

ACCELERATED DISTRIBUTION DEMONSTRATION SYSTEM

REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 9211300284 DOC. DATE: 92/11/17 NOTARIZED: NO DOCKET #
 FACIL: 50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylvania 05000387
 AUTH. NAME AUTHOR AFFILIATION
 METER, J.J. Pennsylvania Power & Light Co.
 STANLEY, H.G. Pennsylvania Power & Light Co.
 RECIP. NAME RECIPIENT AFFILIATION

SUBJECT: LER 92-016-00: on 920416, failed to modify analysis of loss of Spent Fuel Pool Cooling. Caused by analyses not adequately addressing impacts on Fuel Pool Cooling design analysis. Pertinent sections of FSAR will be revised. W/921117 ltr.

DISTRIBUTION CODE: IE22T COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 7
 TITLE: 50.73/50.9 Licensee Event Report (LER), Incident Rpt, etc.

NOTES: Maxwell, G 05000387

	RECIPIENT ID CODE/NAME	COPIES LTR ENCL	RECIPIENT ID CODE/NAME	COPIES LTR ENCL
	PD1-2 LA	1 1	PD1-2 PD	1 1
	RALEIGH, J.	1 1		
INTERNAL:	ACNW	2 2	ACRS	2 2
	AEOD/DOA	1 1	AEOD/DSP/TPAB	1 1
	AEOD/ROAB/DSP	2 2	NRR/DET/EMEB 7E	1 1
	NRR/DLPQ/LHFB10	1 1	NRR/DLPQ/LPEB10	1 1
	NRR/DOEA/OEAB	1 1	NRR/DREP/PRPB11	2 2
	NRR/DST/SELB 8D	1 1	NRR/DST/SICB8H3	1 1
	NRR/DST/SPLB8D1	1 1	NRR/DST/SRXB 8E	1 1
	<u>REG FILE</u> 02	1 1	RES/DSIR/EIB	1 1
	RGNI FILE 01	1 1		
EXTERNAL:	EG&G BRYCE, J.H	2 2	L ST LOBBY WARD	1 1
	NRC PDR	1 1	NSIC MURPHY, G.A	1 1
	NSIC POORE, W.	1 1	NUDOCS FULL TXT	1 1
NOTES:		1 1		

NOTE TO ALL "RIDS" RECIPIENTS:

PLEASE HELP US TO REDUCE WASTE! CONTACT THE DOCUMENT CONTROL DESK. ROOM P1-37 (EXT. 504-2065) TO ELIMINATE YOUR NAME FROM DISTRIBUTION LISTS FOR DOCUMENTS YOU DON'T NEED!

FULL TEXT CONVERSION REQUIRED
 TOTAL NUMBER OF COPIES REQUIRED: LTR 32 ENCL 32

AD4

R
I
D
S
/
A
D
D
S

R
I
D
S
/
A
D
D
S



Pennsylvania Power & Light Company

Two North Ninth Street • Allentown, PA 18101 • 215 / 770-5151

November 17, 1992

U.S. Nuclear Regulatory Commission
Document Control Desk
Washington, DC 20555

SUSQUEHANNA STEAM ELECTRIC STATION
LICENSEE EVENT REPORT 92-016-00
FILE R41-2
PLAS -546

Docket No. 50-387
License No. NPF-14

Attached is Licensee Event Report 92-016-00. Although it was determined that this condition is not reportable, this voluntary report is being submitted to provide the Commission with information about the Station's Spent Fuel Storage Pools.

TC Healy for

H.G. Stanley
Superintendent of Plant - Susquehanna

JJM/mjm

cc: Mr. T. T. Martin
Regional Administrator, Region I
U.S. Nuclear Regulatory Commission
475 Allendale Road
King of Prussia, PA 19406

Mr. G. S. Barber
Sr. Resident Inspector
U.S. Nuclear Regulatory Commission
P.O. Box 35
Berwick, PA 18603-0035

500240

TE 22
11

LICENSEE EVENT REPORT (LER)

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-630), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) **Susquehanna Steam Electric Station - Unit 1** DOCKET NUMBER (2) **0 5 0 0 0 3 8 7** PAGE (3) **1 OF 0 6**

TITLE (4) **Voluntary Report - Spent Fuel Storage Pools**

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 NAMES		DOCKET NUMBER(S)																	
1	0	2	0	9	2	9	2	0	1	6	0	0	1	1	7	9	2	SSES - Unit 2	0	5	0	0	0	3	8	8		

OPERATING MODE (9) **5** THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR §: (Check one or more of the following) (11)

20.402(b)	20.405(c)	50.73(a)(2)(iv)	73.71(b)
20.405(a)(1)(i)	50.36(c)(1)	50.73(a)(2)(v)	73.71(c)
20.405(a)(1)(ii)	50.36(c)(2)	50.73(a)(2)(vii)	<input checked="" type="checkbox"/> OTHER (Specify in Abstract below and in Text, NRC Form 366A)
20.405(a)(1)(iii)	50.73(a)(2)(ii)	50.73(a)(2)(viii)(A)	Voluntary
20.405(a)(1)(iv)	50.73(a)(2)(iii)	50.73(a)(2)(viii)(B)	
20.405(a)(1)(v)	50.73(a)(2)(iii)	50.73(a)(2)(ix)	

LICENSEE CONTACT FOR THIS LER (12)

NAME	TELEPHONE NUMBER
J. J. Meter - Power Production Engineer	7 1 7 5 4 2 - 1 8 7 3

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

CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS	CAUSE	SYSTEM	COMPONENT	MANUFACTURER	REPORTABLE TO NPRDS

SUPPLEMENTAL REPORT EXPECTED (14)

YES (If yes, complete EXPECTED SUBMISSION DATE) NO

EXPECTED SUBMISSION DATE (15)	MONTH	DAY	YEAR

ABSTRACT (Limit to 1400 spaces, i.e., approximately fifteen single space typewritten lines) (16)

On April 16, 1992, Engineers were performing evaluations as part of the future uprated licensed power project. Concerns were raised that the existing analysis for the Station's two Spent Fuel Storage Pools did not reflect the current fuel design and operation of the plant. Additional concerns centered around the ability to re-establish Fuel Pool Cooling (FPC) and Fuel Pool makeup if Fuel Pool Cooling is lost. The concerns were documented on an Engineering Discrepancy Report and subsequently evaluated. The event was determined not to be reportable per 10CFR50.72, 50.73. Fuel design and plant operational changes made in association with spent fuel storage were not reflected in the station's Final Safety Analysis Report (FSAR) but were determined to be bounded by the existing design basis. The consequences of the loss of Fuel Pool Cooling were determined to be satisfactory for the design basis loss of FPC. The long term effects of the loss of FPC for events involving Loss of Cooling Accidents (LOCA's) and Loss of Offsite Power (LOOP's) are beyond the design basis analysis. Additional analyses are planned to further quantify the effects of the beyond design basis scenarios.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2) 0 5 0 0 0 3 8 7	LER NUMBER (6) 9 2 - 0 1 6			PAGE (3) - 0 0 0 2 OF 0 6		
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER			

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

BACKGROUND

The relevant design bases requirements for the Susquehanna Steam Electric Station's (SSES) Fuel Pool Cooling Systems (FPCS) (EIIS CODE:DA) are found in subsection 9.1.3 of the Station's Final Safety Analysis Report (FSAR). They include:

1. Maintain the fuel pool water temperature below 125°F under "normal maximum heat loads" (MNHL) which is defined as 12.6 MBtu/hr.
2. Maintain fuel pool water temperature at or below 125°F during the "emergency heat load" condition equivalent to a full core offload 10.5 days after a shutdown following a typical fuel cycle discharge which fills the fuel pool. This is accomplished by utilizing the Residual Heat Removal (RHR) (EIIS CODE:CE) system (with or without normal fuel pool cooling) for fuel pool cooling. This mode of operation applies "during periods of higher than MNHL generation in the fuel pool, eg., storing of a full core of irradiated fuel shortly after shutdown". The RHR system is used under these conditions to assist the FPCS in dissipating the decay heat.
3. Redundant Seismic Category I Emergency Service Water (ESW) (EIIS CODE:BI) connections to each pool are provided to allow for makeup of evaporative losses in the event of failure of the FPC system.
4. The design basis cause of loss of Fuel Pool Cooling is a seismic event.

The Station's design response to a complete loss of Fuel Pool Cooling due to a Seismic Event is to allow the Fuel Pool to boil with inventory makeup provided from a safety related source, the Emergency Service water (ESW) System. The analysis for this event is documented in Appendix 9A of the FSAR.

During a typical refueling outage, all fuel assemblies are removed from the reactor and placed in the Spent Fuel Pool. This provides for greater control of the core reassembly by lessening the chance of misloading a fuel assembly. Complete core offload/reloads also provide greater control of Shutdown Margin and allow for flexibility while performing system maintenance. This however, also places a greater heat removal burden on the FPCS than originally planned when approximately one quarter of a core was to be offloaded and the remaining fuel shuffled as

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2) 0 5 0 0 0 3 8 7	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 2	- 0 1 6	- 0 0	0 3	OF 0 6

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

needed. Typical outage practice is to maintain one loop of RHR in shutdown cooling until the following two conditions are met: All fuel is removed and the decay heat load of the fuel is less than the capability of the Fuel Pool Cooling System. At this time with the refuel gates removed, the Rx Cavity and Fuel pool are crosstied. This provides a substantial increase in water volume thereby delaying the onset of boiling should all cooling be lost.

EVENT

On April 16, 1992, Engineers (contractor, non-licensed) were performing evaluations as part of the future uprated licensed power project (Power Uprate Project). The Engineers questioned the adequacy of the existing analysis for the Station's two Spent Fuel Storage Pools. Additional concerns with respect to the ability to re-establish Fuel Pool Cooling and Fuel Pool makeup following postulated accident conditions were also raised. The concerns were documented on an Engineering Discrepancy Report (EDR) which was then subjected to a screening process. Several evaluations have been performed to establish the safety significance of the issues raised. As a result, reviewing, evaluating and dispositioning the EDR required several months to complete. The EDR identifies nine specific concerns. The concerns focus on these three main areas:

- 1) Fuel design and plant operational changes are not reflected in the FSAR analysis. Subsequent analysis has shown that current practice is bounded by the design basis analysis.
- 2) The long-term effects of increased evaporation rates that a boiling Spent Fuel Pool could create.
- 3) The Susquehanna design basis analyses do not consider that a loss of Fuel Pool Cooling event could be caused by other than a seismic event. The EDR identifies concerns associated with a LOCA or LOCA/LOOP type event and the ability to provide Fuel Pool Cooling following such events. It should be noted that consideration of this specific scenario was beyond the design basis of the Fuel Pool.

Concerns Associated with Fuel Design and Operational Changes

The fuel pool boiling and radiological release analyses in the FSAR are dependent on fuel design parameters and operating practices. The FSAR analysis is based on the original fuel design (8 x 8 fuel, 12 month fuel cycle, 1/4 core reloads)

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 60.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2) 0 5 0 0 0 3 8 7	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
		9 2	- 0 1 6	- 0 0	0 4	OF 0 6

TEXT (If more space is required, use additional NRC Form 386A's) (17)

whereas the current fuel design is 9 x 9 fuel, 18 month fuel cycle, 1/3 core reloads. The FSAR assumes refueling is accomplished by shuffling fuel within the reactor core whereas current SSES practice is to fully offload the core and then reload. Review of these concerns has shown that current plant conditions remain within the bounds of the original FSAR analysis.

Concerns Associated with Fuel Pool Boiling

Two concerns were raised regarding the long-term effects imposed on the reactor building environment by the increase in evaporation from the fuel pools subsequent to loss of Fuel Pool cooling. The increased evaporation imposes additional long-term heat loads on the reactor building and the water mass resulting from condensation of this moisture could accumulate within the reactor building structure.

Although a loss of Fuel Pool Cooling event could result from several conditions, the design basis condition is a seismic event as analyzed in the FSAR. The Fuel Pool Cooling system is not designed for seismic loads. In this case, the Fuel Pool Cooling system is assumed to be damaged and unavailable for cooling the Fuel Pool. The design basis plant response is analyzed for the radiological consequences of this event, that is, allowing the fuel pool to boil with makeup supplied by ESW. Resulting offsite doses are calculated to be well within required limits and adequate makeup to maintain the fuel covered with water is assured. Evaluation of the effects of increased evaporation and condensation on the reactor building was beyond the original design basis considered for the Fuel Pool Cooling system. Operation of SGTS is anticipated under these conditions, however, the offsite dose analysis for Fuel Pool boiling takes no credit for SGTS.

Other scenarios beyond the design basis loss of Fuel Pool Cooling event which could cause a short-term loss of Fuel Pool Cooling include postulated LOCA and LOOP events. Although they are clearly beyond the current design basis for the Fuel Pool Cooling system, evaluations are ongoing in order to determine the need for any subsequent actions.

CAUSE OF EVENT

The causes of the failure to modify the analysis of loss of Spent Fuel Pool Cooling as documented in the FSAR are: 1) Susquehanna's reload analyses did not adequately address impacts on the Fuel Pool Cooling design analysis, in part because of lack

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 50.0 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2) 0 5 0 0 0 3 8 7 9 2	LER NUMBER (6)			PAGE (3)	
		YEAR	SEQUENTIAL NUMBER	REVISION NUMBER		
			0 1 6	0 0	0 5	OF 0 6

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

of adequate involvement of system design engineers in reviewing the analysis of reloads. 2) Review of changes in operating modes, full core offload as a normal practice, did not identify the need to revise the FSAR analysis.

The concerns involving consequences from a LOCA or LOCA/LOOP event have arisen due to design basis reviews associated with the Station's Power Uprate Project. The concerns were not reviewed as part of the original plant design because they were considered to be beyond the design basis for the Fuel Pool Cooling system.

REPORTABILITY/ANALYSIS

The event was determined not to be reportable under the requirements of the Code of Federal Regulations, Chapter 10 Parts 50.72, 50.73. The operational changes made in association with Spent Fuel storage were not reflected in the Station's FSAR, but were found to be within the design basis for the plant. Using inputs that reflect the current design and operation of the plant, analysis of the pertinent design licensing requirements of the Fuel Pool Cooling System have shown that the Station has not operated outside the licensing basis. More specifically, current operation is bounded by the FSAR analysis results for both decay heat load and offsite dose. The concerns associated with a LOCA or LOCA/LOOP event concurrent with a loss of Fuel Pool Cooling have been determined to lie beyond the design and licensing bases.

It was also determined that boiling of the Fuel Pool was considered only because of a pre-licensing docketed decision to reclassify the Fuel Pool Cooling System as Non-Seismic Category I. In order for this to be approved, fuel pool boiling was required to be assumed for a seismic event, and the resulting offsite dose calculated. Similar conditions were not required to be applied to the Fuel Pool Cooling system under LOOP or LOCA scenarios.

The current evaluation of reportability and operability considerations for these matters was completed on 10/21/92. The evaluation concluded that the design basis loss of fuel pool cooling, as currently designed and analyzed, is acceptable. This is a continual process that will be revisited as pertinent information becomes available.

Although the event was determined not to be reportable, this voluntary report is being submitted to the Commission for informational purposes. Lessons learned in association with event could be useful to the rest of the industry.

LICENSEE EVENT REPORT (LER)
TEXT CONTINUATION

ESTIMATED BURDEN PER RESPONSE TO COMPLY WITH THIS INFORMATION COLLECTION REQUEST: 500 HRS. FORWARD COMMENTS REGARDING BURDEN ESTIMATE TO THE RECORDS AND REPORTS MANAGEMENT BRANCH (P-530), U.S. NUCLEAR REGULATORY COMMISSION, WASHINGTON, DC 20555, AND TO THE PAPERWORK REDUCTION PROJECT (3150-0104), OFFICE OF MANAGEMENT AND BUDGET, WASHINGTON, DC 20503.

FACILITY NAME (1) Unit 1 Susquehanna Steam Electric Station	DOCKET NUMBER (2) 0 5 0 0 0 3 8 7	LER NUMBER (6)			PAGE (3)	
		YEAR 9 2	SEQUENTIAL NUMBER - 0 1 6	REVISION NUMBER - 0 0	0 6	OF 0 6

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

CORRECTIVE ACTIONS

Pertinent sections of the FSAR will be revised to account for changes that have been made to the design of the fuel, fuel cycle operation, and the operational modes of the spent fuel pools.

Procedural and process changes associated with fuel reload design will be made to ensure the impact to other systems is addressed for future reloads.

A review will be completed to identify any additional areas where changes associated with fuel reload design might impact the design of other systems not currently addressed.

Additional analyses are planned to further quantify the effects of evaporation and boiling conditions on the refueling floor atmosphere and the potential transport of moist air to other locations in the reactor building for conditions beyond the current Fuel Pool Cooling system design basis.

Procedures as well as operator training will be developed or modified to provide better guidance to the operators in monitoring the spent fuel pool, reestablishing make-up to the pool, and reestablishing fuel pool cooling should it be lost. Modifications, including improved instrumentation for monitoring of the fuel pool from the main control room are also under evaluation.

ADDITIONAL INFORMATION

None