PSEG Nuclear, LLC

Salem / Hope Creek

Safety Culture Assessment

Conducted by

Utilities Service Alliance

March 1 – 5, 2004

Team Members	
William O'Connor	Chairman, USA Board of Directors – Fermi 2
Stan Stasek	USA Fleet Operations Steering Committee - Fermi 2
Joe Muth	Team Lead - Columbia Generating Station
Neil Bergh	Host Peer - Salem/Hope Creek
Ludwig Thibault	INPO Representative
Owen "Jay" Clayton	Team Member - USA Staff Representative
Vic Gupta	Team Member – D.C. Cook Nuclear Power Station
Art Shean	Team Member - San Onofre Nuclear Generating Station
Robert Zemenski	Team Member - Fermi 2
Del Trausch	Team Member - Fort Calhoun Station
Brad Curle	Team Member - Darlington Station
Rich Hoffert	Team Member - Susquehanna Station
Kevin Billesbach	Team Member - Cooper Station

Table of Contents

I. Executive Summary

In December 2003, PSEG Senior Management requested the Utilities Service Alliance (USA) perform a Safety Culture Assessment at Salem / Hope Creek. The USA Board of Directors agreed to conduct the assessment using the USA methodology established to satisfy the requirements of Recommendation 2 of INPO SOER 02-4, "Reactor Pressure Vessel Head Degradation at Davis-Besse Nuclear Power Station." SOER 02-4 required nuclear utilities conduct a self-assessment to determine to what degree the organization has respect for nuclear safety and that nuclear safety is not compromised by production priorities.

The Salem / Hope Creek Safety Culture Assessment was conducted at the site between March 1 and March 5, 2004. This report documents the results of the assessment; however, the ultimate responsibility for implementing corrective actions rests with the Salem / Hope Creek leadership team. The team recommends use of the Salem / Hope Creek Corrective Action Program to document for resolution the issues discussed in this assessment report. Due to time constraints, the assessment team was not able to fully assess in all cases whether issues identified on one unit were common to the other units.

The assessment process uses the following five SOER 02-4 attributes as a basis to provide information to Salem / Hope Creek leadership team regarding the presence or absence of characteristics that support a strong site safety culture. A statement of the overall team conclusion follows each SOER 02-4 attribute.

Attribute a: All employees are encouraged to identify degraded conditions and have demonstrated a willingness to escalate their concerns when the conditions are not corrected.

Team Conclusions: No evidence was found to indicate site personnel would not escalate nuclear safety concerns when not addressed or not corrected. However, some personnel interviewed indicated reluctance to document issues in the Corrective Action Program (CAP) because of perceptions that the CAP is a burden and not an instrument for performance improvement. Another perception is that when a CAP notification is initiated, it will be assigned to the initiator resulting in more work for the initiator. In addition, some individuals interviewed indicated they very seldom receive feedback on issues identified and many times the issues identified do not get satisfactory resolution. Many also believe that management's focus is more on completion dates instead of corrective action effectiveness.

Attribute b: Station personnel pursue resolution of important and long-standing equipment and materiel problems and execute plant shutdowns, if appropriate, to effect repairs.

Team Conclusions: The corrective action program (CAP) has not been effective in improving station performance. Multiple repeat equipment issues exist due to ineffective corrective actions. Leadership weaknesses contribute to inadequate Work Management stakeholder accountability, work management process inefficiencies, and ultimately to equipment reliability problems. This conclusion is important from the standpoint of the staff's perception of management's ability to

provide the necessary resources, tools, and guidance to resolve issues and help improve plant performance. In some cases, the Salem / Hope Creek site is not learning from internal and external operating experience. Several repetitive events have occurred that were previously documented at the site or at other industry locations. This is indicative of a work environment that is not learning from operating experience.

However, as detailed in the Safety over Production Section of this report, several interviews indicate there has been a recent positive change in the staff's perception of the leadership team. They are now seeing management reinforcing safety and reliability over production concerns and recognizing staff members for meeting this expectation.

Attribute c: Management is involved in important plant activities, especially those having the potential to affect nuclear safety, and exercises accountability and follow-up as appropriate.

Team Conclusions: The senior leadership team has not established a compelling, visible message that reinforces a strong safety culture. As a result, the values, beliefs, and symbols of a strong safety culture were not apparent at Salem / Hope Creek. For example, some personnel do not exhibit strong reactivity management practices, nor do they effectively use the notification process or operating experience to improve performance. Also, the introductory letters in the General Employee Training materials are from the previous Chief Nuclear Officer. The plant physical condition reflects a tolerance or acceptance of conditions that are less than excellent. One example is the Hope Creek emergency diesel generators, which have more than 160 corrective maintenance material condition reports against them, some of which are over a cycle old. Also, Hope Creek Emergency Diesel Generator D has numerous oil leaks and oil weeps. The leaking oil collects in puddles on the engine deck plates, a condition that would not be expected at other nuclear sites.

Attribute d: Managers seek critical feedback from both internal and external sources, and first-hand information is actively sought from those personnel intimately involved with the issues.

Team Conclusions: The management team does not effectively use trending, performance monitoring, and internal or external operating experience to the level expected by a learning organization to improve performance. The lack of trending/performance monitoring applies to CAP notifications, system performance, as well as human performance.

The Quality Assurance function is not effectively utilized at Salem / Hope Creek to improve performance. QA Reports appear to be sufficiently intrusive, however improving performance by use of the QA function is hampered by ineffective line management acknowledgment, internalization, and implementation of corrective actions in response to QA findings. QA is not always delivering its message in an effective, convincing manner, either through its written reports or through verbal and face-to-face interactions. Senior Management has not adequately demonstrated its support of the QA Organization. Some QA personnel are reluctant to deliver a stronger message. QA personnel perceive that they have lost some "teeth" based upon feedback

received from previous Senior Management, which encouraged the use of more neutral language in Assessment Reports.

As stated earlier, the Salem / Hope Creek site has had several repetitive events that were previously documented at the site or at other industry locations. This is indicative of a work environment that is not taking full advantage of feedback from all available sources (including the QA Organization) to improve performance.

Attribute e: Events determined to be significant by the station are recognized and aggressively addressed to determine their root causes and the corrective actions necessary to prevent recurrence.

Team Conclusions: The numerous repetitive equipment issues documented in the Equipment Reliability Section of this report indicates weaknesses in the corrective action and work management programs. Repeat issues suggest a tolerance of poor performance by the management team. Interviews conducted during the assessment week indicated a lack of confidence in the site's ability to resolve equipment issues on the first attempt, on schedule, or in a timely manner. Some modifications (e.g. turbine building cooling modification) represent weaknesses in the design change process resulting in added operational burdens to the staff.

Multiple reactivity control events at Hope Creek are a sign that the leadership team is not aggressively addressing this important issue. The Hope Creek Station staff and management do not always demonstrate a healthy respect for reactor core reactivity with the team noting a number of significant reactivity vulnerabilities overall. The material condition of systems critical to monitoring and controlling core reactivity is not optimal. The health of the control rod drive system and neutron monitoring system is currently assessed as yellow. Hope Creek has experienced a number of reactivity events over the past year. In one instance, Operator actions were not conservative from a reactivity control perspective. QA noted in an assessment report that 20 of 33 completed corrective actions involving control of reactivity issues were inadequately implemented. In an October 21, 2003 letter on reactivity management, station management agreed with a quality assurance issue on reactivity management, yet management downplayed the significance of the issue by introducing their agreement with "Although these evolutions did not have an impact on nuclear safety…" The root cause evaluation team investigating reactivity management practices missed the importance of cultural values and beliefs during their evaluation.

II. Background

The foundation for the USA Safety Culture Assessment used at Salem / Hope Creek is stated in SOER 02-4 as follows:

> *"A major contributor to this event was a shift in the focus at all levels of the organization from implementing high standards to justifying minimum standards. This reduction in standards resulted from excessive focus on meeting short-term production goals, a lack of management oversight, symptom-based problem-solving, justification of plant problems,*

isolationism, ineffective use of operating experience, and a lack of sensitivity to nuclear safety."

Dr. Edgar H. Schein in his book, *Organization Culture and Leadership*, defines culture as "A pattern of shared basic assumptions that the group learned as it solved its problems…" Attachment 5 of this report compares portions of the Davis Besse Case Study with how the Salem / Hope Creek organization has dealt with Salem's Circulating Water System Pump 13B problems. Although it is recognized that the Pump 13 B issue is not as safety significant as the Davis Besse head degradation event, it could be concluded that similar *patterns of shared basic assumptions* or behaviors have been used to solve Salem / Hope Creek problems.

III. Assessment Methodology

The assessment process used to perform the Salem / Hope Creek Safety Culture Assessment is the same process used by the USA plants to fulfill requirements of INPO SOER 02-4 Recommendation 2. The process was implemented in 2003 at Columbia Station, Cooper, D.C. Cook, Fermi, Ft. Calhoun, Susquehanna, and Wolf Creek, as well as Ontario Power Generation plants. The USA approach was to perform the assessments utilizing a team of approximately ten (10) experienced leaders from outside the host plant. The assessment process was designed to be very critical comparing each plant to approximately 90 behavioral characteristics associated with a conservative safety culture model. The overall purpose of the assessment process is to determine to what degree each plant has a healthy respect for nuclear safety and that nuclear safety is not compromised by production priorities.

The precepts of INPO's "Principles for Effective Operational Decision-Making" and "Warning Flags from Plants in Extended Shutdowns," as well as other industry and NRC documents were used as the standards for developing the USA assessment process.

A summary of the USA safety culture assessment process is included as Attachment 1. The USA assessment process links documentation reviews, site observations, and interviews to a set of behavioral characteristics that model a strong safety culture. Culturally based characteristics and attitudes are difficult to detect and evaluate during a short self-assessment process. However, discernible symptoms can exist that may indicate flaws in the overall safety culture of the assessed site. The primary goal of the Salem / Hope Creek assessment was to identify these symptoms, increase management awareness of the symptoms, and leave the site with a list of observations that the plant leadership team can use to improve performance.

The site was provided an electronic file of field notes, observation guides, and interview sheets. These contain 898 separate documented items that are available for review by the Salem / Hope Creek leadership team. Each of the 898 documented items is cross-referenced to the Effective Operational Decision-Making Matrix (**EODMM**) or Leadership Matrix (**LM**). The **EODMM** contains 81 "behavioral characteristics" based on INPO's "Principles for Effective Operational Decision-Making" guidance document. The **LM** contains nine "behavioral characteristics" from INPO's "Warning Flags from Plants in Recent Extended Shutdowns."

A score from 1 to 5 (1 "Needs Much Improvement" to 5 "Exceptional") was assigned by team members to each of the 898 items. These scores were then averaged and transferred to the **EODMM** and the **LM**. Overall scores for the **EODMM** and **LM** are included in **Attachments 2 and 3** respectfully. The scoring on these matrices was used to formulate conclusions drawn concerning the identification of site strengths and weaknesses. Where a high number of scores on a particular "behavioral characteristic" received 1's or 2's ("Needs Improvement"), this characteristic was flagged as a site weakness.

A Safety Conscious Work Environment (SCWE) where individuals can bring up issues without fear of intimidation is an integral part of the site's safety culture. A comprehensive evaluation of the site's SCWE was not performed during this assessment. To assess SCWE at the USA plants a survey was conducted to gain participation from the majority of each site's population. The survey was based on NEI 97-05, "Nuclear Power Plant Personnel-Employee Concerns Program-Process Tools in a Safety Conscious Work Environment." **This survey tool was not a part of the Salem / Hope Creek Safety Culture Assessment.** The team recommends that Salem / Hope Creek evaluate the use of this survey tool as a means to periodically assess the strength of the site's SCWE.

IV. Assessment Results

The primary goal of this report is to identify areas for improvement that can be used by the Salem / Hope Creek leadership team to improve site performance.

The 81 EODMM and 9 LM behavioral characteristics contain numerous areas of overlap and many cross cutting issues. To help provide site focus on the main issues identified during the assessment, the 81 EODMM and 9 LM characteristics (90 total) were reduced to a manageable list of 12 major rollup attributes.

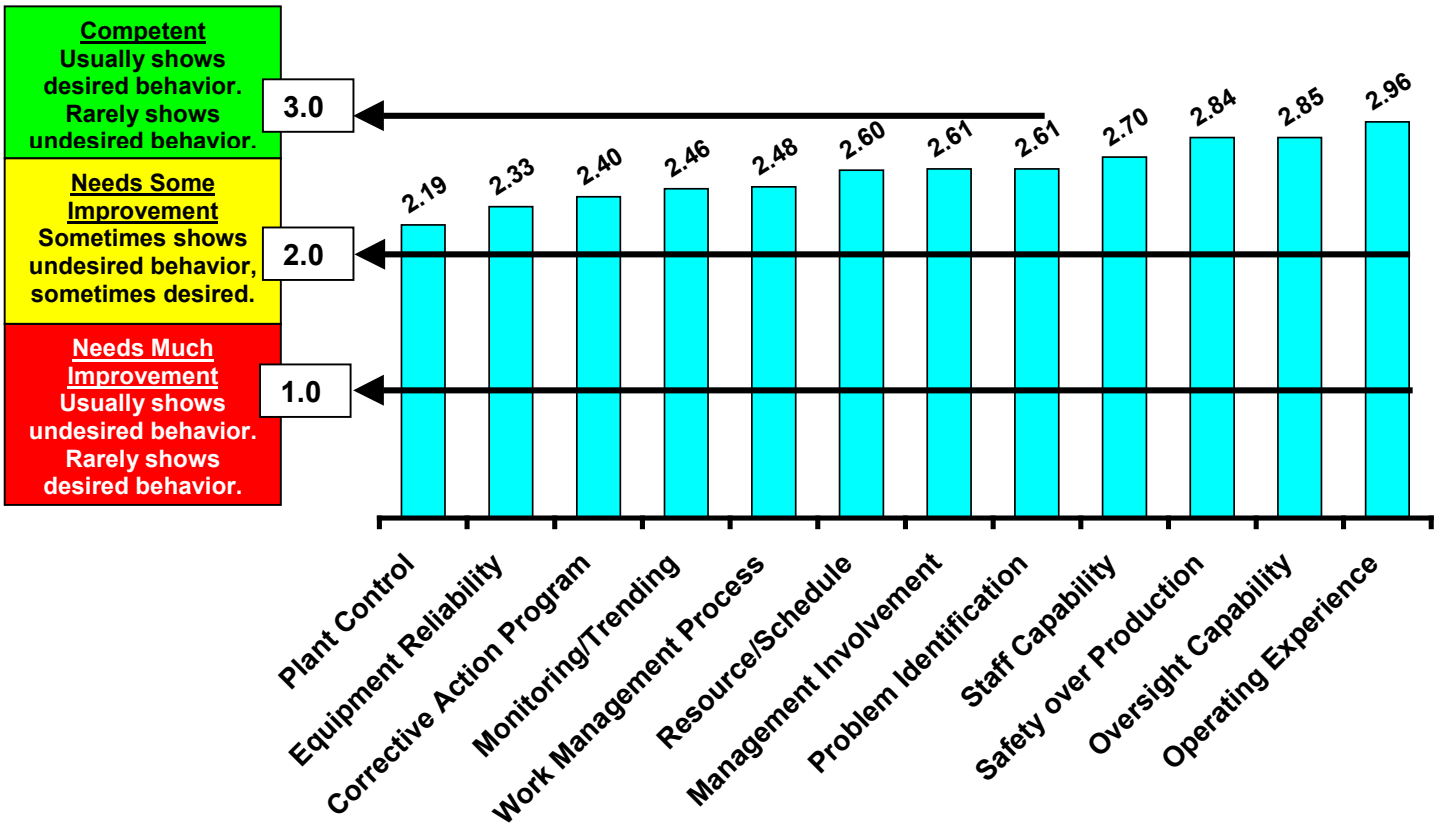
Figure 1 (page 6) is a numerical ranking of the 12 rollup attributes. The scoring shown on Figure 1 is a simple average of 39 critical behavioral characteristics from the EODMM and LM. Attachment 4 lists the 12 rollup attributes with a cross reference to the associated EODMM or LM behavioral characteristic(s). All 12 rollup attributes scored below the Competent Scoring Range as shown on Figure 1 indicating improvement opportunities exist in all areas. This form of data rollup can potentially be used by the Salem / Hope Creek leadership team to prioritize any necessary corrective actions established for the team's findings. The team recommends giving immediate attention to the lowest scoring attribute, "Plant Control."

At each of the USA sponsored assessments, a list of Strengths, Observations, and Weaknesses was discussed at the assessment exit meetings. A Strength is some positive activity or behavior that has had a definite and measurable positive effect on the station's performance. A Weakness is some negative activity or behavior that has had a definite and measurable negative effect on the station's performance. An Observation is a noted difference in behavior, good or bad, that has had no measurable effect on station performance, or because of time constraints, was not researched enough to uncover the measurable effects.

No Strengths were identified during the Salem / Hope Creek Safety Culture Assessment. Three (3) Observations [one positive and two negative], and nine (9) Weaknesses were identified. The exit meeting assessment item and category (observation or weakness) is included in the table below with a reference to the applicable report section.

Category	Exit Meeting Item	Report Section/Page No.
Weakness	Reactivity Management	Plant Control / page 7
Weakness	Corrective Action Process	Corrective Action Program Rigor / page 10
Weakness	Trending	Monitoring/Trending / page 13
(-) Observation	Observation Program	Monitoring/Trending / page 13
Weakness	Work Management	Work Management Process / page 15
Weakness	Inventory/Spare Parts	Work Management Process / page 15
Weakness	Change Management	Resource and Schedule / page 16
(-) Observation	Overtime Controls	Resource and Schedule / page 16
(+) Observation	Senior Management	Management Involvement / page 17
Weakness	Design Control Process	Staff Capability / page 19
Weakness	QA Compliance Oriented	Oversight Capability / page 22
Weakness	Operating Experience Program	Operating Experience / page 24

Figure 1 Ranking of Safety Culture Attributes



Statistical relevance was provided in the scoring in Figure 1 by not including scoring for other EODMM behavioral characteristics with a low number of data points recorded during the assessment week.

A discussion of each of the 12 rollup attributes is included below. Integrated with the discussions are the observations and weaknesses discussed at the Assessment Exit Meeting on March 5, 2004. The presentation order is from low to high scores. The number in parenthesis is the average score of the EODMM/LM behavioral characteristics associated with the rollup attribute. As stated above, Attachment 4 provides a cross-reference between the 12 rollup attributes and the corresponding EODMM and LM characteristic.

Plant Control (Average Score 2.19)

Definition: Plant operations remain deliberate and well controlled. The station has a healthy respect for reactivity management. Management fosters this expectation during decision-making activities. Strong control of plant, equipment, and design configuration is maintained during maintenance, operation and modifications.

This attribute scored the lowest of the 12 rollup attributes (2.19) as shown on Figure 1. The score is low because of the reactivity management issues at Hope Creek. This average includes scoring from EODMM behavioral characteristic 4.B.1.b.

The Hope Creek Station staff and management do not always demonstrate a healthy respect for reactor core reactivity with the team noting a number of significant reactivity vulnerabilities. The station has not adopted high standards or established proper procedure guidelines for reactivity control. A broad understanding and appropriate sensitivity to reactivity management is not evident throughout the organization. Low-level reactivity events are not recognized as potentially significant and addressed. The material condition of systems critical to monitoring and controlling core reactivity is not optimal.

The cause for this appears to be a failure to establish, assess, and reinforce high industry nuclear safety values for reactor control. Site personnel do not always demonstrate accountability for the quality of their work on evolutions and equipment that affects core reactivity.

Specifically,

- Hope Creek has experienced a number of reactivity events over the past year. In March 2003, a power transient occurred during an Infrequently Performed Test Evolution when a turbine bypass valve erratically opened to 75% when operating the Bypass Valve Jack pushbutton. Reactor pressure decreased 50 psig and power increased, almost reaching the 15% upscale APRM trip necessitating rapid action by the Reactor Operator to range up the IRMs and manually control feedwater to avoid an automatic scram. These manual operator actions were not conservative from a reactivity control perspective.

- In September 2003, during a startup from a forced outage, the reactor inadvertently went subcritical while warming the RCIC System and was subsequently taken critical again

without proper procedural guidance. Expected standards for reactivity management were not met. Neither Operations nor Reactor Engineering procedures contained direction on how to recover from this situation. The crew, station management, and reactor engineering discussed the situation and made a decision to proceed with startup. A reactivity brief was conducted but continuing the startup without procedural guidance did not meet industry standards or expectations.

- The QA organization has documented concerns involving the control of reactivity on a number of occasions via quality assessment quarterly reports and most recently with a Reactivity Management-Quality Improvement Area letter to the Senior Vice President. This letter was prompted by ineffective implementation of corrective actions stemming from the root cause analysis of the prior power transient in 2003. QA noted that 20 of 33 completed corrective actions were inadequately implemented. Some actions diverged from the root cause analysis findings and thus not completed. There was no documentation that Corrective Action Review Board approval was obtained before closing the action items, which is contrary to procedural requirements.

- The material condition of critical systems that control and monitor core reactivity are less than optimal. The health of the control rod drive system is currently assessed as yellow. An operability determination is in place to justify operability for a number of rods with excessive withdraw speeds. Double notching of some rods has been experienced. Another 46 CRDMs have experienced high stall flow indicating excessive internal leakage. Frequent accumulator water level alarms occur on 10 Hydraulic Control Units with known piston leaks. Another 10 rods have elevated temperatures. A portion of the RCS unidentified leakage is attributed to known individual mechanism flange leaks. Finally, the CRD exchange machine has been a chronic problem for many years. This has led to less than expected CRDM replacement/change-outs/rebuilds, well below industry standards leading to poor CRD performance.

- The health of the neutron monitoring system is also assessed as yellow. LPRM availability is a concern. At one point during the cycle, 17 LPRMs were not properly functioning. The system engineer stated that no spare parts are available in the inventory system leaving nine LPRMs currently bypassed. SRM failures have also been a chronic issue with an operability determination currently in place.

- From a CRD operation point of view, problems were encountered in the fall 2003 outage with rod withdrawal. The cause was failure to fully exercise and vent control rod drives due to the restart schedule failing to allow adequate time for rod exercising. There was management pressure on the staff to not fully vent in order to meet the schedule for plant restart.

- The Hope Creek Operations turnover sheet notes additional issues associated with core reactivity control with the “A” Standby Liquid Control Pump having high vibrations and other problems with the recirculation pump speed oscillations.

- In an October 21, 2003 memorandum responding to QA findings on reactivity management, management agreed with a quality assurance issue on reactivity management, yet management downplayed the significance of the issue by introducing their agreement with "Although these evolutions did not have an impact on nuclear safety…" This type of statement may unintentionally soften the message of the reactivity control by stating a direct nuclear safety consequence did not occur; therefore, the issue is seen as not important or significant.

Equipment Reliability (Average Score 2.33)

Definition: Safety systems and equipment are maintained to high performance and reliability levels, and workarounds are vigorously eliminated.

This attribute is the second lowest score of the 12 rollup attributes shown on Figure 1. This average includes scoring from three behavioral characteristics of the EODMM [1.B.1.d (2.54), 3.B.3.e (2.24), and 4.B.3.a (2.20)]. The assessment process for this characteristic did not differentiate between safety and non-safety equipment. This attribute is important from the standpoint of the staff's perception of management's ability to provide the necessary resources, tools, and guidance to resolve issues and help provide them with a reliable plant.

The team concluded:

- Equipment Reliability issues have a negative impact on the staff's desire to bring up equipment issues when they have repeatedly brought the same issues up before without adequate resolution. (See Corrective Action Program Rigor page 10, and Problem Identification page 18.).
- Inefficiencies in the work management process contribute to Equipment Reliability issues (see Work Management Process, page 15).
- Design Control inadequacies have challenged the operations department (see Staff Capability page 19).
- Inadequacies in monitoring and trending have a negative impact on Equipment Reliability (see Monitoring/Trending, page 13).

Several interviewees cited reliability or repetitive issues with SW 17 valve, Service Water and Circulating Water System problems, LPRM operability determinations, Turbine Building Cooling Units, Positive Displacement Charging Pump, CRDMs and related equipment, turbine oil conditioning filter skid, water treatment equipment, oil leaks and roof leaks, etc.

One significant example of poor equipment reliability is the multiple failures or degradation of circulating water pumps at Salem. Although it appears that the current root cause evaluation being conducted on the Circulating Pump 13B problems is on the correct path for resolution, multiple previous attempts to address the issue have failed over the years. Attachment 5 is a comparative case study performed by the USA team showing similarities between the Pump 13B issues and the recent industry event concerning reactor vessel head degradation.

The following statements from several interviews indicate management's inability to instill a low tolerance for unreliable equipment and the staff's frustrations with reliability issues:

> "There is a letter stating expectations for equipment deficiencies but few people are aware of this letter"
>
> "Salem PMs may be suspended for some period of time"
>
> "Work Control is broke. Problems with getting equipment fixed."
>
> "Many are tired of writing up the same problem over and over."
>
> "CAP is considered "just more work," not a way to improve"
>
> "Staff still believes that some items will not get fixed because "that's the way it is" "
>
> "If Operations does not push an issue personally, it will not get done."

The team noted that the plant physical condition reflects management and staff tolerance for degraded equipment condition. One example is the Hope Creek emergency diesel generators, which have more than 160 corrective maintenance material condition reports against them, some of which are over a cycle old. In addition, Hope Creek Emergency Diesel Generator D has numerous oil leaks and oil weeps. The leaking oil collects in puddles on the engine deck plates, a condition that would not be expected at other nuclear sites. The material condition of the emergency diesel generators (one of the mitigating systems) should always remain high on the site's priority list.

Corrective Action Program Rigor (Average Score 2.40)

Definition: Investigations are performed on important or repetitive problems as well as adverse trends from non-consequential events. Root causes as well as generic implications are identified. Corrective actions prevent recurrence. Process and program issues are rigorously reported and corrected. Corrective actions are identified and tracked to completion. Dates for action are commensurate with the importance of the item, station priorities, and the consideration of preventing recurrence. Significance determination is integrated with problem identification. Site priority is given to conditions that impact the safe, reliable operation of the station. Management takes deliberate action and provides feedback on the disposition of identified problems. Personnel understand the threshold of problem reporting. The threshold for problem identification is appropriate.

This attribute is the third lowest score of the 12 rollup attributes shown on Figure 1. This average includes scoring from nine behavioral characteristics of the EODMM and LM [3.B.1.a (2.71), 4.B.3.a (2.20), 6.h (2.26), GG (2.19), 5.B.3.e (2.40), 1.B.2.c (2.50), 1.B.3.a (2.38), 1.B.3.c (2.39), and 1.B.2.a (2.58)

The Corrective Action Program has not been effective in improving station performance due to a reluctance to document issues, a lack of persistence in identifying problems, and eroded confidence in the process to resolve issues. Team members also identified failures to implement the requirements of the corrective action program, such as failure to capture issues that should have had operability reviews.

a. Personnel are sometimes reluctant to document issues in corrective action notifications because of perceived or actual consequences. The following examples tend to show a belief that CAP is not seen as "real work" important to improving station performance. Rather it is viewed as a burden or additional work. This is a significant cultural issue that must be addressed.

- The resulting work will most likely be assigned back to the originator.
- Due dates that are imposed for completion of corrective action (CAP) related work can place a priority on CAP work that is higher that normal work responsibilities, even though the regular work may be more important to the plant.
- Supervision and management in many work groups make a clear distinction between CAP work and "real work" and tend to characterize CAP work as an extra burden rather than the process to improve performance.
- Root cause and apparent cause evaluations are considered tedious and time consuming, which adds to the perception that corrective action notifications are an added burden.
- Some personnel stated that they have pressed others to document notifications for issues that they had actually identified to avoid writing notifications "on themselves," and/or to prevent assigning the resultant work to themselves.

b. Many PSEG personnel lack persistence in identifying problems because of the following barriers to issuing corrective action notifications:

- Personnel cited a management expectation for extensive research to provide significant detailed analysis before issuing a corrective action notification, in order to avoid being told that the notification is "premature." This can lead to a delay in obtaining a required operability review and timely corrective actions.
- Some personnel stated that they avoid issuing corrective action notifications because they struggle with the SAP software system and need help to use it.

c. Employee frustration with failure of the corrective action process to resolve issues has eroded confidence in the process.

- Corrective action notification originators are not typically contacted for input and do not get feedback on the disposition of identified problems. Personnel are not familiar with methods to obtain information and state that they are usually unaware of status changes or corrective action progress.
- Personnel feel a need to expedite their identified issues to assure that they will be corrected; otherwise, their issues will not get appropriate attention.

- In many cases, issues are documented and corrective actions are planned, but actions taken to correct conditions have often stopped short of resolving the issues and preventing recurrence.
- Many personnel believe that management's focus is on meeting completion dates and minimizing age of issues. Absent are indications that quality and effectiveness of corrective actions are a management priority.

d. Examples were identified of failures to implement the requirements of the corrective action program, such as failure to capture issues that should have had operability reviews.

- The Corrective Action Program procedure requires an Engineering Management review of notifications, which includes validation of the significance level. Since Level X CRs do not require operability/reportability review, this review is a step that would presumably capture CRs that were not correctly classified and assure that an operability/reportability review is accomplished. Despite this requirement, a significant number of CRs have been identified by the NRC that were initially classified as level X and should have been classified higher. This apparent failure of the program could result in an unacceptable delay or failure to perform a required operability review. (Ref. NC.WM-AP.ZZ-0000, Rev. 7)
- Some individuals stated that their organizations are tracking issues using their own satellite data systems and not documenting them in the corrective action process. This makes trending of issues very difficult.

e. Management and human performance issues are not always addressed in root cause evaluations.

- The Root Cause Evaluation (RCE) team investigating reactivity management practices missed the importance of cultural values and beliefs during their evaluation. The team also missed the similarities between a September 28, 2003 reactivity event at Hope Creek and a 1998 reactivity event at Susquehanna. The Onsite Independent Review Quarterly Report for the fourth Quarter 2003 states "…the root cause evaluation does not adequately address the cultural issues relating to procedure use and adherence…" The RCE team did not address why control room personnel and reactor engineering placed more value on a reactivity-briefing sheet instead of plant procedures. The report does not address why shift and station management believed withdrawing control rods without procedural guidance is acceptable. The RCE team concluded, erroneously, that the Hope Creek event and the Susquehanna event were not similar. In both cases, the control room crews failed to follow their procedures. In both cases, the crews let the reactor drift into subcriticality as they let themselves be detracted by operation of other equipment. In both cases, the crews restarted the reactor from and unknown subcritical condition.

Monitoring/Trending (Average Score 2.46)

Definition: Awareness of equipment and system operation. Awareness and monitoring capability for adverse trends (equipment, human performance, process, programs). Managers monitor performance indicators.

This attribute scored below the "Competent" range (2.46) as shown on Figure 1. This average includes scoring from two behavioral characteristics of the EODMM [1.B.1.b (2.36) and 6.a (2.56)].

The station does not effectively use trending and performance monitoring to the level expected by a learning organization to improve performance. The lack of trending/performance monitoring applies to notifications, system performance, as well as human performance. Emergent plant issues and backlogs are challenging the ability of the station to be a learning organization and proactively apply trending and performance monitoring.

a. The station is not using the Corrective Action Program for trending (notification process). As a result, opportunities are being missed to identify adverse trends and implement effective corrective actions in the areas of Work Management and Equipment/System Performance. The Corrective Action Procedure, NC.WM-AP.ZZ-0002(Q), Revision 7, (effective 3-1-04) was reviewed. Guidance on performing trend analysis is lacking and no centralized group performs trending. Trending guidance provided is as follows:

- Management responsible for trending condition reports for Human Performance issues, conducting common cause analysis, and initiating corrective actions.
- Section 5.9 Trending Analysis: Management or their designees should conduct periodic Common Cause Analysis using TM-2 guidance or other methods deemed suitable by management; each manager or designee should conduct periodic analysis on trend data (symptom codes and cause codes) to assess their department's performance.

The procedural guidance stated above is not being implemented and the station is not effectively using the corrective action process to detect adverse trends.

b. The station is not effectively and consistently using trending and performance monitoring to improve system/equipment performance.

- Performance Monitoring Notebooks are not consistently kept up to date.
- Proactive Performance Monitoring/Trending of CW and SW System is in need of improvement; the system engineer for CW is engaged in daily emergent work and troubleshooting activities, which precludes normal proactive monitoring, and trending.
- There has been some recent progress in this area, but Performance Monitoring remains less than effective.
- Failure of A and B MG Set Ventilation Fans resulting in an unplanned power reduction in September 2003 was partly due to inadequate performance trending.

- Regarding System Health Reports:

  - ✓ There is no tie into CAP notification process; notifications are not listed/trended.
  - ✓ Performance Monitoring trend section is lacking in detail and basis (e.g. "Green: No trends in Alert or Action" with no supporting basis).
  - ✓ PM deferrals stated as having no impact, but no basis for forming this conclusion is discussed.

- QA feedback is that System Engineering Processes and Procedures align well with AP 913 for Predictive/Proactive System Monitoring, but implementation is not adequate.
- Some data is difficult to access; a limited number of computers are available to System Engineers to access real-time plant process data.
- Predictive Maintenance Data is not readily accessible to System Engineers for trending; no system or process exists for System Engineering to access this information easily.

c. Some items are not being trended; for example, in the area of Work Management, reasons for dropping activities from the schedule are not trended.

d. Data being input into the Behavior Observation Program is not being trended. An opportunity is being missed to bin potential human performance issues.

e. Some opportunities to positively affect performance through leadership monitoring and feedback are missed through inconsistent use and reinforcement of the observations made in the Plant Observation Program (PAOWF program). The PAOWF program and its implementation by station leadership represent a potentially powerful monitoring tool to observe and coach individual or group behaviors.

- PAOWF program usability and human factor design is strong. Observation card results and comments can be inserted at individual desktop workstations or entered while in the field using Palm technology.
- Staff interviews with supervision demonstrated knowledge and use of the observation program. Personnel generally responded in terms of the "numbers" of expected observations to be conducted and not in terms of its value to monitoring performance, feedback or ensuring standards or expectations are met.
- Supervisory interviews demonstrated some alignment or knowledge issues regarding the use of the data currently in the system for trend analysis and future observation targeting.
- Review of a sampling of observation cards showed apparent differences in the intrusiveness or quality of the individual efforts. This includes areas where problems may exist such as the effectiveness of the workweek (T1 critique), work control, or work planning behaviors.
- Data analysis is currently under-utilized looking for early trends regarding individual or group behaviors. Functional area data analysis is inconsistently performed.
- Other supervisory administrative work tasks are viewed as affecting the ability of supervision to spend time in the field observing the work force.
- Observation quality or "value added" measurements are not applied for a sampling of observations to improve the quality of observations conducted.

Work Management Process (Average Score 2.48)

Definition: A strong work management process supports reliability, maintenance and operational readiness.

This attribute scored below the "Competent" range (2.48) as shown on Figure 1. This average includes scoring from three behavioral characteristics of the EODMM [1.B.3.a (2.38), 2.B.1.f (2.52), and 3.B.1.c (2.53)].

Leadership weaknesses contribute to inadequate Work Management stakeholder accountability, work management process inefficiencies, and ultimately to equipment reliability problems. Management has not exercised necessary leadership to ensure work management stakeholders understand their roles and responsibilities. Work management stakeholders do not understand or are unwilling to accept their roles and responsibilities. Work management process controls and feedback systems are not fully developed. For the most part, the work management process appears sound; however, ineffective implementation has resulted in poor equipment reliability.

Symptoms of a significant process problem with Work Management include the following:

- Multiple equipment related down powers and forced outages have occurred:

  - ✓ 15 Salem Unit 1 down powers due to equipment issues since January 1, 2004.
  - ✓ 11 forced unit outages since January 2003.
  - ✓ 8 Hope Creek down powers in 2003.

- There have been multiple repeat / ineffective equipment failures:

  - ✓ Turbine building chillers.
  - ✓ Circulating Water System Motors and Pumps.
  - ✓ Hope Creek Control Rod Drive System.
  - ✓ Twice during 2003, Radioactive Gaseous Effluent Monitoring Instrumentation was returned to service beyond the LCO out of service limits following scheduled maintenance.

- Inadequate initial Turbine Building Chiller repairs have resulted in repeat failure (Pending LER for exceeding LCO out of service limits)

- There are continuing challenges to Control Room Operators:

  - ✓ Operability Determinations, Additional Readings List, and Operator Burden List.
  - ✓ Control Room Supervisors interviewed do not believe that the work management process is a reliable method for repairing equipment (Similar belief by Maintenance e.g. Work Control schedulers and Maintenance planners).

- Many maintenance activities cannot be completed as scheduled:

  - ✓ Station has > 6600 open on-line work activities.
  - ✓ Salem Units completed less than 30% of assigned and ready to work corrective maintenance work activities during January 2004.
  - ✓ Station completed less than 15% of assigned and ready to work corrective maintenance activities during week ending 2/28/2004.
  - ✓ Tier 2 daily schedule adherence for week ending 2/28/04 was 44 percent for Salem and 67 percent for Hope Creek with a 95 percent goal.

- There are multiple process shortcomings:

  - ✓ Unable to trend causes for dropping activities from the schedule.
  - ✓ Causes for "failure to complete work" not trended.
  - ✓ Process stakeholders not fully participating in the planning process (Participation in meetings, data input, process adherence/understanding).
  - ✓ Unable to monitor process performance versus industry standards (AP 928).

- Inventory and spare part management needs improvement. Some staff expressed frustration over the inventory reduction program at PSEG. Significant inventory reduction occurred as a cost cutting measure, however, station staff, especially engineering was not consulted before the reduction of parts or equipment. During interviews of site staff, a number of comments were made concerning lack of parts and inventory:

  - ✓ No spare cards for LPRMs.
  - ✓ No parts available for RM-11 video display.
  - ✓ Control rod mechanism exchange machine parts.
  - ✓ Jobs routinely pulled from workweek due to incorrect or unavailable parts.

Resource and Schedule (Average Score 2.60)

Definition: Management supports commitments established. Schedule, resource, and guidance are provided to support implementation.

This attribute scored below the "Competent" range (2.60) as shown on Figure 1. This average includes scoring from three behavioral characteristics of the EODMM and LM [2.B.1.f (2.52), 5.B.1.a (2.60), and FF (2.68)].

a. The Change Management Process is applied and implemented inconsistently, which sometimes results in inadvertent adverse organizational impacts. Many changes involving the realignment of the Salem/Hope Creek organizations have been occurring with most individuals interviewed supportive of the changes. However, without an effective change

management plan, roles are not understood and accountabilities are lost. Examples of change include:

- Realignment of maintenance to be plant specific.
- Two plant managers with separate organizations reporting to them.
- Transition of Human Performance, OE, and corrective actions responsibilities.
- Inventory reduction initiatives.

b. Although some transition plans do include pertinent attributes of the Change Management Procedure, others have missed some important aspects. For instance, as OE, Human Performance, and Corrective Action Program responsibilities are moved to new functions/individuals, limitations of their new workload levels and authority levels may not have been fully recognized to ensure those activities continue to be effectively implemented. The initiative to reduce onsite spare parts inventory has contributed to some maintenance activities being deferred because necessary parts were not available. Interviews with operations personnel indicate that additional duties have been assigned to control room supervision that potentially detract from their ability to monitor/control plant and control room activities while on shift. Some of these are procedure change reviews, root cause analysis support activities, self-assessment report preparation, 50.59, and DCP reviews. Evidence indicates that change management did not address these concerns preemptively.

c. Tracking Overtime: Current management controls do not adequately capture and monitor actual levels of overtime worked by key plant personnel.

- Interviews indicated that some personnel, including licensed operators, are working significant amounts of professional (unpaid) overtime in addition to those hours that are paid to keep up with their assigned duties. In many cases, these additional hours are not captured on official timesheets.
- Overtime reports that are reviewed by the plant managers do not provide sufficient detail to include information down to the individual usage levels. (These monthly reviews are required by Tech Specs.). Feedback indicated that the plant managers review/approve deviations from overtime limits rather than reviewing individual level monthly reports.

Management Involvement - Oversight/Coaching/Communication (Average Score 2.61)

Definition: Managers establish expectations, accountability and provide coaching when expectations/standards are not met. Managers ensure appropriate depth and focus & strive for continuous improvement. Vertical communications are strong.

This attribute scored below the "Competent" range (2.61) as shown on Figure 1. This average includes scoring from five behavioral characteristics of the EODMM and LM [2.B.1.c (2.73), 2.B.3.b (2.55), 3.B.1.h (2.31), 6.j (2.73), and HH (2.73)].

However, recent increased involvement of senior management with plant personnel regarding timely resolution of plant issues, work site discussions, and employee meetings is seen as positive behavior to station personnel:

- An example was conveyed during an interview regarding the Plant Manager's involvement with the resolution of a long-standing concern on the maintenance of Diesel Generator air start filters.
- Interviews revealed some senior managers are routinely observed in the plant assessing work sites and participating in discussions with staff. This has resulted in positive behavior changes in maintenance supervision regarding their involvement with plant staff.
- Interviews with union leadership revealed that the management and union leadership relationship has improved since the recent management changes (September 2003).
- An interview revealed that the Open Door policy has worked to reduce the number of grievances reaching the management level.
- Open communication was observed during a management and union leadership meeting. Because of recent changes, this meeting is occurring routinely (approximately every two weeks).
- An example was conveyed during an interview regarding the Plant Manager's involvement with the Health and Safety council and was recognized as "refreshing."

Problem Identification – Questioning Attitude (Average Score 2.61)

Definition: Personnel utilize the corrective action process to identify issues. Personnel are persistence in identifying problems and suggesting solutions and maintain a questioning attitude. Employees are involved and listened to and raising concerns is valued.

This attribute scored below the "Competent" range (2.61) as shown on Figure 1. This average includes scoring from five behavioral characteristics of the EODMM and LM [1.B.1.c (2.69), 1.B.1.d (2.54), 1.B.2.b (2.57), 2.B.2.b (2.82), and CC (2.43)].

This is an important issue because it is essentially a measure of the willingness of plant staff to identify issues and enter the issues in the corrective action program. An important aspect of this issue is management reinforcement for the reporting of issues. Some interviewees indicated the previous management team lacked reinforcement in the reporting of issues. On the positive side, some said the new management team supports issue identification and provides positive reinforcement in this area. The following response was received from an interviewee:

> "The new management team shows some promise. Recent management praised operators for taking conservative action to shut the reactor down when Hope Creek had a steam leak in the torus. Old management would not have given this positive reinforcement."

The consensus of interviewees was that management does support issue identification and management does provide some reinforcement in this area. However, many interviewed were not familiar with a written policy in this area. None of the interviewees indicated a hesitance to bring up a safety issue or escalate the issue if necessary. However, as detailed in the Corrective Action Program Rigor section of this report (page 10) some personnel are reluctant to document issues in the corrective action program because of the perceived consequences that the resulting work will most likely be assigned back to them. Some staff members indicated their lack of persistence in identifying problems was due to an expectation for extensive research to provide significant detailed analysis before issuing a corrective action notification, in order to avoid being told that the notification is "premature." Some personnel stated that they avoid issuing corrective action notifications because they struggle with the SAP software system and need help to use it.

There also appears to be an eroded confidence in the corrective action process as originators are not typically contacted for input and do not get feedback on the disposition of identified problems. The eroded confidence also stems from actions taken to correct conditions that stop short of resolving the issues and preventing recurrence. Many personnel perceive that management's focus is on completion dates and ages of issues. Some employees perceive that the quality and effectiveness of corrective actions may not be a management priority.

Staff Capability (Average Score 2.70)

Definition: Personnel are knowledgeable and understand safety expectations, including design and licensing bases. The Engineering, Maintenance, and Operations Organizations are strong and aligned with operational safety.

This attribute scored below the "Competent" range (2.70) as shown on Figure 1. This average includes scoring from three behavioral characteristics of the EODMM [1.B.1.a (2.79), 4.B.2.c (2.73), and DD (2.57)].

Many changes involving the realignment of the Salem/Hope Creek organizations have occurred in the recent past with most individuals interviewed supportive of the changes. Maintenance and Engineering were realigned to be plant specific and to enhance their support capability for individual plant operations. System engineers interviewed seem to have more focus on their assigned systems. Operations interviews indicated the recently hired system engineers are very capable and are doing a good job at monitoring their systems and are visible in the plant. Most people interviewed indicated the realignment process has improved accountability. Operator interviews indicated their electronic logging system has been out of service for two months and nobody complains. This could be an indication that the engineering staff is not taking full advantage of this important electronic tool for trending system parameters.

The Work It Now team was praised by many of those interviewed for their support and technical expertise. Failures of the work management processes (schedule compliance, field implementation, and resultant equipment reliability concerns) have reduced the Operations Department confidence in the ability of the maintenance-related organizations to support reliable

plant operation. Interviews indicate safety systems get the required attention but many balance of plant systems have too many issues. Operations interviews indicate they are frequently called upon to make decisions concerning equipment challenges.

Assessment team members concluded that, in some cases, engineers have not followed the design control program. As a result, some consequences of modifications have not been anticipated. These concerns have challenged station operators, affected system engineer duties, and resulted in additional costs.

a. The turbine building chiller modification may not have the controls to anticipate the following effects on the station:

- Units B, C, and A trip at a frequency that is greater than in the past and has affected the CR operators attention. Additionally, system engineering monitoring and troubleshooting plans has also affected the control room operator's attention and confidence.
- Freon charging appears to be about 5000 lbs vice the previous nominal charge of 4000 lbs. This may result in the refrigerant level being maintained above the level for monitoring the level via the sight glass. Thus, the operators do not have a means of determining level and trending for leaks may require alternative measures.

b. Modification to the Tave for Salem unit was increased by 2° Fahrenheit; however, the consideration for impact to Control Room operator training and affected procedures was an action item from the SORC review. The modification review process should have resolved these impacts before submission for approval to SORC. When deficiencies were identified in the FSAR with respect to the Steam Generator descriptions during the 10 CFR 50.59 evaluation, Condition Reports were not immediately submitted into the corrective action program when identified. Rather they were actions identified during the SORC review.

Interviews indicate the quality of engineering products is now a focus area for the engineering human performance coordinator.

Safety over Production (Average Score 2.84)

Definition: Maintain/improve safety margins, equipment reliability, and materiel condition while appropriately considering business variables of production and cost. Management expectations and reinforcement established in this area. Nuclear safety is demonstrated and emphasized in staff interactions and site communications. Management provides periodic training to reinforce expectations concerning nuclear safety expectations and conservative decision making as well as recognizing people for doing so.

This important attribute scored near the "Competent" range (2.84) as shown on Figure 1. This average includes scoring from four behavioral characteristics of the EODMM and LM [1.B.3.d (2.88), 4.B.2.b (2.80), 6.g (3.00), and EE (2.69)].

After one week on site, the team noted a lack of objective evidence of a clear, strong, nuclear safety culture message. Several interviewees indicated some management does reinforce safety as a priority, however, when asked for a specific management policy or specific formal training on this issue; the policy could not be articulated or located. While many of those interviewed believe the new management team has exhibited good balance between safety and production concerns, the objective evidence (*e.g., values, beliefs, and symbols)* in some areas does not support this belief. As a result, the assessment team could not articulate senior management's safety culture message either. The senior leadership team has not yet established and communicated a compelling, visible message that reinforces a strong safety culture.

- Values: Evidence indicates that some personnel do not value strong reactivity management practices. See "Plant Control" (page 7) concerning lack of evidence for sound reactivity management practices. In one case, it appears that management downplayed the value of an issue by rationalizing that a practice or behavior did not have an impact on safety. In an October 21, 2003 letter on reactivity management, management agreed with a quality assurance issue on reactivity management, yet downplayed the significance of the issue by introducing their agreement with "Although these evolutions did not have an impact on nuclear safety…" The Onsite Independent Review Quarterly Report for the 4th Quarter 2003 states "This lack of resolve in meeting procedural requirements at the point of contact is a contributor to the site-wide issues involving Reactivity Management…"

- Beliefs: The assessment team found evidence where some site personnel do not take full advantage of the corrective action program. See discussions in "Corrective Action Program Rigor" (page 10). They believe the CAP process is a burden and not a vehicle to improve performance. The Onsite Independent Review Quarterly Report for the fourth Quarter 2003 states "Weaknesses have been identified with Corrective Action Program Effectiveness…" Many personnel perceive management's focus for the corrective action program is on completion dates and ages of issues instead of quality and effectiveness of corrective actions.

- Symbols: The plant physical condition, symbol, in several areas reflects a tolerance for mediocrity. The Hope Creek Emergency Diesel Generators have more than 160 corrective maintenance materiel condition problems. Some of the problems are more than one cycle old. Hope Creek Emergency Diesel Generator D has numerous oil leaks and oil weeps. The leaking oil collects in puddles on the engine deckplates, a condition that would not be expected at other nuclear sites. The Hope Creek safety related service water intake structure had numerous leaks, lights out of service, and other deficiencies.

An important contributor to a culture that shares the belief that nuclear safety is the overriding priority is management's ability to establish and reinforce nuclear safety expectations and conservative decision-making as well as recognizing people for doing so. In several of the interviews conducted, staff personnel indicated that the new management team is beginning to recognize individuals for making conservative decisions. Positive effects from this management behavior is illustrated in the following interview responses to questions concerning management's reluctance to repair or to shut down and fix things even though production is at stake:

"Used to focus on staying on line. New management is more inclined to get problems fixed."

"Substantial management changeouts recently. Much stronger, better attitude and behaviors that one year ago. Less acceptance of the status quo performance."

"Recently an operator heard an unusual sound. It turned out to be a cracked bracket on a corona ring on a breaker. Got it fixed and received positive recognition."

"Shutdown in December was an example of investing in doing the right thing for the long run."

"Safety is valued much more than production. Example two forced outages were recently extended to repair items that were on the backlog."

"Given direction if not safety, don't operate. Without safety we don't operate."

"Some very recent encouraging signs. But organization lost its safety focus and focused more on costs for some period of time."

"Yes, recently management shutdown to fix an extraction leak."

"Previously there would not have been any positive reinforcement for identifying problems."

"Recent management actions to shutdown Hope Creek demonstrate safety."

Oversight Capability (Average Score 2.85)

Definition: Use of the various oversight groups is effectively utilized, intrusive, and results in performance improvements. Oversight is credible, independent and backed by management.

This attribute scored the second highest of the 12 Rollup Attributes (2.85) as shown on Figure 1. This average includes scoring from four behavioral characteristics of the EODMM and LM [2.B.1.h (2.77), 4.B.3 (2.86), 6.c (2.90), and JJ (2.85)].

The Oversight Capability at Salem / Hope Creek scoring was near the Competent Range; however, there is room for improvement in the oversight area. Assessment team members received mixed messages concerning the oversight function. Many interviewees indicated that Quality Assurance is providing value added however, others indicated the organization is not viewed as important to improving plant performance. QA Reports appear to be sufficiently intrusive however, improving performance by use of the QA function is hampered by ineffective line management acknowledgment, internalization, and implementation of corrective actions in response to QA findings. QA is not always delivering its message in an effective, convincing manner, either through its written reports or through verbal and face-to-face interactions. Senior Management has not adequately demonstrated its support of the QA Organization.

In 2001, formal audit exit meetings were eliminated. Currently the QA Organization briefs issues with individual managers separately, versus the previous system of a single Exit Meeting with all of station management present. Individual management briefs are potentially less effective because station management does not receive an aggregate message of station performance. In addition, conducting formal Audit Exit Meetings of this type better meet the intent of ANSI N45.2.12.

Examples of failure to affect performance improvement or failure by the line organization to acknowledge, internalize, and respond to QA issues include the following:

- Some Operations and Reactor Engineering personnel still have not internalized and accepted that a problem exists with performing reactivity manipulations without an approved procedure to govern the activity (QA identified reactivity issue during startup, September 2003). A follow-up QA Assessment found that the Root Cause Evaluation for this issue did not adequately address the fundamental cultural issues that contributed to the problem.

- A QA follow-up to the power transient event that occurred in March 2003 found that 20 of 23 corrective actions were inadequately performed. Several actions were closed with no documentation that CARB approval was obtained.

- A delta exists between the issues identified by QA and the perception of those issues by the line organization; a review of QA Assessment reports indicated that QA identifies good issues to the line organizations; QA, however, is not perceived by some segments of the line organization as adding value.

    - ✓ Operations personnel consistently provided feedback that QA is too compliance-oriented and does not provide value-added input.
    - ✓ Some RP personnel provided feedback that QA does not identify value-added input and tends to be compliance oriented.
    - ✓ Some Chemistry personnel indicated that they do not often see QA in the field and when they do interact with QA, the message is not delivered in a helpful manner. Chemistry personnel further indicated that they do not believe QA is effective, because two consecutive INPO evaluations identified problems with Chemical Control and QC instrumentation. During the 18-month interval between INPO assessments, QA missed an opportunity to influence changed behaviors.
    - ✓ Engineering indicated that QA provides a balance between performance-based and compliance-based assessment, but indicated that feedback to the organization could be improved by providing recommendations for solutions and by better integrating results of their assessment up to a higher level, thereby packaging issues into programmatic areas for improvement.

- A Stop Work Order was generated by QA in January 2003 with regard to issues associated with the Central Machine Shop (CMS). More than a year later, the Stop Work Order associated with the CMS remains in effect. The 1st, 2nd, and 3rd Quarter QA Reports each indicated that Maintenance had not implemented the required corrective actions. The 4th

quarter QA report indicated that Maintenance had implemented Corrective Actions, but found that the Corrective Actions had not been effective.

- A review of QA Quarterly Assessment Reports for 2003 indicated that Problem Identification and Resolution and Leadership Accountability for following processes and procedures were repeated themes in each quarter. No discernable, overall improvement was noted in these areas over the four quarters in 2003.

- Some QA personnel are reluctant to deliver a stronger message in their Assessment Reports. Although QA feels they have the organizational freedom to identify and document issues, QA personnel perceive that they have lost some "teeth" based upon feedback received from previous Senior Management, which encouraged the use of more neutral language in Assessment Reports. Additional factors which have led QA personnel to the perception that their effectiveness has been reduced include:

  - ✓ The QA reporting process was modified approximately 2 years ago to remove color windows and general performance trend indicators.
  - ✓ Formal Audit Exit Meetings were eliminated in 2001; currently the QA Organization briefs issues with individual Managers separately, versus the previous system of a single Exit Meeting with all of Station Management present.

- QA and line personnel indicated that QA Assessors are not out in the field as much as they should be.

Operating Experience (Average Score 2.96)

Definition: Operating experience information internal and external is effectively utilized for event investigations, error reduction, and improvement in equipment reliability. Operating shift crews are promptly briefed on event(s) to prevent recurrence.

This attribute scored the highest of the 12 rollup attributes (2.96) although still slightly below the Competent Range as shown on Figure 1. This average includes scoring from EODMM behavioral characteristic 4.B.3.b.

Similar to the Oversight Capability scoring, the scoring for Operating Experience was also near the Competent Range; however, there is also room for improvement in this area.

The Salem / Hope Creek site has had several repetitive events that were previously documented at the site or at other industry locations. This is indicative of a work environment that is not learning from Operating Experience.

Various observations and concerns were identified by interviews with staff personnel, observation of site meetings, and review of site documents and policies. The key observations and concerns are as follows:

- Recent problems with the circulating water pump 13B failures have been documented in similar events at a minimum of three other sites (Duane Arnold, DC Cook and Fermi 2). Interviews indicated a lack of awareness of the events at other stations.

- Salem / Hope Creek has had numerous situations occur that were documented in previous industry OE documents, such as the examples listed below taken from the 3rd Quarter, 2003 Quality Assessment / Onsite Independent Review Quarterly Report:

    - ✓ Taking the reactor sub critical, then critical again without proper guidance authorized (similar OE events documented at Vogtle and Susquehanna).
    - ✓ AFW Pump suction over pressurized (similar OE event occurred at Surry).
    - ✓ Noncompliance with SHOP-8 is a repeat issue (numerous switchyard entry and exit OE events).
    - ✓ The inability to state where the site's policy on nuclear safety is located by some of the interviewees.
    - ✓ APRM flow unit summer surveillance went overdue. This occurred in February, then again in September 2003 indicating a lack of learning environment at the site.
    - ✓ T+1 (week after workweek) fails to capture and critique opportunities.

- Salem has had numerous problems with debris clogging of various service and circulating water system components. A recent industry SER-247 identified a similar problem at the Kewaunee Nuclear Station. Salem/Hope Creek personnel have taken the initial steps to identify that a site-relevance evaluation is needed. The evaluation of SEN-247 has been assigned to the 89-13 Program Supervisor.

- Additional observations from interviews and/or meetings:

    - ✓ Most personnel are very enthusiastic about their jobs and their commitment to safety. Many stated that OE is a vital part of their jobs and the future of the station.
    - ✓ Many were NOT familiar with the central database of OE that is directly available off the site's Intranet Page (or they did not understand the questions being asked about a site database for OE).
    - ✓ Many referred to their own department taking the e-mail versions of OE and storing them in a database for their department to use. This could be a duplication of effort in relationship to the site's Intranet OE database.
    - ✓ The September 2003 reorganization resulted in a staff reduction of personnel dedicated to OE.
    - ✓ It was reported that in the five months preceding the 2003 reorganization, twenty-six (26) OE evaluations were documented out of 973 Nuclear Notes OE items received or about 2.7 percent. In the first five months following the reorganization, only five (5) OE evaluations were documented out of 947 Nuclear Network OE items received or about 0.53 percent. This may be an indicator of a loss of priority, lack of attention, or simply a reduction in operating events applicable to either Hope Creek or Salem stations.

- The root cause evaluation team investigating reactivity management practices missed the importance of cultural values and beliefs during their evaluation. The team also missed the

similarities between a September 28, 2003 reactivity event at Hope Creek and a 1998 reactivity event at Susquehanna Steam Electric Station.

V. Recommendations

Using the five attributes of SOER 02-4, Recommendation 2 as the basis for this assessment, the team identified several behavioral shortfalls on the part of the Salem / Hope Creek management and staff. Specific actions to address shortfalls rest with the Salem / Hope Creek management team. Input from the stakeholders is important when assessing and addressing behavioral shortfalls or process inadequacies. After an appropriate level of report evaluation, the Salem / Hope Creek team should enter the issues into the corrective action program and prioritize issue resolution based on potential safety significance. Figure 1 scoring (low to high) can be used as a tool to help prioritize necessary corrective action. Reactivity management and associated culture driven influences should be high on the list of issues to be resolved.

Based on the team's one week assessment and observed or reviewed site weaknesses, the proper safety message from senior leaders may not be fully understood, adequately communicated, or valued by management, supervisors, or staff. The team recommends some form of positive reinforcement and/or enhanced communication in this area.

The team has provided some insight into the inadequacies of the corrective action process. The team attempts to list what is driving, or perceived to be driving, the behavioral shortfalls of this important process. Correcting or influencing positive behavior associated with the identified weaknesses in the corrective action process will set the foundation for performance improvement in many areas.

Attachment 1 USA Self-Assessment Plan

The Utilities Service Alliance (USA) sponsored the SOER 02-4 required Self-Assessment (SA) for member utilities. This self-assessment would be completed as a round robin assessment, using a common assessment plan.

Purpose:

The purpose of the assessment is to determine to what degree station personnel have a healthy respect for nuclear safety and that nuclear safety is not compromised by production priorities. The assessment will emphasize leadership skills and approaches necessary to achieve and maintain the proper focus on nuclear safety.

Assessment Objectives:

The objectives of the assessment are to evaluate the health of the station's safety culture and provide recommendations to station management to improve or sustain this health. The following elements will be specifically assessed:

- ✓ Employees are encouraged to identify degraded conditions and demonstrate a willingness to escalate their concerns when the conditions are not corrected.
- ✓ Station personnel exhibit a questioning attitude, pursue resolution of important and long-standing equipment and materiel problems, and execute plant shutdowns, if appropriate, to effect repairs.
- ✓ Management is involved in important plant activities, especially those having the potential to affect nuclear safety, and exercises accountability and follow-up as appropriate.
- ✓ Events determined to be significant by the station are recognized and aggressively addressed to determine their root causes and the corrective actions necessary to prevent recurrence.
- ✓ Management emphasizes safety as the highest priority and exhibits conservative, safety-conscious, and defense-in-depth decision making.
- ✓ Managers seek critical feedback from both internal and external sources, and first-hand information is actively sought from those personnel intimately involved with the issues.
- ✓ Management fosters a safety-conscious work environment - one in which plant staff feel they can (and do) raise concerns without fear of reprisal.
- ✓ Training is provided for all staff, at all levels, to ensure that each employee understands his or her responsibilities for ensuring safe operations.

Assessment Team Composition:

The self-assessment is completed as a Utilities Service Alliance (USA) round robin assessment. A core team will be established through this USA initiative with team members from each USA member site. The assessment team will consist of a team host from the assessed site and several off-site independent team members from USA member sites. At least one off-site USA member site senior executive will participate on the assessment team. Core team members selected will have sufficient diversity to ensure adequate coverage of all assessment objectives. INPO will be notified of the assessment schedule and invited to participate or observe the assessment.

Assessment Implementation:

The Assessment will combine data review, interviews, and behavioral observations to assess station management behaviors against key principles outlined in INPO Document, "Principles for Effective Operational Decision-Making" and related documents. The assessment will be conducted in the following three phases.

Phase 1 Prescreening Data Collection and Review
Phase 2 Assessment Implementation
Phase 3 Final Report Preparations with Recommendations

Each phase is explained in further detail below.

Phase 1 Prescreening Data Collection and Review

Prescreening material will be requested by the Assessment Team Lead a few weeks before the assessment week. The type of pre-screening material requested will provide insight into the station's decision-making process and behaviors. The material potentially correlates to material involved in or related to missed opportunities that occurred at Davis-Besse. The prescreening material should include the past year except where specifically noted. The Team Leader will review the prescreening material and provide a summary report to the assessment team before the team's arrival on-site. Team members will review the summary report before the assessment week and as required may request further details on the prescreening material during the assessment week document reviews and interviews.

Prescreening material may include but is not limited to the following:

- Justifications for Continued Operation
- Most recent Safety Culture Survey Results and actions (assigned and taken)
- Corporate Safety Review Board Minutes
- Root Cause Analyses for Significant Conditions Adverse to Quality (SCAQ)
- SCAQ CAP extensions - as far back as they go
- A random sampling of lower level CAP reports
- Adverse trends as identified in the CAP
- O&M and Capital Cost Reductions
- Resource Reductions
- NRC Reports (LERs, Enforcement Discretion, etc.)
- NRC Violations
- INPO Evaluation and Site Assist Visit Reports
- CAP backlog
- Deferred outage work
- Capital Projects Funding list (status, priorities, issues)
- QA Audits and Assessments
- Management Policy on Safety
- HP Clock Reset Summary

- CAP Procedure
- SOER 02-04 Responses. Other SOER responses or GL Responses
- GET Training Modules related to SCWE
- JCO Administrative Procedure

Phase 2 Assessment Implementation

After site orientation, the assessment will begin and include behavioral observations and interviews. The on-site assessment duration will be approximately 4 days excluding site orientation and entrance and exit meetings with management. The assessment week activities will include behavioral observations, interviews, and, as required, document reviews. Behavioral observations will be performed during meetings (e.g., daily plant meetings, safety review committee meetings, pre-job briefs, corrective action report screening meetings, etc.). A behavioral observation guide has been developed for use by team members. Interviews will occur with a cross section of employees at all levels throughout the organization. Key executives will also be interviewed. A set of interview questions has been developed from the documents listed in the Reference Section of this White Paper. Through the combination of interviews, observations, and data review, the team will score a matrix based on INPO's "Principles for Effective Operational Decision-Making." The matrix line item scores by themselves will provide limited usefulness; however, a ranking of the matrix scores will highlight areas in need of improvement for the assessed station leadership team. Team leads will brief senior management on the results of the assessment periodically during the assessment week. The team will perform an overall brief with site leaders at the exit meeting. The site leadership team will be responsible for carefully evaluating any problems identified in the assessment that could adversely affect nuclear safety. Opportunities for improvement will be identified by the site leadership team and as required promptly documented in the site's Corrective Action Program.

Phase 3 Final Report Preparation with Recommendations

A preliminary assessment report will be provided to station management at the assessment exit meeting. The team lead and host peer will provide a final assessment report within approximately two weeks of the exit meeting. The final assessment report will be documented in accordance with the site's self-assessment process. The final assessment report will include as a minimum:

- Final Assessment Report formatted to the site's SA process requirements.
- Team recommendations for improvement.
- "Effective Operational Decision-Making Matrix Tally Sheet" scores
- "Effective Operational Decision-Making Matrix" scores
- "Leadership Matrix" scores (based on "Warning Flags from Plants in Extended Shutdowns Matrix").
- Supporting documentation.

Safety Culture Survey

For the USA Fleet plants, a Safety Culture Survey extracted from NEI 97-05, "Nuclear Power Plant Personnel-Employee Concerns Program-Process Tools in a Safety Conscious Work Environment," will be administered independent of the assessment activities themselves. The results of the survey combined with the results of the assessment will then be available to the site's leadership team for the overall evaluation of site safety culture. The survey covers four general topic areas: Safety Conscious Work Environment, Employee Concerns Program, the Corrective Action Process, and Management Conduct. This survey was not performed at Salem / Hope Creek.

Assessment References:

DOC ID	TITLE
INPO SER 02-02	Undetected Leak in Control Rod Drive Mechanism Nozzle and Degradation of Reactor Pressure Vessel Head
INPO	Principles for Effective Operational Decision-Making
INPO SOER 02-04	Reactor Pressure Vessel Head Degradation at Davis-Besse
INPO 02-005	Analysis of Significant Events
INPO	Principles for Effective Self-Assessment and Corrective Action Programs
INPO 98-003	Managing By Experience
INPO	Principles for Enhancing Professionalism of Nuclear Personnel
INPO 97-003	Safety Focus During Changing Times
NRC 9/30/02	Degradation of the Davis-Besse Nuclear Power Station Reactor Pressure Vessel Head Lessons Learned Report
NRC SECY-97-260	Resolution of public comments in response to request for public comments in the federal register notice, "Safety Conscious Work Environment"
NRC	Policy statement for nuclear employees raising safety concerns without fear of retaliation
Dr. Richard A. Meserve, NRC	Meeting On Safety Goals And Safety Culture, Milwaukee, Wisconsin, June 18, 2001
INPO 97-002	Performance Objectives and Criteria for Operating Nuclear Electric Generating Stations
INPO	Warning Flags from Plants in Extended Shutdowns
FENOC	Technical Root Cause 4/17/02
INPO	Warning Flags

Attachment 2 Effective Operational Decision Making Matrix Scoring

Decision Making Matrix SCORING				
1	**2**	**3**	**4**	**5**
NEEDS MUCH IMPROVEMENT Usually shows undesired behavior. Rarely shows desired behavior.	**NEEDS SOME IMPROVEMENT** Sometimes shows undesired behavior, sometimes desired.	**COMPETENT** Usually shows desired behavior. Rarely shows undesired behavior.	**STRENGTH** Usually shows desired behavior with very strong skills.	**EXCEPTIONAL** Almost always shows desired behavior with highest skills.

Note: A score of zero (0) indicates no observations were recorded for this attribute.

Effective Operational Decision Making Matrix			Behavior Responsibility Leadership or Organizational	Average Score (1-5)
Condition or Action Evaluated				
Behavioral Characteristics				
1. Conditions that potentially challenge safe, reliable operation are recognized and promptly reported for resolution				
	1.B.1 Management recognizes potentially degraded conditions by demonstrating these behaviors:			
		a. Ensuring personnel are knowledgeable and understand safety expectations, including design and licensing bases	Leadership	**2.79**
		b. Ensuring personnel are aware of proper equipment or system operation and trends	Leadership	**2.36**
		c. Ensuring personnel maintain a questioning attitude	Leadership	**2.69**
		d. Ensuring personnel are persistence in identifying problems and suggesting solutions	Leadership	**2.54**
	1.B.2 Expectations are clearly defined and demonstrated for the following:			
		a. Understanding the threshold of problem reporting	Leadership	**2.58**
		b. Identifying and communicating problems	Leadership	**2.57**

		c. Evaluating degraded conditions for significance and involving higher levels of management	Leadership	**2.50**
		d. Considering the aggregate effect of problems	Leadership	**2.58**
	1.B.3 Managers and supervisors demonstrate the following:			
		a. Giving priority to conditions that impact the safe, reliable operation of the station	Leadership	**2.38**
		b. Applying the appropriate operational perspective to problems by considering operating conditions, operating experience, license and design basis, and operational and engineering judgment	Leadership	**2.85**
		c. Taking deliberate action and providing feedback on the disposition of identified problems	Leadership	**2.39**
		d. Reinforcing expectations for communicating and escalating issues, as well as recognizing personnel for doing so	Leadership	**2.88**
		e. Operating shift crews are promptly briefed on event(s) to prevent recurrence.	Leadership	**2.33**
2. Roles and responsibilities are established for making and implementing decisions and are thoroughly understood by plant personnel				
	2.B.1 Manager and staff roles and responsibilities are clearly understood and include the following:			
		a. Single-point accountability for decision-making	Organizational	**2.77**
		b. Assembly and direction of multidiscipline investigation team(s) with designated lead(s)	Organizational	**2.36**
		c. Managers' scope of involvement	Organizational	**2.73**
		d. Managers identify key stakeholders who represent internal departments as well as external groups such as vendors, suppliers, and architect engineers	Leadership	**2.58**
		e. Effective and timely communication with key stakeholders demonstrated	Leadership	**0***
		f. Resource and schedule commitments established	Leadership	**2.52**

		g. Implementation and contingency planning demonstrated	Leadership	**2.50**
		h. Independent oversight group activities identified	Leadership	**2.77**
	2.B.2 Management ensures that involved personnel accept responsibility for and demonstrate the following:			
		a. Understanding the entire plan, as well as contingencies and expected outcomes	Leadership	**3.00**
		b. Recognizing and reporting unexpected results for timely resolution	Leadership	**2.82**
		c. Transferring assigned responsibilities to other capable personnel during absences, including appropriate communication to the organization	Leadership	**0***
	2.B.3 Involved personnel understand their roles and responsibilities through the following behaviors:			
		a. Clear communication of details to key stakeholders	Leadership	**2.33**
		b. Management verification of clear understanding through the use of direct communications	Leadership	**2.55**
3. Potential consequences of operational challenges are clearly defined, and alternative solutions are rigorously evaluated.				
	3.B.1 A multidiscipline team approach is used that includes the following:			
		a. Investigation of emergent or changing conditions	Leadership	**2.71**
		b. Engage diverse and specialized expertise from inside and outside the organization as dictated by conditions	Leadership	**2.63**
		c. Establish priorities and allocates resources to optimize group effectiveness	Leadership	**2.53**
		d. Establish time frames to assemble and analyze data commensurate with the situation's importance, complexity, and urgency	Leadership	**3.00**
		e. Objectively consider all input	Leadership	**2.67**

		f. Freely challenge assumptions, facts, and conclusions	Leadership	**2.60**
		g. Openly discuss various solution alternatives	Leadership	**2.50**
		h. Use management oversight to ensure appropriate depth and focus	Leadership	**2.31**
	3.B.2 The condition and consequences are systematically evaluated to accomplish the following:			
		a. Gain team agreement regarding a clear definition of the problem, causes, and consequences	Leadership	**2.60**
		b. Gather the appropriate validated information from diverse sources, including key stakeholders, to ensure consideration of operational effects, nuclear safety margin, personnel safety, and business aspects	Leadership	**2.75**
		c. Define the full scope of degraded conditions	Leadership	**2.45**
		d. Establish the timeliness of needed solutions	Leadership	**2.67**
	3.B.3 Identify alternatives and solutions that consider the following:			
		a. Use risk evaluation and problem analysis tools effectively in the consideration of the various options	Leadership	**2.25**
		b. Ensure the associated risks and consequences are fully defined for each of the recommended solutions and their implementation	Leadership	**2.25**
		c. Characterize the operational impact of solutions by rigorously applying and considering existing operating conditions, operating experience, probabilistic safety assessment (PSA), licensing and design bases, and operational and engineering judgment	Leadership	**2.30**
		d. Capture, validate, and document critical assumptions for future reference	Leadership	**0***

		e. Investigations are performed on important or repetitive problems as well as adverse trends from nonconsequential events to identify the root causes, the generic implications, and the appropriate corrective actions to prevent recurrence, including why self-evaluations did not preclude the problem(s).	Leadership	**2.24**
4. Decisions are based on a full understanding of short- and long-term risks and the aggregate impact of conditions associated with various options.				
	4.B.1 Understand and consider risk, including the following:			
		a. Conduct a broad review of the likelihood and the consequence of a wide range of undesirable results such as reduced reactor safety or personnel safety, equipment damage, or lost power production	Leadership	**2.00**
		b. Ensure that plant operations will remain deliberate and well controlled	Leadership	**2.19**
		c. Conduct a critical review of technical risk bases, such as PSA, as needed	Leadership	**2.33**
		d. Recognize personnel capabilities and readiness to implement solutions	Leadership	**2.68**
		e. Maintain the public trust	Leadership	**2.25**
	4.B.2 Understand and consider the aggregate impact of the various options for the given operating condition, include the following:			
		a. Give broad consideration to other factors and conditions that could adversely affect risk, such as an increased likelihood for human error or the aggregate impact of many minor equipment problems	Leadership	**2.68**
		b. Maintain or improve safety margins while appropriately considering business variables of production and cost	Leadership	**2.80**
		c. Maintain a staff capable of implementing alternatives and associated contingencies	Leadership	**2.73**
		d. Understand potential unintended consequences of the decision on station culture	Leadership	**2.30**

	4.B.3 Various methods to validate solutions, such as the use of independent checks and reviews, are considered		Leadership	**2.86**
		a. Corrective actions address the fundamental causes of problems, rather than the symptoms	Leadership	**2.20**
		b. Relevant operating experience information is reviewed during event investigations	Leadership	**2.96**
5. Implementation plans are developed to effectively communicate actions, responsibilities, compensatory measures, and contingencies to ensure successful outcomes				
	5.B.1 Management ensures implementation plans include the following, as appropriate:			
		a. Schedules and guidance support implementation	Leadership	**2.60**
		b. Clearly identified roles and responsibilities	Leadership	**3.14**
		c. Compensatory measures, as required	Leadership	**3.00**
		d. Contingencies that are based on the consideration of potential events and failures. Abort and hold criteria established.	Leadership	**2.33**
		e. New or revised procedures, as needed, to support changes in plant operations, limitations, policies, or responsibilities	Leadership	**2.67**
		f. Preparation, such as training and use of mockups, to ensure that people can complete activities and contingencies with available resources, procedures, and conditions	Leadership	**2.90**
	5.B.2 Communication aspects of the plan include the following:			
		a. Appropriate avenues to reach all affected personnel	Leadership	**4.00**
		b. Bases for the decision, expected outcomes, potential downsides, planned contingencies, reasons for changes, and abort criteria	Leadership	**2.00**
		c. Messages at the appropriate level of detail for the station staff, oversight organizations, and the public, as needed	Leadership	**0***
		d. Solicited feedback to ensure common understanding of the plan	Leadership	**4.00**

	5.B.3 Implementation of the plan includes the following:			
		a. Management involvement and follow-up to ensure actions are carried out as planned	Leadership	**2.93**
		b. Use of increased monitoring measures throughout the implementation process to validate assumptions and conditions and verify expected results are achieved	Leadership	**3.00**
		c. Reassessment of solutions as new information or changing conditions are identified	Leadership	**2.00**
		d. Review, approval, and communication of plan changes to the same level as the original	Leadership	**0***
		e. Corrective actions are tracked to completion. Dates for action are commensurate with the importance of the item, station priorities, and the consideration of preventing recurrence.	Leadership	**2.40**
6. Decisions and decision-making activities are periodically evaluated				
		a. Senior managers identify and evaluate decisions that relate to problems or events that provide the best learning opportunities	Leadership	**2.56**
		b. Evaluation includes participation by or input from members involved in the decision-making process	Leadership	**2.60**
		c. Senior managers consider the use of independent personnel to conduct evaluations	Leadership	**2.90**
		d. Evaluations are timely to ensure information is current and accurate	Leadership	**0***
		e. Effectiveness reviews compare actual performance to management expectations, high industry standards, and operating experience	Leadership	**2.59**
		f. Lessons learned from decision-making activities are used to improve the decision-making process	Leadership	**0***
		g. Positive examples of decision-making are celebrated, and desired behaviors are reinforced and publicized	Leadership	**3.00**
		h. Formal decision-making models are considered for repetitive situations to enhance the likelihood of future success	Leadership	**2.26**

		i. Case studies or other learning methods based on the evaluations are used for training and development	Leadership	**3.50**
		j. Managers coach individuals to achieve needed improvements		**2.73**
		k. A station environment encourages employees to actively participate in self-assessments (SAs). Management fosters this environment by communicating the importance of SAs in improving station performance.	Leadership	**3.00**

Average score for all behaviors in the Effective Operational Decision Making Matrix: 2.63

Note: A score of zero (0) indicates no observations were recorded for this attribute.

Attachment 3 Leadership Matrix Scoring

Scoring Criteria	NEEDS MUCH IMPROVEMENT Usually shows undesired behavior. Rarely shows desired behavior. (1)	NEEDS SOME IMPROVEMENT Sometimes shows undesired behavior, sometimes desired. (2)	COMPETENT Usually shows desired behavior. Rarely shows undesired behavior. (3)	STRENGTH Usually shows desired behavior with very strong skills. (4)	EXCEPTIONAL Almost always shows desired behavior with highest skills. (5)

Warning Flags from Plants in Extended Shutdowns	Score
AA. Not Overconfident – The "numbers" are good, but the nuclear staff is not living off past successes.	**2.43**
BB. Industry Interaction – There are interactions with other utilities, INPO, and other industry groups. Benchmarking is frequent with notable implementation. As a result, the plant is keeping pace with the industry.	**2.59**
CC. Managing Relationships – The mind-set toward the NRC and INPO is healthy and the organization takes maximum advantage of valuable insights. Employees are involved and listened to, and raising problems is valued.	**2.43**
DD. Operations and Engineering – Operations standards, formality, and discipline are solid. Other issues, initiatives, or special projects do not overshadow plant operational focus. The engineering organization is strong and aligned with operational priorities. Design basis is a priority, and design margins are maintained over time.	**2.57**
EE. Production Priorities – Important equipment problems are solved, and repairs are not postponed while the plant stays on line. Nuclear safety is demonstrated and emphasized in staff interactions and site communications.	**2.69**
FF. Managing Changes – Organizational changes, staff reductions, retirement programs, or relocations are evaluated for impacts - are fully considered; recruiting or training is used to compensate when needs are identified. Processes and procedures support strong performance after management changes.	**2.68**
GG. Plant Events – Event significance is recognized, conservatively addressed and reaction to events is aggressive. Organizational causes of events are explored.	**2.19**
HH. Nuclear Leaders – Managers are open, demonstrate team skills, and are strong communicators. Managers have integrated plant knowledge and operational experience. Senior managers are involved in operations and exercise accountability and follow up.	**2.73**
JJ. Self-Critical – Oversight organizations demonstrate an unbiased outside view and deliver tough messages. Self-assessments find problems and address them.	**2.85**

Attachment 4 Safety Culture Rollup Attributes

EODMM LM Characteristic	Salem Hope Creek Avg Score	*SAFETY CULTURE ATTRIBUTES*
4.B.1.b	**2.19**	**Plant Control**: Plant operations remain deliberate and well controlled. The station has a healthy respect for reactivity management. Management fosters this expectation during decision-making activities. Strong control of plant, equipment, and design configuration is maintained during maintenance, operation, and modifications.
1.B.1.d **3.B.3.e** **4.B.3.a**	**2.33**	**Reliability:** Safety systems and equipment are maintained to high performance and reliability levels, and workarounds are vigorously eliminated.
3.B.1.a **4.B.3.a** **6.h** **GG** **5.B.3.e** **1.B.2.c** **1.B.3.a** **1.B.3.c** **1.B.2.a**	**2.40**	**Corrective Action Program:** Investigations are performed on important or repetitive problems as well as adverse trends from non-consequential events. Root causes as well as generic implications are identified. Corrective actions prevent recurrence. Process and program issues are rigorously reported and corrected. Corrective actions are identified and tracked to completion. Dates for action are commensurate with the importance of the item, station priorities, and the consideration of preventing recurrence. Significance determination is integrated with problem identification. Site priority is given to conditions that impact the safe, reliable operation of the station. Management takes deliberate action and provides feedback on the disposition of identified problems. Personnel understand the threshold of problem reporting. The threshold for problem identification is appropriate.
1.B.1.b **6.a**	**2.46**	**Monitoring/Trending**: Awareness of equipment and system operation. Awareness and monitoring capability for adverse trends (equipment, human performance, process, programs). Managers monitor performance indicators.
1.B.3.a **2.B.1.f** **3.B.1.c**	**2.48**	**Work Management Process**: A strong work management process supports reliability, maintenance, and operational readiness.
2.B.1.f **5.B.1.a** **FF**	**2.60**	**Resource and Schedule:** Management supports commitments established. Schedule, resource, and guidance are provided to support implementation.
2.B.1.c **2.B.3.b** **3.B.1.h** **6.j** **HH**	**2.61**	**Management Involvement - Oversight/Coaching/Communication**: Managers establish expectations, accountability and provide coaching when expectations/standards are not met. Managers ensure appropriate depth and focus & strive for continuous improvement. Vertical communications are strong.
1.B.1.c **1.B.1.d** **1.B.2.b** **2.B.2.b** **CC**	**2.61**	**Problem Identification (Questioning Attitude):** Personnel utilize the corrective action process to identify issues. Personnel are persistence in identifying problems and suggesting solutions and maintain a questioning attitude. Employees are involved and listened to and raising concerns is valued.
1.B.1.a **4.B.2.c** **DD**	**2.70**	**Staff Capability**: Personnel are knowledgeable and understand safety expectations, including design and licensing bases. The Engineering, Maintenance, and Operations Organizations are strong and aligned with operational safety.

EODMM LM Characteristic	Salem Hope Creek Avg Score	*SAFETY CULTURE ATTRIBUTES, continued*
1.B.3.d 4.B.2.b 6.g EE	**2.84**	**Safety over Production:** Maintain/improve safety margins, equipment reliability, and materiel condition while appropriately considering business variables of production and cost. Management expectations and reinforcement established in this area. Nuclear safety is demonstrated and emphasized in staff interactions and site communications. Management provides periodic training to reinforce expectations concerning nuclear safety expectations and conservative decision making as well as recognizing people for doing so.
2.B.1.h 4.B.3 6.c JJ	**2.85**	**Oversight Capability**: Use of the various oversight groups is effectively utilized, intrusive, and results in performance improvements. Oversight is credible, independent and backed by management.
4.B.3.b	**2.96**	**Operating Experience**: Operating experience information internal and external is effectively utilized for event investigations, error reduction, and improvement in equipment reliability. Operating shift crews are promptly briefed on event(s) to prevent recurrence.

Attachment 5 Circulating Water Pump 13B Case Study

On November 22, 2003, the lower portions of Salem's CW Pump 13B pump casing were found detached from the pump and lying in the forebay. After repair and return to service, a month later (12/24/03) the same pump dropped the same parts into the forebay.

The USA Safety Culture Assessment team reviewed the site's behavioral characteristics potentially contributing to the repeated failure of Circulating Water Pump 13B. The review indicates site performance and behaviors associated with this complicated issue do not adequately fulfill principles for a strong organizational safety culture. Because the CW System is non-safety related and is designed with good redundancy, this event does not have the nuclear safety consequences or significance of the Davis-Besse Head Degradation Event. However, for this issue many behaviors at PSEG are similar in nature to behaviors that existed at Davis-Besse.

The USA Safety Culture Assessment Process includes a scorecard of ninety (90) behavioral attributes extracted from INPO's "Principles for Effective Operational Decision-Making," "Warning Flags from Plants in Extended Shutdowns," and other USA standards. Learning opportunities associated with approximately 70 of the 90 behavioral attributes exist for just this one issue. A few of the applicable discussions in the "Principles for Effective Operational Decision-Making" include the following:

- **Personnel at all levels recognize and are intolerant of conditions and behaviors that challenge or reduce margins of plant safety or reliability.**
- **Supervisors and managers take actions to resolve problems and provide feedback to personnel.**
- **The station culture encourages and reinforces a questioning attitude within the workforce.**
- **Decision-makers exhibit strong technical competence, strive to understand broad technical problems, ask challenging questions to confirm technical assumptions, and are sensitive to the aggregate impact of problems, including business aspects.**

Comparing the site's behavioral characteristics associated with the CW Pump 13B issue with the Davis-Besse Case Study provides an excellent learning opportunity for the entire site organization as it progresses towards operational excellence. A few of the comparisons include the following:

Site Knowledge of a Known Hazard with the Potential to Degrade Plant Equipment	
Davis-Besse Hazard: Boric Acid	**Salem Hazard:** Brackish Water and grass.
Addressing symptoms and failing to get to the root cause.	
Davis-Besse: Containment Air Cooler (CAC) Fouling, Radiation Monitor Filter Plugging, red boric acid lava flows on the reactor head, increasing trends in containment radiation, and RCS leakage.	**Salem:** Multiple cases of loose or missing bolts, inspections indicating flange corrosion, bolting flange alignment, impeller failures, and pump casing material issues.
Outage Management	
Davis-Besse: To remain on the outage schedule, decisions were made to remove scaffolding before thorough reactor head cleaning and nozzle inspection.	**Salem:** To remain on schedule, prohibiting the construction of scaffold towers to perform circulating pump casing external inspections**.**
Management Involvement and Oversight	
Davis-Besse: Limited containment entries, inadequate oversight of the corrective action program, overly focused on production concerns or outage duration, and acceptance of degraded conditions (i.e., starting up with known leaking valves and CRD flanges).	**Salem:** General acceptance of corrective actions in the past and past high tolerance for degraded equipment condition and system reliability. Management was not asking the hard question: "Is it fixing the cause or is it fixing the symptom?"
Oversight/Inspection	
Davis-Besse: Overreliance on the written word provided by others concerning head cleanliness. Glowing reports from QA without going out and looking.	**Salem:** Limited QA, line, and management involvement in underwater inspections of the CW pumps. May/June 2003 inspections were not completed over the objections of engineering. Three months later, 26 of 44 bolts found missing on Pump 13B guide barrel.

Internal and External Operating Experience	
Davis Besse: External OE: Head degradation at two other plants in early 1990s. Numerous industry events associated with boric acid corrosion. Nozzle leakage at Oconee in 2001 with CRD nozzle circumferential cracking. Internal OE: Severe pressurizer spray valve corrosion and significant regulator enforcement action. Severe steam generator shell corrosion due to boric acid leakage with the same symptoms as the head degradation event (CAC fouling etc).	**Salem:** External: Similar CW pump failures at Duane Arnold, D.C. Cook, and Fermi 2. Internal: Pump barrel loose or replaced in 1990, 1992, and 2002. February 2002, pump bell hanging by two bolts. August 2002, 2 bolts missing. Bolting issues associated with fiberglass bell mouth.
Benchmarking	
Davis Besse: Overconfidence in performance and limited interface with industry. (i.e., silo effect)	**Salem:** Predictive maintenance at other stations concerning CW pump vibrations predicted impending failure of their CW pump. Can enhancements improve Salem / Hope Creek predictive maintenance?
Corrective Action Program	
Davis Besse: Inadequate cause evaluations, failure to recognize significance of issues, inadequate trending. Overreliance on previous cause evaluations concerning engineering assumptions (i.e., boric acid corrosion does not occur because the reactor head temperature is greater than 500° Fahrenheit).	**Salem:** Past cause evaluation inadequate. Engineering judgment flawed on use of backing rings to correct bolting/flange alignment. Current cause evaluation is much improved. Use of fault tree methodology, time lines, and event and causal factors charts improves success in determining real root cause. Adequacy of the two level 1 CRs and associated corrective actions can improve reliability.