

Commonwealth Edison Company  
Byron Generating Station  
4450 North German Church Road  
Byron, IL 61010-9794  
Tel 815-234-5441

**ComEd**

January 3, 1997

LTR: BYRON 96-0322  
FILE: 3.03.0800 (1.10.0101)

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

Dear Sir:

The Enclosed Licensee Event Report from Byron Generating Station is a supplement to report number 96-019.

This report is number 96-019, Supplement 2; Docket No. 50-454.

Sincerely,

K. L. Kofron  
Station Manager  
Byron Nuclear Power Station

KLK/BP/js

Enclosure: Licensee Event Report No. 96-019, Supplement 2

cc: A. B. Beach, NRC Region III Administrator  
NRC Senior Resident Inspector  
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NRC FORM 366 (4-95)		U.S. NUCLEAR REGULATORY COMMISSION		APPROVED BY OMB NO. 3150-0104 EXPIRES 04/30/98	
<b>LICENSEE EVENT REPORT (LER)</b> (See reverse for required number of digits/characters for each block)					
FACILITY NAME (1)  BYRON NUCLEAR POWER STATION				DOCKET NUMBER (2)  05000454	
PAGE (3)  1 OF 5					
TITLE (4)  SX COOLING TOWER BASIN INSPECTION REVEALED SILT BUILD-UP EXCEEDING SURVEILLANCE ACCEPTANCE					
EVENT DATE (5)			LER NUMBER (6)		REPORT DATE (7)
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
10	15	96	96	019	02
					MONTH DAY YEAR
					01 03 97
			OTHER FACILITIES INVOLVED (8)		
			FACILITY NAME		DOCKET NUMBER
			Byron U-2		05000455
			FACILITY NAME		DOCKET NUMBER
					05000
OPERATING MODE (9)		1	THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)		
POWER LEVEL (10)		97%	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) X 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) 50.73(a)(2)(iv) OTHER 20.2203(a)(2)(iii) 50.36(c)(1) 50.73(a)(2)(v) Specify in Abstract below 20.2203(a)(2)(iv) 50.36(c)(2) 50.73(a)(2)(vii) or in NRC Form 366A		
LICENSEE CONTACT FOR THIS LER (12)					
NAME  M. Robinson, System Engineer				TELEPHONE NUMBER (include Area Code)  815-234-5441 X2107	
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)					
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPROS	
A					
SUPPLEMENTAL REPORT EXPECTED (14)					
X	YES (If yes, complete EXPECTED SUBMISSION DATE).			NO	EXPECTED SUBMISSION DATE (15)
					MONTH DAY YEAR
					06 30 97

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

On 10/15/96, while performing the annual surveillance on the Essential Service Water (BI) (SX) Ultimate Heat Sink (BS) (UHS) cooling tower basins, the diver inspection revealed that silt accumulations exceeded the acceptance criteria. The November 1996 LER reported immediate and long term actions taken and also identified a corrective action to report results of an ongoing investigation into UHS issues. As a result of this ongoing investigation, a number of UHS issues have been identified. Errors were identified on 11/12/96 where design basis calculations did not consider the acceptance criteria for silt buildup nor take into account an anti-vortex box in the basin design. Other identified UHS issues such as, fallen trash racks, harmonic vibrations, concrete expansion anchor corrosion, and UHS intake bay intake channel silting, were identified as under consideration for reportability. These design basis calculational errors are bounded by the operability assessment performed, and compensatory measures taken following the 10/15/96 diver inspection, including raising the UHS basin level from 82% to 97%.

On 12/5/96, it was discovered that silt buildup in the River Screen House (RSH) south intake channel rendered the OB SX makeup pump inoperable under design basis conditions as the UHS makeup source. The OB SX makeup pump was inoperable when the OA SX makeup pump was inoperable the previous day. Under normal river conditions, both SX makeup pumps inoperable was a condition outside of the plant design basis.

It has also been determined that on previous occasions, similar circumstances may have existed. For example, on 7/25/95, silt levels in the RSH intake channels failed to meet surveillance acceptance criteria. In addition, as a result of an operability assessment performed on 12/4/96, it was determined that surveillance acceptance criteria were inadequate to ensure SX makeup pump operability. A revised acceptance criteria was generated.

The cause of these events is inadequate acceptance criteria and cognitive personnel error on the part of engineering personnel.

The safety of the plant and the public was not affected by the discovery of these conditions. This issue is reportable per 10CFR50.73(a)(2)(iii)(B) - any condition that was outside the design basis of the plant.

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BYRON NUCLEAR POWER STATION	05000454	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 2px;">YEAR</td> <td style="width: 25%; padding: 2px;">SEQUENTIAL NUMBER</td> <td style="width: 50%; padding: 2px;">REVISION NUMBER</td> </tr> <tr> <td style="text-align: center; padding: 2px;">96 --</td> <td style="text-align: center; padding: 2px;">019 --</td> <td style="text-align: center; padding: 2px;">02</td> </tr> </table>	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	96 --	019 --	02	2 OF 5
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER					
96 --	019 --	02							

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

**A. PLANT CONDITIONS PRIOR TO EVENT:**

Event Date/Time 10-15-96 / 1500

Unit 1 Mode 1 - Pwr Op      Rx Power - 97%      RCS [AB] Temperature/Pressure NOT/NOP

Unit 2 Mode 1 - Pwr Op      Rx Power - 95%      RCS [AB] Temperature/Pressure NOT/NOP

**B. DESCRIPTION OF EVENT:**

The Ultimate Heat Sink [BS] (UHS) basins provide the suction source for the Essential Service Water [BI] (SX) pumps. The UHS basins are maintained at or above required levels to provide long term cooling for essential plant equipment and emergency water supplies for the Auxiliary Feedwater [BA] (AF) system. Makeup to the basins consists of the SX makeup pumps, with the capability of 1500 gpm each, or the deep well pumps with the capability of 550 gpm each. Due to the difference in makeup capability, the required basin level is greater (82% vs 50%) when relying on the deep well pumps.

NRC Generic Letter (GL) 89-13, issued on July 18, 1989, presented an industry issue dealing with Service Water system problems affecting safety-related equipment. In a 1/29/90 response to GL 89-13, Byron committed to annual visual inspections of the Essential Service Water System [BI] (SX) Ultimate Heat Sink [BS] (UHS). As a result of this commitment, surveillance OBVS SX-5, Inspection of River Screen House (RSH) and Essential Service Water Cooling Tower, was developed and continues to be executed annually.

On 10/15/96, while performing the annual OBVS SX-5 on the UHS, the diver inspection revealed an increase in silt accumulation that exceeded the surveillance acceptance criteria. Previous annual executions of OBVS SX-5 showed slight increases in silt accumulation. The silt was redistributed and the surveillance was left within acceptance criteria. The increase in silt accumulation in the UHS in 1996 may be attributed to a higher than normal Total Suspended Solids (TSS) condition seen on the Rock River this year.

Revision 0 of this LER issued in November of 1996, concluded that the UHS should have been considered inoperable in the past when Technical Specification 3.7.5 action statements c, e, f, g or h were relied upon. This is due to the reduced volume of water available in the UHS due to silt buildup.

A review of plant history (Limiting Condition for Operation Action Requirement (LCOAR) entries) indicated, based on an operability assessment recommendation, that the UHS should have been considered inoperable on numerous occasions. These events were reported per 10CFR50.73(a)(2)(ii)(B) - any condition that was outside the design basis for the plant. The cause of this issue was inadequate acceptance criteria in the inspection/surveillance procedure. The acceptance criteria development did not adequately account for the design configuration of the UHS with regards to volumetric requirements.

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**B. DESCRIPTION OF EVENT (CONT.)**

Revision 0 of this LER issued in November of 1996 additionally reported immediate and long term actions taken, and also identified a corrective action to report results of an ongoing investigation into UHS issues. As a result of this ongoing investigation, a number of UHS issues have been identified. For example, errors were identified on 11/12/96 where design basis calculations did not consider the acceptance criteria for silt buildup nor take into account the geometry of the anti-vortex box in the basin design. Other identified UHS issues such as, fallen trash racks, harmonic vibrations, concrete expansion anchor corrosion, and UHS intake bay intake channel silting were identified as under consideration for reportability. The cause of these issues identified on 11/12/96 and reported in revision 1 to this LER was cognitive personnel error on the part of engineering personnel. The design basis calculations did not consider the acceptance criteria for silt buildup nor take into account the geometry of the anti-vortex box in the basin design. Engineers did not adequately account for the design configuration of the UHS with regards to volumetric requirements.

On 12/5/96, it was discovered that silt buildup in the River Screen House (RSH) south intake channel was sufficient to impair the ability of the intake channel to provide adequate flow to the OB SX makeup pump, under design basis conditions. The design basis of the pump requires it to function as the UHS makeup source in the event of a seismic event that causes the Oregon dam, on the Rock River, to fail. The OB SX makeup pump was inoperable when the OA SX makeup pump was inoperable (out of service) due to silt inspections the previous day. Under normal river conditions, both SX makeup pumps inoperable is a condition outside of the plant design basis. It has also been determined that on previous occasions similar circumstances may have existed. For example, on 7/25/95, during performance of surveillance OBVS SX-5, the data taken for silt levels in the RSH intake channels failed to meet acceptance criteria. The silt was redistributed to meet surveillance acceptance criteria, however no operability assessment was performed.

As a result of an operability assessment performed on 12/4/96 by Byron Site Engineering, for the north RSH intake channel silting concern (OA SX makeup pump), it was determined that surveillance (OBVS SX-5) acceptance criteria were inadequate to ensure SX makeup pump, and ultimately UHS, operability. A revised acceptance criteria has since been generated which bases the acceptable intake channel silt levels on minimum required post accident makeup flows to the SX makeup pumps.

**C. CAUSE OF EVENT:**

The cause of these issues is inadequate acceptance criteria in the inspection/surveillance procedure and cognitive personnel error on the part of engineering personnel. The RSH acceptance criteria development did not adequately consider the hydraulic gradient and intake channel water depth with regards to supplying adequate flow to the SX makeup pumps. UHS basin surveillance acceptance criteria did not adequately account for the design configuration of the UHS with regards to volumetric requirements. In addition, Engineering personnel did not question the non-Technical Specification surveillance failure in regards to operability and satisfying design basis criteria.

**D. SAFETY ANALYSIS:**

The safety of the plant and the public was not affected by these conditions.

All of the Byron Emergency Procedures (e.g. 1/2BEP-O Series, Reactor Trip or Safety Injection and 1/2BEP-1 Series, Loss of Reactor or Secondary Coolant) include an Operator Action Summary which provides guidance on maintaining UHS level if river flow is low or SX makeup pumps are inoperable. This guidance includes aligning UHS makeup from the deep wells.

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D. Safety Analysis:

Design basis calculations setting the 82 percent limit for the UHS level (based on the lower capacity deep well pumps' ability to supply makeup sufficient to offset the evaporation rate of the water in the cooling tower basin) conservatively includes a two hour time delay for manually aligning the deep well pumps. The two hour assumption for deep well alignment is excessive. This assumption is based on the absence of hand wheels on the deep well pump isolation valves, in which case nitrogen bottles would have to be used to open these Air Operated Valves (AOVs). Hand wheels have been installed on these valves which allows a much faster valve opening time.

Additionally, design basis calculations assume one basin stays full to the divider wall and overflows to the affected basin. The affected basin will decrease over 16 hours until the deep well pumps can overcome evaporative losses. During this time period, it is possible for alternative operator actions to be taken that would compensate for the decreasing basin level. The deep well (backup) system for maintaining UHS level, provides for adequate water volume to maintain the SX system in a condition to perform its design function, with the SX makeup pumps inoperable.

E. CORRECTIVE ACTIONS:

- a) Immediate compensatory actions were instituted whereby an administrative basin level of 97 percent will be maintained whenever Technical Specification 3.7.5 action statements c, e, f, g, or h require 82% UHS level. This action was accomplished through the issuance of an operating Daily Order on 10/18/96, and associated procedure revisions.
- b) Silt has been removed from the UHS and RSH intake structures.
- c) Long term, provide additional margin to plant operation by performing one or more of the following (NTS: 454-201-96-1758-02):
  - i. Add an administrative limit to the 82 percent value to account for some level of silt buildup.
  - ii. Modify the design basis of the plant to reduce the time frame for deep well alignment to less than two hours.
  - iii. Adjust the inspection frequency and acceptance criteria to avoid accumulating more silt than is accounted for.
- d) Inspections of SX supplied heat exchangers and other low velocity regions of SX piping will be performed. (NTS: 454-200-96-0063-01)
- e) An investigation into UHS issues continues. The results of the continuing UHS investigation will be reported in a supplement to this LER. (NTS: 454-180-96-0019-01)
- f) Acceptance criteria for surveillance OBVS SX-5 has been revised.



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F. RECURRING EVENTS SEARCH AND ANALYSIS:

Data base searches were performed for industry events. The keywords used for the initial (10/15/96) event were: sediment, heat exchanger, ultimate heat sink, UHS, basin, SX, ESW, reduce, and volume. One similar industry event was found. In this event, UHS silt inspection criteria was inadequately specified and resulted in the UHS not meeting design criteria. This event, in 1993, was transmitted as an operating experience (OE) and was an opportunity to identify this concern at Byron.

Another opportunity came in 1992 when engineering performed an Ultimate Heat Sink (UHS) design basis reconstitution in preparation for a Technical Specification change submittal. During the reconstitution effort, UHS volume was evaluated. Consideration for volume displacement due to silt buildup was not included.

Additional data base searches were performed to encompass the subsequently identified issues (11/12/96, 12/5/96 and 7/25/95). The keywords used were "design AND basis AND calculation". Sixty-three documents were found dating back to 1986. The majority of these documents were applicable to errors in design basis calculations, design basis document deviation control, or design basis knowledge. One of the documents pertained specifically to the UHS.

G. COMPONENT FAILURE DATA:

No Components Failed.