

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



June 30, 1997

LTR: BYRON 97-0145  
FILE: 3.03.0800 (1.10.0101)

U.S. 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 4, Docket No. 50-454/455.

Sincerely,

A handwritten signature in dark ink, appearing to read "K. L. Kofron", is written over the typed name.

K. L. Kofron  
Station Manager  
Byron Nuclear Power Station

KLK/MS/js

Enclosure: Licensee Event Report No. 96-019, Supplement 4

cc: A. B. Beach, NRC Region III Administrator  
NRC Senior Resident Inspector  
INPO Record Center  
ComEd Distribution List

*1/1 DE 22*

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PDR ADOCK 05000454  
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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)				ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS MANDATORY INFORMATION COLLECTION REQUEST: 50.0 HRS. REPORTED LESSONS LEARNED ARE INCORPORATED INTO THE LICENSING PROCESS AND FED BACK TO INDUSTRY. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE INFORMATION AND 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.	
FACILITY NAME (1)  BYRON NUCLEAR POWER STATION, UNIT 1			DOCKET NUMBER (2)  05000454		PAGE (3)  1 OF 14
TITLE (4)  Ultimate Heat Sink Outside Design Basis due to Silt and Calculation Errors					
EVENT DATE (5)		LER NUMBER (6)		REPORT DATE (7)	
MONTH	DAY	YEAR	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER
10	15	96	96	019	04
				MONTH	DAY
				06	30
				YEAR	
				97	
OTHER FACILITIES INVOLVED (8)					
FACILITY NAME			DOCKET NUMBER		
Byron Unit 2			05000455		
FACILITY NAME			DOCKET NUMBER		
OPERATING MODE (9)		THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR 5: (Check one or more) (11)			
1					
POWER LEVEL (10)		20.2201(b)			
097		20.2203(a)(1)			
		20.2203(a)(2)(i)			
		20.2203(a)(2)(ii)			
		20.2203(a)(2)(iii)			
		20.2203(a)(2)(iv)			
		50.36(c)(1)			
		50.36(c)(2)			
		50.73(a)(2)(i)			
		50.73(a)(2)(ii)			
		50.73(a)(2)(iii)			
		50.73(a)(2)(iv)			
		50.73(a)(2)(v)			
		50.73(a)(2)(vi)			
		50.73(a)(2)(vii)			
		50.73(a)(2)(viii)			
		50.73(a)(2)(ix)			
		73.71			
		OTHER			
		Specify in Abstract below or in NRC Form 366A			
LICENSEE CONTACT FOR THIS LER (12)					
NAME			TELEPHONE NUMBER (Include Area Code)		
M. Robinson, System Engineer			815-234-5441 X2107		
COMPLETE ONE LINE FOR EACH COMPONENT FAILURE DESCRIBED IN THIS REPORT (13)					
CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	
SUPPLEMENTAL REPORT EXPECTED (14)					
YES (If yes, complete EXPECTED SUBMISSION DATE).					X NO
EXPECTED SUBMISSION DATE (15)					

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

1. On 10/15/96, a diver inspection revealed that silt accumulations exceeded the surveillance acceptance criteria on the Essential Service Water [BI] (SX) Ultimate Heat Sink [BS] (UHS) cooling tower basins.
2. On 11/12/96 it was discovered that Ultimate Heat Sink design basis calculations did not consider silt buildup nor take into account an anti-vortex box in the basin design.
3. 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.
4. On 1/29/97, Byron engineering personnel identified a concern for the blow down flow from the SX system due to the throttled position of the SX blow down isolation valves.
5. Singularly the causes of these issues are personnel error, defective procedures, and external. Considered in conjunction, these issues can be represented as a management deficiency.

The corrective actions taken included silt removal, administrative control changes, procedural changes, and a design basis calculation re-review.

No previous occurrences of these events have been identified at Byron.

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

These events were reported under 10CFR50.73(a)(2)(i)(B) and 10CFR50.73(a)(2)(ii)(B).

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019	-- 04	2 OF 14

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 capacity of 1350 gallons per minute each or the deep well pumps with the capacity of 550 gallons per minute each. Due to the lack of auto start capability and lower capacity of the deep well pumps the required basin level is greater (82% vs. 50%) when relying on the deep well pumps for SX makeup. The same compensatory action (raising the basin level) is taken when the UHS cooling tower level switches are inoperable. This additional basin level provides time for manual operator actions in the event of an accident.

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 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. The UHS systems were operating as expected at this time. Immediate corrective action taken was to put an administrative control in place that raises the SX basin level for certain plant operating conditions. 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 due to changing Rock River conditions.

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 was due to the reduced volume of water available in the UHS due to silt buildup.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019	-- 04	3 OF 14

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

B. DESCRIPTION OF EVENT (cont.)

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 silt build up was generated externally. This natural phenomenon may be due to changing Rock River conditions. Inoperability of the UHS was caused by having poor acceptance criteria in the basin surveillance procedure (defective procedure) and not factoring the allowable silt into the UHS design analysis (personnel error). The surveillance acceptance criteria was provided by an Architect Engineer (AE) for implementation of NRC Generic Letter 89-13 requirements. The criteria provided did not consider the potential impact of the allowable silt buildup on the water inventory requirements of the UHS. The UHS design analysis did not consider the possibility of silt in the SX Cooling Tower (SX CT) basins when calculating the mass of water available for heat storage or for inventory available to offset system losses from evaporation, drift, blowdown, and AF supply. Both of these errors were caused by inadequate work practice in that available information was not factored into the engineering evaluations. The silt buildup was aggravated by the past practice of silt redistribution instead of removal, during past surveillances, without performing an engineering evaluation. There was a misunderstanding at Byron Station that operability is not typically affected by Non-Technical Specification surveillances. The expectations for Non-Technical Specification surveillance performance were not as clear as expectations for Technical Specification surveillance performance. Non-Technical Specification surveillances were not handled with the same rigor as Technical Specification surveillances. This is an inadequate work practice [ComEd classification].

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 SX investigation, several UHS issues were identified and reported in subsequent revisions to the original LER.

On 11/12/96 it was discovered that neither silt buildup nor the geometry of the anti-vortex box in the basin design, were considered in engineering calculations used to verify the adequacy of the UHS design. The cause of this issue identified on 11/12/96 and reported in revision 1 to the LER, was cognitive personnel error. The engineering calculations did not adequately account for the design configuration of the basins nor take into account the possible silt buildup in determining the usable volume of water in the UHS. The engineering personnel preparing the calculations did not know of and apply key available information to the design calculations. This personnel error was due to inadequate work practices [ComEd classification] in that intended verifications were not performed.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019	-- 04	4 OF 14

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

B. DESCRIPTION OF EVENT (cont.)

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 UHS systems were operating as expected at this time. Immediate corrective action taken was to perform an operability assessment that concluded UHS operability. The silt build up exceeded the annual surveillance acceptance criteria. The SX makeup pump is designed to operate as the UHS makeup source for conditions that include low Rock River water levels resulting from a seismic event that causes the Oregon dam 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. Had it been known that the OB pump was inoperable, required actions would have been to restore the pump within seventy two hours or to verify the operability of the same train deep well pump with both UHS cooling tower basin levels greater than eighty two percent. The SX makeup pump inoperability is reported under 10CFR50.73(a)(2)(i)(B)-any operation or condition prohibited by the plant's Technical Specification. Under normal river conditions, both SX makeup pumps inoperable is a condition outside of the plant design basis. It was also determined that previously 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. These events were reported per 10CFR50.73(a)(2)(ii)(B) - any condition that was outside the design basis for the plant. The silt build up was generated externally. This natural phenomenon may be due to changing Rock River conditions.

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. The UHS systems were operating as expected at this time. Immediate corrective action taken was to perform an operability assessment that concluded UHS operability. The inadequate acceptance criteria were attributed to a defective procedure. The surveillance procedure was inadequate because the surveillance method and acceptance criteria developed by the AE, and reviewed by ComEd Engineering, did not verify an adequate flow path existed from the river channel to the makeup pump suction. The criteria provided was not clear in the purpose for the surveillance or what the design requirement was. This is an inadequate work practice [ComEd classification].

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.



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019	-- 04	5 OF 14

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

B. DESCRIPTION OF EVENT (cont.)

On at least one occasion when RSH intake channel silting exceeded the OBVS SX-5 acceptance criteria, the system engineer had the silt redistributed without performing an engineering evaluation. Redistribution of the silt allowed the conditions to be left within the acceptable range of the surveillance. The failure of engineering personnel to question the surveillance failures in regards to satisfying design basis criteria is a failure to maintain a questioning attitude. Immediate corrective actions included Byron Station Management issuing a letter to station personnel clarifying expectations. The safety related SX system does not have a Technical Specification surveillance requirement to monitor the UHS intake structures for silting. The annual surveillance was written with the intent of providing guidance as to when the safety-related source of SX make up might potentially be impacted. The silting acceptance criteria were developed to assist in responding to the Generic Letter 89-13 "Service Water System Problems Affecting Safety-Related Equipment," recommended action 1, intake structure inspections. The system engineer did not maintain a questioning attitude as to the purpose (i.e., operability/design basis) of the non-Technical Specification surveillance, when it failed. The cause of this issue identified on 12/05/96 and reported in revision 2 to the original LER, was personnel error. The System Engineer, based on previous experience, made the decision to accept the surveillance without seeking the facts and evidence objectively. This is an inadequate work practice [ComEd classification].

On 1/29/97, Byron Site Engineering personnel identified a concern for blow down flow from the SX basins as it relates to the design basis calculation for SX makeup capability. The concern was identified during corrective action activities in response to Rev. 0 of this LER. These corrective actions included reevaluation of the Byron UHS peak temperature and makeup analysis design calculations. Total blow down flow during the design basis scenario for SX makeup capability was assumed to be 250 gallons per minute each from both blow down lines for a total of 500 gallons per minute. The flow is assumed to continue for two (2) hours into the accident at which time plant operators take manual action to isolate blow down flow. Engineering personnel were concerned that the current valve positions were such that flow in excess of 500 gallons per minute could pass through the blow down lines from the SX basins. Site personnel immediately isolated blow down flow through the valves and actions were initiated to determine the actual flow rate through the valves in their as found, full open position. Subsequently, it was determined that, in the past, the blow down isolation valves had been throttled in various positions, including full open. These throttling adjustments were performed to maintain acceptable chemistry conditions in the SX basins because the normal chemical addition equipment was not functioning. Through implementation of a special test procedure, site personnel determined that the maximum total potential blow down flow from the SX basins with the isolation valves in the full open position was greater than the 500 gallons per minute assumed in the Byron UHS design makeup analysis. Immediate corrective action taken was to put an administrative control in place that ensures that the total blowdown flow from the SX basins does not exceed the assumptions in the design makeup analysis.

In combination with the previously identified issues, the additional SX blow down flow would have led to an incremental decrease in the time for one SX basin to go dry under the design basis accident conditions. Byron Station had previously determined that the plant operated outside the design basis for the UHS due to excessive silt buildup in the SX basins and the RSH intake bays.

NRC FORM 366A <small>(4-95)</small>		U.S. NUCLEAR REGULATORY COMMISSION							
<b>LICENSEE EVENT REPORT (LER)</b> TEXT CONTINUATION									
FACILITY NAME (1)	DOCKET	LER NUMBER (6) <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: 25%; 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;">04</td> </tr> </table>	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	96 --	019 --	04	PAGE (3)
YEAR	SEQUENTIAL NUMBER	REVISION NUMBER							
96 --	019 --	04							
BYRON NUCLEAR POWER STATION, UNIT 1	05000454		6 OF 14						

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

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

The issue of the SX blow down valves being throttled such that at times the blow down exceeded the 500 gallons per minute assumed in the UHS design basis calculation for SX capability, is a weakness in the understanding of the SX system design basis. The Chemistry department requested the Operating department to throttle these valves to either increase or decrease SX blow down flow. During plant evolutions requiring SX basin water chemistry regulation, the Chemistry department was focused on their role in continued plant performance. Operating focused on manipulating the valves as requested. These station departments failed to recognize the potential for blow down flow in excess of the UFSAR requirement and design analysis assumptions. The Chemistry and Operating departments did not know this key, available information in making the decision to manipulate the SX blow down valves. This is inadequate training/qualifications [ComEd classification] in that no training was provided. Contributing were no written guidance or institutional knowledge providing an operational tie to the UFSAR requirement or design basis calculation for SX makeup capability.

Another related issue is that engineering personnel, when making calculational assumptions, did not consider all possible operating modes (ie failure of the chemical feed system) that could result in the desire for increased blowdown flow. The calculational assumption of 250 gallons per minute flow from each blow down line was based on a value from the Updated Final Safety Analysis Report (UFSAR). This is an inadequate work practice in that a key calculation assumption was not fully communicated to the station and positive administrative controls were not initiated that would ensure that the assumption would be met.

Currently, the blow down isolation valves have been placed in a position that maintains their blow down flow conservative with respect to the design makeup analysis. Administrative control has been implemented by the site to ensure that the maximum allowable blow down flow per the current design analysis assumptions is not exceeded.

**C. CAUSE OF EVENT:**

1. 10/13/96 issue:

- a. Silt accumulation that exceeded the surveillance acceptance criteria in SXCT basins:

The silt build up was generated externally. This natural phenomenon may be due to changing Rock River conditions.

- b. UHS inoperable on past occasions:

Inoperability of the UHS was caused by having poor acceptance criteria in the basin surveillance procedure (defective procedure) and not factoring the allowable silt into the UHS design analysis (personnel error). There was a misunderstanding at Byron Station that operability is not typically affected by Non-Technical Specification surveillances. The expectations for Non-Technical Specification surveillance performance were not as clear as expectations for Technical Specification performance. Non-Technical Specification surveillances were not handled with the same rigor as Technical Specification surveillances. This is an inadequate work practice [ComEd classification] in that available information was not factored into the engineering evaluations.

NRC FORM 366A (4-95)		U.S. NUCLEAR REGULATORY COMMISSION	
LICENSEE EVENT REPORT (LER) TEXT CONTINUATION			
FACILITY NAME (1)	DOCKET	LER NUMBER (6)	PAGE (3)
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	YEAR	SEQUENTIAL NUMBER
		REVISION NUMBER	
		96 -- 019 -- 04	7 OF 14

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

C. CAUSE OF EVENT (cont.)

2. 11/12/96 issue:

- a. Silt buildup and anti-vortex box not considered in engineering calculations:

The engineering calculations did not adequately account for the design configuration of the SX basins nor take into account the possible silt build up in determining the usable volume of water in the UHS. The engineering personnel preparing the calculations did not know of and apply key available information to the design calculations. The personnel error was an inadequate work practice [ComEd classification] in that intended verifications were not performed.

3. 12/05/96 issue:

- a. Silt buildup in River Screen House intake channel:

The silt build up was generated externally. This natural phenomenon may be due to changing Rock River conditions.

- b. Inadequate assurance of SX makeup pump, and ultimately, UHS operability:

An operability assessment performed on 12/04/96 determined that surveillance OBVS SX-5 acceptance criteria were inadequate to assure the UHS operability. The surveillance procedure was inadequate because the surveillance method and acceptance criteria developed by the AE, and reviewed by ComEd Engineering, did not verify an adequate flow path existed from the river channel to the SX makeup pump suction. This resulted in poor surveillance execution practices not being questioned by management. These personnel errors are inadequate work practices [ComEd classification], in that decisions were made without assessing the entire situation.

- c. Engineering failure to question surveillance failures in regards to satisfying design basis criteria:

Failure to maintain a questioning attitude. Based on previous experience, the System Engineer made the decision to accept the surveillance without seeking the facts and evidence objectively. This personnel error is considered an inadequate work practice [ComEd classification].



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019	-- 04	8 OF 14

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

## C. CAUSE OF EVENT (cont.)

## 4. 01/29/97 issue:

- a. SX blow down valves throttled such that at times the blow down exceeded the 500 gallons per minute assumed in the UHS design basis calculation for SX capability:

Weakness in the understanding of the SX system design basis. Chemistry and Operating departments did not know key, available information in making the decision to manipulate the SX blow down valves. This personnel error is considered inadequate training/qualifications [ComEd classification] in that no training was provided. Contributing were no written guidance or institutional knowledge providing an operational tie to the UFSAR requirement or design basis calculation for SX makeup capability.

- b. Engineering personnel not considering all possible operational modes:

In not considering the possible increase in blowdown flow due to the failure of the chemical feed system, Engineering exhibited tunnel vision. The personnel error was an inadequate work practice [ComEd classification] in that a key calculation assumption was not fully communicated to the station and positive administrative controls were not initiated that would ensure that the assumption would be met.

5. Taken jointly these events could be classified as a Management Deficiency or a weakness in Managerial Methods in that the methods allowed approval of proposals/documents without adequate critique or technical review.

## D. SAFETY ANALYSIS:

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

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.

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) includes a two hour time delay for manually aligning the deep well pumps. The two-hour assumption for deep well alignment is considered conservative. This assumption was 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 had been installed on these valves, which would have allowed for a faster valve opening time.

NRC FORM 366A <small>(A 95)</small>		U.S. NUCLEAR REGULATORY COMMISSION										
<b>LICENSEE EVENT REPORT (LER)</b> <b>TEXT CONTINUATION</b>												
FACILITY NAME (1)	DOCKET	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th colspan="3" style="padding: 2px;">LER NUMBER (6)</th> </tr> <tr> <td style="width: 33%; padding: 2px;">YEAR</td> <td style="width: 33%; padding: 2px;">SEQUENTIAL NUMBER</td> <td style="width: 33%; 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;">-- 04</td> </tr> </table>	LER NUMBER (6)			YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	96	-- 019	-- 04	PAGE (3)
LER NUMBER (6)												
YEAR	SEQUENTIAL NUMBER	REVISION NUMBER										
96	-- 019	-- 04										
BYRON NUCLEAR POWER STATION, UNIT 1	05000454		9 OF 14									

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

**D. SAFETY ANALYSIS (cont.)**

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 approximately 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.

The additional issue that was subsequently identified for excessive SX blow down flow shortens the time for the affected SX basin to go dry under design basis conditions. However, the total timeframe for a basin to go dry is still long term and the conclusion that sufficient time exists for operators to take alternative actions to compensate for decreasing basin level is still valid.

With the SX makeup pumps operable (no reliance on the deep well pumps) procedural guidance does not call for blow down isolation. With blow down wide open it is calculated that an SX makeup pump would not be able to match the inventory loss during a design basis accident. Since the Technical Specification UHS basin level with SX makeup pumps operable is fifty percent, minimal water could be lost before a concern would develop.

**E. CORRECTIVE ACTIONS:**

Issue 1a:

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) De-silting and cleaning of the UHS and RSH intake structures was completed in December of 1996.
- e) The inspection frequency for SX Cooling Tower and River Screen House intake structures has been adjusted to quarterly to trend data for determination of an acceptable inspection frequency. (NTS item #454-200-96-0058-11)
- w) A river study by the University of Iowa to evaluate silting concerns is scheduled to begin 7/28/97. (NTS item #454-180-96-0019-07)

Issue 1b:

Corrective Actions:

- c) Additional margin to plant operation has been added by accounting for an acceptable upper limit of silt buildup in the SX basin. A Technical Specification change was submitted to the NRC on 5/6/97 with new basin water level limits. (NTS item #454-201-96-1758-02.1)

NRC FORM 366A (4-95)		U.S. NUCLEAR REGULATORY COMMISSION							
<b>LICENSEE EVENT REPORT (LER)</b> <b>TEXT CONTINUATION</b>									
FACILITY NAME (1)	DOCKET	LER NUMBER (6)	PAGE (3)						
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 25%; padding: 2px; text-align: center;">YEAR</td> <td style="width: 25%; padding: 2px; text-align: center;">SEQUENTIAL NUMBER</td> <td style="width: 50%; padding: 2px; text-align: center;">REVISION NUMBER</td> </tr> <tr> <td style="padding: 2px; text-align: center;">96 --</td> <td style="padding: 2px; text-align: center;">019 --</td> <td style="padding: 2px; text-align: center;">04</td> </tr> </table>	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	96 --	019 --	04	10 OF 14
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER					
96 --	019 --	04							

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

E. CORRECTIVE ACTIONS (cont.)

- d) Silt buildup acceptance criteria in surveillance OBVS SX-5 have been revised to account for UHS basin volumetric requirements, and hydraulic gradient and intake channel water depth with regards to supplying adequate flow to the SX make up pumps.
- i) The SX non-Technical Specification surveillance procedures are being revised for clarification. Sixteen of twenty-six are complete. Eight of the remaining ten are scheduled to be complete by 9/1/97. (NTS item #s 454-200-96-0058-26 through 51)
- j) For consistency, a single guideline for both technical and non-Technical Specification surveillance procedure writing is being developed. This is scheduled for completion by 8/1/97. (NTS item #454-200-96-0058-16)
- k) A review of non-Technical Specification surveillances, to encompass design basis issues, is being performed. This is scheduled for completion by 7/31/97. (NTS item # 454-200-96-0058-04.01 through -04.14)
- l) The Ultimate Heat Sink design basis calculations have been revised to include silt buildup, valve leak-by, basin geometry, the anti-vortex box, increased blow down flow rate, and new scenarios for a two unit shutdown.
- s) SX design basis understanding/knowledge/training is being assessed. This assessment is scheduled to be completed by 12/31/97. (NTS item #s 454-200-96-0058-15, & 20 through 24)
- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

Issue 2a:

Corrective Actions:

- s) SX design basis understanding/knowledge/training is being assessed. This assessment is scheduled to be completed by 12/31/97. (NTS item #s 454-200-96-0058-15, & 20 through 24)
- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

Issue 3a:

Corrective Actions:

- b) De-silting and cleaning of the UHS and UHS intake structures was completed in December of 1996.

NRC FORM 366A <small>(4-95)</small>		U.S. NUCLEAR REGULATORY COMMISSION							
<b>LICENSEE EVENT REPORT (LER)</b> <b>TEXT CONTINUATION</b>									
FACILITY NAME (1)	DOCKET	LER NUMBER (6)	PAGE (3)						
BYRON NUCLEAR POWER STATION, UNIT 1	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="padding: 2px;">96 --</td> <td style="padding: 2px;">019 --</td> <td style="padding: 2px;">04</td> </tr> </table>	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	96 --	019 --	04	11 OF 14
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER					
96 --	019 --	04							

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E. CORRECTIVE ACTIONS (cont.)

- e) The inspection frequency for SX Cooling Tower and River Screen House intake structures has been adjusted to quarterly to trend data for determination of an acceptable inspection frequency. (NTS item #454-200-96-0058-11)

Issue 3b:

Corrective Actions:

- d) Silt buildup acceptance criteria in surveillance OBVS SX-5 have been revised to account for UHS basin volumetric requirements, and hydraulic gradient and intake channel water depth with regards to supplying adequate flow to the SX make up pumps.
- i) The SX non-Technical Specification surveillance procedures are being revised for clarification. Sixteen of twenty-six are complete. Eight of the remaining ten are scheduled to be complete by 9/1/97. (NTS item #s 454-200-96-0058-26 through 51)
- j) For consistency, a single guideline for both technical and non-Technical Specification surveillance procedure writing is being developed. This is scheduled for completion by 8/1/97. (NTS item #454-200-96-0058-16)
- s) SX design basis understanding/knowledge/training is being assessed. This assessment is scheduled to be completed by 12/31/97. (NTS item #s 454-200-96-0058-15, & 20 through 24)
- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

Issue 3c:

Corrective Actions:

- h) Byron station management has issued a letter clarifying expectations for non-Technical Specification and Technical Specification surveillance performance standards.
- i) The SX non-Technical Specification surveillance procedures are being revised for clarification. Sixteen of twenty-six are complete. Eight of the remaining ten are scheduled to be complete by 9/1/97. (NTS item #s 454-200-96-0058-26 through 51)
- k) A review of non-Technical Specification surveillances, to encompass design basis issues, is being performed. This is scheduled for completion by 7/31/97. (NTS item # 454-200-96-0058-04.01 through -04.14)
- s) SX design basis understanding/knowledge/training is being assessed. This assessment is scheduled to be completed by 12/31/97. (NTS item #s 454-200-96-0058-15, & 20 through 24)

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019 --	04	12 OF 14

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

E. CORRECTIVE ACTIONS (cont.)

- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

## Issue 4a:

## Corrective Actions:

- g) Flow through the SX blow down isolation valves has been administratively controlled to ensure that the total blow down flow from the SX basins does not exceed the assumptions in the design makeup analysis.
- k) A review of non-Technical Specification surveillances, to encompass design basis issues, is being performed. This is scheduled for completion by 7/31/97. (NTS item # 454-200-96-0058-04.01 through -04.14)
- o) Testing of SX blowdown has been completed to support administrative control of blowdown flow.
- p) Operating procedure BOP SX-13 is in the process of being revised to incorporate SX blow down valve position/flow information. This is scheduled for completion by 8/1/97. (NTS item #454-200-97-0007-06)
- q) Engineering is evaluating installation of a flow-limiting device in the SX blow down lines. This evaluation is scheduled to be completed by 9/30/97. (NTS item #454-200-97-0007-02)
- s) SX design basis understanding/knowledge/training is being assessed. This assessment is scheduled to be completed by 12/31/97. (NTS item #s 454-200-96-0058-15, & 20 through 24)
- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

## Issue 4b:

## Corrective Actions:

- l) The Ultimate Heat Sink design basis calculations have been revised to include silt buildup, valve leakage, basin geometry, the anti-vortex box, increased blow down flow rate, and new scenarios for a two unit shutdown.
- r) An Updated Final Safety Analysis review for SX issues is being performed. This review is scheduled for completion by 12/15/97. (NTS item #454-180-96-0019-06)
- s) SX design basis understanding/knowledge/training is being assessed. This assessment is scheduled to be completed by 12/31/97. (NTS item #s 454-200-96-0058-15, & 20 through 24)



LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	13 OF 14
		96	-- 019 --	04	

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

E. CORRECTIVE ACTIONS (cont.)

- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

Issue 5:

## Corrective Actions:

- h) Byron station management has issued a letter clarifying expectations for non-Technical Specification and Technical Specification surveillance performance standards.
- i) The SX non-Technical Specification surveillance procedures are being revised for clarification. Sixteen of twenty-six are complete. Eight of the remaining ten are scheduled to be complete by 9/1/97. (NTS item #s 454-200-96-0058-26 through 51)
- j) For consistency, a single guideline for both technical and non-Technical Specification surveillance procedure writing is being developed. This is scheduled for completion by 8/1/97. (NTS item #454-200-96-0058-16)
- m) Periodic SX debriefs with Byron station managers are being conducted.
- n) A multi-disciplinary task force was formed to follow the SX concerns and tracks greater than one hundred SX improvement items.
- t) UFSAR Conformance training is being implemented. The training will inform pertinent site personnel as to their role in and affect on design basis concerns. This training is scheduled to be completed by 1/15/98. (NTS item #454-180-96-0019-03)

Other:

- f) Inspections of SX supplied heat exchangers and other low velocity regions of SX piping has begun and will be completed during the next refueling outages (B1R08 for the U1 and B2R08 for U2). (NTS item #454-180-96-0019-04 and 454-180-96-0019-05)
- u) An initial multi-disciplinary investigation team was formed and investigated the original SX issue. This investigation team generated over fifty Nuclear Tracking System (NTS) improvement items on the SX system.
- v) Following the original problem identification, over one hundred and fifty Problem Identification Forms (PIFs) were initiated to track SX system improvements.

LICENSEE EVENT REPORT (LER)  
TEXT CONTINUATION

FACILITY NAME (1)	DOCKET	LER NUMBER (6)			PAGE (3)
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER	
BYRON NUCLEAR POWER STATION, UNIT 1	05000454	96	-- 019	-- 04	14 OF 14

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

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, CX, 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, 12/05/96, 07/25/95 and 01/29/97). 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.

None of the documents identified were previous Byron LERs.

G. COMPONENT FAILURE DATA:

No Components Failed.