PSEG NUCLEAR L.L.C.
SALEM/OPERATIONS

S2.OP-ST.AF-0007(Q) - REV. 20

INSERVICE TESTING
AUXILIARY FEEDWATER VALVES
MODE 3

USE CATEGORY : I

- Biennial Review Performed: Yes___ No_√_
- Change Packages and affected document numbers incorporated into this revision: None
- OTSC(s) incorporated into this revision: None
- OPEX(s) incorporated into this revision: None

REVISION SUMMARY:

- The following changes are considered editorial in nature as described in AD-AA-101 as previously approved in other AFW procedures. **(70103182)**

1. 2.1 - Updated second bulleted step to include the new permanently installed Controlotron 1010 flow measurement device.

2. 3.5 - Added Precaution and Limitation to state that the Controlotron 1010 needs to be zeroed only if it does not display a "0" indication.

3. 5.1.5 - Added step to check for "0" indication and to direct maintenance to zero the Controlotron if "0" is not displayed.

4. 5.1.25 - Added step that if the Panametrics flow measurement device was used , then to direct maintenance to remove the Panametrics.

5. 7.6.2 - Updated reference to SC.IC-DC.ZZ-0003(Q), Controlotron Model 960, 990 and 1010 Flow Computer Zero Adjustment.

6. Attachment 1, Section 5.0 - Updated reference to SC.IC-DC.ZZ-0003(Q), Controlotron Model 960, 990 and 1010 Flow Computer Zero Adjustment.

7. Attachment 1, Section 4.0 - Added additional identifier nomenclature to Temporary Test Equipment Installation Point to ensure the test point is properly identified.

IMPLEMENTATION REQUIREMENTS:

Effective Date **12/23/09**

- None

1.0 PURPOSE

1.1 Performance of this procedure is used to partially satisfy the requirements of Technical Specifications 4.0.5 various valves associated with the Auxiliary Feedwater System. This requirement is applicable in Modes 1-3. [C0265]

1.2 Performance of this procedure satisfies the full flow test requirements for the 23 Auxiliary Feed Pump per the requirements of NLR-N89196. This requirement is applicable in Modes 1-3. [C0600]

1.3 Performance of this procedure is required during each Refueling Outage or as otherwise specified for post-maintenance operational retest requirements. IAW ER-AA-321, Administrative Requirements for Inservice Testing, the procedure may be required following a Cold Shutdown, if NOT performed in the last 92 days. (70038509)

1.4 This procedure is performed in Mode 3 with RCS Tavg <543°F and S/G pressure >680 psig.

2.0 PREREQUISITES

___ 2.1 The following test equipment setup and preparation may be performed in any Mode:

___ ♦ **ENSURE** Qualified Individual is available to perform Vibration Data Collection of 23 Auxiliary Feedwater Pump utilizing a Vibration Data Collector

___ ♦ **ENSURE** Maintenance is available to zero either of the 2 flow instruments listed, if required:

- SC.IC-DC.ZZ-0003(Q), Controlotron Model 960, 990 and 1010 Flow Computer Zero Adjustment.

  OR

- SC.IC-GP.ZZ-0177(Q). Panametrics Flow Instrument Data Procedure.

___ ♦ Direct a Qualified Individual to **PERFORM** the following:

___ • **ENSURE** the outlets used for powering test equipment, such as Controlotrons / Panametrics, are "live" by plugging in the proper voltage electrical device, such as a drop light.

___ • **PROGRAM** the Vibration Data Collector to record 23 Auxiliary Feedwater pump vibration. [C0600]

___ • **RECORD** calibration Data for the M&TE and Vibration Data Collection Equipment listed in Attachment 1, Section 3.0 and 4.0. [C0289]

___ • **INSTALL** temporary test equipment as specified in Attachment 1, Section 4.0.

___ 3.6 23 AF Pump should NOT exceed 4000 rpm.

___ 3.7 DO NOT operate 23 AF Pump if suction pressure is <8.0 psig.

___ 3.8 Governor Oil Reservoir level must remain observable in sightglass during performance of this procedure.

___ 3.9 IF substitution of Measuring and Test Equipment (M&TE) is required,
IST THEN the IST Implementation Engineer has specified range, accuracy and documented substitution in the Comments Section of Attachment 4.

___ 3.10 21 and 22 Auxiliary Feedwater Pumps should be OPERABLE during performance of this surveillance.

___ 3.11 IF 23 Auxiliary Feedwater Pump is tripped (MS52) during restoration, THEN requirements of Technical Specification 3.7.1.2 are applicable.

___ 3.12 22 Blowdown tank will spill over into 23 Aux Feed Pump Turbine Steam Header Drain Line at ≈91.6% (66") level. Line will fill with water and present backpressure problems for drains affecting turbine performance.

___ 3.13 Motor driven Auxiliary Feedwater Pumps should be out of service when data is to be obtained. With the motor driven Auxiliary Feedwater Pumps inservice the flow is the sum of the flow from the motor driven and steam driven auxiliary feedwater pumps.

4.0 EQUIPMENT/MATERIAL REQUIRED

4.1 Additional Tools and Equipment:

- ♦ Vibration Data Collector
- ♦ Triaxial Accelerometer
- ♦ Calibrated Stopwatch
- ♦ One (1) Heise Gauge or equivalent, range 0-60/0-100 psig, accuracy ±0.1% of full scale and uncertainty factor of ±0.06 psig or better.
- ♦ One (1) Heise Gauge or equivalent, range 0-3000 psig, accuracy ±0.1% of full scale and uncertainty factor of ±3.0 psig or better.

4.2 Procedure(s):

- ♦ S2.RA-ST.AF-0007(Q), Inservice Testing - Auxiliary Feedwater System Mode 3 Acceptance Criteria, if applicable

___ 5.1.6 IF a Panametrics is to be used in place of Controlotron, THEN direct Maintenance Technician to:

___ A. **INSTALL** Panametrics Flow Instrument.

___ B. **PERFORM** Panametrics Flow Instrument Data adjustment IAW SC.IC-GP.ZZ-0177(Q), Panametrics Flow Instrument Data Procedure.

___ C. **RECORD** Panametrics calibration data AND completion data in Attachment 1, Section 5.0.

___ 5.1.7 **START** 23 Auxiliary Feedwater Pump IAW S2.OP-SO.AF-0001(Q), Auxiliary Feedwater System Operation.

NOTE

The recommended Steam Generator NR level band is 24% to 54%. (P&L 3.2)

CAUTION

The following steps supply Steam Generators with full Aux Feedwater flow. Any Steam Generator Level exceeding 67% will cause an ESF Actuation for Turbine Trip and Feedwater Isolation.

23 Auxiliary Feedwater Pump should be stopped if any SG NR Level is ≥55%.(70067944)

___ 5.1.8 **PERFORM** the following to exercise Check Valve 21AF921 to the full-stroke OPEN position:

___ A. **ADJUST** 21AF11, STEAM GENERATOR INLET VALVE, to obtain ≥11E04 lbm/hr indicated on 2FA5751, 21 S/G AUX FEED FLOW.

___ B. **RECORD** 21AF921 OPEN "Test Results" by initialing
$ the SAT or UNSAT columns using Acceptance Criteria in Attachment 2, Section 1.0.

___ C. **ADJUST** 21AF11, STEAM GENERATOR INLET VALVE, as required, to maintain 21 Steam Generator level.

NOTE

The recommended Steam Generator NR level band is 24% to 54%. (P&L 3.2)

CAUTION

4000 RPM should not be exceeded as turbine damage may result.

The following steps supply Steam Generators with full Aux Feedwater flow. Any Steam Generator Level exceeding 67% will cause an ESF Actuation for Turbine Trip and Feedwater Isolation.

23 Auxiliary Feedwater Pump should be stopped if any SG NR Level is ≥55%. (70067944)

Additional steam flow during 23 Auxiliary Feedwater Pump operation and feeding Steam Generators at ≥44E04 lbm/hr will cooldown the RCS. Pzr Lvl should be maintained between 30-53% to prevent Letdown Isolation during testing.

Values outside of those listed in the acceptable range of S2.RA-ST.AF-0007(Q), for Pump Total Flow Rate, do not necessarily make the pump inoperable, but do invalidate the performance of the procedure.

___ 5.1.12 Simultaneously **PERFORM** the following to establish 44.5E04 lbm/hr Full Flow Performance conditions:

___ ♦ **ADJUST** speed to 3600 (3550-3650) rpm as indicated by 2SA5740.

___ ♦ **ADJUST** 21-24AF11, as necessary, to obtain a S/G Total Aux Feed Flow rate of 44.5E04 lbm/hr (44.1E04 - 44.9E04 lbm/hr) as indicated on 2FA5751, 2FA5752, 2FA5753 and 2FA5754:

___ ♦ **ENSURE** Pump Total Flow Rate is within the Acceptable Range as shown in S2.RA-ST.AF-0007(Q).

___ ♦ IF Pump Total Flow Rate is NOT within the Acceptable Range, THEN **RE-ADJUST** S/G Total Aux Feed Flow rate until Pump Total Flow Rate is in the Acceptable Range.

___ ♦ IF Pump Total Flow Rate is NOT within the Acceptable Range, after re-adjustment of S/G Total Aux Feed Flow rate,

___ 1. **UNLOCK AND OPEN** 2AF144, 23 AUX FD PMP TST LN ISO.

___ 2. **UNLOCK AND THROTTLE** 2AF146, 23 AUX FD PMP TST LN THROT VLV, as necessary, to attain S/G Total Aux Feed Flow rate.

NOTE

Steps 5.1.17 through 5.1.26 maybe performed concurrently with step 5.1.16

___ 5.1.17 **CLOSE** 23AF5, AF PMP SUCT PRESS TAP.

___ 5.1.18 **REDUCE** 23 Auxiliary Feedwater Pump flow, as required, to support current unit conditions.

___ 5.1.19 IF 23 Auxiliary Feedwater Pump is to be removed from operation, THEN **TRANSFER** Auxiliary Feedwater Flow from the 23 Auxiliary Feedwater Pump to the 21 and 22 Auxiliary Feedwater Pumps, as required, IAW S2.OP-SO.AF-0001(Q), Auxiliary Feedwater System Operation.

___ 5.1.20 **ADJUST** Charging flow to establish Pressurizer level at program.

___ 5.1.21 **ADJUST** Steam Generator Blowdown flow to maintain Steam Generator levels.

___ 5.1.22 **RESTORE** 21AF11, 22AF11, 23AF11 and 24AF11, STEAM GENERATOR INLET VALVES to Pretest Positions AND **RECORD** in Attachment 3.

___ 5.1.23 **PLACE** the No. 2 Aux Feed Storage Tank Heater Pump in AUTO.

___ 5.1.24 IF 2AF146 was throttled IAW Step 5.1.12, THEN

___ A. **CLOSE** AND **LOCK** 2AF144, 23 AUX FD PMP TST LN ISO

___ B. **LOCK** 2AF146, AUX FD PMP TST LN THROT VLV, in the throttled position.

___ 5.1.25 IF a Panametrics Flow Instrument was used in this test, THEN

___ A. **PLACE** Panametric Power Supply Switch to OFF position.

___ B. **DIRECT** Maintenance Technician to disconnect and remove the Panametrics Flow Instrument.

___ 5.1.26 Direct a second Operator to **PERFORM** Independent Verification of the following:

___ ♦ Calculations performed in Attachment 2, Section 3.0. **[C0284]**

___ ♦ Component positions specified on Attachment 3. **[C0290]**

___ 5.1.27 IF this surveillance is being performed as a regular scheduled surveillance
S OR to verify post-maintenance operability of the 23 Auxiliary Feed Pump, THEN **RECORD** 23 Auxiliary Feed Pump Full Flow "Test Results" by initialing the SAT or UNSAT columns using Acceptance Criteria in Attachment 2, Section 2.0. **[C0600]**

5.3 **Completion and Review**

___ 5.3.1 **COMPLETE** Attachment 4, Sections 1.0 and 2.0, AND **FORWARD** this procedure to the SM/CRS.

___ 5.3.2 SM/CRS **PERFORM** the following:

___ A. **REVIEW** this procedure with Attachments 1-4 for completeness and accuracy.

___ B. IF all pump Technical Specification Acceptance Criteria (ASME) parameters are SAT AND in the ACCEPTABLE RANGE, THEN **DECLARE** Pump OPERABLE.

___ C. IF ANY pump Technical Specification Acceptance Criteria (ASME) parameter is UNSAT, in the REQUIRED ACTION RANGE, THEN:

___ ♦ **DECLARE** pump inoperable.

___ ♦ **EVALUATE** Technical Specifications for system operability.

___ ♦ **INITIATE** a NOTF IAW LS-AA-120, Issue Identification and Screening Process.

___ ♦ **RECORD** NOTF number(s) on Attachment 4 in the Comments Section.

(step continued on next page)

6.0 RECORDS

Retain the following IAW RM-AA-101, Records Management Program:

- Attachment 1
- Attachment 2
- Attachment 3
- Attachment 4
- Copy of S2.RA-ST.AF-0007(Q), Inservice Testing - Auxiliary Feedwater System Mode 3 Acceptance Criteria (as applicable)
- 23 Auxiliary Feed Pump Vibration Analyzer Printout

7.0 REFERENCES

7.1 Updated Final Safety Analysis Report:

- Section 10.4.7.2, Auxiliary Feedwater System
- Section 15.2.8, Loss of Normal Feedwater

7.2 Technical Specifications - Unit 2:

- 3.7.1.2, Auxiliary Feedwater System
- 3.7.1.3, Auxiliary Feed Storage Tank

7.3 Procedures:

- ER-AA-321, Administrative Requirements for Inservice Testing
- NC.NA-AP.ZZ-0050(Q), Station Testing Program
- NC.NA-AP.ZZ-0022(Q), Measuring & Test Equipment, Lifting & Rigging and Tool Control

7.4 Drawings:

205336, Unit 2 Auxiliary Feedwater

7.5 Others:

- DE-CB.AF-0010(Q), Configuration Baseline Document for Auxiliary Feedwater System
- Section XI of ASME Boiler and Pressure Vessel Code (1983 Edition with Addenda through Summer 1983)
- OMa-6, Inservice Testing of Pumps in Light-Water Reactor Power Plants (1987 Edition with 1988 Addenda)
- Salem Generating Station IST Manual
- NUREG-1482, Guidelines for Inservice Testing at Nuclear Power Plants

ATTACHMENT 1
INSTRUMENTATION AND TEST EQUIPMENT DATA
(Page 1 of 3)

1.0 WORK ORDER DATA

SAP Order Number(s): _____	Reason for Test
_____	___ Scheduled Surveillance
_____	___ Post-Maintenance Operability
	___ Establish New Baseline Data
	___ Other (Explain in Comments)

2.0 INSTRUMENT/TEST EQUIPMENT

Instrument/ Test Equipment	Description	Calibration Overdue Date	Initials
2FA3969	* 21 S/G AFW Flow / Channel		
2FA1087	21 S/G AFW Flow / Sensor		
2FA3970	* 22 S/G AFW Flow / Channel		
2FA1091	22 S/G AFW Flow / Sensor		
2FA3971	* 23 S/G AFW Flow / Channel		
2FA1095	23 S/G AFW Flow / Sensor		
2FA3972	* 24 S/G AFW Flow / Channel		
2FA1097	24 S/G AFW Flow / Sensor		
2SA5740	23 AFW Pump Speed Indication		
2SA5961	23 AFW Pump Speed Demand Ind.		

* Calibration of associated control room console indicator is performed in conjunction with listed channel.

ATTACHMENT 1
INSTRUMENTATION AND TEST EQUIPMENT DATA
(Page 3 of 3)

5.0 **CONTROLOTRON/PANAMETRICS DATA (Section 5.1 only)**

Description	ID Number	Calibration Overdue Date
Controlotron	2FL14752	
Panametrics		

If required, SC.IC-DC.ZZ-0003(Q), Controlotron Model 960, 990 and 1010 Flow Computer Zero Adjustment has been completed.

OR

SC.IC-GP.ZZ-0177(Q), Panametrics Flow Instrument Data Procedure has been completed.

Performed By:_____ Date: _____ Time:_____

6.0 **POST TEST CALIBRATION RESULTS**

Description	ID Number	SAT	UNSAT	Initials
Heise CM or equivalent 0-60/0-100psig. (1)				
Heise CM or equivalent 0-3000psig. (1)				

(1) Post-Test Calibration is NOT required when Electronic Pressure Modules (digital) are used.

Performed by _____ Date _____
M&TE Technician

Performed by _____ Date _____
M&TE Supervisor

ATTACHMENT 2
23 AF PUMP SURVEILLANCE DATA
(Page 2 of 3)

2.0 **VIBRATION READINGS**:

Vibration Position 1: TURBINE OUTBOARD
Vibration Position 2: TURBINE INBOARD
Vibration Position 3: PUMP INBOARD
Vibration Position 4: PUMP OUTBOARD

23 AF Pump Vibration Results		Test Results	
		Acceptable Range SAT	Required Action UNSAT
Non-Technical Specification Acceptance Criteria (Non-ASME)			
Vibration Position 1A	in/sec (1)		
Vibration Position 1H	in/sec (1)		
Vibration Position 1V	in/sec (1)		
Vibration Position 2A	in/sec (1)		
Vibration Position 2H	in/sec (1)		
Vibration Position 2V	in/sec (1)		
Vibration Position 3A	in/sec (1)		
Technical Specification Acceptance Criteria (ASME)			
Vibration Position 3H	in/sec (1)		
Vibration Position 3V	in/sec (1)		
Vibration Position 4A	in/sec (1)		
Vibration Position 4H	in/sec (1)		
Vibration Position 4V	in/sec (1)		
Acceptance Criteria: Vibration Results for the 23 Auxiliary Feedwater Pump are within bands specified in S2.RA-ST.AF-0003(Q), Inservice Testing - 23 Auxiliary Feedwater Pump Acceptance Criteria OR data represents new baseline data as determined by the IST Implementation Engineer.			

(1) Vibration data is only required to be recorded, when a Vibration Analyzer Printout is NOT available.

ATTACHMENT 3
INDEPENDENT VERIFICATION
(Page 1 of 1)

Component	Description	Pretest Position/ Initials	Restoration to Pretest Position/ Initials	Restoration IV	Date
23AF5	AF PMP SUCT PRESS TAP	/	/		
21AF11	STEAM GENERATOR INLET VALVE	/	/		
22AF11	STEAM GENERATOR INLET VALVE	/	/		
23AF11	STEAM GENERATOR INLET VALVE	/	/		
24AF11	STEAM GENERATOR INLET VALVE	/	/		
2AF144	23 AUX FD PMP TST LN ISO	/	/		
2AF146	23 AUX FD PMP TST LN THROT VLV	/	/		

ATTACHMENT 4
COMPLETION SIGN-OFF SHEET
(Page 2 of 2)

2.0 **SIGNATURES**:

Print	Initials	Signature	Date

INDEPENDENT VERIFICATION:

3.0 **SM/CRS FINAL REVIEW AND APPROVAL**:

This procedure with Attachments 1-4 is reviewed for completeness and accuracy. All deficiencies, including corrective actions, are clearly recorded in the COMMENTS Section of this attachment. Technical Specification compliance, procedure compliance, and Acceptance Criteria are evaluated. **[C0283]**

Signature:_____ Date/Time:_____
SM/CRS

4.0 **IST IMPLEMENTATION ENGINEER REVIEW**:

Test Results are reviewed for acceptability. If required, revision of Acceptance Criteria is initiated. Forward completed procedure to Operations Staff.

Signature:_____ Date/Time:_____
IST Implementation Engineer