

# ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

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 FACIL:50-261 H.B. Robinson Plant, Unit 2, Carolina Power & Light C 05000261  
 AUTH.NAME AUTHOR AFFILIATION  
 CROOK,D. Carolina Power & Light Co.  
 SHEPPARD,J.J. Carolina Power & Light Co.  
 RECIP.NAME RECIPIENT AFFILIATION

SUBJECT: LER 91-003-00:on 910214,containment vessel fire during  
 refueling.Caused by overheating of electrical cable.Number  
 of corrective actions developed & Licensee fire protection &  
 health physics personnel conducted tour.W/910325 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED:LTR 1 ENCL 1 SIZE: 8  
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	NRR/DET/ECMB 9H	1 1	NRR/DET/EMEB 7E	1 1
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	RGN2 FILE 01	1 1		
EXTERNAL:	EG&G BRYCE,J.H	3 3	L ST LOBBY WARD	1 1
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Carolina Power & Light Company

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MAR 25 1991

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United States Nuclear Regulatory Commission  
Attn: Document Control Desk  
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H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2  
DOCKET NO. 50-261  
LICENSE NO. DPR-23  
LICENSEE EVENT REPORT NO. 91-003-00

Gentlemen:

The enclosed Licensee Event Report (LER), prepared in accordance with NUREG 1022, Supplements No. 1 and 2, is submitted as an event of potential interest to the industry. The event which is the subject of the report was evaluated against 10 CFR 50.73 and was determined not to meet the reportability requirements.

Very truly yours,

J. J. Sheppard  
General Manager  
H. B. Robinson S. E. Plant

RDC:td

Enclosure

cc: Mr. S. D. Ebner  
Mr. L. W. Garner  
INPO

9103290201 910322  
FDR ADOCK 05000261  
S FDR

TEC

NRC Form 366  
(9-83)

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0104

EXPIRES: 8/31/88

## LICENSEE EVENT REPORT (LER)

FACILITY NAME (1) H. B. ROBINSON STEAM ELECTRIC PLANT, UNIT NO. 2	DOCKET NUMBER (2) 0 5 0 0 0 2 6 1	PAGE (3) 1 OF 0 7
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TITLE (4) CONTAINMENT VESSEL FIRE DURING REFUELING DUE TO NON-APPROVED EQUIPMENT HEATING PROCESS
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EVENT DATE (5)			LER NUMBER (6)			REPORT DATE (7)			OTHER FACILITIES INVOLVED (8)													
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	MONTH	DAY	YEAR	FACILITY NAMES		DOCKET NUMBER(S)											
0	2	1	9	1	0	0	3	0	0	3	2	2	9	1		0	5	0	0	0		

OPERATING MODE (9) N		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)									
POWER LEVEL (10) 0 0 0		20.402(b)		20.405(c)		50.73(a)(2)(iv)		73.71(b)			
		20.405(a)(1)(i)		50.36(c)(1)		50.73(a)(2)(v)		73.71(c)			
		20.405(a)(1)(ii)		50.36(c)(2)		50.73(a)(2)(vii)	X	OTHER (Specify in Abstract below and in Text, NRC Form 366A)			
		20.405(a)(1)(iii)		50.73(a)(2)(i)		50.73(a)(2)(viii)(A)		Information			
		20.405(a)(1)(iv)		50.73(a)(2)(ii)		50.73(a)(2)(viii)(B)					
	20.405(a)(1)(v)		50.73(a)(2)(iii)		50.73(a)(2)(x)						

LICENSEE CONTACT FOR THIS LER (12)		TELEPHONE NUMBER	
NAME David Crook - Senior Specialist - Regulatory Compliance		AREA CODE 8 1 0 3	NUMBER 3 8 3 - 1 1 7 9

COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)											
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC		CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NRC	

SUPPLEMENTAL REPORT EXPECTED (14)		EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
<input type="checkbox"/> YES (If yes, complete EXPECTED SUBMISSION DATE)	<input checked="" type="checkbox"/> NO				

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single-space typewritten lines) (16)

On February 14, 1991, H. B. Robinson Unit No. 2 was in cold shutdown condition for refueling. The Reactor Vessel Head had been removed from the vessel and was in its storage area in the containment building, where it was being "warmed" to facilitate head reassembly and installation. At 2154 hours, a fire was reported on the ground level of the containment building at the head storage area. The fire was extinguished within eight minutes of discovery. The cause of the fire was attributed to localized heating of extension cords used to supply temporary incandescent lighting for the vessel head warming process. An overloaded electrical condition, combined with the resistance of a knotted electrical cord connection, resulted in sufficient heat to ignite the electrical cord insulation, which subsequently ignited combustible materials around the Reactor Vessel Head.

Plant recovery activities included a root cause investigation and an assessment of the effects of the fire on the Reactor Vessel Head and on other equipment in the containment building. These activities were completed, and the Plant was returned to operating status.

This event was reviewed pursuant to 10 CFR 50.73, and was determined not to be reportable. This LER is provided as an event of potential interest to the industry.

<small>NRC Form 365A (9-83)</small>		<b>LICENSEE EVENT REPORT (LER) TEXT CONTINUATION</b>				<small>U.S. NUCLEAR REGULATORY COMMISSION APPROVED OMB NO. 3150-3164 EXPIRES: 8/31/86</small>								
<b>FACILITY NAME (1)</b>  H. B. ROBINSON, UNIT NO. 2		<b>DOCKET NUMBER (2)</b>  0 5   0   0   0   2   6   1		<b>LER NUMBER (6)</b> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="text-align: center;">YEAR</th> <th style="text-align: center;">SEQUENTIAL NUMBER</th> <th style="text-align: center;">REVISION NUMBER</th> </tr> <tr> <td style="text-align: center;">91</td> <td style="text-align: center;">— 0 0 3</td> <td style="text-align: center;">— 0 0 2</td> </tr> </table>			YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	91	— 0 0 3	— 0 0 2	<b>PAGE (3)</b>  OF 0 17	
YEAR	SEQUENTIAL NUMBER	REVISION NUMBER												
91	— 0 0 3	— 0 0 2												

TEXT (If more space is required, use additional NRC Form 365A's) (17)

**I. DESCRIPTION OF EVENT**

On February 14, 1991, Unit. No. 2 was in cold shutdown condition for refueling. The reactor vessel head had been removed from the vessel and was in place in its storage area in the Containment building, where it was being "warmed" using temporary incandescent lights. The warming was being performed due to requirements to maintain the temperature of the head, vessel, and bolting material at a temperature greater than sixty degrees fahrenheit and within a five degree margin between components as a prerequisite to bolt torquing during vessel head reassembly and installation.

At approximately 2145 hours, a licensee Health Physics technician, while providing coverage on the operating deck of the reactor containment building, detected smoke in the area. The technician informed a licensee Operator (Fire Brigade member) who was in the containment building, and then notified the Control Room, who in turn sounded the Containment Evacuation alarm and the Fire alarm, thus activating the site Fire Brigade. The Operator proceeded to investigate the source of the smoke and discovered a fire in the reactor head storage area of the containment building (see Figure 1). A line of flames was observed near the ground floor level of the head storage area, and a tarpaulin which had been hung around the reactor vessel head appeared to be on fire. The Health Physics technician and the Operator extinguished the flames with water from a fire hose station within eight minutes of reporting the smoke. The Fire Brigade responded and further sprayed with water and Halon extinguisher. The Containment air handling units (HVH-1 and HVH-2) were utilized to remove smoke from the containment building. Upon sounding the "all clear" signal at 2327 hours, access to the area affected by the fire was restricted to preserve evidence related to the fire for investigation.

Preliminary inspection for damage indicated that neither the vessel head nor any other components in the area were significantly affected by the heat or smoke of the fire. However, it was evident that due to the chemical composition of the material burned, the surface over much of the vessel head and other containment components had to be surveyed and cleaned. The major area of concern was the deposit of chlorides onto the stainless steel and inconel surfaces of the head.

In order to systematically accomplish tasks necessary for root cause investigation and Plant recovery activities, Plant management formulated two separate recovery teams; one team would perform an investigation to determine the root cause of the fire, and the other would assess the effects of the fire on the reactor vessel head and other equipment in the containment building in order to recover from the event and bring the Plant back to an operating status.

NRC Form 364A  
(9-83)

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-3104

EXPIRES: 8/31/86

FACILITY NAME (1)	DOCKET NUMBER (2)	LER NUMBER (8)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		H. B. ROBINSON, UNIT NO. 2	0 5 0 0 0 2 6 1	9 1	- 0 0 3	- 0 0 3

TEXT (If more space is required, use additional NRC Form 364A's) (17)

I. DESCRIPTION OF EVENT (Continued)

Plant recovery activities were completed and were reviewed by the Plant Nuclear Safety Committee on February 27, 1991. The root cause investigation was completed, and recommendations to preclude recurrence were presented for Management review. The results of both activities are described further in this report.

II. CAUSE OF EVENT

The root cause investigation, conducted in accordance with the Plant Corrective Action Program, determined that the fire resulted from localized overheating of electrical cable insulation at a knotted plug connection between a drop light and an extension cord. The drop light and cord were in a circuit feeding temporary lights being used to warm the reactor vessel head. Reconstruction and analysis of the electrical configuration revealed an overloaded condition for the cables in use (Figure 2). Two cables had been knotted together within six inches of the end plugs, which may not have been tightly connected. This provided a high resistance connection which created an increased potential ignition source. The overloaded electrical cords, combined with the high resistance knotted connection, resulted in sufficient heat to ignite the electrical cord insulation. An adjacent fire retardant tarpaulin, utilized to facilitate the head warming activities, ignited and the fire spread to combustible materials in the area, such as cotton towels which had been used to protect the head "O" rings.

This event is attributed to heating the head without adequate control of a temporary power configuration, resulting in an electrically overloaded condition, combined with utilization of excessive combustible materials in the head storage area.

III. ANALYSIS OF EVENT

The Plant Emergency Plan, implemented in accordance with NUREG 0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants", was utilized to assess the reportability of this event. At the time of the fire, the reactor vessel head, as well as other equipment in the vicinity of the fire, was not performing any safety related function and was not required to be operable by Plant Technical Specifications since the Plant was shutdown and in Refueling condition. Since the head was removed at the time of the fire and was being warmed for reinstallation, this event could not have occurred at operating condition. Also, from the time the fire was identified until the visible flames were extinguished, a total of eight minutes had elapsed.

NRC Form 364A  
(9-83)

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-3164

EXPIRES: 8/31/86

FACILITY NAME (1)  H. B. ROBINSON, UNIT NO. 2	DOCKET NUMBER (2)  0 5 0 0 0 2 6 1	LER NUMBER (8)			PAGE (3)	
		YEAR 9 1	SEQUENTIAL NUMBER - 0 0 3	REVISION NUMBER - 0 0 0 4	OF 0 7	

TEXT (If more space is required, use additional NRC Form 364A's) (17)

III. ANALYSIS OF EVENT (Continued)

Although additional fire fighting activities continued until smoldering material was completely extinguished and the scene was stabilized, the ten minute criteria specified in the Emergency Plan for Unusual Event declaration was not reached. Based on the above, the reporting requirements of 10 CFR 50.73 are not applicable to this event. This report is, however, being submitted to provide information of potential interest to the industry.

The assessment of the affects of the fire on the reactor vessel head and on other areas in the containment building was completed on March 1, 1991. The major areas addressed by this assessment were the affects on equipment and structures from the heat generated by the fire, affects on the head caused by gasses and particulate generated by the fire, affects of extinguishing agents used to control the fire, affects of combustion products on other equipment in the containment building, and restoration efforts to return the equipment affected to an operable status. The assessment concluded that the impact on the reactor vessel head assembly and other equipment in the containment building due to the fire was minimal. The heat generated at the head flange area did not cause any changes in material properties of the stainless steel cladding or to its base metal. Other structures near the fire were also unaffected. Smoke from the fire deposited halogens on the head which could lead to intergranular stress corrosion cracking; however, cleaning, sampling and analysis demonstrated that deposits were reduced to an acceptable level. The HVH-1 and HVH-2 air handling unit filters were changed out due to soot which had accumulated in exhausting the smoke from the building. Electrical components on the head associated with the Control Rod Drive Mechanism were also checked and found within acceptable limits. Other susceptible areas inside the containment building were sampled for the presence of halogens, and only a few areas required cleaning to bring them to within acceptable limits. Because the cleaning of the components was performed expediently and effectively, combined with the short duration that these materials were in contact with surface of the stainless steel material, and the lack of extensive heat, it was determined that no corrosive attack would have occurred. The areas under the reactor vessel head were cleaned to such a degree that transport of foreign materials, if any, into the Reactor Coolant System would be negligible and would have no effect on nuclear fuel.

The results of the assessment of the affects of the fire on the reactor vessel head and other components were presented to the Plant Nuclear Safety Committee on February 27, 1991. Based on the assessment, it was determined that the affects of the fire had been mitigated to the extent required for plant startup.

NRC Form 368A  
(9-83)

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0164

EXPIRES: 8/31/86

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H. B. ROBINSON, UNIT NO. 2	0 5 0 0 0 2 6 1	9 1	— 0 0 3	— 0 0	0 5	OF 0 7

TEXT (If more space is required, use additional NRC Form 368A's) (17)

IV. CORRECTIVE ACTIONS

At the time of the fire, immediate, short term corrective actions were taken to facilitate the fire investigation. Access to the Containment building was restricted in order to preserve evidence for root cause assessment. Licensee Fire Protection and Health Physics personnel conducted a tour of the Containment building, capturing the damage on video tape. In addition, other temporary power configurations were inspected to determine if additional fire hazards existed, and some changes were made as a result of these inspections. Operations personnel increased their tours of the Containment building to once per shift.

Due to the scope and depth of the investigation performed to determine the root cause of the fire and to develop recommendations to preclude recurrence of this event, a number of corrective action recommendations were developed. Items under consideration include development of controls for temporary power installations, controls for portable heater applications, and improved controls over transient combustibles. These recommendations are being addressed via the Plants' Corrective Action Program.

V. ADDITIONAL INFORMATION

## A. Previous Similar Events

None

## B. Component Failures

None

## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

U.S. NUCLEAR REGULATORY COMMISSION

APPROVED OMB NO. 3150-0164

EXPIRES: 8/31/86

FACILITY NAME (1)

H. B. ROBINSON, UNIT NO. 2

DOCKET NUMBER (2)

0 5 0 0 0 2 6 1

LER NUMBER (8)

YEAR SEQUENTIAL NUMBER REVISION NUMBER

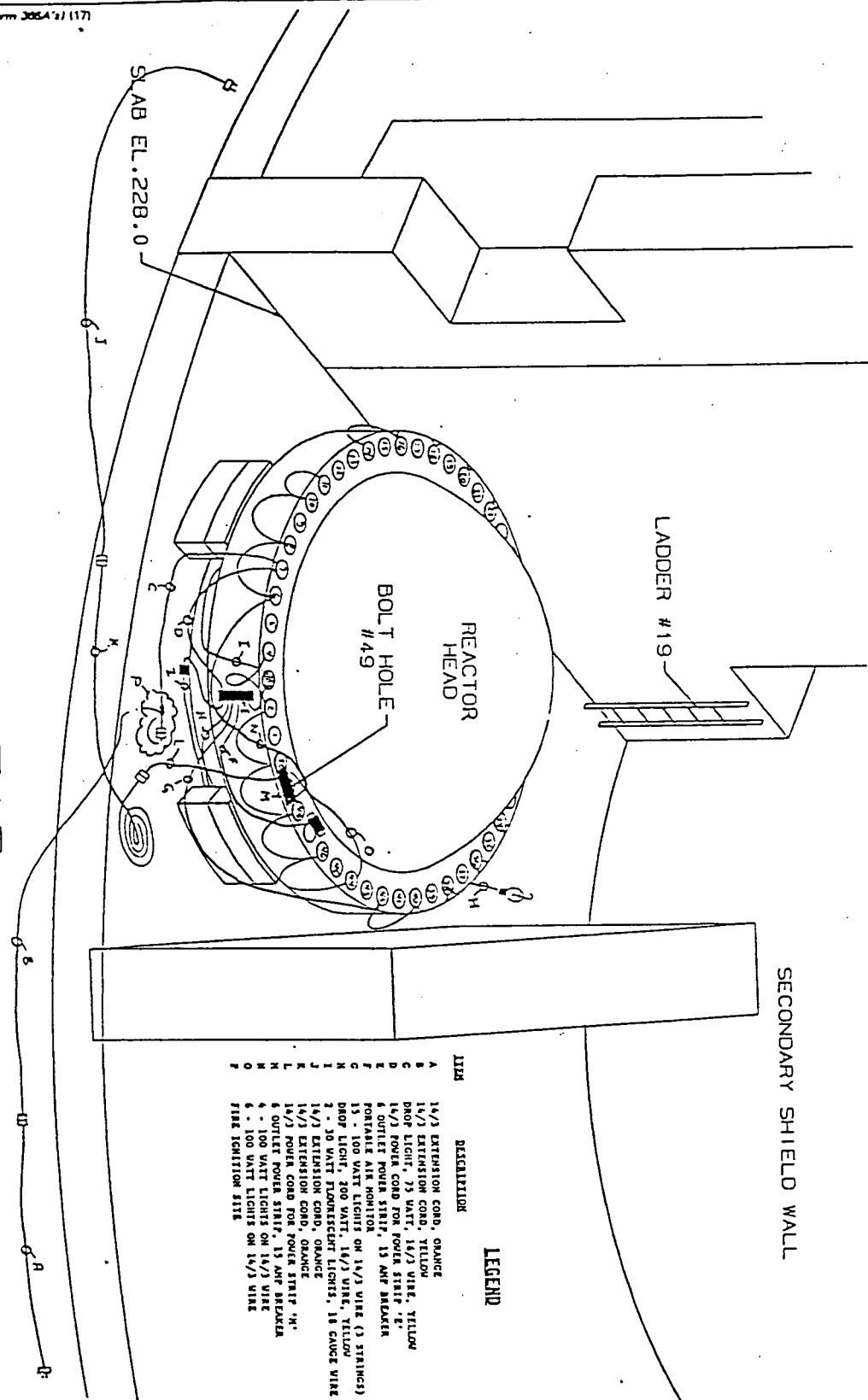
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TEXT (If more space is required, use additional NRC Form 366A's) (17)

REACTOR HEAD  
STORAGE AREA  
LOOKING N 45 E DOWN

"FIGURE 1"





## LICENSEE EVENT REPORT (LER) TEXT CONTINUATION

NRC Form 364A  
(9-83)

FACILITY NAME (1)

H. B. ROBINSON, UNIT NO. 2

TEXT (If more space is required, use additional NRC Form 364A's) (17)

DOCKET NUMBER (2)

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NUMBER  
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"FIGURE 2"

**RV HEAD HEATING WIRING DIAGRAM**