REGULATORY INFORMATION DISTRIBUTION SYSTEM (RIDS)

ACCESSION NBR: 8704140297 DOC. DATE: 87/04/06 NOTARIZED: NO DOCKET #
FACIL: 50-387 Susquehanna Steam Electric Station, Unit 1, Pennsylva 05000387
50-388 Susquehanna Steam Electric Station, Unit 2, Pennsylva 05000388
AUTH. NAME AUTHOR AFFILIATION
KEISER, H. W. Pennsylvania Power & Light Co.
RECIP. NAME RECIPIENT AFFILIATION
ADENSAM, E. BWR Project Directorate 3

SUBJECT: Forwards proof of adequacy rept re standby liquid control, alternate rod injection & reactor recirculation pump trip sys per 10CFR50.62(c)(6). Rept describes specific ATWS design & addresses applicable conditions stated in NRC SER.

DISTRIBUTION CODE: A055D COPIES RECEIVED: LTR 1 ENCL 1 SIZE: 12
TITLE: OR/Licensing Submittal: Salem ATWS Events GL-83-28

NOTES: 1cy NMSS/FCAF/PM. LPDR 2cys Transcripts. 05000387
1cy NMSS/FCAF/PM. LPDR 2cys Transcripts. 05000388

	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL	RECIPIENT ID CODE/NAME	COPIES LTTR	COPIES ENCL
	PD1-2 LA	1	0	PD1-2 PD	3	3
	THADANI, M	1	1			
INTERNAL:	ACRS	6	6	ADM/LFMB	1	0
	NRR LASHER, D	1	1	NRR/ADT	1	0
	NRR/DEST/ICSB	1	1	NRR/DEST/PSB	1	0
	NRR/DEST/RSB	1	1	NRR/DLPQ/QAB	1	0
	NRR/DOEA/GCB	1	0	NRR/PMAS/ILRB	1	0
	NRR/PMAS/PMSB	1	0	OGC/HDS2	1	0
	REG FILE 01	1	1			
EXTERNAL:	LPDR	2	2	NRC PDR	1	1
	NSIC	1	1			
NOTES:		3	3			

TOTAL NUMBER OF COPIES REQUIRED: LTTR 30 ENCL 21

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

PP&L Pennsylvania Power & Light Company
Two North Ninth Street • Allentown, PA 18101 • 215 / 770-5151

APR 0 6 1987

Harold W. Keiser
Vice President-Nuclear Operations
215/770-7502

Ms. E. Adensam, Project Director
Director of Nuclear Reactor Regulation
BWR Project Directorate No. 3
Division of BWR Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUSQUEHANNA STEAM ELECTRIC STATION
ATWS RULE - PROOF OF ADEQUACY
PLA-2833 FILE A17-20A & P10

Docket Nos. 50-387/NPF-14
and 50-388/NPF-22

Dear Ms. Adensam:

Pursuant to 10CFR50.62(c)(6), attached please find a report which demonstrates the adequacy of Susquehanna Units 1 and 2 Standby Liquid Control (SLC) system, Alternate Rod Injection (ARI) system, and Reactor Recirculation Pump Trip (RPT) system.

Pennsylvania Power & Light Co. participated in the BWR Owners Group ATWS Compliance Alternatives Subcommittee and endorses Licensing Topical Report (LTR) NEDE-31096-A, entitled "Anticipated Transients Without Scram; Response to NRC ATWS Rule, 10CFR50.62." The attached report describes the specific ATWS design for Susquehanna Units 1 and 2, and address applicable conditions stated in the NRC staff's safety evaluation report for the LTR.

This letter in conjunction with PLA-2536 dated November 9, 1985, which detailed PP&L's implementation schedule for the ATWS modifications, completes the required submittals delineated in 10CFR50.62.

If you have any questions, please contact D. J. Walters at (215) 770-6536.

Very truly yours,

for H. W. Keiser
Vice President - Nuclear Operations

Attachment

cc: NRC Document Control Desk (original)
NRC Region I
Mr. L. R. Plisco - Resident Inspector
Mr. M. C. Thadani - Resident Manager

A055
1/1

ATWS

PROOF OF ADEQUACY

SUSQUEHANNA STEAM ELECTRIC STATION

[illegible]

[illegible]

STANDBY LIQUID CONTROL (SLC)

10CFR50.62 requires all BWR's have a Standby Liquid Control (SLC) system with a minimum flow capacity and boron content equivalent in control capacity to 86 gallons per minute of 13 weight percent sodium pentaborate solution. To meet this requirement, PP&L has opted to modify the existing Susquehanna SLC systems to make them two pump systems as described in Licensing Topical Report (LTR) NEDE-31096-A. As further described in the LTR, equivalency is achieved by manipulating pump flow and the concentration of sodium pentaborate. For Susquehanna, the minimum allowable SLC pump flow is 41.2 gallons per minute per pump and for purposes of meeting 10CFR50.62, the minimum allowable sodium pentaborate concentration is established as 13.6%.

The minimum pump discharge pressure for two pump operation is consistent with the SLC system component design pressures for rated flow. System pressure drop calculations were performed to determine the pressures arising from increased flow velocities attributable to two pump flow. All affected components were reviewed in light of these new pressures with the result being a new setting for the SLC pump discharge relief valves. Additionally, each SLC pump has been provided with its own separate suction line to assure net positive suction head at the increased flow resulting from two pump operations.

Precipitation temperatures were calculated for the minimum and maximum sodium pentaborate concentrations. All heat tracing and tank heater temperature settings were reviewed and as appropriate these settings were reset to accommodate the new temperature. Additionally, a heat trace trouble alarm has been incorporated in the main control room.

ALTERNATE ROD INJECTION (ARI)

The Susquehanna SES ARI design meets or exceeds the design requirements of the ATWS Licensing Topical Report NEDE-31096-A. The design also meets or exceeds the design requirements found acceptable by the NRC in the staff safety evaluation of the generic ARI design.

The following checklist (from the SER Appendix A) and comments provide details on ARI conformance. Specifically, the checklist deals with design considerations discussed in the SER. The Susquehanna FSAR will be revised to include a description of the ARI design, including detailed discussions on conformance to applicable design criteria, Reg. Guides, industry standards, and the reference Licensing Topical Report. The FSAR update will be incorporated effective with installation of ARI into Unit 1.

APPENDIX A CHECKLIST FOR PLANT SPECIFIC REVIEW OF ALTERNATE ROD INJECTION SYSTEM (ARI)

	Conformance with ARI SER
1. ARI system function time	
Rod injection motion will begin within 15 seconds and be completed within 25 seconds from ARI initiation	YES
Comment	
ARI has been designed to meet the scram time criteria. Scram time performance will be confirmed by testing the completed system.	
2. Safety-related requirements	
(a) Class 1E isolators are used to interface with safety-related systems	N/A
(b) Class 1E isolators are powered from a Class 1E source	N/A
(C) Isolator qualification documents are available for staff audit	N/A
Comment	
ARI is designed as a safety-related Class 1E system with 1E power sources in accordance with existing electrical separation criteria. No special isolation devices are required to maintain separation between ARI and other Class 1E systems.	
3. Redundancy	
The ARI system performs a function redundant to the backup scram system.	YES

Conformance with ARI SER

Comment

The ARI trip system uses divisionally separate pairs of scram air header vent and block valves. These valves and their associated trip systems perform a function redundant to the RPS backup scram valves. Design redundancy exists between ARI and the RPS trip system. No single failure can disable both ARI and RPS.

4. **Diversity from existing RTS**

(a) ARI system is energize-to-function — YES

(b) ARI system uses DC powered valves — YES

(c) Instrument channel component (excluding sensors but including all signal conditioning and isolation devices) are diverse from the existing RTS components. — YES

Comment

ARI uses the existing ATWS Recirculation Pump Trip (ATWS-RPT) instruments for automatic initiation. All trip system components, except for Reactor Steam Dome pressure sensors, are diverse from components used for RPS actuation.

5. **Electrical independence from the existing RTS**

(a) ARI actuation logic separate from RTS logic — YES

(b) ARI circuits are isolated from safety-related circuits — N/A

Comment

ARI is fully independent of the RPS trip system, except for use of common instrument sensing lines. No isolation devices are required to maintain ARI and RPS trip system independence.

6. **Physical separation from the existing RTS**

(a) ARI system is physically separated from RTS — YES

Comment

To the extent possible, ARI is physically separate from RPS. The ARI system will not affect the physical separation of redundant channels within RPS. Per FSAR Section 7.2 the redundant trip channels within RPS

Conformance with ARI SER

are physically separated from each other. Therefore no single physical impact event can result in the loss of scram capability. In addition ARI avoids all jet impingement and missile hazard areas.

7. **Environmental Qualification**

ARI equipments are qualified to conditions during an ATWS event up to the time the ARI function is completed YES

Comment

ARI is designed to complete its safety-related function within 25 seconds of detection of an ATWS condition. The environment in which the system will perform its safety function will not change from the normal conditions. Therefore, environmental qualification per 10CFR50.49 is not required. All system components are designed to function in the expected normal operating environment.

ARI is qualified for anticipated operational dynamic occurrences - Operating Basis Earthquakes and SRV Dynamics, and is qualified for ATWS induced dynamic loads.

8. **Quality Assurance**

(a) Comply with Generic Letter 85-06 YES

Comment

ARI is designed as a Class 1E trip system. The QA requirements of 10CFR50 Appendix B therefore apply.

9. **Safety-related power supply**

(a) ARI system power independent from RTS YES

(b) ARI system can perform its function during any loss-of-offsite power event YES

Comment

ARI is powered from Class 1E station batteries, and is continuously available during any loss-of-offsite power event. ARI system power is independent from the power used for RPS system logic and scram pilot solenoid valve actuation power.

10. **Testability at Power**

(a) ARI testable at power YES

Conformance with ARI SER

(b) Bypass features conform to bypass criteria used in RTS — YES

Comment

ARI is fully testable from sensor to pilot solenoid valves while at power, without the need for ARI system bypasses. Because the system shares sensors with the ATWS-RPT system, bypasses are provided to prevent a trip of the redundant ATWS-RPT system. Optional bypasses are provided for additional protection against spurious ARI actuation during surveillance testing while at power.

Both system bypasses are effected through keylock controlled switches, and both are continuously alarmed in the main control room.

11. Inadvertent Actuation

(a) ARI Actuation setpoints will not challenge scram — YES

(b) Coincident logic is utilized in ARI design — YES

Comment

ARI actuation setpoints are established such that a RPS trip is expected prior to an ARI actuation. In addition, the ARI design protects against spurious trips in the event of any single component failure or operator error. Coincident logic is employed for each ARI trip system, and coincident trip system actuation is required for an ARI scram.

See also COMMENT under Testability. (Item 10.)

12. Manual Initiation

(a) Manual initiation capability is provided. — YES

Comment

ARI is capable of being manually initiated from the main control room. Armed pushbutton switches are provided adjacent to Standby Liquid Control System and Control Rod Drive System controls.

13. Information Readout

(a) Information readout is provided in main control room — YES

Conformance
with ARI SER

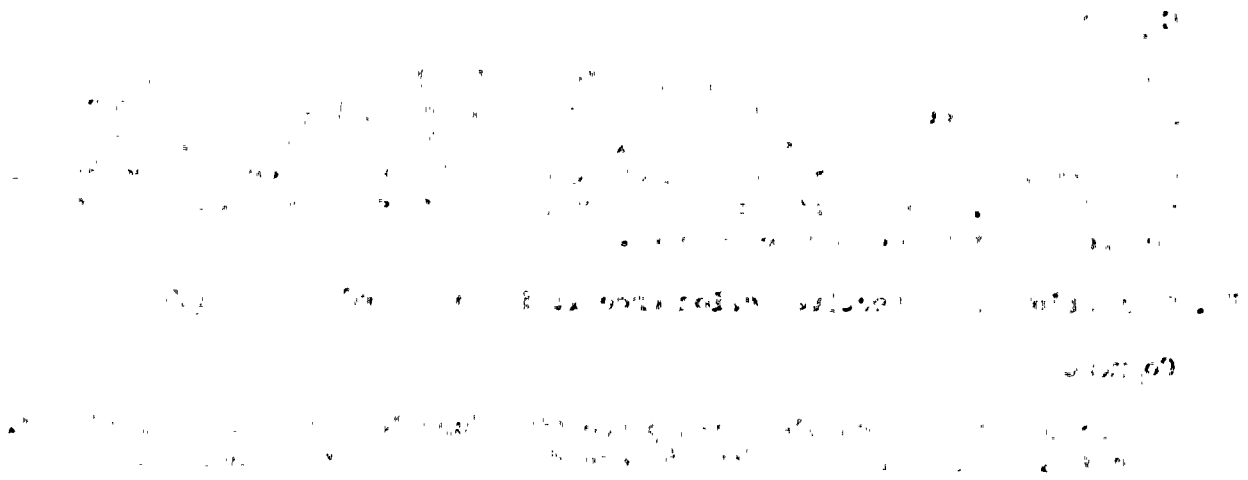
Comment

ARI system status is indicated and alarmed in the main control room. Alarms are produced on system trip, ARI trip system bypass, and ATWS-RPT system bypass. Each pilot solenoid valves position is indicated in the main control room. Verification of successful scram is determined by normal means. The plant computer system and transient monitoring system record ARI trip sequence of events.

14. Completion of protective action once it is initiated YES

Comment

ARI is designed to complete its protective function once it is initiated. Manual reset is inhibited for 25 seconds following system actuation.



REACTOR RECIRCULATION PUMP TRIP (RPT)

The SSES ATWS-RPT design meets or exceeds the design requirements and methods of compliance with those requirements as described in Licensing Topical Report (LTR), NEDE-31096-A.

The SSES ATWS-RPT trip system design conforms to the standard Monticello design as described in Section 4 of the LTR. The SSES design is a divisionally separate and redundant Class 1E trip system with coincident two out of two trip channel actuation required for a Recirculation Pump Trip under ATWS conditions. The redundant trip logic is tolerant of single active component failures.

The ATWS-RPT design was installed for Susquehanna Units 1 and 2 in 1982, during each Units' construction phase. The resulting design, with which each unit was licensed, utilizes the End of Cycle Recirculation Pump Trip (EOC-RPT) breakers via separate, but non-isolated, trip coils.

The association between the EOC-RPT and ATWS-RPT trip systems does not degrade either systems' ability to perform its safety function, nor does this association degrade the independence of the ATWS trip systems and the Reactor Protection System (RPS).

The ATWS trip systems (ARI and ATWS-RPT) are provided as diverse means for producing a rapid shutdown of the reactor in the event that RPS fails to do so. Neither ATWS trip system provides redundancy to the EOC-RPT function. Since the EOC-RPT and ATWS-RPT functions are not redundant to each other, functional independence between the trip systems is not required.

Single active component failures within the ATWS-RPT system cannot affect more than a single division of the EOC-RPT system. The same fault may affect the operation of a single backup scram pilot valve via their common power supply. However, each system is divisionally redundant, so that full capability will remain in each of these systems in spite of the active component failure.

The primary reactor scram function of RPS will not be affected by faults in the ATWS-RPT system because of their separation and diversity of operating principle. Neither will any failure of the primary reactor scram function, or any single failure in the EOC-RPT or backup scram pilot valve circuitry, affect the ability of the ATWS-RPT system from performing its safety related function.

Isolation between the ATWS-RPT and EOC-RPT trip systems serves no design purpose and is therefore not required for the Susquehanna design.

djwmec165a