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Subject: Arkansas Nuclear One - Units 1 and 2
Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6
Response to IR 99-09

Gentlemen:

Inspection Report 99-09, *Safety System Engineering Inspection,* dated November 16, 1999, discussed findings and observations discovered during the inspection of the Arkansas Nuclear One (ANO) service water (SW) system. The report requested that ANO 1) provide views regarding the adequacy of the overall materiel condition of both units' service water systems (including the adequacy of programs and processes, as well as their implementation effectiveness, for maintaining the design capability and margins of these systems); 2) discuss the actions ANO has taken or planned to address SW system degradation; and 3) discuss any other actions taken or planned in response to this inspection. Each question is addressed in the Attachment to the letter. On February 8, 2000, Mr. Phil Harrell of the Nuclear Regulatory Commission (NRC) Region IV staff verbally granted an extension for submittal of this response to February 17, 2000.

ANO is confident that the ongoing performance and condition monitoring programs are effective in identifying degrading design margins and situations that affect the materiel condition of the SW system. These programs are also effective at resolving the identified conditions, maintaining design capability, and restoring margins within the SW system. The current SW system performance data indicates the SW system is fully capable of performing its intended safety-related function and has adequate design and operating margins.

During the 1980's ANO recognized that the SW system was degrading and would require upgrading to ensure it remained operable and maintained adequate design margins. Since then ANO has consistently upgraded selected portions of the SW system and will continue to do so in the future. The response to Question 2, describes actions taken or planned that will ensure that adequate design margins are maintained.

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ANO has taken a proactive approach to develop corrective action plans for each individual finding noted in the inspection report. The overall impact of the findings was also assessed by both an internal assessment team and a corrective action review board (CARB). The overall causes have been determined and corrective action plans to address the causes are currently being developed. As an interim measure, a temporary engineering directive was developed to provide corrective actions that address the identified engineering programmatic issues. The directive will remain in effect until more formal requirements are implemented. Other improvements in engineering programs and processes have also been identified and are discussed in the Attachment.

The corrective actions and identified improvements discussed in this response are not intended to address a specific identified deficiency but describe current ANO plans for upgrading the SW system and engineering processes and are not intended to be specific commitments.

Should you have questions or comments, please call me at 501-858-4601.

Very truly yours,

Jimmy D. Vandergrift
Director, Nuclear Safety Assurance

JDV/RMC
Attachment

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ATTACHMENT

Question #1. Provide the ANO view on the adequacy of the overall materiel condition of the ANO 1&2 SW systems (including the adequacy of programs and processes, as well as their implementation effectiveness, for maintaining the design capability and margins of these systems).

ANO RESPONSE

Service Water Integrity Program – ANO-1&2

Since the 1980's the Service Water Integrity Program (SWIP) has been ANO's method of maintaining the SW system in an optimum condition. Since the advent of the SWIP significant changes and improvements have been made to various components in the SW systems of both units to maintain system performance and design capabilities and to restore margins within these systems. The scope of SWIP includes the SW system and those supporting components that have a direct effect on the SW operational and safety margins. The long-term strategy for maintaining the system and addressing any observed deficiencies is accomplished by:

- Performing examinations and monitoring system performance, which allows for accurate assessment of the system's ability to perform the required functions and of the system's need for cleaning, repair and/or replacement.
- Maintaining the system as clean as practical to reduce thermal performance degradation, corrosion, hydraulic degradation, and biological activity.
- Implementing operating, maintenance, and chemistry practices designed to extend component life.
- Upgrading components as required to prevent any degradation related failures.
- Pursuing enhancements, which are cost effective or justified by safety margin needs or risk assessment.

These items are being accomplished via the established SWIP long-term program plan. Long term plans include testing, non-destructive examination (NDE), chemical control, preventative maintenance and restoration activities. These programs are used to assure the design capability and margins of the SW systems on both units are maintained, as well as maintaining the materiel condition of both units' SW systems. The SWIP program activities were integrated into the normal system engineering responsibilities that include such duties as performance monitoring, maintenance rule administration, and Generic Letter 89-13, *Service Water System Problems Affecting Safety-Related Equipment* compliance. The SWIP and other SW system related open action items are maintained in the system engineering long range planning database.

Generic Letter 89-13 Inspections and Testing – ANO-1&2

Inspections and testing are performed to verify that the SW system is capable of functioning as designed. These inspections and tests have been effective in identifying deficiencies and degrading trends that could impact the capabilities of the SW system. When deficiencies are identified, corrective actions are scheduled so that system performance and design margins are restored and maintained. Some of the tests and inspections performed include:

- Flow tests of safety-related heat exchangers cooled by SW are performed each refueling outage. The most restrictive hydraulic lineup is tested and acceptance criteria includes margin above minimum flow requirements to account for instrument error and potential degradations.
- Heat transfer capability monitoring of certain safety-related water-to-water heat exchangers cooled by SW is performed. These tests provide data for the trending of heat exchanger thermal effectiveness or fouling factors to identify when corrective action to restore heat transfer capability is required.
- Leak testing of the sluice gates in the SW intake structures and system boundary valves is completed each refueling outage to verify that maximum allowable leakage limits are met.
- Flow rate monitoring is performed on the safety-related air-to-water heat exchangers cooled by SW each refueling outage. Air and water flow rate data is collected and evaluated for any necessary corrective actions.
- Visual inspection of a sample of the safety-related heat exchangers is performed as specified in our revised response to GL 89-13 (0CAN109205) dated October 30, 1992.

Major System Modifications and Pipe Replacement – ANO-1

Since the early 1980's significant modifications to the SW system have been implemented in order to accomplish the goals of the SWIP. Some of the most significant items include:

- System Pipe Replacement - During the 1980's carbon steel piping, with minor exceptions, less than four inches in diameter was replaced with stainless steel piping to increase component flow rates and reduce the number of pinhole leaks. This has been effective in maintaining flow to small system loads. Since 1990, large bore pipe replacement has been the focus to restore system design margins. Another benefit has been an increase in flow margins to various loads supplied by the SW system. Approximately 1000 feet of large bore piping has been replaced in an effort to maintain design flow requirements and increase flow margin. These replacements have been effective in increasing flows to the large loads on the SW system.
- Service Water Boundary Valve Replacement - Butterfly valves with soft seats were replaced with triple offset rotary disk valves with hard seats. These valves have stainless steel internals and also provide a more positive sealing valve, which enhances the ability to maintain ECP inventory requirements.
- New Chemical Addition Systems Installation for the SW System - New chemical addition systems for the biocide treatment and corrosion control of the SW system were installed in

the early 1990's. These systems are effective in controlling biofouling and reducing system piping corrosion rates.

- New "C" SW Bay Strainer Installed – This strainer, installed in 1998, provides increased protection from debris and biological fouling threats from the Dardanelle Reservoir.
- SW Pump Upgrades - The shaft sleeves have been upgraded with a harder material to increase the wear characteristics and decrease required maintenance. The bowl assemblies and impellers were upgraded to stainless steel components due to erosion of components that led to past degraded performance. A complete wet end assembly and a spare SW pump motor is available as needed for maintenance.
- ECP Return Line Coating – The return line to the ECP was cleaned and coated with an epoxy coating in the late 1980's to reduce corrosion and fouling. The line is inspected during each refueling outage. The inspections have concluded that the coating has been effective in reducing fouling and potential adverse flow conditions in the ECP return line.
- Intake Canal/Traveling Screen Modifications - Numerous traveling screen modifications have been accomplished and are ongoing. These include:

    - Deployment of a net across the intake canal to prevent shad influx.
    - Installation of a passive debris filter across the intake canal to stop floating debris for removal.
    - Increased the size of the drive motors to increase the speed of the traveling screens
    - Replaced screen baskets to strengthen and improve removal efficiency.
    - Installed dual spray headers to improve debris removal from the screens.
    - Improved debris trough and collection basket system.
    - One circulating water bay and six bar grates were coated with a foul release coating to reduce the attachment of zebra mussels.

Major System Modifications and Pipe Replacement - ANO-2

Since the early 1980's significant modifications to the SW system have been implemented in order to accomplish the SWIP goals. Some of the most significant items include:

- System Pipe Replacement - During the 1980's carbon steel piping, with minor exceptions, less than four inches in diameter was replaced with stainless steel piping to increase component flow rates and reduce the number of pinhole leaks. This has been effective in maintaining flow to small system loads. Since 1990, large bore pipe replacement has been the focus to increase flow margins to the large loads supplied by the SW system. Approximately 1200 feet of large bore piping has been replaced in an effort to maintain design flow requirements and increase flow margin. These replacements have been effective in increasing flows to the large loads on the system.
- Replacement of Carbon Steel Valves - Valves with critical functions such as low leakage boundary valves have been replaced with stainless steel valves or valves with stainless steel internals. Boundary valve leakage has consistently met leakage requirements over the last two operating cycles, which assures that ECP requirements are maintained.

- Installation of New Chemical Addition Systems for SW - New chemical addition systems for the biocide treatment and corrosion control of the SW system were installed in the early and mid 1990's. These systems are effective in controlling biofouling and reducing system piping corrosion rates.
- Installation of a Permanent ECP Return Line Cleaning Station - A permanent station for the cleaning of the ECP return line using polyurethane pipe line cleaners was installed in 1997. The use of this new station to clean the ECP return line significantly increased system flow rates to SW system components.
- SW Pump Upgrades - Replacement of impellers and snap rings with stainless steel components eliminated failures of the pumps and improved performance and reliability.
- Intake Forebay Chemical Injection - Installation of piping to allow injection of sodium hypochlorite and/or sodium bromide just downstream of the traveling screens has essentially eliminated the growth of zebra mussels in the forebay and on the sluice gates. This significantly reduces the chances of zebra mussel shells fouling SW pump strainers and rendering a SW loop inoperable.
- Traveling Screen Upgrade – One screen assembly has been replaced which includes fiberglass baskets with finer mesh wire, a dual spray header, foul release coating, a boot loading leg and other materiel improvements. Additionally, the spray wash supply header has been replaced with stainless steel and rerouted into the ANO-1 discharge header, which improved spray wash pressure and flow. The second screen assembly is currently scheduled for similar upgrades later in 2000.

Pipe Wall Thickness Monitoring - ANO-1&2

Mapping of pipe thickness at selected locations with computerized UT equipment is periodically performed. The selection of inspection locations considers potential aging effects, flow conditions, and piping stresses. This data in conjunction with flow testing data aids in determining system pipe replacement schedules. This program has been effective in optimizing the pipe replacement schedule and preventing failure of the piping.

Chemical Treatment Program – ANO-1&2

Water treatment is used to control biofouling and general corrosion, mitigate microbiologically influenced and induced corrosion, and minimize silt accumulation. Monitoring is performed to assist with evaluation of actions required to appropriately maintain the SW system. Significant changes in this program in the 1990's such as continuous biocide treatment of the system have been effective in controlling biofouling in piping and equipment. This is evidenced in recent component inspections and thermal performance testing of heat exchangers. The injection of corrosion inhibitors has significantly reduced piping corrosion rates in the system. By controlling corrosion and fouling, system design capabilities and margins are maintained. Some of the program's treatment methods include:

- The SW bays are treated with biocide (sodium hypochlorite and/or sodium bromide) to prevent macrobiological and microbiological fouling. This is primarily oriented to prevent the growth of Asiatic clams and zebra mussels within the SW system. Biocide addition also prevents algae and slime growth and helps reduce the affects of microbiologically influenced and induced corrosion.

- Side-stream corrosion racks and bio-boxes are used for the following:
  - Determination of corrosion rates for various in-service and proposed materials.
  - Assessing biological growth in chemically treated SW systems.
  - Evaluation of different chemical treatments for SW to more effectively control biological fouling and reduce corrosion and deposition.
  - The ANO-1&2 SW bays/pump suctions are treated with a corrosion inhibitor and silt dispersant to reduce the corrosion rate of the carbon steel piping and to minimize the accumulation of silt settling within the SW system piping and components.

ASME Section XI Testing – ANO-1&2

ANO-1 was originally constructed and licensed to ANSI B31.1, *Power Piping*. However, ANO-1 performs ISI periodic pressure testing per ASME code class 3 in accordance with the 1992 Edition, with portions of the 1993 Addenda of the ASME Codes. ANO-2 performs ISI periodic pressure testing per ASME code class 3 in accordance with the 1986 Edition, no Addenda, The system leakage tests are performed on periodic bases (approximately 40 months) of which there are three periods in a 10-year interval. In addition to the periodic system leakage test, a 10-year hydrostatic test is required near the end of the 10-year interval. ANO 1&2 has been approved to use code case N-498-1, which requires a system leakage test in lieu of the hydrostatic pressure tests. The periodic and the 10-year pressure tests are performed concurrently. ANO-2 will be performing its ISI 10-year update at the end of March 2000 to the same ASME code year as ANO-1, at which time system leakage tests will be performed on both ANO-1&2 to the same code year.

ASME Section XI Repair/Replacement activities for ASME code class 3 SW systems are performed in accordance with the 1992 Edition, with portions of the 1993 Addenda (for pressure testing) for both ANO-1&2. The only exception to a code repair to an ASME code class 3 SW ferritic steel or austenitic stainless steel pressure boundary would be a temporary non-code repair based on the guidance which has been provided by the NRC in Generic Letter 90-05, *Guidance for Performing Temporary Non-Code Repair of ASME Code Class 1, 2, and 3 Piping*. Other alternate methods may be acceptable to the NRC but are subject to a case-by-case evaluation. Hydrostatic tests and associated VT-2 visual examinations required as a result of repairs or replacements are performed in accordance with the 1992 Edition, with portions of the 1993 Addenda of the ASME Section XI Code. In lieu of performing the hydrostatic pressure test, a system leakage test and associated VT-2 visual examination may be used provided the additional NDE examination requirements related to code case N-416-1 are met.

CONCLUSION

Based on the information provided above, ANO is confident that the ongoing performance and condition monitoring programs are effective in identifying degrading design margins and situations that affect the materiel condition of the SW system. These programs are also effective at resolving the identified conditions, maintaining design capability, and restoring margins within the SW system. The current SW system performance data indicates the SW system is fully capable of performing its intended safety-related function and has adequate design and operating margins.

During the 1980's ANO recognized that the SW system was degrading and would require upgrading to ensure it remained operable and maintained adequate design margins. Since then ANO has consistently upgraded selected portions of the SW system and will continue to do so in the future. The response to Question 2, describes actions taken or planned that will ensure that adequate design margins are maintained.

Question #2. Discuss the actions taken or planned to address SW system degradation

ANO RESPONSE

The following are actions that have been completed or are ongoing. These actions were planned prior to the performance of the SSEI and are in addition to those described in question 1.

SW Pipe Replacement – ANO-1

In an effort to maintain design capability and system integrity, replacement of piping segments in the SW system will continue based on UT inspection data and flow testing. UT inspections were performed in 1999 and are also planned in 2001/2002. This data will be used to plan future piping replacement schedules. Additionally, visual inspections of the ECP return line coating provides insight on the condition of this piping. In 1R15 (third quarter 1999) approximately 150 feet of the loop 1 supply header piping was replaced. Approximately 80 feet of the common return header will be replaced during 1R16 (first quarter 2001) as part of the ongoing replacement program. Other piping segments are designated for potential replacement and are included in the long range plan.

SW Pipe Replacement – ANO-2

In an effort to maintain design capability and system integrity replacement of piping segments in the SW system will continue based on UT inspection data and flow testing. In 2P99 (fourth quarter 1999) approximately 250 feet of eight-inch piping for the "A" Emergency Diesel Generator (EDG) was replaced. This piping segment was replaced during 2P99 based on a NRC commitment; however, it had been scheduled for replacement in 2R14 (third quarter 2000). This replacement restored design flow margin to the EDG. Currently ANO plans to replace the four-inch carbon steel supply and return piping to the emergency control room chillers with stainless steel piping in 2R14. The piping to the major safety related loads cooled by SW has been replaced with the exception of the containment coolers. The remaining above ground safety-related piping yet to be replaced are the main supply and return headers in the containment auxiliary building and the containment cooler piping inside containment. Other piping segments are designated for potential replacement and are included in the long range plan.

Long Range Plans/Modifications – ANO-1

As part of the SWIP program and system engineering responsibilities, long-range plans have been established for issues related to the SW system in order to assure design margins and capabilities are maintained and to improve the operation and reliability of the system. These long-range plans include some system modifications. Listed below are some of the more significant items related to the SW system that have not been previously discussed:

- Intake Structure Upgrades – Structural stiffening of travelling screens and the addition of larger high speed drives to increase operating margins.
- "A" SW Bay Strainer - The bay strainer for the "A" SW bay is scheduled for installation during the second quarter of 2000. The bay strainer for the "C" SW bay was installed in 1998. This will provide increased protection from debris and biological fouling potential from the Dardanelle Reservoir.
- "A" Reactor Building Spray Pump Bearing Cooler - This cooler will be replaced at the next opportunity based on the need to disassemble the pump. There have been no cooler flow related issues related to this cooler since the replacement of the tubing between the bearing jacket cooler and the seal cooler in 1995.
- ECP Supply Line – In 1995 the ECP supply line was cleaned using the polyurethane pipeline cleaners.
- Strategic Planning Tools - The strategic plans for SW pipe replacement/cleaning and the tools used to develop those plans will be reviewed for adequacy and improved as necessary (ANO – 1&2).
- Deposit Accumulation Testing System (DATS) monitors - The benefits of adding DATS monitors to the ANO SW system will be evaluated (ANO – 1&2).

Long Range Plans/Modifications – ANO-2

As part of the SWIP program and system engineering responsibilities, long-range plans have been established for issues related to the SW system in order to assure design margins and capabilities are maintained and to improve the operation and reliability of the system. These long-range plans include some system modifications. Listed below are some of the more significant items related to the SW system that have not been previously discussed:

- Service Water System Debris Concerns/Traveling Screen Upgrade - During 1996 the SW intake became fouled with zebra mussels. These mussels caused fouling of the SW pump strainers. To reduce the amount of debris collecting in the forebay, the traveling screens are being modified to reduce the size of debris allowed to enter the forebay. This project is expected to be completed during 2000.
- ECP Return Line - The ECP return line requires periodic cleaning to reduce backpressure in the line that is caused by corrosion nodules. This backpressure restricts flow in the line and causes low flow conditions in the SW system. Currently ANO plans to clean this line during 2R14 due to increasing backpressure. This will increase system flows on both loops of SW.
- ECP Return Line/Add Coating - The main carbon steel headers are subject to both general corrosion and pitting. Without protection these headers will require replacement at least once during the life of the plant. To correct the corrosion and pitting the use of a pipe liner or coating is being considered.
- ECP Supply Line - The supply line from the ECP is fouled from corrosion nodules. The fouling in the line results in lower than normal pump bay levels when aligned to the ECP and could ultimately result in system flows being affected. A permanent station for cleaning this

line with polyurethane pipeline cleaners is planned to be installed to allow for periodic cleaning. This modification is scheduled for 2R15.

- Service Water Crossover Valves Logic Change - During hot weather operation ANO is required to operate in a three pump configuration to meet normal cooling requirements for the loop aligned to the auxiliary cooling water (ACW) system. This change will modify the logic of the crossover valves that separate the SW loops so that these two loops can be crosstied while in operation. This will provide balanced flows between the SW loops during normal operation and allow the loop with ACW to have more flow available during hot weather operation. This modification is currently scheduled for 2R15.
- Service Water Modifications for Power Uprate - Piping modifications are required to provide additional cooling to the stator water coolers on ACW. The changes include removing the main chillers from ACW and cooling them with a portion of the SW that goes to the component cooling water coolers. Additionally, the ACW booster pumps will be disconnected from ACW and used to boost the SW supplying the chillers if required. This modification is currently scheduled as part of the power uprate project.
- ANO-2 SW Pumps - The SW pumps were upgraded in the mid 1990's due to failures of impeller snap rings. Inspections since that time have revealed no significant wear on the impeller or the new thrust collars that replaced the snap rings. The pumps are currently inspected once every three years. There has been no significant loss in pump performance between these inspections. The performance of the "A" SW pump currently does not meet the original manufacturer's pump curve due to impeller shrinkage that occurred during manufacturing. ANO plans to replace these impellers in the near future in an effort to improve the performance of this pump.

Operating Margin Improvement

In response to the SSEI, the following actions have been completed to address reductions in operating margins within the SW system:

- Increased the minimum flow required to the ANO-1 EDG's and decay heat coolers in test procedures from 400 GPM to 525 GPM and from 1650 to 1750 GPM, respectively. This action increased the margin between the required and predicted thermal performance for these components.
- Established that the heat exchanger fouling measured during thermal performance testing at ANO is representative of worst case conditions and is not required to be "adjusted" when predicting design basis performance. This action dispelled the concern that the margins documented in thermal tests of heat exchangers did not represent what would be available under worst case fouling.

The following actions are planned to respond to the SSEI findings concerning reductions in operating margins within the SW system:

- Removal of the overly conservative treatment of SW inlet temperature to the ANO-2 EDG lube oil and jacket water heat exchangers in the thermal test evaluation methodology will be considered. SW flow through the three EDG heat exchangers is arranged in series such that one outlet temperature is the inlet temperature for the next heat exchanger, etc. Presently the outlet temperatures are determined based upon the capacity of the coolers under design limiting conditions rather than on the actual heat duty that would exist. By definition, capacity must be greater than or equal to actual duty for a test to be declared successful; therefore, the calculated outlet temperatures under this method will be greater than or equal to the highest temperatures that would actually enter the downstream heat exchangers. Assuming a higher inlet SW temperature to the next heat exchanger than necessary reduces the predicted thermal performance of that heat exchanger artificially.

- The ANO-2 EDG design basis calculation will be revised to reconcile differences with HOLTEC STER and clarify the limiting load case. ANO will demonstrate formally that the medium time frame load case is not limiting as current design basis calculation implies.
- The formal evaluation of the potential for containment cooler boiling and its effects utilizing GOTHIC thermal-hydraulic analysis code will be finalized.
- Contingencies for biocide injection post accident in the event the normal injection system is inoperable will be formally incorporated into plant procedures.
- A formal engineering scoping report will be developed that considers various ways of improving safety-related operating margins in the ANO-1 & 2 SW systems.

Question #3 – Discuss any other actions ANO has taken or planned in response to this inspection.

ANO RESPONSE

During the SSEI inspection approximately 25 condition reports were issued to address each individual finding. Treated individually each finding is being corrected by enhancing a specific program or by revising an individual calculation, report, etc. However, due to the large number of individual findings a significant condition report was issued on September 15, 1999, to determine if generic engineering programmatic issues exist.

As a result of an initial review of the overall engineering programmatic issues, interim guidance in the form of a temporary engineering directive, ADM-07, *Design Control,* was issued on November 9, 1999, to define and communicate management expectations in implementing engineering programs until more formal programs can be revised. The directive provides guidance for:

- Using the proper engineering process when performing engineering level work, calculations, operability determinations and situations where an off normal condition would result in equipment being credited for operability or placed in service with a component or system parameter outside of design values.
- Expectations for providing engineering input for on line system adjustments such as system flow balancing.
- Using a more comprehensive engineering change process that includes review and approval requirements when revising a system level design basis.
- Clarification of design verification requirements. Design verification is required when design input is provided for a safety-related evaluation or change.
- Management expectations concerning procedure adherence. Procedure requirements must be adhered to or revised via approved processes.
- Increasing engineering sensitivity concerning configuration management thresholds. The configuration management threshold extends beyond hardware configuration to include such items as procedure controls, lubricant types, chemistry control, consumable material, etc.

During the week of October 18, 1999, an internal assessment team performed an integrated evaluation of the SSEI findings, condition reports and ANO interim directive requirements (in draft form at the time of the assessment). The assessment team validated the overall ANO conclusions and endorsed the interim corrective actions. Additionally, the assessment team did not find any significant safety or process issues, but did provide recommendations for improvement in several engineering related areas.

Since the September 15, 1999, condition report was classified as "significant", a CARB was convened to determine the overall causes of the SSEI findings and recommend corrective actions. The CARB completed on February 7, 2000, considered the internal assessment team findings as well. Corrective action plans to address the overall findings are currently being developed. The expectations and controls addressed in the interim engineering directive will remain in effect until more formal programs are revised to include these expectations and correct the causes identified by the CARB.

Other corrective actions to address SSEI issues described in the report cover letter include:

- **Corrective Action Program**

  Subsequent to the inspection, an engineering peer group improved specific guidance for engineering related condition reporting thresholds. This guidance will be incorporated into condition reporting procedures.

  The question of whether a generic concern, for areas outside of engineering, related to the generation of condition reports for plant problems has been evaluated. ANO routinely monitors various sub-systems for conditions adverse to quality that should have generated a condition report. This review has not indicated a trend in the failure to issue condition reports. The most recent quality assurance audit of the corrective action program supports this conclusion.

- **System Condition Monitoring**

  During the Spring of 1999 ANO began implementing an enhanced equipment performance monitoring program. This program establishes the monitoring requirements, to detect degrading conditions, for selected parameters of those systems whose performance affects plant safety or efficient, reliable station operation. This also includes risk significant systems within the scope of the maintenance rule. This program scheduled for full implementation later this year, has been effective in identifying degrading trends. During 1999 the following degrading trend examples were identified and corrected or plans were made to correct them in the future:

  <u>ANO-1</u>
  - Identification of low oil levels on a reactor coolant pump on two separate occasions and subsequent corrective actions in late 1999 and early 2000.
  - Identification of low oil level on a high pressure injection pump and subsequent corrective actions in the Spring of 1999
  - Identification of industry issues with high pressure injection pump nozzle thermal sleeve cracking and subsequent corrective actions in refueling outages 1R14 and 1R15

  <u>ANO-2</u>
  - Identification of degrading lube oil pressure trends on an EDG and subsequent corrective actions in mid-cycle outage 2P99.
  - Identification of outboard bearing vibration on a high pressure safety injection pump and subsequent corrective actions in 2R13

- Identification of a reduction in the heat removal capability on the main generator isolation phase bus cooler. Corrective actions are scheduled for implementation during 2R14.

- **Operating Margins**

In addition to the margin recovery actions specific to the SW system discussed in question 2 above, the following generic actions have been completed:

- Generic lessons learned have been conveyed to engineering personnel.
- A new engineering directive provides guidance for disposition of changes that may involve reductions in operating margins.
- Continuing training on GL 91-18, *Information to Licensees Regarding Two NRC Inspection Manual Sections on Resolution of Degraded and Nonconforming Conditions and on Operability,* and the proper classification and disposition of degraded and non-conforming conditions was conducted for engineering support personnel.
- The results of the SSEI and the importance of performing broad, integrated reviews of proposed changes in addition to the new Engineering Directive (ADM-07) were presented at the most recent engineering department meeting.

With respect to improving operating margins in other systems, a formal design margin recovery program has been in place at ANO for approximately three years. The specific items currently included in the program will be reviewed to ensure the appropriate priority and level of activity is currently assigned to each. The need for the addition of new items will be evaluated. Consideration will be given to integrating program goals more effectively with the site's strategic plan.

- **Operator Workarounds**

The NRC SSEI team identified a single example of an operator workaround (OWA) that was not included in the OWA program. An executive management assessment performed in 1999 prior to the SSEI identified other issues with the OWA program. These include:

- Operators are not fully cognizant of the full definition of an OWA
- Maintenance and communication of the OWA lists lack rigor
- Multiple, inconsistent OWA lists exist

To address the OWA findings a multi-unit task force developed a corrective action plan that will implement a consistent formal approach for both units' OWA programs.