52-003

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 7, 1996

Mr. Nicholas J. Liparulo, Manager
Nuclear Safety and Regulatory Activities
Nuclear and Advanced Technology Division
Westinghouse Electric Corporation
P.O. Box 355
Pittsburgh, Pennsylvania 15230

SUBJECT: FOLLOWON INFORMATION CONCERNING THE AP600 PROBABILISTIC RISK ASSESSMENT (PRA)

Dear Mr. Liparulo:

As a result of its review of the June 1992 application for design certification of the AP600, the staff determined that it needed additional information in order to complete its review. The staff issued a request for additional information (RAI) concerning the level 1 PRA as documented in a letter dated April 22, 1996, to Westinghouse. The purpose of this letter is to transmit information to Westinghouse to enable it to better answer one of the RAIs in the April 22, 1996, letter.

Specifically, question 720.333 revolves around common cause failures for check valves. A portion of the RAI states "An NRC-sponsored evaluation of LER and NPRDS events, which occurred between 1980 and 1993, at operating nuclear power plants, has found about twenty (20) events involving common cause failure of check valves. Such events should be reviewed for applicability to the AP600 design. Please state the AP600 design and operational features which ensure that such events cannot occur with the AP600 check valves."

Enclosure 1 is the licensee event report (LER) portion of the database that is mentioned above. An explanation of the database that was used to develop the above information can be found in a 6 volume set that was prepared for the NRC's Office for Analysis and Evaluation of Operational Data by Idaho National Engineering Laboratory (INEL). The title of the documents are INEL-94/0064 "Common-Cause Failure Data Collection and Analysis System." The six volumes in the series are publicly available and are titled as follows:

Volume 1 - Common-Cause Failure Project Overview,

Volume 2 - Definition and Classification of Common-Cause Failure Events,

Volume 3 - Data Collection and Coding Common-Cause Failure Events,

Volume 4 - CCF Database Reference Manual,

090075

DF01

Volume 5 - Procedure for Analyzing Common Cause Failure Events in Reliability and Risk Studies,

Volume 6 - Common-Cause Failure Parameter Estimations.

The nuclear plant reliability data system (NPRDS) portion of the database is proprietary and is currently unavailable for use by Westinghouse. However, as stated in the RAI there were 20 events overall, of which 12 were from the NPRDS database. The NPRDS database entries involved common cause failure of the check valves due to improper maintenance, improper design, flow oscillation induced failure, concentrated boric acid solidification inside the valves, buildup of corrosion products resulting in the valves sticking closed, and low flow caused by binding of the flap in the valves. If you have any additional questions concerning the database please call me at (301) 415-1132.

Sincerely,

original signed by:

Joseph M. Sebrosky, Project Manager
Standardization Project Directorate
Division of Reactor Program Management
Office of Nuclear Reactor Regulation

Docket No. 52-003

Enclosure: As stated

cc w/enclosure:
See next page

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DOCUMENT NAME: A:PRA INFO (4D AP600 DISK) *See previous concurrence

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Mr. Nicholas J. Liparulo
Westinghouse Electric Corporation

Docket No. 52-003
AP600

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Qualified Events Report

Total Records Found : 20

Name / Plant	Description / Component	Fail Mode	F Mode Applic	Prox Caus	Time Del.	Coupl Fact	Coupl Str.	Shk Typ	Comp Code	CCCG Size	Oper Stat	Evt Type	Evt Lev	Def Mec
L-255-90-1893-VO	HI PRESS INJ HOT LEG INJ CHECK VALVES FAIL FULL FLOW TEST													
PALISADES			1.00	1.00	1.00	----	----	----	----	----	----	----	----	----
0% HPI	VO	1.00	DE	1.00	HDSC	1.00	L	CKV	3	BOD	CCF	SYS	MAI	
L-272-81-2048-VO	AFW STEAM SUPPLY CHECK VLVS DAMAGED DUE TO VALVE CYCLING													
SALEM 1			1.00	1.00	1.00	1.00	----	----	----	----	----	----	----	----
---% AFW	VO	1.00	DE	1.00	HDSC	1.00	L	CKV	4	BOD	CCF	SYS	MAI	
L-289-80-1894-VO	LOOSE PARTS IN HI PRESS INJECTION CHECK VALVES.													
THREE MILE ISLND			0.50	0.50	0.00	0.00	----	----	----	----	----	----	----	----
0% HPI	VO	1.00	IC	1.00	HDCP	1.00	NL	CKV	4	BOD	CCF	SYS	MAI	
L-324-80-1940-VO	RCIC/HPCI TURBINE EXHAUST CHECK VLVS LOCKED CLOSED.													
BRUNSWICK 2			1.00	1.00	----	----	----	----	----	----	----	----	----	----
0% HCI	VO	1.00	MA	1.00	OOOS	1.00	NL	CKS	2	BOD	CCF	SYS	MAI	
L-338-81-2050-VO	AUX FEED WATER PUMP STEAM SUPPLY CHECK VALVES, PARTS MISSING													
NORTH ANNA 1			1.00	1.00	1.00	----	----	----	----	----	----	----	----	----
---% AFW	VO	1.00	IC	1.00	OMTC	1.00	NL	CKV	3	BOD	CCF	SYS	MAI	
L-346-82-1897-VO	HI PRESS SAFETY INJ STOP CHECK VALVES STICKING CLOSED.													
DAVIS-BESSE 1			1.00	1.00	1.00	0.00	----	----	----	----	----	----	----	----
0% HPI	VO	1.00	DE	1.00	HDCP	1.00	NL	CKS	4	BOD	CCF	SYS	MON	
L-368-81-2053-VO	AFW PUMP STEAM SUPPLY CK VLVS INTERNAL DAMAGE, MISSING PARTS													
ARKANSAS 2			1.00	1.00	0.00	0.00	----	----	----	----	----	----	----	----
---% AFW	VO	1.00	DM	1.00	HQMM	1.00	NL	CKV	4	BOO	CCF	SYS	MAI	
L-395-86-2054-VO	POTENTIAL FAILURE OF AFW CHECK VALVES MISSING TACK WELDS.													
SUMMER 1			0.10	0.10	0.10	0.10	0.10	0.10	0.10	----	----	----	----	----
100% AFW	VO	1.00	DM	1.00	HQMM	1.00	L	CKV	7	BOO	CCF	SYS	MON	

Enclosure 1

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :		Component Type	: @	Shock Type	:
Plant Name :		Failure Mode	: VO	Operat. Status	:
Plant Type :		Proximate Cause	:	Event Type	:
System :		Coupling Factor	:	Event Level	:

Name	L-255-90-1893-VO	Plant	PALISADES		Power	0%	
System	HPI	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKV	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MAI
Shock Type	L	Prox Cause	DE	Oper Status	BOO		
CCCG Size	3	Coupl Factor	HDSC	Event Type	CCF		

Description HI PRESS INJ HOT LEG INJ CHECK VALVES FAIL FULL FLOW TEST

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	1.00	1990/09/30	--:--:--	9		----	----/--/--	--:--:--
2	X	1.00	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	1.00	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4		----	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

LER#: 255-90-018.

EVENT TEXT: Since the CVs were replaced with swing check valves, assumed a design error in the application of the CV.

09/30/90

POWER LEVEL - 000%. ON SEPTEMBER 30, 1990, AT 1632 HOURS THE PLANT WAS SHUTDOWN AND ON SHUTDOWN COOLING. THE SURVEILLANCE TEST RO-65, HPSI/RHPSI CHECK VALVE TEST, WHICH PROVIDES FOR FULL STROKE TESTING OF CERTAIN HIGH PRESSURE SAFETY INJECTION (HPSI) PUMP SUCTION AND DISCHARGE CHECK VALVES AND THE HOT LEG INJECTION (HLI) CHECK VALVES WAS BEING CONDUCTED. TECHNICAL SPECIFICATION 4.0.5A REQUIRES TESTING OF VALVES IN ACCORDANCE WITH THE ASME BOILER AND PRESSURE VESSEL CODE, SECTION XI, EDITION AND ADDENDA AS SPECIFIED BY 10CFR50.55A(G). THE CODE REQUIRES THAT CHECK VALVES BE EXERCISED TO THE POSITION REQUIRED TO FULFILL THEIR FUNCTION. THE NRC HAS INTERPRETED THIS TO MEAN FULL STROKE TESTING IS REQUIRED OR, IF FULL STROKING OF THE DISC CANNOT BE VERIFIED, FULL FLOW TESTING. THE RESULTANT FLOW RATES FOR EACH OF THE TWO PRIMARY COOLANT SYSTEM (PCS) HOT LEGS WERE LESS THAN THE ACCEPTANCE CRITERIA OF 250 GALLONS PER MINUTE (GPM). THE FAILURE OF THE TEST TO SATISFY THE ACCEPTANCE CRITERIA WAS REPORTED TO THE SYSTEM ENGINEER AND THE SHIFT MANAGER AND A CORRECTIVE ACTION DOCUMENT WAS ISSUED. SUBSEQUENT ANALYSIS ON OCTOBER 12, 1990 DETERMINED THAT THE FLOW DELIVERED TO THE HOT LEGS WAS LESS THAN THAT REQUIRED BY THE PLANT SAFETY ANALYSIS. THE HLI CHECK VALVES (CK-ES-3408, 3409 AND 3410)

RE REPLACED WITH SWING CHECK VALVES. THIS EVENT IS REPORTABLE AS A CONDITION
/TSIDE THE DESIGN BASIS OF THE PLANT.

ame	L-272-81-2048-VO	Plant	SALEM 1		Power	---%	
ystem	AFW	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
omponent	CKV	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MAI
hock Type	L	Prox Cause	DE	Oper Status	BOD		
CCG Size	4	Coupl Factor	HDSC	Event Type	CCF		

escription AFW STEAM SUPPLY CHECK VLVS DAMAGED DUE TO VALVE CYCLING

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	1.00	1981/06/16	--:--:--	9		----	----/--/--	--:--:--
2	X	1.00	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	1.00	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4	X	1.00	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

:R#: 272-81-059.

\USE: Inadequate design for application.
XUP. FACTOR: System Operation. (Flow oscillation.)

/ENT TEXT: Assumed all CVs were failed completely.

5/16/81

N 6-16-81, DURING INITIAL TESTING OF UNIT 2, NO. 23 AUXILIARY FEEDWATER PUMP
URBINE STEAM SUPPLY CHECK VALVE (23MS46) WAS FOUND TO BE DAMAGED INTERNALLY.
NVESTIGATION REVEALED SIMILAR DAMAGE TO 21MS46 AND TO UNIT 1 VALVES (11 AND 13
346). PROMPT NOTIFICATION WAS MADE TO THE COMMISSION. ALL VALVES WERE
EPAIRED UNDER THE SUPERVISION OF A VENDOR REPRESENTATIVE. AN ENGINEERING
ONSULTANT FIRM WAS RETAINED BY PSE&G TO INVESTIGATE AND DETERMINE THE CAUSE.
MONTHLY RADIOGRAPHY PROGRAM, FOR ALL MS46 VALVES, WAS INSTITUTED UNTIL THE
AUSE WAS DETERMINED AND CORRECTED. THE CAUSE WAS ATTRIBUTED TO STEAM SYSTEM
LOW OSCILLATIONS, CAUSING THE VALVE DISCS TO HAMMER THEMSELVES AGAINST THE
EATS, AND TO INADEQUATE VALVE DESIGN FOR THIS APPLICATION. THE SYSTEM FLOW
SCILLATIONS HAVE BEEN SUBSTANTIALLY REDUCED, AND PLANS ARE BEING MADE TO
EPLACE THE VALVES WITH ONES OF A DIFFERENT DESIGN.

Name	L-289-80-1894-VO	Plant	THREE MILE ISLND		Power	0%	
System	HPI	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKV	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MAI
Shock Type	ML	Prox Cause	IC	Oper Status	BOD		
CCCG Size	4	Coupl Factor	HDCP	Event Type	CCF		

Description LOOSE PARTS IN HI PRESS INJECTION CHECK VALVES.

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :		Component Type	: @	Shock Type	:
Plant Name :		Failure Mode	: VO	Operat. Status	:
Plant Type :		Proximate Cause	:	Event Type	:
System :		Coupling Factor	:	Event Level	:

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	0.50	1980/02/06	--:--:--	9		----	----/--/--	--:--:--
2	X	0.50	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	0.00	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4	X	0.00	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

LER#: 289-80-003.

EVENT TEXT: Considered as a potential failure to open for both CVs.

02/06/80

DURING VALVE MODIFICATIONS THE VALVE SEAT HOLD-DOWN DEVICES FOR HPI PUMP DISCHARGE CHECK VALVES (MU-V73A/73C) WERE FOUND TO BE LOOSE. LOOSE VALVE INTERNALS COULD POTENTIALLY BLOCK THE VALVE OUTLET REDUCING HPI PUMP FLOWS. THIS IS CONSIDERED TO BE REPORTABLE UNDER THE REQUIREMENTS OF TECH. SPEC. 6.9.2.A(9). PRELIMINARY EVALUATION OF THE CAUSE IS POSSIBLE CORROSION OF THE SEAT HOLD-DOWN DEVICES. A CONTINUING INSPECTION PROGRAM AND DESIGN STUDY ARE BEING DEVELOPED TO DETERMINE THE SCOPE OF THE PROBLEM AND PLAN CORRECTIVE ACTIONS.

Name	L-324-80-1940-VO		Plant	BRUNSWICK 2		Power	0%
System	HCI	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKS	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MAI
Shock Type	NL	Prox Cause	HA	Oper Status	BOD		
CCCG Size	2	Coupl Factor	0005	Event Type	CCF		

Description RCIC/HPCI TURBINE EXHAUST CHECK VLVS LOCKED CLOSED.

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :	Component Type : B	Shock Type :	
Plant Name :	Failure Mode : VO	Operat. Status :	
Plant Type :	Proximate Cause :	Event Type :	
System :	Coupling Factor :	Event Level :	

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	1.00	1980/09/07	--:--:--	9		----	----/--/--	--:--:--
2	X	1.00	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3		----	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4		----	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

ER#: 324-80-062.

CAUSE: Stop-check valves left locked closed.

EVENT TEXT: Procedure to be modified.

09/07/80

POWER LEVEL - 000%. CAUSE - OPERATOR ERROR. WHILE PERFORMING THE RCIC FLOW RATE TEST THE RCIC TURBINE TRIPPED ON HIGH TURBINE EXHAUST PRESSURE. AN INVESTIGATION REVEALED THE MANUALLY OPERATED STOP CHECK VALVE IN THE RCIC TURBINE EXHAUST TO THE TORUS WAS LOCKED CLOSED. ALSO THE MANUALLY OPERATED STOP CHECK VALVE IN THE HPCI TURBINE EXHAUST TO THE TORUS WAS CHECKED AND FOUND CLOSED. THE APPARENT CAUSE IS PERSONNEL ERROR. BOTH VALVES WERE IMMEDIATELY REPOSITIONED TO OPEN AND LOCKED. A PROCEDURE WILL BE DEVELOPED ON THE METHODS FOR PERFORMING SYSTEM LINEUPS. OPERATING PROCEDURES FOR VALVE LINEUP VERIFICATION WILL BE REVISED.

Name	L-338-81-2050-VO	Plant	NORTH ANNA 1		Power	---%	
System	AFW	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKV	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MAI
Shock Type	NL	Prox Cause	IC	Oper Status	BOO		
CCCG Size	3	Coupl Factor	OMTC	Event Type	CCF		

Description AUX FEED WATER PUMP STEAM SUPPLY CHECK VALVES, PARTS MISSING

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :		Component Type	: B	Shock Type	:
Plant Name :		Failure Mode	: VO	Operat. Status	:
Plant Type :		Proximate Cause	:	Event Type	:
System :		Coupling Factor	:	Event Level	:

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	1.00	1981/12/17	--:--:--	9		----	----/--/--	--:--:--
2	X	1.00	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	1.00	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4		----	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

LER#: 338-81-089.

EVENT TEXT: Assumed missing parts would prevent CV from opening on demand.

12/17/81

THE TURBINE DRIVE AUXILIARY FEEDWATER PUMP WAS REMOVED FROM SERVICE IN ORDER TO INSPECT THE INTERNALS OF THREE UPSTREAM CHECK VALVES, ONE VALVE IN EACH STEAM SUPPLY LINE TO THE PUMP. THIS EVENT IS REPORTABLE PURSUANT TO T.S. 6.9.1.9.B. THIS EVENT OCCURRED BECAUSE THERE WAS REASON TO BELIEVE THAT ONE OR MORE OF THE CHECK VALVES PREVIOUSLY REFERENCED MAY HAVE BEEN MISSING OR LOOSE DISC NUTS. THE THREE VALVES WERE DISASSEMBLED AND A DISC NUT, WASHER AND RETAINING PIN WERE FOUND MISSING ON ONE VALVE. ONE DISC NUT WAS LOOSE AND ONE NUT IMPROPERLY SECURED. THE DISC NUTS, WASHER AND PINS WERE REPLACED ON ALL THREE VALVES.

Name	L-346-82-1897-VO	Plant	DAVIS-BESSE 1		Power		0%
System	HPI	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKS	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MON
Shock Type	NL	Prox Cause	DE	Oper Status	BOD		
CCCG Size	4	Coupl Factor	HDCP	Event Type	CCF		

Description HI PRESS SAFETY INJ STOP CHECK VALVES STICKING CLOSED.

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :		Component Type	: a	Shock Type	:
Plant Name :		Failure Mode	: VO	Operat. Status	:
Plant Type :		Proximate Cause	:	Event Type	:
System :		Coupling Factor	:	Event Level	:

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	1.00	1982/06/04	--:--:--	9		----	----/--/--	--:--:--
2	X	1.00	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	1.00	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4	X	0.00	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

ER#: 346-82-023.

AUSE: Incorrect seat angle.
CCG: 3, other CV already modified.

6/04/82

URING THE REFILLING OF THE REACTOR COOLANT SYSTEM AN EXCESSIVE DIFFERENTIAL RESSURE OCCURRED ACROSS THE STOP CHECK VALVES IN THE HIGH PRESSURE INJECTION HPI) LINE. FURTHER TESTING DETERMINED THE PROBLEM EXISTED ON THREE OF FOUR NJECTION LINES AFTER CLOSURE OF THE STOP CHECK VALVES WITH THE MANUAL CTUATOR. THIS INCIDENT IS BEING REPORTED IN ACCORDANCE WITH TECH SPEC .9.1.8. SINCE MAKEUP FLOW HOLDS ONE VALVE OPEN DURING UNIT OPERATION, BOTH IGH PRESSURE INJECTION PUMPS HAD ONE OPERABLE INJECTION LINE. THE ORIGINAL ALVE DESIGN USED IS A 15 DEGREE SEAT ANGLE WHICH CAUSED THE DISC TO STICK, SPECIALLY AFTER CLOSURE WITH THE HANDWHEEL. THE ONE VALVE THAT DID NOT STICK AD BEEN REPLACED IN 1977 WITH A VALVE WITH A 30 DEGREE SEAT. THE VALVES WERE ODIFIED TO HAVE A 30 DEGREE SEAT ANGLE AND NEW DISCS WITH A 27 DEGREE ANGLE ERE INSTALLED. EACH VALVE WAS RESEATED, TESTED AND NO FURTHER STICKING CCURRED.

Name	L-368-81-2053-VO	Plant	ARKANSAS 2		Power	---%	
System	AFW	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKV	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MAI
Shock Type	NL	Prox Cause	DM	Oper Status	BOO		
CCCG Size	4	Coupl Factor	HQMM	Event Type	CCF		

Description AFW PUMP STEAM SUPPLY CK VLVS INTERNAL DAMAGE, MISSING PARTS

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :		Component Type	: B	Shock Type	:
Plant Name :		Failure Mode	: VO	Operat. Status	:
Plant Type :		Proximate Cause	:	Event Type	:
System :		Coupling Factor	:	Event Level	:

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	1.00	1981/10/01	--:--:--	9		----	----/--/--	--:--:--
2	X	1.00	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	0.00	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4	X	0.00	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5		----	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6		----	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		----	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

LER: 368-81-034.

CAUSE: Incorrect locking device.
COUP. FACTOR: Not per design drawing.

EVENT TEXT: Wire locking instead of pin, wire broke causing parts to disassemble.

10/01/81

WHILE DISASSEMBLING AN EMERGENCY FEEDWATER PUMP TURBINE STEAM SUPPLY CHECK VALVE TO REPAIR A MINOR HINGE PIN LEAK, INTERNAL DAMAGE WAS DISCOVERED. THE VALVE COUNTERPART ON THE OTHER STEAM GENERATOR (SG) HEADER WAS DISASSEMBLED REVEALING SIMILAR RESULTS. VALVE 2MS-39A HAD THE DISK STUD BROKEN FROM THE DISK, AND THE DISK STUD, STUD NUT AND WASHER WERE MISSING. VALVE 2MS-39B HAD THE DISK STUD NUT AND WASHER MISSING. AT FACTORY ASSEMBLY, WIRE WAS USED TO HOLD THE DISK STUD RETAINER NUT ON INSTEAD OF A PIN AS PER THE DESIGN DRAWING. THE WIRE APPARENTLY BROKE AND ALLOWED THE NUT TO BACKOFF. THE DAMAGED PARTS WERE REMOVED AND REPLACED WITH NEW PARTS. SEARCH FOR THE MISSING PARTS WAS CONDUCTED, AND ALL OF THE PARTS WERE FOUND WITH THE EXCEPTION OF ONE NUT. THE VALVE INVOLVED IS AN ANCHOR VALVE COMPANY 4 SWING CHECK VALVES.

Name	L-395-86-2054-VO	Plant	SUMMER 1		Power	100%	
System	AFW	Failure Mode	VO	Coupl Strngth	1.00	Event Level	SYS
Component	CKV	Fail Mode App	1.00	Time Delay	1.00	Defense Mech	MON
Shock Type	L	Prox Cause	DM	Oper Status	BOO		
CCCG Size	7	Coupl Factor	HGMM	Event Type	CCF		

Description POTENTIAL FAILURE OF AFW CHECK VALVES MISSING TACK WELDS.

Qualified Events Report

Total Records Found : 20

(Search Mask)

Event Name :		Component Type	: B	Shock Type	:
Plant Name :		Failure Mode	: VO	Operat. Status	:
Plant Type :		Proximate Cause	:	Event Type	:
System :		Coupling Factor	:	Event Level	:

Component Degradation Values

	Use?	P	Date	Time		Use?	P	Date	Time
1	X	0.10	1986/02/14	--:--:--	9		----	----/--/--	--:--:--
2	X	0.10	----/--/--	--:--:--	10		----	----/--/--	--:--:--
3	X	0.10	----/--/--	--:--:--	11		----	----/--/--	--:--:--
4	X	0.10	----/--/--	--:--:--	12		----	----/--/--	--:--:--
5	X	0.10	----/--/--	--:--:--	13		----	----/--/--	--:--:--
6	X	0.10	----/--/--	--:--:--	14		----	----/--/--	--:--:--
7		0.10	----/--/--	--:--:--	15		----	----/--/--	--:--:--
8		----	----/--/--	--:--:--	16		----	----/--/--	--:--:--

ER#: 395-86-001.

AUSE: Missing tack welds.
OUP. FACTOR: Should have been done as part of the manufacturing process.

VENT TEXT: Applies to other systems also. Incipient failure, no actual
ailures found.

2/14/86

OWER LEVEL - 100%. ON 2-14-86, THE LICENSEE COMPLETED A SUBSTANTIAL SAFETY
AZARD EVALUATION (10CFR21) OF THE AS FOUND CONDITION AND DESIGN BASIS FUNCTION
OR 51 ANCHOR DARLING CHECK VALVES INSTALLED IN VARIOUS SYSTEMS AT THE VIRGIL
. SUMMER NUCLEAR STATION. THE EVALUATION DETERMINED THAT A POTENTIAL FAILURE
XISTED FOR 7 VALVES IN THE EMERGENCY FEEDWATER SYSTEM. THIS POTENTIAL FAILURE
OULD REPRESENT A SUBSTANTIAL SAFETY HAZARD BECAUSE OF THE POSSIBILITY OF A
OSS OF EMERGENCY FEEDWATER FLOW AND IS REPORTABLE IN ACCORDANCE WITH 10CFR21.
HE POTENTIAL DISABLING OF THE VALVES IS ATTRIBUTED TO THE MANUFACTURER'S
AILURE TO APPLY REQUIRED CAPTURE TACK-WELDS TO CERTAIN INTERNAL COMPONENTS
URING THE MANUFACTURING PROCESS. THE MISSING TACK-WELDS COULD ALLOW HINGE
INS AND DISC NUT THRU-PINS TO BACK OUT AND DISABLE THE VALVES. THE LICENSEE
PENED AND INSPECTED 63 OF THE 64 ANCHOR DARLING CHECK VALVES INSTALLED IN THE
LANT. FIFTY-ONE VALVES HAD ONE OR MORE OF THE TACK WELDS MISSING AND WERE
EPAIRED DURING THE INSPECTION PROCESS. NO VALVES WERE FOUND TO BE INOPERABLE.
HE REMAINING VALVE (XVC-1900 MU), A 3-INCH VALVE IN THE RETURN LINE TO THE
EACTOR MAKEUP WATER STORAGE TANK, WAS NOT INSPECTED BECAUSE OF ITS
NACCESSIBILITY. THIS VALVE IS NOT REQUIRED FOR SAFE SHUTDOWN OF THE PLANT.