corrective Actions (Continued)

service and satisfactorily passed operational testing.

JGD:SGS
3/27/78



EVENT DESCRIPTION

At 2215 hours on 7/15/77 the unit was returned to service after being shutdown since 7/7/77. During startup, problems were encountered with high offgas flow rates, low recombiner preheat temperatures, and low recombiner temperatures.

At 0900 hours on 7/17/77 operations was notified by a chemical laboratory analyst that the concentration of hydrogen in the offgas system was greater than 4%. One of the redundant hydrogen analyzers was in service during this period, but did not indicate an abnormal concentration of hydrogen in the offgas system. Subsequent analysis at 1345 indicated hydrogen concentration was less than 4%. About 1200 hours on 7/17/77, an attempt was made to place the standby steam jet air ejector (SJAE) "B" in service. Problems were encountered with the pressure controller regulating dilution steam to the third stage of SJAE. During the 1-3/4 hour period associated with the unsuccessful attempt to transfer SJAE's, several significant but brief transients were noticed in system pressure, apparently due to excessive dilution steam. Increases were noticed in system flow rate, dew point, and reheater inlet temperature. Efforts to transfer the SJAE were terminated at 1400 hours on 7/17/77, and system operation using the original "A" SJAE resumed. The stack radiation monitor showed no increase during this period. The charcoal adsorber beds were in service with parallel flow through two trains of three vessels each.

An effort to switch to the standby recombiner was unsuccessful because acceptable preheater temperatures could not be obtained.

DESCRIPTION OF THE OCCURRENCE

At about 1200 hours on 7/17/77, the temperature of adsorber beds "B," "C," "D," and "F" began to increase from their steady state average temperature of 67° F. The temperature of "C" bed peaked at 146° F at 1645 hours, and "D" bed temperature peaked at 146° F at 1720 hours. The indicator temperature of "B" bed went offscale (150° F) at 1610, and "F" bed temperature peaked at 138° F at 1815 hours. The temperature of the vault housing the charcoal vessels increased steadily beginning after 1200 hours on 7/17/77, from its normal 75° F to 100° F over a 7-hour period.

The charcoal vessels were isolated at 2000 hours and the offgas flow was routed through the bypass line. On 7/18/77 at 0420 hours a nitrogen purge was began through "B" and "C" vessels.

On 7/18/77, at 1200 hours the adsorber vault room was entered. The bottom of "D" vessel was found to be hot with its blue-gray paint discolored but not blistered or cracked. A slight discoloration of the paint covering the center portion of "B" vessel was evident. Thermocouples were attached to the exterior surfaces of vessels "B" and "D" for supplemental monitoring during the nitrogen purge. The maximum skin temperature recorded was 142° F at midpoint of "B" vessel.

All vessel temperatures were within the normal range on 7/20/77.



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CORRECTIVE ACTION

A task force composed of TVA operating and design employees and GE employees met at BFNP on 7/20/77 and 7/21/77 to investigate the occurrence. On 7/22/77 the unit was removed from service to facilitate repair work recommended by the task force. During the outage, work on the preheater drainlines revealed that two common sections of 1-1/2" line were restricted. Since external means were used to dislodge the blockage, the cause for the blockage is not known. It was these blocked drainlines which prevented normal steam flow through either of the recombiner's preheaters. Without adequate preheat, condensation formed in the preheater. This condensate carried over to the recombiner vessel, covered the catalyst, and prevented recombination. When the recombiner drain was opened, moisture drained off the catalyst reinitiating recombination.

The existing bottom drains on the charcoal beds were found to be inadequate to drain the entire system. A Design Change Request to install a low point drain on the inlet to each vessel has been initiated.

Restricted sample lines preventing the hydrogen analyzer from functioning were blown free. The sensor measuring the moisture content of the influent to the charcoal beds was coated with dirt and had to be replaced. Methods to improve the reliability of these two instruments are being pursued. On 7/23/77 the unit was returned to service after demonstrating satisfactory operation of both preheaters, both recombiners, both hydrogen analyzers, and "B" SJAE.

Plant procedures have been reviewed and revised to include explicit actions to be taken in the event vital offgas system parameters deviate from their designed range.

Samples of the charcoal in "B" vessel were taken and examined. No evidence of discoloration or degradation was seen. The moisture content of the samples was determined to be 2%. Samples of the charcoal in the other beds will be taken to ensure it is dry before the beds are placed back in service.

An extensive investigation was conducted to determine the cause of the temperature excursion. All evidence suggests a hydrogen ignition in the offgas system ignited carbon fines in adsorber beds B and D which resulted in some sustained combustion. This heat was transported by the offgas flow to other beds as evidenced by the swings in bed temperature.

The system was operated for approximately 12 hours (midnight until noon) just before the incident with no recombination taking place. Since there was no flow on the steam side of the offgas preheater because of the blocked preheater drain, the dilution steam, instead of being preheated, was at saturated temperature. This resulted in condensation on the catalyst which prevented recombination from taking place. Without recombination, the radiolytic production rate of hydrogen (about 50 cfm at that time) and the offgas flow (200 cfm at the time of the incident) gave a hydrogen concentration from the inlet of the holdup pipe to the stack of 25%.



The SJAE logic is such that one jet must be shut completely down before the other can be started. This results in about a two-minute period in changing SJAE's when there is no dilution steamflow. Quite likely, when the attempt was being made to switch from "A" to "B" set of SJAE's misting over of the catalyst ceased when "A" SJAE was shutdown, and, during the two-minute interval before "B" was started up, hydrogen diffused back into either recombiner (the valve on the standby recombiner was cracked open), contacted the now-active catalyst, and ignition took place. Velocity of a flame front of this sort is about 6,000 fps (reference 1) and accounts for the "blown apart" appearance of the pre- and after-filter elements.

The theory of spontaneous combustion by moisture adsorption does not seem possible for this type of system. Experimental data utilizing moist gas flow (references 2 and 3) gave temperature increases at least an order of magnitude below the ignition point of carbon; and, in fact after an initial temperature peak, further temperature rises were not possible due to the thermal desorption of the water. In other words, spontaneous combustion appears to be a self-limiting phenomenon given a set of airflow and humidity conditions. Experimental data with no airflow also gave a very low temperature rise (46°F) for the size of carbon bed in question (reference 4).

Ignition by hydrogen flame appears the most plausible; and, in fact, an almost identical circumstance occurred in 1958 (reference 5).

The charcoal beds were returned to service on November 11, 1977. Special Test 155 was performed to closely monitor differential pressure and isotopic delay times during the first two months of service. All system parameters closely paralleled values obtained during the initial startup testing program. Thus, the July 17, 1977, temperature excursion did not affect the performance of the charcoal beds.

Attachment III

References

1. Carlson, Knight, Henrie, Flame and Detonation Initiation and Propagation in Various Hydrogen-Air Mixtures, With and Without Water Spray, Atomics International Division, issued May 11, 1973.
2. J. L. Kovach, The Evaluation of the Ignition Temperature of Activated Charcoals in Air, Steam, Oxygen and Oxides of Nitrogen, Nuclear Consulting Services, Inc., NUCON 024, 1968.
3. Dederick, Martin, Porter, Reactions of Hydrogen/Oxygen Mixtures with Charcoal and Thermal Effects Associated with Physical Adsorption, General Electric Company, Report No. 72CRD182, June 1972.
4. Personal correspondence between Dan L. Paul, TVA Chemical Section, and Willard Clark, President, Barnebey - Chaney, July 28, 1977.
5. Browning, Removal of Fission Product Activity from Gases, Nuclear Safety 1 (4), page 49, June 1960.

