FITZPATRICK - 24 MONTH OPERATING CYCLE

NUCLEAR STEAM SUPPLY SYSTEMS SURVEILLANCE TEST IMPROVEMENTS

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I. Executive Summary

The Fitzpatrick plant will be operating on a 24 month operating cycle. This longer cycle length has a direct effect on surveillance testing and maintenance activities that are currently performed on a 18 month or refuel outage basis.

At Fitzpatrick, the Nuclear Steam Supply System (NSSS) is routinely inspected, tested, and maintained to provide high reliability. This system is subject to tests which verify the operability of several subsystems such as: the Recirculation System, the Main Steam System up to the main steam isolation valves, and the Feedwater System from the feedwater isolation valves.

In addition, preventive maintenance (PM) is periodically performed on individual components.

Test frequencies are mandated by the plants' technical specifications, operational requirements, and inservice inspection schedules. Maintenance activities are based on operational feedback and manufacturer's recommendations.

This study evaluates the changes to maintenance and surveillance requirements to support a nominal twenty four month operating cycle. Justification is provided, where appropriate, to support test extensions.

Our evaluations conclude that 1) the current surveillance test intervals can be safely extended to support a nominal 24 month operating cycle, and 2) maintenance activities can be accommodated by the longer cycle.

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II. Purpose

The Fitzpatrick plant will be operating on a 24 month operating cycle. To avoid either an 18 month surveillance outage or an extended mid-cycle outage, changes are required to the Nuclear Steam Supply System surveillance test intervals prescribed by the Fitzpatrick Technical Specifications. Substantiating the impacts of the longer cycle length on the NSSS surveillance, maintenance, and test activities requires a comprehensive review of the system, its individual components, and the integrated effect of all test and maintenance activities on operability.

III. General System Safety Function

The Nuclear Steam Supply System consists of three subsystems: the Recirculation System, the Main Steam System up to the main steam isolation valves, and the Feedwater System from the feedwater isolation valves. These systems combine to ensure there is a sufficient flow of coolant through the reactor vessel in all modes of operation. Their specific function is described below.

The Recirculation System provides variable coolant flow to the reactor core for the adjustment of reactor power level. Adjustment of the core coolant flow rate changes reactor power output, thus providing a means of following plant load demand without adjusting control rod position. The system is designed to provide a slow coastdown of flow so that fuel thermal limits cannot be exceeded as a result of malfunctions. The arrangement of the system piping is such that a failure cannot compromise the integrity of the floodable inner volume of the reactor vessel.

The Recirculation System consists of two recirculation loops external to the reactor vessel which provide a piping path for the driving flow of water to the reactor vessel jet pumps. Each external loop contains one variable speed, motor-driven recirculation pump and three motor-operated gate valves which are provided to facilitate pump maintenance. Each pump discharge line contains a venturi-type flow element which provides a coolant flow input signal for the Reactor Protection System. The recirculation loops are part of the reactor coolant pressure boundary and are located totally inside the primary containment structure.

The recirculated coolant consists of saturated water, returned from the steam separators and dryers, which has been cooled by incoming feedwater. This water passes down the annulus between the reactor vessel inner wall and the core shroud. A portion of the coolant exits from the vessel and passes through the two external recirculation loops to become the driving flow for the jet pumps. Each of the two external recirculation loops discharges high pressure flow into an external manifold from which individual recirculation inlet lines are routed to the jet pump risers within the reactor vessel. The remaining portion of the coolant mixture in the annulus becomes the jet pump driven flow. This flow enters the jet pumps at the suction inlet and is accelerated by the driving flow. The flows, both driving and driven, are mixed in the jet pump throat section, pass down through the jet pump diffuser and into the vessel bottom head and up through the core.

The Main Steam System provides high pressure steam from the boiling water reactor to the turbine-generator unit. The Main Steam System consists of four high pressure carbon steel lines from the reactor through the main steam isolation valves to the turbine stop and control valves.

The main steam isolation valves automatically close to isolate the Reactor Coolant Pressure Boundary (RCPB) in the event of a pipe break downstream from the valves. This automatic closure: 1) prevents damage to the fuel barrier by limiting the loss of reactor coolant, 2) limits the release of radioactive materials by closing the RCPB in case of a gross release of radioactive materials from the reactor fuel to the reactor coolant and steam, and 3) limits release of radioactive materials by closing the primary containment barrier in case of a major leak from the Reactor Coolant System inside the primary containment. Two isolation valves are installed on each main steam line; one is located inside and the other is located outside the primary containment. In the event of a main steam line break occurs inside the primary containment, closure of the isolation valve outside the containment acts to seal the primary containment itself. The MSIVs function in conjunction with the steam line flow restrictors to limit the coolant blowdown rate from the reactor vessel, thereby preventing core damage and excessive release of radioactivity during a primary steam line break outside the primary containment.

The main steam piping is designed to carry steam from the reactor vessel through the primary containment to the main steam turbine. Four steam lines are utilized between the reactor and the turbine. The use of these multiple lines permits turbine stop valve and main steam isolation valve tests during plant operation with a minimum amount of load reduction. To fully achieve this objective, the four steam lines are headered through a bypass valve chest upstream of the turbine stop valves. This also ensures that the Turbine Bypass System is connected to the active steam lines. Drain lines are connected to the low points of each main steam line inside and outside the drywell. Each drain line is connected to a high pressure drain manifold located on the condenser shell through an orifice and a drain valve mounted in parallel. The orifice permits continuous draining of the steam lines' low points. Relief valves are located on the main steam piping. An air accumulator is provided for each relief valve. It will hold the valve open for 30 minutes or will permit five actuations following failure of air supply to the accumulators.

The Feedwater System provides the required flow of feedwater to the reactor with sufficient margin to continue flow under all anticipated transient conditions. The system includes equipment and piping downstream of condensate outlet feedwater heater isolation valves that provides the flow path from the Condensate System to the reactor vessel. This equipment includes two fifty percent capacity turbine-driven centrifugal reactor feed pumps, arranged in parallel to take suction from the fifth point feedwater heater outlets and discharge through the sixth point feedwater heaters and then into the reactor vessel.

IV. Surveillance Test and Maintenance Activity Evaluation

The operability of systems and components required by the plant's safety analyses is established by the surveillance requirements contained in the Technical Specifications. Surveillance testing, by definition, can only identify that a component or a system is incapable of performing its safety function (i.e., inoperable). Preventive maintenance, however, reduces the number of failures found during plant operation or during testing.

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Nuclear Steam Supply System test, maintenance, and inspection activities were thoroughly evaluated to determine the impacts of a 24 month operating cycle. The longer cycle length requires an extension of the following tests:

1. ST-22B
2. ST-39H
3. ST-39K
4. ST-39N
5. ISP-3-8
6. ISP-78
7. ISP-92-1
8. ISP-92-2

Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test (IST)
Reactor Vessel Operational Pressure Test (ISI)
Shutdown Cooling Suction Operational Pressure Test (ISI)
Outboard MSIV Simulated Loss of Instrument Air Drift Test
Reactor Level Indication Instrumentation (02-3LI-58A) Calibration
Recirculation Pump Temperature Instrument Calibration
Reactor Vessel Safety/Relief Valve Monitoring System (VMS) Functional Test
Reactor Vessel Safety/Relief Valve Thermocouple Functional Test

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A review of the NSSS preventive maintenance activities shows the following maintenance activity currently scheduled for a frequency of 18 months: Reactor Vessel Safety/Relief Valve Maintenance (MP-2.4), Main Steam Isolation Valve Maintenance (MP-29.1), Main Steam Line Isolation Valve Closure (RPS) Position Switch Calibration (MP-29.2), Limitorque Motor Operators - Model SMB/SB Preventive Maintenance, Inspection, and Functional Testing (MP-59.21), Limitorque Motor Operators - Model SMB and SB Preventive Maintenance, Inspection, Lubrication, and Testing on Baselined MOVs (MP-59.51), Lubrication of Electric Motors (Without Disassembly) with Grease Lubricated Bearings (MP-101.04), and Replacement of ASCO Series NP8323 Solenoid Valves (MP-200.1). All other scheduled NSSS maintenances are not affected by the extension to the nominal 24 month fuel cycle.

1. Surveillance Test Changes

The decision to extend surveillance test intervals considers:

1. the function of the test in determining overall system availability,

2. the integrated effect of testing and maintenance activities on system operability, and

3. the burden of testing at power. For example: testing that could lead to a plant transient, testing that results in unnecessary equipment wear, or testing that leads to radiation exposure of plant personnel.

These three considerations are applied to an evaluation of Fitzpatrick Nuclear Steam Supply System (NSSS) surveillance tests.

This evaluation also included a study of specific surveillance histories, operational occurrences, and maintenance programs to determine if equipment operability problems are being identified in a timely fashion (References 1, 2, & 3). Surveillance test data for the past six years (1986-1991) was analyzed for each test affected by the extended surveillance interval. Operational Occurrence Reports involving NSSS components were also analyzed for the last 6 years; a summary of this review is included in Attachment B. The maintenance review sought to confirm that recurring or symptomatic problems affecting operability are currently being corrected without relying on surveillance tests to identify performance degradation. Justifications are included for each specific test extension.

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The following NSSS surveillance tests are performed once per operating cycle or once per refueling outage.

1. Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test - IST (ST-22B)

The Pressure Relief System consists of eleven safety/relief valves (SRVs), all of which are located on the main steam lines within the drywell between the reactor vessel and the first main steam isolation valves. The SRVs can be either automatically actuated by excess steam pressure or opened manually through remote switches. Their purpose is to prevent overpressurization of the reactor coolant system, which could lead to reactor coolant pressure boundary failure and result in an uncontrolled release of fission products.

Each pilot-operated SRV consists of two principal components: a pilot stage assembly and the main stage assembly. The SRVs have two modes of operation: spring and relief. In the spring mode, the spring loaded pilot valve opens when steam pressure at the valve inlet overcomes the spring force holding the pilot valve closed. In the relief mode, valves are opened manually or automatically using pressurized nitrogen. All SRVs can be operated from a remote panel located outside the control room.

This surveillance procedure consists of manually actuating each SRV to verify proper mechanical function, and also ensure that no blockage exists in the valve discharge line (tailpipe). Valve operation is verified by observing effects on temperature and acoustic monitors in the SRV tailpipe (Reference 4).

The first consideration in SRV surveillance extension is on-line testing as a determination of SRV system integrity. The Safety Relief Valve Monitor Instrument Check (ST-22I), performed on a monthly basis, demonstrates the operability of SRV tailpipe acoustic and temperature monitoring systems by both recording noise levels from each SRV accelerometer and recording thermocouple temperature. This monthly surveillance ensures that a leaking or partially open SRV will be detected during normal operation (Reference 5).

Another factor to consider for extension is the current requirement that some pilot assemblies be removed and tested each refueling outage. The bench testing includes setpoint, leakage, and pilot disk sticking tests. If necessary, refurbishment is performed in accordance with manufacturer recommendations.

The final consideration for surveillance extension with the nominal 24 month operating cycle is the past performance of the SRVs. Operating occurrence reports from 1986 to 1991 were reviewed to determine SRV reliability. This analysis showed that setpoint drift was a concern. The problem is generic to the industry and is not cycle length dependent. FitzPatrick has been responsive to the issue, and has submitted new SRV Technical Specifications changes to the NRC in early 1990. These changes included an adjustment of the maximum permissible setpoint tolerance from one percent to three percent (Reference 6). SRV setpoint drift has been tracked at Fitzpatrick with respect to valve length of service, and does not exhibit an increasing drift trend with a longer service interval. Extension of SRV surveillance testing with the 24 month operating cycle is therefore not precluded since SRV drift is not cycle length dependent. Results from this study are included in Attachment C.

The Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test can be safely extended for the following reasons: 1) leaking or partially open SRVs are readily detected during normal operation, 2) a review of past performance shows that SRVs are mechanically reliable with the exception of setpoint drift, and there has been no evidence of tailpipe blockage. Regarding setpoint drift, trending with respect to length of service revealed SRV drift not to be cycle length dependent.

Subsequent to the initial issuance of this report (revision 0, June, 1992), the Authority has assessed potential drift over a 60 month period since proposed Specification 4.6.E.1 allows a maximum test frequency of 60 months. It was concluded that SRV drift, as measured by the surveillance data, is not dependant on the time between surveillances (Reference 42).

2. Reactor Vessel Operational Pressure Test - ISI (ST-39H)

The purpose of this surveillance is to verify the integrity of the reactor vessel and attached Class I piping systems. The leaktightness of the reactor coolant pressure boundary is a major concern due its to importance in protecting against the release of radioactive material. Using the control rod drive system and the reactor water cleanup system, the reactor vessel and attached piping is filled and pressurized. During pressure holds at 500 psig and 1000 psig, leakage inspections are conducted (Reference 7).

The first factor in pressure test extension are currently applicable code requirements. In accordance with the requirements of ASME Section XI, Class I system leakage pressure testing must be performed prior to the reactor going critical following a refueling outage. Section XI does not stipulate a maximum duration between refueling outages; so test extension is not precluded. The frequency requirement for leakage pressure tests is instead based on the repair, replacement, and/or the disassembly and reassembly of the Class I system pressure boundary (Reference 8).

Another consideration in surveillance extension is the measurement of leakage from the reactor coolant pressure boundary during normal plant operation. An increase in leakage would be readily detected by the drywell sump monitoring system and/or the drywell continuous atmosphere radioactivity monitoring system. In addition, excessive leakage would affect drywell temperature and pressure, which are continuously monitored (Reference 9).

The Reactor Vessel Operational Pressure Test can be safely extended for the following reasons: 1) ASME Section XI requirements do not preclude pressure test extension, 2) the refueling outage is the most appropriate time to conduct this test because the RCS has been disassembled and reassembled, and 3) leakage from the reactor coolant pressure boundary would be readily detected.

3. Shutdown Cooling Suction Operational Pressure Test - ISI (ST-39K)

The purpose of this test is to verify the integrity of the shutdown cooling suction line between 10MOV-17 and 10MOV-18. The procedure consists of pressurizing the Class I piping between the two valves to 1005 psig and holding for a 10 minute interval. A visual examination of piping for evidence of leakage is then performed. The test is completed satisfactorily if there is no leakage observed from the welded pressure boundary between 10MOV-17 and 10MOV-18 (Reference 10).

The first consideration in extension of this surveillance with the longer operating cycle is the burden of testing at power. The Class I piping between the two valves is isolated from the recirculation system during normal operation. Both motor operated isolation valves are interlocked with an RCS signal such that they cannot be opened unless the reactor pressure is less than 75 psig. Therefore, it is impractical to perform this leak test at times other than the refueling outage (Reference 11).

Another factor in test extension relates to currently applicable code requirements. In accordance with the requirements of ASME Section XI, Class I system leakage pressure testing must be performed prior to the reactor going critical following a refueling outage. Section XI does not stipulate a maximum duration between refueling outages; therefore not precluding test extension. The frequency requirement for leakage pressure tests is instead based on repairs, replacements, or the disassembly and reassembly of the Class I system pressure boundary (Reference 8).

Another consideration in surveillance extension is the measurement of leakage from the shutdown cooling piping during the system operation. Leakage inside the drywell would be readily detected by the drywell sump monitoring system and/or the drywell continuous atmosphere radioactivity monitoring system.

The Shutdown Cooling Suction Operational Pressure Test can be safely extended for the following reasons: 1) the refueling outage is the most appropriate time to conduct this test because the components have been disassembled and reassembled, 2) the longer test interval is consistent with the requirements of ASME Section XI, and 3) leakage from the pressure boundary during shutdown cooling operation would be detected.

4. Outboard MSIV Simulated Loss of Instrument Air Drift Test (ST-39N)

The purpose of this surveillance test is to verify the integrity of the outboard MSIV instrument air supply check valves to maintain a sufficient supply of instrument air in the accumulators to maintain the outboard MSIVs open upon a loss of instrument air. The test also verifies the integrity of the instrument air accumulators to maintain the outboard MSIVs open during the postulated loss of the instrument air system. Leaktightness of the accumulators is verified by isolating the instrument air supply and measuring the time interval from the start of depressurization until the MSIVs close under spring force. Leakage is acceptable if the MSIVs remain open for 30 minutes or longer (Reference 12). The fail-safe position of the valve is closed, but since the accumulator is being tested for leakage over a period of time, the most practical way to test accumulator integrity is by having the accumulator keep the MSIV open.

The MSIVs are spring loaded, pneumatic, piston-operated valves designed to fail closed on loss of pneumatic pressure to the valve operator. Each valve operator is actuated by a dual solenoid pilot valve - one solenoid powered by AC, the other by DC. An accumulator, located close to each isolation valve, provides pneumatic pressure for the purpose of assisting in valve closure, in the event of failure of the pneumatic supply pressure to the valve operator system. Also, each MSIV has 4 spring guide shafts each containing three stacks of emergency closing springs. These springs are compressed when the valve is open and expand when the air pressure is either vented or lost from under the piston. This exerts a downward force pushing the valve stem and disk to close the valve. The springs alone are capable of shutting the valve in 3 to 5 seconds.

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The first consideration with surveillance extension relates to industry recommendations. GE SIL-477 recommends testing each MSIV actuator and accumulator, which assists closure of the MSIVs following loss of air, for leaktightness each refueling outage (Reference 13). James A. FitzPatrick Maintenance Procedure 29.1, Section 7.5.32, performs this recommended leak test of the accumulator assembly each refueling outage. This ensures both the integrity of the accumulators and their ability to assist spring force in MSIV closure when instrument air is lost (Reference 14). The extension of MP-29.1 with the nominal 24 month operating cycle is discussed in the maintenance evaluation section later in the report.

A further factor MSIV accumulator operability is the quality of instrument air and its importance in accumulator and check valve integrity. In NRC Generic Letter 88-14, the poor quality of the instrument air was found to be directly related to pneumatic component malfunctions (Reference 15). The Authority's response to Generic Letter 88-14 included a review of general instrument air procedures and surveillances, as well as an analysis of the outboard MSIVs in a loss of air scenario. Some changes as a result of this review included: operating procedures ensuring that the air parameters are monitored and recorded during normal operation along with a testing program that checks air quality by measuring dew point and particle size (Reference 16). These practices ensure that air remains at a high quality and meets industry standards, thereby lowering the likelihood of failure for MSIV pneumatic components, such as the failure of the MSIV accumulator check valve to isolate on low air supply pressure.

Another consideration in surveillance extension is the burden of testing at power. The fail-closed testing of the outboard MSIVs cannot be performed during power operation since access to the steam tunnel is required. Also, the temporary modification of the instrument air system to simulate the loss of air may cause unplanned plant transients (Reference 11).

A review of occurrence reports from 1986 to 1991 revealed no failures associated with MSIV pneumatic components. MSIV accumulators have been consistently leaktight and routinely meet the acceptance criteria.

The Outboard MSIV Simulated Loss Of Instrument Air Drift Test can be safely extended for the following reasons: 1) the integrity of the accumulators is ensured each refueling outage through post-maintenance testing, 2) the quality of instrument air meets current industry standards, and thereby lowers the likelihood of MSIV pneumatic component failure, 3) the MSIVs cannot be tested during power operation, or during cold shutdown when the drywell is inerted, and 4) a review of past MSIV accumulator performance has shown them to be leaktight and the check valves functioning properly.

5. Reactor Level Indication Instrumentation (02-3LI-58A) Calibration (ISP-3-8)

The purpose of this procedure is to perform a calibration of the local Reactor Water Level Indicating Switch. This wide range Barton indicator provides operators with reactor water level information during shutdown from outside the control room and is calibrated once every operating cycle (Reference 17).

This calibration can be extended with the longer fuel cycle if the potential increase in instrument drift does not affect the capability to achieve a safe plant shutdown. Safe shutdown from outside the control room uses reactor water level control based on the Emergency Operating Procedures (EOPs). Allowances are provided in the EOPs for instrument inaccuracies and environmental effects as necessary. For example, density compensation is required due to the increase in instrument water leg temperature associated with post accident conditions in the drywell. These allowances, which are based on post-accident conditions contain ample margin to accommodate any increased drift in the reactor water level indicator. Based on discussions with the vendor, drift is expected to be minimal (less than 1 percent of span over the lifetime of the switch). Due to this small drift, the vendor also stated that drift is included in the reference accuracy (Reference 18).

Therefore, extension of this calibration interval with the nominal 24 month operating cycle is allowable since the drift of the indicating switches is not affected by length of service.

Another consideration in extension are problems with calibrating the reactor level instrumentation during power operation. On-line calibrations of reactor water level instruments is considered risky because valve manipulations and/or an induced hydraulic transient can result in a scram (References 19 & 20). Therefore, it is safer to extend the calibration interval with the longer fuel cycle than to calibrate the instrument every 18 months during power operation.

The Reactor Level Indication Instrumentation Calibration can be safely extended for the following reasons: 1) the potential increase in drift associated with the longer calibration interval is accommodated by the large allowances for harsh environmental effects on instruments in the EOPs, 2) drift is minimal, and 3) calibration of the instrument at power could cause unplanned plant transients.

6. Recirculation Pump Temperature Instrument Calibration (ISP-78)

The purpose of this procedure is to demonstrate the operability of the Recirculation Pump Temperature Instrument Channels of the Recirculation System. There are four temperature transmitters calibrated as part of the procedure: 02-TT-157A, B, C, & D (Reference 21).

Past calibration data was analyzed to predict drift associated with the longer calibration interval of 30 months (24 months plus 25%). Field data from five calibration dates were evaluated to establish drift values by comparing the "as-found" channel conditions to the previous calibrations "as-left" conditions.

The expected drift for the resistance temperature detectors (RTDs) over a year will not exceed 0.2 percent of the operating temperature range (Reference 22). From this manufacturer data, the vendor allowable drift (VDA) for the instrument was calculated for 30 months as 1.096% of span. This allowable drift was extrapolated using the "square root sum of the squares" methodology. An analysis of past drift data was performed to find the best estimate drift (BED). The BED, 0.696% of span, is an average of the past drift values, and is a good predictor of future drift for these instruments. Since the best estimate drift is lower than the vendor allowable drift, the calibration of the Recirculation Loop Suction Temperature can be safely extended with the nominal 24 month operating cycle. The drift calculations are included in Attachment D.

7. Reactor Vessel Safety/Relief Valve Monitoring System (VMS) Functional Test (ISP-92-1)

The purpose of this procedure is to perform a functional check of the accelerometers that are located on the SRVs. The procedure is applicable to the following eleven instruments: 02VMS-071A through L. The surveillance consists of lightly tapping the SRV tailpipe close to the accelerometer while listening to the audio output. The resultant acoustic response is then observed and recorded at the Relay Room panel for both the primary and redundant accelerometer (Reference 23).

The first consideration in the SRV monitoring surveillance extension is on-line testing as a determination of system operability. The Safety Relief Valve Monitor Instrument Check (ST-22I), performed on a monthly basis, demonstrates the operability of safety relief valve tailpipe acoustic and temperature monitoring systems by measuring both noise levels and temperatures from each SRV (Reference 5).

Another factor in test extension is that the surveillance cannot be completed during power operation. The required tapping on SRV tailpipes to test accelerometer response requires access to the normally inerted drywell.

The final consideration for extension is the past performance of the equipment in testing. The previous four refueling outages test results were reviewed to evaluate system reliability. Out of 88 accelerometer readings, both primary and redundant for 11 instruments in four tests, there were only 3 instances where the accelerometer failed to register. In none of these cases were both the primary and redundant accelerometers inoperable. Therefore, operators would have been able to detect SRV operation.

The Reactor Vessel Safety/Relief Valve Monitoring System Functional Test can be safely extended with the nominal 24 month operating cycle for the following reasons: 1) the monthly surveillance of the SRV accelerometers ensures their operability, 2) the test must be performed during shutdown conditions since access to the drywell is required, and 3) a review of past performance for the acoustic monitors showed their reliability.

8. Reactor Vessel Safety/Relief Valve Thermocouple Functional Test (ISP-92-2)

The purpose of this procedure is to functionally check the thermocouples located on the safety/relief valves. This procedure is applicable to the following eleven instruments: 02-TE-112A & B and 02-TE-113A thru J. The surveillance consists of recording the ambient temperature recorded by the thermocouple, then placing a bag of ice on the thermocouple. The response of the thermocouple to the lower temperature is correspondingly recorded. The ice is removed, and the thermocouple monitored to ensure its return to ambient conditions (Reference 24).

The first consideration in SRV thermocouple surveillance extension is on-line testing as a determination of system operability. The Safety Relief Valve Monitor Instrument Check (ST-22I), performed on a monthly basis, demonstrates the operability of safety relief valve tailpipe acoustic and temperature monitoring systems by measuring both noise levels and temperatures from each SRV monitor (Reference 5).

Another consideration for test extension is that the surveillance cannot be completed during power operation. The procedure requires drywell access, and is therefore not practical to test at power.

The final consideration for extension is the past performance of the equipment in testing. A review of the operating occurrence reports from 1986 to 1991 revealed no failures with SRV thermocouples.

The Reactor Vessel Safety/Relief Valve Thermocouple Functional Test can be safely extended with the nominal 24 month operating cycle for the following reasons: 1) the monthly surveillance of the SRV thermocouples ensures their operability, 2) the test must be performed during shutdown conditions since access to the drywell is required, and 3) a review of past performance for the SRV thermocouples showed their reliability.

2. Maintenance Activity Changes

1. Reactor Vessel Safety Relief Valve Maintenance (MP-2.4)

This procedure describes the maintenance and inspection of the Reactor Vessel Safety/Relief Valves. This includes solenoid removal & replacement, pilot removal & replacement, base removal & replacement, and the maintenance of the main stage assembly. In addition, the pilot assembly is bench tested, with refurbishment performed, if necessary, in accordance with the manufacturer recommendations. Also, maintenance includes inspection of the pilot valve stem labyrinth seal area (Reference 25).

The major concern with SRV performance is their tendency to drift beyond the range of allowable lift settings. A review of the operating occurrence reports from 1986 to 1991 revealed that SRV performance has been good other than drift. This problem with SRV setpoints is a known issue and is currently being addressed by the BWROG. Also, a Technical Specification change package was submitted to the NRC to increase the maximum permissible setpoint tolerance from one percent to three percent, consistent with ANSI/ASME OM-1-1981 (Reference 6).

With reference to the extension to a nominal 24 month operating cycle, the longer frequency between the surveillances is expected to have no effect on SRVs from a mechanical standpoint. Concerning the issue of setpoint drift, an analysis of SRV actual lift settings with respect to length of service was performed to identify any drift trends. The results show that there is no increasing drift trend with a longer length of service. Therefore, SRV drift is not time dependent and will not be affected by the extension to a 24 month operating cycle. The SRV drift trend, prepared by G. Ottman - JAF Technical Services, is shown in Attachment C.

The final factor in extension of this maintenance activity is the burden of performing the maintenance during power operation. SRV maintenance must be completed when the reactor is in the cold shutdown condition with the drywell de-inerted and ventilated.

The Reactor Vessel Safety Relief Valve Maintenance can be safely extended with the nominal 24 month operating cycle for the following reasons: 1) a review of past operational occurrence reports found no problems with SRVs other than drift from the lift setting, 2) an analysis of SRV setpoint drift with respect to length of service shows no increasing drift trend in longer intervals, and 3) maintenance of the SRVs at times other than the refueling outage is impractical.

2. Main Steam Line Isolation Valve Maintenance (MP-29.1)

This procedure describes the routine maintenance performed on the Main Steam Isolation Valves. This procedure is applicable to the following valves and their subcomponents: 29AOV-80A, B, C, & D and 29AOV-86A, B, C, & D. This maintenance procedure includes the inspection, cleaning, and lubrication of the MSIVs, as well as post-maintenance testing which includes a springs-only fast close test (Reference 14).

The quarterly performance of the MSIV Fast Closure Test (ST-1B) ensures the integrity of MSIV mechanical components. MSIVs are closed and opened by their control switch. The time interval between placing the MSIV control switch to the closed position and the red open indicating light illuminating is measured with a calibrated stopwatch. All MSIVs should have a closing time of 3 to 5 seconds. Problems with this on-line surveillance would require an investigation into the cause, with maintenance performed if necessary (Reference 26). This fast-close stroke test ensures the mechanical operability of the MSIVs. However, the fast-close stroke test is unable to readily detect spring fatigue or degradation since closure is accomplished with both spring and pneumatic force.

The issue of MSIV spring integrity is discussed in GE SIL No. 477 (Reference 13). The letter recommends that a springs-only full stroke closing test be performed to confirm that stem packing friction does not prevent MSIV closure in the event that pneumatic force is lost. This testing is to be performed following refueling outage MSIV

leak rate testing, or whenever the packing chamber is adjusted. The justification for extending the springs-only testing portion of this maintenance activity relies on the fact that problems with stem packing friction is a known issue which is closely maintained and monitored. Procedures ensure valve packing adjustments do not increase stem friction force beyond the spring force following an outage, while the monthly fast-close test would detect excessive increases in stem friction.

A review of the MSIV work request history was performed to determine if MSIV operability problems were time-dependent, and also check the reliability of the MSIV springs. No time-dependent or spring-related MSIV failures were found. All MSIV actuators were rebuilt in the 1988 refueling outage.

The Main Steam Line Isolation Valve Maintenance can be safely extended for the following reasons: 1) the on-line fast stroke testing ensures MSIV operability and would identify equipment problems except for the integrity of the springs, 2) MSIV springs-only closing capability is ensured by the post-maintenance testing, while of on-line fast-stroke test would detect excessive increases in spring force; also, GE SIL No. 477 recognizes that springs-only testing should be performed following leakage testing and valve packing adjustments, and 3) a review of past MSIV work requests found no evidence of time dependent or spring related failures.

3. Main Steam Line Isolation Valve Closure (RPS) Position Switch Calibration (MP-29.2)

The purpose of this procedure is to perform a calibration of the Main Steam Isolation Valve 10% Closure Limit Switches of the Reactor Protection System. This is applicable to the following switches: 29PNS-80A, B, C, & D and 29PNS-86A, B, C, & D (Reference 27).

The first consideration for extension of this maintenance procedure is the existence of on-line monitoring and testing to determine MSIV limit switch operability. Since the switches are periodically monitored in the control room, a broken switch or any significant movement in switch position would be readily detected by operators. Also, the Main Steam Isolation Valves Limit Switch Instrument Functional Test (ST-1I) is performed monthly to ensure the operability of MSIV closure limit switches through the cycling of the MSIV to the 10 percent closed position. The

failure of this surveillance would alert operators to investigate the switches, and perform the required maintenance, if necessary (Reference 28).

Another consideration for maintenance extension with the longer operating cycle is the fact that the calibration must be performed while the plant is in a shutdown condition. Realigning of the limit switches during power operation could subject technicians to increased radiation exposure.

The Main Steam Line Isolation Valve Closure (RPS) Position Switch Calibration can be safely extended with the nominal 24 month fuel cycle for the following reasons: 1) periodic control room monitoring of MSIV limit switches and the monthly performance of the MSIV limit switch functional test ensure equipment operability, and 2) performance of the calibration at power could subject technicians to increased radiation exposure.

4. **Limitorque Motor Operators - Model SMB/SB Preventive Maintenance Inspection and Functional Testing (MP-59.21)**

5. **Limitorque Motor Operators - Model SMB and SB Preventive Maintenance Inspection, Lubrication, and Testing on Baselined MOVs (MP-59.51)**

These Limitorque Motor Operators preventive maintenance procedures are currently performed once every 18 months and include the following: external inspection, motor inspection, motor and gear house grease inspection, worm gear immersion inspection, "as-found" torque switch settings, and post-work testing. Two separate procedures are written since the MOVs at FitzPatrick are undergoing baseline diagnostic testing using the VOTES test system. At the current time, all MOVs have not been baselined; therefore, separate maintenance procedures are necessary. The MOV preventive maintenance procedure for baselined MOVs includes "as-found" limiter plate setting, "as-found" geared limit switch settings, and "as-left" geared limit switch settings (Reference 29 & 30).

The following NSSS MOVs are maintained every 18 months: "A" and "B" Recirculation Pump Discharge Valves (02MOV-53A & 02MOV-53B), Inside Main Steam Drain Isolation Valve (29MOV-74), Outside Main Steam Drain Isolation Valve (29MOV-77). The Reactor Head Vent to Main Steam Line Limitorque Valve (29MOV-102) was listed in the maintenance procedure, but has since been disabled and is currently in manual mode.

These procedures consist primarily of maintenance on the Limitorque actuator, but also includes the separate issue of valve stem cleaning and lubrication. The justifications for each are explained below.

Concerning actuator maintenance, the Limitorque Type SMB Instruction and Maintenance Manual states that a schedule should be made to periodically inspect and lubricate all Limitorque equipment. The manual recommends an initial 18 month maintenance frequency with a provision for altering the interval based on operating experience, frequency of operation, and operating conditions (Reference 31). This was affirmed by Limitorque Maintenance Update 92-1 which restated that the maintenance interval depends on inspection histories (Reference 32). MOV actuator performance will be reviewed periodically to determine the adequacy of the preventive maintenance.

Motor Operated Valve surveillance and maintenance is currently being evaluated at FitzPatrick as a result of Generic Letter 89-10 (Reference 33). The generic letter work is now in progress, and will ultimately provide greater assurance of MOV operability.

The MOVs are located both inside and outside of the drywell. The outboard valve (29MOV-77) is operated infrequently and is installed in a controlled environment (i.e. dust free and moderate temperature). The inboard valves (02MOV-53A & 53B, and 29MOV-74) are also operated infrequently. However, inboard valves are subject to moisture intrusion and the effects of higher temperatures on oils and lubricants.

An important consideration in the extension of this preventive maintenance activity involves past performance. This is less of a concern for the four MOVs covered under this report since they have been recently overhauled or replaced. In the 1990 refueling outage, 29MOV-74 was replaced. In the 1992 refueling outage, 02MOV-53A & B are scheduled for overhaul, while 29MOV-74 is scheduled for

replacement. Also, by the end of the 1992 refueling outage, all MOVs will be baselined using the VOTES diagnostic system.

An important consideration in MOV operability is the quality and reliability of the lubrication used in the valves and actuators. To allow extension of this preventive maintenance, the lubricants utilized in the actuators must not significantly degrade over the nominal 24 month operating cycle. The main gear case is lubricated with Exxon Nebula EP-0. This lubricant is a calcium complex-gelled mineral oil plus additives that is effective over a wide range of load, speed, temperature, and moisture conditions. The operating limit for the Nebula grease ranges from 200° to 300° F. The geared limit switch is lubricated with either Exxon Beacon 325 or Mobil Mobilgrease 28. The Beacon 325 is an ester-based, lithium soap-gelled product that is formulated for use over a wide temperature range. Its operating limit is from 200° to 300° F. The Mobilgrease 28 is a synthetic hydrocarbon based, clay-gelled product that is also designed for use over a wide temperature range. Its operating limit is from 200° to 325° F. The motor bearings are permanently lubricated at the factory for a 40 year life (Reference 34). Since the temperature inside the drywell is required to be 140° F or less during plant operation (Reference 35), and the auxiliary buildings are also kept at a controlled temperature, MOV lubricant degradation due to temperature effects during normal operation is not likely to occur.

The valve stem maintenance includes the cleaning of the valve stem threads below the operator and applying Nebula EP-0. Extending the lubrication interval could increase the possibility of poor MOV performance from an increase in stem friction. Justification for the extension of valve stem lubrication relies on the ability of MOV stroke testing to detect valve stem lubrication problems. As stated previously, 2 MOVs are stroke tested quarterly, while two are stroked during cold shutdown. Such testing, along with past experience showing an 18 month lubrication frequency to be acceptable, allows the lubrication interval to be safely extended with the 24 month operating cycle. Also, EPRI-NMAC is currently researching the area of valve stem/stem nut lubrication. Upon completion of the program, the valve stem inspection and lubrication may be modified to require a different lubricant, a different lubrication interval, or a combination of both (Reference 34).

The integrity of the MOVs that perform a containment isolation function, 29MOV-74 & 77, is confirmed by the containment isolation valve leakage test, which is performed every refueling outage. This surveillance ensures that each MOV meets its individual leakage acceptance criteria (Reference 36). Increased valve leakage may indicate common deficiencies such as seat leakage or valve stem packing leakage, but also the early stages of actuator degradation. This would allow maintenance to be performed on the affected MOV before actuator operability concerns arise.

Also, the FitzPatrick Inservice Testing (IST) Program includes the quarterly stroke testing of 29MOV-74 & 77, and the cold shutdown stroke testing of 02MOV-53A & 53B (Reference 11). A failure of the valves to meet surveillance acceptance criteria would be investigated and corrected, if necessary.

Another measure of MOV operability is the VOTES diagnostic system, which can detect the rate of MOV loading phenomenon during flow/differential pressure tests. The system can measure changes in MOV performance, and also help adjust torque switch settings (Reference 37). Baseline testing will be completed for all MOVs by the end of the 1992 refueling outage. In the future, deviations from the baseline will be evaluated and corrective maintenance performed as necessary to ensure continued MOV operability.

The final consideration in the extension of MOV preventive maintenance are the conditions required for its completion. Three of the MOVs are inside the drywell, therefore requiring access for maintenance. Since the drywell is inerted during normal operation, it is not practical to perform this maintenance activity other than during a refueling outage.

The Limitorque Valve Operator Preventive Maintenance can be safely extended for the following reasons: 1) the Limitorque manual recommends that the initial preventive maintenance frequency should be every 18 months, but does not preclude adjustment of the maintenance interval based on acceptable operating frequency, conditions, and experience, 2) work performed in conjunction with Generic Letter 89-10 program will enhance reliable operation of the MOVs, 3) the MOVs evaluated are recently overhauled or replaced, 4) the lubricants used in the MOV actuators have a good record of past performance with no evidence of cycle dependent degradation, 5) on-line and cold shutdown stroke

testing, along with good past experience, ensure reliable valve stem/stem nut lubrication, 6) leak testing of the two MOVs that perform a containment isolation function could reveal early actuator degradation, 7) IST stroke testing, both quarterly and cold shutdown, help to ensure the operability of all four MOVs, 8) baseline diagnostic testing (VOTES) is being performed on all MOVs and will increase confidence in valve operability, and 9) performance of the maintenance during operation is impractical since access to the to the normally inerted drywell is required for three of the MOVs.

6. Lubrication of Electric Motors (Without Disassembly) with Grease Lubricated Bearings (MP-101.04)

This maintenance procedure consists of the periodic lubrication of electric motors (without disassembly) with grease lubricated bearings. It applies to electric motors that have grease lubricated ball or roller bearings. The motors included in the maintenance activity that fall under the category of NSSS include the Recirculation MG Set Lube Oil Pumps (02-184P-2A1, 2A2, 2A3, 2B1, 2B2, & 2B3) (Reference 38).

The maintenance is scheduled to be performed each refueling outage, but is currently being completed more frequently for the Recirculation MG Set Lube Oil Pumps. The Lubrication Evaluation Data Sheets that specifically apply to the greasing of motor bearings in the Recirculation MG Set Lube Oil Pump revealed that greasing is performed annually with 0.6 oz. of Mobilith AW-2 grease per bearing (Reference 39). This falls well within vendor recommendations that the motor bearings be greased at 18 month intervals. Therefore, extension of this maintenance activity with the nominal 24 month operating cycle is not necessary.

7. Replacement of ASCO Series NP8323 Solenoid Valves (MP-200.1)

The purpose of this maintenance procedure is to specify the replacement installation requirements (which serves as the procedure for the performance of environmental qualification maintenance and preventive maintenance) for the ASCO Series NP8323 solenoid valves installed on the

Main Steam Isolation Valve actuators. This procedure is applicable to the ASCO three-way solenoid valves with the following plant identification numbers: 29SOV-80A2 through D2 and 29SOV-86A2 through D2. The maintenance frequency of 18 months has been determined by the EQ program Aging Data Base (Reference 40).

The primary consideration in replacement interval extension with the 24 month operating cycle is the EQ life of the equipment. The ASCO Series NP8323 Solenoid valves have a qualified life of 2.6 years for the inboard valves (29SOV-80A2 through D2) and 1.7 years for the outboard valves (29SOV-86A2 through D2) due to the combined effects of a normal and accident environment (Reference 41).

Since the EQ life of the solenoid valves on the inboard MSIVs (29SOV-80A2 through D2) is greater than 30 months (2 years + 25%), their replacement can be safely extended with the longer operating cycle. It is also recommended that the replacement of the solenoid valves on the outboard MSIVs (29SOV-86A2 through D2) be either: 1) performed annually in conjunction with the mid-cycle and refueling outages since the EQ life is less than 30 months, or 2) the EQ life be reevaluated for possible extension to 30 months.

V. Summary and Conclusions

To support the 24 month fuel cycle, extension of the following once per refueling outage and once per operating cycle Nuclear Steam Supply System surveillance test intervals is proposed.

1. The Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test (ST-22B) can be safely extended for the following reasons: 1) leaking or partially open SRVs are readily detected during normal operation, 2) a review of past performance shows that SRVs are mechanically reliable with the exception of setpoint drift, and there has been no evidence of tailpipe blockage. Regarding setpoint drift, trending with respect to length of service revealed SRV drift not to be cycle length dependent.

2. The Reactor Vessel Operational Pressure Test (ST-39H) can be safely extended for the following reasons: 1) ASME Section XI requirements do not preclude pressure test extension, 2) the refueling outage is the most appropriate time to conduct this test because the RCS has been disassembled and reassembled, and 3) leakage from the reactor coolant pressure boundary would be readily detected.

3. The Shutdown Cooling Suction Operational Pressure Test (ST-39K) can be safely extended for the following reasons: 1) the refueling outage is the most appropriate time to conduct this test because the components have been disassembled and reassembled, 2) the longer test interval is consistent with the requirements of ASME Section XI, and 3) leakage from the pressure boundary during shutdown cooling operation would be detected.

4. The Outboard MSIV Simulated Loss Of Instrument Air Drift Test (ST-39N) can be safely extended for the following reasons: 1) the integrity of the accumulators is ensured each refueling outage through post-maintenance testing, 2) the quality of instrument air meets current industry standards, and thereby lowers the likelihood of MSIV pneumatic component failure, 3) the MSIVs cannot be tested during power operation or cold shutdown when the drywell is inerted, and 4) a review of past MSIV accumulator performance has shown them to be leaktight and the check valves functioning properly.

5. The Reactor Level Indication Instrumentation Calibration (ISP-3-8) can be safely extended for the following reasons: 1) the potential increase in drift associated with the longer calibration interval is accommodated by the large allowances for harsh environmental effects on instruments in the EOPs, 2) drift is minimal, and 3) calibration of the instrument at power could cause unplanned plant transients.

6. The Recirculation Pump Temperature Instrument Calibration (ISP-78) can be safely extended with the nominal 24 month operating cycle since the best estimate drift is lower than the vendor allowable drift.

7. The Reactor Vessel Safety/Relief Valve Monitoring System Functional Test (ISP-92-1) can be safely extended with the nominal 24 month operating cycle for the following reasons: 1) the monthly surveillance of the SRV accelerometers ensures their operability, 2) the test must be performed during shutdown conditions since access to the drywell is required, and 3) a review of past performance for the acoustic monitors showed their reliability.

8. The Reactor Vessel Safety/Relief Valve Thermocouple Functional Test (ISP-92-2) can be safely extended with the nominal 24 month operating cycle for the following reasons: 1) the monthly surveillance of the SRV thermocouples ensures their operability, 2) the test must be performed during shutdown conditions since access to the drywell is required, and 3) a review of past performance for the SRV thermocouples showed their reliability.

9. The Reactor Vessel Safety Relief Valve Maintenance (MP-2.4) can be safely extended with the nominal 24 month operating cycle for the following reasons: 1) a review of past operational occurrence reports found no problems with SRVs other than drift from the lift setting, 2) an analysis of SRV setpoint drift with respect to length of service shows no increasing drift trend in longer intervals, and 3) maintenance of the SRVs at times other than the refueling outage is impractical.

10. The Main Steam Line Isolation Valve Maintenance (MP-29.1) can be safely extended for the following reasons: 1) the on-line fast stroke testing of the MSIVs would identify equipment problems except for the integrity of the springs, and 2) GE SIL No. 477 recommends that MSIV testing and maintenance be performed every refueling, not precluding maintenance activity extension.

11. The Main Steam Line Isolation Valve Closure (RPS) Position Switch Calibration (MP-29.2) can be safely extended with the nominal 24 month fuel cycle for the following reasons: 1) periodic control room monitoring of MSIV limit switches and the monthly performance of the MSIV limit switch functional test ensure equipment operability, and 2) performance of the calibration at power could lead to unplanned plant transients.

12. The Limitorque Valve Operator Preventive Maintenance (MP-59.21 & MP-59.51) can be safely extended for the following reasons: 1) the Limitorque manual recommends that the initial preventive maintenance frequency should be every 18 months, but does not preclude adjustment of the maintenance interval based on acceptable operating frequency, conditions, and experience, 2) work performed in conjunction with Generic Letter 89-10 program will enhance reliable operation of the MOVs, 3) the MOVs evaluated are recently overhauled or replaced, 4) the lubricants used in the MOV actuators have a good record of past performance with no evidence of cycle dependent degradation, 5) on-line and cold shutdown stroke testing, along with good past experience, ensure reliable valve stem/stem nut lubrication, 6) leak testing of the two MOVs that perform a containment isolation function could reveal early actuator degradation, 7) IST stroke testing, both quarterly and cold shutdown, help to ensure the operability of all four MOVs, 8) baseline diagnostic testing (VOTES) is being performed on all MOVs and will increase confidence in valve operability, and 9) performance of the maintenance during operation is impractical since access to the to the normally inerted drywell is required for three of the MOVs.

13. The Lubrication of Electric Motors (Without Disassembly) with Grease Lubricated Bearings (MP-101.04) is not necessary to extend with the longer operating cycle since the maintenance activity is currently being performed on an annual basis.

14. The Replacement of ASCO Series NP8323 Solenoid Valves (MP-200.1) has two recommendations concerning extension due to different component locations. Since the EQ life of the solenoid valves on the inboard MSIVs (29SOV-80A2 through D2) is greater than 30 months (2 years + 25%), their replacement can be safely extended with the longer operating cycle. It is also recommended that the replacement of the solenoid valves on the outboard MSIVs (29SOV-86A2 through D2) be either: 1) performed annually in conjunction with the mid-cycle and refueling outages since the EQ life is less than 30 months, or 2) the EQ life be reevaluated for possible extension to 30 months.

Technical Specification changes will be required by the extension of certain tests. The proposed changes to the Fitzpatrick Technical Specifications are given in Attachment F. All other Technical Specifications surveillance requirements evaluated for extension in this report state that tests are to be completed during refueling. These cases require no changes to the Technical Specifications.

VI. References

1. Index of Operations Surveillance Test Procedures, January 23, 1992.

2. Operating Occurrence Report Logs from 1986 to 1991.

3. Maintenance Department Preventive Maintenance Schedule, September 24, 1990.

4. Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test [IST] (ST-22B), Revision 19, October 17, 1990.

5. Safety Relief Valve Monitor Instrument Check (ST-22I), Revision 9, December 12, 1991.

6. James A. FitzPatrick Nuclear Power Plant, "Proposed Change to the Technical Specifications Regarding Updated SRV Performance Requirements and Miscellaneous Changes," JPN-89-084, December 20, 1989.

7. Reactor Vessel Operational Pressure Test [ISI] (ST-39H), Revision 15, June 6, 1990.

8. ASME Boiler and Pressure Vessel Code, Section XI, Summer 1983 Addenda.

9. James A. FitzPatrick Nuclear Power Plant, Central Control Room Logs.

10. Shutdown Cooling Suction Operational Pressure Test (ST-39K), Revision 3, June 6, 1990.

11. James A. Fitzpatrick Nuclear Power Plant, Second Ten Year Interval Inservice Testing Program, May 5, 1991.

12. Outboard MSIV Simulated Loss of Instrument Air Drift Test (ST-39N), Revision 3, May 2, 1990.

13. GE Service Information Letter (SIL) No. 477, "Main Steam Isolation Valve Closure," January 3, 1989.

14. Main Steam Isolation Valve Maintenance (MP-29.1), Revision 9, June 28, 1990.

15. NRC Generic Letter No. 88-14, "Instrument Air Supply Problems Affecting Safety Related Equipment," August 22, 1988.

16. NYPA Letter JPN-89-007, "Response to Generic Letter 88-14 Instrument Air Supply System Problems Safety Related Equipment," February 17, 1989.

17. Reactor Level Indication Instrument Calibration (ISP-3-8), Revision 0, September 21, 1988.

18. Memorandum DC-92-001, "Barton Flow Indicator Switch," March 27, 1992.

19. Prompt Reportable Occurrence, LER 90-001

20. Prompt Reportable Occurrence, LER 90-026

21. Recirculation Pump Temperature Instrument Calibration (ISP-78), Revision 11, December 4, 1991.

22. Rosemount Inc., "Series 78S, 88S Platinum Resistance Temperature Sensors," Product Data Sheet 2389, 1984.

23. Reactor Vessel Safety/Relief Valve Monitoring System (VMS) Functional Test (ISP-92-1), Revision 1, September 10, 1986.

24. Reactor Vessel Safety/Relief Valve Thermocouple Functional Test (ISP-92-2), Revision 1, June 3, 1987.

25. Reactor Vessel Safety/Relief Valves Maintenance (MP-2.4), Revision 3, July 18, 1991.

26. MSIV Fast Closure (ST-1B), Revision 14, August 21, 1991.

27. Main Steam Line Isolation Valve Closure (RPS) Position Switch Calibration (MP-29.2), Revision 0, March 26, 1989.

28. Main Steam Isolation Valves Limit Switch Instrument Functional Test (ST-1I), Revision 15, June 12, 1991.

29. Limitorque Motor Operators - Model SMB/SB Preventive Maintenance Inspection and Functional Testing (MP-59.21), Revision 10, November 20, 1991.

30. Limitorque Motor Operators - Model SMB and SB Preventive Maintenance Inspection, Lubrication and Testing on Baselined MOVs (MP-59.51), Revision 1, December 12, 1991.

31. Limitorque Type SMB Instruction and Maintenance Manual: Bulletin SMBI-82C, 1982.

32. Limitorque Maintenance Update 92-1, Section 6, "Limitorque 18 Month Lube Inspection."

33. NRC Generic Letter 89-10, "Safety Related Motor-Operated Valve Testing and Surveillance," June 28, 1989.

34. Electric Power Research Institute (EPRI), Nuclear Maintenance Applications Center, "Lubrication Guide," Revision 1, July, 1991.

35. Operating Procedure F-OP-53, "Drywell Ventilation and Cooling," Revision 5, May 19, 1988.

36. Type B and C LLRT of Containment Penetrations [IST] (ST-39B), Revision 25, January 7, 1992.

37. Data Acquisition of Limitorque Valves Using VOTES (MP-59.36), Revision 3, January 8, 1992.

38. Lubrication of Electric Motors (w/o disassembly) with Grease Lubricated Bearings (MP 101.04), Revision 14, May 8, 1991.

39. Lubrication Evaluation Data Sheet for Recirculation MG Set Lube Oil Pump - Motor, October 11, 1985.

40. Replacement of ASCO Series NP-8323 Solenoid Valves (MP-200.1), Revision 1, May 30, 1990.

41. Environmental Qualification File No. 3503, System Component Evaluation Worksheet regarding the following components: 29SOV-80A2 through D2 & 29SOV-86A2 through D2.

42. Memorandum EP-RF-95-060, "Extension of the Surveillance Interval for JAF Safety Relief Valves in Support of the 24 Month Operating Cycle", dated March 7, 1995.

Nuclear Steam Supply System
Surveillance Test Extensions

FITZPATRICK - 24 MONTH OPERATING CYCLE

ATTACHMENT A

SAFETY EVALUATION

24 MONTH OPERATING CYCLE
NUCLEAR STEAM SUPPLY SYSTEM
SURVEILLANCE TEST EXTENSIONS

I. Safety Evaluation

The proposed changes have been reviewed in accordance with the requirements of 10 CFR 50.59 and 10 CFR 50.92. These changes, which extend the test intervals do not involve an unreviewed safety question nor do they constitute a Significant Hazards Consideration.

1. The probability of occurrence and the consequences of an accident or malfunction of safety-related equipment previously evaluated in the safety analysis report will not be increased.

   Changes are proposed to increase the surveillance test interval (STI) with the nominal 24 month fuel cycle for the following surveillances: Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test - IST (ST-22B), Reactor Vessel Operational Pressure Test - ISI (ST-39H), Shutdown Cooling Suction Operational Pressure Test - ISI (ST-39K), Outboard MSIV Simulated Loss of Instrument Air Drift Test (ST-39N), Reactor Level Indication Instrumentation Calibration (ISP-3-8), Recirculation Pump Temperature Instrument Calibration (ISP-78), Reactor Vessel Safety/Relief Valve Monitoring System (VMS) Functional Test (ISP-92-1), and Reactor Vessel Safety/Relief Valve Thermocouple Functional Test (ISP-92-2). These changes extend the STIs. They do not involve any hardware modifications. There is no increase in (1) the probability of an accident occurring, (2) the consequences of an accident, and (3) the consequences of equipment malfunction. However, increasing the STIs may affect the probability of equipment malfunction.

   Regarding the probability of equipment malfunctions:

   - The Manual Safety Relief Valve Operation and Valve Monitoring System Functional Test (ST-22B) can be safely extended with the longer operating cycle. Leaking or partially open SRVs are readily detected during normal operation, and a review of past performance shows that SRVs are mechanically reliable with the exception of setpoint drift. Regarding setpoint drift, a safety evaluation was prepared by GE that defined an upper limit for SRV opening pressure well above current allowable (1%), proposed allowable (3%), and expected worst case (considering the increased emphasis on SRV operability) setpoint drift. FitzPatrick recognizes the complexity of the SRV drift issue and is working to correct operability problems by participating in the BWROG SRV setpoint drift program and submitting SRV Technical Specifications changes. Also, all SRVs will be removed for bench testing over the operating cycle until the setpoint drift issue is resolved which exceeds Technical Specifications and ANSI/ASME OM-1-1981 requirements.

   - The Reactor Vessel Operational Pressure Test (ST-39H) and the Shutdown Cooling Suction Operational Pressure Test (ST-39K) can be safely extended with the longer operating cycle. Leakage from the pressure boundaries during normal or shutdown cooling operation would be detected. Also, ASME Section XI requirements do not preclude pressure test extensions, and the refueling outage is

the most appropriate time to conduct the testing since the systems have been disassembled and reassembled.

- The Outboard MSIV Simulated Loss Of Instrument Air Drift Test (ST-39N) can be safely extended with the longer operating cycle. The surveillance has no effect on the fail-safe position (closed) of the MSIVs; keeping the MSIV open during the loss of instrument air is the test condition. The quality of instrument air meets current industry standards which lowers the likelihood of MSIV pneumatic component failure. Also, the MSIVs cannot be tested during power operation since the air supply originates from a common header which would require the impractical isolation of all four isolation valves for testing.

- The Reactor Level Indication Instrumentation Calibration (ISP-3-8) can be safely extended with the longer operating cycle. The drift is minimal, and the potential increase in drift associated with the longer calibration interval is accommodated by the large allowances for harsh environmental effects on instruments in the EOPs. Also, calibration of the instrument at power could cause unplanned plant transients.

- The Recirculation Pump Temperature Instrument Calibration (ISP-78) can be safely extended with the longer operating cycle since the projected drift (BED30) is lower than the expected drift based on vendor data (VDA30).

- The Reactor Vessel Safety/Relief Valve Monitoring System Functional Test (ISP-92-1) and the Reactor Vessel Safety/Relief Valve Thermocouple Functional Test (ISP-92-2) can be safely extended with the longer operating cycle. The monthly surveillance of the SRV acoustic monitors and thermocouples, along with their reliable past performance ensures system operability. Also, the tests must be performed during shutdown conditions since access to the drywell is required.

2. The possibility of an accident or malfunction of a different type than evaluated previously in the safety analysis report is not created.

   The proposed changes extend STIs. The proposed changes do not change the manner in which the Nuclear Steam Supply System functions. An evaluation of past equipment performance and a study of on-line testing show the longer STIs will not degrade Nuclear Steam Supply equipment. Therefore, the proposed changes do not create any new failure modes or a new accident.

3. The margin of safety as defined in the basis for any technical specification is not reduced.

   The proposed changes do not reduce the margin of safety as defined in the basis for any Technical Specifications. The proposed changes extend STIs. Evaluation of the past performance of the equipment indicates that the effects of extending the STIs would not involve a significant reduction in a margin of safety.

FITZPATRICK - 24 MONTH OPERATING CYCLE

ATTACHMENT B

NSSS OPERATIONAL OCCURRENCE REPORTS

OPERATIONAL OCCURRENCES (1986 - 1991)

86-015	MSIV 29AOV-80B Limit Switch did not reset.
86-035	"A" Feedwater Return Valve Gasket Leak (Bonnet). Valve since replaced.
86-043	MSIV 90% Limit Switch Out of Calibration.
86-081	"B" Recirculation Discharge Bypass Valve motor not operating valve. Valve since removed.
86-086	MSIV 29AOV-86A 90% Limit Switch did not reset.
86-094	Outboard Main Steam Line Drain - Relay Tripped (sprayed by water).
86-193	Reactor Recirculation Pump Suction Temperature Setpoint Drift.
87-010	MSIV 29AOV-86A failed leak rate test.
87-019	SRV Setpoint Drift.
87-034	Reactor Recirculation Pump Motor "A" Tripped during performance of RCIC Auto Actuation Test.
87-068	MSIV 29AOV-86C Fast Close Time Out of Specification. (2.5 sec. compared to Tech Spec. valve 3 - 5 sec.).
88-061	SRV 02RV-71F, L & H found to lift at > 1% above setting.
88-148	RWR Temperature Detectors 10TE-145A & B found not in service.
88-149	SRVs 02-RV-71D & J found set > 1% above nominal.
88-166	MSIV 29AOV-80A 90% Limit Switch not resetting.
89-013	SRVs 02-RV-71C, K & B left > 1% above setting.
89-033	SRV 02RV-71K inadvertently opened by operator during surveillance.
89-054	MSIV 29AOV-80A 90% Limit Switch failed to reset during monthly surveillance ST-1I.
89-095	RWR Loop Temp Recorder 02TR-165 found not calibrated.
89-134	RWR Inboard Sample Valve 02-2SOV-39 failed closed.
89-165	Flow Unit 02FT-110F reading 20% when actual flow at 42%.
89-179	MSIV 29AOV-86C would not open after fast close test.

24M OPERATING CYCLE
NUCLEAR STEAM SUPPLY SYSTEM

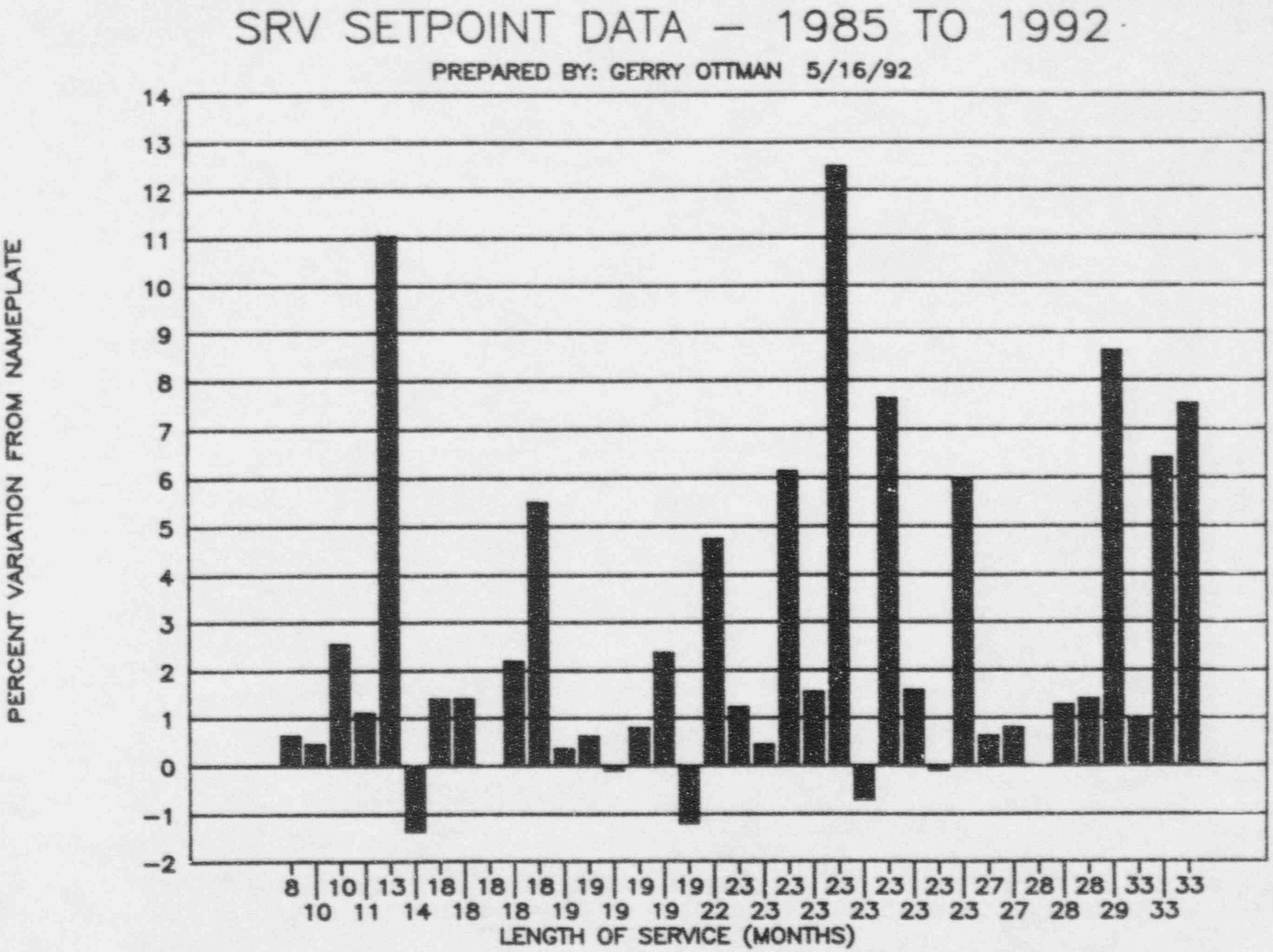
OPERATIONAL OCCURRENCES (1986 - 1991)

89-18[illegible]	Feedwater Flow Transmitters out of calibration.
89-215	Reactor Scram during SRV Testing.
89-240	Feedwater Flow Instuments A & B (anomalous test results) no compensation for static pressurization.
89-253	SRVs 02RV-71E & F found > 1% lift setting limit.
90-073	MSIV 29AOV-86A reopened with switch in closed position.
90-080	MSIV Position Switch 29PNS-80C2 (90%) may have exceeded EQ life.
90-142	MSIV 29AOV-80D would not close fully using slow close switch.
90-174	SRV 02RV-71K pilot assembly as found setting below nameplate during Wyle lab test.
90-176	MSIVs 29AOV-80B & 86B inoperable due to missed surveillance test for springs-only closing time.
90-194	"A" Recirculation Loop rapid temperature increase of 160° to 320° in 3 seconds.
90-228	SRV 02RV-71J pilot assembly setpoint found with 2.3% deviation.
90-239	Limit Switch 29PNS-80A2 did not reset when MSIV full open.
90-245	RWR Pump 02-2P-1B run back to minimum speed while at 100% power.
90-294	RWR Outboard Sample Valve 02-2AOV-40 did not indicate closed during surveillance ST-1C.
90-299	RWR Inboard Sample Valve 02-2SOV-39 leaking past seat approximately 1.2 liters/min with valve closed (02-2SOV-40 inoperable also).
90-332	Startup Flow Control Valve wide open.
91-037	Recirculation MG Pump trip on 1/26/91 and 2/4/91.

FITZPATRICK - 24 MONTH OPERATING CYCLE

ATTACHMENT C

SAFETY/RELIEF VALVE DRIFT ANALYSIS


SRV SETPOINT DATA – 1985 TO 1992
PREPARED BY: GERRY OTTMAN 5/16/92
PERCENT VARIATION FROM NAMEPLATE
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
–1
–2
8 10 10 11 13 14 18 18 18 18 18 19 19 19 19 19 19 22 23 23 23 23 23 23 23 23 23 23 27 27 28 28 28 29 33 33 33
LENGTH OF SERVICE (MONTHS)

Nuclear Steam Supply System
Surveillance Test Extensions

FITZPATRICK - 24 MONTH OPERATING CYCLE

ATTACHMENT D

DRIFT WORKSHEET FOR ISP-78

ISP-78 DATA FOR
ROSEMOUNT 414H3BF1
RECIRC LOOP A1 PUMP INLET TEMP

AVERAGE (30 MONTHS) = 0.696 %SPAN	(18 MONTHS) = 0.506 %SPAN
STD DEV (30 MONTHS) = 0.537 %SPAN	(18 MONTHS) = 0.444 %SPAN
AVG+STD (30 MONTHS) = 1.233 %SPAN	(18 MONTHS) = 0.95 %SPAN
AVG+3STD (30 MONTHS) = 2.307 %SPAN	(18 MONTHS) = 1.838 %SPAN
BED (30 MONTHS) = 0.696 %SPAN	(18 MONTHS) = 0.506 %SPAN
VDA (30 MONTHS) = 1.096 %SPAN	(18 MONTHS) = 1.077 %SPAN
BED30 < VDA30 = YES	BED18 < VDA18 = YES

DATE	DRIFT(mV)	DAYS	30 MONTHS DRIFT(mV)	30 MONTHS %SPAN	18 MONTHS %SPAN
02-TT-157A					
29-SEP-1986	1.94	558	2.28	1.518	1.2939
09-APR-1988	0.24	530	0.29	0.195	0.1601
21-SEP-1989	0.28	253	0.51	0.340	0.1868
01-JUN-1990	0.23	292	0.4	0.266	0.1534
20-MAR-1991					
02-TT-157B					
29-SEP-1986	1.16	563	1.35	0.902	0.7737
14-APR-1988	0.29	525	0.36	0.238	0.1934
21-SEP-1989	0.22	253	0.4	0.267	0.1467
01-JUN-1990	0.79	292	1.37	0.914	0.5269
20-MAR-1991					
02-TT-157C					
29-SEP-1986	1.92	563	2.24	1.492	1.2806
14-APR-1988	0.23	525	0.28	0.189	0.1534
21-SEP-1989	0.48	253	0.87	0.583	0.3201
01-JUN-1990	1.24	292	2.15	1.434	0.8271
20-MAR-1991					
02-TT-157D					
29-SEP-1986	1.87	563	2.18	1.454	1.2472
14-APR-1988	0.31	525	0.38	0.254	0.2068
21-SEP-1989	0.11	253	0.2	0.133	0.0734
01-JUN-1990	0.83	292	1.44	0.960	0.5536
20-MAR-1991					

NOTE: 1) NO DATA POINTS DELETED USING THE OUTLIER TEST
2) CAL-TOL = CALIBRATION TOLERANCE EXPRESSED AS %SPAN

FITZPATRICK - 24 MONTH OPERATING CYCLE

ATTACHMENT E

MOV WORK REQUEST EVALUATION

MOV WORK REQUEST EVALUATION

29MOV-74

Work Request #063588
Date: 4/1/90
Fiche: N/A
Deficiency: Valve tag incorrect.
Corrective Action: Fabricate and install new tag. VCS-90 was etched out and VGW-90 etched on tag.

Work Request #007210
Issue Date: 10/17/88
Fiche: 5921:110-130
Deficiency: Routine PM on Limitorque motor operator per MP-59.21.
Corrective Action: Replaced reducers and fittings.

Work Request #051110
Issue Date: 3/9/90
Fiche: 10890:4-6
Deficiency: Connected MOV to power supply in training for procedure checkout 59.36 DRAFT.
Corrective Action: Connected replacement MOV-74 to power for procedure 59.36.

Work Request #056946
Issue Date: 9/20/89
Fiche: 5380:6-94
Deficiency: While performing MOVATS testing, went to stroke valve manually and declutch lever, would not stay in manual. Valve was electrically operable.
Corrective Action: Adjusted lever IAW MP-59.22. PWT SAT.

Work Request #060929
Issue Date: 11/12/88
Fiche: 5316:89-115
Deficiency: Valve actuator driving valve into backseat before motor trips.
Corrective Action: Adjust open limit switch to 10%. Cycled, stroked, timed SAT.

Work Request #062746
Issue Date: 11/20/88
Fiche: 5288:202-211
Deficiency: Position indicator showed valve in dual position while indicator at switch indicated open.
Corrective Action: Reset rotor to open contacts.

Work Request #062877
Issue Date: 11/11/88
Fiche: 5342:140-166
Deficiency: Replace melamine torque switch with new fibrite torque switch.
Corrective Action: Installed switch to meet EQ requirements via 10CFR21.

Work Request #063314
Issue Date: 10/18/88
Fiche: 5316:139-147
Deficiency: While PM on operator, found flex for motor leads was broken where it enters motor compartment.

Corrective Action: Disconnected and reconnected motor leads. Replace flex. PWT SAT.

Work Request #071512
Issue Date: 4/20/90
Fiche: 10932:59-68
Deficiency: N/A
Corrective Action: Installed VOTES strain gage per MP-59.42.

Work Request #073424
Issue Date: 4/4/90
Fiche: N/A
Deficiency: N/A
Corrective Action: Implemented installation procedure for MOD F1-87-128, Replacement of MOV-74.

Work Request #072976
Issue Date: 4/2/90
Fiche: 10905:41
Deficiency: MOV-74 has packing leak, causing MOV-74 and MOV-77 to fail LLRT.
Corrective Action: Valve replaced per F1-87-128.

29MOV-77

Work Request #087487
Issue Date: 10/2/91
Fiche: N/A
Deficiency: Inspect valve for potential problems affecting valve's ability to open as discussed in INPO OE 475 and JAF OE REVIEW 910472. Complete by 10/31/91.
Corrective Action: N/A

Work Request #063286
Issue Date: 10/31/88
Fiche: 5319:4-59
Deficiency: Body to bonnet leak found during hydro testing.
Corrective Action: Fixed. PWT SAT.

Work Request #071858
Issue Date: 5/2/90
Fiche: 5447:41-44
Deficiency: During PWT for PM, seal-in function of open control circuit failed to operate.
Corrective Action: Inspected and retested, problem could not be found - self-corrected.

Work Request # 082273
Issue Date: 3/12/91
Fiche: 1707:4820-4823
Deficiency: Provide insulation removal and reinstallation support for walkdown inspection.
Corrective Action: Insulation removed, walkdown, replaced original insulation.

02MOV-53A

Work Request #087609
Issue Date: 12/19/91
Fiche: N/A

Deficiency: Performed as found baseline on MOV.
Corrective Action: N/A

Work Request #007154
Issue Date: 10/7/88
Fiche: 5315:216-231
Deficiency: Routine PM per 59.21
Corrective Action: SAT.

Work Request #060784
Issue Date: 8/24/88
Fiche: 10671:161-175
Deficiency: Check backseated valve for damage.
Corrective Action: Closed out per JTS-88-0873.

Work Request #063850
Issue Date: 10/13/88
Fiche: 5229:223-229
Deficiency: N/A
Corrective Action: Open limit switch cover to allow EQ and NRC inspection.

Work Request #064600
Issue Date: 10/30/88
Fiche: 5320:190-204
Deficiency: Excessive seal leakoff.
Corrective Action: Torqued packing per MP-59.9. PWT SAT.

Work Request #070398
Issue Date: N/A
Fiche: 5442:16-27
Deficiency: Valve backseated on 1/12/90 for leakage. Need to repack valve.
Corrective Action: Repacked per 59.20.

Work Request #071515
Issue Date: 4/9/90
Fiche: N/A
Deficiency: N/A
Corrective Action: Replace packing put in Jan 90 forced outage with graphite packing.

Work Request #071536
Issue Date: 8/8/90
Fiche: 1703:2128-2131
Deficiency: Triple packing not sealing well, put in 5 ring graphite live load packing.
Corrective Action: Completed.

Work Request #071606
Issue Date: 1/12/90
Fiche: 5428:55-62
Deficiency: Electrically backseat valve due to possible leakage.
Corrective Action: Valve backseated per MP-59.20. See WR#71665.

Work Request #071665
Issue Date: 6/14/90
Fiche: 10975:174-175

Deficiency: Do engineering evaluation of valve.
Corrective Action: Memo JMD-90-109, 500 cycle fatigue failure.

Work Request #071667
Issue Date: 1/20/90
Fiche: 5428:169-224
Deficiency: Repack valve since electrically backseated.
Corrective Action: Current trace per MP-59.21. MOVATS current trace C1-0 11.4 amps.

Work Request #071703
Issue Date: 1/19/90
Fiche: 5428:97-102
Deficiency: Electrically backseat valve.
Corrective Action: See WR#071665.

Work Request #083211
Issue Date: 10/7/91
Fiche: N/A
Deficiency: Nameplate in error. Replace per F1-87-061-114.
Corrective Action: Done.

02MOV-53B

Work Request #088146
Issue Date: 11/22/91
Fiche: N/A
Deficiency: Install live load packing on valve. Reduce potential to backseat.
Corrective Action: Done.

Work Request #090840
Issue Date: 12/19/91
Fiche: N/A
Deficiency: Perform as found baseline on MOV
Corrective Action: N/A

Work Request #007153
Issue Date: N/A
Fiche: 5292:173-191
Deficiency: Perform routine PM-59.21.
Corrective Action: PWT SAT.

Work Request #060785
Issue Date: 8/23/88
Fiche: 10671:176-190
Deficiency: Check backseated valve for damage.
Corrective Action: Memo JTS-88-0873.

Work Request #063850
Issue Date: 10/13/88
Fiche: 5279:223-229
Deficiency: Open 10% limit switch cover for EQ and NRC inspection.
Corrective Action: Done.

Work Request #064595
Issue Date: 10/30/88
Fiche: 5321:4-15
Deficiency: Weeping drip from packing.
Corrective Action: Torqued packing per MP-59.5. PWT SAT.

Work Request #071536
Issue Date: N/A
Fiche: 1703:2128-2131
Deficiency: Triple packing no good. Change to 5 ring graphite packing.
Corrective Action: Ref: D1-90-055.

Work Request #073789
Issue Date: 9/5/90
Fiche: 1703:3415-3439
Deficiency: Troubleshoot problem with runback signal.
Corrective Action: Fixed.

Work Request #083211
Issue Date: 10/7/91
Fiche: N/A
Deficiency: Nameplate in error. Replace per F1-87-061-114.
Corrective Action: Done.

Nuclear Steam Supply System
Surveillance Test Extensions

FITZPATRICK - 24 MONTH OPERATING CYCLE

ATTACHMENT F

TECHNICAL SPECIFICATIONS CHANGES

Table 4.1-2 (cont'd)

REACTOR PROTECTION SYSTEM (SCRAM) INSTRUMENT CALIBRATION
MINIMUM CALIBRATION FREQUENCIES FOR REACTOR PROTECTION INSTRUMENT CHANNELS

Instrument Channel	Group (1)	Calibration (4)	Minimum Frequency (2)
Turbine Control Valve Fast Closure Oil Pressure Trip	A	Standard Pressure Source	Once/operating cycle
Turbine Stop Valve Closure	A	Note (5)	Note (5)

NOTES FOR TABLE 4.1-2

1. A description of three groups is included in the Bases of this Specification.
2. Calibration test is not required on the part of the system that is not required to be operable, or is tripped, but is required prior to return to service.
3. The current source provides an instrument channel alignment. Calibration using a radiation source shall be made each refueling outage.
4. Response time is not a part of the routine instrument channel test but will be checked once per operating cycle.
5. Actuation of these switches by normal means will be performed ~~during the refueling outages~~ every 24 months. MP-29.2
6. Calibration shall be performed utilizing a water column or similar device to provide assurance that damage to a float or other portions of the float assembly will be detected.
7. Sensor calibration once per operating cycle. Master/slave trip unit calibration once per 6 months.

RPS

TABLE 4.2-8 (cont'd)

MINIMUM TEST AND CALIBRATION FREQUENCY FOR ACCIDENT MONITORING INSTRUMENTATION

	Instrument		Instrument Functional Test	Instrument Calibration Frequency	Instrument Check
15.	Core Spray Flow		N/A	Once/Operating Cycle	Once/day
16.	Core Spray Discharge Pressure		N/A	Once/Operating Cycle	Once/day
17.	LPCI (RHR) Flow		N/A	Once/Operating Cycle	Once/day
18.	RHR Service Water Flow		N/A	Once/Operating Cycle	Once/day
19.	Safety/Relief Valve Position Indicator (Primary and Secondary)	ISP-92-1	~~Once/Operating Cycle~~ Once/24 months	N/A	Once/month
20.	Torus Water Level (narrow range)	ISP-92-2	N/A	Once/Operating Cycle	Once/day
21.	Drywell-Torus Differential Pressure		N/A	Once/Operating Cycle	Once/day

3.5 (cont'd)

D. Automatic Depressurization System (ADS)

1. The ADS shall be operable whenever the reactor pressure is greater than 100 psig, and irradiated fuel is in the reactor vessel and prior to reactor startup from a cold condition, except as specified below:

   a. From and after the date that one of the seven safety/relief valves of the ADS is made or found to be inoperable for any reason while it is required, continued reactor operation is permissible only during the succeeding 30 days unless repairs are made and provided that during such time the HPCI System is operable.

   b. From the time that more than one of the seven safety/relief valves of the ADS are made or found to be inoperable for any reason, continued reactor operation is permissible during the succeeding 24 hrs. unless repairs are made and provided, that

4.5 (cont'd)

D. Automatic Depressurization System (ADS)

1. Surveillance of the Automatic Depressurization System shall be performed ~~during each operating cycle~~ every 24 months as follows:

   22A a. A simulated automatic initiation which opens all pilot valves. — ST-22B

   22B b. Manually open each safety/relief valve while bypassing steam to the condenser and observe a ≥10% closure of the turbine bypass valves, to verify that the safety/relief valve has opened. — ST-22B

   22A c. A simulated automatic initiation which is inhibited by the override switches. — ST-22A

(covered under ECCS ACT)

3.6 (cont'd)

E. Safety and Safety/Relief Valves

1. During reactor power operating conditions and prior to startup from a cold condition, or whenever reactor coolant pressure is greater than atmosphere and temperature greater than 212°F, the safety mode of all safety/relief valves shall be operable, except as specified by Specification 3.6.E.2. The Automatic Depressurization System Valves shall be operable as required by Specification 3.5.D.

4.6 (cont'd)

E. Safety and Safety/Relief Valves

1. At least one half of all safety/relief valves shall be bench checked or replaced with bench checked valves ~~once each operating cycle~~ every 24 months. The safety/relief valve settings shall be set as required in Specification 2.2.B. All valves shall be tested every ~~two operating cycles~~. 48 months.

MP-2.4

3.6 (cont'd)

2.

a. From and after the date that the safety valve function of one safety/relief valve is made or found to be inoperable, continued operation is permissible only during the succeeding 30 days unless such valve is made operable sooner.

b. From and after the time that the safety valve function on two safety/relief valves is made or found to be inoperable, continued reactor operation is permissible only during the succeeding 7 days unless such valves are sooner made operable.

3. If Specification 3.6.E.1 and 3.6.E.2 are not met, the reactor shall be placed in a cold condition within 24 hours.

4. Low power physics testing and reactor operator training shall be permitted with inoperable components as specified in Item B.2 above, provided that reactor coolant temperature is ≤212°F and the reactor vessel is vented or the reactor vessel head is removed.

4.6 (cont'd)

2. At least one safety/relief valve shall be disassembled and inspected ~~once/operating cycle~~. every 24 months. MP-2.4

3. The integrity of the nitrogen system and components which provide manual and ADS actuation of the safety/relief valves shall be demonstrated at least once every 3 months.

4. An annual report of safety/relief vave failures and challenges will be sent to the NRC in accordance with Section 6.9.A.2.b.

123 Main Street
White Plains, New York 10601
914 681 6200

Ref 6

MY COPY

New York Power Authority

Memorandum

August 16, 1994
NED-AP-94-379

TO: T. Moskalyk

FROM: A. Petrenko

SUBJECT: JAF SAFETY RELIEF VALVES SETPOINT CHANGE

General Electric Report GE-NE-187-50-1191, prepared for JAFNPP Power Uprate and issued on Nov. 1991, assumed that the setpoint change for the SRV single setpoint of 1110 psig was implemented. This change was recommended by GE in the "Updated SRV Performance Requirements" report NEDC-31697P, prepared for JAFNPP in April, 1989. However, this recommendation to change SRV setpoints from 1090, 1105 & 1140 psig to a common setpoint of 1110 psig, was not implemented.

Following is the NED/I&C review of documents and concurrence of the original setpoint change. Attached is the MCM 8 Setpoint Change Request, originated by System Engineering (SE) on 6/29/94. Note, that although "there is a change to the facility as described in the FSAR", **no Nuclear Safety Evaluation** is needed for this MCM, for the following reasons.

A detailed Safety Evaluation was included in the **submittal of** the **Technical Specification** SRV specification **change** to the NRC. The Conclusion of the last **Safety Evaluation** revision, submitted via JPN-94-013 on March 2, 1994, includes all pertinent **statements** to insure that "the changes, as proposed, do not constitute an unreviewed safety question **as defined in 10 CFR50.59**".

I was informed on 8/12/94 by SE that "site will go ahead with change to SRV pilots during upcoming outage, using 1110 psig setpoints". It is assumed that tolerances, further discussed below, will be applicable for both, the current and uprate power setpoints. Should the power uprate take place in 1996, the submitted MCM 8 forms will be revised for a setpoint of 1145 psig ± 3%.

There is no reason to repeat all the conclusions, recommendations and changes since the initial Technical Specification change submittal via JPN-89-084 in December 20, 1989. However, it is worthwhile to summarize pertinent events since that time.

The initial submittal of Technical Specification change request specified that "at least 9 of 11 SRVs shall have a nominal setting

of 1110 psig with allowable setpoint error of ± 3 percent". This submittal was based on the recommendations of GE report NEDC-31697P. Two tolerances are quoted in Table 1-1 of this report. First, the tolerance beyond which valve refurbishment and additional testing is required, was specified as ± 3%, for both the original three and the new single setpoints. Second, the tolerance on the as-left SRV setting prior to returning a valve to service, was specified as ± 1%, also for both case setpoints.

Updated SRV Performance Requirements for JAFNPP report **NED-31697P-2** of March 1993, did not change any of the above statements. **The NRC staff accepted a generic change** of valve setpoint tolerance to **± 3% in the GE report**. However, the NRC did not accept the philosophy of an upper limit as means to further reduce the number of LERs. "Evaluation to determine the need for an LER must be made for setpoints when drift outside ± 3% is found". The subsequent **Technical Specification change application and Safety Evaluation revisions**, sent to the NRC on March 2, 1994 via **JPN-94-013**, **addressed** the above **NRC concerns**. Approval of these documents is expected in August 1994.

There are no Analytical Limits associated with these SRVs. Technical Specification Section 2.2 specifies nominal setting for 9 of 11 SRVs, as discussed above. **GE has calculated** a nominal SRV **setpoint** for the original and power uprate conditions, to satisfy both overpressure limits and simmer margin. Therefore, no formal Instrument Loop Setpoint calculation has to be performed. It is only a past Drift (DR), which has to be evaluated.

The SRV pilots have been refurbished for a setting of ± 1%, before they were returned to the site. This setting is defined as Calibration Tolerance (CT), which may be used in place of Reference Accuracy (RA) in the setpoint uncertainty calculation (Ref.3). The maximum permissible setpoint tolerance of ± 3%, beyond which valve refurbishment is required, should have a **margin** when considering CT and Drift (DR). The **past data** indicate that the **actual drift** for the JAFNPP SRVs **did not exceed 1.40 % of valve setting over a 24-month period**-see note 1 below. **The expected drift is 2.03%. When combined with the CT,** the **Channel Uncertainty will be 2.26%, leaving margin of 0.74% or 8.21 psig**, to avoid unnecessary LERs-see Attachment to this memo. This applies for the present and 24-month refueling cycle.

Notes:

1. The past actual drifts were established using Wyle Laboratories Group records. The standard deviation and average was calculated using % average of As-Found and As-Left (refurbished) data, as a measure of past drifts of various SRV pilots. With sample size of 20, the 95/95 Tolerance Factor is 2.75 (Ref.1).

JAF SAFETY RELIEF VALVES SETPOINT CHANGE

One set of data with average real drift of 3.75% (see Att.page 3), was not used. JAFNPP is switching to new disc material which will preclude effects of the first "pop" during the test, causing the highest deviation from the sample. As mentioned before, past drift did not exceed 1.4%; **most drifts were below 1.0%.**

2.It is assumed that Measurement & Test Equipment Error (MTE) is included in the Wyle Labs documented test data.

To conclude, NED/I&C concurs with the following:

1. **For both** single **SRV setpoints** of 1110 and 1145 psig **(power uprate)**, the maximum permissible setpoint tolerance of ± 3% is **acceptable, for both 18 and 24-month cycles.**

2. **According to GE analysis,** presently **two of eleven SRVs may be inoperable,** without adversely affecting HPCI, RCIC, Primary Containment integrity, Fuel Thermal Limits and ECCS/LOCA performance. It is recommended that these items be re-visited before implementing power uprate.

3. All eleven SRVs should be replaced with the refurbished and recertified pilots, if necessary, prior to startup of each refueling outage. This is twice as many SRVs as required by the Technical Specification. This will provide greater assurance to satisfy paragraphs 1 & 2 above. However, not all pilots need to be sent out to Wyle Labs. As an example, replacing five previously set and certified spare pilots and sending out six for testing and new settings, will satisfy requirement for replacement of all SRV pilots. When the SRVs with spare pilots (previously reset and certified) were installed and exercised after each plant startup, no SRV leakage was ever detected. It may be assumed that these pilots do not drift while in storage.

The above discussion covered the single setpoint issue only. Additional "Items potentially affected by SRV Setpoint Change", identified by SE (see attached list), are not addressed here for the following reasons. Technical Specification request for single setpoint change has been completed. FSAR change and EOP Calculations-if any-will be addressed after the installation of single setpoint pilots. Specific SRV setpoints are not quoted in FSAR. Editorial changes will be needed on pages 14.5-2, -12 & -13, where the text refers to a "lowest safety/relief valve group and setpoints". This implies that there is more than one group of SRV setpoints. MOV analysis is currently run for power uprate conditions. Since the 1110 psig single setpoint envelopes the existing setpoints, there is no need to run this program for this pressure-see NED-AP-94-377.

JAF SAFETY RELIEF VALVES SETPOINT CHANGE

Should there be changes to HPCI, RCIC, RPV Transient or ATWS system responses, they will be addressed after the single setpoint of 1110 psig is approved for implementation. The same applies for Torus Loading, Operator Training Lesson Plans and Plant Equipment Database. SRV Surveillance Test MST-102.04 will be updated for applicable setpoint change. It is further recommended that these issues be revisited and further analyzed for the Plant Power Uprate conditions.

References:

1. Probability and Statistics for Engineers and Scientists, 3-rd Edition by R.E.Walpole and R.H.Myers, 1985 MacMillan Publ.Co.

2. Statistics for Management by R.I.Levin, 4-th Edition.

3. ISA-dRP67.04, Part II, Methodologies for the Determination of Setpoints for Nuclear Safety-Related Instrumentation (Draft 10).

4. MST-102.5 Rev.00,RV Safety/Relief Valve Setpoint Verification.

5. OPTS-89-017, Proposed Changes to the Technical Specifications Regarding Updated SRV Performance Requirements and Miscellaneous Changes, First Issued via OPN-89-084 on December 20, 1989

Andrej Petrenko
Sr.I&C Engineer, NED/I&C

cc:R.Fredricksen
D.Ruddy
J.Gray
J.Ellmers
T.Savory
D.Kieper
M.Abramski
G.Ottman
Records-11

ATTACHMENT 4.1
SETPOINT CHANGE REQUEST

SCR Number: JAF-94-0024 Tag Number: 02RV-71A→L Modification No.: ________ ☐ IP3 ☒ JAF

Description of Change: Change SRV setpoint for all 11 SRVs to 1110 psig

Requested Implementation Date/Reason: Required for 1994 Refuel Outage Tech Spec Ammendment request currently at NRC for incorporation into JAF T.S. (See attached reference list)

Requested By: Gerald Ottman (Originator) 6/28/94 (Date)

SETPOINT CHANGE - Check as appropriate

QA Category: ☒ Category I ☐ Category M ☐ Non-Cat I (IP3) ☐ Cat II/III (JAF)

Setpoint Type: ☐ 1 ☒ 2 ☐ 3 ☐ 4 ☐ 5 ☐ Expedited ☒ Permanent ☐ Temporary

☒ Approved

☐ Disapproved Reason for Disapproval: ________

[signature] (System Engineer) 6/29/94 (Date) [signature] (Sys Eng Mgr/Sup) 6/29/94 (Date) ATT. TO NED-AP-379 (Calc. No.) (Rev.)

WPO-NED/I&C (Sponsor Organization) ANDREI PETRENKO (Sponsor Engineer) 8/16/94 (Date) [signature] (Calculation Review) 8/25/94 (Date)

[signature] (Mgr/Sup, WPO-NED/SED/TSD) 8/23/94 (Date) ________ (System Engineer) ________ (Date)

SAFETY AND ENVIRONMENTAL EVALUATION APPLICABILITY REVIEW

	YES	NO
1. Is there a change to the facility as described in the FSAR? Justification: CHANGE FROM 3-SETPOINT SRV GROUPS TO ONE SINGLE SETPOINT SRV GROUP - SEE ATT. FSAR PAGE 14.5-13.	☒	☐
2. Is there a change to a procedure as described in the FSAR? Justification:	☐	☒
3. Is there a test or experiment not described in the FSAR? Justification:	☐	☒
4. Is there a change to the Technical Specifications or Operating License? Justification: UPDATED SRV PERFORMANCE REQUIREMENTS JPTS-89-017 - SEE ATT. JPN-93-033, DATED MAY 5, 1992.	☒	☐
5. Is there a change to the Environmental Protection Plan? Justification: ~~UPDATED SRV PERFORMANCE REQUIREMENTS JPTS-89-017~~	☐	☒
6. Will there be an adverse effect on the environment? Justification:	☐	☒

☐ Answers to all questions are "NO". No potential for an Unreviewed Safety or Environmental Question exists.

☒ Answers to Question (1) 2 or 3 marked "YES". Preparation of a Safety Evaluation is required. Safety Evaluation No. NOT REQD. SEE NED-AP-94-379.

☒ Answer to Question 4 marked "YES". Preparation of a license amendment is required. Letter No. JPN-94-013, MARCH 2/94.

☐ Answer to Question 5 or 6 marked "YES". Preparation of an Environmental Evaluation required. Environmental Evaluation No. ________

[signature] (Performed By) 8/16/94 (Date) [signature] (Reviewed By) 8-23-94 (Date)

MANAGEMENT APPROVAL

________ (PORC Meeting. No.) ________ (PORC Chairman) ________ (Date) ________ (Resident Manager) ________ (Date)

SETPOINT CHANGE REQUEST

SCR Number: JAF-94- ☐ **EXPEDITED SETPOINT CHANGE**

☐ Approved
☐ Disapproved Reason for Disapproval: ____________________

____

____

____________ (Requested By) ______ (Date) ____________ (Safety/Environ/Tech Review) ______ (Date)

____________ (Res Mgr, Setpoint Types 1 & 2) (Shift Sup, Setpoint Types 3, 4 & 5) ______ (Date) ____________ (Implementing Document)

☐ **CANCELLATION**

Reason: ____________________

____

____

____________ (Requested By) ______ (Date) ____________ (Spnsr Organization) ______ (Date) ____________ (System Engineer) ______ (Date)

____________ (PORC Mtg No.) ____________ (PORC Chairman) ______ (Date) ____________ (Resident Manager) ______ (Date)

Setpoint Change Document Update Sheets: Transmitted: ____ Received: ____ Attached: ____

Setpoint Change Document Revision Lists: Transmitted: ____ Received: ____ Attached: ____

DOCUMENTS AFFECTED

Name/Number	Operability	Closeout
SEE ATT. LIST OF "ITEMS POTENTIALLY	☐	☐
AFFECTED BY SRV SETPOINT CHANGE".	☐	☐
	☐	☐
	☐	☐
	☐	☐
	☐	☐

COMPLETION

____________ (Implemented-Work Doc. No.) ______ (Date) ____________ (Job Supervisor) ______ (Date)

Data Entry Request - Initiated: ______ (Date) Returned: ______ (Date)

Required Documents Updated: ______ (Date) or Modification Follow List (MFL): ______ (Date)

Completed: ____________ (Setpoint Coordinator) ______ (Date)

ATTACHMENT 4.3
SETPOINT CHANGE DOCUMENT UPDATE SHEET

SCR Number: JAF-94   Date: 8/16/94   ☐ IP3   ☒ JAF

Responsible Organizations:

- ☐ Fire/Safety
- ☐ Appendix R
- ☐ Security
- ☐ EQ
- ☐ Procur Eng
- ☐ Tech Services
- ☐ Simulator
- ☐ Performance
- ☐ Training
- ☐ Reactor Eng
- ☐ Safety
- ☐ ______
- ☒ Ops
- ☒ I&C
- ☐ Maint
- ☐ ______
- ☐ RES
- ☐ ISI
- ☐ IST

SENSOR	RANGE		ACCURACY		AFZ	LAIZ
	Eng Units	Fld Units	Eng Units	Fld Units	Fld Units	Fld Units

COMPONENT	RANGE		ACCURACY		AFZ	LAIZ
	Eng Units	Fld Units	Eng Units	Fld Units	Fld Units	Fld Units
02RV-71A	1,110 psig ±3%	(1,077-1,143) psig	± 2.26%	± 25.0 psig	(1,085-1,135) psig	(1,099-1,121) psig
THRU						
02RV-71L						

ATTACHMENT 4.3
SETPOINT CHANGE DOCUMENT UPDATE SHEET (CONT.)

SCR Number: JAF-94-________ Date: 8/16/94 ☐ IP3 ☒ JAF

INDICATOR	RANGE		ACCURACY		AFZ	LAIZ
	Eng Units	Fld Units	Eng Units	Fld Units	Fld Units	Fld Units
NA						

TRIP UNIT	SETPOINT		ACCURACY		AFZ	LAIZ
	Eng Units	Fld Units	Eng Units	Fld Units	Fld Units	Fld Units
NA						

Print the following data:

Sponsor Engineer: [signature] Telephone No.: WPO X-6655

ATTACHMENT TO NED-AP-94-379

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Cartidge **S/N 1080** at 1105 ± 11 psig, **March 18 & 21/92**.

Test Run #	As Found	Test Run #	Refurbished To	Notes
1	1119psig	3	1113	Runs 1 & 2
2	1111	4	1112	Adjusted
3	1108	5	1105	
4	1107	6	1102	
	Avg.1111psig		Avg.1108psig	
Runs on **Dec.13 & Aug.31/89**				
1	1112psig	1	1101	
2	1071	3	1110	Run2,instr
3	1065	4	1105	failure.
4	1066	5	1104	
	Avg.1078psig		Avg.1105psig	

Past Drift=1105-1111=-6.0psig/1105)100%=-0.54%

Cartidge **S/N 1087** at 1140 ± 11 psig, **March 21 & 25/92**

Test Run #	As Found	Test Run #	Refurbished To	Notes
1	1132psig	3	1139psig	
2	1142	4	1139	
3	1134	5	1140	
4	1129	6	1135	
		7	1137	
		8	1133	
	Avg.1134psig		Avg.1137psig	
Runs on **Dec.12/89 & April 23/90.**				
1	1194*	3	1152psig	*Notice of
2	1121	4	1144	anomaly.
3	1115	5	1140	Runs 1 & 2
4	1108	6	1146	Adjusted.
		7	1143	
	Avg.1114.7psig		Avg.1145psig	

Past Drift=(1145-1134)/1145)100%=0.96%

Runs on **Nov.17 & 20/87.**				
*		10	1141psig	*Instr.
3	1120	11	1140	Malfunct.
4	1113	12	1137	
5	1127	13	1141	
	Avg.1119.5psig		Avg.1139.75psig	

Past Drift=(1139.75-1114.7)/1139.75)100%=2.2%

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Cartridge S/N 1110 at 1140 ± 11 psig, April 21/90 & Jan. 21/92

Test Run #	As Found	Test Run #	Refurbished To
1	1149 psig	1	1141
2	1134	2	1147
3	1128	3	1148
4	1134	4	1151
	Avg. 1136.25 psig	5	1149
Both Runs [redacted]			
1	1148 psig	8	1150
2	1140	9	1148
3	1139	10	1144
4	1134	11	1158
			Avg. 1147.5 psig

Past Drift=(1147.5-1136.25)/1147)100%=0.98%

Cartridge S/N 1111 at 1140 ± 11 psig, June 7 & 20/90

Test Run #	As Found	Test Run #	Refurbished To
1	1144 psig	1	1137
2	1142	2	1133
3	1145	3	1130
4	1143	4	1130
	Avg. 1143.5 psig		
Both Runs March 21 & 25/87			
1	1153 psig	10	1141
2	1143	11	1140
3	1147	12	1138
4	1144	13	1140
5	1143		Avg. 1139.75 psig

Past Drift=(1139.75-1143.5)/1143.5)100%=0.33%

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Cartridge S/N 1012 at 1140 ± 11 psig, **March 18 & 21/92**

Test Run #	As Found	Test Run #	Refurbished To
1	1156 psig*	3	1149
2	1103	4	1146
3	1102	5	1145
4	1186	6	1145
	Avg. 1097 psig	7	1142
	*Notice of Anomaly		

Runs on Oct. 10 & 13/88

1	1142 psig	1	1141
2	1127	2	1139
3	1127	3	1141
4	1132	4	1138
			Avg.1139.75psig

Past Drift =(1139.75-1097)/1139.75)100%=3.75%*
*Assuming leakage, more than 3 (Std Dev.), not used.
Runs on Feb. 5 & 16/87.

1	1131 psig	8	1151
2	1198	9	1146
3	1100	10	1150
4	1104	11	1146
			Avg.1148.25psig

Past Drift =(1148.25-1132)/1148.25)100%=1.4%

Cartridge S/N 1013 at 1140 ± 11 psig, March 19 & April 8/90

Test Run #	As Found	Test Run #	Refurbished to
1	1227 psig*	4	1139
2	1157	5	1143
3	1160	6	1145
4	1157	7	1146
	Avg. 1158 psig		

Runs of April 20 & 24/90

1	1147	3	1144
2	1170	4	1146
3	1176	5	1138
4	1157	6	1149
	Avg.1162.5psig		Avg. 1144.25psig
	*Notice of Anomaly		

Past Drift=(1144.25-1158)/1158)100%=1.19%

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Runs on August 29 & Sept. 1/87

1	1171	1	1143
2	1145	2	1145
3	1140	3	1150
4	1135	4	1150
			Avg.1147.0

Past Drift =(1147-1162.5)/1162.5)100%=-1.33%

Cartridge S/N 1045 at 1140±11psig, August 8/90 & Jan. 20/92

Test Run #	As Found	Test Run #	Refurbished To
1	1167psig*	1	1151
2	1142	2	1151
3	1146	3	1146
4	1149	4	1147
	Avg. 1145.67psig		
	*Note of Anomaly		

Runs on May 4 & August 11/86

1	1151psig	3	1141
2	1149	4	1145
3	1147	5	1142
4	1146	7	1149
			Avg.1144.25psig

Past Drift=(1144.25-1145.67)/1145.67)100=0.12%

Cartridge S/N 1050 at 1150.± 10 psig, March 20 & April 6/92

Test Run #	As Found	Test Run #	Refurbished To
1	1122psig*	1	1199
2	1101	2	1101
3	1102	3	1197
4	1102	4	1194
		5	1104
	Avg. 1101.67psig		Avg. 1099psig
	*Notice of Anomaly		

Runs on Dec. 12/89 & April 11/90

1	1089psig*	1	1097
2	1098	2	1101
3	1095	3	1101
4	1086	4	1107
	Avg.1093psig		Avg.1101.5psig
	*Notice of Anomaly		

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Past Drift =(1101.5-1101.67)/1101.67) 100%=-0.015%

Runs on Oct 10 & 12/88 /

1	1204PSIG*	4	1110
2	1107	5	1109
3	1105	6	1108
4	1105	7	1105
		8	1105
	Avg.1105.67psig		Avg.1107.4psig
	*Notice of Anomaly		

Past Drift =(1107.4-1193)/1174.4) 100%=1.30%

Runs on July 20/85/

None -------		1	1109
		2	1115
		3	1105
		4	1111
			Avg.1110.5psig

Past Drift =(1110-1105.67)/1110) 100%=0.23%

Cartridge S/N 1051 at 1090 ± 10 psig, Dec.12/89 & Feb. 3/92

Test Run #	As Found	Test Run #	Refurbished To
1	1080	1	1086
2	No Data	2	1094
3	1080	3	1091
		4	1093
	Avg.1080psig	5	1089

Runs on August 28 & 31/87

1	1102	1	1095
2	1106	2	1080
3	1105	3	1095
4	1102	4	1092
			Avg.1090.5psig

Past Drift=(1090.5-1080)/1090.5)100%=0.96%

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Cartridge S/N 1052 at 1040± 11psig, March 19 & 21/92

Test Run #	As Found	Test Run #	Refurbished To
1	1139	3	1145
2	1125	4	1143
3	1126	5	1144
4	1130	6	1148
	Avg.1130psig	7	1149
		8	1143

Runs on April 20 & 25/90

1	1147	7	1140
2	1156	8	1145
3	1150	9	1145
4	1144	10	1146
	Avg.1149.25psig		Aug.1144psig

Past Drift=(1144-1130)1144)100%=1.22%

Runs on Oct. 11 & 13/88

1	1165	4	1144
2	1156	5	1148
3	1156	6	1137
4	1155	7	1137
	Avg.1158psig		Avg.1141.5psig

Past Lrift=(1141.5-1149.25)/1149.25)100%=0.67%

1	1137	12	1145
2	1137	13	1146
3	1136	14	1146
4	1136	15	1145
			Aug.1145.5psig

Past Drift=(1145.5-1158)/1158)100%=1.08%

Cartridge S/N 1052 at 1140 ± 11psig, March 20 & 21/92

Test Run #	As Found	Test Run #	Refurbished To
1	1139	5	1142
2	1138	6	1140
3	1135	7	1139
4	1134	8	1140
	Avg.1136.5psig		

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNPP on 8/10/94

Runs on Dec. 14/88 & April 1/90

1	1156	5	1136
2	1153	6	1130
3	1146	7	1137
4	1139	8	1141
		9	1143
			Avg.1139.2psig

Past Drift=(1139.2-1136.5)/1139.2)100%=0.24%

Cartridge S/N 1056 at 1105 ± 11psig, April 21 & May 9/90

Test Run #	As Found	Test Run	Refurbished To
1	1104	1	1115
2	1101	2	1114
3	1110	3	1113
4	1107	4	1110
	Avg.1105.5psig		

Runs on May 2 & July 14/88

1	1110	2	1111
2	1184	3	1113
3	1181	4	1108
4	1183	5	1111
	Avg.1089.5psig		Avg/1110.75psig

Past Drift=(1110.75-1105.5)/1105.5)100%=0.48%

1	1143*	9	1104
2	1104	10	1108
3	1107	11	1102
4	1104	12	1101
	Avg.1005		Aug.1103.75psig

*Notice of Anomaly

Past Drift=(1103.75-1089.5)/1103.75)100%=1.29%

Cartridge S/N 1062 at 1090 ± 11psig, June 7 & 21/90

Test Run #	As Found	Test Run	Refurbished To
1	1077*	1	1097
2	1176	2	1098
3	1178	3	1102
4	1174	4	1099
	Avg.1076psig		

*Notice of Anomaly

WYLE LABORATORIES GROUP REPORTS

Collected at JAFNFP on 8/10/94

Runs on May 3 & August 17/88

1	1172 *	10	1090
		11	1089
		12	1085
		13	1083
	*Severe Leakage		Avg.1086.75psig

Past Drift=(1086.5-1076)/1086.5)100%=0.99%

Cartridge S/N 1088 at 1090 ± 10 psig, Dec. 21/88 & August 18/89

Test Run #	As Found	Test Run	Refurbished To
1	1156psig*	1	1104
2	1121	2	1108
3	1124	3	1184
4	1130	4	1091
		5	1086
		6	1094
	*Notice of Anomaly		Avg.1094.5psig

Runs on June 16 & 19/94

2	1084	1	1010±10* Inlet Pressure
3	1088	2	1010±10*
4	1088	3	1010±10*
5	1085	4	1010±10*
	Avg.1086.25psig		

Past Drift=(1094.50-1086.25)/1094.5)100%=0.75%

Expected Drift, based on the saple size is:

DR=2.75(STD DEV)+AVG

The Past Drift data for the Standard Deviation, are from the above data bank and are summarized here. Note:it is a pilot cartidge air operator being refurbished. Then, the pilots are returned to the site to be installed on Safety Relief Valves as needed.

Cartidge S/N	x	$x-\bar{x}$	$(x-\bar{x})^2$	Notes
1080	0.54	0.264	0.070	
1087	0.96	0.156	0.024	
1087	2.20	Not used.		>3(Std Dev)
1110	0.98	0.176	0.031	
1111	0.33	0.474	0.225	
1012	1.40	0.596	0.355	
1013	1.19	0.386	0.149	
1013	1.33	0.525	0.276	
1045	0.12	0.684	0.468	
1050	0.015	0.789	0.622	
1050	1.30	0.496	0.246	
1050	0.23	0.574	0.329	
1051	0.96	0.156	0.024	
1052	1.22	0.416	0.173	
1052	0.67	0.134	0.018	
1052	1.08	0.276	0.076	
1053	0.237	0.567	0.321	
1056	0.48	0.324	0.105	
1056	1.29	0.486	0.236	
1062	0.99	0.186	0.034	
1088	0.75	0.054	0.003	

Then, SUM x = 16.072
Mean $\bar{x}$ = 16.072/20 = 0.804
Std Dev = SUM $(x-\bar{x})^2$ /n-1) = (3.745/19) = 0.446

Then, the **expected** Drift will be: DR= 2.75(0.446)+0.804=2.03%. and Channel Uncertainty is:

$\pm (CT^2 + DR^2)^{1/2} = (1.0^2 + 2.03^2)^{1/2} =$ 2.26% or 25.1 psig, rounded to 25.0 psig. The **margin** is:

3.0 - 2.26 =± 0.74% or ± 8.21 psig, or about 8.0 psig.

As-Found-Zone (AFZ) is: 1,110 ± 25psig, or (1,085-1,135)psig.
Leave-As-Is-Zone (LAIZ), to be used for refurbished pilots, is: 1,110 ± 11psig, or (1,099-1,121)psig.
The Range is 1,110 ± 33 psig, or (1,077-1,143)psig.