Duke Energy®

JAMES R. MORRIS
Vice President

Duke Energy
Catawba Nuclear Station
4800 Concord Rd.
York, SC 29745

803-701-4251
803-701-3221 fax

April 20, 2010

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Subject: Duke Energy Carolinas, LLC
Catawba Nuclear Station, Unit 1
Docket Nos. 50-413
Licensee Event Report 413/2010-02, Revision 0
Problem Investigation Process No. C10-01020

Attached is Licensee Event Report (LER) 413/2010-002 Revision 0 entitled "Discovery of Reactor Coolant System Pressure Boundary Leak at Therrnowell 1NCTW5850 Seal Weld".

This report is being submitted in accordance with 10 CFR 50.73 (a)(2)(ii)(A), "Degraded or Unanalyzed Condition." This event is considered to be of no significance with respect to the health and safety of the public. There are no regulatory commitments contained in this LER.

If questions arise regarding this LER, contact Phil Barrett at 803-701-4138.

Sincerely,

James R. Morris

Attachment

IE22
NRR

cc: L. A. Reyes
Regional Administrator, Region II
U.S. Nuclear Regulatory Commission
Marquis One Tower
245 Peachtree Center Ave., NE Suite 1200
Atlanta, Georgia 30303-1257

J. H. Thompson
Project Manager (Catawba)
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852-2738
Mail Stop O-8 G9A

G. A. Hutto, III
NRC Senior Resident Inspector
Catawba Nuclear Station

INPO Records Center
700 Galleria Place
Atlanta, GA 30339-5957

bxc: (electronic copy) (with attachment) :

INPO lerevents@inop.org
K.W. Phillips
R.D. Hart
G.Y. Helton
S.F. Hatley (EPIX)
M.K. Green
D.R. Brenton
S. L. Nader
A.M. Peterman
R.G. Hull
T.W. King
H.D. Brewer
K. R. Alter
K.L. Ashe
B.J. Horsley
M.J. Brown

bxc (hard copy) (with attachment):

L.F. Vaughn
G.F. Winkel
P.W. Barrett
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PMPA

NRC FORM 366 (9-2007) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

(See reverse for required number of digits/characters for each block)

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4. TITLE
Discovery of Reactor Coolant System Pressure Boundary Leak at Thermowell 1NCTW5850 Seal Weld.

5. EVENT DATE			6. LER NUMBER			7. REPORT DATE			8. OTHER FACILITIES INVOLVED	
MO	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REV NO	MO	DAY	YEAR	FACILITY NAME	DOCKET NUMBER
									N/A	
02	18	2010	2010	– 002	00	04	20	2010	FACILITY NAME: N/A	DOCKET NUMBER

9. OPERATING MODE: 4

10. POWER LEVEL: 0

11. THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: *(Check all that apply)*

	20.2201(b)	20.2203(a)(3)(i)	50.73(a)(2)(i)(C)	50.73(a)(2)(vii)
	20.2201(d)	20.2203(a)(3)(ii)	X 50.73(a)(2)(ii)(A)	50.73(a)(2)(viii)(A)
	20.2203(a)(1)	20.2203(a)(4)	50.73(a)(2)(ii)(B)	50.73(a)(2)(viii)(B)
	20.2203(a)(2)(i)	50.36(c)(1)(i)(A)	50.73(a)(2)(iii)	50.73(a)(2)(ix)(A)
	20.2203(a)(2)(ii)	50.36(c)(1)(ii)(A)	50.73(a)(2)(iv)(A)	50.73(a)(2)(x)
	20.2203(a)(2)(iii)	50.36(c)(2)	50.73(a)(2)(v)(A)	73.71(a)(4)
	20.2203(a)(2)(iv)	50.46(a)(3)(ii)	50.73(a)(2)(v)(B)	73.71(a)(5)
	20.2203(a)(2)(v)	50.73(a)(2)(i)(A)	50.73(a)(2)(v)(C)	OTHER
	20.2203(a)(2)(vi)	50.73(a)(2)(i)(B)	50.73(a)(2)(v)(D)	Specify in Abstract below or in NRC Form 366A

12. LICENSEE CONTACT FOR THIS LER

FACILITY NAME	TELEPHONE NUMBER (Include Area Code)
Phil Barrett, Regulatory Compliance	803-701-4138

13. COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT

CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANU-FACTURER	REPORTABLE TO EPIX
E	AB	PSF		YES					

14. SUPPLEMENTAL REPORT EXPECTED

	YES (If yes, complete EXPECTED SUBMISSION DATE)	X	NO

15. EXPECTED SUBMISSION DATE

MONTH	DAY	YEAR

16. ABSTRACT (Limit to 1400 spaces, i.e., approximately 15 single-spaced typewritten lines)

Event Description: On February 18, 2010, with the unit in Mode 4, a reactor coolant pressure boundary leak was identified at the 1A reactor coolant hot leg thermowell 1NCTW5850 seal weld. A cool down to Mode 5 was initiated.

Unit Status: At the time of the event, Unit 1 was in Mode 4 at 0% power. Power had been reduced to perform an inspection in containment to identify the source of primary leakage.

Event Cause: The cause of the failed seal weld was inadequate weld control when the weld was fabricated during initial construction. The weld failure resulted from the presence of a discontinuity involving a metal removal process. Applied loads, primarily pressure loads (high strain - low cycle fatigue) to the weakened area (i.e. location metal removed) contributed to the seal weld failure.

Corrective Actions: After reducing primary system pressure, additional weld passes were applied at the seal weld associated with the mechanical joint located between the weld boss and the thermowell. Visual examination of the other three Unit 1 hot leg RTD thermowells concluded no sign of leakage.

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BACKGROUND

Catawba Nuclear Station is a Westinghouse Pressurized Water Reactor [EIIS: RCT].

The primary function of the Reactor Coolant (NC) System (RCS) [EIIS:AB] is removal of the heat generated in the fuel due to the fission process, and transfer of this heat via the steam generators (SG) [EIIS:SG] to the secondary plant. The reactor coolant is circulated through four loops connected in parallel to the reactor vessel, each loop containing a SG, a reactor coolant pump [EIIS:P], and appropriate flow and temperature instrumentation for both control and protection.

Components that contain or transport the coolant to or from the reactor core make up the NC system. Component joints are made by welding, bolting, rolling, or pressure loading, and valves isolate connecting systems from the RCS.

Technical Specification (TS) 3.4.13 specifies that in Modes 1, 2, 3 and 4, RCS operational leakage shall be limited to: No pressure boundary leakage, 1 gallon per minute (gpm) unidentified leakage, 10 gpm identified leakage, and 150 gallons per day primary to secondary leakage through any one SG. TS 3.4.13 Condition B states that if any pressure boundary leakage exists, the unit must be in Mode 3 in 6 hours and Mode 5 in 36 hours.

EVENT DESCRIPTION
(Dates and times are appropriate)

12/30/2009
While performing Unit 1 Mode surveillance, the Radiation Protection group noted the count rate on 1EMF38 (containment particulate monitor) increased significantly since 12/26/09.

1/4/2010
Engineering identified a trend of an approximate 1 gallon per hour (gph) input to the "B" Containment Floor and Equipment sump (CF&E).

1/5/2010 - 2/15/2010
A failure investigation/troubleshooting team was formed. Troubleshooting activities included boroscope and robotic inspections to identify the leak

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location. Air samplers were located such that a leak in the reactor vessel head area could be identified. A tracer dye was also added to the Lower Containment Ventilation Unit (LCVU) drain lines to determine if any portion of the condensate was an input to the 1B CF&E sump. It was determined that a drain valve from the 1D LCVU was leaking and providing a small input to the sump. During inspection of LCVUs, boron was found on the motor housing of the 1D LCVU.

2/15/2010 - 2/16/2010
Engineering identified leak on lower containment floor. Potential leak sources identified. Robotic inspection device was acquired and readied for subsequent inspections.

2/17/2010
Engineering identified boron in "A" hot leg insulation and an active leak. Station Management decided to shut down the unit to visually identify the leak source.

2/17/2010 2052
Operations entered abnormal procedure AP/1/A/5500/009, Rapid Downpower.

2/18/2010 0333
Mode 3 entered.

2/18/2010 0600
Engineering confirmed the source of leak was coming from hot leg 1A.

2/18/2010 0700
Station Management determined that the unit needed to be cooled to Mode 4 to safely remove insulation and identify the leak source.

2/18/2010 1348
Entered Mode 4.

2/18/2010 1900
Insulation was removed and the leak source was confirmed as coming from the thermowell seal weld.

2/18/2010 1915
Operations entered Technical Specification Action Item Log (TSAIL) for RCS pressure boundary leakage and commenced a cool down to Mode 5.
2/19/2010 0223

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Entered Mode 5.

2/19/2010 1630
Peening and weld repair of the seal weld on the 1A hot leg thermowell were not successful at a primary pressure of 330 psi. Primary system pressure was reduced to eliminate water flow to facilitate weld repair.

2/20/2010 0605
The PZR was solid, and 1B NC Pump running

2/20/2010 1400
Following a reduction in RCS pressure, repair welding was started at approximately 1200. The areas were sealed and follow-up welding was performed to yield a near flush configuration of the boss and thermowell.

CAUSAL FACTORS

The cause of the failed seal weld was inadequate weld control when the weld was fabricated during initial construction. The weld failure resulted from the presence of a discontinuity involving a metal removal process (i.e. local grinding or manual filing). Applied loads (primarily high strain - low cycle fatigue pressure loads) to this weakened local area of the weld led to the eventual failure. This observation was supported by the original weld documentation. The initial seal weld was rejected both visually and by a liquid penetrant test. The weld was later accepted, presumably after only surface conditioning (i.e. the addition of weld material was not required) where manual filing or grinding of the surface was performed to clear the rejectable location.

Contributing Causes:

The original design of this thermowell configuration included a metal o-ring which provided pressure boundary. During thermowell installation, the o-ring was removed to allow fitment for welding. By removing the o-ring, the seal weld became the pressure retaining boundary (see attached figure). The configuration change was reviewed and approved by the NSSS vendor.

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CORRECTIVE ACTIONS

Immediate:

1. The extent of condition was addressed with respect to Unit 2. Absence of increased activity on 2EMF38, normal levels in the Ventilation Unit Condensation Drain Tank, and normal levels in the CF&E sump indicates a similar condition does not exist.

2. The affected weld was repaired. The welding was performed to yield a near flush configuration of the boss and thermowell.

3. Visual inspections (VT-2) were performed on RCS loops 1B, 1C and 1D for extent of condition. No additional problems were identified

4. Initiated Corrective Actions to inspect the Unit 2 NC Wide Range Hot Leg RTD configurations and assure the RTDs are added to the Trip List for Unit 2.

Subsequent: None

Planned:

1. Determine the seal weld size considering all operating/design loads to preclude leakage on the hot leg wide range thermowell/weld boss joint.

2. Increase the seal weld size on the 1A, 1B, 1C, 1D, 2A, 2B, 2C and 2D hot leg wide range thermowell / weld boss joints, if necessary.

SAFETY ANALYSIS

There were no adverse safety consequences associated with this event.

With the completed repair on thermowell 1NCTW5850, pressure boundary integrity was restored and there are no current operability concerns. Visual inspections (VT-2) have been performed to address the extent of condition on similar wide range thermowells on 1B, 1C, and 1D hot legs and no evidence of leakage was identified.

With this leak present during Modes 1 - 4, Technical Specification 3.4.13 was not satisfied. No pressure boundary leakage is acceptable. The degraded condition of the thermowell seal weld did not represent a challenge to the

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nuclear safety of the unit. The configuration of the joint is controlled under all loads by the mating threads and threaded insert installed between the boss and thermowell. The base materials including the threads of the boss and thermowell prevent a catastrophic failure under all conditions. The seal weld is not credited in resisting loads. The consequences of a complete failure of the seal weld are limited by the structural configuration of the thermowell assembly such that any leak would have no impact on system function and be promptly identified by the leakage detection system.

Leakage from thermowell 1NCTW5850 seal weld did not challenge the nuclear safety of Unit 1. The basis of this conclusion is:

- Leak rates were low, on the order of 0.05 gpm.
- There was no risk of catastrophic failure based on the configuration of the thermowell and welding boss.
- Leakage was promptly identified by the use of existing leakage detection equipment.
- All leakage was maintained within the containment structure.

A risk-informed approach was used to determine the risk significance associated with the pressure boundary leakage.

The Conditional Core Damage Probability (CCDP) and the Conditional Large Early Release Probability (CLERP) of this event was evaluated by considering the following:

- The increased likelihood of a Small LOCA due to a reactor coolant hot leg thermowell seal weld leak. Due to Technical Specification 3.4.13, this condition declared pressure boundary leakage.
- The duration of the LCO non-compliance (approximately 2 months)
- A conservative approach via the use of the average maintenance PRA model to represent plant configuration, equipment unavailability, and maintenance activities.

The CCDP associated with this event was determined to be less than 1.0E-06. The CLERP associated with this event is non-limiting with respect to the CCDP and was determined to be less than 1.0E-7.

Given the above, this event was determined to be of no significance to the health and safety of the public.

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ADDITIONAL INFORMATION

To determine if a recurring or similar event exists, a search of Catawba's three year history was conducted. There have been no reportable events with respect to failures of the NC system pressure boundary.

This event does not constitute a Safety System Functional Failure.