Nebraska Public Power District
Nebraska's Energy Leader

NLS2001027
April 30, 2001

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

Subject: Licensee Event Report No. 2001-002
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

The subject Licensee Event Report is forwarded as an enclosure to this letter.

Sincerely,

J. A. McDonald
Plant Manager

/jrs
Enclosure

cc: Regional Administrator
USNRC - Region IV

Senior Project Manager
USNRC - NRR Project Directorate IV-1

Senior Resident Inspector
USNRC

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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001

Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Cooper Nuclear Station	05000298	1 OF 6

TITLE (4)

Ineffective Operating Crew Performance in Maintaining Positive Reactor Water Level Control During a Reactor Shutdown Resulted in an Automatic Actuation of the Reactor Protection System.

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 NAME	DOCKET NUMBER
03	03	2001	2001	-- 002 --	00	04	30	2001		05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	3
POWER LEVEL (10)	000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

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

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Michael T. Boyce, Risk and Regulatory Affairs Manager	402-825-5100

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	SJ	P	DELAVAL	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	X	NO				

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

On March 3, 2000, the plant was proceeding with a planned shutdown in preparation for a Mid-Cycle Outage (MCO). Following the planned manual scram at 0942 Central Standard Time (CST), positive reactor water level control was not continuously maintained.

The "B" feedwater pump turbine tripped at the vessel high water level set point at approximately 0945 CST. Reactor Water Cleanup (RWCU) blowdown to the main condenser isolated on high heat exchanger discharge temperature. Digital Electro-Hydraulic control was initiated to lower pressure. Then the Reactor Core Isolation Cooling (RCIC) system was initiated and began injection. An automatic reactor scram signal actuated at approximately 1028 CST due to low water level. As water level began to rise, RCIC flow was reduced. Water level began to lower and a manual scram was initiated. Positive level control was then re-established.

The cause of the event was ineffective operating crew performance exacerbated by equipment problems and weaknesses in procedures and training. Immediate corrective actions included inspection, testing, and repair of equipment, revisions to procedures, re-assignment of selected crew personnel, and additional simulator training These actions occurred prior to startup from the MCO.

Long term corrective actions include development of new crew selection criteria, and implementation of planned high intensity training and self-assessment activities for the operating crews.

PLANT STATUS

On March 3, 2001, the plant was proceeding with a planned shutdown in preparation for a Mid-Cycle Outage (MCO). The plant was in Mode 3 and at zero percent power when the event occurred.

As the shutdown proceeded, power had been reduced in preparation for initiation of a manual scram. Following the manual scram at approximately 0942 Central Standard Time (CST), all control rods inserted successfully. However, subsequent positive reactor water level control was not continuously maintained.

After a scram from power, reactor water level is expected to initially drop as voids collapse and negative reactivity is added by inserting control rods. After this initial drop, water level will increase at a fairly rapid rate because incoming feedwater flow is higher than outgoing steam flow until the feedwater startup valves (EIIS:SJ) are closed. Water level will continue to rise after the startup valves are isolated because the effect on level from the reactor heating the cooler feedwater is higher than the exiting house loads steam flow until the temperature approaches steady state. As the temperature approaches steady state, water level should begin to decrease until additional water is injected. During this event, water level continued to increase and the "B" feedwater pump turbine (EIIS:SJ) automatically tripped at the vessel high level set point at approximately 0945 CST.

Reactor Water Cleanup (RWCU) (EIIS:CE) blowdown to the main condenser (EIIS:SQ) was then initiated in order to mitigate the rise in reactor water level. RWCU flow increased to approximately 100 gpm when blowdown was initiated. This initial flow rate did not immediately stop reactor water level from rising. The panel operator made a small adjustment to the flow controller and system flow increased to approximately 180 gpm. Recognizing this flow to be excessive, and observing the level to decrease, the panel operator lowered blowdown flow to approximately 150 gpm. The combination of excessive blowdown flow and high reactor water temperature caused the water temperature in the non-regenerative heat exchanger Reactor Equipment Cooling (REC) (EIIS:CC) return line to exceed saturation temperature resulting in both level and pressure perturbations as voids formed and collapsed. Subsequently, the RWCU non-regenerative heat exchanger outlet temperature exceeded the system isolation set point and RWCU isolated at about 0954 CST.

Reactor water is pumped through regenerative and non-regenerative heat exchangers in the RWCU system. After exiting the non-regenerative heat exchanger, which uses REC as the heat sink, reactor water passes through two filter demineralizers. Flow is then split between blowdown to the main condenser and flow back to the reactor through the regenerative heat exchangers. Excessive blowdown causes less regenerative heat exchanger heat transfer and higher temperatures in both the RWCU and REC systems.

The following actions were taken to re-establish an injection source for water into the Reactor Pressure Vessel (RPV) as water level continued to lower:

- Restart of the "B" Reactor Feedwater Pump, which failed to restart because of an equipment malfunction (approximately 1008 CST).
- The "A" Reactor Feedwater Pump, was not started because of turbine heat-up limitations.
- Opening the main turbine bypass valves (EIIS:SO) with the Digital Electro-Hydraulic (DEH) (EIIS:JI) control system to lower pressure so that a condensate booster pump (EIIS:SD) could be used for injection (approximately 1025 CST).
- Initiation of the Reactor Core Isolation Cooling (RCIC) (EIIS:BN) system injection (approximately 1027 CST).

TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

Water level continued to lower to the point of actuating an automatic scram signal as the main turbine bypass valves started to open and as a result of relatively cooler emergency Condensate Storage Tank (ECST) water from the RCIC entering the Reactor Pressure Vessel (RPV) (approximately 1028 CST). Water level eventually turned and began to rise as RCIC injection and the increased flow through the Control Rod Drive (CRD) charging water header exceeded the lowering of level from the opening turbine bypass valves and cooling of the water in the RPV. RCIC injection was then reduced and the scram was reset (approximately 1036 CST). Water level again began to lower, and full RCIC injection flow was re-established and a manual scram was inserted as water level approached the low-level scram set point (approximately 1040 CST). Water level then began to rise as a result of RCIC injection. RCIC maintained water level until a condensate booster pump could be used to control level. RCIC was then secured (approximately 1045 CST) and the condensate booster pump was used to control level through the remainder of the shutdown.

BASIS OF REPORT

The actuation of the Reactor Protection System (reactor scram) is reportable per 10CFR50.73(a)(2)(iv)(B).

CAUSE

The cause of this event is ineffective operating crew performance, exacerbated by equipment performance problems and weaknesses in procedures and training. There were deficiencies in key operating crew performance elements including oversight, command and control, teamwork, and communications, and in individual contributions. These deficiencies resulted in the following operational occurrences during this event:

- Feedwater turbine trip on high reactor water level.
- RWCU isolation on high non-regenerative heat exchanger outlet temperature.
- REC level, temperature and pressure perturbations.
- Automatic reactor scram on low water level.
- Manual reactor scram on approaching the low-level set point.

CONTRIBUTING CAUSES

There were three contributing causes to this event that exacerbated the root cause of inadequate operating crew performance. The experience, knowledge and skills of the operating crew were not adequate to compensate for these additional issues.

1) The following equipment performance issues contributed to the loss of continuous positive level control:

a) Partially open RWCU blowdown orifice bypass valve - RWCU blowdown flow is normally limited during blowdown by a restricting orifice installed in the blowdown line. A bypass valve around the orifice is provided, which was subsequently found to be partially open despite closed indication. Lower flow resistance affected the sensitivity of the flow controller and contributed to the excessive blowdown flowrate.

b) "B" feedwater pump turbine failure to restart - The feedwater pump turbine control circuitry is designed to trip the turbine on high vessel level, and to allow for restart when level is restored to below the reset point. The high level trip failed to reset during the event, preventing restoration of the feed pump.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

2) The following procedural weaknesses contributed to the loss of continuous positive level control:

a) The feedwater system operating procedure included misleading directions regarding timing for reducing feedwater turbine speed to prevent the high level trip.

b) There was a lack of procedural guidance on RWCU blowdown flow requirements. With the exception of non-regenerative outlet temperature, system procedures did not adequately limit the use of RWCU blowdown.

c) Plant procedures did not adequately restrict a feedwater pump turbine start with heat-up limitations being observed.

3) The following training weaknesses contributed to the loss of continuous positive level control:

a) Lack of reinforcement that lowering the feedwater pump turbine speed is the most effective way to prevent a high level trip during a controlled shutdown - Reducing turbine speed to prevent the high level trip was not consistently presented in simulator scenarios. Additionally, the training simulator did not accurately model the response time of the feedwater startup flow control valves.

b) Lack of practice for recovering from a loss of feedwater event during normal plant evolutions such as plant shutdown - Detailed techniques of level control during off-normal events were not routinely practiced.

c) Lack of awareness of REC system response during RWCU blowdown - Contributing to the excessive RWCU blowdown flowrate was the fact that the training simulator did not model the response of REC at elevated RWCU blowdown flows and temperatures.

d) Lack of recognition of the difference between indicated vessel level and the scram set point - Failure to manually scram the reactor prior to initiation of an automatic trip was due in part to the crew's lack of awareness that the actual scram set point is slightly greater than the nominal value, due to biasing differences in the available level indication.

EXTENT OF CONDITION

The extent of condition was investigated with a focus on the root cause of this event, ineffective crew performance. Although some aspects of the event contributing factors were significant, the root cause analysis determined that the expected standard for crew performance is such that the event should have been precluded despite the contributing factors with which the crew was confronted.

The event was a result of a specific crew's human performance deficiencies, the cause of which could adversely affect the effective performance of other plant evolutions performed by the same operating crew. A generic problem with operating crew performance, however, does not exist, Management's observations and evaluation of the performance of other crews and their observations and evaluation of the performance of the crew on-duty during this event noted that, for the crew in question, individual competencies, especially with regard to an understanding of integrated plant response, was a significant contributor to the event, as well as the fact that a command and control deficiency existed.

SAFETY SIGNIFICANCE

During this event, all equipment responded as designed, except for the "B" feedwater pump turbine and the RWCU system. Although there were vibrations on the "A" feedwater pump turbine when there was an attempt to restart it, the turbine would have been capable of starting and providing level control. It was not employed in order to protect long-term equipment reliability.

Regarding defense-in-depth, multiple coolant makeup sources were available. In addition to the RCIC system, the High Pressure Coolant Injection System (HPCI) and the CRD system were available as additional high pressure makeup sources. The condensate system, Residual Heat Removal (RHR) and Core Spray systems were available for makeup. The Safety Relief Valves (SRV's) and the main condenser were also available for pressure reduction.

The REC system was fully functional during the time period of its use. This portion of the event was terminated by the isolation of the RWCU system. At no time during this event was the REC system function lost.

The plant response was entirely within the bounds of the transients as evaluated in the Cooper Nuclear Station (CNS) Probabilistic Risk Assessment (PRA). In reviewing the plant response against the modeling assumptions used in the PRA, it was determined that the assumptions for the transients were not affected. The event did not occur during the worst-case plant conditions and the resulting plant response and operator actions were encompassed by current analyses.

There were no safety system functional failures in this event.

CORRECTIVE ACTIONS

A) Immediate Actions (Items 1-8,10 completed prior to the startup from the MCO)

1) Selected plant procedures were revised to enhance control of REC and RWCU temperatures and flow rates during blowdown operations.

2) The Feedwater System Operating Procedure was revised to restrict the use of the "Quick Restart" section.

3) The panel operator on-duty during the event was counseled on expected operating practices when placing components in service.

4) The shift supervisor on-duty during the event developed focus areas to improve his oversight. These were discussed with and observed by the Operations Supervisor. Improved on-shift oversight performance was noted.

5) All operating crews involved in plant startup from the MCO received simulator training prior to startup on scenarios that included external distractions and equipment failures to challenge their command and control skills.

6) Two Control Room Supervisors were re-assigned.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

7) Operating crews affected by the staffing change received simulator training focusing on team skills.

8) The operating crew that was on-duty during the event was re-constituted and this re-constituted crew was evaluated in a dynamic examination prior to resuming watch duties.

9) Operations Management conducted a Lessons Learned Tailgate training session on the event and re-enforced Management expectations on brief content, what constitutes effective pre-staging for an evolution, and timeliness of briefs and crew updates.

10) Equipment that malfunctioned during this event was repaired prior to startup. The "B" feedwater pump was successfully reset during testing. Inspection, testing and engineering evaluation of the RWCU and REC systems demonstrated that they were structurally sound and that system integrity was unaffected by the event. The blowdown line restricting orifice bypass valve position indication was repaired.

B) Long Term Actions

1) CNS anticipates new crew selection criteria development and proceduralization by June 14, 2001.

2) Planned High Intensity Training to establish a step change in operating crew performance is anticipated to be completed by June 21, 2001.

3) Crew performance self-assessment of all the operating crews to measure the effectiveness of the high intensity training and new crew selection criteria is anticipated to be completed by November 8, 2001.

4) High intensity training materials on standards will be included in initial license training by June 21, 2001.

PREVIOUS EVENTS

Recent events related to crew performance are - a mispositioned control rod event as discussed in Inspection Report 00-06; human error in performing surveillance testing on the 4160 V buses (LER 2000-012); and performing maintenance in the 345/161 kV switchyard without proper procedures (NCV 0013-02).

CNS has been in the process of implementing best industry practices in the areas of control room standards and training methods to achieve excellence in crew performance before the event discussed in this LER occurred.

Correspondence Number: NLS2001027

The following table identifies those actions committed to by the District in this document. Any other actions discussed in the submittal represent intended or planned actions by the District. They are described for information only and are not regulatory commitments. Please notify the NL&S Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
Develop new crew selection criteria	June 14, 2001
Implement high intensity training	June 21, 2001
Complete crew performance self-assessment of all operating crews	November 8, 2001
High intensity training material on standards will be included in initial license training	June 21, 2001

Nebraska Public Power District
Nebraska's Energy Leader

NLS2001027
April 30, 2001

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

Gentlemen:

Subject: Licensee Event Report No. 2001-002
Cooper Nuclear Station, NRC Docket 50-298, DPR-46

The subject Licensee Event Report is forwarded as an enclosure to this letter.

Sincerely,

J. A. McDonald
Plant Manager

/jrs
Enclosure

cc: Regional Administrator
USNRC - Region IV

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NRC FORM 366 (6-1998) U.S. NUCLEAR REGULATORY COMMISSION

LICENSEE EVENT REPORT (LER)

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

APPROVED BY OMB NO. 3150-0104 EXPIRES 06/30/2001
Estimated burden per response to comply with this mandatory information collection request: 50 hrs. Reported lessons learned are incorporated into the licensing process and fed back to industry. Forward comments regarding burden estimate to the Records Management Branch (T-6 F33), U.S. Nuclear Regulatory Commission, Washington, DC 20555-0001, and to the Paperwork Reduction Project (3150-0104), Office of Management and Budget, Washington, DC 20503. If an information collection does not display a currently valid OMB control number, the NRC may not conduct or sponsor, and a person is not required to respond to, the information collection.

FACILITY NAME (1)	DOCKET NUMBER (2)	PAGE (3)
Cooper Nuclear Station	05000298	1 OF 6

TITLE (4)
Ineffective Operating Crew Performance in Maintaining Positive Reactor Water Level Control During a Reactor Shutdown Resulted in an Automatic Actuation of the Reactor Protection System.

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 NAME	DOCKET NUMBER
03	03	2001	2001	-- 002 --	00	04	30	2001		05000
									FACILITY NAME	DOCKET NUMBER 05000

OPERATING MODE (9)	3
POWER LEVEL (10)	000

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more) (11)

	20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
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	20.2203(a)(2)(ii)		20.2203(a)(4)	x	50.73(a)(2)(iv)		OTHER
	20.2203(a)(2)(iii)		50.36(c)(1)		50.73(a)(2)(v)		Specify in Abstract below or in NRC Form 366A
	20.2203(a)(2)(iv)		50.36(c)(2)		50.73(a)(2)(vii)		

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER (Include Area Code)
Michael T. Boyce, Risk and Regulatory Affairs Manager	402-825-5100

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO EPIX
B	SJ	P	DELAVAL	Y					

SUPPLEMENTAL REPORT EXPECTED (14)				EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
	YES (If yes, complete EXPECTED SUBMISSION DATE).	x	NO				

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

On March 3, 2000, the plant was proceeding with a planned shutdown in preparation for a Mid-Cycle Outage (MCO). Following the planned manual scram at 0942 Central Standard Time (CST), positive reactor water level control was not continuously maintained.

The "B" feedwater pump turbine tripped at the vessel high water level set point at approximately 0945 CST. Reactor Water Cleanup (RWCU) blowdown to the main condenser isolated on high heat exchanger discharge temperature. Digital Electro-Hydraulic control was initiated to lower pressure. Then the Reactor Core Isolation Cooling (RCIC) system was initiated and began injection. An automatic reactor scram signal actuated at approximately 1028 CST due to low water level. As water level began to rise, RCIC flow was reduced. Water level began to lower and a manual scram was initiated. Positive level control was then re-established.

The cause of the event was ineffective operating crew performance exacerbated by equipment problems and weaknesses in procedures and training. Immediate corrective actions included inspection, testing, and repair of equipment, revisions to procedures, re-assignment of selected crew personnel, and additional simulator training These actions occurred prior to startup from the MCO.

Long term corrective actions include development of new crew selection criteria, and implementation of planned high intensity training and self-assessment activities for the operating crews.

PLANT STATUS

On March 3, 2001, the plant was proceeding with a planned shutdown in preparation for a Mid-Cycle Outage (MCO). The plant was in Mode 3 and at zero percent power when the event occurred.

As the shutdown proceeded, power had been reduced in preparation for initiation of a manual scram. Following the manual scram at approximately 0942 Central Standard Time (CST), all control rods inserted successfully. However, subsequent positive reactor water level control was not continuously maintained.

After a scram from power, reactor water level is expected to initially drop as voids collapse and negative reactivity is added by inserting control rods. After this initial drop, water level will increase at a fairly rapid rate because incoming feedwater flow is higher than outgoing steam flow until the feedwater startup valves (EIIS:SJ) are closed. Water level will continue to rise after the startup valves are isolated because the effect on level from the reactor heating the cooler feedwater is higher than the exiting house loads steam flow until the temperature approaches steady state. As the temperature approaches steady state, water level should begin to decrease until additional water is injected. During this event, water level continued to increase and the "B" feedwater pump turbine (EIIS:SJ) automatically tripped at the vessel high level set point at approximately 0945 CST.

Reactor Water Cleanup (RWCU) (EIIS:CE) blowdown to the main condenser (EIIS:SQ) was then initiated in order to mitigate the rise in reactor water level. RWCU flow increased to approximately 100 gpm when blowdown was initiated. This initial flow rate did not immediately stop reactor water level from rising. The panel operator made a small adjustment to the flow controller and system flow increased to approximately 180 gpm. Recognizing this flow to be excessive, and observing the level to decrease, the panel operator lowered blowdown flow to approximately 150 gpm. The combination of excessive blowdown flow and high reactor water temperature caused the water temperature in the non-regenerative heat exchanger Reactor Equipment Cooling (REC) (EIIS:CC) return line to exceed saturation temperature resulting in both level and pressure perturbations as voids formed and collapsed. Subsequently, the RWCU non-regenerative heat exchanger outlet temperature exceeded the system isolation set point and RWCU isolated at about 0954 CST.

Reactor water is pumped through regenerative and non-regenerative heat exchangers in the RWCU system. After exiting the non-regenerative heat exchanger, which uses REC as the heat sink, reactor water passes through two filter demineralizers. Flow is then split between blowdown to the main condenser and flow back to the reactor through the regenerative heat exchangers. Excessive blowdown causes less regenerative heat exchanger heat transfer and higher temperatures in both the RWCU and REC systems.

The following actions were taken to re-establish an injection source for water into the Reactor Pressure Vessel (RPV) as water level continued to lower:

- Restart of the "B" Reactor Feedwater Pump, which failed to restart because of an equipment malfunction (approximately 1008 CST).
- The "A" Reactor Feedwater Pump, was not started because of turbine heat-up limitations.
- Opening the main turbine bypass valves (EIIS:SO) with the Digital Electro-Hydraulic (DEH) (EIIS:JI) control system to lower pressure so that a condensate booster pump (EIIS:SD) could be used for injection (approximately 1025 CST).
- Initiation of the Reactor Core Isolation Cooling (RCIC) (EIIS:BN) system injection (approximately 1027 CST).

Water level continued to lower to the point of actuating an automatic scram signal as the main turbine bypass valves started to open and as a result of relatively cooler emergency Condensate Storage Tank (ECST) water from the RCIC entering the Reactor Pressure Vessel (RPV) (approximately 1028 CST). Water level eventually turned and began to rise as RCIC injection and the increased flow through the Control Rod Drive (CRD) charging water header exceeded the lowering of level from the opening turbine bypass valves and cooling of the water in the RPV. RCIC injection was then reduced and the scram was reset (approximately 1036 CST). Water level again began to lower, and full RCIC injection flow was re-established and a manual scram was inserted as water level approached the low-level scram set point (approximately 1040 CST). Water level then began to rise as a result of RCIC injection. RCIC maintained water level until a condensate booster pump could be used to control level. RCIC was then secured (approximately 1045 CST) and the condensate booster pump was used to control level through the remainder of the shutdown.

BASIS OF REPORT

The actuation of the Reactor Protection System (reactor scram) is reportable per 10CFR50.73(a)(2)(iv)(B).

CAUSE

The cause of this event is ineffective operating crew performance, exacerbated by equipment performance problems and weaknesses in procedures and training. There were deficiencies in key operating crew performance elements including oversight, command and control, teamwork, and communications, and in individual contributions. These deficiencies resulted in the following operational occurrences during this event:

- Feedwater turbine trip on high reactor water level.
- RWCU isolation on high non-regenerative heat exchanger outlet temperature.
- REC level, temperature and pressure perturbations.
- Automatic reactor scram on low water level.
- Manual reactor scram on approaching the low-level set point.

CONTRIBUTING CAUSES

There were three contributing causes to this event that exacerbated the root cause of inadequate operating crew performance. The experience, knowledge and skills of the operating crew were not adequate to compensate for these additional issues.

1) The following equipment performance issues contributed to the loss of continuous positive level control:

a) Partially open RWCU blowdown orifice bypass valve - RWCU blowdown flow is normally limited during blowdown by a restricting orifice installed in the blowdown line. A bypass valve around the orifice is provided, which was subsequently found to be partially open despite closed indication. Lower flow resistance affected the sensitivity of the flow controller and contributed to the excessive blowdown flowrate.

b) "B" feedwater pump turbine failure to restart - The feedwater pump turbine control circuitry is designed to trip the turbine on high vessel level, and to allow for restart when level is restored to below the reset point. The high level trip failed to reset during the event, preventing restoration of the feed pump.

2) The following procedural weaknesses contributed to the loss of continuous positive level control:

a) The feedwater system operating procedure included misleading directions regarding timing for reducing feedwater turbine speed to prevent the high level trip.

b) There was a lack of procedural guidance on RWCU blowdown flow requirements. With the exception of non-regenerative outlet temperature, system procedures did not adequately limit the use of RWCU blowdown.

c) Plant procedures did not adequately restrict a feedwater pump turbine start with heat-up limitations being observed.

3) The following training weaknesses contributed to the loss of continuous positive level control:

a) Lack of reinforcement that lowering the feedwater pump turbine speed is the most effective way to prevent a high level trip during a controlled shutdown - Reducing turbine speed to prevent the high level trip was not consistently presented in simulator scenarios. Additionally, the training simulator did not accurately model the response time of the feedwater startup flow control valves.

b) Lack of practice for recovering from a loss of feedwater event during normal plant evolutions such as plant shutdown - Detailed techniques of level control during off-normal events were not routinely practiced.

c) Lack of awareness of REC system response during RWCU blowdown - Contributing to the excessive RWCU blowdown flowrate was the fact that the training simulator did not model the response of REC at elevated RWCU blowdown flows and temperatures.

d) Lack of recognition of the difference between indicated vessel level and the scram set point - Failure to manually scram the reactor prior to initiation of an automatic trip was due in part to the crew's lack of awareness that the actual scram set point is slightly greater than the nominal value, due to biasing differences in the available level indication.

EXTENT OF CONDITION

The extent of condition was investigated with a focus on the root cause of this event, ineffective crew performance. Although some aspects of the event contributing factors were significant, the root cause analysis determined that the expected standard for crew performance is such that the event should have been precluded despite the contributing factors with which the crew was confronted.

The event was a result of a specific crew's human performance deficiencies, the cause of which could adversely affect the effective performance of other plant evolutions performed by the same operating crew. A generic problem with operating crew performance, however, does not exist, Management's observations and evaluation of the performance of other crews and their observations and evaluation of the performance of the crew on-duty during this event noted that, for the crew in question, individual competencies, especially with regard to an understanding of integrated plant response, was a significant contributor to the event, as well as the fact that a command and control deficiency existed.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

SAFETY SIGNIFICANCE

During this event, all equipment responded as designed, except for the "B" feedwater pump turbine and the RWCU system. Although there were vibrations on the "A" feedwater pump turbine when there was an attempt to restart it, the turbine would have been capable of starting and providing level control. It was not employed in order to protect long-term equipment reliability.

Regarding defense-in-depth, multiple coolant makeup sources were available. In addition to the RCIC system, the High Pressure Coolant Injection System (HPCI) and the CRD system were available as additional high pressure makeup sources. The condensate system, Residual Heat Removal (RHR) and Core Spray systems were available for makeup. The Safety Relief Valves (SRV's) and the main condenser were also available for pressure reduction.

The REC system was fully functional during the time period of its use. This portion of the event was terminated by the isolation of the RWCU system. At no time during this event was the REC system function lost.

The plant response was entirely within the bounds of the transients as evaluated in the Cooper Nuclear Station (CNS) Probabilistic Risk Assessment (PRA). In reviewing the plant response against the modeling assumptions used in the PRA, it was determined that the assumptions for the transients were not affected. The event did not occur during the worst-case plant conditions and the resulting plant response and operator actions were encompassed by current analyses.

There were no safety system functional failures in this event.

CORRECTIVE ACTIONS

A) Immediate Actions (Items 1-8,10 completed prior to the startup from the MCO)

1) Selected plant procedures were revised to enhance control of REC and RWCU temperatures and flow rates during blowdown operations.

2) The Feedwater System Operating Procedure was revised to restrict the use of the "Quick Restart" section.

3) The panel operator on-duty during the event was counseled on expected operating practices when placing components in service.

4) The shift supervisor on-duty during the event developed focus areas to improve his oversight. These were discussed with and observed by the Operations Supervisor. Improved on-shift oversight performance was noted.

5) All operating crews involved in plant startup from the MCO received simulator training prior to startup on scenarios that included external distractions and equipment failures to challenge their command and control skills.

6) Two Control Room Supervisors were re-assigned.

TEXT *(If more space is required, use additional copies of NRC Form 366A)* **(17)**

7) Operating crews affected by the staffing change received simulator training focusing on team skills.

8) The operating crew that was on-duty during the event was re-constituted and this re-constituted crew was evaluated in a dynamic examination prior to resuming watch duties.

9) Operations Management conducted a Lessons Learned Tailgate training session on the event and re-enforced Management expectations on brief content, what constitutes effective pre-staging for an evolution, and timeliness of briefs and crew updates.

10) Equipment that malfunctioned during this event was repaired prior to startup. The "B" feedwater pump was successfully reset during testing. Inspection, testing and engineering evaluation of the RWCU and REC systems demonstrated that they were structurally sound and that system integrity was unaffected by the event. The blowdown line restricting orifice bypass valve position indication was repaired.

B) Long Term Actions

1) CNS anticipates new crew selection criteria development and proceduralization by June 14, 2001.

2) Planned High Intensity Training to establish a step change in operating crew performance is anticipated to be completed by June 21, 2001.

3) Crew performance self-assessment of all the operating crews to measure the effectiveness of the high intensity training and new crew selection criteria is anticipated to be completed by November 8, 2001.

4) High intensity training materials on standards will be included in initial license training by June 21, 2001.

PREVIOUS EVENTS

Recent events related to crew performance are - a mispositioned control rod event as discussed in Inspection Report 00-06; human error in performing surveillance testing on the 4160 V buses (LER 2000-012); and performing maintenance in the 345/161 kV switchyard without proper procedures (NCV 0013-02).

CNS has been in the process of implementing best industry practices in the areas of control room standards and training methods to achieve excellence in crew performance before the event discussed in this LER occurred.

Correspondence Number: NLS2001027

The following table identifies those actions committed to by the District in this document. Any other actions discussed in the submittal represent intended or planned actions by the District. They are described for information only and are not regulatory commitments. Please notify the NL&S Manager at Cooper Nuclear Station of any questions regarding this document or any associated regulatory commitments.

COMMITMENT	COMMITTED DATE OR OUTAGE
Develop new crew selection criteria	June 14, 2001
Implement high intensity training	June 21, 2001
Complete crew performance self-assessment of all operating crews	November 8, 2001
High intensity training material on standards will be included in initial license training	June 21, 2001