



NRC-00-053

Wisconsin Public Service Corporation

(a subsidiary of WPS Resources Corporation)

Kewaunee Nuclear Power Plant

North 490, Highway 42

Kewaunee, WI 54216-9511

920-388-2560

July 12, 2000

10 CFR 50.73

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

Ladies/Gentlemen:

**Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Reportable Occurrence 2000-010-00**

In accordance with the requirements of 10 CFR 50.73, "Licensee Event Report System," the attached Licensee Event Report (LER) for reportable occurrence 2000-010-00 is being submitted. This report does not contain any new commitments.

Sincerely,

A handwritten signature in black ink, appearing to read "Mark L. Marchi".

**Mark L. Marchi
Vice President-Nuclear**

TJW

Attach.

**cc - INPO Records Center
US NRC Senior Resident Inspector
US NRC, Region III**

IE22

LICENSEE EVENT REPORT (LER)

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

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.

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TITLE (4)
Testing and Evaluation Determine the Service Water System has a Lower Design Basis Temperature Than Previously Believed

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
06	12	2000	2000	-- 010	-- 00	07	12	2000		05000
THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)										
OPERATING MODE (9)		0		20.2201(b)		20.2203(a)(2)(v)		50.73(a)(2)(i)		50.73(a)(2)(viii)
POWER LEVEL (10)		0		20.2203(a)(1)		20.2203(a)(3)(i)		X 50.73(a)(2)(iii)		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)		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 Thomas J. Webb - Nuclear Licensing Director	TELEPHONE NUMBER (Include Area Code) 920-388-8537
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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

SUPPLEMENTAL REPORT EXPECTED (14)

YES X (If yes, complete EXPECTED SUBMISSION DATE).	NO	EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR
			10	12	2000

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

On June 12, 2000, during the review of service water system testing performed during the 2000 refueling outage, it was determined that both emergency diesel generators were inoperable for a short period of time in 1991 due to elevated lake temperatures. Additionally, both trains of local area fan coil units located on the fan floor and mezzanine levels in the auxiliary building were out of service at separate times. The fan coil units maintain post accident environmental conditions to ensure safety related equipment located in these areas remain operable.

Prior to commencing power operation after refueling, compensatory actions were taken to ensure operability of all equipment up to a lake temperature of 73 degrees F and administrative action was taken to declare the affected equipment inoperable prior to lake temperature reaching this value.

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DESCRIPTION OF EVENT

On June 12, 2000, during the review of service water system testing performed during the 2000 refueling outage, it was determined that both emergency diesel generators were inoperable for a short period of time in 1991 due to elevated lake temperatures. Additionally, both trains of local area fan coil units located on the fan floor and mezzanine levels in the auxiliary building were inoperable at separate times. The fan coil units maintain post accident environmental conditions to ensure safety related equipment located in these areas remain operable.

The original design of the service water system (SW) [BI] assumed a single train (two pumps [P] per train) provided sufficient safeguards cooling during a design basis accident assuming an inlet temperature of 66 degrees F. During an internal audit in 1990, it was determined that lake temperature had exceeded 66 degrees F in the past. Questions arose as to the basis for this temperature. Testing and an evaluation performed in 1990 and 1991 demonstrated that an inlet temperature of 80 degrees F was acceptable. This testing involved placing each service water train in its design bases accident line-up separately. This was consistent with the Updated Safety Analysis Report (USAR) assumption that the worst case single failure was a loss of an entire train.

During the 1999-2000 operating cycle it was identified that the back pressure caused by common discharge piping [PSP] reduced service water flow through serviced components when both trains were operating. To gain a better understanding of this phenomenon, to address other questions concerning the service water system performance, and to obtain data to develop a service water flow model, additional testing was scheduled for the 2000 refueling outage. Unlike the previous tests and evaluations, a loss of a single train was not assumed to be the worst case. The test and evaluation during the 2000 outage included the affects on service water flow and pressure due to:

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- 1) Failures of single components and not a whole train,
- 2) Back pressure caused by common discharge piping,
- 3) Plugging of service water pump discharge strainers [FLT],
- 4) Failure of containment fan coil unit [FCU] discharge throttle valves [V] to fully open, and
- 5) The effects of component cooling water heat exchanger [HX] control valves failing open (refer to Fig. 1).

Their associated train of service water supplies the jacket water coolers for each emergency diesel [DG]. These separate trains of service water discharge into a common header after exiting the jacket water coolers. During the 1990 and 1991 tests, the cooler in the train not under test had no flow established. This line-up maximized flow through the train under test but did not reflect reduced flow associated with a backpressure. This reduced flow would have caused elevated diesel generator jacket water temperature under design basis accident conditions with a service water inlet temperature of 80 degrees F. Calculations determined that during accident conditions, assuming measured fouling factors, both diesels remained operable as long as service water inlet temperature remained less than or equal to 75.7 degrees F. Because the elevated jacket water temperature was not within the parameters supplied by the diesel generator manufacturer, the diesel generators were conservatively assumed to be inoperable whenever lake temperature exceeded 75.7 degrees F. This occurred on June 8, 1991 from 1921 hours to 2011 hours.

All of the local area fan coil units are also supplied by separate trains of service water and discharge into a common header. The testing performed in 1990 and 1991 did not include service water flow to the fan coil units in the opposite train. Like the emergency diesel generators, there is a backpressure effect of having both trains of service water supplying the fan coil units thereby reducing flow through individual fan coils. Additional complications occur with the local area fan

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coil units because the air side of the units also discharge into a common air duct [DUCT]. This causes a reduction in air flow similar to that found for common service water discharge piping. Analysis of the fan coil units was performed using test data that simulated various failures. The analysis determined that two sets of local area fan coil units experience significant reduction in flow as a result of increased backpressure due to sharing a common discharge. These fan coil units are located on the fan floor and mezzanine levels of the auxiliary building.

For the fan floor fan coil units, a failure of cooling water to one train while both trains are running was found to be worst case. This occurs because airflow is reduced due to a backpressure in the air duct and service water is supplied to only one unit. Analysis revealed that the fan floor fan coil units would not have removed the required heat load on several occasions because of high lake water temperature and assuming a failure of the service water supply valve to one train. Both fan floor fan coil units have been out of service 11 times since 1990. All instances occurred in August of 1995. The maximum time both fan coil units were out of service was 36 hours on August 22 to August 23.

The mezzanine area fan coil units do not have a control valve in the service water supply line like the fan floor area fan coil units. Therefore, a failure of one fan with both trains of service water available is the worst case for these units. Analysis revealed that the mezzanine area fan coil units would not have removed the required heat load on several occasions because of high lake water temperature and assuming a fan failure. Both mezzanine fan coil units have been out of service three times since 1990. The worst case was for eight hours and 47 minutes, which occurred on August 17 1995 from 1432 hours to 2319 hours.

The testing performed this outage also revealed that the margin on containment fan coil units and component cooling water heat exchangers were less than expected. The containment fan coil units are used to reduce containment pressure following a design basis accident. Containment

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fan coil units [BK] were re-analyzed at a reduced flow and found to have adequate heat removal. The component cooling system [CC] provides cooling for those systems that interface with reactor coolant to provide an additional barrier between the contaminated water and the environment. This includes the residual heat removal system [BO] used to cool the plant to cold shutdown conditions.

CAUSE OF THE EVENT

This event was caused by a failure to recognize a design interaction during original plant construction and the assumption that a loss of a whole train was a limiting failure. When the plant was built, the designers did not anticipate that backpressure from opposite trains components would negatively affect flow. Due to the length of time since plant design, we can not determine if they did not realize the potential for this effect or if they did not consider it part of the plants design basis to have both trains operating post accident. Previous testing failed to identify this vulnerability because each service water train was tested separately. Therefore the backpressure effect was not observed.

ANALYSIS OF THE EVENT

This event is being reported in accordance with 10CFR50.73(a)(2)(ii)(B), as a condition that was outside of the design basis of the plant. Contrary to the design basis of the plant both diesel generators were out of service for approximately 50 minutes. This event was also report in accordance with 10CFR50.72(b)(2)(i) and 10CFR50.72(b)(2)(iii)(D) at 9:15 CST on June 12, 2000.

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Kewaunee's probabilistic risk assessment (PRA) was reviewed to determine the significance of this event. The analysis found an increase in the core damage frequency of $1.8E-07$ as a result of both diesels being inoperable for 50 minutes.

It is important to note that both diesels would only be inoperable if both started to mitigate an event. If only one diesel started, there would be no flow reduction due to backpressure in the common discharge because the non-operating diesel would not be discharging into the common header. Furthermore, although the diesel generator coolers are the same model, there is difference in their performance. Therefore, if design basis event had occurred and both diesels started, an alarm on the B diesel would have been expected to come in first, the calculated maximum allowable service water temperature for diesel generator B was 71.7 degrees F. Therefore, the operators would shutdown this diesel first. Once the B diesel was shutdown, the backpressure effect would be eliminated. Therefore, the actual increase in core damage frequency would be less than calculated.

CORRECTIVE ACTIONS

- 1) Administrative actions were taken to declare the affected equipment inoperable when lake temperature is greater than 73 degrees F. An annunciator to alert the Operators when lake temperature exceeded 73 degrees F was installed to aid the operators in diagnosing high lake temperatures.
- 2) The air filters were removed on the Auxiliary Building mezzanine fan coil units to increase airflow.
- 3) A temporary change (TCR) was implemented to fail open the train A strainer backwash valves. The backwash valves flush debris from the strainers when differential pressure across the strainers reaches a predetermined value. Placing the strainers in continuous backwash prevents a high differential pressure from developing in case of instrument

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failure. A high differential pressure would reduce the margin on the containment fan coil units.

- 4) Administrative action was taken to ensure that service water to the turbine building is supplied by the B train of service water. Train A of service has less margin due to supplying spent fuel pool cooling and other components at a higher elevations. Because only one train of service water can supply the turbine header at a time, having it supplied by train B ensures sufficient flow to train A safeguards equipment. Analysis has shown that train B has sufficient margin to supply the turbine header and its associated safeguards components.
- 5) To add margin to other components, a design change has been initiated to change the safety injection signal to the component cooling water heat exchanger (HX) SW outlet valves. Each component cooling HX has two SW outlet valves; a throttle valve used for normal operation and a gate valve that opens on a safety injection signal. Testing has demonstrated that for immediate emergency operation, the throttle valve provides sufficient cooling to safeguard components. The gate valve would be required for plant cool down during containment sump recirculation. Currently the gate valve receives an open signal and the throttle valve's position is temperature controlled. The design change will result in the throttle valve opening at the start of the accident and leave the gate valve closed during the initial phases of the accident. This will add margin to other components while maintaining sufficient flow through the heat exchangers for immediate emergency loads.
- 6) The service water discharge piping for the mezzanine fan coil units was split. This will eliminate the backpressure effect thereby increasing service water flow to both units.
- 7) A temporary design change was implemented to fail open the inlet valves to the fan floor fan coil units.

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ADDITIONAL INFORMATION

Equipment Failures:

None.

Other Information:

This investigation into this event is not complete. Additional analysis of the event will continue to look at the causes, solutions, and implications of the as found condition. We expect to submit supplement to this LER with in 90 days of July12, 2000.

SIMILAR EVENTS

None.