

July 18, 2002

LICENSEE: Wolf Creek Nuclear Operating Corporation (WCNOC)
FACILITIES: Wolf Creek Generating Station (WCGS)
SUBJECT: MEETING WITH REPRESENTATIVES OF WOLF CREEK NUCLEAR
OPERATING CORPORATION FOR WOLF CREEK GENERATING
STATION (TAC NO. MB5147)

A meeting was held on Tuesday, June 11, 2002, between the Nuclear Regulatory Commission (NRC) staff and the licensee for WCGS. The meeting was held at the request of NRC to discuss the programs to (1) investigate the component cooling water (CCW) system pipe weld cracking found by the licensee in the recently completed WCGS refueling outage (i.e., Refueling Outage (RO) 12), and (2) determine the root cause for the weld cracking. The CCW piping is an intermediate plant piping system, comprised primarily of non-safety related piping, but having some safety-related piping. The CCW system provides cooling to heat exchangers in other plant systems to remove heat from the systems and discharge the heat to the heat sink for the plant. The meeting and the programs are not part of any review of a licensing action on WCGS being conducted by the NRC. The notice for the meeting was issued on May 31, 2002.

Enclosure 1 is the list of attendees. Enclosure 2, a handout by the NRC staff, has the scope on the separate licensee and NRC programs on the CCW pipe cracking and the agenda for the meeting. The joint effort is for the NRC and the licensee to share information developed in the two programs. There were no handouts from the licensee. The scope and history of the programs is given in Enclosure 2. The agenda for the meeting was the following:

- Team member introductions
- Overview and update of the [licensee's] CCW pipe weld evaluation
- What information will be shared
- Handling of proprietary information
- Logistics of the licensee providing samples of weld cracks to the NRC
- Future discussions, meetings, and analyses to be conducted

Initially, before the meeting began, the licensee showed the NRC staff attending the meeting samples of weld cracks that had been taken from the CCW piping removed during the recently completed WCGS refueling outage. The NRC staff later chose seven welds in three pipe sections as the weld crack samples they wanted sent to the NRC contractor for investigation and characterization of the cracks.

The meeting followed the above agenda. In the overview and update of the licensee's evaluation of the CCW weld cracking, the licensee explained that it had discovered that the operating temperature originally identified for each CCW piping was the design service conditions specified for the specific piping function and not the operating temperature. Since completion of RO12, operating temperatures have been measured and the temperature for the

reactor coolant pump thermal barrier return, which had the most extensive weld cracking, was significantly lower than the design conditions, with only about 10°F to 20°F across the heat exchanger.

The licensee described its program to determine the root cause for the cracking and the corrective actions needed to prevent the cracking in the CCW piping welds; however, the licensee also indicated that its primary goal was to determine the corrective actions. The licensee's program is a continuation of their previous unsuccessful effort to determine the cause of the cracks found in the CCW piping welds since 1994. The staff stated its program was to determine a root cause and to confirm the crack morphology which has been reported in previous root cause analyses performed by the licensee (i.e., in one of the reports from the licensee listed below).

In the discussion of what information will be shared between the NRC and the licensee, it was decided that interpretations of facts learned about the cracking phenomena would be added to the list of information being shared. The list is given in bullet 3 of Enclosure 2.

To support earlier conference calls between the NRC and the licensee on the CCW weld cracking, the licensee provided, by mail or e-mail, the following licensee documents to the NRC on the cracking phenomena:

- Altran Corporation Technical Report No. 00628-TR-002, "Root Cause Investigation of CCW System Weld Cracking," Revision 1, dated June 13, 2001.
- Altran Corporation Technical Report No. 00628-TR-Revision 1, "Failure Analysis of Cracked Component Cooling Water System Welds," dated May 23, 2001.
- Altran Corporation Technical Report No. 00617-TR-001, dated August 10, 2000.
- Dominion Engineering, Report No. R-4323-00-2, "Review of McGuire and Wolf Creek Component Cooling Water System Cracking," Revision 0, dated May 1995.
- Licensee document: CCW Piping - Correct Action Document PIR-2000-2899, dated October 6, 2000.
- CCW piping susceptibility table which lists the CCW piping functions/uses, pipe schedule, service condition, pipe size, etc.

A copy of the CCW piping susceptibility table is in Enclosure 3.

The licensee stated in the meeting that the above reports and the susceptibility table were not proprietary.

The licensee's and the NRC investigation programs, logistics on the weld crack samples being provided to the NRC contractor, and future telephone calls and meetings were discussed. The first call of the NRC/Licensee working group was scheduled for Wednesday afternoon, June 26, 2002. No further decisions were made. The NRC and licensee completed their discussions and the meeting was ended.

/RA/

Jack Donohew, Senior Project Manager, Section 2
Project Directorate IV
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-482

Enclosures: 1. List of Meeting Attendees
2. NRC/Wolf Creek CCW Pipe Crack Programs
3. CCW Piping Susceptibility Table

cc w/encls: See next page

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ADAMS ACCESSION NOs: Meeting Notice: ML021510172
 Meeting Summary ML021770439
 Package: ML021780278

OFFICE	PDIV-2/PM	PDIV-2/LA	EMCB/SC	PDIV-2/SC
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DATE	7/12/02	7/12/02	7/15/02	7/18/02

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LIST OF ATTENDEES AT MEETING ON JUNE 11, 2002

NRC/WOLF CREEK CCW PIPE CRACK PROGRAMS

<u>NAME</u>	<u>AFFILIATION</u>
J. Donohew	NRC/NRR/PDIV-2
B. Elliot	NRC/NRR/EMCB
W. Cullen	NRC/RES
Y. Diaz Sanabria	NRC/NRR/PDIV-2
W. Sifre	NRC/RGNIV
I. Barnes	NRC/RGNIV/consultant
F. Brush	NRC Resident Inspector
J. Yunk	WCNOC
D. Meredith	WCNOC
D. Womelsdorf	WCNOC
J. Stamm	WCNOC
R. Denton	WCNOC
R. Staehle	WCNOC consultant
A. Turner	WCNOC consultant

Where:

- NRC = Nuclear Regulatory Commission
- NRR = Office of Nuclear Reactor Regulation
- RES = Office of Nuclear Regulatory Research
- PDIV-2 = Project Directorate IV-2
- EMCB = Materials and Chemical Engineering Branch
- RGNIV = NRC Region IV
- WCNOC = Wolf Creek Nuclear Operating Corporation

June 4, 2002

NRC/WOLF CREEK COMPONENT COOLING WATER (CCW) PIPE CRACK PROGRAMS

Scope:

During Refueling Outage XII, Wolf Creek Nuclear Operating Corporation (the licensee) for Wolf Creek Generating Station (WCGS) identified a large number of cracked welds in the CCW system. The licensee identified the cracks as possibly being stress corrosion cracking. Although, from prior analysis and independent evaluation has been performed by the licensee on the welds, and an exact root cause of the degradation is not clear at this time. The licensee and NRC have agreed to work jointly on the further analysis of the cracking phenomena to determine the root cause. A certain level of independence needs to be maintained for both parties but there will be periodic meetings and communications between the parties to share information determined by each party. Each party will have its own investigation and its own contractors. The following is an overview of the joint program.

Wolf Creek Participants:

Brad Norton: Director Engineering
Dan Womelsdorf: System Engineer and Lead Engineer Contact Person
David Meredith: System Engineer
Roger Staehle Ph.D: Staehle Consulting/Consultant
Jennifer Yunk: WCGS Licensing Manager

NRC Participants:

William Bateman: Branch Chief, Materials and Chemical Engineering Branch/NRR
Stephanie Coffin: Section Chief, Materials and Chemical Engineering Branch/NRR
Barry Elliott: Lead Technical Engineer, Materials and Chemical Engineering Branch/NRR
William Cullen: NRC Contract Project Manager, Materials Engineering Branch/RES
Jack Donohew: WCGS Project Manager

Delivery of Cracked Welds to NRC

The NRC has requested weld crack samples from the CCW piping removed during Refuel XII, or the previous refueling outage. The logistics of identifying the sample welds and having them transported to where NRC needs the samples will be worked out by the end of the meeting of June 11, 2002.

ENCLOSURE 2

INITIAL MEETING

A meeting is planned at the WCGS site starting at 8am on June 11, 2002; the agenda is the following:

- Team member introductions
- Overview and update of the CCW pipe weld evaluation
- What information will be shared
 - Sharing description of investigations and identification of contractors/consultants used by both parties. (Briefly discuss what each party is doing to determine the impact of material, pipe fabrication, and water chemistry on the root cause.)
 - Sharing of plans for and results of analyses of cracking phenomena
 - Sharing of facts on cracking phenomena
 - Sharing of conclusions on root cause of phenomena
 - Not sharing implications of the above facts and conclusions (i.e., NRC and the licensee do not share what actions they will take, or when they will take them, based on the facts and conclusions. Any regulatory action that may be taken by NRC will be through normal NRC channels and not through this program.)
 - Sharing of how information will be documented
- Handling of proprietary information
 - Is any information received by NRR to date from the licensee proprietary
 - Expectation for future proprietary information
- Logistics of licensee providing samples of weld cracks to NRC
 - NRC seeing licensee's store of CCW piping weld cracks, seeing crack indications, and identifying which welds it wants
 - Licensee paying for transportation of welds to NRC identified location
 - Overview of plant operating history, piping repair history, and water chemistry history of the CCW piping system. (The details of the histories can be provided to NRC at a later date.)
- Future discussions, meetings, and analyses to be conducted
 - Location
 - Timeframe
 - Documentation of information
 - Future telecons and meetings - initially there will be biweekly calls between the working group (NRC and licensee lead engineers, RES contract project manager, and maybe the WCGS licensing manager, NRR project manager, and EMCB Section Chief), and bimonthly meetings at NRC with NRC/licensee management. Ian Barnes of Region IV has been invited to attend the June 11th meeting and participate in the working group calls. The working group will decide when to conduct its calls, and when there will be meetings including management.

CCW PIPING SUSCEPTIBILITY TABLE												04/18/2002
Susceptibility Factors (Note 1):												
	1. Pipe schedule (affects weld residual stress distributions)											
	2. Time at Temperature (Operating temperature and duty cycle)											
Function/Use	Pipe Schedule	Service Condition (estimated temperature and duty cycle)Pipe Size (in.)	Total # welds	#Weld UT		#Welds rejected w/indications		# Welds Repaired/Replaced		Consequences	Redundancy	
				(RF 11)	RF 12)	(RF 11)	(RF 12)	(RF 11)	(RF 12)			
RCP Thermal Barrier Return	160	Continuous (130 deg)	3"	127	2	58	0	35	0	110 (Note 4)	(Note 7)	
RCP Thermal Barrier Return	120	Continuous (130 deg)	4"	45	0	32	0	0	NA	(Note 5)	(Note 7)	
RCP Thermal Barrier Return Header (Class 2)	120		4"	17	0	17	0	1 (Note 6)	0	1	(Note 7)	
Letdown Hx Return	40	Continuous (160 deg)	6"	56	46	0	31	NA	41 (Note 3)	NA	(Note 7)	
Seal Water Hx Return	40	Continuous (24/7/365) (118 deg)	4"	19	2	0	0	0	0	NA	(Note 7)	
RCP Upper Bearing (UB) Cooler Return	40	Continuous (116 deg)	4"	64	2	6	1	0	1	0	(Note 7 and Note 9)	
RCP Lower Bearing (LB) Cooler Return	40	Continuous (116 deg)	1"	39 (Note 2)	0	0	NA	NA	NA	NA	(Note 7)	
RCP Motor Air (MA) Cooler Return	40	Continuous (113 deg)	4"	111	4	27	1	3	1	3	(Note 7 and Note 9)	
RCP Motor Air (MA) Cooler Return	40	Continuous (113 deg)	6"	34	0	0	NA	NA	NA	NA	(Note 7)	
RCP UB/LB/MA Return Header	40		8"	43	0	0	NA	NA	NA	NA	(Note 7)	
RCP UB/LB/MA Return Header	40		10"	20	0	0	NA	NA	NA	NA	(Note 7)	
RCP UB/LB/MA Return Header	40		12"	14	0	0	NA	NA	NA	NA	(Note 7)	
RCP UB/LB/MA Return Header (Class 2)	40		12"	12	0	0	NA	NA	NA	NA	(Note 7)	
RCDT Hx Return (Radwaste)	40	Continuous (110 - 130 deg)	4"	14	0	0	NA	NA	NA	NA	(Note 7)	

Fuel Pool Hx Return	.375 wall nominal	Continuous/ Tempertures over 100 F only during refuel. (24/7/365) (150 deg)12"										(Note 8)
CCP Oil Cooler Return	40	Intermittent. (135 deg) (3000 hr/yr. '85 to '89, 2000 hr/yr. '90 to '94). Cycle 12: 68 hr.2"										(Note 8)
RHR Hx Return	.375 wall nominal	Intermittent - shutdown during a refuel - 800 hr/yr (130 deg)18"										(Note 8)
RHR Pump Seal HX Return	80	Intermittent - 800 hr/yr (160 deg)	1"									(Note 8)
SI Pump Oil Cooler Return	40	8 hr/yr (150 deg)	2"									(Note 8)
Excess Letdown Hx Return	40	Intermittent < 10 hrs/year (195 deg)	4"	11	0	0	NA	NA	NA	NA		(Note 7)
NOTES:												
(1) Common return header piping was not considered in the susceptibility ranking because of the collection of flows from various lines												
(2) Includes 10 socket welds.												
(3) 10 welds were replaced without inspection												
(4) All piping is being replaced except for small sections that are being inspected and found to be free from cracks.												
(5) All welds verified free from cracks. Welds will be replaced only if required to facilitate other repairs.												
(6) Indication was a 1/4 inch weld defect, not a crack.												
(7) The CCW System is designed to remove the heat from components important to mitigating the consequences of a LOCA or MSLB and to transfer heat to the ESW System. The Service Loop portion of the CCW System is not required to perform this function. From a Maintenance Rule and PRA perspective, the CCW Service Loop is considered low Safety Significance. A preliminary risk evaluation has determined an increase in core damage risk from operation with degraded Service Loop piping of approximately 3.5E-08/year.												
(8) Two 100% capacity trains which cool redundant engineered safety features components (e.g., RHR heat exchangers, RHR pump seal coolers, CCP bearing oil coolers). The CCW System provides cooling water to selected essential and non-essential components during normal plant operations, including shutdown, and also provides cooling water to several engineered safety feature systems during a LOCA or MSLB. Non-redundant components cooled by the CCW System which are not required for post-LOCA heat removal or are not safety-related are cooled through a single common header (Service Loop).												
(9) Cracks were evaluated for structural integrity using the methodology and acceptance criteria from Code Case N-513. All cracks were evaluated as 100% through wall, which is a conservative assumption. Structural integrity was maintained. 1 crack could not be evaluated because interferences prevented complete UT length characterization. Based on the measured length of the indeterminate crack, it would have structural integrity. These cracks are being repaired/replaced during Refuel 12.												

Wolf Creek Generating Station

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