Progress Energy

JAN 31 2007

Serial: HNP-07-015

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

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
INSPECTION AND MITIGATION OF ALLOY 82/182 PRESSURIZER BUTT WELDS

Ladies and Gentlemen:

In October 2006, while performing inspections of pressurizer (PZR) Alloy 82/182 butt welds in accordance with MRP-139, a PWR licensee discovered several circumferential indications in the PZR surge, safety, and relief nozzles. Because of the potential importance of this issue, Carolina Power and Light Company (CP&L) doing business as Progress Energy Carolinas, Inc. commits to the following actions taken or planned at the Harris Nuclear Plant (HNP) for inspecting or mitigating Alloy 82/182 butt welds on PZR spray, surge and relief lines.

Inspection of PZR Alloy 82/182 butt welds at HNP has not yet been completed, but HNP intends to complete all of the inspection and mitigation activities on these locations in refueling outage 14 (RFO-14) in the Fall 2007.

Attachment 1 provides the results of completed inspections and the details of HNP's inspection and mitigation activities.

Attachment 2 provides a discussion of reactor coolant system (RCS) leakage monitoring.

Attachment 3 provides an example of the leakrate trend of unidentified RCS leakage.

Attachment 4 provides the commitments to this letter. This document contains new or revised regulatory commitments.

Future inspections of PZR Alloy 82/182 butt welds at HNP will be performed in accordance with industry guidance (MRP-139). The results of future inspections or mitigations of PZR Alloy 82/182 butt weld locations will be reported to the NRC within 60 days of startup from the outage during which they were performed.

**Progress Energy Carolinas, Inc.**
Harris Nuclear Plant
P. O. Box 165
New Hill, NC 27562

A110

In addition to the inspection and mitigation actions described by this letter, HNP will continue to monitor primary system leakage on a daily basis until all Alloy 82/182 butt weld locations on the PZR have been inspected or mitigated or until Mode 5 (Cold Shutdown). The procedures we intend to use are OST-1026, Reactor Coolant System Leakage Evaluation, Computer Calculation, Daily Interval, Modes 1-2-3-4 (i.e., the preferred method for performing the RCS leakrate calculation), or OST-1226, Reactor Coolant System Leakage Evaluation, Manual Calculation, Daily Interval, Modes 1-2-3-4. This daily monitoring will provide adequate assurance that structural integrity is maintained and that any primary system pressure boundary leakage is discovered in a timely manner. Both of these procedures contain three levels of trigger points, which escalate the required actions based on measurements exceeding a statistical mean value. These required actions include identifying the source of the leak and performing additional surveillances up to performing a containment entry to conduct visual inspections.

If HNP should shut down due to excessive primary system unidentified leakage, and if the leakage cannot be confirmed to originate from a source other than the PZR, a bare metal visual examination of Alloy 82/182 butt weld locations on the PZR will be performed to determine whether the leakage originated at those locations.

The NRC will be informed prior to any revision of the information contained in this letter.

Our staff is available to meet with the NRC to discuss any of the information in this letter. Please refer any questions regarding this submittal to Dave Corlett at (919) 362-3137.

R. J. Duncan, II
Vice President
Harris Nuclear Plant

RJD/jpy

Attachments:

1. Results of Completed Inspections and Details of HNP's Inspection and Mitigation Activities
2. Discussion of RCS Leakage Monitoring
3. Leakrate Trend of Unidentified RCS Leakage
4. Commitments

c:
Mr. P. B. O'Bryan, NRC Senior Resident Inspector
Mr. C. P. Patel, NRC Project Manager
Dr. W. D. Travers, NRC Regional Administrator
Mr. J. H. Riley, NEI

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESULTS OF COMPLETED INSPECTIONS AND DETAILS OF HNP'S
INSPECTION AND MITIGATION ACTIVITIES

*Request 1: Results of Inspections*

*Address all relevant inspections of pressurizer (PZR) Alloy 600/82/182 butt welds, with emphasis on those performed within the preceding two operating cycles. A table format similar to that in Attachment 2 is recommended to provide an accurate cross reference of inspection methods, results, and limitations with the associated location(s) since these nozzles are not necessarily treated identically. The following information should be provided for every inspection:*

- *Inspection scope*
- *Date*
- *Method(s) used*
- *PDI qualification*
- *Coverage obtained*
- *Limitations encountered*
- *Findings*

*Information on bare metal visional examinations (BMVs) performed should also be included if applicable.*

*Reports of future inspection results should be submitted to the NRC within 60 days of the end of the station refueling outage during which the inspection was performed.*

*If any inspections using non-PDI methods are cited, the information provided should include appropriate bases to establish credibility for the exam.*

Response 1:

Table 1 provides the Inspection and Mitigation Summary for Alloy 82/182 Pressurizer Butt Welds in the table format recommended by Attachment 2 of the Nuclear Energy Institute (NEI) letter to the Nuclear Strategic Issues Advisory Committee Steering Group dated January 19, 2007.

Table 2 provides the Results of Completed Inspections including information on BMVs performed and inspections using non-PDI methods.

Reports of future inspection results will be submitted to the NRC within 60 days of the end of the station refueling outage during which the inspection was performed.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESULTS OF COMPLETED INSPECTIONS AND DETAILS OF HNP'S
INSPECTION AND MITIGATION ACTIVITIES

**Table 1: Inspection and Mitigation Summary for Alloy 82/182 Pressurizer Butt Welds**

| Nozzle | | MRP-139 Volumetric Inspection Requirement to be Met* | | Mitigation to be Completed | Comments |
|---|---|---|---|---|---|
| **Function / Designation** | **Susceptible Material Description** | **Outage Designation** | **Start Date (MM/YYYY)** | **Outage Designation** | |
| Spray / II-PZR-01NSEW-16 | Nozzle-to-safe end weld | RFO-14 | 09/2007 | RFO-14 (Fall 2007) | *Preemptive Full Structural Weld Overlay; Volumetric Exam to be performed post-mitigation |
| Surge / II-PZR-01NSEW-15 | Nozzle-to-safe end weld | RFO-14 | 09/2007 | RFO-14 (Fall 2007) | *Preemptive Full Structural Weld Overlay; Volumetric Exam to be performed post-mitigation |
| Safety / II-PZR-01NSEW-17 | Nozzle-to-safe end weld | RFO-14 | 09/2007 | RFO-14 (Fall 2007) | *Preemptive Full Structural Weld Overlay; Volumetric Exam to be performed post-mitigation |
| Safety / II-PZR-01NSEW-18 | Nozzle-to-safe end weld | RFO-14 | 09/2007 | RFO-14 (Fall 2007) | *Preemptive Full Structural Weld Overlay; Volumetric Exam to be performed post-mitigation |
| Safety / II-PZR-01NSEW-19 | Nozzle-to-safe end weld | RFO-14 | 09/2007 | RFO-14 (Fall 2007) | *Preemptive Full Structural Weld Overlay; Volumetric Exam to be performed post-mitigation |
| Relief / II-PZR-01NSEW-20 | Nozzle-to-safe end weld | RFO-14 | 09/2007 | RFO-14 (Fall 2007) | *Preemptive Full Structural Weld Overlay; Volumetric Exam to be performed post-mitigation |

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESULTS OF COMPLETED INSPECTIONS AND DETAILS OF HNP'S
INSPECTION AND MITIGATION ACTIVITIES

**Table 2: Results of Completed Inspections**

| Inspection Scope Weld (Nozzle) | Date(s) | Examination Method(s)[1] | PDI Qualification[2] | Coverage Obtained[3] | Finding |
|---|---|---|---|---|---|
| II-PZR-01NSEW-16 (Spray) | 08/1988 & 10/1998 | PT | N/A | 100% | No Relevant Indication (NRI) |
| | 08/1988 & 11/1998 | UT | N/A | 100% | NRI |
| | 10/2004 & 04/2006 | BMV | N/A | 100% | NRI |
| II-PZR-01NSEW-15 (Surge) | 11/1989 & 04/2000 | PT | N/A | 100% | NRI |
| | 11/1989 & 04/2000 | UT | N/A | 95% | NRI |
| | 10/2004 & 04/2006 | BMV | N/A | 100% | NRI |
| II-PZR-01NSEW-17 (Safety) | 04/1991 & 10/1998 | PT | N/A | 100% | NRI |
| | 04/1991 & 11/1998 | UT | N/A | 97.5% | NRI |
| | 10/2004 & 04/2006 | BMV | N/A | 100% | NRI |
| II-PZR-01NSEW-18 (Safety) | 04/1991 & 10/1998 | PT | N/A | 100% | NRI |
| | 04/1991 & 11/1998 | UT | N/A | 97.5% | NRI |
| | 10/2004 & 04/2006 | BMV | N/A | 100% | NRI |
| II-PZR-01NSEW-19 (Safety) | 04/1997 & 10/1998 | PT | N/A | 100% | NRI |
| | 04/1997 & 11/1998 | UT | N/A | 97.5% | NRI |
| | 10/2004 & 04/2006 | BMV | N/A | 100% | NRI |

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
RESULTS OF COMPLETED INSPECTIONS AND DETAILS OF HNP'S
INSPECTION AND MITIGATION ACTIVITIES

## Table 2: Results of Completed Inspections

| Inspection Scope Weld (Nozzle) | Date(s) | Examination Method(s)[1] | PDI Qualification[2] | Coverage Obtained[3] | Finding |
|---|---|---|---|---|---|
| II-PZR-01NSEW-20 (Relief) | 04/1997 & 10/1998 | PT | N/A | 100% | NRI |
| | 04/1997 & 11/1998 | UT | N/A | 97.5% | NRI |
| | 10/2004 & 04/2006 | BMV | N/A | 100% | NRI |

[1] Abbreviations: UT = Ultrasonic Testing; PT = Penetrant Testing; BMV = Bare Metal Visual; In addition, VT-2 visual examinations of the Class 1 pressure boundary are performed every refueling outage.

[2] PDI Qualification is applicable to UT only; but it is not applicable to the completed inspections since they were performed prior to PDI's implementation in 2002. The completed UT examinations listed on this table were performed in accordance with procedures qualified to the ASME Section XI Code of record at that time. Additional examinations, not listed on this table, were performed in RFO-13 (Spring 2006) to provide information to plan the overlays scheduled to be completed in RFO-14 (Fall 2007).

[3] Limitations encountered are documented in the applicable NDE reports.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
DISCUSSION OF RCS LEAKAGE MONITORING

*Request 2: RCS Leakage Monitoring*

*Until all pressurizer Alloy 600/82/182 butt weld locations are mitigated or inspected per a PDI qualified UT method, enhanced leakage monitoring should be implemented. The following is provided as guidance for the information that should be communicated on the program.*

*Address current RCS leakage monitoring capabilities, methods, action levels, and responses. Alternatively, if enhanced RCS leakage monitoring is planned as part of this commitment, describe those plans.*

*[The following information should be provided:]*

- *Monitoring methods employed should be identified (sump level, containment radiation monitors, etc.)*
- *Overall sensitivity to RCS leakage technically supported by these combined methods should be stated quantitatively (e.g., 0.1 gpm, 0.05 gpm change in 24-hour trend, etc.)*
- *Action levels defined in site operating procedures should be described, including both absolute unidentified leakage value triggers, as well as "change from a baseline" triggers*
- *Responses to exceeding action levels should be described including the specific physical actions to be taken to identify the source of the change, and how the prescribed actions escalate with time and continued change in leakage*
- *If you have taken a position with regard to the PWR OG RCS leakage monitoring guidance documents recently issued, you may want to discuss that as well*

Response 1:

Monitoring Methods

This response does not address primary-to-secondary leakrate monitoring and response, which are controlled through CRC-804, Primary-to-Secondary Leak Rate Monitoring, and AOP-016, Excessive Primary Plant Leakage, and are consistent with the recommendations from EPRI 1008219, PWR Primary-To-Secondary Leak Guidelines.

HNP employs the following methods to monitor Reactor Coolant System (RCS) leakage:

- Containment sump level
- Containment radiation monitors
- RCS mass balance calculation

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
DISCUSSION OF RCS LEAKAGE MONITORING

Containment sump level monitoring is performed automatically through a dedicated program that resides on the HNP plant process computer (ERFIS). The program satisfies Technical Specifications (TS) 3.4.6.1.b (The Reactor Cavity Sump Level and Flow Monitoring System) and is compliant with Regulatory Guide 1.45 in that it can detect an increase in RCS leakage of 1.0 gallon per minute (gpm) within one hour. The general methodology used by the program for determination of the sump inleakage rate is described in OP-163, ERFIS. Every 30 minutes the program calculates a new 30-minute inleakage rate. If the rate exceeds an established baseline value by more than 0.76 gpm, or if the change in leakrate over the last 60 minutes exceeds 0.76 gpm, then an annunciator will alarm to indicate potential unidentified leakage. The program is used in conjunction with the RCS mass balance to differentiate between inleakage from the RCS and from other fluid systems inside containment. A manual backup method to calculate sump inleakage is provided in AOP-016 for the condition where the plant process computer is unavailable or the dedicated monitoring program is inoperable.

The Containment Leak Detection Radiation Monitor (REM-01LT-3502ASA) utilizes airborne particulate and noble gas detectors to monitor the containment atmosphere for evidence of Reactor Coolant Pressure Boundary leakage, which satisfy TS 3.4.6.1.a and TS 3.4.6.1.c. The monitor provides Main Control Room alarm and display. Additionally, AOP-016 provides a manual method for tracking changes in monitor readings and correlating these to changes in RCS leakrate.

An RCS mass balance is performed using a qualified computer program with data obtained from the plant process computer. The program is run on a desktop computer in the control room and is used to satisfy TS Surveillance Requirement 4.4.6.2.1.d. The program uses the OSI PI application to obtain, validate and process the required input parameters, and calculates unidentified and identified leakage automatically. Use of the program to obtain RCS leakrates is controlled through surveillance OST-1026. A manual method for data entry and leakrate calculation is provided in surveillance OST-1226. The RCS mass balance is performed daily and the value for unidentified leakage is compared to the long term statistical mean and standard deviation.

Overall Sensitivity

The containment sump level monitoring program has a design sensitivity which allows detection of a 0.76 gpm change in sump inleakage in a one-hour period.

As described in the HNP FSAR and using assumptions described in Regulatory Guide 1.45 (including 0.1% failed fuel), the containment leak detection radiation monitor can detect a postulated step increase in RCS leakage from 0.1 to 1.0 gpm in less than one hour. However, the FSAR also acknowledges that this sensitivity is affected by actual RCS activity. Industry wide, RCS activity has decreased due to improved fuel

performance and improved chemistry control. The decrease in leakage detection capability due to improved fuel performance is a recognized industry issue as documented in NRC IN 2005-24, Nonconservatism in Leakage Detection Sensitivity. This issue has been identified, and is being tracked, in both the HNP corrective action program, and in the HNP site process for degraded/non-conforming conditions. Resolution is being pursued in coordination with appropriate industry and regulatory contacts. The other redundant methods identified previously, such as sump level and daily RCS mass balances, are expected to be more sensitive for RCS leak detection purposes.

The sensitivity of the mass balance calculation is based on a leakrate value three standard deviations from the long term statistical mean leakrate (or baseline). A confirmed RCS unidentified leakrate value that is three standard deviations above the long term statistical mean requires prompt actions to identify and isolate the leak.

The mean and standard deviation are generally updated every three months. They may also be updated in response to recognition of new sources or isolation of existing sources of RCS leakage. During Cycle 14, the mean of unidentified RCS leakage has varied between 0.040 gpm and 0.057 gpm. The standard deviation has varied between 0.015 gpm and 0.026 gpm. An example of the leakrate trend of unidentified RCS leakage is shown in Attachment 3.

Currently, the long term statistical mean value for unidentified leakrate is 0.044 gpm and the standard deviation is 0.026 gpm. The value for three standard deviations is 0.079 gpm. The unidentified leakrate value at three standard deviations from the mean is 0.123 gpm. This value is represented as the ULC (Upper Control Limit) on Attachment 3. Since the mass balance calculation is performed daily, the sensitivity of this method is a change of 0.123 gpm in a 24-hour period. This value is representative and bounding for the previous UCL limits computed in the current cycle.

Action Levels

The absolute limit for unidentified leakage is 1.0 gpm prescribed in TS 3.4.6.2, Operational Leakage.

The trigger points for the RCS mass balance calculation are defined in terms of deviation from the long term statistical mean (or baseline) and are defined in the leakage surveillance tests as follows:

Trigger Point One - Nine consecutive unidentified leakrate measurements above the mean

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
DISCUSSION OF RCS LEAKAGE MONITORING

Trigger Point Two - Two of three unidentified leakrate measurements exceed two standard deviations above the mean

Trigger Point Three - One unidentified leakrate measurement exceeds three standard deviations above the mean

Responses to Exceeding Action Levels

The associated TS action statement for unidentified leakage greater than 1.0 gpm, is to reduce unidentified leakage to within 1.0 gpm within four hours or be in Mode 4 (Hot Shutdown) within the next six hours.

The physical actions for RCS leakage greater than one of the actions levels are described below:

Trigger Point One - Nine consecutive unidentified leakrate values above the mean:

- Take actions to find leak through system walkdowns, system inspections and system alignments.
- Perform additional surveillances to confirm leakage rate.

Trigger Point Two - Two of three unidentified leakrate measurements exceed two standard deviations above the mean:

- Ensure all Trigger Point One actions are in place.
- Check additional parameters such as containment temperature and humidity, containment sump inleakage and containment radiation monitoring.
- Obtain and analyze containment air sample.

Trigger Point Three - One unidentified leakrate measurement exceeds three standard deviations above the mean:

- Ensure all Trigger Point One and Two actions are in place.
- Implement a formal trouble shooting plan.
- Initiate a nuclear condition report (NCR).
- Perform a containment entry and conduct visual inspections of accessible equipment for evidence of unidentified or pressure boundary leakage.

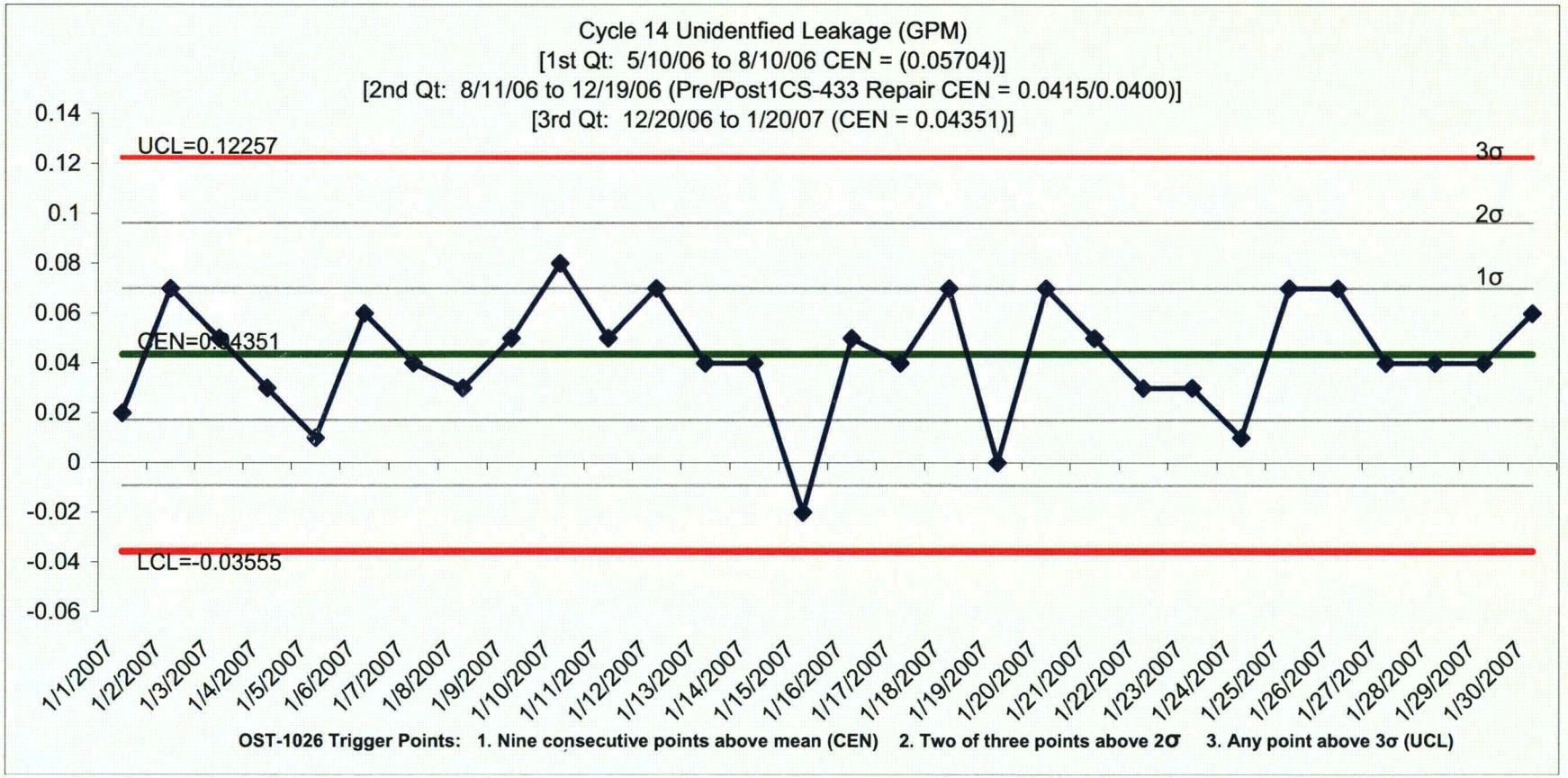
SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
DISCUSSION OF RCS LEAKAGE MONITORING

Position with regard to the PWR OG RCS leakage monitoring guidance

HNP has adopted a major portion of the PWR Owner's Group (OG) RCS leakage monitoring guidance (WCAP-16243-NP and WCAP-16465-NP) and is reviewing the remaining portions as potential enhancements to the current leakrate monitoring program. The HNP leakrate monitoring program has the following elements consistent with those described in the WCAPs:

1. Leakrate evaluations are performed daily and at generally the same time of day as long as plant status allows.
2. Inputs to the computer program are real time and gathered from the plant process computer (ERFIS).
3. Time averaging of data is used to increase precision.
4. The algorithms, including physical constants, used in calculating the various leakrate terms are consistent with those described in the WCAPs.
5. The leakage results are expressed in terms of conditions at standard atmospheric pressure.
6. Historical trends of RCS Unidentified and Identified leakrates are maintained and updated daily immediately following the daily leak rate determination.
7. The historical trends of RCS leakage are evaluated statistically for trigger points indicative of significant changes in the RCS leakrates.

SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
LEAKRATE TREND OF UNIDENTIFIED RCS LEAKAGE



SHEARON HARRIS NUCLEAR POWER PLANT, UNIT NO. 1
DOCKET NO. 50-400/LICENSE NO. NPF-63
INSPECTION AND MITIGATION OF ALLOY 82/182 PRESSURIZER BUTT WELDS
COMMITMENTS

| Commitment(s) | Scheduled Completion Date |
|---|---|
| 1. HNP will mitigate the pressurizer Alloy 82/182 butt welds by installing full structural weld overlays on these welds and will inspect post-overlay during refueling outage 14 (RFO-14) in the Fall 2007. | End of RFO-14 (Fall 2007) |