UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION IV
1600 E. LAMAR BLVD
ARLINGTON, TX 76011-4511

June 9, 2016

EA-14-008
EA-14-088

Mr. Jeremy Browning
Site Vice President
Arkansas Nuclear One
Entergy Operations, Inc.
1448 SR 333
Russellville, AR 72802-0967

SUBJECT: ARKANSAS NUCLEAR ONE – NRC SUPPLEMENTAL INSPECTION REPORT 05000313/2016007 and 05000368/2016007

Dear Mr. Browning:

On February 26, 2016, the U.S. Nuclear Regulatory Commission (NRC) completed the onsite portion of an inspection at Arkansas Nuclear One (ANO), Units 1 and 2. The inspection was conducted in accordance with the guidance contained in NRC Inspection Manual Chapter (IMC) 0305, "Operating Reactor Assessment Program," and Inspection Procedure (IP) 95003, "Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs, or One Red Input." The NRC performed the inspection in response to ANO having Multiple Degraded Cornerstones, as defined by the NRC's Reactor Oversight Process (ROP). The enclosed report documents the inspection findings, which were discussed at a public meeting on April 6, 2016, with you and other members of your staff. A subsequent telephonic exit was conducted on May 12, 2016, with you and other members of your staff to discuss changes to the characterization of three violations.

Inspection Conclusions

The NRC determined that ANO is being operated safely. This conclusion is based in part on the fact that there have not been any significant operational events or risk-significant findings since entry into Column 4, the robust plant design has not been compromised, and the operational focus has improved. The inspection team also noted that operator fundamentals have been strengthened and decision making has been more conservative. Based on Entergy's review of the causes of the performance decline, the findings from the independent Third Party Nuclear Safety Culture Assessment, and the results of the NRC's independent diagnostic evaluation, the team determined that Entergy understands the depth and breadth of performance concerns associated with ANO's performance decline. The team concluded that effective implementation of the Comprehensive Recovery Plan (CRP), supported by the allocation of adequate resources and continued enhanced oversight by Entergy leadership, should lead to substantial and sustained performance improvement.

The inspection team identified what it considered to be missed opportunities for ANO to have promptly initiated performance improvements since being placed in Column 4. More specifically, ANO: 1) was slow to implement corrective actions to address the findings from the Corrective Action Program cause evaluation and the Third Party Nuclear Safety Culture Assessment; 2) did not perform an evaluation of the causes for safety culture problems; 3) did not recognize procedure adherence and training as problem areas; and 4) did not include in the CRP all of the actions that are needed to fully address the significant performance deficiencies. Entergy addressed each of these inspection team observations by performing additional cause evaluations and developing additional corrective actions before the conclusion of the inspection.

Basis for the Inspection

The actions and findings considered by the NRC in reaching the determination to conduct this supplemental inspection included the following:

> In a letter to you dated June 23, 2014 (available electronically in the NRC's document system (ADAMS) as ML14174A832), the NRC informed you of its final significance determination associated with an inspection finding in the Initiating Events Cornerstone for Units 1 and 2 identified in the first quarter of 2014. This finding of substantial safety significance (Yellow) involved your staff's failure to provide adequate oversight for the planned movement of the Unit 1 turbine stator in March 2013, using a temporary hoisting assembly.
>
> In a letter to you dated January 22, 2015 (ML15023A076), the NRC informed you of its final significance determination associated with an inspection finding in the Mitigating Systems Cornerstone for Units 1 and 2 identified in the third quarter of 2014. This finding, also of substantial safety significance (Yellow), involved your staff's failure to design, construct, and maintain the Units 1 and 2 auxiliary building and emergency diesel fuel storage building flood barriers so that they would protect safety-related equipment from flooding.
>
> In an Annual Assessment Letter dated March 4, 2015 (ML15063A499), the NRC informed you that ANO Units 1 and 2 had been placed in the Multiple/Repetitive Degraded Cornerstone Column (Column 4) of the NRC's Action Matrix. Having one Yellow finding in the Initiating Events Cornerstone for Units 1 and 2, and one Yellow finding in the Mitigating Systems Cornerstone for Units 1 and 2 formed the basis for this decision in accordance with IMC 0305.
>
> In addition, you reported a White Unplanned Scrams per 7,000 Critical Hours Performance Indicator (PI) in the Initiating Events Cornerstone for Unit 2 for the second and third quarters of 2014.

On January 15, 2016, your staff notified the NRC of Entergy's readiness for the NRC to perform supplemental inspections to review the actions taken to address performance issues at ANO (ML16019A047). The NRC then began the onsite phase of a supplemental inspection on January 25, 2016, using the following IPs to review Entergy's evaluation of the causes for declining performance at ANO, as well as corrective actions taken or planned to address performance concerns:

- IP 95001, “Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area,” for the White PI associated with Unit 2 unplanned scrams.

- IP 95002, “Supplemental Inspection for One Degraded Cornerstone or Any Three White Inputs in a Strategic Performance Area,” for each of the two Yellow findings pertaining to each unit.

- IP 95003, “Supplemental Inspection for Repetitive Degraded Cornerstones, Multiple Degraded Cornerstones, Multiple Yellow Inputs or One Red Input.”

The team examined activities conducted under your licenses as they relate to safety and compliance with the Commission’s rules and regulations and with the conditions of your license. The team reviewed selected procedures and records, observed activities, and interviewed personnel. A listing of the documents requested by the team for review during the inspection is available electronically in ADAMS as ML16076A221. The results of the IP 95003 inspection provided insights into the breadth and depth of safety, organizational, and programmatic issues that contributed to declining performance. This inspection included a diagnostic review of programs and processes that are not typically inspected as part of the baseline inspection program. The inspection included an independent assessment of the safety culture at ANO, including the results of Entergy’s independent Third Party Nuclear Safety Culture Assessment and associated apparent cause evaluation. In addition, this inspection included an assessment of the completed and planned actions related to the four Yellow findings and the White PI using IPs 95002 and 95001, respectively.

Review of Actions to Address Significant Performance Deficiencies

Based on the results of the 95003 supplemental inspection, we concluded that your evaluations and corrective actions for the three unplanned, Unit 2 scrams that contributed to the White Unplanned Scrams per 7000 Critical Hours PI, were consistent with the evaluation criteria in IP 95001. You identified, based on the results of your evaluations, the following causes for the scrams: improper installation of both onsite and offsite high voltage electrical equipment; inadequacies involving preventive maintenance, response to operating experience, and guidance and oversight to operators; as well as a lack of operator training on core performance characteristics late in core life. From your common cause evaluation, you identified that station leaders did not recognize the risk associated with frequent initiating events, and as such, did not challenge/validate assumptions. We noted that Entergy has taken, or plans to take, corrective actions in these areas. The NRC determined that the IP 95001 inspection objectives have been met. Based on the results of this inspection, the White PI is closed. The PI returned to Green in the fourth quarter of 2014.

The team determined that your staff performed a number of evaluations to identify the causes associated with the Yellow findings. You concluded that the root causes for the Yellow stator drop findings involved inadequate guidance and project management oversight of vendors’ design and testing of the temporary lift assembly. The team determined that since the stator drop event, you have implemented corrective actions to enhance station requirements for oversight of supplemental workers performing contract work activities. However, the team concluded that actions to improve contractor oversight have not yet been fully effective,

and as such, further action is needed because oversight plans for contract outage workers were inadequate, qualification requirements for contractors to act as supervisors did not have a consistent standard, and designated ANO oversight personnel lacked adequate guidance and training to effectively perform their oversight role. You identified that the root causes for the Yellow flood protection findings involved inadequate preventive maintenance strategies, incomplete design documentation, and the failure to verify whether the existing plant configuration met licensing basis requirements for flood mitigation. The team identified an Unresolved Item because some of your actions to correct the degraded flood protection finding resulted in modifying existing fire seals in a way that created an untested configuration. We understand that you have scheduled fire resistance testing to determine whether there is an actual degraded condition. The NRC will continue to monitor the effectiveness of your corrective actions for the Yellow findings during future inspections.

Inspection Findings

The team documented 16 NRC-identified findings of very low safety significance (Green) in this report. Eleven of the findings involved violations of NRC requirements. Further, the team documented four licensee-identified violations which were determined to be of very low safety significance in this report. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2.a of the NRC Enforcement Policy.

Planned Confirmatory Action Letter

On May 17, 2016, Entergy submitted a letter to the NRC, “Submittal of ANO Comprehensive Recovery Plan Area Action Plans” (ML16139A059), describing the specific set of actions it plans to take in order to improve performance at ANO. The NRC will review the actions you plan to take outlined in the Area Action Plans, and intends on issuing a Confirmatory Action Letter (CAL). This CAL will be used to confirm Entergy’s key actions, which when effectively implemented and independently validated by the NRC through inspection follow-up activities, will provide the basis for the NRC’s performance assessment of ANO Units 1 and 2 in the context of determining when ANO should transition out of Column 4 of the NRC’s Action Matrix, in accordance with IMC 0305.

If you contest the violations or significance of the NCVs identified in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the U.S. Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington, DC 20555 0001; with copies to the Regional Administrator, Region IV; the Director, Office of Enforcement, U.S. Nuclear Regulatory Commission, Washington, DC 20555 0001; and the NRC resident inspector at ANO.

If you disagree with a cross-cutting aspect assignment or a finding not associated with a regulatory requirement in this report, you should provide a response within 30 days of the date of this inspection report, with the basis for your disagreement, to the Regional Administrator, Region IV; and the NRC resident inspector at ANO.

In accordance with Title 10 of the Code of Federal Regulations (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agency Wide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

Sincerely,

/RA/

Marc L. Dapas
Regional Administrator

Docket Nos. 50-313 and 50-368
License Nos. DPR-51 and NPF-6

Enclosure:
Inspection Report 05000313/2016007
and 05000368/2016007
w/ Attachment: Supplemental Information

In accordance with Title 10 of the Code of Federal Regulations (10 CFR) 2.390, "Public Inspections, Exemptions, Requests for Withholding," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC's Public Document Room or from the Publicly Available Records (PARS) component of the NRC's Agency Wide Documents Access and Management System (ADAMS). ADAMS is accessible from the NRC Web site at http://www.nrc.gov/reading-rm/adams.html (the Public Electronic Reading Room).

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/RA/

Marc L. Dapas
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w/ Attachment: Supplemental Information

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SUBJECT: ARKANSAS NUCLEAR ONE – NRC SUPPLEMENTAL INSPECTION REPORT 05000313/2016007 and 05000368/2016007

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U.S. NUCLEAR REGULATORY COMMISSION

REGION IV

Docket:	05000313; 05000368
License:	DPR-51; NPF-6
Report:	05000313/2016007; 05000368/2016007
Licensee:	Entergy Operations, Inc.
Facility:	Arkansas Nuclear One, Units 1 and 2
Location:	Junction of Hwy. 64 West and Hwy. 333 South Russellville, Arkansas
Dates:	January 25 through May 12, 2016 (main team) September 21, through October 30, 2015 (outage group)
Team Members:	Neil O'Keefe – Team Leader (RIV) John Dixon – Assistant Team Leader (RIV) Dana Lackey – Team Administrative Assistant (RIV) <u>Emergency Preparedness Group</u> Ryan Alexander (RIV) <u>Senior Reactor Analyst</u> Rick Deese (RIV) <u>Engineering and Programs Group</u> John Mateychick – Group Lead (RIV) Javier Brand (RI) Sam Graves (RIV) Mel Holmberg (RIII) Steve Smith (RII) <u>Maintenance and Testing Group</u> Phil McKenna (RII) – Group Lead Tom Hartman (RIV) Zachary Hollcraft (NRR) Louis McKown (RI) <u>Operations and Training Group</u> TJ Farina – Group Lead (RIV) Dave Dumbacher (RII) Mike Kennard (RIV) Michael Meeks (RII)

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Clyde Osterholtz (RIV)
Dori Willis (NRR)

Outage Group
John Dixon – Group Leader
Brian Correll (RIV)
Ron Kopriva (RIV)
Wayne Sifre (RIV)

Approved By: Neil O'Keefe
Chief, Project Branch E
Division of Reactor Projects

EXECUTIVE SUMMARY

The NRC determined that Arkansas Nuclear One (ANO), Units 1 and 2 are being operated safely. This conclusion is based in part on the fact that there have not been any significant operational events or risk-significant findings since entry into Column 4, the robust plant design has not been compromised, and the operational focus has improved. The inspection team also noted that operator fundamentals have been strengthened and decision making has been more conservative. Based on ANO's review of the causes of its performance decline, the independent Third Party Nuclear Safety Culture Assessment, and the NRC's independent diagnostic evaluation, the team determined that Entergy understands the depth and breadth of performance concerns associated with ANO's performance decline. The NRC team concluded that effective implementation of the Comprehensive Recovery Plan (CRP), supported by the allocation of adequate resources and continued enhanced oversight by Entergy leadership, should lead to substantial and sustained performance improvement.

Significant Performance Deficiencies

The inspection team concluded that Entergy's evaluations for the three Unit 2 unplanned scrams that contributed to the White Unplanned Scrams per 7000 Critical Hours performance indicator were conducted in a manner that satisfied the evaluation criteria in Inspection Procedure 95001. The NRC team determined that the corrective actions taken or planned, based on the results of ANO's cause evaluations, are appropriate to resolve the causes. The NRC concluded that the inspection procedure 95001 inspection objectives were met, and therefore the White performance indicator is closed. The performance indicator returned to Green in the fourth quarter of 2014.

The NRC team determined that ANO identified the relevant causes for the Yellow findings. ANO determined that the root causes for the stator drop finding involved inadequate guidance and project management oversight of vendors' design and testing of the temporary lift assembly. The NRC team agreed with ANO's root cause evaluation results. However, the NRC team concluded that corrective actions to improve contractor oversight have not yet been fully effective. More specifically, further action is needed because oversight plans for contract outage workers were inadequate, qualification requirements for contractors to act as supervisors did not have a consistent standard, and designated ANO oversight personnel lacked adequate guidance and training to perform their oversight role. The root causes for the Yellow flood protection finding involved inadequate preventive maintenance strategies, incomplete design documentation, and the failure to verify whether the existing plant configuration met licensing basis requirements for flood mitigation. The NRC team identified an unresolved item because some of the actions to correct the degraded flood protection finding resulted in modifying existing fire seals in a way that created an untested configuration. ANO has scheduled fire resistance testing to determine whether there is an actual degraded condition. The NRC will continue to monitor the effectiveness of the corrective actions for the Yellow findings during future inspections.

Findings

The NRC team documented 16 NRC-identified findings of very low safety significance (Green). Eleven of the findings involved violations of NRC requirements. The NRC team also documented four licensee-identified violations which were determined to be of very low safety significance. The findings involved inadequate implementation of elements of the Corrective Action Program (CAP) and engineering programs, as well as insufficient actions to address

degraded equipment. The findings involving equipment were primarily associated with corrosion and flow blockages in the safety-related service water system or components cooled by service water.

Identification, Assessment, and Correction of Performance Deficiencies

ANO identified most of its performance problems. ANO concluded that leaders did not make CAP implementation a priority, did not adequately oversee the CAP, and relied on unverified assumptions. ANO staff did not always assign the appropriate significance level to condition reports, resulting in problems not being sufficiently understood so that corrective actions would be effective. Cause evaluations tended to focus on addressing the most apparent problem (e.g., equipment issues) without examining organizational and programmatic elements.

The NRC team concluded that CAP procedures were adequate; however, ANO did not always implement the program as intended. Station personnel at all levels lacked a clear understanding of one or more elements of the CAP process and their roles and responsibilities. There were a number of instances where ANO did not adequately evaluate and use internal (site) and external (industry) operating experience to prevent future problems. Some evaluations relied on unverified assumptions, and degraded conditions were accepted through evaluations, resulting in reduced safety margins or long-term compensatory actions. Limited resources led to CAP action backlogs, impacting timely corrective action. ANO was ineffective in using performance assessments and trending to identify declining performance.

Interim actions to improve CAP performance yielded positive results with respect to the quality of documentation; however, the NRC team noted multiple examples where cause evaluations and extent of condition reviews were narrowly focused, condition reports were closed without completing specified actions, and problems requiring an evaluation for potential operability bypassed the on-shift licensed operator review function.

Human Performance

ANO identified many areas where human performance did not meet industry standards. The causes involved poor leadership behaviors. The CRP had limited actions to directly address improving worker behaviors or increasing field presence of managers to set and enforce expectations. Following the inspection, ANO developed actions to address these concerns.

ANO implemented prompt action to improve operator performance. The NRC team's observations in the control room, plant, and simulator indicated improvement efforts have been effective. Actions to improve the quality and effectiveness of supervisory field observations appear to be successful at the first- and second-line supervisor level.

ANO, and independently the NRC team, identified concerns with procedure adherence. ANO did not evaluate the causes for problems in this area beyond determining that the quality of site-specific procedures and work instructions were below current industry standards and are not adequately human factored. The NRC team identified that workers attempt to informally resolve unclear guidance in procedures rather than stopping and notifying supervisors. The CRP includes key actions to review and upgrade station procedures, but actions to improve procedure adherence were limited. Following the inspection, ANO developed actions to strengthen procedure use and adherence.

The Third Party Nuclear Safety Culture Assessment identified that ANO personnel tolerated, and at times normalized, degraded conditions. In addition to using analyses to accept degraded conditions and reduced margins, ANO management adopted long-term or permanent compensatory measures. These compensatory actions distracted operators from their normal duties and challenged response actions during events. The true number of degraded conditions and compensatory measures was not apparent because they were dispersed in a variety of tracking processes or the actions were made permanent through analyses or proceduralized actions.

Equipment Reliability Programs and Processes

Since 2007, the reduced resources available to do work created a number of challenges that slowly began to impact equipment reliability. ANO reduced the amount of preventive maintenance performed and extended the time between maintenance activities. The loss of experienced staff made on-time completion of maintenance activities difficult. The lack of effective action to maintain equipment reliability in an aging plant caused an increase in emergent work that disrupted scheduled maintenance. A cumbersome and poorly understood process for approving and funding equipment upgrades resulted in only the highest priority work being approved, and rescheduling or cancellation of lower priority work. ANO did not identify problems in the Site Integrated Planning Database process for approving and funding major projects. The NRC team noted that the CRP was updated to address this gap. Also, ANO failed to adequately identify, monitor, and correct multiple degraded conditions with the safety-related service water system.

Safety Culture

ANO determined that the most significant causes for declining performance were ineffective change management with respect to resource reductions, and leadership behaviors that were not commensurate with a strong safety culture. When implementing resource reductions across its fleet in 2007 and 2013, Entergy did not consider the unique staffing needs for ANO created by having two units with different technologies. ANO management did not reduce workloads through efficiencies or the elimination of unnecessary work, as was intended as part of the resource reduction initiatives. Leaders attempted to prioritize work with the available resources, but were unable to address expanding work backlogs. An unexpected increase in attrition between 2012 and 2014 caused a loss in experienced personnel, a reduced capacity to accomplish work, and an increase in the need for training and supervision. While the NRC team determined that workers were willing to raise safety concerns, the workers were not confident that management would address more routine problems. ANO leaders missed an opportunity to engage the workforce early in the recovery process to help identify, assess, and develop corrective actions for declining performance. As a result, the NRC team's independent safety culture evaluation noted limited improvement in safety culture since the completion of ANO's independent Third Party Nuclear Safety Culture Assessment.

ANO did not initially assess the training function, even though safety culture assessments identified training as a problem area. Workers reported that training did not have sufficient priority, impacting their ability to perform their current roles and the ability to achieve higher level qualifications. In response, ANO conducted an evaluation and identified that training needed to be used as a tool to correct problems and improve performance and created a Training Area Action Plan.

ANO did not create a specific improvement plan to address the findings of the safety culture assessments, choosing to address selected safety culture attributes that were associated with root cause evaluations rather than treating the findings in the context of a separate problem area. By not performing a cause evaluation for safety culture, ANO management missed the opportunity to address the full scope of safety culture weaknesses. In response, ANO performed two cause evaluations, developed the Safety Culture Area Action Plan, and assigned a full-time Safety Culture Manager.

Comprehensive Recovery Plan

When the inspection started, the CRP lacked several important attributes. The CRP did not include objectives or adequate performance measures to determine whether the expected outcomes were achieved once the actions were complete. In response, ANO developed 14 area action plans that incorporated goals and desired outcomes, corrective action summaries, effectiveness measures, prioritization descriptions, and actions to sustain performance improvement. Area Action Plans were developed for each Fundamental Problem Area and Problem Area that addressed the root and contributing causes.

SUMMARY OF FINDINGS

IR 05000313/2016007; 05000368/2016007; 9/21/2015 – 05/12/2016; Arkansas Nuclear One; Supplemental Inspections inspection procedure (IP) 95003, for Multiple Degraded Cornerstones; IP 95002, for One Degraded Cornerstone; and IP 95001, for One White Input.

The inspection activities described in this report were performed between January 25, 2016, and February 26, 2016, by a team of 27 inspectors from the NRC's Region I, II, III, and IV Offices, the Office of Nuclear Reactor Regulation, and the Office of Nuclear Regulatory Research. Sixteen findings of very low safety significance (Green) are documented in this report. Eleven of these findings involved violations of NRC requirements; one of these findings involved a Severity Level IV violation under the traditional enforcement process. Additionally, one unresolved item and four licensee-identified violations of very low safety significance are documented in this report.

The significance of inspection findings is indicated by their color (Green, White, Yellow, or Red), which is determined using Inspection Manual Chapter 0609, "Significance Determination Process." Their cross-cutting aspects are determined using Inspection Manual Chapter 0310, "Components Within the Cross-Cutting Areas." Violations of NRC requirements are dispositioned in accordance with the NRC Enforcement Policy. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process."

Cornerstone: Initiating Events

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," because the licensee failed to follow procedure EN-LI-102, "Corrective Action Program," which required verification that the required action has been completed as intended. Specifically, for the extent of condition reviews for the stator drop event, two corrective actions were closed even though the actions were inadequate. The licensee's corrective actions included re-performing the actions and documenting the failures in the corrective action program as condition reports CR-ANO-C-2016-00479 and CR-ANO-C-2016-00480.

  The failure to complete two of the extent of condition reviews associated with the stator drop event specified in the associated corrective action plan was a performance deficiency. The performance deficiency was determined to be more than minor because, it was associated with the design control attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to complete actions related to identifying and correcting the extent of condition for a significant condition adverse to quality could potentially lead to an initiating event. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1 – "Initiating Events Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the inadequate closure of corrective actions did not cause a reactor trip or the loss of mitigation equipment relied upon to transition the plant from the onset of a trip to a stable shutdown condition. This finding had a problem identification and resolution cross-cutting aspect of Resolution because the licensee did not take effective corrective actions to address issues in a timely

manner commensurate with their safety significance. Specifically, the scope of the actions taken as part of the corrective actions did not resolve the issue as describe in the corrective action statement [P.3]. (Section 7.1)

- Green. The team identified a Green finding for the licensee's failure to ensure that effectiveness reviews to assess the adequacy of corrective actions as required by procedure EN-LI-118-ANO-RC, "Cause Evaluation Process," were appropriate. Specifically, the team identified numerous examples in which effectiveness reviews for corrective actions to prevent recurrence failed to assess whether corrective actions achieved the intended results. The licensee's corrective actions included revising the effectiveness reviews to ensure that the corrective actions achieve the desired effect, and documenting the issue in the corrective action program as condition reports CR-ANO-C-2016-00482 and CR-ANO-C-2016-01013.

  The failure to establish adequate effectiveness review success criteria to verify the intended results for corrective actions to prevent recurrence were achieved was a performance deficiency. The performance deficiency was determined to be more than minor because, it impacted the human performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to complete actions related to identifying and correcting the extent for a significant condition adverse to quality could potentially lead to an initiating event. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1 – "Initiating Events Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because it did not cause a reactor trip or the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. This finding had a problem identification and resolution cross-cutting aspect of Self-Assessment because the licensee did not ensure that the organization routinely conducted self-critical and objective assessments of its programs and practices. Specifically, the Corrective Action Review Board tasked with validating the effectiveness of the corrective action plans did not ensure that the effectiveness review plans assessed whether the implemented corrective actions were effective [P.6]. (Section 7.2)

- Green. The team identified a Green finding for the licensee's failure to evaluate operating experience as required by procedure EN-OE-100-02, "Operating Experience Evaluations." This procedure allowed taking no action for operating experience issues that were applicable to the station if multiple barriers existed to preclude failure. The team identified two examples where the licensee had not correctly verified the adequacy of credited barriers and as a result, represented a vulnerability to a similar event occurring at the station. The licensee's corrective actions included re-performing the operating experience evaluations and documenting the issue in the corrective action program as condition reports CR-ANO-C-2016-00463 and CR-ANO-C-2016-00782.

  The failure to evaluate operating experience was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the protection against external factors attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to take corrective action to address the large motor and respiratory

protection operating experience could result in a similar adverse condition or event at the station. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1 – "Initiating Events Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding would not result in exceeding the reactor coolant system leak rate for a small loss of coolant accident or affect systems used to mitigate a loss of coolant accident, did not cause a reactor trip and loss of mitigation equipment, did not involve the loss of a support system, did not involve a degraded steam generator tube condition, and did not impact the frequency of a fire or internal flooding event. This finding had a human performance cross-cutting aspect of Conservative Bias because the licensee failed to ensure that individuals used decision making-practices that emphasized prudent choices over those that were simply allowable. Specifically, individuals performing evaluations rationalized assumptions rather than verifying the actual conditions [H.14]. (Section 7.3)

Cornerstone: Mitigating Systems

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," because the licensee failed to implement the Microbiologically Influenced Corrosion Monitoring Program in a manner that would monitor for pipe wall loss in the service water system. Specifically, the team identified that the licensee had not maintained representative monitoring points and allowed an excessive time period between pipe wall thickness inspections. The licensee's corrective actions included initiating an evaluation of the Microbiologically Influenced Corrosion Monitoring Program and documenting the issue in the corrective action program as condition reports CR-ANO-C-2016-00435, CR-ANO-C-2016-00524 and CR-ANO-C-2016-00546. The team did not identify a loss of structural integrity in any service water system pipe caused by these errors and therefore did not have an operability concern.

  The failure to implement the Microbiologically Influenced Corrosion Monitoring Program was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone objective and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to monitor service water system pipe locations for microbiologically influenced corrosion could result in a loss of pipe structural integrity (e.g., large pipe break) resulting in the loss of a service water train and adversely affecting safety-related equipment necessary for accident mitigation. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. This finding had a human performance cross-cutting aspect of Conservative Bias because the licensee failed to ensure that individuals used decision-making practices that emphasized prudent choices over those that were simply allowed. Specifically, the program database contained errors related to non-

conservative decisions regarding the impact of monitoring points following pipe replacement and limiting the maximum time between monitoring for wall loss [H.14]. (Section 7.4)

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR 50.55a(g)(4) for the licensee's failure to inspect Unit 2 service water pump supports in accordance with ASME Code Section XI. Specifically, the licensee failed to include Unit 2 service water pump supports in the Inservice Inspection Program and had not completed a visual VT-3 examination since the supports were installed in 1991. The licensee's corrective actions included incorporating the supports into the Unit 2 Inservice Inspection Program, performing an immediate operability determination, assigning a corrective action to determine the past operability, and documenting the issue in the corrective action program as condition reports CR-ANO-2-2016-00361 and CR-ANO-2-2016-00421.

  The failure to inspect the Unit 2 service water pump supports in accordance with ASME Code Section XI was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the design control attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to periodically inspect the pump supports could result in the failure to identify a nonfunctional support that would increase the risk of a pump failure. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. The team did not identify a cross-cutting aspect for this issue because the cause of this performance deficiency was not reflective of current performance. (Section 7.5)

- Green. The team identified two examples of a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for the licensee's failure to correct conditions adverse to quality. Specifically, the licensee failed to correct long term degraded service water flow to the Unit 2 safety-related train B emergency diesel generator heat exchangers since 2008, and degraded Unit 1 reactor containment building coatings since 2009. The licensee's corrective actions included performing an operability determination and determining that the service water system and the Unit 1 containment sump were operable and documenting the issue in the corrective action program as condition reports CR-ANO-C-2016-00946, and CR-ANO-1-2015-00200.

  The failure to correct conditions adverse to quality associated with Unit 2 service water flow to the B emergency diesel generator heat exchangers and the Unit 1 reactor containment building coatings was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to correct long term degraded: 1) service water flow beyond the action limit in accordance with procedure EN-DC-159, "Component and System Monitoring," to the B emergency diesel generator heat exchangers, which challenged the capability of emergency diesel generator

response to design basis events; and 2) containment coatings which challenged the Unit 1 emergency core cooling system capacity. The finding was evaluated using Inspector Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2, "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of mitigating system, structure or component, but the system, structure or component maintained operability. This finding had a human performance cross-cutting aspect of Design Margins because the licensee failed to place special attention on maintaining margins in safety-related equipment. Specifically the licensee has repeatedly: 1) throttled service water flow away from the safety-related shutdown cooling heat exchangers, reducing the shutdown cooling design margins to maintain minimally acceptable flow to the emergency diesel generator heat exchangers since 2008; and 2) reduced the available containment sump margin rather than correct containment coating deficiencies [H.6]. (Section 7.6)

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to assure that the design basis service water cooling flow rates for the Unit 2 high pressure safety injection pump bearing and seal coolers were correctly translated into operating and surveillance procedures. Specifically, the pump surveillance and operating procedures were inadequate to monitor for, or correct degraded service water flow to the pump seal and bearing coolers. The procedures allowed for zero flow to the coolers, whereas the design drawing required 20 gallons per minute. The licensee's corrective actions included performing an immediate operability determination and determining the pumps were operable based on the most recent surveillance flow tests, requesting a prompt operability determination, scheduling inspection of the seal and bearing coolers, and documenting the issue in the corrective action program as condition reports CR-ANO-2-2016-00672 and CR-ANO-2-2016-00674.

  The failure to correctly incorporate the design basis service water cooling flow for the Unit 2 high pressure safety injection pump coolers into the operating and surveillance procedures was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the design control attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to incorporate the design basis service water cooling flow into the operating and surveillance procedures could result in the failure of the high pressure safety injection pumps during accident mitigation. The finding was evaluated Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. The team did not identify a cross-cutting aspect for this issue because the cause of this performance deficiency was not reflective of current performance. (Section 7.7)

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to

establish a test program for the Unit 2 service water supply to emergency feedwater pump suction lines. Specifically, the licensee failed to demonstrate that flow through this line would remain satisfactory for design basis accidents. The licensee's corrective actions included performing an operability determination and determining that the last performance of the procedure in 2015 documented a flow rate greater than the required value, was evaluating the lack of a surveillance test program for monitoring flow rate loss in these lines, and documenting the issue in the corrective action program as condition report CR-ANO-2-2016-00670.

The failure to establish a test program for the Unit 2 service water to emergency feedwater pump suction supply line was a performance deficiency. The performance deficiency was determined to be more than minor because, it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to monitor the flow through the Unit 2 service water to emergency feedwater pump suction supply line could result in loss of adequate flow to support emergency feedwater pumps for accident mitigation. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. The team did not identify a cross-cutting aspect for this issue because the error that caused this deficiency was not reflective of current performance. (Section 7.8)

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for the licensee's failure to establish a test program for monitoring the Unit 1 emergency feedwater pumps casing wall thickness loss to demonstrate that the pumps would remain satisfactory for service. The scope of the Wall Thinning Aging Management Program included the emergency feedwater pumps casing. However, the team noted that the procedure did not include wall thickness measurements on the emergency feedwater pumps casings. The licensee's corrective actions included performing an immediate operability determination and determining the pumps were operable, and documenting the issue in the corrective action program as condition report CR-ANO-1-2016-00606.

  The failure to establish a test program for monitoring the Unit 1 emergency feedwater pumps casing wall thickness loss was a performance deficiency. The performance deficiency was determined to be more than minor because, it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to monitor the Unit 1 emergency feedwater pumps casing wall thickness could result in a corrosion- or erosion-induced pump casing failure. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or

qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. This finding had a human performance cross-cutting aspect of Work Management for failing to implement a process of planning, controlling, and executing work activities such that nuclear safety is an overriding priority. Specifically, the licensee entered the period of extended operation in May 2014 and had not established a surveillance procedure to monitor the corrosion induced wall loss of the pump casings as required by the approved aging management program [H.5]. (Section 7.9)

- Green. The team identified a Green finding for the licensee's failure to create an operational decision making issue document per procedure EN-OP-111, "Operability Decision Making Issue (ODMI) Process." Specifically, the licensee failed to evaluate the plant impact and operational challenges associated with not repairing safety injection tank check valve 2SI-13D bonnet leakage, which was identified prior to starting up from the fall 2016 outage. The leakage increased to the point where normal makeup capability was challenged. The licensee's corrective actions included performing an unplanned shutdown to repair safety injection tank check valve 2SI-13D, and documenting the issue in the corrective action program as condition reports CR-ANO-2-2016-00546, CR-ANO-C-2016-0948, and CR-ANO-C-2016-01348.

  The failure to establish operational decision making issue guidance per procedure EN-OP-111 to address safety injection tank check valve 2SI-13D leakage was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment reliability attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the leak became an operational challenge, in that, operators were filling the safety injection tank for the majority of the shift. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time, and did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic, flooding, or severe weather initiating event. This finding had a problem identification and resolution cross-cutting aspect of Self-Assessment because the licensee did not conduct self-critical and objective reviews of degraded plant issue to determine whether they should be addressed using the operational decision making issue process [P.6]. (Section 7.10)

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR 50.49(f) for the licensee's failure to ensure that Unit 1 pressurizer block valve CV-1000, was installed in the qualified configuration. Specifically, the safety-related motor operated block valve was installed with the limit switch compartment facing downward instead of up. The licensee's corrective actions included performing a prompt operability determination and determining the valve was operable, evaluating the extent of condition, and documenting the issue in the corrective action program as condition report CR-ANO-C-2016-00884.

  The failure to ensure the pressurizer motor operated block valve CV-1000 was in the qualified configuration was a performance deficiency. The performance deficiency was

determined to be more than minor because, it was associated with the design control and equipment performance attributes of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, valve CV-1000 not being installed in the qualified configuration increased the possibility of leaking grease or accumulating condensation in the limit switch compartment which could cause failure, electrical shorts or erratic operation. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. This finding had a problem identification and resolution cross-cutting aspect of Operating Experience because the licensee failed to systematically and effectively collect, evaluate, and implement relevant internal and external operating experience in a timely manner [P.5]. (Section 7.11)

- Green. The team identified a Green finding for the licensee's failure to fully implement procedure EN-DC-310, "Predictive Maintenance Program," Revision 7. Specifically, the licensee failed to perform predictive maintenance-related thermography on medium-voltage safety-related electrical switchgear. The team identified that the predictive maintenance equipment list appropriately included the medium-voltage switchgear as components in the predictive maintenance program. However, the monitoring was not being scheduled or performed. The licensee's corrective actions included performing an operability determination and determining that there was no impact to the performance of the switchgear, creating tasks to perform thermography, and documenting the issue in the corrective action program as condition report CR-ANO-C-2016-00571.

  The failure to perform predictive maintenance on safety-related medium-voltage switchgear as required by procedure EN-DC-310 was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, degradation of safety-related medium voltage switchgear could go unidentified for extended periods, reducing system reliability. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time, and did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic, flooding, or severe weather initiating event. This finding had a problem identification and resolution cross-cutting aspect of Identification because the licensee did not identify issues completely, accurately, and in a timely manner. Specifically, the licensee did not identify that their implementation of the Predictive Maintenance Program did not appropriately address safety-related medium-voltage switchgear as requiring periodic thermography inspections [P.1]. (Section 7.12)

- Severity Level IV - Green. The team identified a Green finding for the licensee's failure to update the Level 1 probabilistic risk assessment model as required by procedure EN-DC-151, "Probabilistic Safety Assessment (PSA) Maintenance and Update," Revision 5. This finding also involved a Severity Level IV, non-cited violation of 10 CFR 50.9, "Completeness and Accuracy of Information," because the licensee failed to submit complete and accurate model maintenance information in their license amendment request for the extension of the integrated leak rate testing for the Unit 1 reactor building. Procedure EN-DC-151 established requirements to ensure that ANO's models represent the as-built, as-operated plant in a manner sufficient to support the applications for which they are used, including performing periodic updates within four years of the previous update. The licensee had not updated the internal events model for Unit 1 since July 2009 and for Unit 2 since 2008. The licensee's corrective actions included completing the model update for Unit 1 on April 15, 2016, for Unit 2 on February 29, 2016, and documenting the issue in the corrective action program as condition report CR-ANO-C-2016-01573.

  The failure to perform probabilistic risk assessment updates as required by procedure EN-DC-151 was a performance deficiency and therefore a finding. An NRC-identified violation of 10 CFR 50.9 was associated with this finding because it impacted the regulatory process in that inaccurate information was provided to the NRC that was material in making a licensing decision. Therefore, in accordance with Inspection Manual Chapter 0612, Appendix B, "Issue Screening," this issue was evaluated using both the finding and traditional enforcement processes. This violation is associated with a finding that has been evaluated by the significance determination process and communicated with a significance determination process color reflective of the safety impact of the deficient licensee performance. The significance determination process, however, does not specifically consider the regulatory process impact. Thus, although related to a common regulatory concern, it is necessary to address the violation and finding using different processes to correctly reflect both the regulatory importance of the violation and the safety significance of the associated finding.

  The performance deficiency was determined to be more than minor because it was associated with the equipment performance and procedure quality attributes of the Mitigating Systems cornerstone objective and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the lack of a formal process to ensure that probabilistic risk assessment model updates were performed as scheduled impacted license amendment requests, performance indicator accuracy, and daily maintenance risk evaluations for planned and emergent maintenance activities since the internal events model was not reflective of current plant conditions. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time, and did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic, flooding, or severe weather initiating event.

  Consistent with Section 6.9 of the NRC Enforcement Policy, this violation was determined to be a Severity Level IV violation because inaccurate information was provided, but it would

not have likely caused the NRC to reconsider its regulatory position or undertake substantial further inquiry.

This finding had a human performance cross-cutting aspect of Resources because the licensee did not ensure that sufficient personnel resources were available to perform all probabilistic risk assessment duties, including model maintenance [H.1]. (Section 7.13)

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the licensee's failure to follow corrective action program procedures. Specifically, the team identified that condition reports were not being promptly screened for operability by the control room as required by procedure EN-LI-102-ANO-RC, "Corrective Action Program." The licensee's corrective actions included ensuring that there was no direct impact on safety and performing an operability determination for the identified condition reports, revising station policy to require that all condition reports be routed to the control room for review, and documenting the issue in the corrective action program as condition reports CR-ANO-C-2016-00359, CR-ANO-C-2016-00400, and CR-ANO-C-2016-00558.

  The failure to properly evaluate condition reports for classification and operability determination was a performance deficiency. The performance deficiency was determined to be more than minor because, it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to properly evaluate condition reports in accordance with applicable procedures could result in conditions adverse to quality being left uncorrected or not being evaluated to ensure operability was maintained. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 2 – "Mitigating Systems Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating system, structure or component, but the system, structure or component maintained its operability. This finding had a human performance cross-cutting aspect of Change Management because the licensee failed to adequately implement changes, including the training of staff concerning those changes, so that nuclear safety remained an overriding priority. Specifically, the licensee failed to ensure that station personnel were able to identify the difference between an "adverse" and "non-adverse" condition following the change which added these criteria to procedure EN-LI-102-ANO-RC [H.3]. (Section 7.14)

Cornerstone: Barrier Integrity

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to ensure that numerous structural components located inside Units 1 and 2 reactor containment buildings were installed per structural drawings. The team identified numerous sections of floor grating and ¼ inch plate steel supports that came in direct contact with the containment liner. In some cases, contact between the containment liner and the components resulted in damage to the liner and the liner protective coating. The licensee's corrective actions included performing an operability determination and determining that the Units 1 and 2 containment liner was operable but degraded and nonconforming, establishing

plans to correct the deficiencies in each unit's upcoming outage, and documenting the issue in the corrective action program as condition reports CR-ANO-1-2016-00492, CR-ANO-2-2016-00397, and CR-ANO-2-2016-00413.

The failure to ensure that numerous structural components inside Units 1 and 2 reactor containment buildings were properly installed was a performance deficiency. The performance deficiency was determined to be more than minor because, it was associated with the configuration control attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accident or events. Specifically, the failure to ensure that items inside the Units 1 and 2 reactor containment buildings were installed per structural drawings could result in damage to the safety-related containment liner and challenge its function to protect the public from radionuclide releases. The finding was evaluated using Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 3 – "Barrier Integrity Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the finding did not represent as actual open pathway in the physical integrity of reactor containment and did not involve an actual reduction in function of hydrogen ignitors. This finding had a problem identification and resolution cross-cutting aspect of Identification because the licensee failed to implement a corrective action program with a low threshold for identifying issues. Specifically, the licensee failed to identify numerous containment liner stand-off clearance deficiencies during the required containment liner inspections over the operating life of the plant [P.1]. (Section 7.15)

Cornerstone: Occupational Radiation Safety

- Green. The team identified a Green finding and an associated non-cited violation of 10 CFR 20.1501(c) because the licensee failed to ensure that instruments and equipment used for quantitative radiation measurements were calibrated periodically for the radiation measured. Specifically, the licensee did not properly calibrate the Unit 1 Reactor Building Atmospheric Particulate Radiation Monitor RE-7460. The license's corrective actions, included removing radiation monitor RE-7460 from service, instituting compensatory measures for assessing reactor coolant system leak detection in accordance with Technical Specification 3.4.15, "RCS Leakage Detection Instrumentation," and documenting the issue in the corrective action program as condition reports CR-ANO-1-2016-00056 and CR-ANO-1-2016-01087.

  The failure to properly calibrate radiation monitor RE-7460 was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the plant instrumentation attribute of the Occupational Radiation Safety cornerstone and adversely affected the cornerstone objective to ensure adequate protection of the worker health and safety from exposure to radiation from radioactive material. Specifically, the failure to properly calibrate radiation monitor RE-7460 adversely impacted its ability to be used to identify reactor coolant system leakage and the ability to assess radioactive airborne concentrations and dose rates. The finding was evaluated using the significance determination process in accordance with Inspection Manual Chapter 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," dated June 19, 2012, and Appendix C, "Occupational Radiation Safety Significance Determination Process," dated August 19, 2008. The team determined that the

finding was of very low safety significance (Green) because it was not an as-low-as-reasonably-achievable (ALARA) issue, there was no overexposure or substantial potential for an overexposure, and the ability to assess dose was not compromised. This finding had a human performance cross-cutting aspect of Documentation because the licensee failed to create and maintain complete, accurate and up-to-date documentation. Specifically, the licensee personnel failed to translate the vendor manual instruction to ensure the detector was installed against the hard stop so that it was in the correct position to make the calibration valid [H.7]. (Section 7.16)

Licensee-Identified Violations

Violations of very low safety significance that were identified by the licensee have been reviewed by the team. Corrective actions taken or planned by the licensee have been documented in the licensee's corrective action program. These violations and associated corrective action tracking numbers are listed in Section 8 of this report.

REPORT DETAILS

1. PERFORMANCE HISTORY

Entergy's Arkansas Nuclear One (ANO) Units 1 and 2 entered Column 4, Multiple/Repetitive Degraded cornerstone, of the NRC's Reactor Oversight Process (ROP) Action Matrix as a result of four Yellow findings starting in the third quarter of 2014. Two of these findings of substantial safety significance in the Initiating Events cornerstone were identified as a result of the events surrounding the stator drop event that occurred on March 31, 2013, which resulted in damage to non-safety plant equipment, one fatality and eight injured personnel. The other two Yellow findings were in the Mitigating Systems cornerstone for the performance deficiencies associated with inadequate flood protection of safety equipment that were revealed as a result of plant damage from the stator drop.

On March 31, 2013, during a Unit 1 outage, while lifting the Unit 1 main generator stator out of the turbine building the temporary lifting rig failed, causing the 525 ton stator to fall approximately 30 feet into the train bay. The train bay is shared between Unit 1 and Unit 2. The impact caused damage to the Unit 1 side of the turbine building and power distribution systems. Parts of the lift rig impacted the Unit 2 side of the turbine building. Damage to electrical buses resulted in a loss of offsite power (LOOP) to Unit 1 for six days. Emergency diesel generators (EDG) powered both trains of safety-related equipment in Unit 1. Cable damage prevented the use of the alternate AC (AAC) (i.e., station blackout) diesel generator to supply power to either unit. This resulted in a loss of power to all non-safety loads in Unit 1. Water from a ruptured fire main in the train bay leaked past degraded floor hatch seals and entered the Unit 1 auxiliary building. The water on the lowest level of the auxiliary building leaked past a partially open floor drain valve and entered watertight safety-related train B decay heat pump room.

Unit 2 had been operating at 100 percent power. When the stator impacted the turbine building floor the vibration caused the breaker for reactor coolant pump B to trip, which resulted in an automatic reactor trip. Water from the ruptured fire main flowed to several areas of the plant, causing additional damage. Offsite power to Unit 2 from startup transformer 3 (SU3) was lost after water caused an electrical fault inside the Unit 2 non-safety switchgear in the turbine building, resulting in a loss of power to the remaining reactor coolant pumps and the train B safety-related equipment. Train B equipment was powered by EDG 2, which stated automatically, while train A and non-safety equipment were automatically powered from startup transformer 2 (SU2).

The event was documented in NRC Augmented Inspection Team (AIT) Report 05000313/2013011 and 05000368/2013011 (ML13158A242). NRC AIT Follow-up Inspection Report 05000313/2013012 and 05000368/2013012 (ML14083A409 and Errata ML14101A219) documented a preliminary Red and Yellow finding for the heavy component drop for Units 1 and 2 respectively. The final significance determination and Notice of Violation (NOV) for the Yellow heavy component drop findings were documented in NRC Inspection Report 05000313/2014008 and 05000368/2014008 (ML14174A832). NRC Inspection Report 05000313/2014009 and 05000368/2014009 (ML14253A122) described the preliminary Yellow flood protection findings. The final significance determination and NOV for the Yellow flood protection findings were documented in NRC Inspection Report 05000313/2014010 and 05000368/2014010 (ML15023A076).

2. LICENSEE SITE RECOVERY AND COMPREHENSIVE RECOVERY PLAN

In response to these events, ANO implemented a recovery process based on benchmarks of other facilities. The recovery project included dedicated Entergy leadership, outside experts, and Entergy corporate personnel. The recovery process includes: 1) assessments of programs, design, and safety culture; 2) a collective evaluation of the assessment findings; 3) cause analysis of fundamental problems and problem areas; 4) a Comprehensive Recovery Plan (CRP) to address the fundamental problems and problem areas; and 5) effectiveness reviews.

ANO's recovery effort used the following phased approach:

- Assessment Phase
- Analysis Phase
- Action Plan Development Phase
- Implementation Phase

Assessment Phase

The Assessment Phase identified the problem descriptions to be analyzed; established the period of declining performance to be evaluated; determined whether programs were sufficient to identify, assess, and correct deficiencies to prevent further degradations; evaluated the capability of safety-and risk-significant systems to fulfill their intended safety functions; identified safety, organizational, and performance issues; evaluated emergency response organization (ERO) readiness; conducted a Third Party Nuclear Safety Culture Assessment (TPNSCA); and developed problem descriptions for the stator lift assembly collapse, unplanned scrams performance indicator, and degraded flood protection barriers.

During this phase, ANO conducted evaluations that included the topics listed in Inspection Procedure (IP) 95003. The evaluations included:

- Key Attribute Reviews (KAR)
- Identification, Assessment and Correction of Performance Deficiencies (IACPD) reviews
- Historical Data Review
- Focused Assessments
- Safety Culture Assessments

Each evaluation described problems as Significance Performance Deficiencies or Negative Observations. The results of each review were combined, and individual problems were "rolled up" into broader Significance Performance Deficiency Rollups and Problem Descriptions.

Analysis Phase

The Analysis Phase involved two steps – the Collective Evaluation and Cause Analyses. The Collective Evaluation analyzed the Assessment Phase results for patterns, trends, or groupings to identify the major problems areas driving performance problems.

Once the major problems were identified an analysis was performed to determine the relationships between the problems. The problems that caused other problems were

designated as Fundamental Problem Areas (FPA), and those caused by FPAs were designated as Problem Areas (PAs).

The Collective Evaluation report documented eight FPAs and (initially) five PAs. Each of the FPAs was entered into the Corrective Action Program (CAP). A root cause evaluation (RCE) was performed for each FPA to determine the extent of condition and cause, while the PAs initially received no cause evaluation. The recovery team believed that corrective actions addressing the causes for the FPAs would also resolve the causes for the PAs.

The NRC team questioned the recovery team's decision not to perform casual evaluations of the PAs. In response, ANO performed apparent cause evaluations (ACE) or gap analyses for each PA.

The NRC team questioned the recovery team's decision not to perform causal evaluations for the safety culture attributes identified in the Synergy safety culture survey, the TPNSCA, and the RCEs. The team also questioned the recovery team's decision not to treat safety culture as a separate problem area. In response, ANO performed a common cause analysis, an ACE, and developed the Safety Culture Area Action Plan (AAP).

The NRC team questioned the recovery team's decision to not evaluate Training, and the problems identified in both safety culture assessments. In response, ANO evaluated the uses of training to improve station performance and categorized training as a PA. ANO also performed cause evaluations for the issues that were identified during the safety culture assessments.

The recovery team later revised the PAs by deleting Performance Improvement Tools and Work Management and adding Training, resulting in four PAs. Safety culture, while not designated as an FPA or PA, nonetheless had an action plan developed. The final list of FPAs and PAs included:

<u>Fundamental Problem Areas</u>

- Leadership Fundamentals
- Organizational Capacity
- Corrective Action Program
- Preventive Maintenance
- Lift Rig Failure and Vendor Oversight
- Decision Making and Risk Management
- Design and Licensing Basis
- Corporate and Independent Oversight

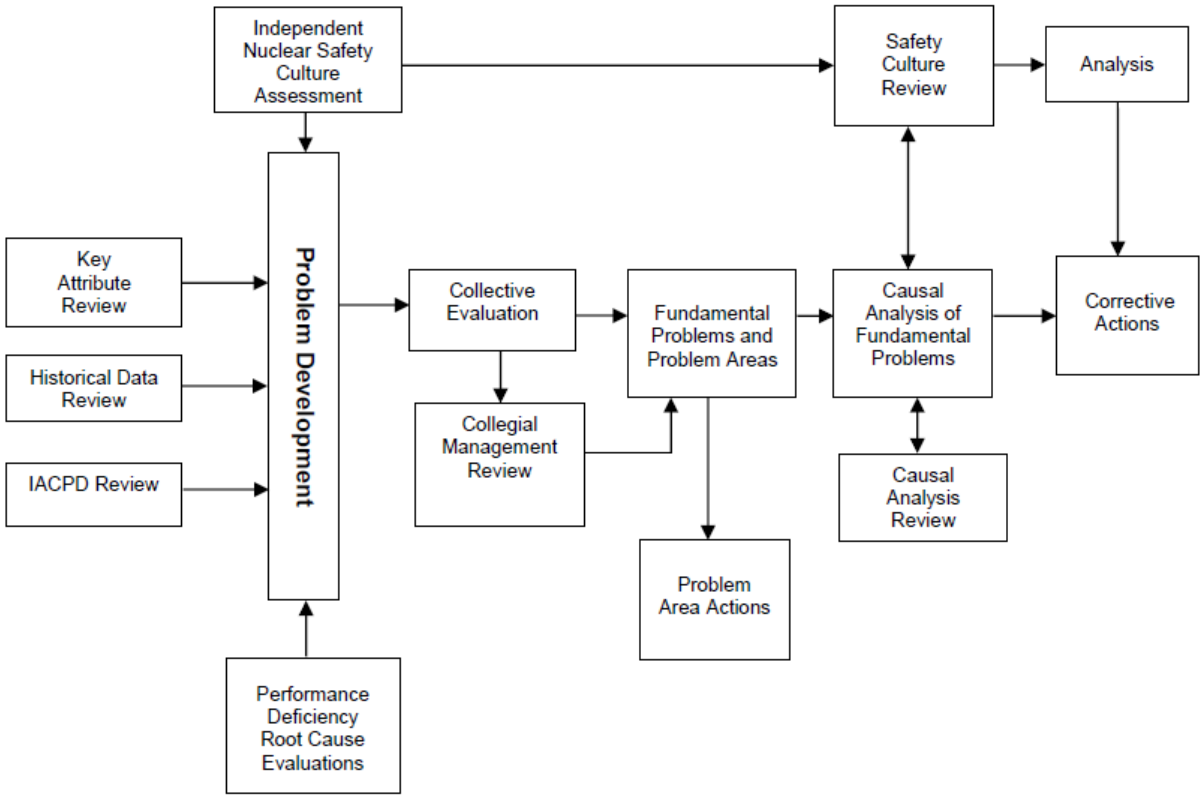
<u>Problem Areas</u>

- Nuclear Fundamentals
- Procedure and Work Instruction Quality
- Plant Health
- Training

Action Plan Development Phase

After the cause evaluations were completed, ANO developed and scheduled corrective actions in the CRP. When the IP 95003 inspection started the NRC team determined the CRP did not include goals and desired outcomes, corrective actions summaries, effectiveness measures, prioritization descriptions, and actions to sustain performance improvement. In response the recovery team developed AAPs for the FPAs, PAs, and safety culture that included each of the missing elements identified by the NRC team. The causes and actions were mapped to the Nuclear Safety Culture Traits and Attributes to aid in understanding predominant nuclear safety culture (NSC) causes. Each AAP was evaluated to determine if interim or compensatory actions were needed.

The following diagram graphically illustrates the recovery process:



3. NRC METHODOLOGY AND DIAGNOSTIC ASSESSMENT

3.1 Strategic Performance Area Affected
(IP 95003 Section 02.01.a)

The intent of IP 95003 is to allow the NRC to obtain a comprehensive understanding of the depth and breadth of safety, organizational, and performance issues at facilities where data indicates the potential for serious performance degradation. The objectives of the IP 95003 inspection are to:

1. Provide additional information to be used in deciding whether the continued operation of the facility is acceptable and whether additional regulatory actions are necessary to arrest declining performance;

2. Provide an independent assessment of the extent of risk-significant issues to aid in the NRC's current assessment that an acceptable margin of safety exists;

3. Independently evaluate the adequacy of facility programs and processes used to identify, evaluate, and correct performance issues;

4. Independently evaluate the adequacy of programs and processes in the affected strategic performance areas;

5. Provide insight into the overall root and contributing causes of identified performance deficiencies;

6. Independently assess the licensee's safety culture and assess their evaluation of safety culture.

The NRC team performed an independent review (diagnostic assessment) of ANO's performance, including conducting an evaluation of the adequacy of programs and processes in the affected strategic performance areas to ensure that the NRC has a comprehensive understanding of the depth and breadth of safety, organizational, and performance issues at ANO. The Yellow findings and White performance indicator (PI) affected the Initiating Events and Mitigating Systems cornerstones. Therefore, the applicable sections of IP 95003 that relate to the Reactor Safety Strategic Performance Area, plus sections required to be performed during all IP 95003 inspections were implemented.

Because the supplemental inspections for the White PI and Yellow findings for each unit had not been conducted, the scope of this inspection included use of IP 95001, "Supplemental Inspection for One or Two White Inputs in a Strategic Performance Area," and IP 95002, "Supplemental Inspection for One Degraded Cornerstone or Any Three White Inputs in a Strategic Performance Area."

3.2 Inspection Focus
(IP 95003 Section 02.01.b)

The NRC team implemented the requirements of IP 95003 as follows:

- Assess the Reactor Safety Strategic Performance Area:
    - Strategic performance area identification was performed (Section 02.01)
    - Review of licensee control systems for identifying, assessing and correcting performance deficiencies was performed (Section 02.02)
    - Assessing of performance in the reactor safety strategic area was performed (Section 02.03)
- The NRC determined through inspections that performance in the Radiation Safety and Safeguards Strategic Performance Areas has been acceptable. Therefore, the

inspections in Sections 02.04 through 02.06 were not required.

- Perform safety culture assessments:
    - Evaluate the licensee's TPNSCA was performed (Sections 02.07)
    - Determine the scope of and plan for the NRC's Graded Safety Culture Assessment was performed (Section 02.08)
    - Perform the NRC's Graded Safety Culture Assessment was performed (Section 02.09)
- Review the significant performance deficiency causes was performed (Section 02.10)
- A review of performance in the Emergency Preparedness Area was performed (Section 02.03.g). The NRC determined through inspections that there were no concerns with performance of the emergency response teams. Therefore, the NRC did not implement Attachment 95003.01.

The recovery team determined, and the NRC verified, that the period of performance decline started in 2007. Therefore, inspection activities reviewed ANO performance from 2007 through January 2016.

The NRC team reviewed ANO's cause evaluations for the Yellow findings and the White PI to determine if corrective actions, taken and planned, were sufficient to correct the deficiencies and prevent recurrence. The team performed interviews with Corporate Functional Area Managers located at Entergy Corporate in Jackson, Mississippi, to ensure ANO adequately addressed feedback from corporate assessments, evaluations, and oversight. The NRC team assessed the audits and assessments performed by the Nuclear Independent Oversight (NIOS) group, the line organization, and external organizations.

The NRC team assessed whether the process for allocating resources provided for consideration of safety and compliance, and whether consideration was given to the management of online maintenance, outage activities, plant modifications, maintenance and engineering backlogs, and correction of workarounds. The NRC team evaluated whether performance indicators and thresholds/goals were aligned with the corrective actions needed to address the documented performance issues.

The NRC team assessed whether employees were willing to raise safety concerns and that concerns entered into the Employee Concerns Program (ECP) received attention through interviews, observations, and reviews of documentation. The NRC team assessed the mechanisms for the workforce to suggest improvements and explain disagreements with technical resolutions for identified deficiencies, and the available feedback mechanisms.

For the Design KAR, the NRC team selected a sample of systems and assessed the extent of risk-significant design issues. Systems selected included AC electrical power distribution, containment sump screens, fire protection, service water (SW), and a sample of planned modifications listed in the Site Integrated Planning Database (SIPD). The NRC team performed at-power containment walkdowns in Units 1 and 2 to independently assess the condition of the containment protective coatings, sump screens, and containment liner.

For the Human Performance KAR, the NRC team assessed the actions for identifying, evaluating, and correcting deficiencies involving human performance and organizational and programmatic problems. This included reviewing ANO's ability to implement the Emergency Plan.

For the Procedure Quality KAR, the NRC team assessed the actions for addressing procedure and work instruction quality, the timeliness of the procedure and work instruction feedback process, the willingness to stop and correct an unclear procedure, human factoring (the clarity of precautions, limitations, and instructions in notes), and a sample of Emergency Plan implementing procedures against the requirements of the Emergency Plan.

For the Equipment Performance KAR, the NRC team assessed the maintenance and testing of risk-significant plant structures, systems, and components (SSCs). The NRC team assessed ANO's implementation of on-line and outage maintenance, including backlogs; preventive maintenance (PM) scope, frequency, deferrals, technical bases, and use of vendor recommendations and industry experience; and longstanding equipment issues. The NRC team assessed a sample of ANO's engineering programs.

For the Configuration Control KAR, the NRC team assessed whether ANO maintained risk-significant systems and fission product barriers in accordance with the design and licensing basis. The NRC team reviewed the root causes, extent of condition and extent of cause for the Yellow findings involving the missing and degraded flood protection features for additional configuration control insights. The NRC team assessed proceduralized work-arounds for degraded/non-conforming equipment, longstanding equipment issues, configuration control, the use of risk in the work control processes, the causes for reactor fuel leaks, and the corrective actions for flood protection deficiencies on outside transformers.

For the ERO Readiness KAR, the NRC team assessed ANO's identification and correction of deficiencies involving ERO performance during drills and exercises; the availability of qualified staffing on-shift for emergencies; the capability to activate, staff, and augment the emergency response facilities and organization; the emergency siren system health; changes to the emergency action levels and the Emergency Plan; and corrective actions for the willful falsification of Emergency Plan records (documented in NRC Inspection Report 05000313/2013503 and 05000368/2013503).

ANO completed the TPNSCA prior to the IP 95003 inspection. As a result, the NRC team evaluated the results of the assessment, along with a recently completed Synergy Safety Culture Survey and follow-up surveys. The NRC team evaluated ANO's March 2015 management team decision that an updated safety culture review was not needed. The NRC team performed interviews and observations, with 17 percent of the general population and 20 percent of the most affected groups identified in the Safety Culture Survey data.

The NRC team performed the requirements of IP 95002 for the stator load drop and the degraded flood protection features Yellow findings. For each of these findings, the NRC team evaluated or independently determined that ANO adequately identified the problem; performed a root cause, extent of condition, and extent of cause; planned or has completed corrective actions that address the NOV that was the basis for the finding; and considered whether any safety culture component caused or significantly contributed to the event.

For the Unit 2 White PI, the NRC team completed the requirements of IP 95001. The NRC team evaluated that ANO adequately identified the problem; performed a root cause, extent of

condition, and extent of cause; and planned or has completed corrective actions that address the NOV that was the basis for the finding. The NRC team used the ANO Unit 2 simulator to evaluate operator performance during scenarios similar to the events that resulted in the unplanned scrams.

4. REVIEW OF GREATER THAN GREEN FINDINGS AND PERFORMANCE INDICATOR

(IP 95003 Section 02.10)

4.1 Review of Yellow Stator Drop Finding

(IP 95002 and IP 95003 Section 02.02)

Background

On March 31, 2013, a temporary lifting rig failed and caused the drop of the 525-ton Unit 1 main generator stator. The stator drop resulted in a LOOP for Unit 1, which was in a refueling outage; and a reactor trip and partial LOOP for Unit 2, which had been operating at full power. There was structural damage to the turbine building and the fire protection system. On April 5, 2013, the NRC initiated an AIT to review the event. The AIT documented Unresolved Item (URI) 05000313/2013011-09, associated with ANO's implementation of the Material Handling Program. On March 24, 2014, the NRC closed the URI to Apparent Violations (AVs) 05000313/2013012-04, and 05000368/2013012-05 associated with ANO's failure to implement the requirements contained in procedure EN-MA-119, "Material Handling Program." On June 23, 2014, the NRC issued the final Yellow safety significance determination and NOV in NRC Inspection Report 05000313/2014008 and 05000368/2014008. The NOV stated:

1. The licensee approved a design for the temporary hoisting assembly that was not supported by detailed drawings, specifications, evaluations, and/or certifications. The licensee failed to identify the deficiencies in vendor Calculation 27619-C1, "Heavy Lift Gantry Calculation," and the incorrectly sized component in the north tower structure of the temporary hoisting assembly. In addition, the temporary hoisting assembly was not designed for at least 125 percent of the projected hook load.

2. The licensee failed to perform a load test in all configurations for which the temporary hoisting assembly would be used.

4.1.1 Problem Identification

(IP 95002 Sections 02.01 and 02.02)

ANO initiated condition report (CR) CR-ANO-C-2013-0888 in March 2013, to evaluate the lift rig failure. The NRC team noted that this RCE focused on the vendor's actions that resulted in the lift rig failure, and did not include a review of ANO's role. ANO subsequently performed a second RCE to assess ANO's role. The NRC team noted that the ANO's initial approach to performing the RCE was consistent with performance observations at that time, which included focusing on the most apparent problems (e.g., the equipment failure) without examining the organizational and programmatic causes that may have led to the problem.

4.1.2 Root Cause, Extent of Condition, and Extent of Cause

(IP 95002 02.02)

After the NRC issued the AVs, ANO initiated a second RCE in September 2014, (CR-ANO-C-2014-02838) to evaluate ANO's failure to recognize the deficient design and the failure to ensure that load testing was performed.

Root Cause Evaluation CR-ANO-C-2013-0888

The NRC team determined that ANO used an evaluation team with broad knowledge and expertise. ANO's RCE team applied Fault Tree Analysis, Failure Mode Analysis, and Events and Causal Factors Chart techniques to evaluate the condition. The RCE report documented the following causes:

Root Cause 1: The temporary lift assembly design did not ensure the lift assembly north tower could support the loads anticipated for the lift.

Root Cause 2: The subcontractor failed to perform required load testing of the modified temporary lift assembly prior to its use at ANO in accordance with OSHA [Occupational Safety and Health Administration] regulations.

Contributing Cause 1: The lead contractor and subcontractors inaccurately represented that the hoist assembly had been used at other electric power stations to lift components that exceeded the anticipated weight of the Unit 1 stator.

Contributing Cause 2: The lead contractor failed to provide adequate oversight and control of the sub-contractor's performance.

Contributing Cause 3: Procedure EN-MA-119 did not provide clear guidance regarding independent reviews of special lift equipment.

Contributing Cause 4: Supplemental project personnel lacked sufficient knowledge of OSHA and ASME [American Society of Mechanical Engineers] NQA-1 application to temporary lift assemblies and accepted the sub-contractor's assertion that load testing was not required based on a combination of engineering analysis and previous use.

Root Cause Evaluation CR-ANO-C-2014-02318

The NRC team determined that ANO used an evaluation team with broad knowledge and expertise. ANO's RCE team applied Barrier Analysis and Why Staircase techniques to evaluate the condition. The RCE report documented the following causes:

Root Cause 1: The Stator Rewind Project was not organized or managed in a manner that provided sufficient oversight of the vendor's design and testing for the temporary lift assembly.

Root Cause 2: Procedure EN-DC-114, "Project Management," provided insufficient guidance to identify and manage risk items with high consequence, particularly for cases where the probability of the event was judged to be very low.

Contributing Cause 1: Weak implementation of administrative controls applicable to the project contributed to the failure to adequately implement a number of administrative requirements.

Contributing Cause 2: Procedure EN-MA-119 did not provide clear guidance regarding the level of review required to approve the design and testing of vendor-supplied special lift equipment, including how an alternate standard should be identified and approved for use.

Contributing Cause 3: ANO placed undue confidence in the vendor's capabilities.

Contributing Cause 4: The corrective action plan developed and implemented for CR-ANO-C-2012-0596, "Conservative Assumptions in Decision Making (H.1.b) Substantive Cross-Cutting Issue," was not effective in changing behaviors of personnel involved in high risk decisions (including Project Management). This cause contributed to the failure to detect the deficient vendor design and faulty decision not to perform a load test, which resulted in a non-compliance with procedure EN-MA-119 requirements.

Extent of Condition for RCE CR-ANO-C-2013-0888

The NRC team concluded that the extent of condition review for this RCE focused narrowly on problems with the guidance and implementation of procedure EN-MA-119. ANO's review included engineering documentation and oversight for the design, testing, and installation activities and did not evaluate ANO's role in the stator drop event.

Extent of Condition for RCE CR-ANO-C-2014-02318

The extent of condition review for this RCE focused on the identification of additional vendor-related deficiencies in other processes and products, including:

- Vendor-contracted designs for specialty equipment devices used to support maintenance, testing, or modification activities (CR-ANO-C-2014-02318, corrective actions (CA) -8 and -87).

- Vendor-contracted technical services not bound by the design change process (CR-ANO-C-2014-02318, CAs -9 and -89).

- ANO and vendor design input documents prepared in the last 3 years (CR-ANO-C-2014-02318, CA-94).

- ANO and vendor-prepared calculations prepared in the last 3 years (CR-ANO-C-2014-02318, CA-95).

- ANO and vendor-prepared engineering reports prepared in the last 3 years (CR-ANO-C-2014-02318, CA-96).

- ANO and vendor-prepared engineering changes prepared in the last 3 years (CR-ANO-C-2014-02318, CA-97).

- ANO and vendor-prepared engineering changes prepared for Unit 1 refueling outage 1R25 (CR-ANO-C-2014-02318, CA-98).

The NRC team noted that ANO's extent of condition review did not identify any additional conditions adverse to quality.

Extent of Cause for RCE CR-ANO-C-2013-0888

The NRC team noted that ANO's extent of cause review for this RCE focused on fleet-wide critical lifts to be performed with vendor specialty equipment to ensure that lessons learned from the ANO event were incorporated. Additionally, Entergy initiated actions to enhance vendor oversight fleet-wide.

Extent of Cause for RCE CR-ANO-C-2014-02318

The NRC team noted that ANO's extent of cause review for this RCE focused on the identification of site-wide weaknesses similar to the causes of the stator drop event, including:

- Assessing whether the organization of temporary work groups and large multi-discipline project teams ensured the ability to provide adequate oversight.

- Assessing whether technical/administrative procedures provided insufficient guidance to identify and address items with potentially high consequences.

- Assessing whether non-engineering procedures with the potential to affect nuclear safety identified circumstances where engineering support should be obtained.

ANO's extent of cause review concluded that procedure changes were needed to address the following:

- Improve guidance to ensure that the identification and management of risk items with potentially high consequences.

- Develop a strategy to reinforce human performance behaviors in the areas of procedure use and adherence, challenging assumptions, and field presence by leaders.

- Revise procedures to clarify the control of engineering support.

4.1.3 Corrective Actions
(IP 95002 Section 02.03)

The following summarizes the major corrective actions that were included in the lift rig failure:

- Revise project management procedures to ensure projects are organized and managed with (1) effective support by subject matter experts and (2) effective vendor and technical oversight. (VO-18)

- Revise project management procedures to ensure high consequence risks are properly identified and eliminated/mitigated through a structured risk management process. (VO-19)

- Issue a procedure for management and oversight of supplemental personnel including improvements to (1) defined responsibilities, (2) assessment of risk, and (3) vendor oversight plans. (VO-20)

- Develop and implement recurring training for project management personnel on risk recognition and conservative decision making. (VO-21)

- Revise procedure EN-DC-114 to provide guidance in specifying contract language which will ensure detailed engineering calculations, quality requirements and standards are provided for internal and third party review, in accordance with revised procedure EN-MA-119, when specially designed temporary lift assembles are to be used. (VO-23)

- Revise procedure EN-MA-119, to require a documented engineering response to evaluate critical lifts if using any specially designed temporary lifting device, any lifting device that cannot be load tested per procedure EN-MA-119 criteria, or any lifting device without a certified load rating name plate rating affixed to it. (VO-24)

Additionally, ANO developed a number of corrective actions related to the Vendor Oversight FPA, which are described in more detail in Section 5.5.5.

4.1.4 Independent Assessment of Extent of Condition and Extent of Cause
(IP 95002 Section 02.04)

The NRC team conducted an independent extent of condition and extent of cause review for the issues associated with the stator drop Yellow findings. The NRC team confirmed that the findings involved organizational and programmatic factors related to the management and oversight of contracted activities. The NRC team verified that there were deficiencies in the organization and management of the Stator Lift Project, overconfidence in the vendor's work, poor implementation of procedures, and weaknesses in risk identification and mitigation.

The NRC team's analysis included the use of guidance in the following NRC IPs:

- IP 71841, "Human Performance"
- IP 71111.18, "Plant Modifications"
- IP 71111.04, "Equipment Alignment"
- IP 71111.13, "Maintenance Risk and Assessments and Emergent Work"

The NRC team's independent extent of condition and extent of cause review included the following areas:

- Implementation of post-Fukushima modifications to install spent fuel pool (SFP) level instruments.

- A sample of vendor contracts to assess whether quality and technical requirements were included.

- Interviews with project managers to assess the oversight provided by ANO staff to vendor staff. The projects reviewed included: 2L-L6 Cooling Tower Crane Project, SW Piping Replacement Project, and Main Steam Isolation Valve Refurbishment Project.

- A sample of procedures related to the use of permanently installed rigging equipment.

- Observations of multiple lifting and rigging activities between January 25 and February 5, 2016, and February 22-26, 2016. Section 5.5.7 describes additional reviews of lifting and rigging.

The results of this independent review are documented below.

4.1.5 Safety Culture Considerations
(IP 95002 Section 02.05)

The NRC team concluded that ANO's evaluation appropriately considered safety culture components. ANO's evaluation identified weaknesses in the following safety culture components:

- Field Presence
- Roles, Responsibilities, and Authorities
- Resources
- Challenge Assumptions
- Conservative Bias
- Procedure Adherence
- Consistent Process

Corrective actions were developed for root and contributing causes associated with each of the above safety culture attributes. The NRC team determined that the RCEs identified problems associated with the following safety culture components but ANO did not develop corrective actions to address the performance concerns. The concern with corrective action development for safety culture is further discussed in Section 6.2.

- Standards
- Teamwork
- Accountability for Decisions
- Change Management
- Resolution
- Work Management
- Challenge the Unknown
- Avoid Complacency

Inspection Team Observations and Findings

Problem Identification

ANO initiated the first RCE, CR-ANO-C-2013-0888, in March 2013, to evaluate the collapse of the stator lifting rig. As discussed in NRC Inspection Report 05000313/2015008 and 05000368/2015008, ANO did not document the AV and the subsequent NOV in the CAP until September 2014. The NRC noted in NRC Inspection report 05000313/2013012 and 05000368/2013012 that the first RCE did not evaluate ANO's failure to adequately review and approve work performed by a contractor. The NRC team determined that the second RCE, CR-ANO-C-2014-2318, adequately addressed the identification problems, risk consequences, and compliance concerns associated with the stator drop event.

The NRC team concluded that the processes that were used to develop the RCEs were appropriate. Additionally, the NRC team concluded that the analysis techniques used by ANO's evaluation team were sufficient to identify the root and contributing causes of the stator drop event.

Extent of Condition

The NRC team concluded that ANO's extent of condition review did not address the following items to the extent described in the second RCE:

- Action taken to address Extent of Condition 2 did not address the entire scope of the specified action. As part of this extent of condition review, ANO reviewed other contracted services procured in the last 3 years to assure quality and technical requirements were met.

    - The review of contracts had excluded contracts that had been completed. The NRC team identified examples involving the spent fuel storage facility, a transformer that provided offsite power to Unit 2, and flood barrier walkdowns.

    - Failed to review 125 contracts that involved non-safety work. The NRC team identified examples involving analyses used to determine the acceptability of the transient stability of the electric power system for Unit 2, the qualification of new SFP level instrumentation, and the software for analyzing the results of flow accelerated corrosion (FAC) in piping.

    - Failed to review contracts under $250,000 associated with non-safety equipment.

    A violation associated with the failure to complete extent of conditions reviews is documented in Section 7.1.

- Documentation for closed actions involving the extent of condition, extent of cause, and corrective action documentation did not demonstrate that the actions had been fully completed. Nevertheless, the NRC team independently confirmed that the actions had been completed.

Extent of Cause

The NRC team concluded that ANO performed a comprehensive extent of cause review with one exception. Specifically, the extent of cause review performed for RCE CR-ANO-C-2014-02318 Root Cause 2, which reviewed technical/administrative procedures to determine whether they provided sufficient guidance for the activity performed, did not provide objective evidence as to why additional corrective actions were not needed to address the area.

The NRC team noted that ANO's evaluation reviewed CRs written in a window of the previous 45 days and established a success criterion of "no adverse consequence." ANO closed the action following the review of 71 CRs for which no adverse consequence occurred as a result of the lack of clear guidance. The NRC team questioned the basis for the selection of this success criterion involving no negative consequence, and why the scope of the review was not expanded since a large number of CRs was found with the attribute of "lack of guidance." The NRC team requested the 71 CRs for independent review.

ANO was unable to provide the 71 CRs included in the extent of cause evaluations. ANO re-performed the extent of cause analysis using the same period and identified 167 CRs with the associated attribute of lack of guidance. ANO determined that the discrepancy between the 167 CRs and the original population of 71 CRs was attributed to not having documented the original search criteria. ANO's review concluded that a problem in the adequacy of operations

procedures should have been identified, and the scope of the review should have been expanded.

Following the re-performance of the extent of cause review, ANO performed an analysis to determine if corrective actions being taken in the CRP for procedure/work instruction quality (documented in CR-ANO-C-2015-03033) encompassed the operations procedure deficiencies. ANO concluded and the NRC team verified that corrective actions in the CRP encompassed the issue. The NRC team agreed with this assessment. The NRC team concluded that the failure to perform a complete extent of cause review that evaluated whether the root cause of the stator drop event had a similar adverse impact in other programs or processes was contrary to procedure EN-LI-118, "Causal Evaluation Process," Revision 22. However, the NRC team determined this issue was of minor safety significance since ANO was able to demonstrate that the problems identified were addressed by corrective actions in the CRP.

Corrective Actions

The NRC team conducted a review of ANO's completed corrective actions associated with the stator drop event. The corrective action plan in RCE CR-ANO-C-2014-02318 included 195 corrective actions. At the time of this inspection, 14 corrective actions remained open. The NRC team reviewed closeout documentation for 61 completed corrective actions (CR-ANO-C-2014-02318, CAs 8-23, 26, 28-30, 32, 34, 56, 58-60, 62, 63, 67, 82, 85, 87, 89, 92, 94-98, 100-102, 110, 113, 114, 117, 118, 121-123, 134, 152, 158, 177, 178, 181, and 195). Additionally, the NRC team reviewed a sample of completed corrective actions from RCE CR-ANO-C-2013-0888 (CAs 1-12, 19, and 20).

The NRC team identified the following issues:

- ANO closed CR-ANO-C-2014-02318, CA-19 when 20 percent of the required population had not received the training specified in this action. This action was intended to reinforce expected behaviors in the project management group for the oversight of major contractors and supplemental personnel. In response, ANO documented the incomplete training in CR-ANO-C-2016-00574. The NRC team concluded that the failure to provide the required training as specified by CA-19 was contrary to procedure EN-LI-102, "Corrective Action Program." The NRC team concluded that this issue was of minor significance because, although 20 percent of the project management group was omitted, they had received similar training as part of RCE CR-ANO-C-2013-0888 (CAs 22-26, and 33).

- Actions to ensure that "first-of-a-kind" evolutions received a risk screening were not fully effective. The NRC team noted that RCE CR-ANO-C-2014-02318 specified that procedure EN-DC-114 be revised to provide sufficient guidance to identify and manage risk items with high consequences, particularly if the likelihood of occurrence was deemed to be low. ANO's actions included revising the project management procedures to include guidance on how to identify and manage "first-of-a-kind" and "first-in-a-while at ANO" activities. As part of the review of corrective actions, the NRC team attended a Risk Review Meeting for a peening project performed by a vendor. During the meeting, the NRC team noted that during the identification of risks for the Unit 1 bottom-mounted nozzle reactor vessel peening project, a first-of-a-kind risk was not identified in the Unit 1 Risk Matrix. In contrast, the NRC team noted that the Unit 2 Reactor Vessel Closure Head Alloy 600 peening project had a first-of-a-kind risk identified in the Unit 2 Risk Matrix. The NRC team questioned the distinction between these projects since neither

had been performed before at ANO. ANO's responded that the Unit 1 activity was not considered to be a first-of-a-kind evolution because bottom-mounted nozzle peening had been performed by the vendor previously in Japan and the processes planned for Unit 1 work were aligned with the previous application. In contrast, ANO indicated that since peening had never been applied to reactor vessel closure head nozzles, it was a first-of-a-kind evolution for the vendor.

As part of the corrective action to prevent recurrence (CAPR), procedure EN-FAP-PM-004, "Project Implementation – Segment 3 and 4," Revision 3, was revised to provide risk management guidance to specifically identify credible (though potentially) low probability items of high consequence, as well as focused oversight of potential high consequence evolutions. The NRC team noted that ANO's interpretation of a first-of-a-kind evolution did not meet the intent of procedure EN-FAP-PM-004 because the procedure focused on whether the work was new to the site rather than new to the vendor. Additionally, the NRC team concluded that recent examples of placing undue confidence in vendor expertise was similar to those that contributed to the stator drop event. ANO initiated CR-ANO-1-2016-00520 to document the unclear guidance for first-of-a-kind risk reviews. The NRC team considered the failure to ensure the Unit 1 bottom-mounted nozzle peening project was identified as a first-of-a-kind project to be contrary to the requirements of procedure EN-FAP-PM-004. The NRC team concluded that this issue was of minor significance because other actions had already been taken to address the potential risk.

The NRC team determined that with the additional planned actions implemented by ANO, the corrective action plan addressed the root and contributing causes.

Effectiveness Reviews

The NRC team assessed ANO's effectiveness review plans for CAPRs and for the stator drop event to determine whether the expected results were achieved. The NRC team concluded that the effectiveness review plan for the CAPRs (LO-ALO-2014-001, CAs 10-13) contained quantitative and qualitative measures to verify that the CAPRs were implemented and were effective. In particular, the effectiveness reviews included actions to verify that the changes met the intent of the CAPRs and contained reviews of current projects to assess that the process was being implemented as intended.

In contrast, the NRC team noted that the effectiveness review associated with stator drop corrective action plan LO-ALO-2015-001, CA-7 and CA-8, did not contain quantitative and qualitative measures to verify that the corrective action was effective. Specifically, the NRC team identified that three effectiveness reviews only verified that actions were completed, not that they were effective. The NRC team concluded that the Effectiveness Review Plan per LO-ALO-2015-001, CA-7 and CA-8 was inadequate. The NRC team identified a finding associated with the failure to develop an adequate effectiveness review, documented in Section 7.2.

Addressing the Notice of Violation
(IP 95002 Section 02.03.e)

The NRC issued an NOV (EA-14-008) to ANO on June 23, 2014. Through their review, the NRC team concluded that information regarding the reasons for the violation, the corrective actions taken and planned to be taken to correct the violation and prevent recurrence, and the date when full compliance was achieved, was addressed in Entergy's letter dated November 20,

2014, (ML14324A783). During this inspection, the NRC team confirmed that ANO's RCE and planned and implemented corrective actions adequately addressed the stated violations.

4.2. Yellow Flood Protection Finding
(IP 95002 and IP 95003 Section 02.10)

Background

On March 31, 2013, the failure of a temporary lifting rig caused the drop of the Unit 1 main generator stator. The dropped stator damaged fire protection system piping located in the turbine building train bay. Water from the fire protection system migrated to the Unit 1 auxiliary building, filling the auxiliary building sump. Water then leaked into the B decay heat vault, as documented in CR-ANO-1-2013-01286. The NRC performed inspections on both the stator drop event and the subsequent flooding event that followed. On August 1, 2014, the NRC documented preliminary Yellow findings in NRC Inspection Report 05000313/2014009 and 05000368/2014009. On January 22, 2015, the NRC issued the final significance determination in NRC Inspection Report 05000313/2014010 and 05000368/2014010. The finding identified two violations associated with the failure to design, construct, and maintain the Unit 1 and Unit 2 auxiliary buildings and emergency diesel fuel storage building flood barriers so that they would protect safety-related equipment from flooding. The NRC concluded that these violations were of substantial safety significance (Yellow). The two violations were:

1. The licensee failed to assure that applicable regulatory requirements and the design basis were correctly translated into specifications, drawings, procedures, and instructions and that design changes were subject to design control measures commensurate with those applied to the original design. Specifically, ANO failed to protect safety-related equipment located below the design flood level from the effects of flooding.

2. The licensee did not accomplish activities affecting quality in accordance with documented instructions, procedures, or drawings. Specifically, the licensee failed to assure that safety-related equipment located below the design flood level was protected from the effects of flooding.

All safety-related equipment needed to safely shut Units 1 and 2 down and maintain them safely shut down is located below the maximum flood level and is required to be protected from flooding. ANO located these systems in either the auxiliary building or the emergency diesel fuel storage building. Over 100 examples of unsealed or degraded penetrations, unisolable floor drains, and open ventilation ductwork were identified. Additionally, degraded flood barriers such as gaskets, access doors and closure plates, and penetration seals were identified.

During the third quarter of 2012, ANO had an outside design agency (ODA) to perform walkdowns of the flood protection features required by the licensing basis. These walkdowns were required by an NRC 10 CFR 50.54(f) request for information letter dated March 12, 2012 (ML12053A340). The walkdowns were part of the post-Fukushima flooding design basis verification effort that was intended to identify and address plant-specific vulnerabilities or performance deficiencies, and verify the adequacy of monitoring and maintenance procedures. A second ODA walkdown was conducted in the third quarter of 2013 as a result of the self-revealing deficiencies from the flooding event. This second walkdown identified more than 100 additional deficiencies. Some of the deficiencies were from original construction, and some involved barriers that had ineffective PM or corrective maintenance. These additional

deficiencies existed at the time of the first ODA walkdown but were not identified. The inadequate walkdowns were evaluated and documented by ANO in ACE CR-HQN-2014-00059.

4.2.1 Problem Identification
(IP 95002 Section 02.01)

ANO performed two RCEs for this finding. The RCE performed under CR-ANO-C-2013-1304 looked at flood protection issues following the flooding associated with the stator drop event. ANO subsequently decided to perform another RCE under CR-ANO-C-2014-0259 because they determined that the first RCE was not adequate.

4.2.2 Root Cause, Extent of Condition, and Extent of Cause
(IP 95002 Section 02.02)

Root Cause Evaluation CR-ANO-C-2013-1304

ANO used a cross-functional team with both internal and external team members with experience in the areas of engineering, licensing, and maintenance. ANO used Event and Causal Factors Charting as the analysis method.

ANO determined that ineffective PM strategies resulted in degraded passive flood protection hatches that had the potential to impact safety-related equipment. A significant contributor to this cause was ANO not recognizing the significance of flood hatch integrity. ANO determined that PM strategies for different flood protection hatches were inconsistent and inadequate. Additionally, numerous missed opportunities were revealed from 2011 to present where ANO failed to recognize adverse conditions with hatches or adverse trends in flood seal health. The RCE team did not identify any design deficiencies or concerns with the maintenance rule program monitoring of flood barriers. Barring degradation, installation error, or other non-conforming conditions, the doors and hatches should perform their intended design functions. Following the review, ANO initiated corrective actions to improve flood response and PM procedures, verify and document the design for flood protection features, and correct and upgrade flood seals that used low density foam to more modern materials. The RCE identified the following causes:

Root Cause: Inadequate PM strategy to maintain flood hatches and doors in accordance with plant design basis.

Contributing Cause 1: Failure to recognize the significance of passive flood hatches as credited flood barriers for a design basis flooding event.

Contributing Cause 2: Post maintenance testing of flood hatches is not required if the hatch is removed for scheduled or emergent maintenance other than the hatch PM.

Root Cause Evaluation CR-ANO-C-2014-0259

ANO used a cross-functional team with both internal and external team members with experience in the areas of engineering, licensing, maintenance, operations, performance improvement, regulatory oversight, training, and quality assurance. ANO used multiple analytical techniques including Event Reconstruction, Barrier Analysis, Common Cause Analysis, Streaming Analysis, Organizational and Programmatic Analysis, Operating Experience (OE) Review, Safety Culture Review, and Cognitive Analysis.

The RCE report documented the following causes:

Root Cause 1: When previous opportunities for identification [of degraded flood protection features] occurred, ANO personnel did not sufficiently challenge and verify whether existing plant configuration met licensing basis requirements for mitigation of flooding events.

Root Cause 2: The detailed design requirements of flooding features were not documented.

Contributing Cause 1: Because reviews and responses were narrowly focused, the organization did not identify deficiencies after receiving previous internal and external OE related to flooding.

Contributing Cause 2: The PM strategy in place to maintain flood protection features was inadequate both in frequency and content.

Contributing Cause 3: Entergy personnel provided minimal oversight of ODA activities related to Fukushima walkdowns.

Extent of Condition

The initial condition evaluated by ANO was external and internal flood protection deficiencies related to Updated Final Safety Analysis Report (UFSAR) requirements for Unit 1 and Unit 2 auxiliary and emergency diesel fuel storage buildings. This was later expanded to include the following passive structures and systems and other acts of nature:

- Reactor building, intake structure, emergency cooling pond, and post-accident sample building.
- Barriers used to protect against external and internal floods, high energy line breaks, fire, external events (tornado, icing, seismic, etc.), and radiation.
- Barriers required to support emergency operating procedure (EOP) actions.
- Drains, abandoned equipment, and openings that may pose a threat to flood protections.

The extent of condition evaluation included a review of the Security Plan, Technical Specifications, Quality Assurance Manual, Emergency Plan, Offsite Dose Calculation Manual, Core Operating Limits Report, National Pollution Discharge Elimination System Permit, Independent Spent Fuel Storage Installation Certificate of Conformance, and Fire Protection Program.

Extent of Cause

ANO's extent of cause review looked for potential deficiencies that went undetected by station personnel. The extent of cause review was subsequently expanded to look for other engineering activities that might be susceptible to causes identified by ANO during the review. This review included:

- Flood barriers in other Seismic Class 1 structures that could challenge the ability to maintain reactor core cooling.

- Deficiencies in SSCs that could result in an initiating event.

- Flood barriers in any structure that could result in an initiating event.

- Equipment/floor drains or roof drains that could result in challenging the ability to maintain reactor core cooling or result in an initiating event.

- Passive protection against other external events such as tornado, icing, seismic events, fire, security, etc. that could result in challenging the ability to maintain reactor core cooling or result in an initiating event.

- Passive barriers that offer radiation protection or air tightness.

- Equipment required to mitigate beyond design basis accidents or events.

- Barriers/drains that must function in order to be able to perform EOPs.

- The scope and content of procedure EN-LI-100, "Process Applicability Determination," Revision 16.

4.2.3 Corrective Action
(IP 95002 Section 02.03)

ANO developed a corrective action plan to addresses the root causes, contributing causes, and safety culture attributes. The corrective actions were intended to improve flooding protection program ownership, design documentation, plant configuration, maintenance, process controls and management oversight. To provide sustainability of the corrective actions, ANO established the new External and Internal Flood Protection Program that included quarterly Program Health Reports and Plant Health Committee oversight. The major corrective actions taken and planned included:

- Develop external flooding (i.e., protection from flooding sources outside of the plant) design basis documentation so configuration control is defined and maintained. (FP-1)

    - Develop an engineering report and flood protection drawings similar to fire protection drawings to clearly document the flooding design basis and credited flood protection features (credited external flood protection features and credited operator actions).

    - Assign unique equipment identification to each flood protection feature and boundary.

- Develop internal flooding (i.e., protection from flooding sources inside the plant) design basis documentation so configuration control is defined and maintained. (FP-2)

    - Develop an engineering report and flood protection drawings similar to the fire protection drawings to clearly document the flooding design basis and credited flood

protection features (credited internal flood protection features and credited operator actions).

- Update the design requirement in the Flooding Upper Level Document.

- Assign unique equipment identification to each flood protection feature and boundary.

- Establish an Engineering Barrier Program to include external and internal flood protection in accordance with the requirements of procedure EN-DC-329, "Engineering Programs Control and Oversight." (FP-4)

  - Assign program owner and backup.

  - Establish PMs for external and internal flood protection features including scope, frequency, testing criteria, and acceptance criteria.

- Complete the following procedure revisions as ANO specific procedures: (FP-5)

  - Revise procedure EN-DC-329 to include external and internal flood protection in the Engineering Program List.

  - Revise the flooding programmatic aspects of procedure EN-DC-150, "Condition Monitoring of Maintenance Rule Structures."

- Validate that all external flood gaps identified from the review of documentation for credible flood paths and the follow-up walk downs have been resolved. (FP-6)

- Perform walk downs of all credited internal flood protection features and document the results in an engineering report. (FP-7)

- Validate that all internal flood gaps identified from the review of documentation for credible flood paths and the follow-up walk downs have been resolved. (FP-8)

- Establish the Program Notebook and initial Program Health Report for flood protection in accordance with procedure EN-DC-143, "Engineering Health Reports," to identify, communicate, prioritize and drive resolution of issues that challenge an effective flood protection strategy including performance indicators, initial color rating (Red or Yellow), and action plan. (FP-9)

- Develop and conduct initial and continuing training essential to understanding and maintaining the licensing basis for flood barrier features. Address operations, engineering, and work planning groups. (FP-13)

4.2.4 Independent Assessment of Extent of Condition and Extent of Cause
(IP 95002 Section 02.04)

The NRC team conducted an independent extent of condition and extent of cause review of the issues associated with the degraded flood barriers Yellow findings. The NRC team's

independent review focused on the root and contributing causes, and whether ANO's evaluations identified and bounded organizational issues.

The NRC team identified that ANO did not examine fire protection barriers during the extent of condition reviews. Therefore, the NRC team performed visual inspections of over 100 fire seals in safety-related areas in both units, including the control room, cable spreading rooms, electrical tunnels, computer room, EDG and diesel fuel buildings, and the auxiliary buildings. The NRC team's inspections included difficult to access locations that required ANO to open doors of electrical panels, cabinets, junction boxes, electrical conduits, and under removable floor panels in the computer room.

The NRC team performed walkdowns of numerous flood barriers in both units, including fire seals that had been modified to perform a dual function (fire/flood protection) that had been installed after ANO identified missing seals following the flooding event. The NRC team observed and interviewed technicians and contractors, and reviewed installation procedures for new flood barrier materials using Polywater and P12 for electrical conduits.

4.2.5 Safety Culture Considerations
(IP 95002 Section 02.05)

The NRC team concluded that ANO's evaluation appropriately considered safety culture components. ANO's evaluation identified weaknesses in the following safety culture components:

- Challenge Assumptions
- Documentation
- Operating Experience
- Resources
- Field Presence
- Design Margins

ANO developed corrective actions for the root and contributing causes associated with each of the above safety culture attributes. The RCEs identified problems associated with the following safety culture components but ANO did not initially develop corrective actions to address the performance concerns. The concern with corrective action development is further discussed in Section 6.2.

- Identification
- Evaluation
- Resolution
- Training

Inspection Team Observations and Findings

The NRC team concluded that ANO used appropriate processes in the development of the two RCEs, and that ANO's evaluation team and analysis techniques were sufficient to identify the root and contributing causes of degraded flood protection barriers. The NRC team determined that ANO had performed a comprehensive review and inspection of both units' flood protection program including extensive walkdowns and assessments of the flood protection barriers and identified multiple degraded flood barriers and flood protection program deficiencies.

The NRC team determined the corrective action plan addresses the root and contributing causes and safety culture attributes. The NRC team determined that corrective actions taken and planned enhanced the flood protection program by improving configuration control, design documentation, program ownership, PM quality, maintenance process controls, and contractor oversight.

The NRC team concluded that ANO established a schedule for implementing and completing the remaining corrective actions that was appropriate for the safety significance, and has developed measures for determining the effectiveness of the corrective actions to preclude repetition.

The NRC team determined that 388 corrective actions were initiated as part of the flood protection recovery efforts. The NRC team reviewed the following completed actions and found them to be acceptable:

- From RCE CR-ANO-C-2013-1304, there were a total of 109 corrective actions. All 109 have been completed by ANO. The NRC team reviewed 67 corrective actions (CAs 12-75, and 82-84).

- From RCE CR-ANO-C-2014-00259, there were a total of 262 corrective actions. ANO has completed 210 with 52 remaining open. The NRC team reviewed 29 corrective actions (CAs 12, 21, 22, 24, 25, 29, 64, 81, 106, 153 and 156-175).

- The NRC team reviewed RCE CR-ANO-C-2014-02318, CA-24 and CR-HQN-C-2014-0386, CA-13.

The NRC team concluded that RCE team conducted a comprehensive safety culture assessment that properly identified the safety culture attributes related to the problem and causes. The NRC team did not identify any additional safety culture components.

The NRC team identified that ANO implemented corrective actions associated with flood protection barriers that may have reduced the resistance of fire seals. The RCEs performed by ANO determined that numerous fire seal locations also required a flood seal. Actions were initiated to modify existing fire seals so they could be credited as a flood protection barrier. The NRC team identified that two of the new materials used for the dual function fire/flood seals (Polywater and P12) had not been qualified to demonstrate the required fire resistance. The NRC team was concerned that the dual function seals no longer afforded access to perform visual inspections of the fire seal. ANO documented this concern in CR-ANO-C-2016-0490. The NRC team documented an URI to further review the dual function seals in Section 7.17.

Addressing the Notice of Violation
(IP 95002 Section 02.03.e)

The NRC issued an NOV (EA-14-088) to ANO on January 22, 2015. Through their review, the NRC team concluded that information regarding the reasons for the violation, the corrective actions taken and planned to be taken to correct the violation and prevent recurrence, and the date when full compliance was achieved, was addressed in Entergy's letter dated February 23, 2015, (ML15054A607). During this inspection, the NRC team confirmed that ANO's RCE and planned and implemented corrective actions adequately addressed the stated violations.

4.3 Review of White Unplanned Scrams Performance Indicator
(IP 95001)

4.3.1 Summary of Events

Background

ANO's Unit 2 PI for Unplanned Scrams per 7,000 Critical Hours was White for the second and third quarters of 2014, due to three trips, on December 9, 2013, April 3, 2014, and April 27, 2014. In addition to performing individual RCEs for each trip, ANO performed collective RCE CR-ANO-2-2015-0362, "Unplanned Reactor Scrams," to assess the factors that led to the White PI.

The NRC team: reviewed ANO's RCEs, readiness assessments, and other evaluations conducted in support of the RCEs; reviewed corrective actions to address the causes; held discussions with ANO personnel to determine whether the root and contributing causes, as well as the contribution of safety culture components were understood; performed system walkdowns; and evaluated a dynamic scenario in the simulator performed by an operational crew.

4.3.2 Unit Auxiliary Transformer Fault

Event Description

On December 9, 2013, a phase-to-phase and phase-to-ground fault occurred on the 6.9kV 'C' phase in the non-segregated bus supplying non-vital buses 2H1 and 2H2 from the Unit 2 unit auxiliary transformer (UAT). A fault occurred in the bus duct where the bus duct passed through the turbine building wall. ANO's RCE concluded that the fault was caused by inadequate insulation that had been installed during original construction. The UAT exploded because the protective circuit had a wire that was found disconnected. The fault resulted in a plant trip and lock-out of the switchyard autotransformer, which then caused a loss of 22kV off-site power to both units and an auto-start of the Unit 2 train B EDG to supply safety bus 2A-4. ANO documented the event in RCE CR-ANO-2-2013-2242, "Unit Auxiliary Transformer 2X-02 Bus Faults and 2X-02 Explosion/Fire".

ANO Evaluation Results

In June 1979, ANO replaced most of the buses from the turbine building wall to the switchgear on both the SU3 and UAT non-segregated buses. ANO concluded that the flexible link bolted connections inside the bus duct were not properly insulated at that time.

The RCE report documented that ANO failed to properly address an OE report from a similar event at Columbia Generating Station. In response to this OE report, ANO decided not to inspect the flexible links in the turbine building void area even though the bolted connections were similar to those that failed at Columbia Generating Station. ANO concluded that megger tests of the bus bars were sufficient. Inspection of the bolted connections was not recommended because their location was considered to be inaccessible and would necessitate removing and replacing the tape covering the bolting. The decision to take no action for OE that was applicable to ANO based on a perception of low risk was a missed opportunity to identify the latent condition.

The disconnected main generator lockout relay wire prevented isolation of the fault, causing a catastrophic failure of the UAT. The RCE report documented that the disconnected wire was most likely a human performance error that had occurred in 1995. Post-modification testing in 1995 did not functionally test the protective relays. The lack of periodic functional testing of protective relays was identified as a contributing cause in the RCE.

The RCE used three primary evaluation methods: Event and Causal Factors Charting, Failure Modes Analysis, and Equipment Failure Evaluation. The following causes were identified:

Direct Cause: The direct causes of the faults were phase-to-ground and phase-to-phase electrical faults.

Direct Cause: The direct cause of the UAT explosion and fire was a wire that was not connected in the common circuit for the UAT differential relays.

Root Cause: The most probable root cause for the bus faults was improper installation of the 6.9kV flexible links inside the turbine building. The bolting around the A and B phase flexible links contained little or no Duxseal around the bolt heads, covered with tape. This created air pockets and voids under the tape around the bolt heads, allowing partial discharge or corona across the air gap which can form ozone and nitric acid in the presence of moisture in the air, both of which can damage the insulation and degrade the connection. The damaged flexible link joints contained evidence of green corrosion products, possibly the result of nitric acid corrosion of the copper components. The human performance errors associated with the improper installation were not addressed in the RCE due to it being a latent issue, dating from work performed in 1979.

Contributing Cause 1: A contributing cause for the bus faults was inadequate design of the bus/duct. The 6.9kV buses within duct enclosures do not meet minimum National Electrical Code air gap clearances. There was a layer of under-rated (600V) tape applied. Without the Duxseal, the combination of air gap and tape did not provide sufficient insulation.

Contributing Cause 2: A second contributing cause for the bus faults was inadequate PM details. PMs did not require looking specifically for corona effects or require performing digital low resistance ohm measurements across bolted connections. Inspections were not required in difficult to access areas. PMs failed to prevent moisture intrusion into bus ducts. ANO failed to revise PM instructions to address industry OE concerning inspection of the bolted connections.

Root Cause: The root cause for the UAT explosion is unknown but related to a human performance error of not re-connecting wire #1274 in panel 2C20 at terminal board TB11-1. The evaluators noted that ANO had lifted lead sheets at that time and like today, the use of the lifted lead sheet was practiced during training exercises but not emphasized or presented in classroom portions of training. Use of lifted lead sheets is treated as skill of the craft and learned by on-the-job training.

Contributing Cause: A contributing cause for the UAT explosion and fire was lack of a PM. The main generator lockout relays were not functionally tested to verify circuit performance to protect the UAT. This prevented identifying the open circuit that prevented isolating the fault.

The NRC team concluded that the RCE was thorough and included an evaluation of post-event hardware inspection and failure analysis by two vendors. The RCE team consisted of station personnel from engineering, maintenance, and operations, and was supplemented with three

engineers from two vendors. The cause evaluation utilized diverse analysis techniques. The evaluation did not address the human performance error associated with the improper installation of the 6.9kV flexible links due to it being latent (believed to have occurred in 1979) and the limited documentation associated with the 1979 work.

ANO's evaluation included a review of internal and external OE. The review of internal OE did not identify any relevant items. The external OE review determined that the station missed an opportunity to identify the degraded condition by deciding to take no action to inspect taped-over bolted connections in response to the Columbia Generating Station event.

Risk Consequence Review

ANO's evaluation of the safety significance using the Unit 2 Equipment Out Of Service model determined that the potential consequence to nuclear safety and general safety of the public of this event was negligible.

Extent of Condition and Extent of Cause

ANO's RCE included extent of condition and extent of cause reviews that evaluated other systems and components for the two defective conditions: 1) degraded medium voltage (4.16kV and 6.9kV) non-segregated bus insulation, degraded bus ducts, and marginal or insufficient clearances, and 2) non-functional or potentially non-functional protective relay circuits that provide medium voltage electrical equipment protection. ANO developed the following corrective actions: redesign the Unit 2 medium voltage buses to improved fault resistance; develop new PM inspections for all site medium voltage 6.9kV and 4.16kV non-segregated bus bolted connections; and develop PM activities to functionally test protective relay circuits.

The extent of cause review evaluated each root and contributing cause developed in the evaluation, with the exception of the UAT explosion, because the cause was "unknown but related to a human performance error of not re-landing wire #1274 in cabinet 2C20 at terminal board TB11-1.' Since it is unknown, an extent of cause cannot be performed." Corrective actions were developed for the high risk components, most of which overlap with the extent of condition corrective actions.

Safety Culture Impact

The NRC team concluded that ANO's evaluation appropriately considered safety culture components. ANO's evaluation identified weaknesses in the following safety culture components:

- Avoid Complacency
- Work Management
- Questioning Attitude

Corrective actions were developed for each of these safety culture attributes.

Corrective Actions

ANO's evaluation identified the following corrective actions:

- Redesign and replace the damaged Unit 2 UAT medium voltage buses (PH-12)
- Redesign Unit 2 SU2 and SU3 medium voltage buses and ducting (PH-12)
- Revise and perform improved inspection PMs
- Develop and implement functional circuit testing for relays with protective trip functions
- Improve maintenance procedures that control lifted leads

Inspection Team Observations and Findings

The NRC team questioned the prioritization of ANO's actions to visually inspect and test Unit 2 medium voltage bus bolted connections, specifically those associated with transformers SU2 and SU3, as extent of condition actions. The SU3 non-segregated buses are very similar to UAT buses which failed in December 2013. A review of ANO's testing and evaluation of SU3 and planned corrective actions are documented in Section 5.2.1.

4.3.3 Lightning Strike to the Grid Caused Loss of Offsite Power

Event Description

Subsequent to the UAT fault, Unit 2 was restarted with the UAT removed from service, with all offsite power to the unit being supplied through the SU3 transformer instead of the UAT. On April 3, 2014, while operating at 100 percent power, a lightning strike on 161kV Russellville East Transmission line 5 miles from site caused a fault that was sensed at ANO. The momentary voltage drop actuated the SU3 under-voltage protection, which tripped the SU3 feeder breakers to buses 2A1 and 2A2 (vital 4.16kV), and 2H1 and 2H2 (non-vital 6.9kV), resulting in a Unit 2 trip. Subsequent investigation identified that the lightning protection system on the 161kV Russellville East Line (operated by Entergy Transmission) was degraded. ANO performed RCE CR-ANO-2-2014-0707, "ANO-2 Trip from 100 Percent Power while Aligned to Offsite Power (Startup 3 Transformer)."

ANO Evaluation Results

ANO's RCE report documented that degraded conditions existed with the lightning protection system on the 161kV Russellville East transmission line. When this line was rebuilt in 2010, no testing was performed. Grounding resistance measurements performed after the reactor trip were five times higher than the desired resistance reading.

ANO's evaluation included both internal and external OE. Internal OE reviews identified dozens of lightning strikes and grid disturbance affecting ANO, including ones that caused unit trips and power reductions. These CRs indicated that lightning strikes on each of the 161kV and 500kV transmission lines connected to the ANO switchyard have resulted in voltage perturbations at ANO. External OE reviews identified five reports that were applicable to ANO.

A similar lightning strike event occurred on July 10, 2013, when Unit 1 was shut down and Unit 2 was operating with power supplied from the UAT. A lightning strike induced a fault on the Russellville East Line, which caused a voltage drop to 50.6kV on the 161kV system. Control room alarms related to the lightning strike were received by both units, but Unit 2 continued to

operate normally. Unit 1 was aligned to SU2 transformer, and some Unit 1 equipment tripped due to low voltage. No Unit 2 equipment tripped because voltage on the plant buses was being controlled by the main generator output. One of the alarms received in the Unit 2 control room was, "SU3 Selected Not Available." For the plant conditions at the time, it is likely this alarm was caused by an under-voltage condition on the SU3 transformer 4.16kV and 6.9kV windings.

ANO determined that the ACE for the July 2013 lightning strike, CR-ANO-C-2013-1838, did not investigate the alarms received by the control rooms. The alarms were dismissed as "spurious and quickly reset" in the operability determination. The ACE conducted for this event concluded that it was not uncommon for either control room to receive "nuisance alarms" during lightning/grid disturbances and thus the cause of these nuisance alarms would not be addressed any further. By failing to evaluate these alarms, ANO failed to recognize the susceptibility of SU3 to an under-voltage event caused by a lightning induced fault on the 161KV Russellville East Line. As a result, this information was not available to the On-site Safety Review Committee when making the determination to restart Unit 2 with offsite power being supplied only via SU3. Further, the OE search performed to support Engineering Change EC-48200 (which allowed power operations aligned to SU3 transformer) did not find CR-ANO-C-2013-1838.

ANO's RCE used the following primary evaluation methods: Failure Modes Analysis, Event and Causal Factor Charting, Barrier Analysis, Why Staircase Analysis, and Performance Improvement International Organization and Program Evaluation. These evaluations identified the following causes:

Direct Cause: A lightning strike caused a fault on the 161kV Russellville East Transmission Line (approximately 5 miles from the Site).

Root Cause: The lightning protection system on 161kV Russellville East Transmission Line was compromised. This resulted in the inability of the lightning protection system to prevent an under-voltage condition at the SU3 transformer after a lightning strike to the transmission line, resulting in a reactor trip of Unit 2.

Contributing Cause: Unit 2 was operating at power with plant loads aligned to SU3 transformer instead of the UAT. The decisions to start up Unit 2 without completing repairs needed to place the damaged UAT back in service did not consider all failure mechanisms, specifically low or under-voltage conditions.

The NRC team concluded that the RCE was conducted to a level of detail that was adequate for the significance of the problem. The RCE was performed by a cross-functional team with both internal and external team members, and involved liaison with the external grid operator, Entergy Transmission. The cause evaluation utilized diverse analysis techniques that were appropriate.

Risk Consequence Review

ANO's evaluation of the safety significance was estimated by increasing the frequency of a LOOP by a factor of 10 above normal. This increase is consistent with the factor applied for the 10 CFR 50.65 (a)(4) program for grid instability and resulted in an increase in core damage frequency (delta-CDF) of 3.9E-07 per year. ANO Unit 2 operated with the UAT unavailable from

December 9, 2013, through April 3, 2014, or 0.32 years. Therefore, ANO determined the conditional core damage probability (CCDP) of the event to be:

(3.9E-07 per year) * (0.32 years) = 1.2E-07

Based on the core damage frequency (CDF) and CCDP, ANO concluded that this event had a "very small" impact on risk, as defined in Regulatory Guide 1.174.

Extent of Condition and Extent of Cause

ANO's RCE included extent of condition and extent of cause reviews that evaluated other systems and components for the defective condition. The evaluation considered various combinations of Unit 2 power sources and trip initiators. ANO did not identify any issues to be addressed during the extent of condition review that were not being addressed by actions associated with the root cause. The evaluation concluded that any extent of condition for Unit 1 would be the same as for Unit 2 due to the similar design and common connections to the grid.

The extent of cause review evaluated the root and contributing causes. The review documented that the cause did not exist for other offsite transmission lines providing ANO with power, but CA-26 was developed to ensure that the static line grounds are within the acceptance criteria per Entergy Transmission Standards for the other 500kV and 161kV transmission lines.

Safety Culture Impact

The NRC team concluded that ANO's evaluation appropriately considered safety culture components. The evaluation identified weaknesses in the safety culture component of Consistent Process. ANO underestimated the risk associated with the decision to operate Unit 2 while supplying auxiliary loads with offsite power via SU3. ANO understood that Unit 2 was vulnerable to grid disturbances, but did not recognize the elevated risk associated with this abnormal lineup. The station exhibited an inconsistent process by not performing an adequate OE search which resulted in not identifying applicable OE on lightning strikes on the Russellville East transmission line. This aspect is being addressed by the CAs for Contributing Cause 1.

Corrective Actions

ANO developed corrective actions to address each of the root cause and contributing causes. The corrective actions to the transmission lines must be performed by the grid operator, Entergy Transmission. ANO's actions are to identify and track the grid operator's performance of these actions. The principal corrective actions include:

- Track completion of Entergy Transmission repairs to the ground system (lightning protection) on the Russellville East transmission line. (PH-14)

- Track development by Entergy Transmission of an appropriate scope to check the static line grounds and ensure the acceptance criteria per Entergy Transmission Standards are met. This assessment is requested for each of the remaining transmission lines that terminate in the ANO switchyard. (PH-14)

- Have Entergy Transmission check the static line grounds in accordance with the defined scope and ensure the acceptance criteria per Entergy Transmission Standards to ensure

all high voltage sources supplying the ANO switchyard are adequately protected from lightning strikes. (PH-14)

- Revise procedure EN-DC-136-ANO-RC, "Temporary Modifications," Attachment 9.11, Section 3.5 (Operating Experience Search Results) to require internal OE searches when developing temporary modifications.

- Revise Unit 1 and 2 normal operating procedures for electrical distribution with additional precautions to raise awareness of the vulnerability to a grid-induced feeder under-voltage trip when the unit is supplied from an offsite source.

The NRC team determined that ANO established a schedule for implementing and completing the corrective actions. Completion of repairs for the 161kV Russellville East Transmission Line is due in July 2016.

4.3.4 Automatic Trip Due to Axial Shape Index Exceedance

Event Description

On April 27, 2014, the grid operator requested ANO to reduce power due to severe weather impacting the grid. During power reduction, the plant automatically tripped at 51 percent power due to axial shape index (ASI) exceeding the trip setpoint. ANO documented the event in RCE CR-ANO-C-2014-1142, "Automatic Reactor Trip during Rapid Plant Shutdown."

ANO Evaluation Results

ANO conducted an RCE in which Event and Causal Factor charting was the primary evaluation method to determine inappropriate actions, failed barriers, and causal factors. An Organization and Programmatic Evaluation was performed to validate the conclusions from the Event and Causal Factor chart. ANO assessed plant performance and operator response during the transient. The evaluation identified a deviation between planned rod motion and actual rod motion due to insufficient rod insertion; missed opportunities for the control room supervisor (CRS) and the reactor operator to address ASI deviation; ineffective communications; limited operator experience conducting plant shutdowns at end of core life (EOL); and insufficient procedural guidance.

ANO's OE review identified a similar problem involving operator response to ASI deviations at EOL in Unit 2 in 2010. Operators exceeded the technical specification limits for ASI during a planned shutdown. The reactivity management plan in 2010 had not been accurate and the operators had not been aggressive in using control rods to manage ASI. While operators had inserted control rods beyond what the reactivity plan expected, ASI still drifted outside of limits before operators restored it within technical specification limits. As corrective action for the 2010 shutdown, ANO reinforced expectations for operator monitoring and response. Reactor Engineering improved the reactivity control strategy to promote use of rod control Group P for ASI control as early as feasible. Group P has more rod worth and is therefore more effective at controlling ASI.

ANO concluded that corrective action for the 2010 precursor event failed to prevent the 2015 trip. The following causes were identified for the 2015 trip:

Direct Cause: Insufficient rod insertions were made to maintain ASI within limits, resulting in an automatic reactor trip.

Root Cause: Fragmented guidance was provided to operators to manage a transient condition. Operators incorrectly believed that rod insertions were limited to 3 inches at a time in all cases, and did not understand that at EOL, larger control rod insertions at a faster rate were needed.

Contributing Cause 1: The CRS did not exercise sufficient command and control to prioritize activities and manage crew distractions to the reactor operator. When it became clear that ASI continued to deviate from limits and the first plant protection system channel trip for ASI was received, the CRS opted to pursue a crew discussion rather than direct tripping the reactor.

Contributing Cause 2: Operator actions needed to compensate for dynamic effects of ASI change at EOL due to having a more negative moderator temperature coefficient were not understood by the reactor operator and CRS. No historical evidence could be found of using the 1-hour (rapid) shutdown reactivity plan at EOL, or fully practicing a 1-hour rapid plant shutdown plan in simulator training. Training for rapid plant shutdowns was provided but not for a full shutdown, where ASI control will be most challenging. Shutdown training was focused on task performance for starting the shutdown prior to transitioning into additional abnormal operating procedures (AOP) or EOPs. Additionally, the training provided for shutdowns was not consistently at EOL and usually only provided for EOL during the last training cycle prior to an outage.

Contributing Cause 3: Rules for conduct of operations during transient conditions were not clearly defined. This contributed to the event by delaying control rod insertions while operators obtained permissions and peer checks. The reactor operator had been obtaining permission from the CRS for each rod manipulation and obtaining peer checks, both of which limited the amount of reactivity that was inserted at a crucial time.

ANO's evaluation included both internal and external OE. The internal OE review only identified the 2010 event discussed above and a 1995 Unit 2 automatic trip when ASI was exceeded during a reactor startup with high xenon concentration. An external OE search identified 72 relevant examples, with two that provided useful information for this trip. ANO concluded that there were enough examples of the complexities of controlling ASI late in core life to highlight the need for training and/or briefing on reactivity manipulation challenges when nearing EOL conditions.

Risk Consequence Review

ANO performed a qualitative risk assessment. This assessment stated that "based on having the core operating limit supervisory system and all four channels of the core protection calculator operable throughout the event, and no safety limits challenged or exceeded, the risk was considered low." It further stated, "The operators were in the act of inserting a manual reactor trip. Had the automatic trip not occurred, the operators would have manually tripped the reactor." Licensee Event Report 05000368/2014-002 stated "No safety limits were challenged or exceeded. Systems or components needed to safely shutdown the reactor, maintain safe shutdown conditions, remove residual heat, control the release of radioactive material, and mitigate the consequences of an accident were available."

Extent of Condition and Extent of Cause

ANO's evaluation included extent of condition and extent of cause reviews. The extent of condition was limited to the automatic trip occurring instead of the crew manually tripping the reactor. Unit 1 was excluded from the extent of condition assessment because "the automatic rod control system, use of axial power shaping rods and the inlet temperature program (constant Tave) are significantly different from the Unit 2 design and will better control the reactor during a down power. The treatment of ANO-1 axial shape (Imbalance is equivalent to ASI but the magnitude is reduced by the fraction of rated power level) that is inherent in the design and safety analysis of Babcock & Wilcox plants gives ANO-1 a significant advantage over ANO-2. In addition, a 2-hour shutdown at the end of core life is much more manageable for ASI control." The NRC team concluded that ANO's decision to exclude Unit 1 from the extent of condition review was reasonable.

ANO included Unit 1 in its Extent of Cause review of potentially inadequate or missing AOPs and identified no affected Unit 1 AOPs. The NRC team noted that Unit 1 had procedure 1203.45, "Rapid Plant Shutdown."

The extent of cause review did not address the extent of cause for Contributing Cause 1 [CRS lack of command and control], because ANO credited an extent of cause review conducted for RCE CR-ANO-C-2014-0154. To address the root cause, ANO evaluated whether other procedures containing operator guidance during transient operation should be improved or relocated to an AOP.

Safety Culture Impact

The NRC team concluded that ANO's evaluation appropriately considered safety culture components. The evaluation identified weaknesses in the following safety culture components:

- Resources
- Leader Behaviors
- Training

Corrective actions were developed for each of these safety culture attributes.

Corrective Actions

ANO developed corrective actions to address each of the root and contributing causes. ANO performed RCE CR-ANO-C-2014-1545 to address command and control issues, and credited these corrective actions for Contributing Cause 1. The principal corrective actions include:

- Develop a rapid plant shutdown AOP, OP-2202.053, "Rapid Power Reduction."

- Revise procedure 2102.004, "Power Operations," Attachment A to clarify that the intent of the limit imposed for control rod insertions and ASI control do not apply in transient and urgent conditions.

- Modify required training material to include details on the potential rate of ASI change that can occur at EOL. Develop training tasks for 1-hour plant shutdowns at different

times in core life, and incorporate these tasks into licensed operator initial and requalification training programs.

- Ensure that the Entergy Crew Performance Evaluation for Unit 2 scheduled for fall for 2014 included a 1 hour shutdown.

- Revise procedure COPD-032, "Transient Conduct of Operations," to include improved guidance for control rod manipulation.

Inspection Team Observations and Findings

The team concluded that the RCE was performed by a cross-functional team with both internal and external team members, and involved coordination with personnel from the grid operator, Entergy Transmission. The cause evaluation used diverse analysis techniques that were appropriate. The extent of cause and extent of condition reviews were adequate.

To assess the effectiveness of corrective actions, the NRC team, in conjunction with ANO's training staff, developed a dynamic simulator scenario which included a 1-hour rapid plant shutdown at EOL, unstable grid, loss of SU3 offsite power following shutdown, and loss of instrument air. These were all events which the station had experienced at various times since the 2013 stator drop event. Scenario development was informed by the guidance of NUREG-1021, "Operator Licensing Examination Standards," Revision 10. The scenario was administered to an operating crew, and evaluated by an NRC chief examiner. The examiner evaluated the crew's use and adherence to the newly-developed AOP 2202.053, control of ASI, control rod manipulations, CRS command and control, effectiveness of the reactivity plan, and crew communications. The examiner determined that the crew implemented the rapid plant shutdown in accordance with procedures, and addressed emergent malfunctions. The crew was familiar with the procedural requirements and maintained control of ASI throughout the evolution. Post-scenario interviews with the crew indicated that the operators had trained on the lessons learned from the 2014 ASI-induced trip, including formal evaluations on the evolution. The operators stated that the new Rapid Power Reduction AOP was an effective tool which clarified the requirements of the evolution. The NRC team determined that corrective actions were effective.

4.3.5 Evaluation of the Combination of Events

In addition to RCEs for each of the three reactor scrams, ANO performed a collective RCE of the three events. This RCE used the following primary evaluation methods to determine causes and corrective actions: Management Oversight Risk Tree Analysis, Event and Causal Factor Charting, Barrier Analysis, and an Organizational and Programmatic Evaluation. ANO's RCE team consisted of station personnel from operations, NIOS, performance improvement, and maintenance. The scope of the review included precursor events identified in each of the evaluations to determine whether these events provided additional insights related to the causes of the scrams. The three scram cause evaluations and the three precursor events were re-analyzed to identify common factors, focusing on factors that could have prevented the scram events. The results confirmed the results of the individual analyses that were conducted for each event.

ANO's evaluations documented the following causes:

Root Cause: Station leaders do not recognize the risk associated with frequent initiating events. As a result, leaders have not identified and prioritized actions necessary to mitigate the risks that resulted in multiple scrams. Frequent scrams are indicative of erosion of safety margin and increased safety significance.

Contributing Cause: Leadership weaknesses in challenging and validating assumptions resulted in technical evaluations that failed to adequately identify and address all the associated risks. The following processes were most susceptible: 1) the significant OE evaluations; 2) the engineering change notice process; 3) the engineering change process; and 4) the Operations Decision Making Issue (ODMI) process.

The OE search results included a review of other plants that had White PIs for Unplanned Scrams per 7000 Critical Hours. The OE search results revealed three common themes:

1. OE was not being effectively used in the decision making process to ensure the proper rigor was used to evaluate and understand the risk associated with an activity.

2. PIs were not factored into the risk-informed decision process, thereby leaving the site vulnerable to exceeding PI limits.

3. Classification of events related to whether they count toward a PI or not does not receive an independent review to aid in preventing misclassifications of an event.

The NRC team concluded that ANO's RCEs included a consideration of prior occurrences and OE. The NRC team concluded that ANO evaluated each issue using a systematic methodology to identify the root and contributing causes.

Safety Culture Impact

A combined safety culture assessment was performed to determine whether weaknesses in safety culture caused or significantly contributed to the condition. The results identified weaknesses in the following safety culture components:

- Evaluation
- Conservative Bias
- Challenge the Unknown
- Challenge Assumptions
- Operating Experience

Corrective actions were developed for each of these safety culture attributes.

Corrective Actions

ANO developed corrective actions to address the root cause and contributing cause. Because the issues identified in this causal analysis overlapped with other evaluations performed during the recovery process (such as Leadership Fundamentals, and Decision-Making and Risk Management), many of the corrective actions are credited for completion by the other assessments. The principal corrective actions include:

- Develop a What It Looks Like sheet that targets behaviors in the area of challenging assumptions, risk determinations, and decision making.

- Establish a requirement for a separate Operational Focus Meeting to discuss NRC ROP performance indicators with low margin.

- Develop a decision tool that teaches a "minimum risk option" behavior that drives the decision maker to develop multiple solutions and select the decision that has the least risk by considering: (DM-1)

    - Nuclear risk
    - Industrial risk
    - Dose risk
    - Plant transition risk
    - Equipment reliability risk
    - Generation loss risk
    - Financial risk

The team concluded that the corrective actions were appropriate and addressed the root and contributing causes for the events, individually and collectively.

4.3.6 Overall Team Conclusions

The NRC team determined that ANO's four RCEs were adequate with respect to:

- Identifying the root and contributing causes
- Identifying duration, prior identification opportunities, and pertinent OE
- Addressing the extent of condition and extent of cause
- Including an appropriate consideration of safety culture components
- Establishing a schedule for implementing and completing the corrective actions

The NRC team noted that CAPRs for the four RCEs had been completed for each event, with the exception of repairs for the 161kV Russellville East Transmission Line. The NRC team determined that ANO had developed an effectiveness review plan to determine the method, attributes, acceptance criteria, and schedule for effectiveness reviews of the CAPRs for each of the events. While the NRC team considered the extent of condition review for the ASI trip to be narrow, the subsequent RCE for the combined set of events covered the subject adequately. Specifically, for RCE ANO-C-2014-1142 the extent of condition review considered the failure to manually trip the reactor when an automatic trip was imminent, and did not consider instances where operators experienced difficulty controlling ASI within limits. The collective evaluation for the three trips addressed operator control of ASI.

The NRC team concluded that ANO's evaluations and corrective actions for these three trips were sufficient to meet the objectives of IP 95001.

5. REACTOR SAFETY STRATEGIC PERFORMANCE AREA

5.1 Allocation of Resources
(IP 95003 Section 02.02.c)

Organizational Capacity Fundamental Problem Area

Background

ANO identified that a significant contributor to declining performance at the station was the availability and allocation of resources. As described in NUREG-2165, "Safety Culture Common Language," allocation of resources involves leaders ensuring that:

- staffing levels and personnel qualifications are consistent with the workload
- facilities are available and maintained
- tools, equipment and procedures are available and maintained
- resource allocation ensures short-term and long-term safe and reliable operation
- the implications of deferred work are rigorously evaluated for safety implications

Problems with allocation of resources became evident through accumulation of work backlogs in multiple work groups, declining performance in the CAP, inefficient maintenance and engineering work planning and execution, and declining staffing and experience levels. These resource challenges were identified during the Synergy Safety Culture Survey performed in late 2014, the TPNSCA performed in early 2015, and the RCEs for the Yellow stator drop findings, the Yellow flood protection findings, and the CAP.

ANO Evaluation Results

ANO performed evaluations to investigate the causes and impacts related to organizational capacity, including:

- ANO IP 95003 Investigation Period Basis Document
- Allocation of Resources
- Historical Data Review
- Collective Evaluation
- Organizational Capacity RCE

ANO determined that the resource issues were an FPA. ANO concluded that "Organizational Capacity (i.e., allocation of resources and process efficiencies) has been insufficient to maintain adequate station performance." The Organizational Capacity RCE report documented the following causes:

Root Cause: The ANO leadership team did not consistently apply a strategic approach in allocation of resources to support the safe long-term operation of the station. In some areas, this behavior resulted in the leadership team providing inadequate long-term plans that resulted in degraded equipment and margins.

Contributing Cause 1: Station leaders exhibit behaviors that do not consistently set the standard that personnel and equipment are available and adequate to support nuclear safety.

Contributing Cause 2: The ANO leadership team did not fully resolve risks identified while implementing important resource changes. This contributed to the condition due to poor implementation of changes directed by the 2007 Alignment initiative, the 2013 Human Capital Management (HCM) initiative, and supporting fleet procedure changes.

Contributing Cause 3: The 2007 Alignment and 2013 HCM staffing goals did not adequately consider the impact of ANO having two dissimilar units. This contributed to the condition due to ANO staffing or proficiency levels not being sufficient to meet workload in some areas.

Other findings of the Organization Capacity RCE included:

- Since 2007, ANO has experienced a gradual decline in staffing and experience. The Entergy fleet staffing reduction initiatives, known as Alignment and HCM which caused ANO to reduce staffing from being even with industry average for a 2-unit site to below average. Since 2007, ANO staffing declined while the industry average trend increased.

- The Entergy fleet initiatives to attain a standardized staffing model across sites did not account for the unique aspects at ANO created by having two units that used different designs. ANO did not perform effectiveness assessments after reducing staffing levels. The recovery team concluded that the Entergy change management process had not been effectively implemented.

- Unexpected increases in retirements between late 2012 and 2014 resulted in a loss of experienced personnel. The recovery team concluded that the loss of experience was not effectively managed.

- Insufficient organizational capacity contributed to high levels of overtime in maintenance, backlogs, teamwork issues, and uncertainty and stress among the workforce. Additionally, there was an adverse impact on leaders' field presence and the ability to resolve plant issues.

- Limited resources and ineffective prioritization of long-standing issues contributed to an increase in emergent maintenance and equipment reliability challenges.

- High workloads and limited staffing made it challenging to train a workforce with over 40 percent of the workers having less than 5 years of experience at ANO.

ANO performed the Organizational Capacity RCE in concert with the Corporate and Independent Oversight, Leadership Fundamentals, PM, Decision Making and Risk Management, and Design and Licensing Basis FPA RCEs to ensure a broad evaluation of these interrelated topics. ANO concluded that the extent of condition and extent of cause for the Organizational Capacity FPA impacted the site and corporate organization. Separate evaluations of Entergy corporate organization and fleet sites were conducted as a result of this conclusion.

Corrective Actions

The following corrective actions were identified in the Organizational Capacity AAP:

- Perform organizational capacity assessments to determine staffing requirements for 16 key departments based on experience, training needs, knowledge management needs, timing of expected retirements, resignations and reassignments and the needs for a site with two dissimilar units. (OC-1)

- Authorize the hiring of Entergy personnel and/or contractor positions identified as immediate staffing requirements by the ANO People Health Committee (APHC) during organizational capacity assessment reviews. (OC-2)

- Establish and implement an ANO Integrated Strategic Workforce Plan that provides a strategic long-term perspective of future staffing needs with a focus on ensuring staffing is sufficient to support nuclear safety. The workforce planning process will look into the future at least five-years, be updated annually, and reviewed quarterly by the APHC. (OC-3)

- Establish and implement an APHC to place priority on staffing and retention issues that are impacting ANO employees or could impact nuclear safety. (OC-4)

- Develop and issue an Entergy change management procedure for planning, execution, and follow up of “high risk” changes. The procedure will include specific expectations for reviewing effectiveness of the “high risk” change. (OC-5)

- Create and issue an ANO specific recovery procedure to align with procedure EN-LI-121, “Trending and Performance Review Process,” and incorporate a tool to analyze externally-identified performance issues both individually and in the aggregate to present actionable data to the Aggregate Performance Review Meetings (APRM). (OC-6)

Inspection Team Observations and Findings

The NRC team assessed resources in each inspection area to determine whether ANO practices supported safe operation and whether planned corrective actions promoted sustained performance improvement. The NRC team concluded that ANO’s resource allocation evaluations were comprehensive. The recovery team developed a sound basis for determining that the period of decline started in 2007. The evaluation report documented multiple conditions that contributed to the failure at the site and corporate level to identify and arrest declining performance.

The NRC team determined that the multi-year gradual performance decline occurred because of policy changes, changing workforce composition, and leadership responses. Performance monitoring tools and management responses were ineffective in recognizing and addressing the decline until they began to impact performance. While nuclear safety remained a priority, actions to balance competing priorities, manage problems, and prioritize workload resulted in reduced safety margins.

Interim Actions

In July and August 2015, ANO surveyed department managers to identify the immediate staffing shortfalls, and hired over 100 temporary workers to supplement the existing work force. In a few cases, temporary assistant manager positions were created to improve managers' ability to handle their workload. Industry experts were hired as mentors to help improve performance in operability determinations, CAP implementation, safety culture behaviors, and leadership behaviors.

The NRC team concluded that the interim actions were effective as a short-term strategy while a comprehensive improvement plan was being developed.

Staffing and Experience

The NRC team reviewed the results from ANO's staffing studies. ANO used detailed Electric Utility Cost Group data and state of the art methods to assess staffing, experience and qualification needs. The NRC team observed the APHC meeting to discuss the results of the Training Department study and recommendations on February 22, 2016. Other work group staffing studies were scheduled to be completed and reviewed by June 2016.

The NRC team identified the following observations:

- At the start of the inspection, there were no specific milestones to complete hiring to address long-term staffing needs.

- Interviews with hiring officials indicated that the majority were not knowledgeable in using Entergy's procedures for hiring. Administrative support for hiring was not available or effectively used.

- The organizational capacity assessments were designed to identify hiring targets, many of which included the need to recruit experienced workers. The NRC team noted that ANO had experienced difficulty recruiting experienced people in key technical areas, and that ANO had not addressed the challenge of recruiting experienced workers within the Organizational Capacity AAP.

- The APHC process addressed each of the organizational capacity challenges at ANO. The first several work group evaluations were effective in identifying and quantifying workloads, the skills needed, and gaps. The workload estimates were included for current conditions, expected additions due to CRP actions, and the projected final steady-state work following CRP completion. The recommended additions and changes aligned with comparable industry data. However, the APHC was approving only a portion of the recommended additions for immediate hiring, while approval for the majority of the staff increases were held for future consideration. Hiring schedules extended into late summer, which might affect the ability to meet CRP action targets for 2016.

- Losses of experienced personnel resulted in engineering having 48 percent of staff having less than 5 years of nuclear power plant experience. Engineers assigned responsibility for multiple systems or programs had difficulty performing all assigned duties. In some cases, engineering program owners had not completed all the required

qualifications, and ANO relied on additional oversight and mentoring as bridging strategies.

- Operations Department staffing and training had been maintained. ANO and Entergy placed a high priority in maintaining an effective pipeline of trained and qualified operators. This included anticipating future needs.

- Training was one of the most-impacted departments for staffing and experience. The HCM initiative caused a 25 percent reduction in training staffing. Retirements further reduced department staffing.

- After HCM, ANO had only one permanent probabilistic risk assessment (PRA) engineer, and the corporate PRA support group had none at a time when the PRA workload was high. The amount of work assigned to one individual was a principle contributor to a violation documented in Section 7.13 involving the failure to complete periodic PRA model updates.

In response to these observations, ANO added actions to complete approval and hiring for new employees to the CRP, added an additional employee in the Human Resources Department to support hiring, and developed strategies to recruit experienced workers in targeted areas and arrange an exchange program with outside organizations to improve experience in targeted groups.

The NRC team concluded that the planned corrective actions for improving staffing and experience were appropriate to address the causes identified.

Department Performance Improvement Coordinator Staffing

The NRC team interviewed a number of Department Performance Improvement Coordinators (DPICs) who were responsible for processing and closure of CRs, development of performance indicator results, and supporting Department Performance Review Meetings (DPRMs). The NRC team assessed the current health of the DPIC organization through interviews of a sample of ANO DPICs.

The NRC team identified the following:

- In many cases the workload of the DPICs required a significant amount of overtime (40 percent or more).

- Large departments (e.g., operations, maintenance, and engineering) were assigned a full-time DPIC; in some cases (e.g., operations) these departments had multiple DPICs or assistant DPICs. Smaller departments (e.g., licensing and emergency preparedness) assigned a DPIC as a collateral duty.

- Engineering was in the process of hiring a full-time contractor to assist the Engineering Department DPIC and to support the ANO recovery effort.

The NRC team concluded that DPICs were understaffed to perform the DPIC-related roles and responsibilities. The NRC team concluded that actions to increased staffing for DPIC functions as part of the organizational capacity assessments would improve the workload problems.

Journeyman Qualification and Training

The TPNSCA identified that station leadership did not fully support training. Specifically, worker observations included:

- Personnel being taken out of training to address emergent issues
- Qualification requirements were revised to reduce the level of detail and rigor of training
- Workloads prevented workers from completing training for advanced qualifications

Safety culture survey results indicated that journeyman maintenance workers were not receiving training to support advanced qualifications, and there were not enough qualified journeymen to complete some maintenance activities.

While ANO did not specifically address journeyman level qualifications or maintenance staff training in the assessments, ANO did evaluate issues with the PM Program in CR-ANO-C-2015-2834. Root Cause 2 of that CR stated: "ANO leadership has not provided the organizational structure, the staff's priorities or dedicated resources to support the continuously improving PM Program." As described above, the organizational capacity studies and subsequent hiring was intended to improve the staffing levels and address the necessary level of qualification for current work.

The NRC team reviewed training procedures, Task Training Matrices, and bench strength reports. The NRC team interviewed maintenance personnel, supervisors and training personnel to assess whether ANO addressed the issues from the TPNSCA. The NRC team's interviews confirmed that in the past, personnel had been removed from training to perform emergent work, however, recent improvement was noted.

Inspectors reviewed the instrumentation and controls (I&C) Task Training Matrix and discussed recent changes to the qualification requirements with training and I&C supervisors. The qualification card was updated to aggregate qualifications that could be simplified to a single signature. Supervisors stated that while workers may not be required to prove proficiency on specific equipment in the plant, they were still required to perform the specific tasks in a shop or training setting. Classroom or computer based training had not replaced actual performance of required activities for qualification.

Discussions with craft workers and supervisors revealed that, due to organizational capacity issues, journeyman level workers were encountering difficulty in completing advanced qualifications. Because of the limited number of qualified craft workers combined with the high emergent workload and the large maintenance backlog, lower level journeymen were unable to complete advanced qualification requirements. Bench strength goals for the shops were met, but the number of available workers was lower because qualified workers were assigned to other duties and shops (e.g., Fix-It-Now team, relay shop, dry fuel storage, and Backlog Team).

ANO created the Maintenance Backlog Reduction Project with a separate team under the fix-it-now process. This team was intended to be made up of supplemental workers; however, qualified supplemental workers were not available for every skillset. As a result, some full-time workers were moved from the maintenance shops to the Backlog Team. Unless they were previously ANO employees who can re-qualify, the supplemental personnel do not receive training and can only be utilized as helpers. The result is that some supplemental workers provide limited help in addressing backlog and capacity issues.

The NRC team determined that the root causes for organizational capacity encompassed the challenges with maintaining an adequate level of journeyman qualifications. The corrective actions planned for organizational capacity were appropriate to identify the additions to the maintenance staff workforce necessary to reduce the maintenance backlog, address emergent issues, and ensure advanced qualification of journeymen.

Completed Corrective Action Review

The NRC team reviewed the following closed corrective actions credited in the CRP to address issues identified in the Organizational Capacity FPA:

1. CR-ANO-C-2015-02831, CA-17: "Verify that a staffing study was performed by comparing ANO staffing data to Electric Utility Cost Group staffing data for selected plants."

   The intent of CR-ANO-C-2015-2831, CA-17 was to determine near-term staffing needs to support the recovery process and other station needs. After reviewing the staffing study, ANO determined that additional supporting actions were needed.

   The NRC team reviewed licensee data associated with the hiring of additional staff to address the results of the staffing study using Electric Utility Cost Group data and to assist in station recovery activities. The team was told that 124 new permanent positions were approved for hiring in 2015. This was in addition to the 47 positions that were approved for hiring to replace losses. The NRC team noted that an additional 128 contract staff were hired to assist in the recovery process.

   The NRC team concluded that the intent of CR-ANO-C-2015-2831, CA-17 was met.

2. CR-ANO-C-2015-02831 CA-18: "Develop and implement a corporate oversight support plan for 95003 ANO recovery."

   The "2016 Corporate Oversight Plan ANO 95003 Recovery," Revision 0, met the objectives of CA-18. CR-ANO-C-2015-02831, CA-40 was issued to verify that the plan was being implemented every four months.

   The NRC team concluded that the intent of CR-ANO-C-2015-2831, CA-18 was met.

5.2 Design and Configuration Control
(IP 95003 Section 02.03.b and f)

5.2.1 Design Review of Electrical Power Distribution Systems
(IP 95003 Section 02.03.b)

Background

As part of the Collective Evaluation process, ANO identified that the design and licensing basis had not been maintained in some areas and was not well documented in other areas, resulting in degraded safety margins and plant vulnerabilities.

The NRC team selected the electrical power distribution system in each unit for independent review to: assess the extent of risk-significant design issues; assess the effectiveness of corrective actions for design deficiencies; review modifications to determine if the system was capable of functioning as specified by design and licensing documents, regulatory requirements, and commitments for the facility; and to determine if the system was operated consistent with the design and licensing basis. The NRC team reviewed the corrective actions and engineering changes made to the electrical power distribution systems following the stator drop and flooding events.

ANO Evaluation Results

ANO evaluation teams identified problems with the documentation, maintenance, and knowledge of the design and licensing basis and characterized these issues as an FPA in CR-ANO-C-2015-2833, "Root Cause Evaluation - Design and Licensing Basis." ANO performed "KAR – ANO Switchyard Focused Assessment," to evaluate whether the design, equipment, and maintenance activities for switchyard components controlled by ANO were in conformance with industry standards and requirements. The assessment report documented weaknesses in: the material condition of ANO-controlled switchyard equipment; responses of the nuclear units to grid disturbances; design limitations of the station's startup power system; and ANO's response to switchyard deficiencies and industry OE reports. ANO performed "KAR - Design Assessment," to determine if controls were established and maintained to prevent risk-significant events that affected the reliability of mitigating systems and barriers by confirming the adequacy of design, as-built configuration, and post-installation testing of a sample of plant modifications. This assessment review included equipment in the AC electrical power distribution system.

ANO identified that PM controls and supporting programs had not been effective in preventing risk-significant equipment failures, noting that PM deficiencies have contributed to several significant conditions. ANO documented the identification of PM Program deficiencies in the PM RCE (CR-ANO-C-2015-2834), which included deficiencies impacting the AC electrical power distribution system.

Key Corrective Actions Related to AC Electrical Power Systems

ANO identified the following corrective actions related to the licensing basis, design basis, and maintenance of both unit's AC electrical power system:

- Replaced damaged Unit 2 medium-voltage metal enclosed bus ducting with improved designs. Inspected and scheduled replacement for Unit 1 medium-voltage metal enclosed bus ducting. (PH-12)

- Modified SU2 bus ducting flood protection integrity up to the maximum flood level. (FP-6)

- Modified the Unit 2 medium-voltage switchgear that had been affected by water intrusion during the stator drop event to reduce susceptibility to water and foreign material intrusion. (FP-8)

- Modified cooling fan control circuitry for station transformers to eliminate an identified common-mode failure vulnerability.

- Initiated design change work and reviews to address NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System."

- Identified that the component database had incorrect setpoint data for the safety-related bus under-voltage relays due to not considering equipment inaccuracies. The non-conservative setpoints were changed and calibration procedures for these relays were updated to reflect new setpoints.

- Updated equipment databases to include switchyard equipment which was important to safety. Developed PM activities to improve equipment reliability, including autotransformer banks, circuit breakers, disconnect switches, voltage regulator/load tap changers, surge arrestors, voltage transformers, protective relaying and voltage monitoring components, and motor operated disconnects.

- Updated equipment reliability and tracking actions for replacement of switchyard circuit breakers B0125 and B0126 due to not having the necessary fault current interrupt ratings.

Inspection Team Observations and Findings

The NRC team performed design reviews and walkdowns of major components in the AC electrical power distribution system including ANO-controlled switchyard components, and the medium and low-voltage onsite distribution systems. The NRC team reviewed component and system design bases; preventive and corrective maintenance strategies; equipment testing; modifications; material condition and equipment reliability; OE; and corrective actions taken to address deficiencies involving design, maintenance, and modifications. The NRC team reviewed the design and licensing basis of the AAC diesel generator intended for use during station blackout conditions. The NRC team reviewed the ANO Cable Reliability Program for medium and low-voltage cables categorized as safety-related or covered by the ANO Maintenance Rule Program.

The NRC team reviewed design changes to transmission and distribution system components and procedures to ensure the ability to function as required during the design basis maximum flood levels. The NRC team concluded that design changes adequately addressed the flood protection vulnerabilities.

The NRC team assessed ANO's performance in the control and implementation of the design and licensing basis for the AC electrical power distribution system. The NRC team reviewed corrective action documents, engineering change packages, engineering equivalent change packages, procedures, and 10 CFR 50.59 screenings associated with pending and completed design changes. The NRC team determined that ANO had developed or was developing processes and plans to address the deficiencies. The NRC team determined that the processes used by ANO to identify deficiencies in the design and licensing basis and maintenance activities for AC electrical power distribution systems were adequate.

The NRC team reviewed design changes to the medium-voltage distribution system that were made to address damage caused by the March 2013 stator drop event. The NRC team determined that ANO was thorough in the design reviews and post-installation testing.

The NRC team identified that ANO was not performing periodic thermography on 4.16kV buses as required by the Predictive Maintenance Program. This is documented as a finding in Section 7.12.

Untimely Resolution of Bus Duct Fault Resistance

From the review of the Unit 2 auxiliary transformer failure in 2013, the NRC team noted that ANO had not fully completed extent of condition inspections of the metal enclosed bus ducts for the SU3 transformer. The reactor trip caused by this failure is discussed in Section 4.3.2. A fault occurred in the bus ducting because insulating materials over bus bar connections had degraded. ANO concluded that during original installation in 1979, insulating compound had not been applied over the bus joint connections before wrapping the joint, allowing a corona to form under the wrapping, degrading the insulation. ANO replaced the failed bus ducting with a new design for connecting and insulating the conductor joints.

The NRC team determined that the SU3 transformer's bus ducts had a similar configuration and construction details as that of the failed UAT, and had been installed around the same time by the same company. ANO had concluded that the bus should be inspected to determine whether similar degraded conditions were present, but decided to defer the inspection until 2017. The NRC team was concerned that this inspection may not have been timely to determine whether a similar latent condition existed.

ANO engineers described the testing and inspections performed on SU3 to support decision making and continued operation of SU3. During an inspection, the wrappings were probed by hand to identify missing or degraded insulation compound underneath the wrapping without identifying any voids. ANO performed resistance testing and did not identify any unacceptable insulation between phases or phase-to-ground. The test results could not be compared to prior data for trending purposes because ANO used a different test method, so ANO could not determine whether the insulation had a degrading trend. ANO had concluded that a failure in SU3 was less likely because the UAT was more heavily loaded under most plant conditions.

The NRC team concluded that ANO exhibited non-conservative decision making that relied on engineering judgment and incomplete information to address the extent of condition reviews for the failure of the Unit 2 auxiliary transformer. Specifically:

- ANO decided not to remove the wrap and inspect the connections on SU3 before restarting the unit.

- The initial inspection of the wrap on SU3 provided limited information, and did not ensure that the insulating compound was intact.

- The test results indicated that insulation resistance was adequate, but did not provide information about whether insulation was degrading.

- No technical basis was developed to support scheduling the inspection in 2017 and continuing to operate Unit 2 for 4 years before completing the inspection.

- ANO did not establish compensatory measure to monitor the insulation, even though the failure mechanism of concern involved time-dependent degradation.

The NRC team determined that the current schedule represented the next available opportunity to conduct the SU3 inspection. ANO planned to replace the existing ducts and insulation with a more effective design.

5.2.2 Maintenance of the Design and Licensing Basis
(IP 95003 Section 02.03.b)

Background

ANO identified that a significant contributor to performance problems at the station was that the design and licensing basis had not been maintained. This resulted in degraded safety margins and plant vulnerability to events. Examples of problems with maintaining the design and licensing basis requirements included flood barriers, critical calculations, high energy line break analyses, and the air operated valve program. Weaknesses in maintaining the design and licensing basis were identified in the Synergy Safety Culture Survey, the TPNSCA, and RCEs for CAP and the Yellow findings.

ANO Evaluation Results

ANO recovery project evaluations of the causes and impacts related to maintenance of the design and licensing basis, including:

- Historical Data Review
- Collective Evaluation
- Design Review KAR
- Configuration Control KAR
- High Energy Line Break Program assessment
- PM Program assessment
- Air-Operated Valve Program assessment
- Switchyard design assessment

The recovery team determined that the design and licensing basis issues should be identified as an FPA. The recovery team completed an RCE which documented the following causes:

Root Cause: Station leadership did not consistently exhibit and reinforce behaviors that demonstrate risk to nuclear safety is the overriding priority in decision making. Because of this, station personnel were making non-conservative decisions related to the station licensing basis and design basis which were not being corrected by the leadership team.

Contributing Cause 1: Engineering has not implemented a knowledge transfer and retention plan.

Contributing Cause 2: Some of the Entergy fleet engineering change procedures do not contain sufficient detail for use by less experienced engineers which has resulted in inconsistent engineering change packages.

Contributing Cause 3: Station personnel do not consistently demonstrate an understanding of the risk significant aspect of non-safety maintenance rule systems and how this relates to the station design basis, the station licensing basis, and the station risk model.

Contributing Cause 4: Some design information and the bases for the licensing basis documents are not easily retrievable or available in the current document system.

Planned Corrective Actions

The corrective actions in the Design and Licensing Basis AAP included:

Key Corrective Actions

- Establish metrics to monitor performance that would indicate that leadership focus on minimizing risk and nuclear safety results in improvement to the health of maintenance rule systems. (DB-1)

- Facilitate behavior change by rewarding performance that indicates leadership behaviors are focused on minimizing risk and nuclear safety by incorporating maintenance rule monitoring goals into the supervisor and above incentive plan. (DB-2)

- Provide training to engineering, operations, and planners to increase the knowledge and skills of those groups regarding passive barriers and other design basis features. (DB-3)

Actions to Address Engineering Programs

- Experienced mentors will be assigned to the component and programs areas from July 1, 2016, through July 1, 2017. This mentoring effort will focus on behaviors, qualification and standards of the ANO component and programs areas to ensure full compliance and to build the knowledge and proficiency in these areas. (DB-9)

- Resolve standards performance deficiencies from the engineering program assessments completed during the Preventative Maintenance Program extent of condition review. (DB-10)

- Perform one benchmark or one self-assessment between March 1, 2016, and March 1, 2020, for each of 24 engineering programs. (DB-11)

- Training and industry exposure will be used to build the knowledge, proficiency and standards within the program and component areas as the owners of each program listed in DB-11 will participate in at least one industry meeting or specialized training course focused in their program area between March 1, 2016 and March 1, 2020. (DB-12)

Actions to Update and Maintain Design Documentation

- Upper level documents and critical drawings will be revised and upgraded to incorporate mark-ups, OE and industry best practices to ensure that these documents are easy to use and support decision making regarding maintenance of the design and licensing basis. (DB-15)

- Key calculations and reports will be revised and upgraded to incorporate mark-ups, OE and industry best practices to ensure that these documents are easy to use and support decision making regarding maintenance of the design and licensing basis. (DB-16)

- An engineering standard will be produced to provide sustainable, consistent guidance to station engineers in the performance of their duties. This standard will incorporate best practices for developing engineering products beyond simple procedural compliance and ensure that standards and expectations for performance of engineering duties are clearly articulated to the workforce. (DB-17)

Actions to Improve License Submittal Quality

- Re-baseline expectations for supporting information for NRC license amendment requests or relief requests based on past requests for additional information. (DB-18)

- Provide Regulatory Assurance departmental training on development of NRC license amendment requests. (DB-19)

Inspection Team Observations and Findings

Design and Licensing Basis FPA Review

The NRC team assessed the CRP corrective actions to address problems documented in the Design and Licensing Basis FPA. Many of the corrective actions were to be performed under the Leadership Fundamentals and Organizational Capacity AAPs.

The NRC team reviewed corrective actions to improve standards for engineering personnel performing their duties, backlogs in updating engineering documents, completeness of the document system, and engineering personnel's ability to search the document system. ANO planned to develop and implement an engineering standard that provides the tools, guidance, standards and expectations for documenting and maintaining design and licensing basis documents, along with a desktop guide to aid in searching the documentation system for design and license documents. The detailed ANO plans were not available at the time of the inspection for the NRC team to assess.

The NRC team noted that the only corrective action to address leader decision making involving use of design and licensing basis information required establishing metrics to monitor performance that would indicate that leadership focus on risk and nuclear safety results in improvement to the health of maintenance rule systems. The NRC team noted that system health is only one area impacted by decision making that relies upon application of the design and licensing bases. The action to develop a metric did not address other processes, such as operability evaluations, plant modifications, and 50.59 screenings and evaluations. The NRC team concluded that this metric, by itself, would not be an effective indicator of the knowledge and appropriate application of the design and licensing basis. In response, ANO added actions to improve decision making and monitor the results of decisions that rely on application of design and licensing basis information.

The NRC team reviewed corrective actions concerning backlogs in updating engineering documents and completeness of the document system. ANO indicated that critical documentation, including calculations, drawings, upper level documents, and standards will be updated and revised to industry standards for excellence, but detailed ANO plans were not available at the time of the inspection for the NRC team to assess.

The Design and Licensing Basis RCE report documented that the station's knowledge of the design and licensing basis and the ability to appropriately apply information had deteriorated. This deterioration occurred gradually due to decreased staffing and the loss of experienced personnel without an adequate knowledge transfer program. The NRC team reviewed corrective actions concerning engineering personnel's knowledge of the design and licensing basis. The NRC team's interviews with engineering personnel confirmed that the current design and licensing basis training was conducted at a high level (overview) and that opportunities for mentoring by experienced personnel were not sufficient to compensate for the limited training. The planned corrective actions included determining engineering staff training needs as part of the organizational capacity studies. The planned corrective actions appear to be appropriate; however, detailed plans were not available at the time of the inspection for the NRC team to assess.

Implementing Modifications

The Collective Evaluation identified weaknesses with the organization's ability to identify, prioritize, fund, and implement modifications and other capital improvements required to address equipment issues in a timely manner. ANO's ability to implement modifications was evaluated under the Plant Health PA. ANO determined that employees do not understand how to process an issue through the SIPD process from initial identification to implementation of a modification. The SIPD processes were complex and burdensome, and did not produce an overall plan which considered risk in the prioritization of activities. ANO identified that: 1) multiple lists are used to track plant deficiencies, with each process having its own method of risk ranking; 2) multiple review processes (management review meetings) are used to obtain funding and a completion schedule; 3) no methodology exists to align priorities developed by the review committees; and 4) there is no mechanism to assure that issues which have not been fully approved are addressed in a timely manner.

The NRC team reviewed the ANO and Entergy corporate procedures related to the SIPD process to evaluate the activities required before a modification receives approval, funding, and an implementation schedule. The NRC team interviewed ANO personnel at the staff and management levels, including members of review committees that are part of the SIPD process. The NRC team's conclusions were consistent with the issues identified during the Collective Evaluation. The NRC team concluded that proposed corrective actions appeared to be appropriate; however, detailed plans were not available at the time of the inspection for the NRC team to review.

5.2.2.1 Unit 1 Reactor Vessel Seal Leakage and Design Review
(IP 95003 Section 02.03.b)

The NRC team reviewed design and licensing basis documents associated with the Unit 1 reactor vessel seal leak-off line. The NRC team reviewed ANO's actions to address industry OE concerning the potential for stress corrosion cracking of reactor vessel flange seal leak-off lines. These topics were selected as a KAR sample for design in part because Unit 1 was experiencing leakage at this mechanical joint, and ANO had decided not to isolate the leak-off line to place the installed redundant O-ring in service due to concerns about degradation of the leak-off line.

The Unit 1 reactor closure head flange and the reactor vessel flange are joined by 60 studs and sealed using two metallic O-rings. The reactor vessel head flange inner and outer O-rings are hollow tubes set within grooves machined in the vessel head. The in-service seal (normally the

inner O-ring) will expand and seal as pressure is increased in the reactor coolant system (RCS). Two ½-inch diameter holes through the vessel flange between the O-rings are connected to piping that is routed to the reactor building sump. Two normally open valves allow isolation of any leakage. The drain line contained a temperature detector with an alarm to warn of leakage past the inner O-ring seal. This design enabled ANO to detect a leak at the inner O-ring and isolate the leak by shutting the drain valves. With the drain valves closed, the leakage would pressurize the space between O-rings and be sealed by the outer O-ring. If a leaking inner O-ring was not isolated, industry OE showed that steam-cutting of the reactor vessel and/or head material could occur, requiring difficult repairs.

The NRC team confirmed that the ANO configuration for this leak-off line was consistent with the requirements in instruction manual, "Unit 1 Reactor Vessel (TDB015 200)," and the design documents for the leak-off line included that design requirements. Therefore, the NRC team concluded that ANO had designed the Unit 1 reactor vessel flange O-ring leak-off line consistent with the licensing basis.

ANO Response to Operating Experience

In 2005, ANO identified that an industry OE report of stress corrosion cracking of the reactor vessel seal drain line was applicable to ANO. During refueling outages, the drain line isolation valves were shut and the lines filled with water when the reactor cavity was filled to support refueling. The OE report identified that a reactor vessel seal leak-off line that had experienced stress corrosion cracking from chlorides introduced during construction or concentrated from the RCS through evaporation failed when the drain line was isolated to stop a leak from the inner reactor vessel head O-ring.

The NRC team concluded that ANO had failed to address the industry OE concern about stress corrosion cracking for over 10 years, despite having created a series of plans in CR-ANO-1-2005-01140 and CR-ANO-1-2008-02560 to pressure test, inspect, or replace the drain piping. The NRC team determined that these plans had been changed or deferred 13 times. In some instances, planned work was deferred because the planned action could not be implemented.

Implications of not stopping a Seal Leak

The NRC team reviewed ANO's actions in response to leakage at the inner O-ring that was identified in April 2015, and concluded that ANO promptly identified the source of the leakage and subsequently monitored the increasing trend using a specific monitoring plan. However, ANO management decided not to isolate the leak, in part because of questions about whether the drain line would fail when pressurized. By failing to resolve questions about the integrity of the drain line piping for 10 years, ANO failed to maintain the design capability to place the redundant reactor vessel seal in service if the inner O-ring developed a leak. As a result, the unisolated high-pressure leak created conditions that could steam-cut the reactor vessel flange and/or the reactor head flange and require difficult repairs.

On December 15, 2015, the leak stopped following a Unit 1 trip. ANO theorized that an increase in system pressure during the plant transient allowed the inner O-ring to seal. ANO management decided not to remove the reactor head to identify and resolve the problem during this unplanned outage, in part because the leakage had stopped.

ANO planned to replace or plug the drain line piping in Unit 1.

5.2.2.2 Unit 1 Emergency Core Cooling Sump Design Margin Assessment
(IP 95003 Section 02.03b)

Background

The NRC team reviewed a sample of Unit 1 activities to determine if design margins were maintained. The NRC team selected the Unit 1 emergency core cooling system (ECCS) sump inside containment as an inspection sample because containment coating deficiencies had reduced debris margin for the Unit 1 containment sump. The NRC team noted that both units had experienced degraded coatings issues over the last 10 years, and had not taken action to effectively correct the problems.

ANO Evaluation Results

The ECCS sump is designed to collect small amounts of system leakage during normal plant operation, and during a loss of coolant accident, the sump collects borated water and provides a recirculation source of water for the low pressure injection and reactor building spray pumps after the volume of the borated water storage tank has been injected into the RCS or sprayed directly into containment.

Engineering evaluations in CR-ANO-1-2915-0861 documented that there was no assurance that the ECCS sump screens would be capable of supporting core cooling during an accident in the Unit 1 containment building. During an accident, degraded paint or rust from uncoated carbon steel could be transported to the ECCS sump and clog the screens. At ANO, the largest contributor to the reduction in available ECCS sump screen flow margin was carbon steel inside containment that was uncoated or had degraded coatings. ANO was required to evaluate all sources of potential debris during an accident and verify that the ECCS sump screens could pass the flow rate needed to support ECCS operation. During the Unit 1 outage in 2016, ANO identified additional coatings deficiencies that exceeded the available ECCS sump screen margin.

Unqualified coatings and degraded qualified coatings are tracked by periodic inspections performed in accordance with procedure OP-5000.025, “ANO Coatings Assessment Program. This procedure specified the calculational method to be used to determine the amount of debris that can be generated due to uncoated carbon steel during a design basis accidents. Using this procedure, ANO determined the debris margin had been exceeded by 1.40 cubic feet. Engineering personnel revised procedure OP-5000.025 to change the calculational method and performed additional walkdowns and field measurements of corrosion layer thicknesses on the uncoated carbon steel surfaces. ANO’s coating re-analysis demonstrated a positive safety margin remained for the sump screens.

Inspection Team Observations and Findings

Containment Inspections

On February 3, 2016, the NRC team conducted walkdowns and visual inspections of accessible areas inside the Unit 1 containment while the unit operated at 100 percent power. A similar walkdown was performed in Unit 2 on February 2, 2016, while Unit 2 operated at 100 percent power. The NRC team observed the condition of coatings on the containment liner and other components, piping insulation, and loose or potential transportable debris. The NRC team

inspected accessible portions the Unit 2 ECCS sump screen, but the Unit 1 sump screen could not be inspected.

For both units, the NRC team identified several potential transportable sources of debris that had not been identified by ANO, and inadequate liner clearances involving sections of floor grating, structural components, pipe supports, and concrete flooring. The team identified loose floor grating that was vibrating and rubbing against the Unit 2 liner plate, resulting in liner coating damage. The inadequate structural clearance increased the likelihood that the safety-related containment liner would be damaged during a seismic event or during normal plant operation. The NRC team identified a violation associated with the inadequate structural clearances, which is documented in Section 7.15.

ANO evaluated the aggregate effect of the loose items identified by the NRC team and determined the additional transportable debris did not exceed the available ECCS sump screen flow margin. The NRC team reviewed ANO's evaluations and agreed with their conclusions.

Sump Screen Margin Review

The NRC team reviewed ANO's 2015 response to having negative ECCS sump screen margin in Unit 1. The NRC team determined that ANO used a conservative methodology to assess the debris that could be created by damaged and degraded coatings that was specified in the ANO Coatings Assessment Program. Beyond the coatings program, ANO addressed the potential debris from corrosion products on the uncoated carbon steel. Previously, ANO treated corrosion products as if the debris was the same as the equivalent area of missing coatings by using the same rule of thumb. When the margin for degraded coatings was exceeded during the Unit 1 2015 outage, engineering personnel measured the actual thickness of corrosion products on uncoated carbon steel, and used the average thickness as a corrosion product rule of thumb. ANO's calculation of transportable debris due to corrosion products using the actual thickness restored the ECCS sump screen flow margin to a positive value. The NRC team concluded that this method was reasonable.

The NRC team concluded that for over 10 years, ANO management had not taken action to resolve degraded coatings inside both containment buildings, and allowed reductions in margin to increase. The NRC team identified the failure to restore degraded containment coatings as an example of a violation for inadequate corrective actions in Section 7.6.

5.2.3 Configuration Control
(IP 95003 Section 02.03.f)

ANO documented the results of the performance evaluation in the Configuration Control KAR. This report stated that configuration control issues continue to occur, but the configuration control conformed to station requirements.

The NRC team reviewed CRs involving configuration control issues, the Configuration Control KAR report, the Collective Evaluation report, and the CRP. The NRC team toured the plant and interviewed the Configuration Control KAR evaluators, auxiliary operators and work control senior reactor operators.

The NRC team noted that ANO's review and assessment of configuration control was focused on component mispositioning events, tagging errors, and a limited review of temporary modifications. ANO's review did not assess other ways that the configuration of the plant is

changed temporarily (e.g., design issues, ODMI's, and Work Orders). Therefore, the NRC team reviewed these areas.

The NRC team reviewed multiple examples where configuration control challenges had occurred. Collectively, these examples did not reflect a decline in performance or impact safety. One example that occurred during this inspection demonstrated a lack of configuration control that rendered safety injection tank (SIT) 2D inoperable.

5.2.4 License Changes Needed to Support Safe Plant Operations
(IP 95003, Section 02.02.c)

Background

The NRC identified a multi-year trend in licensing change requests and relief requests that were untimely, not properly supported, or incomplete. Representative examples included:

- Six of 28 Unit 1 submittals and 12 of 47 Unit 2 submittals requested approval in 8 months or less for changes that normally require one year to review and approve.

- Eight of 28 Unit 1 submittals and 14 of 47 Unit 2 submittals required two or more supplements to provide the information needed by the NRC to complete the review and approval.

- Other examples included rejected and withdrawn requests due to having provided inadequate technical bases.

In response to this trend, ANO evaluated the timeliness and quality of license change submittals needed to support safe plant operations.

ANO Evaluation Results

ANO performed an assessment of licensing action submittal quality and documented the results in CR-ANO-C-2016-0203. ANO reviewed all submittals to the NRC between 2005 through 2014.

ANO determined that, “while the information…does not suggest significant quality issues, it does indicate a change/rise in the number of submittals withdrawn, denied, or not accepted beginning in 2009, a change that has not subsided.” ANO identified that the challenges in improving license submittal quality were the timeliness and quality of licensing action products delivered to regulatory assurance by other departments and the ability of regulatory assurance personnel to screen products for quality and completeness. ANO provided the NRC team with a supplement to the correspondence quality review following the second week of onsite NRC inspection. The purpose was to outline corrective actions that were taken to improve NRC submittal quality, including relevant actions that were included in the CRP as a result of other recovery efforts. ANO identified that the process for approval and funding needed to obtain contractor support hindered timely license submittals.

Planned Corrective Actions

The following major actions to improve license submittal quality were added to the Design and Licensing Basis AAP:

- Re-baseline expectations for supporting information for NRC license amendment requests or relief requests based on past requests for additional information. (DB-18)

- Provide Regulatory Assurance Departmental training on development of NRC license amendment requests. (DB-19)

Inspection Team Observations and Findings

The NRC team assessed ANO's performance in the area of license submittal quality, with a focus on the station's efforts to identify the extent of the problem and develop corrective actions. This included reviewing causal analyses and CRs, and interviewing Regulatory Assurance Department management.

The NRC team concluded that ANO's history of requesting short approval times for licensing action submittals was driven by late identification of the need for a licensing action. Late submittals were needed to support upcoming outages, and were not identified early enough to support timely submission.

While corrective actions to improve the licensing action submittal process were established in the CRP, those actions to improve Regulatory Assurance Department's internal processes were not yet complete. ANO acknowledged that the level of supporting information in years past may not be sufficient to support current licensing actions. ANO initiated corrective actions to re-baseline expectations for the level of detail in licensing action submittals.

The NRC team concluded that ANO's evaluation of license change submittals was thorough and included a detailed assessments. Corrective actions were appropriate to address the problems identified.

5.2.5 Engineering Program Implementation
(IP 95003 Sections 02.03.b and f)

Background

ANO conducted assessments of a sample of engineering programs. ANO completed RCE CR-ANO-C-2015-2833 associated with the Design and Licensing Basis FPA. Additionally, ANO completed extent of condition reviews which included 30 snapshot assessments of engineering programs. Snapshot self-assessments were a type of self-assessment performed in accordance with procedure EN-LI-104, "Self-Assessment and Benchmark Process." The engineering program snapshot assessments were performed by several individuals with knowledge and expertise in the subject, and were used to assess subjects with a limited scope.

ANO Evaluation Results

In the snapshot assessments of engineering programs, ANO did not identify any program that was considered inadequate. ANO concluded that each of these programs was adequate and in compliance with the applicable codes, standards, and regulatory requirements.

Inspection Team Observations and Findings

Overall Engineering Program Observations

The NRC team reviewed 12 snapshot assessments of engineering programs to independently assess the extent of condition for design and licensing basis performance issues. Specifically, the NRC team reviewed the following programs and the associated snapshot assessments:

- ASME Code Section XI Inservice Inspection (ISI) Program
- ASME Code Section XI Repair and Replacement (RR) Program
- Welding Program
- Microbiologically Influenced Corrosion (MIC) Monitoring Program
- The Generic Letter (GL) 89-13 Service Water Program
- Large Motor Program (discussed in Section 5.3.9.2)
- Lifting and Rigging Program (discussed in Section 5.5.7)
- Preventive Maintenance Program (discussed in Section 5.3.2)
- Predictive Maintenance Program (discussed in Section 5.3.2)
- Aging Management Programs (discussed in Section 5.3.9.1)
- Safety-Related Coatings Program
- Margin Management Program

The NRC team identified three programs with performance issues:

- For the MIC Monitoring Program, the team identified errors in monitoring of SW system piping for corrosion loss and an adverse trend in MIC induced SW system piping leakage. A finding associated with the MIC Program is documented in Section 7.4.

- For the ASME Code Section XI ISI Program, the team identified Unit 2 SW system pump supports were not monitored by the program, and the program scope had not been maintained. A violation associated with this issue is documented in Section 7.5.

- For the GL 89-13 Service Water Program, the team identified that ANO was not monitoring and correcting biofouling-induced flow blockages in the SW system. The NRC team identified that ANO did not have an adequate assessment of system performance problems or a holistic plan to correct the problems and causes. Violations associated with examples of inadequate monitoring and correction of service water degradation are documented in Sections 7.6, 7.7, and 7.8.

ANO snapshot assessments of engineering programs were conducted in a systematic manner, some used industry experts, and identified program deficiencies. However, the NRC team concluded that ANO's snapshot assessments were not fully effective in assessing whether some programs addressed longstanding equipment performance trends or whether plant components were appropriately included in programs. The NRC team concluded that the ASME Code Section XI Repair and Replacement Program snapshot assessment was not sufficient to provide a full assessment of program performance. In response to the NRC team's observations, ANO initiated actions (CR-ANO-C-2016-00614) to conduct benchmarking of engineering programs and assign experienced mentors.

The NRC team noted that loss of experienced engineers had created challenges. Through interviews, the NRC team noted that program owners have limited experience with their programs, some had not completed assigned training or qualifications, and some had responsibility for running multiple programs. Program owners did not believe they had sufficient time to implement all of their assigned responsibilities. Engineering managers indicated that losses of experienced program owners through retirements in the last several years had impacted their ability to improve program performance, and most new hires were entry-level engineers with limited experience. Each new individual was assigned a plan to provide support. In some cases, they were assigned mentors with expertise in their program to provide on-the-job training. In response to the NRC team's observations, ANO developed a plan to improve the recruiting of experienced engineers and to develop exchange programs with engineering vendors to more rapidly develop engineering experience. ANO added actions to the Plant Health, Design and Licensing Basis, and Preventive Maintenance AAPs to resolve problems identified during the engineering program reviews, to resolve longstanding equipment issues, and improve staffing and experience in engineering.

ASME Code Section XI Inservice Inspection Program Assessment

NRC regulations require an ISI program for safety-related SSCs to be conducted in accordance with the ASME Code Section XI. ISI programs require periodic nondestructive examinations of SSCs to detect and correct degraded conditions and thereby provide reasonable assurance of pressure boundary integrity in safety systems.

ANO's ASME Code Section XI ISI Program had been subject to frequent change of program ownership. ANO identified the program owner changes as a chronic issue in program health reports. The current program owner had been in place for less than one year and also had several other responsibilities, including being the site welding engineer, the ASME Code Repair Replacement Program owner, and lead engineer for maintaining over 200 vessels under the National Board Inspection Code certification process. ANO recently hired a replacement ISI program owner who was expected to finish qualification in the first quarter of 2016. Additionally, ANO employed a contractor and former ANO ISI Program owner to provide program support. The NRC team concluded that ANO was making progress in improving staffing for the ASME Code Section XI ISI Program.

ANO's snapshot assessment of the ASME Code Section XI ISI Program documented 17 problems, including a failure to conduct ISI program audits within the frequency required by the Quality Assurance Program Manual. This was treated as a licensee-identified violation, which is documented in Section 8.1. ANO's assessment report documented that the program was well-organized and managed, and provided valuable information for the plant to maintain equipment reliability. The NRC team concluded that the ASME Code Section XI ISI Program snapshot assessment applied a systematic approach to review the program and identified program deficiencies.

To independently assess the ASME Code Section XI ISI Program, the NRC team performed a walkdown of the Unit 1 and 2 SW system. The NRC team reviewed the ISI program plans for each unit, and reviewed a sample of ultrasonic examination records for dissimilar metal welds in the Unit 2 RCS to confirm compliance with the prior Code interval requirements for examination of the ASME Code Section XI, Subsection IWB Category B-F, "Pressure Retaining Dissimilar Metal Welds in Vessel Nozzles." The NRC team identified that ANO failed to include the Unit 2 SW system pump lateral supports in the ISI program, which is documented as a violation in Section 7.5. Consequently, these supports had not been examined for inservice degradation

since installation in 1991. The NRC team confirmed that ANO had completed the nondestructive examinations to meet this requirement for the prior Unit 2 Code Interval. The NRC team reviewed pressure test records for the ASME Code Section XI, Subsection IWD Category D-B, “All Pressure Retaining Components,” for the Unit 1 SW system during the prior Code Interval and confirmed Code compliance for this examination category.

MIC Monitoring Program

The NRC-issued GL 89-13, “Service Water Problems Affecting Safety-Related Equipment,” described NRC expectations for maintaining a program of surveillance and control techniques to improve the availability, reliability, and safety margin of SW systems. On January 26, 1990, ANO responded to GL 89-13 and committed to establish a water treatment program to control biofouling and to establish a corrosion monitoring program to assist in evaluating actions needed to maintain the SW system. ANO committed to performing periodic ultrasonic thickness mapping of SW system piping at selected locations and to evaluate the data for trends.

The NRC team interviewed the current MIC Monitoring Program engineer and Unit 1 SW System Engineer, who was responsible for the Chemical Addition Program and the backup to the Unit 2 SW System Engineer. The program owner reported that no requirements existed to conduct periodic assessments of the MIC Monitoring Program since 2014, and that the last periodic MIC Monitoring Program Assessment was performed in 2012 (LO-ALO-2012-00065).

ANO completed a snapshot assessment of the MIC Monitoring Program on December 9, 2015. The assessment report documented six problems and stated that the MIC Monitoring Program met applicable Codes, industry standards, and regulatory requirements, but that a conflict existed between the corporate MIC program (EN-DC-340, “Microbiologically Influenced Corrosion (MIC) Monitoring Program”) scope and that of the ANO MIC Monitoring Program (CALC-A-EP-2005-001). Specifically, the ANO MIC Monitoring Program scope was smaller (more restrictive) than the corporate procedure because it did not apply to non-safety carbon steel piping (other than the Fire Protection System). The ANO program did not include stainless steel pipe. ANO entered this problem into the CAP (CR-ANO-C-2015-04876) and was evaluating corrective actions. The NRC team concluded that the MIC Monitoring Program snapshot assessment applied a systematic approach to review of the program and was effective in identifying program deficiencies.

To independently assess the MIC Monitoring program, the NRC team reviewed the program implementing procedures, nondestructive examination records, the program inspection database, and performed a walkdown of Unit 1 and 2 SW systems. The NRC team reviewed multiple CRs associated with pipe leaks in the SW system attributed to MIC for both units. In 2015, ANO documented an adverse trend associated with 23 leaks attributed to MIC in the SW system since 2000 (CR-ANO-C-2015-01032). ANO attributed the increase in leaks caused by MIC to past periods of insufficient chemical addition (biocide treatment). Specifically, ANO had identified (reference LO-ALO-2012-00065) that the Unit 2 Chemical Addition system was out of service for between 200 and 2150 hours per year over the last several years. A violation associated with this failure to follow chemistry control requirements was documented in NRC inspection report 05000313/2016001 and 05000368/2016001.

The NRC team reviewed a self-revealing leak in a Unit 2 shutdown cooling heat exchanger shell at the start of the fall 2015 outage. The NRC team determined that the shutdown cooling heat exchanger shells were cooled by SW, and had been scheduled to receive non-destructive examination due to corrosion found in other hear exchangers cooled by SW. However, the

shutdown cooling heat exchanger examinations had not been performed, and were rescheduled out of two prior refueling outages. In response to the leak, ANO performed non-destructive examinations of both heat exchangers and identified considerable wall loss in multiple areas. The leak was one of several localized pits in each heat exchanger that ANO concluded were caused by MIC. Repairs were made to ensure the shells have structural integrity through the current operating cycle.

The NRC team identified a violation associated with a number of implementation issues with the MIC Program that adversely affected SW system pipe thickness monitoring, which is documented in Section 7.8. Based on the MIC Program implementation issues and the adverse trend in MIC-induced SW system pipe leakage indicated, the NRC team concluded that ANO had not effectively assessed the performance of the MIC Monitoring Program.

Generic Letter 89-13 Service Water Program

On January 26, 1990, ANO committed to establishing a program to address biofouling in raw water cooling systems which included chlorination, inspection and cleaning, and periodic flow tests. This included conducting periodic flow tests of the safety-related heat exchangers cooled by the SW system and periodic flushes of normally stagnant SW system pipe sections.

The NRC team interviewed the program owner for the GL 89-13 Service Water Program. The engineer had been the program owner for about 6 months and had responsibility for the Air Operated Valve Program and Motor Operated Valve Programs. The new program owner indicated that the prior program owner retired without providing a turnover or mentoring. The program owner reported that no requirements have existed to conduct periodic assessments of the GL 89-13 Service Water Program since 2014.

ANO completed a snapshot assessment of the GL 89-13 Service Water Program on December 15, 2015. The assessment report documented seven problems, and stated that the overall program health was good with respect to the primary goal of ensuring the system's ability to provide its required heat removal function. The report stated that the program had maintained flows above required limits, although problems were identified with improving low flow margins for some components, inadequate configuration control, inadequate alignment between governing documents, and implementation actions that need to be addressed. Specifically, the Unit 2 EDG heat exchangers (2E-20/63/64A and B), shutdown cooling heat exchangers (2E-35A and B), and B control room chiller condenser (2VE-1B) had a longstanding trend of having low flow margin, although the flows have been maintained above the required flow.

The NRC team noted that the ANO snapshot assessment did not classify the long-term low flow margin trends as problems because credit was given for the site processes to elevate awareness of the margin concern, the effectiveness of past actions at sustaining acceptable flow, and the success of recently performed actions at improving flow margin. The NRC team concluded that ANO had been attempting to manage a problem that affected the entire SW system by reducing margins to keep the system within the minimum requirements. The NRC team identified a violation documented in Section 7.6 because ANO had not taken actions required by the program to correct the sustained low-flow margins for the Unit 2 B EDG heat exchangers. The NRC team concluded that the snapshot assessment applied a systematic approach to review of the GL 89-13 Service Water Program, but did not provide a realistic assessment of the effectiveness of the program in identifying and correcting longstanding degraded conditions.

To independently assess the GL 89-13 Service Water Program, the NRC team reviewed implementing procedures, completed surveillance test records, and performed a walkdown of the Unit 1 and 2 SW systems. The NRC team identified that ANO had not replaced the smaller bore piping lines with stainless steel material as originally planned in 1990. Consequently, biofouling induced blockage has occurred in SW system lines resulting in low flow margins for some components. Additionally, the NRC team identified that ANO was not addressing surveillance results that showed long-term degradation and loss of flow margin. For example:

- During the 2014 Unit 2 SW system surveillance test, ANO recorded a flow rate to the EDG heat exchangers (2E- 20/63/64A) that was in the "action required" range and this degraded flow condition had existed for more than five operating cycles. ANO corrected this condition by replacing the SW system supply piping to this EDG in 2015. During the replacement, the Unit 2 SW system engineer observed that the surfaces inside the original pipe were heavily occluded/blocked with MIC tubercles. The NRC team documented a violation in Section 7.6.

- In 2015, ANO experienced reduced flow in the Unit 1 carbon steel SW system makeup line to the SFP attributed to biofouling. A licensee-identified violation is documented in Section 8.3.

- In 2015, ANO experienced reduced flow conditions in the carbon steel supply lines to the Unit 2 HPSI pump A seal and bearing oil coolers. The NRC team documented a violation associated in Section 7.7.

- As of February 2016, ANO had not established a surveillance test to monitor flow loss due to biofouling in the SW system supply lines to the Unit 2 emergency feedwater (EFW) system pumps. The NRC team documented a violation in Section 7.8.

The NRC team concluded that these examples indicate that the ANO GL 89-13 Service Water Program had not been fully effective in identifying and correcting low-flow margins caused by biofouling. In response, ANO added actions to the Plant Health AAP and planned to address the violations through the CAP.

ASME Code Section XI Repair and Replacement (RR) and Welding Programs

NRC regulations require that repairs for safety-related components be conducted in accordance with the ASME Code Section XI requirements. Section XI requires licensees to establish a repair program that includes controls such as using Code-qualified welders and developing repair procedures to maintain reasonable assurance for pressure boundary integrity of safety systems.

The NRC team interviewed the ASME Code Section XI RR Program owner. This individual had been the program owner for less than one year and was also the site welding engineer, the program owner for the ASME Code Section XI ISI Program, and had site responsibility for maintaining National Board Inspection Code certifications on over 200 pressure vessels. The program owner believed that his current responsibilities could not be completed by one person. The backup for the ASME Code Section XI RR owner was a temporary contractor who had formerly been the RR program owner. The lack of a permanent backup program owner had been identified in the 2014 and 2015 program health reports, but ANO had not assigned a

backup owner. The program health reports identified an increased trend toward use of vendors outside of Entergy to perform fabrication and repair activities.

The ASME Code Section XI Code requires an Authorized Nuclear Inservice Inspector (ANII) with responsibilities that include observation, review, and approval of Code repairs and inservice inspections. The NRC team interviewed the ANII assigned to ANO to gain insights into the performance of the ANO ASME Code Section XI RR Program. The ANII had been assigned to ANO for approximately one year and had previous work experience as an ANII at another nuclear power plant. The ANII considered the ANO program adequate. He related that when he had identified problems, ANO appropriately addressed them.

ANO completed a snapshot assessment of the ASME Code Section XI RR Program on December 14, 2015. The assessment report documented five problems and stated that the program was well-organized and managed, and provided valuable information for the plant to maintain equipment reliability. The NRC team noted that the scope of this program assessment did not include a review of program work products to confirm that the program complied with the ASME Code Section XI requirements (e.g., Repair/Replacement Plans, Code Reconciliations, Owners Acceptance Reports (OAR), and Code Repair Reports (NIS-2 forms)). Additionally, the individuals performing the snapshot assessment did not interview the ANII to obtain performance insights. Because the snapshot review for the ASME Code Section XI RR Program did not include a review of a sample of completed work products, the NRC team concluded that it did not provide an adequate assessment of program performance. Therefore, the NRC team reviewed a sample of completed work products for this program.

ANO completed a snapshot assessment of the Welding Program on December 11, 2015. The assessment report documented 16 problems and stated that the Welding Program was structurally strong with good procedures and other program tools, but also had a few examples of Code non-conformances. The assessment report documented that the Welding Program lacked sufficiently qualified and experienced full time staff, which at times resulted in reactive management of the program that created increased risk for future errors; and efforts to improve staffing shortage have been ineffective. The NRC team concluded that this snapshot assessment applied a systematic approach to review of the Welding Program and was effective in identifying program deficiencies.

To independently assess the ASME Code Section XI RR Program and the Welding Program, the NRC team reviewed a sample of ASME Code Section XI RR plans, and the records for a completed Code repair replacement activity. Specifically, the NRC team reviewed records (Work Order 00389851) for the Unit 2 SFP cooler pipe weld leak at the inlet reducer pipe weld and confirmed that the repair was completed in accordance with the ASME Code Section XI repair requirements. The NRC team selected this repair because it involved a weld procedure identified as having deficient guidance in the Welding Program snapshot assessment. Specifically, ANO had identified a weld procedure specification WPS-SS-8/8-B Revision 0 that allowed use of any ASME Section IX P-No. 8 base metal, but lacked sufficient guidance for selection of the proper weld filler metal with respect to minimum tensile strength and chemical composition to meet the requirements of the ASME B31.1 Construction Code. Based upon the NRC team's review of the Unit 2 SFP cooler (E-27B) pipe weld leak, the correct filler metal for this repair had been selected and no deviations from Code requirements were identified.

5.3 Equipment Performance Monitoring and Trending
(IP 95003 Section 02.03.e)

5.3.1 Plant Health Problem Area
(IP 95003 Section 02.03.e)

Background

As part of the Collective Evaluation Process, Plant Health was identified as a PA because the processes and decision making associated with monitoring and maintaining equipment in a reliable condition had not always been effective.

ANO Evaluation Results

The recovery team's evaluation of Plant Health identified that not all equipment issues were being addressed in a manner necessary to preserve safety and operating margins. By not addressing equipment issues, additional compensatory actions added burdens to the staff. Also, long term strategies were determined to be ineffective for replacing safety-related and other important components that were vulnerable to age-related failures. ANO concluded that plant health problems were the direct result of causal factors identified in the FPAs of Organizational Capacity, Preventive Maintenance, and Design and Licensing Basis, with contributing causes from the Leadership Fundamentals and Decision Making and Risk Management FPAs. ANO did not manage resources with a long term view, and exhibited weak focus with respect to eliminating or mitigating challenges to reliable plant operations, prompt and thorough resolution of challenges, and maintaining margins.

Specific issues documented in ANO's evaluation included:

- On-line and outage scope control practices and decision making do not support equipment reliability and maintenance of equipment performance. Newly identified issues and schedule impact were not effectively balanced.

- Leaders have not ensured that resources are available to support equipment reliability, addressing obsolete equipment, and reduce growing backlogs of changes to procedures, drawings, and other documents.

- The Plant Health Committee is not reviewing and resolving all of the degraded equipment issues documented in individual System Health Reports.

- Multiple problems were identified with the implementation of the SIPD process, used for modifications, replacements, and other capital projects. ANO had 1745 issues in the process, and a recovery team reconciliation subsequently closed 1350 as being already complete or no longer needed. Many items lacked management sponsors or project leads, or lacked information needed to proceed through the process. Many items were in the SIPD process for years without being resolved due to deferments, insufficient funding, or unavailable parts.

- Continued equipment reliability issues impact the online and outage schedules and ability to manage the maintenance workload because emergent failures disrupt planned work.

- Changes to the obsolescence program shifted the focus away from performance monitoring (engineering) to the availability of parts (procurement). Although System Engineers identified obsolescence issues in System Health Reports, engineering management has not taken a proactive role in creating solutions.

- Capital spare components have not been adequately maintained.

Planned Corrective Actions

The following significant corrective actions were identified in the Plant Health AAP:

- For open SIPD items, ensure management sponsors and project managers are assigned to verify database content is updated. This action supports effective decision making by ensuring the accuracy and completeness of existing SIPD records. (PH-1)

- Perform a review of the SIPD database from 2007 to present to identify PM or equipment reliability projects related to critical equipment that have been cancelled without mitigation strategies. (PH-2)

- Review and update the current Aging/Obsolescence List, Critical Spares List, and Equipment Reliability Issues List to identify items that should be included in the 2017 and 2018 business cycles. (PH-3)

- Review and update the current site Unit Commitment List to identify operations and maintenance and capital projects which are required to be resolved by completion of refueling outages 1R27 and 2R26. (PH-4)

- Develop and implement a comprehensive site plan for equipment reliability that identifies the implementing resources (people, materials, funding, and time) needed to support on-line and outage Unit Commitment List items that require resolution by completion of 1R27 and 2R26. (PH-5)

- Obtain an independent third party review of the selection of SIPD items that are targeted on the comprehensive site plan for equipment reliability to ensure the decisions for inclusion and exclusion are aligned with industry standards and expectations associated with timely resolution of degraded equipment and design margins. (PH-6)

- Conduct a benchmark of the Plant Health Committee and Plant Health Working Group at a recognized industry leader in identifying and addressing equipment reliability issues. The intent of this action is to validate the action plan for improving our Plant Health Committee and establishing a Plant Health Working Group. (PH-9)

- Develop educational materials for the plant heath process including SIPD processing. Include a detailed flowchart, workbook, and detailed presentation materials. Deliver the presentation to system, component, and program engineers and to selected supervisory personnel. Have the workbook completed by personnel following the presentation. (PH-10)

- Develop a job familiarization guide for Plant Health Working Group and Plant Health Committee members and alternates. Have all members and alternates complete the guide. (PH-11)

- The following list contains equipment reliability issues in systems or components necessary for the safe and reliable operation of the unit(s) that will be resolved over the next two unit operating cycles. The intent of this action is to demonstrate improved equipment reliability by resolving long-standing equipment issues. (PH-12)

    - Unit 1 reactor building coatings margin improvement
    - Unit 1 NI-501 detector replacement
    - Unit 2 shutdown cooling heat exchanger replacement
    - Unit 2 instrument air compressor replacement
    - Fire suppression system reliability improvement
    - Diesel fire pump engine overhaul
    - Radiation monitor reliability improvement
    - Unit 2 component cooling water (CCW) system performance improvements
        - 2P-33C CCW pump overhaul
        - 2P-33B CCW pump overhaul
        - 2E-28B CCW heat exchanger replacement
    - Service water and circulating water chemical treatment system upgrade
    - Unit 2 condensate pump 2P-2A rebuild
    - Unit 1 letdown heat exchanger replacement
    - Decay heat check valves DH-17 and DH-18 replacement
    - Unit 1 reactor vessel head O-ring leakage resolution
    - SU2 transformer inspections
    - SU3 transformer inspections
    - Complete design of Unit 1 integrated control system reverse engineered modules
    - Implement single point vulnerability (SPV) mitigation and elimination efforts
    - Unit 1 and Unit 2 super particulate iodine and noble gas monitor (SPINGS) replacement

- The following list contains equipment reliability issues that are being evaluated by the Plant Health Committee for resolution commensurate with the potential impact on safe and reliable operation of the units by December 20, 2018. For items not resolved by the due date, the Plant Health Committee will provide the safety basis for the extension. (PH-13)

    - Resolution of Unit 1 EDG exhaust stack thinning
    - Resolution of Unit 2 EDG exhaust stack thinning
    - Unit 2 SFP cooling system performance improvement
    - Service water piping replacement
    - Correct back-leakage into the Unit 1 boric acid system
    - Unit 2 EFW Terry turbine governor replacement
    - Unit 2 spare SW motor issue resolution
    - Unit 1 high pressure injection pump P-36B motor refurbishment
    - Tornado/missile protection for EFW piping resolution
    - Unit 1 reactor vessel head leak-off line replacement

- Track and audit the completion of the following equipment reliability issues related to the White finding and the potential for additional unplanned scrams. (PH-14)

    - Audit completion of repair of 161kV Russellville east transmission line lightning protection system.

    - Audit completion of Entergy Transmission inspection of static line grounds on transmission lines that end in the ANO switchyard and ensure the acceptance criteria per Entergy Transmission Standards, including: 1) Pleasant Hill (500KV); 2) Fort Smith (500kV); 3) Mabelvale (500kV); and 4) Pleasant Hill (161KV).

    - Replace damaged Unit 2 UAT 6.9kV and 4.16kV buses and ducting.

    - Audit completion of SU3 non-segmented bus inspections, to include visual confirmation of filler material under taped, bolted connections.

    - Verify that all medium voltage connections have adequate fill and air gap.

        1) Issue work requests to inspect all ANO-1 and ANO-2 medium voltage connections for the existence of corona effects.

        2) Issue work requests to re-tape all ANO-1 and ANO-2 medium voltage connections and ensure adequate fill is installed.

Inspection Team Observations and Findings

The NRC team performed a review the Plant Health PA evaluation, the Plant Health Project Plan, and associated corrective actions. The NRC team conducted interviews with key personnel, attended meetings associated with the Plant Health program, and performed a review of the SIPD and System Health Report processes.

The NRC team performed an independent assessment of the material condition of SSCs that support containment functions, and reviewed a sample of degraded fire protection features. These assessments included at-power entries of both units' containment buildings, the material condition and health of systems including:

- Containment isolation valves
- Borated water leaks
- Auxiliary building tours with focus on penetration areas and containment isolation valves
- Containment liner and coating issues
- Containment sump conditions
- Containment floor spalling
- Decay heat removal systems check valve leakage in both units
- Fire impairment backlog reduction strategy
- Fire main piping replacement strategy

The NRC team concluded that ANO's evaluation of the Plant Health PA was comprehensive. The evaluation provided a critical look at the Plant Health Program, including long term equipment reliability and obsolescence, and identified key issues that the program had

previously failed to identify or correct. While the evaluation and corrective actions were appropriate, the NRC team had the following additional observations:

- ANO had a significant backlog of degraded fire protection features. The NRC team noted that this backlog continued to increase, and only 20 percent of mechanical maintenance technicians were qualified to work on the fire protection system, which contributed to the challenge of reducing this backlog.

- After observing borated water leaks in both containments, the NRC team was concerned that ANO was not correcting borated water leaks in a timely manner. The NRC team identified an active leak from check valve 2SI-13D inside the Unit 2 containment which was allowing borated water to puddle at the containment liner seams. ANO had identified this leak in November 2015, prior to the end of the last Unit 2 outage, but had failed to monitor it until the NRC team found the leak and questioned the impact it was having inside containment.

- The NRC containment walkdowns identified loose and missing feedwater piping insulation. This could create transportable debris during an accident and challenge ECCS sump screen functions.

- The Plant Health Project Plan was incomplete and lacked sufficient detail to provide assurance that identified issues would be corrected. Some of those steps did not appear to support timely improvements in equipment reliability, potentially missing opportunities to add scope to the next outage for each unit.

In response, ANO added actions to the Plant Health AAP, including corrective actions to address equipment reliability issues and a review to re-evaluate longstanding problems that had failed to be resolved or had been removed from the resolution process.

5.3.2 Preventive Maintenance
(IP 95003 Section 02.03.e)

Background

The Collective Evaluation identified that the PM Program had been deficient in preventing risk-significant equipment failures. A gradual decline in PM Program performance had begun at least 8 years earlier, and was accelerated by changes to procedure EN-DC-324, “Preventive Maintenance Program.” As a result, ANO identified the PM Program as an FPA.

ANO Evaluation Results

ANO performed evaluations as part of the recovery project to investigate the causes and impacts related to declining PM Program performance, including:

- PM root cause evaluation
- Historical Data Review
- Collective Evaluation
- PM Technical Basis and Program Performance IACPD Evaluation

The PM RCE documented that declining effectiveness of the PM Program was the result of non-conservative decision making, inadequate organizational capacity to support a continuously improving PM Program, and ineffective reinforcement of standards by station leaders. A gradual decline of performance at the station appears to have started in 2008. This decline was accelerated by initiatives to reduce staff, streamline processes, and make revisions to procedure EN-DC-324 which deviated from industry standards. Since 2013, a number of equipment failures occurred that involved deficiencies in PM controls and supporting functions. The equipment failures included:

- Deficient flood barriers, self-revealed after the stator drop event.
- An electrical fault in the Unit 2 UAT, which resulted in a plant trip.
- An over speed trip of the AAC diesel generator.
- A Unit 2 main steam isolation valve failure to close during testing.
- An electrical fault in breaker 2B3-23, which resulted in loss of the associated motor control center bus.

ANO's PM RCE documented the following causes:

Root Cause 1: Station leaders use decision making-practices involving the PM Program that emphasize choices that are allowable over those that are conservative. These practices have failed to prevent significant station events, regulatory challenges, and outage delays.

Root Cause 2: The ANO leadership team has not provided the organizational structure, the staff's priorities, or dedicated resources to support the PM Program. This resulted in inadequate long-term plans that failed to prevent degraded equipment and loss of margin.

Contributing Cause 1: ANO staff and leaders are not demonstrating and reinforcing high standards of performance for the PM Program.

Contributing Cause 2: PM improvement projects were terminated prior to completion without the development of adequate mitigation strategies.

Contributing Cause 3: PM Program feedback is not effectively implemented.

Contributing Cause 4: Station leaders have not provided the organizational structure, support, and resources needed to establish CAP as a core business priority.

ANO performed the PM RCE in concert with five other FPAs to ensure a broad evaluation of these interrelated topics. The other FPAs were Corporate and Independent Oversight, Leadership Fundamentals, Decision Making and Risk Management, Design and Licensing Basis, and Organizational Capacity.

The extent of condition was evaluated to determine whether there were same or similar deficiencies in other programs used to reduce failures of risk-significant equipment and to improve reliable plant operation. ANO's review identified 44 programs that are the same as or similar to the PM Program. ANO performed assessments of these 44 programs and planned

corrective actions to address the findings. ANO determined that the extent of cause for each of the PM Program RCE root and contributing causes will be addressed by RCEs for the other fundamental problem root causes.

Planned Corrective Actions

The following corrective actions were identified under the PM AAP:

Key Corrective Actions

- Create a site specific procedure for component classification that will ensure appropriate classification of equipment for PM based upon risk and safety. (PM-1)

- Create a site-specific PM program procedure that includes lessons learned from the PM FPA root cause related to critical input to PM changes. (PM-2)

- Transfer responsibility for PM evaluations of all maintenance rule components and critical system redundancy components to engineering to ensure that appropriate expertise is brought to bear on these evaluations. (PM-4)

Actions to Increase Management Oversight

- The PM Oversight Group will review all PM change requests for a minimum of 12 months and initiate corrective action for any that do not meet management standards for quality. (PM-5)

- The Event Report Review Board will review all formal OE evaluations for 12 months and initiate corrective action for any that do not meet management standards for quality. (PM-6)

- The Planning Quality Review Team will perform an enhanced review of critical work orders for a minimum of 12 months and feedback the results to the planning staff. (PM-7)

- Develop metrics for the number of open craft work order feedback requests. (PM-9)

- Reestablish the PM Program health report for a period of at least 12 months. (PM-10)

Actions to Improve Qualification and Training

- Implement a new qualification card for maintenance personnel who perform PM evaluations. (PM-11)

- Implement training for all personnel who are qualified to establish PM requirements. (PM-12)

Actions to Evaluate PM Program Resources

- Perform a resource allocation study of the PM Program that identified positions needed to maintain a continuously improving PM Program. (PM-13)

- Address gaps in the PM Program baseline staffing level based on the current levels of experience in the departments and at the site. (PM-14)

Preventive Maintenance Program Reconciliation

- Review a sample of component criticality classifications to validate that the station's risk significant equipment is classified correctly. (PM-15)

- Review the last nine years of critical PM deferrals to identify non-conservative decisions and develop any needed recovery actions to be implemented in the next system outage. (PM-16)

- Re-evaluate the PM strategies for maintenance rule low risk significant components and components required for critical system redundancy. (PM-17)

- Develop mitigation strategies to address cancelled projects in the SIPD including embedded sub component projects. (PM-18)

Actions to Reduce PM Change Request Backlogs

- Revise the PM procedure to require that craft work order feedback is monitored and incorporated within 90 days or model work order placed into "plan" status. (PM-19)

Strategic Review of Performance Standards and Staffing Issues

- Track Leadership Fundamentals RCE CR-ANO-C-2015-02829 CA-022. Improve the performance review process for leadership fundamentals supportive of long term strategic improvement. (PM-20)

Inspection Team Observations and Findings

The NRC team assessed ANO PM Program performance to determine whether it was sufficient to support safe operation and whether planned corrective actions would promote sustained performance improvement. ANO's evaluations related to PM were comprehensive and identified multiple conditions that contributed to the failure of the PM Program to sustain reliable equipment performance. While thorough, the NRC team identified issues in the analysis and resolution plan associated with the PM Program, including:

- The database used to support the PM Program had incomplete information. The Preventive Maintenance Optimization Software (PMOS) was intended to document the PM classification and basis for plant components. While there was a documented basis for the classification entered, many components in critical systems had little or no description of the component functions, associated maintenance rule functions, credible failure modes, and consequences of failure in the PMOS entry description, contrary to procedure EN-DC-153, "Preventive Maintenance Component Classification." While the NRC team concluded that this is not a violation of regulatory requirements, this information is needed to support PM decisions. ANO planned to address the incomplete information concern through actions to validate criticality classifications under the Design

and Licensing Basis AAP (DB-15) and create a requirement for system engineers to validate the classification during work schedule reviews for maintenance planning.

- Multiple instances of incorrect PM classifications and supporting basis information. ANO planned to evaluate PM classifications through actions to validate criticality classifications under the PM AAP (PM-15).

- ANO does not track low critical or non-critical first time PMs. ANO performed a program assessment of first time PMs in 2012, identifying greater than 500 outstanding first time high critical activities. ANO has reduced the number of first time high critical PM activities to 70.

The NRC team assessed the application of the PM Program to mitigate SPVs, which identified components whose failure can result in having to operate at reduced power or a unit trip. ANO's evaluation documented 3292 components as SPV, and included mitigation strategies in CALC-ANOC-SE-00001. The NRC team reviewed the snapshot assessment of the SPV program (AL-ALO-2015-00079) performed under the extent of condition evaluation associated with the PM RCE and noted that ANO appropriately scheduled mitigation actions for all of the unmitigated SPVs in upcoming outages.

The NRC team assessed examples of PM scope and frequency changes for adequate technical justification. ANO identified during the PM RCE that engineering evaluations did not address all aspects needed for PM change request evaluations, and current PM change request evaluations have been inadequate to prevent events. The NRC team sampled several equipment PM items that had frequency reductions and did not identify any additional consequences from PM scope reductions. The NRC team concluded that ANO's evaluation of this area was adequate.

Non-Critical Preventive Maintenance Support

ANO Evaluation Results

ANO's PM Program was managed by different organizations based on the PM classification of the component. Critical component PMs were managed by the Engineering Department; non-critical component PMs were managed by the Maintenance Department; run-to-failure components were addressed by the CAP. In 2008, the scope of non-critical components was expanded to include some components important to the safe and reliable operation of the plant. This change expanded the role of Maintenance Department coordinators in PM Program implementation without adding resources. HCM further reduced resources needed to implement the maintenance programs.

ANO evaluated the differences in implementation of the critical PM Program by engineering and non-critical PM Program by maintenance as part of the PM RCE. ANO identified that station leaders made the decision to transfer responsibility for PM strategies of non-critical components to maintenance without adequate change management. ANO identified that maintenance personnel lacked the proper training and qualification to manage the population of components expanded by the change in definition of non-critical.

Planned Corrective Actions

Corrective actions under PM-11 and PM-12 implement improved training and qualification requirements for personnel responsible for PM changes. Further, ANO established corrective action PM-4 to transfer responsibility for PM strategies of all maintenance rule components to engineering.

Inspection Team Observations and Findings

The NRC team identified that Maintenance Department PM coordinators have reduced the time spent performing PMs in order to perform other maintenance activities. This included extending PM frequencies for non-critical components without an adequate technical basis. ANO planned to address the extension of non-critical PMs through actions PM-16 and PM-17.

Technical Justification of PM Scope Reductions

ANO Evaluation Results

ANO identified weaknesses within the PM technical basis and program implementation. ANO concluded that several recent events had been a result of PM activities that were performed less frequently than recommended by the vendor. Additionally, examples were identified where the bases for the PM strategies were deficient.

Planned Corrective Actions

ANO identified the following corrective actions to address PM technical justifications:

- Create a site specific PM Program procedure that includes lessons learned from the PM FPA related to critical input to PM changes. (PM-2)

- Transfer responsibility for PM evaluations of all maintenance rule components and critical system redundancy components to engineering. (PM-4)

- The PM Oversight Group (PMOG) will review all PM change requests for a minimum of 12 months and initiate corrective actions for any that do not meet management standards for quality. (PM-5)

Inspection Team Observations and Findings

The NRC team concluded that ANO's evaluations for PM scope changes were comprehensive. The NRC team noted that the evaluations included a sound basis for determining that the period of decline started in 2008. The decline involved non-conservative decision making, inadequate organizational capacity, and ineffective reinforcement of standards by station leadership. The evaluations identified multiple conditions that contributed to the failure to identify and resolve declining performance. The NRC team concluded ANO's evaluation was sufficient and did not identify any additional consequences from PM scope reductions.

Predictive and Component and System Monitoring Programs

ANO conducted a snapshot assessment of the Predictive Maintenance Program. The Predictive Maintenance Program and the Component and System Monitoring Programs provide

feedback to the PM Program. The assessment identified one negative observation associated with non-critical equipment being tracked in a degraded condition on the Predictive Maintenance Watch List for greater than 200 days. ANO did not perform an assessment of the Component and System Monitoring Program. ANO did not generate any corrective actions associated with Predictive Maintenance or Component and System Monitoring Programs.

The NRC team assessed the Component and System Monitoring Program by sampling performance monitoring plans, trend data, and walkdown reports for high risk components in both units. The NRC team concluded that performance monitoring plans were thorough, complete, and approved by station management; and that adverse conditions identified during walkdowns were documented in CRs. However, trend data was inconsistent. Missing or incorrect data was observed for Unit 1 and Unit 2 reactor protection system and Unit 1 EFW. Data for the Unit 1 and Unit 2 AC and DC distribution systems could not be used to identify trends. The NRC team identified a violation for the failure to correct conditions adverse to quality involving the Unit 2 train B SW flow to the B EDG heat exchangers (see Section 7.6), and a finding for not performing predictive monitoring of 4.16kV buses (see Section 7.12).

The NRC team determined that the Predictive Maintenance and Component and System Monitoring Programs failed to inform the station of the ineffectiveness of the PM Program. Adverse conditions identified by the NRC team indicate continued weaknesses in implementation of performance monitoring and the PM Programs.

5.3.3 On-Line Work Management
(IP 95003 Sections 02.03.c and e)

ANO Evaluation Results

ANO identified that the execution of the work management process was not consistently supporting predictable, well-prepared implementation of work. Problems in execution of the work management processes impact the station's ability to manage risk and effectively maintain the plant. Problems with work management became evident through accumulation of work backlogs, inefficient maintenance and engineering work planning and execution, lack of recognition and understanding of plant risk, and declining staffing and experience levels.

ANO performed evaluations as part of the recovery project to investigate the causes of declining work management processes, including:

- ANO IP 95003 Investigation Period Basis Document Management of Risk
- Historical Data Review
- Collective Evaluation
- Work Management Program Review

ANO initially determined that the work management issues should be identified as a PA. The recovery team later determined that issues with work management would be addressed under the PM FPA, the Design and Licensing FPA, the Nuclear Fundamentals PA, and the Procedure and Work Instruction Quality PA.

ANO performed the Work Management Program review by observing field activities, work week planning meetings, daily schedule execution, and reviewing work management program

procedures, work management performance indicators, and the CR database. The Work Management Program review report documented the following conclusions:

- Procedure, EN-WM-101, "On-line Work Management Process," is aligned with industry standards.

- There is a weakness in the knowledge and understanding of roles and responsibilities, including:

    - Adding work to a schedule and the subsequent impact on risk management, resources, and other scheduled work

    - Associating tag-outs with work packages

    - Performance indicator calculations

    - Resource demand and supply

    - Work that is moved between refueling outages and on-line processes

    - Unapproved changes to scheduled work

    - Adherence to work classification guidelines

    - The inclusion of support requirements in the preparation phase of scheduling (including walkdowns of support functions such as scaffolding, insulation, welding, and radiation protection)

- Cycle plans for Unit 1 and Unit 2 did not cover the entire cycles.

Planned Corrective Actions

ANO initiated the following corrective actions:

- Develop roles and responsibilities for the quorum line participants in the work management process. (DM-17)

- Develop and implement work management training for senior managers, managers, and each of the identified work management positions with respect to their roles and responsibilities. (DM-18)

- Develop and implement supply versus demand model and metrics to determine and monitor resource needs to meet work load demand. (DM-20)

- Benchmark outside the Entergy fleet to identify best practices in the work management process. (DM-22)

- Have a group from another plant perform a peer assist visit in work management. (DM-23)

Inspection Team Observations and Findings

The NRC team assessed ANO performance to determine whether work management was sufficient to support safe operation and whether planned corrective actions would promote sustained performance improvement. The NRC team identified the following observations:

- ANO's work planning process and scheduling processes were undergoing noticeable improvements to increase accountability and promote communication across work groups to ensure work is properly scheduled within the available resources.

- ANO planned work assuming that all maintenance workers would be available to support work. This necessitated that any emergent work be addressed by the fix-it-now team, or planned work must be rescheduled. As a result, emergent maintenance frequently disrupted planned work.

- Work is delayed or removed from the schedule because preparations were not completed prior to equipment being taken out of service. Examples included unavailable workers, missing parts were not available, or incomplete maintenance risk evaluations.

- The fix-it-now team was expected to work off minor maintenance and backlog work. Because a work plan did not exist, workers pursued other activities.

The NRC team concluded that the corrective actions addressed the problems in work management. ANO recognized that they need to improve the capacity to complete maintenance to improve station performance. In response, ANO added actions to the Decision Making and Risk Management AAP to improve work management.

5.3.4 Outage Work Management
(IP 95003 Sections 02.03.c and e)

Background

The recovery team identified that ANO consistently planned shorter outages and spent less during outages than other two unit nuclear sites. The recovery team did not assess outage performance. The Organizational Capacity FPA, "Equipment and Work Prioritization," section discussed ANO capital spending and concluded that capital spending at ANO was lower than other two unit sites from the period of 2006 through 2012.

Inspection Team Observations and Findings

The NRC team determined that the lower capital expenditures at ANO could be attributed to the long-term planning process. ANO's implementation of the SIPD process lacked long-range planning, was difficult to manage, and lacked the engineering resources to fulfill the SIPD process requirements. This is further discussed in Section 5.2.2.

The NRC team identified the following observations:

- Outage durations were established five outages (about 7.5 years) in advance. The process involved estimating outage duration based on known major work at that time, without being able to account for jobs identified closer to the outage. ANO management

attempted to plan and execute outages based on early estimates of outage duration. Additionally, safety culture assessments indicated that ANO resisted adding outage scope when new problems were identified during outages. During the fall 2015 Unit 2 outage, some improvement was noted in adding work scope to the outage.

- As discussed in Section 5.2.2, the SIPD process for making capital improvements was ineffective. Only work needing approval and funding for the next outage was addressed. This contributed to the relatively low outage expenditures, and was a contributing factor to equipment reliability challenges.

- The Engineering Department organizational capacity issues resulted in engineers having too many assigned duties to be able to properly plan for outage scoping meetings.

The NRC team concluded that planned corrective actions in the Plant Health and Decision Making and Risk Management AAPs were appropriate to improve outage work management.

5.3.5 Maintenance Backlogs
(IP 95003 Sections 02.03.e)

ANO Evaluation Results

The Organizational Capacity RCE report documented that the cause of the high backlog of maintenance work orders was the failure of the ANO leadership team to apply a strategic approach to the allocation of resources to support the safe long-term operation of the station. ANO documented in the PM RCE report that engineering resources were insufficient to prepare for work planning meetings intended to establish PM scope. ANO identified that the work order backlog continued to fail to meet Entergy fleet goals. ANO documented that the Maintenance Department did not meet goals for backlog reduction in 2015, has not aligned around common backlog reduction goals for 2016, and does not understand the level of risk residing in the work backlog.

Planned Corrective Actions

ANO established a maintenance backlog reduction project to reduce the volume of critical and non-critical corrective and degraded backlog work orders. ANO identified that a large fraction of the maintenance backlog involved completed work that had not received the closure reviews and final status updates. Prior to this inspection, ANO completed the reviews and closed over 2500 work orders for each unit. This action reduced the backlog to approximately 500 work orders for each unit, which was a level typical of other plants.

ANO also developed a “passive risk tool” to provide a method of assessing work to balance competing needs in scheduling work.

Inspection Team Observations and Findings

The NRC team reviewed the work order backlog to determine whether ANO had resolved known latent equipment reliability concerns. The ANO work order backlog included all open work orders, including preventive and corrective maintenance.

The NRC team concluded that ANO had not been managing the work backlog in accordance with Entergy standards provided in procedure EN-WM-101 Section 5.7, which required

validating the accuracy and the correct classification of backlog items and identifying aggregate issues or trends on systems and components. ANO failed to perform this review in 2015 and failed to document the results of the review that was conducted in 2014 (CR-ANO-C-2016-00775 and CR-ANO-C-2016-00833). While the NRC team concluded that this was not a violation of regulatory requirements, performing these evaluations would provide information needed by work management staff to prioritize and reduce the backlog.

The NRC team identified weaknesses in the selection of the "right work" in the normal work planning process and the backlog reduction process. ANO defined "right work" as the grouping of work activities which best meet the equipment reliability needs of the station by balancing the priority to correct degraded conditions against the capability of the station to complete the activity. The mechanical, electrical, and I&C maintenance coordinators for the online maintenance disciplines and the backlog project manager for the backlog reduction team select the "right work." The NRC team noted that the process did not seek input from operations and engineering to help identify the "right work" activities. For normal online work, ANO's implementation resulted in a poor work bundling, excessive equipment unavailability, and delays in addressing difficult or complex tasks.

The NRC team noted that the backlog reduction project lacked the planning, prioritization, and resources to perform difficult or complex tasks. As a result, the backlog reduction team completed the easiest jobs instead of the most important jobs. The backlog reduction project did not yet have a plan to address more complex work that will require assistance from other work groups.

The NRC team concluded that ANO had identified and closed a significant fraction of the apparent maintenance work backlog. The NRC team did not identify any concerns with the contents of the work backlog, and concluded that actions to improve organizational capacity and the efficiency of work control processes were appropriate to address the causes for allowing a large work backlog to occur.

5.3.6 Maintenance Rework

Background

The recovery team identified several examples of inadequately performed maintenance, including:

- Unit 1 decay heat removal pump failed to start in March 2013 while in reduced RCS inventory due to installation of the incorrect breaker spring.

- Unit 2 entered Mode 3 in June 2014, with an inoperable EFW pump due to inadequately performed maintenance.

To assess maintenance rework, ANO completed ACE CR-ANO-C-2015-00627, "Critical Equipment Rework during Refueling Outages," in May 2015. This ACE identified the following additional examples of critical components that required rework:

- Letdown cooler E-29A inlet isolation valve CV-1213 leak at the bonnet pressure seal.

- Pressurizer makeup block valve CV-1234 leak at the bonnet pressure seal.

- Auxiliary feedwater pump P-75 outboard bearing housing assembled 90 degrees out of correct position.

- Power range neutron detector NI-6 failed cable connection.

The apparent cause for critical equipment rework during refueling outages was "supervisors not recognizing the outage risk involved with the potential failure" of the specific equipment. ANO concluded that maintenance rework had improved, and that actions to improve field presence, oversight of contractors, and work instruction quality would drive additional improvement.

Inspection Team Observations and Findings

The NRC team reviewed procedure EN-MA-123, "Identification and Trending of Rework," interviewed the Rework Reduction Program Coordinator, reviewed maintenance rule (a)(1) evaluations, and searched the CAP for issues classified as rework. Walkdowns were conducted in the turbine, auxiliary and containment buildings to identify maintenance deficiencies.

The NRC team determined that ANO had a program that identified and trended rework. The NRC team did not find additional examples of rework. The Unit 1 rework metric in 2015 was red due to the rework examples listed above, but was currently white.

Discussions with the Rework Reduction Program Coordinator and maintenance personnel revealed that when workers raised issues, action was not always taken to address the concerns before proceeding, resulting in failed post maintenance tests and rework. One recent example involved leakage from the Unit 2 safety injection system check valve, 2SI-13D. During the fall 2015 outage, maintenance was performed on valve 2SI-13D. Leakage at the body to bonnet joint was discovered during a resident inspector walkdown of the Unit 2 containment prior to the completion of the fall outage, and identified by the NRC team to have increased leakage in February, 2016. The NRC team determined through interviews with the mechanics that they expressed concerns with the condition of the valve; however, the concerns were not raised to the outage control center or to engineering. As a result, Unit 2 started up with valve 2SI-13D leaking. This leakage increased to the point that a plant shutdown was required on February 23, 2016.

The NRC team concluded that the planned corrective actions to address the PM and Decision Making FPAs, and the Nuclear Fundamentals PA should collectively address the causes of the existing level of rework concerns raised by workers in the field.

5.3.7 Work Instruction and Preventive Maintenance Feedback
(IP 95003 Section 02.03.d)

ANO Evaluation Results

ANO identified that the level of detail in work orders has not been sufficient to prevent plant events, the backlog of work order and PM feedback has increased, PM documents are not updated until the PMs are entering the work scheduling process, and insufficient resources are available to support work planning. As part of the PM RCE, ANO evaluated the work order instruction and PM feedback process. ANO concluded that Procedure and Work Instruction Quality should be a treated as a PA. The evaluations documented problems that included:

- Due to a backlog of work instruction feedback forms, the quality of work order instructions has not been effectively improved over time.

- Work order instructions lack sufficient detail, including details needed to ensure work scope is fully accomplished, steps provide and verify critical attributes, and critical steps are identified.

- Craft feedback is not being incorporated into work order instructions prior to the initial work planning meetings, necessitating updates that distract from other work planning activities.

- Work instruction feedback backlog is not effectively monitored or managed.

- Supervision has not assured work order quality, and management has not reinforced high standards for PM work order reviews.

Planned Corrective Actions

ANO identified the following corrective actions to address the work instruction quality issue:

- Develop and implement a site procedure writer guide based on applicable industry standards. (PQ-1)

- Develop and implement a work order instructions guide based on applicable industry standards. (PQ-2)

- Perform scoping reviews to assess the extent of procedure and work instruction quality issues. (PQ-3)

- Conduct a Procedure Professionals Association Certification Course for selected plant personnel. (PQ-4)

- Risk rank station procedures as safety significant, important, or normal to facilitate procedure upgrade project scoping. (PQ-5)

- Upgrade procedures classified as “safety significant.” (PQ-6)

- Upgrade procedures classified as “important.” (PQ-7)

- Upgrade procedures classified as “normal.” (PQ-8)

- Upgrade Critical 1-4 Model Work Orders with a frequency of greater than or equal to 2 years or 2 refueling outages. (PQ-9)

- Review and/or validate station procedures with respect to gaps in use of “notes and cautions,” and ensure needed corrections are entered into the appropriate station processes for completion. (PQ-10)

- Establish periodic review and validation of station procedures. This will support a systematic approach to revising station procedures not included in other actions to the standards contained in the new writers' guide. (PQ-11)

ANO was also implementing the following actions to address the feedback process issue:

- Hire contractors to work down the backlog of work order and PM feedback.
- Develop metrics for the number of open work order feedback requests.
- Require work order feedback be resolved prior to the next occurrence of the PM.

Inspection Team Observations and Findings

The NRC team identified the following:

- Corrective actions did not include providing training to the planners on writing work orders using industry standards. In response, ANO added actions to include training under PQ-4 above.

- Corrective actions to strengthen the work management process and develop a structured process for reducing the feedback backlog were not tracked in the CRP. In response, ANO added the actions to the CRP (DM-17 through 23).

- Maintenance workers were providing work order feedback informally rather than submitting a Procedure Improvement Form.

- Planners do not perform searches for feedback. The NRC team identified that they typically only review the feedback on the last work order and not the work order feedback log when planning for the next job. In response, ANO developed actions to assess the extent of work instruction quality issues, and to conduct industry certification training for procedure writers (PQ-3 and PQ-4).

The NRC team concluded that the results of assessments performed by ANO identified problems in PM and work instruction feedback area. The assessment reports documented deficiencies and linked causes to organizational capacity issues in the relevant departments and with leadership. The NRC team concluded that ANO developed corrective actions to address knowledge and standards, and to upgrade station procedures.

5.3.8 Control Room Deficiencies and Operator Work-Arounds
(IP 95003 Section 02.03.e)

Background

ANO recovery team evaluations documented examples of temporary modifications and tagging clearances that had been in the plant for prolonged periods of time because degraded conditions had not been corrected. ANO's Collective Evaluation Report stated that the aggregate risk associated with equipment conditions is not clearly identified, properly mitigated, or eliminated, and station leaders are not demonstrating and reinforcing high standards for station performance and accountability.

Inspection Team Observations and Findings

The NRC team reviewed ANO's identification of control room deficiencies and operator work-arounds, and the station's processes for evaluation and incorporation of identified issues into the Operations Aggregate Index. The Operations Aggregate Index process was used to ensure that degraded equipment and increased operator burdens are identified, assessed, and prioritized. The NRC team performed control room observations and system walk downs, reviewed turnover sheets and daily status reports, and conducted interviews with operators, supervisors and Operations Department management.

The NRC team determined that ANO was not consistently implementing the Operations Concern Program. The NRC team identified the following examples of deficiencies where compensatory actions for degraded equipment were being tracked informally or outside the Operations Concern Program (e.g., turnover sheet carryover items, standing instructions, or ODMI directions):

- Unit 1 - Auxiliary operators monitored computer room temperature twice per shift due to the room cooler being broken.

- Unit 1 - Auxiliary operators monitored the steam leak on the high pressure turbine casing twice per shift, and reviewed the rapid down power procedure each shift.

- Unit 1 – An oil leak on a lube oil purifier skid required emptying a catch bucket 2 to 3 times per shift.

- Unit 1 – Three of 12 nitrogen receivers were manually isolated from the nitrogen header due to lifting relief valves when aligned, requiring them to be manually placed in service if needed.

- Unit 2 – The local starting computer screen for the AAC diesel generator was not working, requiring non-licensed operators to be briefed on the manual start procedure at the beginning of each shift.

- Unit 2 - Since November of 2015, check valve 2SI-13D leakage required operators to refill SIT 2T-2D as needed to compensate for the leakage.

- Unit 2 - Main chiller A condenser inlet valve 2CV-3806 had internal binding, requiring an alternate method to be used in place of the normal line up. Compensatory actions were being tracked as a carryover item on the Unit 2 shift relief sheet.

The Operations Concern Program owner confirmed that these examples had not been evaluated for classification as operator work-arounds or Burdens. The NRC team was concerned the issues that bypassed the Operations Concern Program may not be corrected in a timely manner. The NRC team noted that Operations Concerns Program records were not retained or trended. ANO later determined that the examples did not meet the threshold for inclusion in the Operations Aggregate Index as operator work-arounds or Burdens.

The NRC team concluded that ANO tolerated low-level degraded conditions that, individually, were below the thresholds for being classified as a priority item. ANO did not assess the

collective impact on operator performance. The examples described above had the following impacts:

- Increased the number of operator actions needed to respond to events (e.g., manually starting or realigning important systems)

- Caused operators to have to continually review response actions due to degraded conditions (e.g., rapid power reduction, manual AAC DG start)

- Distracted operators from plant operations in order to take actions needed to compensate for the degraded condition (e.g., draining, refilling, locally monitoring)

The NRC team noted that on February 19, 2016, while Unit 2 operators were refilling SIT 2T-2D to compensate for check valve leakage while draining SIT 2T-2C to compensate for in-leakage from a different check valve, SIT 2T-2D became inoperable because compensatory actions to address two different material condition issues in the same train were incompatible.

Based on walkdowns of control rooms, interviews with operators, and reviews of outstanding work orders, the NRC team concluded that control room deficiencies were identified and corrected in a timely manner. A review of online and outage control room deficiencies indicated that the Operations Department was aggressive in repairing control room equipment.

5.3.9 Strategic Equipment Management and Aging Management
(IP 95003, Section 02.03.e)

5.3.9.1 Equipment Aging Management
(IP 95003, Section 02.03.e)

Background

On January 10, 2001, the NRC approved ANO Unit 1 for an additional 20 year period of licensed operation. ANO Unit 1 entered the period of extended licensed operation on May 21, 2014. ANO established 41 aging management programs (AMPs) to identify, monitor and manage the effects of aging on plant SSCs. As part of the CRP, ANO initially assigned one action for the AMPs, which was to complete a review of the site Aging/Obsolescence (PH-3).

Inspection Team Observations and Findings

The NRC team reviewed activities associated with three Unit 1 AMPs (Inservice Inspection Program, Wall Thinning Monitoring Program, and the SW Integrity Program) to determine if these programs had been effectively implemented. The NRC team identified performance deficiencies in the Wall Thinning Monitoring Program and the SW Integrity Programs.

The NRC team reviewed a sample of nondestructive examination records for the ASME Code Section XI, Subsection IWD, Category D-B, “All Pressure Retaining Components,” for the Unit 1 SW system during the prior Code Interval and confirmed Code compliance. Therefore, the NRC team concluded that the ISI AMP was functioning as intended.

The Wall Thinning Inspection AMP included monitoring specific components within the EFW system. The NRC team reviewed a sample of points monitored to support the Wall Thinning AMP within the EFW system that had been incorporated into the FAC Program procedures.

The NRC team noted that the EFW pipe locations were monitored for wall thinning by ultrasonic examination, but the specific piping locations required by the Wall Thinning AMP were not differentiated from other FAC locations within the FAC implementing procedures. The NRC team was concerned that the FAC procedure could be changed without recognizing that the Wall Thinning AMP was affected. Additionally, the NRC team identified that the wall thickness on the EFW pump casings monitoring points were not directly measured. Instead, ANO documented in CALC-ANO1-ME-11-00027, "Review of the Wall Thinning Inspection AMP for License Renewal Implementation," that wall loss would be identified through internal visual inspections. However, the NRC team identified that ANO had not established an adequate procedure to ensure wall loss would be identified in these visual examinations prior to reaching ASME Code minimum wall thickness. Specifically, procedure OP 1402.009, "P-7A and B Emergency Feedwater Pump Maintenance," lacked guidance to determine how wall thickness loss would be determined based upon an internal visual examination of the pump casing. The NRC team concluded that ANO had insufficient procedure controls to ensure proper implementation of the Wall Thinning AMP.

The SW Integrity Program specified that inspections will be performed to ensure wall thickness remains above the minimum required to avoid leaks or failures under normal conditions and postulated transient and accident conditions. A violation for inadequate SW system inspections and corrective actions is documented in Section 7.4. Because ANO did not recognize the SW system flow blockage and MIC leakage trend as aging issues, no actions had been assigned to evaluate the need for changes to this AMP. The NRC team concluded that these examples indicated that ANO was not ensuring proper implementation of the SW Integrity AMP.

The NRC team concluded that the examples involving two of the AMPs discussed above indicated a lack of AMP knowledge oversight. The NRC team identified that following NRC approval, ANO had not assigned an overall owner for AMPs. The specific AMP requirements were incorporated into other procedures and programs, and system engineers were expected to implement the AMP requirements. The NRC team noted that the examples above and interviews with system engineers indicated that staff were not knowledgeable of the AMP requirements. The NRC team noted that ANO did not conduct periodic audits of the AMPs, and the Plant Health Committee was not challenging trends to determine whether they represented aging management issues. In response, ANO initiated CR-ANO-C-2016-0402, CR-ANO-C-2016-0476, CR-ANO-C-2016-0606, CR-ANO-2016-0678, and CR-ANO-2016-0679 to evaluate the team's concerns.

5.3.9.2 Large Motor Program
(IP 95003, Section 02.03.b and e)

Background

The Large Motor Program (LMP) at ANO is a long-term program to manage motors with more than 200 horsepower. The intent is to identify, schedule and track motor rewinding and refurbishment. By procedure, this program is managed at the corporate level with the ANO program engineer responsible for monitoring and maintaining the long range plan for motors onsite. ANO Units 1 and 2 have some original motors in place after operating for almost 40 years.

ANO Evaluation Results

ANO performed a snapshot assessment of the LMP, documented in LO-ALO-2015-00098, as a part of the PM RCE extent of condition evaluation. This assessment identified weaknesses in maintaining the program in accordance with procedure EN-DC-344, "Large Motor Program," and documented that supervisors and managers, including the corporate functional area manager, were not implementing the program as defined in procedure EN-DC-344. Specifically:

- Monitoring was not being performed on a consistent basis. The last update of the motor performance monitoring matrix occurred in the third quarter of 2014.
- Performance of the LMP was not being monitored using a program health report.
- On-line testing was not being performed for motors that were required to be monitored.
- Visual inspections of pump motors were not being performed.

The assessment documented that weaknesses could cause ANO to miss indications of degraded conditions before a motor failure. Most of these weaknesses were the result of organizational capacity and resource issues; specifically the program engineer managed 10 programs and systems, and had no backup owner. The program engineer initiated CR-ANO-C-2016-00178 to address concerns regarding organizational capacity and the management of the LMP. Despite the above deficiencies, the LMP snapshot assessment report documented that ANO met the Electric Power Research Institute (EPRI) guidelines for large motor maintenance and testing.

Planned Corrective Actions

Issues identified in the LMP snapshot assessment were documented in CR-ANO-C-2016-00074. Action DB-10 in the Design and Licensing Basis AAP required developing corrective actions for deficiencies found during this assessment.

Inspection Team Observations and Findings

The NRC team's observations were consistent with the findings of both the snapshot assessment and the issues captured in the program engineer's CR. The NRC team concluded that ANO's snapshot assessment captured the major program deficiencies and appropriately linked these causes to organizational capacity and leadership fundamentals issues within the Engineering and Maintenance Departments. The NRC team noted that corrective actions from the snapshot assessments were appropriate.

5.3.9.3 Implementation of Vendor Recommendations
(IP 95003, Section 02.03.d and e)

Background

Prior NRC findings identified examples where ANO was not implementing vendor recommendations for maintenance of plant equipment. ANO identified several instances where vendor manuals were not being maintained up to date or were not implemented properly. This resulted in equipment not being maintained in accordance with vendor recommendations.

Procedure EN-DC-148, “Vendor Manuals and the Vendor Re-Contact Process,” requires the key vendors to be re-contacted every three years to verify that manuals are up-to-date and non-key vendors are updated “as necessary.”

ANO Evaluation Results

ANO assessed vendor information during the following evaluations:

- ANO IP 95003 Investigation Period Basis Document Design Assessment (KAR evaluation)

- LO-ALO-2015-00071, “Entergy Nuclear Vendor Manuals and the Vendor Re-Contact Process – Rev. 1” (Snapshot Assessment from PM RCE)

- LO-ALO-2015-00072, “Entergy Nuclear Acceptance of Vendor Manuals” (Snapshot Assessment from PM RCE)

The snapshot assessments evaluated whether the programs were implemented in accordance with procedures EN-DC-148 and EN-DC-149, “Acceptance of Vendor Documents.” ANO concluded that the processes were adequate, but the vendor manual process owner had not been proactively involved, there is no management review of the process, and the non-key vendor manuals do not have an update schedule. ANO identified examples where system modifications were made and the vendor manuals were not updated, and where PM schedules were not aligned with vendor recommendations.

ANO determined that the vendor manual control issues did not involve significant performance problems and assigned improvement efforts to the Design and Program Engineering group through CR-ANO-C-2015-02296. The assessment identified program deficiencies and linked causes to organizational capacity issues within the Engineering Department and the Leadership Fundamentals FPA.

ANO identified that non-critical vendor manuals had not been updated since 2013. Procedure that were not on the Key Vendor List. The NRC team identified that these manuals were rarely updated. ANO indicated that these vendor manuals were required to be checked when PM changes were being considered.

Planned Corrective Actions

Issues identified through the snapshot assessments of the Vendor Manual Program were documented in CR-ANO-C-2015-02296. The corrective actions for this CR are only to review the issue, investigate as needed, and assure actions are assigned as applicable.

Inspection Team Observations and Findings

The NRC team’s observations were consistent with the findings of the snapshot assessments and CR-ANO-C-2015-02296. The NRC team identified the following:

- There was no process to update the Significant Component List when the PRA received a periodic update to add any systems that increased from non-risk significant to risk significant. SSCs that were classified as risk significant are required to be included in

the Significant Component List and be added to the Key Vendor List. For example, the AAC diesel generator became a significant contributor to the current PRA, but the system was not added to the Significant Component List or Key Vendor List. As a result, the vendor manual was several revisions out of date.

The NRC team concluded that the planned corrective actions for the vendor manual program snapshot assessments were not sufficiently developed to determine whether the actions would ensure improvement.

5.4 Identifying Assessing and Correcting Performance Deficiencies
(IP 95003 Section 02.02)

5.4.1 Corrective Action Program Fundamental Problem Area
(IP 95002, Section 02.02.a, c, d and g)

Background

ANO identified that a significant contributor to the performance problems at the station was ineffective implementation and oversight of the CAP. Additionally, NRC Yellow findings associated with the stator drop and flooding event identified problems with CAP implementation and quality.

ANO Evaluation Results

ANO identified CAP implementation as an FPA that contributed to the degraded performance at the station based on assessment of programs associated with Problem Identification and Resolution (PI&R), NIOS observations and assessments, a TPNSCA, the Synergy Safety Culture Survey, feedback from the plant's Safety Review Committee, NRC findings and observations, and other related sources. ANO stated in RCE report CR-ANO-2015-01240, "Corrective Action Program (CAP)," that senior station leadership reviewed results from independent sources, ANO staff, and Entergy Corporate self-assessments and identified that ANO had significant weaknesses in the implementation and management oversight of the CAP and that, as a result, 1) ANO was continuing to be unnecessarily challenged in operating and maintaining safe and reliable plant performance, and 2) potential and actual conditions that were adverse to quality for SSCs were not always properly identified, evaluated and resolved.

ANO's RCE report stated that ANO exhibited a performance decline, slowly followed by self-revealing station events indicating a reduction in safety performance, and that site and corporate leaders were either unaware of the decline or were slow to react. The RCE team determined that specific safety performance and regulatory information was not provided to corporate leaders through the monitoring processes. In addition, ANO determined that the communication of safety performance challenges between corporate and site leaders were ineffective at arresting the performance decline.

The RCE documented the following causes:

Direct Cause 1: ANO personnel did not always meet expectations for CAP procedure use and adherence.

Root Cause 1: ANO leaders did not consistently uphold standards, manage ANO personnel staffing and training, and monitor performance to maintain CAP as core business.

Contributing Cause 1: Key CAP values and behaviors were not in a handbook to support daily reference by employees and reinforcement by leaders.

Contributing Cause 2: CAP and performance improvement training are insufficient in frequency and content to fully support expectations and workforce turnover.

Contributing Cause 3: ANO leaders and immediate supervisors have not demonstrated and reinforced high standards of performance, including CAP procedure use and adherence.

Contributing Cause 4: ANO leaders had not maintained a full set of CAP PIs.

The RCE report noted examples where standards were not set or enforced by the Corrective Action Review Board (CARB) when reviewing cause evaluations, and by managers at DPRMs and APRMs. The CARB was not effective in identifying problems with cause evaluations, and the DPRMs/APRMs were not effective in identifying overall CAP performance issues and driving performance improvement.

ANO concluded that expectations for CAP performance had not been clearly communicated and there has been inadequate guidance for implementing key elements from problem identification through evaluations and corrective action closures. Additionally, there was a lack of periodic training to maintain alignment on concepts and expectations.

The RCE report documented challenges with ANO's ability to monitor CAP performance and to detect signs of decline. The RCE report noted that existing CAP performance indicators were biased to quantitative results (completing actions) over qualitative results (product quality and non-approval), and did not provide the level of detail needed to monitor performance.

Additional observations from the RCE report included:

- ANO personnel did not write CRs prior to self-revealing events or identification by independent and external groups.

- Rigor and attention to detail are not always evident in the documentation associated with operability determinations and functionality assessments.

- DPICs and the Condition Review Group (CRG) did not categorize CRs consistent with the CAP procedure. The incorrect categorization resulted in not addressing the problems using the CAP.

- ACE and RCE evaluators reviewed the extent of condition and/or extent of cause too narrowly or too broadly to identify conditions and/or causes that need to be addressed in other areas.

- There are cases where ACE/RCE evaluators did not identify underlying organizational and programmatic causes.

- Corrective action owners and/or evaluators did not define or execute corrective actions in a manner that is Specific, Measurable, Achievable, Realistic and Timely (SMART).

- There are cases where corrective action owners were not timely and complete in action closure, including providing objective evidence to support closure.

- Performance improvement functions and responsible managers did not promptly identify and correct ANO's CAP performance issues.

Planned Corrective Actions

ANO implemented a number of actions to improve CAP performance including training personnel, improving program oversight, performing additional trending, performing multiple internal reviews of significant issues, and hiring external CAP consultants to bridge the performance gaps until ANO personnel perform at appropriate levels.

Principle corrective actions included revising ANO procedures to re-define the CAP model to include an organizational structure with specific roles, responsibilities, and the staffing resources necessary to establish CAP as a core business priority. To re-define the CAP model, ANO focused on the following specific areas:

- Operability and functionality determinations

- Reportability determinations

- Management reviews of CRs

- Management reviews of CR evaluations, corrective action plans, dispositions, and effectiveness reviews

- CARB review of significant station issues

- CAP self-assessment and benchmarking

- CAP trending of low level issues

- Corporate oversight of CAP implementation

- Line ownership of the CAP through DPICs

The above actions were intended to improve the quality and thoroughness of causal evaluations, increase the effectiveness of reviews of CAP products, and increase senior station and corporate management ownership of the program. ANO added DPICs to facilitate line implementation of the program and improve program oversight and monitoring of the CAP. ANO established subject matter experts to coach, mentor and independently review RCEs and ACEs at the station. ANO developed improved station and corporate level metrics and performance monitoring tools for the CAP to facilitate senior management and corporate oversight.

Specific key corrective actions from the CAP AAP included the following:

Actions to Improve the Corrective Action Program

- Establish CAP content in the ANO Employee Handbook to include behaviors for prompt identification of conditions into CAP. (CA-1)

- Establish a NSC observer function and expectations to observe and provide feedback on leader behaviors (NSC and SCWE) in key forums and provide trends for review by the Nuclear Safety Culture Monitoring Panel (NSCMP). (CA-2)

- Conduct an organizational capacity study to determine and correct staffing and proficiency needs, including needs to support CAP implementation. Establish a People Health Committee to support ongoing monitoring and adjustments. (CA-3)

- Develop and implement initial and continuing CAP training for station employees, ACE/RCE evaluators, responsible managers (including CARB and CRG), DPICs, OE specialists and points of contact, and performance improvement personnel. (CA-4)

- Train investigators, managers and Performance Improvement staff on proper causal techniques, manager oversight expectations and engagement, and conducting quality reviews of completed cause evaluations and corrective actions. Establish initial and refresher training requirements in these areas. (CA-5)

- Implement training, benchmarking, process improvements, and monitoring/feedback to improve the rigor, attention to detail, and overall quality of operability determinations and functionality assessments. (CA-6)

- Establish/refine key CAP station and group level performance indicators. (CA-7)

- Revise the CARB process to require the Performance Improvement Manager to present the status of the condition reporting process using established metrics to the CARB. (CA-9)

- Improve the periodic performance reviews and oversight of CAP and OE performance in DPRMs and APRMs. (CA-10)

- Revise procedure EN-LI-102 to require a focused self-assessment every 2 years to ensure staffing levels support effective CAP implementation and oversight. (CA-11)

Actions to Improve the Operating Experience Program

- Develop metrics to evaluate and monitor the health of the OE Program. (CA-12)

- Establish an OE mentor to review OE responses and provide critical feedback. (CA-13)

- For a period of one year, establish CARB oversight of selected OE responses to verify program implementation meets CARB standards. (CA-14)

- Revise the OE actions for selected responses to require a pre-job brief from the OE specialist. This brief should include examples of missed opportunities from past OE responses and a review of the procedure requirements for a satisfactory OE written response. (CA-15)

- Train each OE point of contact on their responsibilities and skills needed to recognize the applicability of OE, elevate OE, and use search tools to locate OE for evaluation. (CA-16)

- Revise OE Program procedure to include an annual review of the list of vendors providing safety-related products/services to ensure new suppliers are added. (CA-17)

Inspection Team Observations and Findings

The NRC team reviewed ANO's efforts to: 1) address the significant weaknesses in the implementation and management oversight of the CAP that ANO identified in the internal assessments, and 2) identify the root and contributing causes of the performance decline at ANO that resulted in the four Yellow findings. In particular, the NRC team reviewed RCE report CR-ANO-C-2015-1240, "Corrective Action Program (CAP)," root and contributing causes, corrective actions, planned effectiveness reviews, and IACPD–EN-LI-123-BA-FA-001, "PI&R Focused Assessment." The NRC team reviewed corrective actions credited in ANO's CRP to address the CAP FPA.

The NRC team concluded that the ANO CAP was adequate to support nuclear safety. Specifically, corrective action procedures and program design were consistent with industry practices relative to 10 CFR 50, Appendix B requirements for conditions adverse to quality (CAQs) and significant conditions adverse to quality. Although issues were identified during this inspection, the NRC team concluded that the CAP was adequately implemented and complied with regulatory requirements.

The NRC team reviewed RCE CR-ANO-C-2015-01240 and the associated gap analysis for the CAP documented in RCE CR-ANO-C-2015-02830. The NRC team assessed the scope of ANO's evaluations, interim and planned corrective actions, timeliness of actions, and scheduled effectiveness reviews. The NRC team concurred with ANO's determination that ANO leaders did not consistently uphold standards, manage ANO personnel staffing and training, and monitor performance to maintain CAP as a priority for the station.

Interim Actions

RCE CR-ANO-C-2015-1240 included the following interim actions:

- Supplemented performance improvement staff with three cause analyst subject matter experts

- Used subject matter experts to mentor cause evaluators and perform independent reviews

- Conducted closure reviews for priority 1, 2 and 3 Condition Reports/Actions

- Assigned additional staff to assist with the performance of causal analysis and DPIC duties

The NRC team reviewed closeout documentation associated with the above interim actions and confirmed they were completed and improved the completeness and quality of documentation.

Condition Report Review and Categorization

The NRC team assessed a persistent trend in incorrectly categorizing CRs at ANO. The initial categorization was used to assign the level of review, evaluation and priority that would be used to resolve the problem. The trend involved ANO assigning categorization codes that were lower than what was required by CAP procedures.

To understand the cause for this trend, the NRC team observed screening meetings and interviewed ANO personnel with roles implementing the CAP. From these interviews, the NRC team identified that ANO personnel did not have an understanding of the underlying bases of the existing CAP categorization process. In particular, there was not a consistent understanding of how to differentiate between adverse and non-adverse conditions.

Recently the nuclear industry developed guidance on how to more effectively manage performance improvements at nuclear sites while differentiating between regulatory requirements and other business concerns. Industry developed the term “CAQ Plus” to differentiate between safety/regulatory issues and issues of lower level impact. When Entergy adopted the CAQ Plus strategy, the fleet CAP procedure did not use the terminology in the guidance. Instead, Entergy used the terms "adverse" and "non-adverse" with its own Entergy Corporate specific definitions.

The NRC team concluded that when Entergy adopted the CAQ Plus strategy, the change management was inadequate to ensure that the procedures and training supported an understanding of the new process, and no effectiveness review was performed to ensure the program change achieved the intended results.

Corrective Action Program Metrics

The NRC team determined that ANO’s revised CAP metrics were consistent with industry standards. The new metrics addressed the quality of the evaluations, use of internal and external OE in conducting the evaluations, the impact of organizational and programmatic issues, the assessment of the effectiveness of the evaluations, and the timeliness of corrective actions.

Effectiveness Reviews

The NRC team identified that effectiveness reviews for completed actions focused on whether the actions were completed rather than whether they were effective (See Sections 5.5.2, 7.2 and 7.10). For significant issues, ANO’s CARB reviewed the effectiveness of corrective actions.

Timeliness of Corrective Action Program Improvements

The NRC team identified past challenges to timely improvement of the CAP. ANO had been taking action to improve CAP performance over the past several years. During this time, Entergy’s HCM initiative reduced the resources assigned to manage the CAP in 2013. In 2014,

Entergy Corporate personnel revised the Corporate CAP procedures to support a reduced CAP work load. The NRC team concluded that the corporate changes made performance improvement more difficult at ANO.

5.4.2 Corrective Action Program Trending
(IP 95003 Section 02.02)

Background

ANO's Collective Evaluation Report documented issues with the identification of trends. Furthermore, NRC PI&R inspection report IR 05000313/2015008; 05000368/2015008 identified that when the software used for CAP trending was replaced, ANO did not add historical data to ensure a full data set for trending or adjust the thresholds for determining whether a trend existed. The NRC team further reviewed ANO's ability to trend issues in the CAP and the overall impact the trending software change had on ANO's ability to evaluate CAP data.

ANO Evaluation Results

The ANO Collective Evaluation Report identified the following:

- The station does not identify and correct adverse performance trends before they become a more substantial challenge to the station.

- Station management was not effectively utilizing the trending program to identify and correct declining performance resulting in repeated equipment and systems failures and continued human performance deficiencies.

- Failure to apply adequate cognitive trending to equipment CRs has resulted in a failure to identify and correct adverse equipment trends.

Planned Corrective Actions

ANO planned the following corrective actions related to trending improvement:

- Develop and implement initial and continuing CAP training for station employees, ACE/RCE evaluators, responsible managers (including CARB and CRG), DPICs, OE specialists and points of contact, and performance improvement personnel. (CA-4)

- Establish/refine key CAP station and group level performance indicators. (CA-7)

- Improve the periodic performance reviews and oversight of CAP and OE performance in DPRMs and APRMs. (CA-10)

Inspection Team Observations and Findings

The NRC team concluded that procedure EN-LI-121 and the trending software, as currently configured, were used properly and were capable of identifying trends. While the NRC team determined that ANO failed to implement a change in trending software to ensure that data was available to support trending, no missed trends were identified by the inspectors. The following specific issues were identified:

Corrective Action Program Trending Software

ANO transitioned to new CAP trending software in 2013. The new software reduced the number of trend codes available for use. The NRC team determined that when the new software was implemented, ANO did not conduct formal training on the new procedure or software. As a result, ANO personnel did not fully understand the proper use or full capabilities of the software. Specifically, at the time of initial implementation ANO was not aware that the software was capable of trending CRs written before the software change was made. As a result, during the PI&R inspection in June 2015, ANO informed the NRC team that they were unable to include CRs written prior to the software change in the trending process. Following the NRC PI&R inspection, ANO contacted the Entergy Corporate office and discovered that the software was actually capable of trending historical CRs, if configured accordingly. ANO was unaware of that capability, so they had not been including historical CR information in the trend analyses.

Department Performance Improvement Coordinator Training

The NRC team evaluated the ability of ANO performance improvement personnel to use the CAP trending software. The NRC team identified that DPICs had not received formal training on the use of statistical methods for trending. Although Entergy trend analysis procedure EN-LI-102-02 included a fleet lesson plan, this training was not incorporated into DPIC training at ANO, and no DPICs had completed this training. ANO documented this issue in the CAP as CR-ANO-C-2016-1264. The NRC team did not identify any instances where the lack of training led to a failure to identify a trend.

5.4.3 Review of Root Cause Evaluations for Fundamental Problem Areas
(IP 95003 Section 02.02.a)

The NRC team reviewed the eight FPA RCEs. The NRC team reviewed ANO's processes to determine the extent to which ANO used systematic methods to identify causes, the level of depth, extent of cause, extent of condition, use of multi-disciplinary teams, and the use of different root cause methodologies in the evaluations. The following issues were identified:

- There was not a clear association between corrective actions documented in an RCE and an associated cause because the recovery team coordinated and combined corrective actions among the eight RCEs to avoid duplication of effort.

- RCEs identified potential issues during the causal evaluations that were not further evaluated unless they were specifically related to the governing problem statement. Examples in the stator drop RCE included the following:

    - Work crews associated with the stator lift working 14 hour days was not evaluated. As a result, ANO did not assess the potential impact on station worker fatigue practices or organizational capacity.

    - Industrial safety issues such as the failure to establish heavy lift zone exclusion areas and missing barriers/barricades near fall hazards were identified and not evaluated.

- ANO's Vendor Oversight RCE identified weak implementation of administrative controls and placing undue confidence in vendor services as common cause failures. However, ANO did not assess the underlying safety culture aspects.

- The Decision Making and Risk Management RCE report stated that the corrective action plan developed and implemented for CR-ANO-C-2012-0596, Conservative Assumptions in Decision Making, was not effective in changing behaviors of personnel involved in high-risk decisions, including Project Management. The 2012 RCE was initiated in response to an NRC substantive cross-cutting issue in the area of human performance associated with the use of conservative assumptions in decision making. The licensee reviewed 18 NRC violations/findings (2007-2012) in the area of human performance associated with conservative assumptions in decision making to identify a common cause. The licensee identified the root cause of the issue as, "ANO management has failed to recognize that a cultural issue exists related to the aspect of conservative assumptions in decision-making." The NRC team concluded that the 2012 problems had not been resolved. However, there was no analysis of why the corrective actions in 2012 were ineffective or how the corrective actions to resolve issues with high risk decisions in 2015 were going to be more effective than the actions taken in 2012.

- The Design and Licensing Basis RCE team identified that the problem statement, the identified causes, and the corrective actions to prevent recurrence were incongruent. Specifically, the problem statement was, "The design and licensing basis has not been maintained in some areas." The root cause identified by ANO was that, "Station Leadership is not consistently exhibiting and reinforcing behaviors that demonstrate risk to nuclear safety is the overriding priority in decision making. Because of this, station personnel are making non-conservative decisions related to the station licensing basis and design basis which are not being corrected by the leadership team." The NRC team determined that ANO's evaluation failed to demonstrate how station leadership, by not exhibiting and reinforcing behaviors on risk to nuclear safety, was manifested in ANO not maintaining its design and licensing basis. The NRC team determined that ANO's planned corrective actions address both aspects.

The NRC team noted that the recovery team used the Collective Evaluation process to group examples of problems from earlier evaluations and identify the most significant problems. This process settled on a limited number of problem groups (FPAs and PAs). The resulting problems were assigned problem statements that were used as the focus for RCEs or ACEs. The NRC team noted that performing cause evaluations for problem statements that were intended to represent a collection of diverse examples created a number of challenges:

- The grouping of diverse examples into a high-level problem statement involved an informal assessment of causes. For example, human performance issues were mostly grouped under the Nuclear Fundamentals and Leadership Fundamentals FPAs. Rather than revisiting those initial assumptions, the recovery team attempted to coordinate the development of corrective actions across the RCEs. The NRC team's observations concerning misalignment between problem statements, causes, and corrective actions, or in some cases missing corrective actions were a result of this sequence of decisions.

- The Decision Making and Risk Management RCE focused on decision making as the problem and risk management issues as a consequence, resulting in having inadequate corrective actions to address risk management and recognition. The NRC team

identified examples that indicated ANO failed to manage risk because they failed to recognize conditions that required a risk assessment (see Section 5.5.2.3). In response, ANO developed a series of corrective actions that appear to address the symptoms, but no cause analysis was performed.

The NRC team identified that each of the RCEs focused cause statements on behaviors (primarily on leader behaviors). This strategy created a focus on safety culture aspects, roles and responsibilities, and accountability, which are related to ANO's decline in safety performance. However, implementing this strategy limited the scope of the cause evaluations. For example:

- The CAP RCE identified that ANO's cause evaluations had sometimes failed to assess organizational and programmatic causes. The NRC team concluded that by stopping at causes involving leader behaviors, the root and contributing causes documented in FPA RCEs did not assess organizational and programmatic causes of the behaviors of workers.

- The CAP RCE identified that DPICs and CRG members did not always apply the correct significance to CRs. The misclassification of significance was addressed as a standards problem in the CRP. ANO failed to identify that the Entergy fleet CAP procedure change to implement CAQ Plus and lack of training were relevant contributors.

The NRC team concluded that by the end of the inspection, ANO completed evaluations that collectively identified causes for the problems that contributed to ANO's declining safety performance. The NRC team identified areas where ANO did not develop corrective actions to address identified problems, and in some cases these omissions necessitated further analysis by ANO to support corrective action development. The NRC team concluded that the reason for the gaps involved ANO's decision to limit the number of cause evaluations to be performed and focus corrective actions on improved leader behaviors.

5.4.4 Corrective Action Program Implementation and Oversight
(IP 95003 Sections 02.02.a and 02.03.c)

Background

ANO identified that a significant contributor to performance problems was the inadequate and inconsistent implementation of the CAP. In the CAP FPA, ANO concluded that the implementation and management of the CAP has been ineffective. Potential and actual conditions that are adverse to quality for SSCs are not always properly identified, evaluated and resolved. The Entergy fleet CAP assigned decision making and oversight roles to members of the CRG and CARB, who were predominantly managers and directors.

ANO Evaluation Results

The ANO Collective Evaluation Report identified the following problems related to CRG and CARB performance:

- Condition reports inappropriately bypassed the operability review. The CRG does not always identify or correct these conditions.

- CARB oversight is not effective in ensuring significant conditions adverse to quality and other important issues are evaluated in-depth, are thoroughly documented, and that corrective action plans are timely and applicable.

- Oversight by responsible managers, CRG and CARB has not been effective in addressing performance concerns with the ANO CAP process.

- With 13 percent of items being reclassified at CRG, there is an indication that the DPIC screening results are inconsistent with procedure EN-LI-102.

- Weaknesses exist with CRG providing effective oversight of the timeliness of corrective action completion.

- Training material provided by the Fleet for CARB is outdated, not reflective of current procedures, and weak by industry standards. No training on how to conduct organizational and programmatic reviews is provided by the training.

- Shortfalls in CAP implementation are not being addressed in a timely manner and may challenge recovery efforts. Contributing is the lack of leadership engagement in ensuring quality in CAP products.

- Corrective actions are being performed without documenting sufficient detail and objective evidence that the action was completed.

- Causal analysis related corrective actions are not always written or implemented in a manner that addresses the intent of the corrective action or the identified problem statement.

Planned Corrective Actions

The following corrective actions were associated with improving CARB and CRG oversight effectiveness:

- Establish a NSC observer function and expectations to observe and provide feedback on leader behaviors (NSC and SCWE) in key forums and provide trends for review by the NSCMP. (CA-2)

- Develop and implement initial and continuing CAP training for station employees, ACE/RCE evaluators, responsible managers (including CARB and CRG), DPICs, OE specialists and points of contact, and performance improvement personnel. (CA-4)

- Train investigators, managers and performance improvement staff on proper causal techniques, manager oversight expectations and engagement, and conducting quality reviews of completed cause evaluations and corrective actions. Establish initial and refresher training requirements in these areas. (CA-5)

- Revise the CARB process to require the Performance Improvement Manager to present the status of the condition reporting process. (CA-9)

- Revise procedure EN-LI-102 to require a focused self-assessment every 2 years focused primarily on whether staffing levels support effective CAP implementation and oversight. (CA-11)

Inspection Team Observations and Findings

The NRC team assessed whether ANO's CRG and CARB performance was aligned with procedures EN-LI-102-ANO-RC, "Corrective Action Program;" EN-FAP-LI-001, "Condition Review Group (CRG);" and EN-FAP-LI-003, "Corrective Action Review Board (CARB) Process." The NRC team observed several CRG meetings and one CARB meeting, and reviewed completed documents.

The NRC team concluded that performance of the pre-screening committee, CRG, and CARB was consistent with ANO's evaluation results. The NRC team determined that while the administrative procedures were usually followed, they were not implemented in a manner that achieved consistent results.

Condition Report Pre-Screening Committee Meetings

The NRC team determined that the recommendations of the CR pre-screening committee were normally approved by the CRG. The pre-screening meeting attendees included the DPICs and one member of the Performance Improvement organization.

During observations of pre-screening meetings, the NRC team concluded that when there was disagreement on the classification of a CR, the pre-screening committee identified the CR to be a "bring-back" item to be reviewed again at the next scheduled meeting. The intent of this action was to allow additional consideration and fact-finding. The NRC team determined that this practice was contrary to the guidance provided to the DPICs as documented in CR-ANO-C-2015-01240, CA-49; which required that the CR be classified at the meeting as "adverse" unless all members agreed it should be classified as "non-adverse." This issue was identified as a finding and is documented in Section 7.14.

Condition Review Group Meetings

The NRC team assessed the performance of the CRG. ANO procedure EN-LI-102-ANO-RC, stated that the CRG was responsible for the following activities:

- Reviewing CRs to determine if an adverse condition exists, classify, and assign responsibility
- Approving closure of CRs to the work management system
- Determining when to apply the Entergy fleet learning review process
- Ensuring appropriate operability/functionality reviews are performed
- Oversight of operable-degraded or nonconforming conditions
- Determining when to apply CARB oversight responsibilities to ACEs

The NRC team determined that the CRG's review of CR and OE screening results did not always identify deficiencies. For example:

- The CRG sometimes failed to perform an adequate review of CRs recommended as "non-adverse" and to identify that these CRs were required to be categorized as "adverse." The NRC team documented a violation associated with this issue in Section 7.14.

- The CRG did not always determine whether to apply the Entergy fleet learning review process, the term used for internal OE. The NRC team documented a finding associated with this issue in Section 7.3.

The NRC team determined that while the CRG ensured operability/functionality reviews were performed, they did not always ensure the reviews were performed in a timely manner as required by procedure EN-LI-102-ANO-RC. Specifically:

- The NRC team identified instances in which CRs inappropriately bypassed the control room and, as a result, an operability review was not promptly performed. ANO documented this issue in the CAP as CR-ANO-C-2016-00359 and modified the program software to prevent any CRs from bypassing the control room. The NRC team documented a violation associated with this issue in Section 7.14.

- The NRC team identified that if a CR bypassed the control room, the CRG may not perform a review until several days later. Procedure EN-FAP-LI-001 required that, "Site Condition Reports initiated since the CRG agenda was posted will be reviewed at CRG for potential immediate action." The NRC team determined that the CRG was not reviewing CRs written in the previous 24 hours, not all CRs initiated since the CRG agenda was posted. Specifically, CRG was not reviewing CRs written on Tuesdays and alternating Thursdays due to the meeting schedule. As a result, the NRC team discovered multiple examples in which CRG failed to ensure an operability evaluation was performed in a timely manner. ANO documented this issue in the CAP as CR-ANO-C-2016-00400 and modified the agenda preparation process to include all CRs in the CRG's review.

Overall, the NRC team concluded that CRG continued to be inconsistent in ensuring that the CAP standards were followed, and were not always challenging CAP products.

Corrective Action Review Board Meetings

The NRC team observed the one CARB meeting that occurred during the inspection. The NRC team observed the CARB review RCE CR-ANO-1-2015-04178, "Unit One Manual Trip Due to Loss of Main Feedwater." The NRC team noted that the CARB had previously rejected this RCE three times when the product failed to meet CARB standards. The CARB challenged several conclusions and corrective action plans documented in the evaluation before rejecting the RCE again.

The NRC team noted that while the CARB was observed to challenge the RCE conclusions and basis for those conclusions, most of the questions and concerns originated from a single individual. While this observation did not involve a deficiency, the NRC team was unable to determine whether CARB would be effective if that individual was not present.

The NRC team determined that the CARB meeting was performed in accordance with the Entergy fleet administrative procedure. CARB demonstrated high standards by requiring improvements to be made to the RCE.

5.4.5 CAP Knowledge, Training and Procedures
(IP 95003 Section 02.02)

Background

The NRC team evaluated the ability of managers to support decision-making and performance assessment in the CAP, the ability of DPICs and cause evaluators to perform trending of issues, and the ability of workers to understand and follow CAP procedures.

ANO Evaluation Results

The Collective Evaluation Report documented the following related to CAP knowledge, training, and procedures:

- Training and personnel development in CAP have been ineffective to support quality program implementation.
- Previous training material provided by the fleet for CARB, and RCE and ACE evaluators is outdated, not reflective of current procedures, and weak by industry standards. No training on how to conduct organizational and programmatic reviews is provided.
- Administrative procedures related to the CAP are not consistently followed.
- Procedure use and adherence for administrative requirements in procedure EN-LI-102 and EN-LI-118 is less than adequate.
- Procedure use and adherence in conducting RCEs was less than adequate.
- Most RCE extent of condition and extent of cause reviews were narrowly focused.
- Most RCEs were not conducted to an adequate level of detail to identify root and contributing causes.

Planned Corrective Actions

ANO's CRP included corrective actions in the CAP FPA to address problems with knowledge and training, including:

- Establish CAP content in the ANO Employee Handbook to include behaviors for prompt identification of conditions into CAP. (CA-1)
- Establish a NSC observer function and expectations to observe and provide feedback on leader behaviors (NSC and SCWE) in key forums and provide trends for review by the NSCMP. (CA-2)

- Develop and implement initial and continuing CAP training for station employees, ACE/RCE evaluators, responsible managers (including CARB and CRG), DPICs, OE specialists and points of contact, and performance improvement personnel. (CA-4)

- Train investigators, managers and performance improvement staff on proper causal techniques, manager oversight expectations and engagement, and conducting quality reviews of completed cause evaluations and corrective actions. Establish initial and refresher training requirements in these areas. (CA-5)

- Implement training, benchmarking, process improvements, and monitoring/feedback to improve the rigor, attention to detail, and overall quality of operability determinations and functionality assessments. (CA-6)

- Establish/refine key CAP station and group level performance indicators. (CA-7)

Inspection Team Observations and Findings

The NRC team reviewed CAP procedures, ANO-specific procedures, and fleet administrative procedures. The NRC team conducted interviews with several DPICs, cause evaluators, craft personnel, performance improvement staff, and supervisors.

Corrective Action Program Knowledge

The NRC team concluded that the knowledge of CAP processes and concepts was weak among ANO staff. Based on interviews and observations, the NRC team determined that ANO personnel, including those responsible for CAP implementation, did not understand some program elements. The NRC team noted that change management for successive CAP changes was inadequate in that station personnel did not receive training needed to understand and implement their roles. Also, there was limited initial CAP training and no periodic training to ensure workers had an adequate understanding of the overall processes. The NRC team received many comments from individuals stating they understood how to initiate a CR, but did not understand how to implement the processes needed to correct and close CRs.

The NRC team reviewed the longstanding trend in misclassifying CRs as “non-adverse” when proper application of the guidance would have required classifying the issue as “adverse.” The NRC team identified that personnel did not receive training on program changes that implemented the CAQ Plus industry initiative. In addition to a lack of training, Entergy used the adverse/non-adverse terminology rather than adopting the recommended terminology from the industry guidance.

Corrective Action Program Training

The NRC team identified the following observations:

- DPICs were not consistently trained. For example, one DPIC reported receiving some computer-based training and approximately five weeks of on-the-job training, while another DPIC indicated he was “self-taught.”

- Training provided to cause evaluators was inconsistent. Some cause evaluators were provided a 40-hour training course, while others only received 8 hours of training.

- ANO provided familiarization guides for most CAP roles, including DPICs, cause evaluators, and CARB members. However, the NRC team found that none of the guides included formal training. Instead, these familiarization guides only required the review of procedures, the observation of meetings, and having discussions with supervisors.

In response, ANO wrote CR-ANO-C-2015-1240, CA-68 to evaluate training for DPICs, cause evaluators, and CARB members.

CAP Procedures

The NRC team concluded that CAP procedures were adequate; however, ANO did not always implement the CAP procedures as intended. The NRC team noted that Entergy procedures provided flexibility in the interpretation of criteria for making decisions on the dispositioning of CRs and cause evaluations, and that this flexibility contributed to examples of non-conservative decision-making. The NRC team identified that ANO personnel used this procedural flexibility to take actions that did not meet the intent of the procedure. Examples included:

- The Yellow finding for the stator drop event documented that ANO had inappropriately used procedure flexibility to conclude that load testing of the temporary lift rig was not needed.

- Procedure EN-LI-102-ANO-RC included a guide that specified classification levels for CRs. However, the procedure permitted the CRG to "downgrade" CRs based on judgement. ANO found examples where the CRG "downgraded" CRs documenting NRC violations, resulting in the lack of a thorough evaluation of the problem.

- On multiple occasions, ANO improperly classified conditions as "non-adverse," thereby excluding them from the formal CAP, when the identified conditions met NRC requirements for inclusion under 10 CFR 50, Appendix B, Criterion XVI, "Corrective Actions." This is documented as a violation in Section 7.14.

- CAP procedures, including EN-LI-102-ANO-RC, directed users to tables with limited guidance to support decision-making.

5.4.6 Self-Assessment and Benchmarking Activities
(IP 95003, Section 02.02.b)

ANO Evaluation Results

ANO identified that performance improvement tools were not effectively implemented to identify and correct problems. Two specific improvement tools were self-assessments and benchmarking. ANO identified that conducting minimal industry benchmarking contributed to a lack of alignment with industry standards and ineffective corrective actions. Additionally, ANO determined that from 2007 to 2013, focused self-assessments were not rigorous in following the self-assessment process.

The recovery team initially concluded that the use of performance improvement tools should be treated as a PA during the Collective Evaluation process. Later, the recovery team decided that

the actions to address performance improvement should be included under a number of other AAPs. ANO concluded that past strategies used for ensuring that continuous organizational learning occurs through knowledge transfer, self-assessment, OE use, and benchmarking were weak. The evaluation stated that, in some cases, the continuous learning process was not being utilized effectively to identify and resolve knowledge and behavioral shortfalls of personnel at the station.

ANO identified that performance improvement tools were not used effectively to identify and correct problems. As a result, problems were left uncorrected until identified by external groups or self-revealing events. Performance improvement tools not used effectively include:

- Self-assessments
- Benchmarking
- DPRMs and APRMs (see Section 5.4.1)
- Performance indicators and trending (see Section 5.4.2)
- OE (see Section 5.4.8)

The Leadership Fundamentals RCE report documented issues with ANO leadership's effectiveness in fostering a learning organization and a culture of continuous improvement. The RCE report documented the following:

Contributing Cause 1: ANO Leaders have not maintained a strong continuous improvement organization. This contributed to the condition by allowing ANO to: 1) not stay current with some industry standards; 2) accept minimum standards; and 3) not always be self-critical with a bias for action to improve performance. Specifically, a focus on short-term results sometimes took precedence over the continuous improvement activities of performance review, benchmarking, OE, and self-assessment that are necessary to maintain strong station performance and achieve excellence.

Planned Corrective Actions

The following corrective actions were identified under the Leadership Fundamentals AAP:

- Create trending and issue performance review metrics to improve the review of leader behaviors and performance results in the areas of: (LF-11)
    - Leadership Fundamentals: (1) Vision and Values, (2) Teamwork, (3) Accountability, (4) Employee Engagement, and (5) Resource Allocation
    - Performance Improvement: (1) Issue identification, evaluation and resolution, (2) Ownership of procedures and work processes, (3) Industry participation, (4) Self-assessments and benchmarking, and (5) OE
    - Nuclear Safety: (1) Decision-making, and (2) Safety Conscious Work Environment
- Create a tool to analyze externally identified performance issues both individually and in aggregate to present actionable data to the APRM. (LF-14)

Inspection Team Observations and Findings

The NRC team reviewed ANO's efforts to address the weaknesses identified in the areas of self-assessments and benchmarking. In particular, the NRC team reviewed: Identifying, Assessing and Correcting Performance Deficiencies (IACPD) – Audits and Assessments; KAR – Use of Industry Information; and RCE CR-ANO-C-2015-2829, "Leadership Fundamentals." Additionally, the NRC team reviewed a sample of completed self-assessments, snapshot benchmarks, and observed a Self-Assessment Review Board meeting.

The NRC team concluded that ANO's evaluations related to the use of benchmarking and self-assessments were appropriate. ANO effectively utilized industry experts in the recovery project self-assessments. The population of self-assessments reviewed were self-critical and adequately identified performance issues. During the NRC team's review of ANO's benchmarking improvement efforts, the NRC team identified the following:

- The use of benchmarking was largely absent from the ANO CRP even though ANO identified that they had performed limited benchmarking with plants outside the Entergy fleet and did not keep informed on industry practices. Only one action in the CRP utilized benchmarking to address a performance gap.

- ANO had not established specific benchmarking goals for 2016. At the end of this inspection, ANO had planned three benchmarking trips, and had only conducted a total of eight benchmarking trips in 2014 and 2015.

- When the Performance Improvement PA was removed, most actions were moved to other plans, but the actions to address self-assessment and benchmarking improvements were not added to another AAP.

In response to these observations, ANO documented this issue in the CAP as CR-ANO-C-2016-00630 with an action to evaluate whether any changes were needed. ANO also added actions to conduct benchmarking at stations that were industry leaders in several AAPs.

5.4.7 Corporate and Independent Oversight Fundamental Problem Area
(IP 95003 02.02.b and d)

Background

ANO identified that a significant contributor to performance problems at the station was that the oversight by corporate and independent organizations did not serve as an effective barrier to prevent a significant decline in ANO safety performance over an extended period of time. The recovery team concluded that Corporate and Independent Oversight should be treated as an FPA.

ANO Evaluation Results

ANO documented an initial evaluation in the Performance Goals and Corporate Oversight Performance Area Report. Following the Collective Evaluation, ANO performed RCE CR-ANO-C-2015-2836, "Corporate and Independent Oversight." This RCE documented that ANO exhibited a performance decline slowly followed by self-revealing station events indicating a significant reduction in safety performance, and that site and corporate leaders were either

unaware of the decline or slow to react. The report further concluded that corporate leadership safety values and action behaviors such as allocation of resources, change management, and problem identification and resolution did not serve as effective barriers to the decline in overall ANO safety performance. The RCE team determined that some specific safety performance and regulatory information was not provided to corporate leaders through the performance monitoring processes. In addition, the communication of safety performance challenges between corporate and site leaders were ineffective at arresting the decline.

This RCE evaluated the effectiveness of the NIOS group in assessing ANO's performance, and the corporate response to either external performance assessments. The RCE identified the following causes:

Root Cause 1: The corporate organization had not conducted effective change management for significant organizational changes, such as the elimination of corporate functional area assessments and corporate and independent oversight staffing, which resulted in corporate and ANO organizational instability. This resulted in not identifying shortcomings in the original planning and execution of significant organizational changes starting with Alignment and including HCM. This cause produced a mismatch between workload and available resources for Corporate and Independent Oversight at ANO which contributed to a significant decline in ANO safety performance.

Root Cause 2: There was a lack of a corporate comprehensive oversight structure to monitor behaviors, competencies, processes, and a lack of metrics to recognize that leadership safety values and actions had allowed a significant decline in overall ANO safety performance starting in 2007. This root cause resulted in an incomplete picture of plant performance which resulted in an overall decline in ANO safety performance.

Contributing Cause: ANO leaders had not maintained a strong continuous learning culture. This resulted in an insufficient alignment of priorities, improper delegation of responsibilities, ineffective communication, and inadequate follow-up of action resolutions identified by corporate and independent oversight, as well as external oversight organizations, and resulted in an overall decline in ANO safety performance.

Planned Corrective Actions

The following corrective actions were identified in the Corporate and Independent Oversight Fundamental Problem AAP:

- Revise procedure EN-FAP-OM-011, "Corporate Oversight Model," to include station NSC output from the NSCMP as inputs to the Oversight Analysis Meeting and Oversight Review Board. (CO-1)

- Revise procedure EN-FAP-OM-002, "Management Review Meetings," to prioritize review of NSC status and regulatory performance to the operational excellence management review meeting agenda. (CO-2)

- Align ANO and fleet key performance indicators with the industry and establish goals that are challenging and consistent with industry practices. (CO-3)

- Revise procedures that govern Nuclear Oversight Performance Assessments to include NSC trend codes. Apply relevant safety culture trend code(s) during the trending process. Based on report frequency, roll up codes to provide a perspective on NSC and include in established reporting process. (CO-4)

- Develop and issue an Entergy change management procedure for planning, execution, and follow up of "high risk" changes. The procedure will include specific expectations for reviewing the effectiveness of "high risk" changes. Perform a snapshot benchmarking to check the approach for change management against industry practices. (CO-5)

Inspection Team Observations and Findings

The NRC team reviewed RCE report CR-ANO-C-2015-2836, "Corporate and Independent Oversight," root and contributing causes, corrective actions, and planned effectiveness reviews. The NRC team reviewed completed corrective actions associated with RCE CR-HQN-2014-00291, "Fleet Quality of Causal Analysis for Organizational and Programmatic Issues," which identified that:

> …high level cause investigations, including those for significant self-revealing events, stop short of identifying the underlying systemic causes when the individuals that made the mistake are identified. Investigations appear to be reluctant to draw attention to the existing organizational, programmatic, and leadership failure modes that created the environment allowing the individual error to result in a break-through significant event.

The NRC team concluded that ANO's evaluations related to Corporate and Independent Oversight were comprehensive and that the root causes and contributing cause that ANO identified in RCE CR-ANO-2015-2836 were appropriate. The NRC team determined that the identified corrective actions were appropriate to address the root causes and contributing cause and the planned effectiveness reviews were appropriate.

Interim Actions

RCE CR-ANO-C-2015-2836 included the following interim actions:

- Hire and assign two supplemental employees to the NIOS group at ANO to assist in monitoring station and IP 95003 recovery team behaviors.

- Assign additional supplemental resources to corporate in an oversight function of the IP 95003 recovery activities.

- Revise procedure EN-PL-155, "Entergy Nuclear Change Management," to require an effectiveness review for all changes indicated as "High Complexity/Risk" on Attachment 3.1, "Change Impact Checklist."

The NRC team reviewed closeout documentation associated with these interim actions and confirmed that supplemental employees had been assigned at ANO and at the Entergy corporate office to assist in monitoring the recovery team effort. The NRC team confirmed that procedure EN-PL-155, Revision 9, included an effectiveness review aspect for all identified high complexity/risk changes.

Completed Corrective Action Review

The NRC team reviewed closed corrective actions that were credited in the CRP in addressing issues identified in the Corporate and Independent Oversight FPA. In particular, the following corrective actions were reviewed:

- CR-HQN-2014-00291, CA-9: Train investigators, managers, Corporate Functional Area Managers, CARB, performance improvement managers and staff on proper causal techniques, manager oversight expectations and engagement, and conducting quality reviews of completed investigations.

- CR-HQN-2014-00291, CA-10: Implement procedure revision for procedure EN-LI-118 to clarify roles and responsibilities for responsible managers, CARB members and performance improvement managers.

- CR-HQN-2014-00291, CA-11: Conduct an independent review of station and fleet root causes for the past two years and determine if organizational and programmatic issues are addressed.

- CR-HQN-2014-00291, CA-12: Establish a process for challenging ongoing high level causal analyses using a core team of select key managers across the fleet.

- CR-HQN-2014-00291, CA-13: Implement a case study, using examples from this investigation, for quality and alignment of investigations. This case study will be provided to CARB members and line managers who are responsible for site implementation of the CAP.

- CR-HQN-2014-00291, CA-14: Assign mentors to site performance improvement managers who are new to performance improvement or need additional coaching for causal analysis.

- CR-HQN-2015-00530, CA-3: Revise procedure EN-QV-136, “Nuclear Safety Culture Monitoring,” to clarify requirements for corporate level reviews of NSC results from the sites.

For the corrective actions reviewed, the NRC team concluded that ANO’s efforts supported the closure of these actions. However, the NRC team identified the following two issues:

- Corrective actions due dates were frequently extended. Of the seven closed corrective actions reviewed, five actions had due dates that were extended at least once and in most cases were extended multiple times. In particular, an action in HQN-2014-00291 to establish a process for challenging ongoing high level causal analyses using a core team of select key managers across the fleet was extended four times and added more than 6 months to the original due date. This was intended as an Interim Action, and the extension did not ensure this action was timely.

- Some RCEs were inappropriately excluded from the scope of ANO’s review. The NRC team noted that HQN-2014-00291, CA-11 prescribed an independent review of station and fleet root causes for the past two years to determine if organizational and programmatic issues were properly addressed. The NRC team identified that Entergy

Corporate personnel excluded RCEs associated with NRC issues from review if a follow-up NRC inspection was performed. The NRC team concluded that because NRC follow-up inspections did not necessarily focus on whether organizational and programmatic issues were addressed, these RCEs were inappropriately excluded from review.

In response, Entergy Corporate personnel wrote CR-HQN-2016-00194 to enter the above issues into the CAP.

5.4.8 Use of Internal and External Operating Experience
(IP 95003 Section 02.02.a and g)

Background

ANO identified that a significant contributor to performance problems at the station were deficiencies in the evaluation and use of OE. ANO identified that deficiencies in OE Program implementation contributed to the CAP and Decision Making and Risk Management FPAs.

ANO Evaluation Results

ANO performed a review of the processes for addressing OE, documented in "Use of Industry Information Assessment," in support of the IACPD reviews. This assessment compared ANO practices to industry guidance, including the implementation of industry guidance entitled "Engaged, Thinking Organization." The OE process was further evaluated as part of the Collective Evaluation.

ANO concluded that the OE Program procedure conformed to industry guidance, although procedure use and adherence problems were identified in implementing the program. Challenges were identified in the interface between site and corporate organizations, weaknesses in use of vendor bulletins, and the effectiveness of performance metrics. At times, ANO's OE evaluations tended to justify why an issue was not applicable to ANO rather than finding ways to use the lessons presented in OE reports to improve performance. ANO's review identified evidence of a lack of conservative bias, lack of information validations or verification leading to shallow evaluations, narrowly focused evaluations, and some "production over safety" behaviors. Management support for the OE process was hampered by competing priorities and limited resources. Vendor information and recommendations were not effectively captured, evaluated and implemented at ANO. Procedure EN-OE-100, "Operating Experience Program," does not provide assignment of responsibilities to obtain relevant vendor bulletins for screening by the OE Program. Implementation of vendor recommendations has often been untimely and incomplete.

Overall, the evaluation concluded that, "Evidence suggests the station is not using either external or internal OE to effectively capture lessons learned from industry experience. Management commitment in terms of focus, resources and oversight is not ensuring that the OE Program is sufficiently robust to prevent events or improve organizational and programmatic performance."

Planned Corrective Actions

ANO identified the following corrective actions in the CAP AAP to address OE program implementation issues:

- Develop metrics to evaluate and monitor the health of the OE program. (CA-12)
- Establish an OE mentor to review OE responses and provide critical feedback. (CA-13)
- For a period of one year, establish CARB oversight of selected OE responses to verify program implementation meets CARB standards. (CA-14)
- Revise the OE actions for selected responses to require a pre-job brief from the OE specialist. This brief should include examples of missed opportunities from past OE responses and a review of the procedure requirements for a satisfactory OE written response. (CA-15)
- Train each OE point of contact at ANO on their responsibilities and skills needed to recognize the applicability of OE, elevate OE, and use search tools to locate OE for evaluation. (CA-16)
- Revise the OE Program procedure to include an annual review of the list of vendors providing safety-related products/services to ensure new suppliers are added. (CA-17)

Inspection Team Observations and Findings

The NRC team reviewed procedure EN-OE-100 and interviewed OE staff members. The NRC team reviewed a sample of OE evaluations, as well as all corrective actions ANO developed as a result of these evaluations.

The NRC team identified additional examples of problems with the implementation of the OE program. The OE Program allowed ANO to decide that no action was needed to address OE reports that were determined to be applicable to ANO if sufficient pre-existing barriers existed such that the outcome would be minimized at ANO. The NRC team concluded that although ANO appropriately evaluated whether external OE was applicable to ANO, the corrective actions developed to address OE were sometimes insufficient. In addition, ANO had not established an effective method to evaluate vendor-related OE. In particular:

- The OE screening process identified OE that was applicable to the site for which corrective actions were required to be implemented (i.e., Level A1) and OE that was applicable to the site with adequate barriers already in place (i.e., Level 2). The NRC team identified several examples in which barriers were being credited that had not effectively been verified or validated. When the NRC team checked, some credited barriers would not have been effective. The NRC team documented a finding associated with this issue in Section 7.3.
- The CRG was responsible for reviewing the screening and approving the categorization of OE; however, CRG did not review the adequacy of the credited pre-existing barriers for issues screened as Level A2.

- The OE Program required vendor bulletins to be evaluated. The NRC team determined that ANO had not established an effective method to ensure that all vendor bulletins were evaluated. Corporate personnel distributed bulletins from vendors common to all plants, but individual sites were responsible to obtain and evaluate information from other vendors. ANO had not ensured that all vendor information was being tracked and evaluated by the OE Program. ANO initiated CR-ANO-C-2016-00782 to enter this issue into the CAP.

- The NRC team identified that each of the last four unplanned scrams involved ANO's failure to effectively use internal OE (three scrams) or external industry OE (one scram). This is further discussed in Section 4.3.1.

5.5 Human Performance
(IP 95003 Section 02.03.c)

5.5.1 Leadership Fundamentals FPA
(IP 95003, Section 02.02.a)

Background

ANO identified that leaders had not consistently demonstrated and reinforced high standards of performance and that, as a result, the NSC at ANO has weakened since 2007 and the ANO team has not adequately addressed performance issues. In particular, ANO identified Leadership Fundamentals as one of eight FPAs that contributed to having degraded performance.

ANO Evaluation Results

RCE report CR-ANO-C-2015-2829, "Leadership Fundamentals," documented that ANO leaders were not consistently demonstrating and reinforcing standards and expectations. ANO concluded that there were weaknesses in the leader behaviors needed to provide effective communications and build trust with employees, to create a vision to arrest the performance decline, to reinforce high standards and expectations, to foster a learning organization and culture of continuous improvement, and to make sound decisions that manage risk.

The Leadership Fundamentals RCE team concluded that although there were opportunities to address this at a precursor level during the mid-cycle assessments in 2010 and 2012, these efforts were not fully effective in resolving the underlying issues. The RCE documented the following causes:

Root Cause 1: ANO leaders often focus on behaviors that get short-term results over long-term strategic improvement. Leaders focused on day-to-day business without having a clear long-term strategy for performance review and problem identification and resolution. Specific problems involved consistent CAP implementation and a culture of continuous improvement, the strategic allocation of resources, the quality of processes and procedures, a strong NSC, high standards, effective communications, and building trust.

Contributing Cause 1: ANO leaders had not maintained a strong continuous improvement organization. ANO did not stay current with some industry standards, often accepted minimum standards, were not always self-critical, nor did they have a bias for action to improve performance.

Contributing Cause 2: ANO leaders had not established an adequate infrastructure to support NSC behaviors.

Contributing Cause 3: ANO leaders did not have adequate focus on developing leaders and their performance in reinforcing standards. Some leaders lack the skill set to reinforce standards.

Contributing Cause 4: ANO leader communications lack sufficient face-to-face engagement and message content to align the workforce have not been effective in creating a sense of urgency and teamwork in the resolution of ANO's decline in performance; and have not reinforced safety values, vision and strategy, stated goals and progress, and aligned and engaged the leadership team.

Planned Corrective Actions

The following corrective actions were identified under the Leadership Fundamentals AAP:

Actions to Set/Communicate Standards/Expectations for Leader Behaviors

- Conduct leadership assessments for the senior leadership team, managers and superintendents and establish individual development plans to support closing identified gaps in leader behaviors. (LF-1)

- Establish and roll out an ANO employee handbook with attributes and behaviors supporting nuclear safety and long term strategic improvement. The purpose of the handbook is to communicate and reinforce key values and behaviors. (LF-2)

- Provide supervisory training on constructive conversation skills. (LF-3)

- Establish weekly leadership alignment meetings for supervisors and above to reinforce actions and behaviors needed to achieve recovery objectives. (LF-4)

- Provide supervisory training on NSC and SCWE. (LF-5)

- Benchmark an external organization for leadership fundamentals and develop improvement actions as warranted based upon the results. (LF-6)

Actions to Model and Reinforce Leader Behaviors

- Establish and implement external coaching for a sample of department and station performance review meetings in the trending and performance review process. (LF-8)

- Establish a NSC observer function to observe and provide feedback on leader behaviors in key forums and to provide observation data for review by the NSCMP. (LF-9)

- Establish and implement an interim paired observations program for leaders to coach leaders on leadership behaviors. (LF-10)

Actions to Monitor Leader Behaviors

- Create trending and performance review metrics to improve the review of leadership in the areas of: (LF-11)

    - Leadership Fundamentals: (1) Vision and Values, (2) Teamwork, (3) Accountability, (4) Employee Engagement, and (5) Resource Allocation.

    - Performance Improvement: (1) Issue identification, evaluation and resolution, (2) Ownership of procedures and work processes, (3) Industry participation, (4) Self-assessments and benchmarking, and (5) OE.

    - Safety: (1) Decision-making, and (2) Safety Conscious Work Environment.

- Create a simple tool to analyze externally identified performance issues both individually and in the aggregate to present actionable data to the APRM. (LF-14)

Inspection Team Observations and Findings

The NRC team reviewed RCE CR-ANO-C-2015-2829, "Leadership Fundamentals," root and contributing causes, corrective actions, and planned effectiveness reviews. The NRC team concluded that ANO's evaluations related to Leadership Fundamentals FPA were comprehensive and that the root and contributing causes that ANO identified in RCE CR-ANO-2015-2829 were appropriate. The NRC team also concluded that the planned corrective actions were appropriate to address the root and contributing causes, and the planned effectiveness reviews served as an adequate means to assess the overall effectiveness of the completed corrective actions.

Interim Actions

RCE CR-ANO-C-2015-2829 included an interim action to establish a plan and obtain resources for a Standards Team during the Unit 2 outage in the fall of 2015. The NRC team reviewed closeout documentation associated with this interim action and confirmed that the Standards Team plan included actions to perform additional focused observations on procedure use, decision making, and nuclear fundamentals during the outage. The Standards Team was comprised of contractors with extensive nuclear experience, and they effectively identified shortcomings in leadership and nuclear fundamentals during their observations.

The corrective actions were planned to be complete prior to the upcoming fall 2016 Unit 1 outage, but ANO planned to assess the effectiveness of corrective action prior to the outage in order to determine whether additional action was needed.

Review of Completed Corrective Actions

The NRC team reviewed the following corrective actions credited in the CRP to address issues identified in the Leadership Fundamentals FPA that were completed:

- CR-ANO-C-2015-02829, CA-48: Distribute an "Acknowledgement of Understanding/Commitment with EN-LI-121," letter to CRG members, DPRM and APRM members, DPICs, and the ANO management team.

- CR-ANO-C-2015-02829, CA-33: Establish and implement an interim Leadership and Alignment Meeting guideline tailored to support recovery.

- CR-ANO-C-2015-02829, CA-34: Establish and implement an interim paired observation guideline tailored to support recovery.

- CR-ANO-C-2015-02831, CA-22: Develop and implement a procedure to conduct an APHC.

The NRC team concluded that the closure packages and associated documentation adequately documented the completed actions. The NRC team also concluded that the planned corrective actions should resolve the identified causes. However, the NRC team identified some cases in which the corrective actions were not fully effective, including:

- DPRMs did not always address all procedural requirements. The NRC team attended DPRMs for the Operations, Security, Production and Radiation Protection Departments to determine whether the requirements outlined in EN-LI-121 were met. In each of the meetings the NRC team attended, the list of scheduled benchmarks and self-assessments was not compared to the Performance Improvement Issues Matrix to verify all necessary self-assessments and benchmarks were identified. The NRC team identified that in two cases the Performance Improvement Issues Matrix did not contain all required inputs.

- The Leadership Fundamentals performance indicator was revised with criteria that were unclear, adversely impacting the ability of the DPRMs to fulfill the function of ensuring that ANO maintained a strong continuous improvement organization.

- The NRC team interviewed a NIOS representative regarding DPRMs, who stated that although NIOS had identified numerous issues with DPRM quality in 2015, meeting quality was improving.

- The NRC team observed two examples where the external NSC observer was not fully effective. These examples are described in Section 5.5.1.3.

- The APHC did not assign actions to address all identified staffing shortfalls. The NRC team attended an APHC meeting to discuss Training Department staffing and noted that the APHC approved actions to request additional staffing. However, the APHC did not approve actions to replace short-term contractors that would be leaving in the near-term.

- The Paired Observation Program was not always effective. For example, during a paired observation between an Assistant Operations Manager and a Mechanical Maintenance Supervisor, the Assistant Operations Manager stepped out of his Paired observer role and focused his attention on assisting the Maintenance Supervisor in troubleshooting an activity and working directly with operations staff in making decisions affecting the work activity.

5.5.1.2 Leader Field Presence
(IP 95003, Sections 02.02.a, 02.03.c)

Background

ANO identified that leaders had not consistently demonstrated and reinforced high standards of performance or monitoring performance. As a result, the NSC at ANO has weakened since 2007 and the ANO team has not adequately addressed performance issues. This topic was part of the Leadership Fundamentals FPA.

ANO Evaluation Results

RCE report CR-ANO-C-2015-2829, "Leadership Fundamentals," documented that ANO leaders were not consistently demonstrating and reinforcing standards and expectations. While the causes identified for the Leadership Fundamentals problem statement did not directly involve field presence, the corrective actions developed by ANO indicated that supervisor and manager presence in the field was a contributing factor.

Planned Corrective Actions

The following corrective actions were identified in the Leadership Fundamentals AAP related to the field presence of leaders:

- Develop and implement a “field presence” initiative that promotes and measures leader field presence. The objective is to drive and verify field presence by leaders to engage with employees and reinforce high standards. (NF-9)

- Establish and implement a Paired Observation Program. This is a “coach the coach” program to improve coaching interaction quality. (NF-10)

Inspection Team Observations and Findings

The NRC team determined that the planned corrective actions to improve the field presence of leaders were appropriate, however, the details of the field presence initiative were not developed in time for the NRC team to review. The NRC team concluded that the Paired Observation Program was improving the effectiveness of supervisors as managers provided feedback based on experience. The APHC process was intended to help remove barriers to increase supervisor and management field presence by strategically increasing staffing, including adding leaders.

The NRC team observed work in the field and discussed the field presence of leaders with ANO employees and contractors. Team members observed and interviewed mechanics, operators, chemistry technicians, radiation protection technicians, carpenters and painters. The individuals interviewed believed their supervisors spent a sufficient amount of time in the field, and that they prioritized their presence based on the complexity and risk significance of the activity being performed.

The NRC team noted that the CRP did not contain specific metrics to measure and trend the number, duration, or results of field observations to demonstrate whether field presence was improved or effective. There was an existing expectation that leaders spend at least 25 percent

of their time doing field observations, but it was not clear that this expectation was being met in all cases. In response, ANO created action NF-9 to develop a field presence initiative.

5.5.1.3 Standards and Accountability
(IP 95003, Sections 02.02.a, 02.03.c)

Background

ANO identified that leaders had not consistently demonstrated and reinforced high standards of performance and that, as a result, the NSC at ANO has declined since 2007 and the ANO team has not adequately addressed performance issues.

ANO Evaluation Results

RCE report CR-ANO-C-2015-2829, "Leadership Fundamentals," documented deficiencies in leadership behaviors related to standards and accountability needed to consistently:

- Create a vision, strategy, resource allocation, teamwork, and alignment to arrest the performance decline and achieve excellence.

- Reinforce high standards and expectations for performance.

The RCE team concluded that this decline was related to initiatives to reduce staff and streamline processes, the loss of experienced personnel through retirement, and increased demands placed on the workforce. The RCE identified the following causes associated with accountability and standards:

Root Cause 1: ANO leaders focus on behaviors that obtain short-term results over long-term strategic improvement. Station leaders lost focus on the long-term strategic actions necessary to maintain sustainable high levels of performance. Specifically, the need for behaviors that consistently support CAP implementation and a culture of continuous improvement, the strategic allocation of resources, the quality of processes and procedures, a strong NSC including some elements of SCWE, high standards of individual and team performance, effective communications, and the building of trust.

Contributing Cause 1: ANO leaders did not maintain a strong continuous improvement organization. This contributed to the performance decline by allowing ANO to: 1) not stay current with industry standards; 2) accept minimum standards; and 3) not be self-critical with a bias for action to improve performance.

Contributing Cause 3: ANO leaders did not have an adequate focus on the professional development of leaders and their performance in reinforcement of standards. This contributed to the performance decline because some leaders lacked the skill set to reinforce standards.

Planned Corrective Actions

The following corrective actions were identified that relate to standards and accountability in the Leadership Fundamentals AAP:

- Establish and roll out an ANO employee handbook with attributes and behaviors supporting nuclear safety and long term strategic improvement. The purpose of the handbook is to communicate and reinforce key values and behaviors. (LF-2)

- Provide supervisory training on constructive conversation skills. (LF-3)

- Establish and implement an interim paired observations program for leaders to coach leaders on leadership behaviors (LF-10)

Inspection Team Observations and Findings

The NRC team reviewed RCE CR-ANO-C-2015-2829, "Leadership Fundamentals," root and contributing causes, corrective actions, and planned effectiveness reviews. The NRC team reviewed ANO's efforts to observe, coach, and reinforce expectations through the following accountability tools:

- Daily paired observations
- One-by-one (1x1) meetings and improvement plans
- NSC observers
- DPRM/APRM coaches
- Leader assessments

The NRC team concluded that ANO's evaluations related to standards and accountability were comprehensive, the root and contributing causes identified were appropriate, and the corrective actions planned were appropriate to address the root and contributing causes. With the exception of 1x1 meetings, the planned actions were in the early stages of implementation or had not yet been developed. Nonetheless, the NRC team observed that the ANO staff were engaged and open to feedback, and first- and second-line supervisor field presence was improving and resulting in appropriate performance feedback.

The NRC team noted deviations from ANO standards discussed in the examples below, but ANO leaders present did not use accountability to address the deviation.

Daily Paired Observations

The NRC team reviewed the new Paired Observation Program intended to share observations and reinforce techniques between leaders and, in parallel, provide a forum for assigned leaders and leadership and alignment meeting participants to share experiences.

The purpose of Paired Observations was to implement a "coach-the-coach" approach to improving leader behaviors in observing and reinforcing behaviors at work locations. Directors, managers, and superintendents were required to conduct paired observations outside of the coaches' departments. The observation was to be a day in the field, and was expected to cover the pre-job briefs, walk-downs, interactions with other departments, work performance, human performance tool use, procedure adherence, documentation, and post job critiques.

The NRC team observed the implementation of the Paired Observation Program and concluded that the program was a useful tool for improving leadership and accountability. The NRC team observed a consistent focus by managers to provide feedback regarding human performance tool use and behaviors of the first line supervisors and staff being observed. In addition, there was a focus on the quality of pre-job briefings and post-job critiques, as well as procedure use and adherence. The NRC team noted that an observation form used to document and track the results of observations included appropriate evaluation criteria.

The NRC team identified the following performance issues that were not identified by supervisors during paired observations:

- During a paired observation between an assistant operations manager and a mechanical maintenance first line supervisor, the manager began assisting the supervisor he was observing in troubleshooting an activity and working directly with operations staff in making decisions affecting the work activity.

- Mechanical maintenance workers failed to wear all required personal protective equipment (i.e., hearing protection).

- A piece of equipment being tested by electrical maintenance workers was missing fasteners (CR-ANO-1-2016-0443).

- A bracket was not properly installed between safety-related breaker cubicles during work on the south battery charger normal cooling unit (CR-ANO-1-2016-0439).

The NRC team concluded that the Paired Observation Program was an effective standards and accountability tool. The NRC team concluded that this process was well executed overall, with some opportunities for improvement.

1x1 Meetings and Improvement Plans

The NRC team reviewed procedure EN-FAP-OM-016, “Performance Management Processes and Practices,” that ANO leaders used to conduct one-by-one (1x1) monthly performance management meetings with their direct reports. The purpose of these meetings was to ensure effective coaching and feedback is being provided to reinforce positive behaviors and that actions are being taken to change inappropriate behaviors. The meeting provided a forum to discuss a leader’s performance and the performance of supervisors within the group, served to reinforce standards and expectations, and ensure vertical alignment within the organization.

The NRC team observed a sample of 1x1 meetings to determine whether the procedure was being effectively implemented. The NRC team noted that the first line supervisors came well-prepared and had completed copies of Attachment 7.1, which served as an effective tool to guide the discussions of their own performance and that of their staff. The NRC team noted that discussions that were frank, with individuals demonstrating a willingness discuss and document their own opportunities for improvement. The content of the discussions were documented in Attachment 7.1 and retained by the senior leader.

During one of the observations, the NRC team noted that the discussion focused primarily on the performance of the junior leader's staff, with little discussion of the performance of the junior

leader. In another meeting, the discussion primarily involved solving a technical issue, impacting the overall effectiveness of the 1x1 discussion.

The NRC team concluded that the scope and format of the 1x1 meeting was an effective standards and accountability tool. The NRC team concluded that this process was well executed overall, with some opportunities for improvement.

Nuclear Safety Culture Observers

The NRC team reviewed actions to establish and implement an NSC observation process to include the following:

- Establish a NSC observer function and expectations. An NSC observer function is to be assigned to a leader in attendance at the start of selected ANO meetings to monitor behaviors and provide constructive feedback at the end of meetings.

- Establish a NSC observation form to include the top leader behaviors to be demonstrated and reinforced at ANO meetings.

- Revise procedure EN-QV-136 to include results from the safety culture observer forms in the data sets for review and action.

- Coaches will have upper level management experience in nuclear power plant performance improvement and/or regulatory recovery.

At the end of this inspection, ANO had begun implementing the NSC observation process using two external NSC observers. On a number of occasions, the external NSC observer actively participated by asking questions and providing feedback using a top ten leader behaviors evaluation form. The NRC team reviewed the evaluation form and noted that it included the following positive behavior descriptions to assess the meeting discussion:

- Continuous Learning
- Effective Safety Communication
- Decision-Making
- Leadership Safety Values and Actions
- Personal Accountability
- Problem Identification and Resolution
- Questioning Attitude
- Environment for Raising Concerns
- Respectful Work Environment
- Work Processes

The NRC team concluded that the evaluation form served as a good evaluation tool. The NRC team concluded that for most of the meetings observed, the feedback provided by the external NSC observer added value and the meeting participants were open to the questions and the feedback. However, the NRC team identified two cases where the external NSC observer was not fully effective. In the first case, the meeting members were unaware of the role of the external NSC observer and as a result did not acknowledge his feedback. In the second case, the external NSC observer did not address an ambiguous safety culture message that was delivered to the ANO staff by a senior ANO manager. During a meeting to discuss the results of

a self-assessment, the senior manager stated that the meeting was a “waste of time.” The manager later clarified those remarks were intended to mean that poor preparations for the discussion of the self-assessment results wasted the time of those attending, rather than the overall usefulness of self-assessments.

The NRC team concluded that the scope and format of the external NSC Observer Program was an appropriate improvement and accountability tool. This process was well executed overall, with opportunities for improvement.

Performance Review Meeting Coaches

The NRC team reviewed actions to establish and implement a plan for external coaches to monitor a sample of DPRM and APRM meetings. Per this corrective action, the plan for coaches assessed:

- At least one third of DPRMs each DPRM review cycle, and the APRM each APRM review cycle
- The adequacy of DPRM/APRM guidance
- The quality of inputs and results
- The effectiveness of leaders in challenging performance, identifying performance issues, and taking action to resolve issues
- Tracking actions to conduct snapshot assessments

ANO had one DPRM/APRM coach who had attended seven of the 11 DPRM meetings during the most recent meeting cycle. At the conclusion of a performance review meeting, the coach provided insights based on meeting observations using a DPRM/APRM Grading Sheet. The NRC team concluded that this was an effective method to improve DPRM/APRM performance.

The NRC team reviewed the DPRM/APRM grading sheet used by the DPRM/APRM coach to assess the quality of meetings. The grading sheet included 14 individual criteria, and each was assigned a numerical score to be used for trending. The NRC team noted that no guidance was provided for scoring, resulting in a subjective result that could prevent effective trending. However, the NRC team concluded that the primary intent of providing independent feedback was being met, and the use of DPRM/APRM coaches was an effective improvement and accountability tool.

Leader Assessments

The NRC team reviewed actions to conduct assessments of the senior leadership team, managers and superintendents and the use of procedure EN-FAP-OM-016 to close gaps in leader behaviors to support their development. To accomplish this corrective action, ANO contracted with a vendor to perform leadership assessments focused on the following selected leadership attributes:

- Promotes a clear vision and strategy to achieve excellence
- Fosters a learning organization – continuous improvement

- Develops an aligned, engaged workforce
- Builds and sustains trust with employees and external stakeholders
- Provides effective coaching and feedback in an environment of healthy accountability
- Makes effective decisions and appropriately manages risk
- Achieves sustainable results

The NRC team discussed the selected leadership attributes and overall assessment strategy with ANO management and the vendor project manager, and concluded that the strategy and actions appeared to be an effective mechanism to assess and improve ANO leader performance.

By the end of the inspection, all 41 identified ANO managers had completed on-line leadership testing and assessment interviews. The NRC team noted that these assessments were only being performed for leaders in positions above first line supervisors. To assess the adequacy of the implementation of these actions, the NRC team reviewed the on-line testing questions to verify that the questions were aligned with the targeted leadership attributes and observed a number of the interviews. The NRC team concluded that the leader assessments were appropriately focused on identifying gaps in leader behaviors to support individual improvement.

5.5.2 Decision Making and Risk Management FPA
(IP 95003, Section 02.03.c)

Background

ANO identified that decision making at all levels in the ANO organization had at times failed to recognize, mitigate and manage risk. In some cases, unrecognized or unverified assumptions, or unchallenged field decisions, contributed to consequential events and challenges.

ANO Evaluation Results

ANO performed follow-up evaluations as part of the recovery project to further investigate the causes and impacts related to decision making and risk management, including:

- Historical Data Review
- Collective Evaluation
- Decision Making and Risk Management RCE (CR-ANO-C-2015-02832)

ANO had previously attempted to improve problems with conservative decision making in RCE CR-ANO-C-2012-00596, “NRC Substantive Cross-Cutting Issue H.1.b, Decision Making.” The recovery team concluded that previous efforts to address the conservative decision making were not fully effective. Based on the results of these evaluations, along with input from many of the other recovery project evaluations, ANO determined that the Decision Making and Risk Recognition issue should be identified as an FPA.

The RCE report documented that station personnel have not applied a conservative bias when making decisions. Unrecognized or unverified assumptions, or unchallenged field decisions contributed to events, degraded design margins, and challenged plant operation. A systematic process has not been used to ensure decisions are rigorous and thorough and that technical considerations are properly addressed. In addition, decisions are not communicated to support

organizational alignment. Weaknesses in the execution of work management processes have impacted the station's ability to manage risk and effectively maintain the plant.

ANO's Decision Making and Risk Management RCE documented the following causes:
Root Cause: Station leaders exhibit leadership behaviors that do not consistently promote the NSC aspects for conservative decision making.

Contributing Cause 1: The station has sometimes exhibited weak operational focus with respect to eliminating or mitigating challenges to reliable plant operation, prompt and thorough resolution of challenges, maintaining margin and communicating the basis of decisions affecting plant operation.

Contributing Cause 2: The station has not been a self-critical, continuous learning organization with a bias for action to achieve performance improvement. This cause contributed to a mindset that ANO's performance was largely satisfactory, little change was needed, and outside input was of limited value. In a number of cases, this cause resulted in ineffective actions that were narrowly focused or only met the minimum required to address performance issues.

Planned Corrective Actions

The following major corrective actions were documented in the Decision Making and Risk Recognition AAP:

Actions to Improve Decision Making Behaviors

- Establish a decision making tool for station personnel that includes expectations for use at ANO. The intent of this action is to establish a "minimum risk option" behavior that drives the decision maker to develop multiple solutions and drive the decision that has the least risk. (DM-1)

- Establish a decision making NSC observation form to include the top leader behaviors to be demonstrated and reinforced at ANO meetings. The form should include decision making practices that emphasize prudent choices over those that are simply allowable. (DM-2)

- Establish decision making and risk management content in the ANO Employee Handbook to include behaviors for making effective decisions and appropriately managing risk with the expectation for employees and leaders to use the book in communicating, demonstrating and reinforcing appropriate behaviors. (DM-3)

Actions to Strengthen Risk Recognition

- Benchmark a nuclear facility outside the Entergy fleet for its ability to recognize risk. Incorporate the learnings and develop a risk recognition training plan to be delivered at ANO. (DM-5)

- Deliver risk recognition training and develop curriculum for all site personnel with unescorted access. (DM-6)

- Develop and implement training on procedures governing risk assessment for work management SROs, work week managers, shift managers, and unit coordinators. (DM-7)

- Develop and implement a familiarization guide for the function of work management SRO which will ensure clear understanding of job functions. (DM-8)

- Establish recurring training for project management personnel on risk recognition and conservative decision making. (DM-9)

- Revise procedure EN-WM-104, "On-Line Risk Assessment," to include guidance for classifying as high risk those work activities involving a credible risk concern with unacceptable consequences and first-of-a-kind or first-in-a-while activities. (DM-10)

- Revise project management procedures to ensure high consequence risks are properly identified and eliminated/mitigated through a structured risk management process. (DM-11)

Actions to Improve Operational Focus

- Conduct benchmarking of a high performing station in the area of operations focus with a plan based on "Principles for Effective Operational Decision Making." (DM-12)

- Assign a mentor from outside the Entergy fleet to coach and mentor each shift manager, emphasizing the aspect of leadership in operational focus. (DM-13)

- Assign a mentor to review all ODMIs until proficiency is demonstrated. (DM-14)

- Perform a benchmark on a high performing station outside the Entergy Fleet on ODMI development, implementation and effectiveness reviews, and develop improvement actions based upon the results. (DM-15)

- Develop and implement training for key personnel on ODMI development, implementation and effectiveness reviews. (DM-16)

Actions to improve decision making in work management are described in the on-line work management assessment in Section 5.3.3. Actions to address the root cause for the Decision Making and Risk Management FPA are described in the Leadership Fundamentals FPA assessment in Section 5.5.1.

Inspection Team Observations and Findings

The NRC team assessed ANO performance related to decision making and risk management to determine whether performance was sufficient to support safe operation and whether planned corrective actions would promote sustained performance improvement.

ANO's evaluations related to decision making and risk recognition identified multiple conditions that contributed to declining performance. ANO identified that decision making at all levels in the ANO organization failed to recognize, mitigate and manage risk. Corrective actions at the craft and first line supervisor level have contributed to recent plant performance improvement.

Consideration of Decision Making Impact to Margins

The NRC team noted multiple examples in prior NRC findings and ANO recovery evaluations that indicated poor decision making at ANO had allowed design and safety margins to be eroded. Examples included:

- Adopting strategies that attempt to manage problems rather than resolving them, such as allowing flow blockages and pipe corrosion in SW system to continue until the conditions impacted operability/functionality.

- Revising the PM Program to be less conservative without assessing the impact on failure rates.

- Placing compensatory measures for degraded or non-conforming equipment into permanent procedures rather than resolving the degraded or non-conforming condition.

- Addressing plant problems with evaluations that reduce design margins or accept a lower standard, such as when allowable flows for EDG and high pressure injection pump bearing coolers were permanently reduced in engineering documents when it was difficult to maintain the original design flow rate.

- Allowing the number of minor equipment issues that can be addressed by added operator actions to build up with no way to monitor the collective impact. The collective risk associated with having these conditions during events and off-normal conditions has not been considered during decision making.

Operational Decision Making Instructions

The ODMI process is a tool used to formalize the process used to make and document decisions that impact plant operation. The NRC team reviewed several long-term degraded conditions that were the subject of ODMIs to assess whether the process was implemented and maintained effectively. The NRC team identified the following observations:

- Operators, including shift managers and CRSs, did not always have a clear understanding of the decisions, action thresholds, and compensatory measures established in existing ODMIs.

- The NRC team identified that similar degraded conditions (leaking safety injection/decay heat removal check valves) resulted in different decisions in the two units. The NRC team noted one example where operations and engineering personnel disagreed, no action was taken to resolve the disagreement, and the ODMI document was not updated or followed.

- When the safety injection check valve leakage in Unit 2 increased, operators began taking different actions than those defined in the ODMI, and did not re-enter the formal ODMI decision making process.

- Examples were noted where ODMI documentation did not accurately reflect the impact of the degraded condition for all functions.

- A process existed to periodically assess whether long-term ODMIs continued to be accurate, appropriate, or effective. The NRC team determined that ANO had not recently performed any periodic assessments. ANO personnel stated that such a review was only required if deemed necessary by the Corrective Action and Assessment Manager.

- One ODMI created competing compensatory actions. Section 7.10 describes a violation caused by the incompatible actions created from two different ODMIs affecting the Unit 2 safety injection system.

- The check valve 2SI-13D bonnet leakage was identified prior to the start of the operating cycle in November 2015. ANO decided to restart the unit based on a non-conservative belief that the leakage would not increase. No action was assigned to verify this assumption, and ANO failed to consider the impact of the leak on surrounding SSCs. The NRC team inspected the Unit 2 containment and identified that leakage from 2SI-13D had increased and borated water was collecting against on the containment moisture barrier and containment liner, where corrosion could degrade the containment liner.

Interim Actions

ANO implemented the following interim actions to improve decision making and risk management:

- Ensuring the work control SROs and on-watch SROs understand the need to ask risk-based questions and risk-mitigating actions for all work that is released to the field.

- Improved communications to the site to enhance the awareness of the risk drivers and risk significant systems.

- Communicated the results of the Collective Evaluation process to ANO employees and solicited feedback from the employees on other potential fundamental problems or problem areas.

- Reviewed the Outage Human Performance Plan to make changes based on the recovery evaluations to address problems and avoid associated risk impacts.

During interviews, workers and supervisors stated that they were receiving more information about plant conditions, were more aware of the related risks, and more attention was being given to risk awareness. Therefore, the NRC team concluded that the interim actions were effective while a comprehensive improvement plan was being developed.

5.5.2.1 Assessment of Probabilistic Risk Assessment Model
(IP 95003 Section 02.03.c)

The NRC team reviewed ANO's internal events and fire PRA models for completeness, adherence to applicable requirements, usability, and its products. The NRC team identified that the Unit 1 internal events model was last updated in July 2009, and the Unit 2 internal events model was last updated in 2008. Both of these updates were past the periodic maintenance

update frequency of four years as specified in procedure EN-DC-151, "PRA Maintenance and Update," Revision 5. The NRC team questioned the accuracy of the models relative to the current operating plant configuration. The NRC team concluded that the out of date models could cause licensing concerns and operational assessment issues. The most significant causal factor for not conducting timely PRA model updates was a lack of resources. Specifically, ANO did not have sufficient qualified personnel to perform PRA model updates when they were required.

Licensing Concerns

The NRC team reviewed the license amendment requests that ANO submitted for NRC review and approval that were risk-informed and were submitted after ANO's PRA models exceeded the requirements for periodic updates. The following submittals were reviewed:

- Unit 1 Containment Integrated Leak Rate Testing Extension
- Unit 1 National Fire Protection Association (NFPA) 805 Risk Informed Fire Protection Program
- Unit 2 NFPA 805 Risk Informed Fire Protection
- Unit 1 Radiation Monitor RE-7460

Unit 1 Containment Integrated Leak Rate Testing Extension

The NRC team identified a Severity Level IV violation of 10 CFR 50.9, "Completeness and Accuracy of Information," because ANO failed to submit complete and accurate information concerning PRA model maintenance information in the license amendment request for the extension of the integrated leak rate testing (ILRT) for the Unit 1 reactor building. ANO's application stated that the PRA model was maintained in accordance with Entergy's program (EN-DC-151), when the Unit 1 PRA had not been updated within the required periodicity. This violation is documented in Section 7.13.

Unit 1 NFPA 805 Risk Informed Fire Protection Program

The NRC team determined that the Unit 1 internal events PRA model was issued in July 2009 and was at its four year required update point in July 2013. The licensee made its NFPA 805 submittal to adopt a risk-informed fire protection plan in December 2013. The fire PRA model for Unit 1 is built upon the internal events PRA model, and the license amendment request relied upon the results of the fire PRA model. The licensee failed to provide complete information to address the Unit 1 internal events PRA model not being current in the submittal as required by Regulatory Guide 1.205, "Risk-Informed, Performance-Based Fire Protection for Existing Light-Water Nuclear Power Plants." This submittal was still under review at the time of this inspection. On March 10, 2016, the Office of Nuclear Reactor Regulation issued a request for additional information concerning the Unit 1 PRA update results and its impacts to support the review of the NFPA 805 license amendment request. Because the inaccurate information was discovered and was being addressed in the licensing process, the NRC team concluded that consistent with Section 1.5.3 of the NRC Enforcement Manual, no enforcement action was necessary.

Unit 2 NFPA 805 Risk Informed Fire Protection

The NRC team determined that the Unit 2 internal events PRA model was issued in July 2008 and was within its four year required update point in March 2012, when ANO made its NFPA 805 submittal to adopt a risk-informed fire protection plan. For reasons other than PRA model update timeliness, this NFPA 805 license amendment request submittal was returned to ANO for resubmittal. The licensee resubmitted the NFPA 805 license amendment request, and the NRC team determined the submittal was adequate regarding information about the PRA model. The NRC team concluded no violation of NRC requirements occurred in this case.

Unit 1 Radiation Monitor RE-7460

On April 29, 2011, ANO submitted a license amendment request to adopt Technical Specification Task Force Item 513 to revise the operability requirements and actions for RCS leakage instrumentation. ANO proposed revising the language in the technical specification bases that describes the conditions under which the gaseous and particulate atmosphere radioactivity monitors could be considered operable. The proposed new technical specification bases stated, in part, that the monitor could be considered to be operable when it is capable of detecting a 1 gallon per minute increase in unidentified leakage within one hour given RCS activity equivalent to that assumed in the design calculations for the monitor. When asked, ANO was unable to provide a design calculation for RE-7460 that could be used as the basis for operability decisions. The NRC team considered this to be a violation of 10 CFR 50.9, "Complete and Accurate Information." The NRC team consulted with the technical reviewers at the NRC Office of Nuclear Reactor Regulation and determined this violation of be minor significance because the inaccurate information did not impact the decision to approve the license amendment request.

5.5.2.2 Adequacy of Risk Assessment Tools
(IP 95003 Section 02.02.c)

The NRC team evaluated risk assessment tools used to support decision making at ANO to determine if they were clear, understandable and adequate. The NRC team determined that two procedures, EN-WM-104, Revision 12, and COPD-024, "Risk Assessment Guidelines," Revision 58, were used to assess risk at the station. The NRC team reviewed the procedures and interviewed personnel and determined that the procedures were thorough and accurate, but required significant experience and knowledge to implement. The NRC team noted that licensed operators assigned as operations work liaisons were assigned risk management responsibilities, but nearly all of them had limited experience and no specific training to be able to implement risk recognition and risk management responsibilities. The operations work liaisons stated that procedure COPD-024 was confusing and difficult to understand, and as a result, they tended to ask other operators how to perform some actions.

The NRC team reviewed the Equipment Out Of Service Program. This program ran the PRA model for each unit to quantify daily maintenance risk. The NRC team found the program adequate for performing quantitative risk assessments.

5.5.2.3 Knowledge of Station Risk Insights
(IP 95003 Section 02.03.d; IP 95002 Section 02.04)

The Yellow stator drop findings identified that ANO had failed to recognize and manage the risk associated with the stator lift. The NRC team assessed station personnel's knowledge of risk

aspects. This assessment included a review of past performance in recognition and management of risk. This review assessed how ANO addressed risk in the AAPs, and assessed ANO's current performance. The NRC team reviewed historical performance of risk knowledge and recognition through document reviews. This included a review of the following violations from NRC inspection reports from 2007 to 2016:

- Failure to perform a risk assessment prior to mobile crane activities in the vicinity of Startup 2 transformer. [NRC Integrated Inspection Report 05000313/2007004 and 05000368/2007004]

- Failure to recognize risk created by the fix-it-now team when changing the maintenance activity on high energy line break door 62 operating mechanism from troubleshooting to minor maintenance. Maintenance personnel opened the door for 15 minutes, and failed to inform the control room which resulted in not recognizing the need to enter an 8 hour shutdown technical specification. [NRC Integrated Inspection Report 05000313/2008003 and 05000368/2008003]

- Failure to recognize the risk consequences of a declining trend in performance for the AAC diesel generator. ANO failed to properly characterize 10 malfunctions that impacted the reliability of the system. [NRC Integrated Inspection Report 05000313/2008003 and 05000368/2008003]

- Failure to perform an adequate risk assessment for planned maintenance in which ANO failed to adequately evaluate the proposed condition of door 340, a barrier required for high energy line break protection, and provide appropriate risk management actions for this condition. [NRC Integrated Inspection Report 05000313/2008005 and 05000368/2008005]

- Failure to recognize risk when I&C technicians performed activities not in accordance with instructions while working on the pushbutton for the EFW steam admission valve. A different wiring configuration was discovered as compared to the work instruction, but maintenance continued without guidance. [NRC Integrated Inspection Report 05000313/2011003 and 05000368/2011003]

- Failure to recognize the risk consequences of running the non-safety auxiliary feedwater pump without minimum flow protection. [NRC Integrated Inspection Report 05000313/2014005 and 05000368/2014005]

- Two examples of failing to recognize risk associated with working in the switchyard. [NRC Integrated Inspection Report 05000313/2015004 and 05000368/2015004; and 05000313/2016001 and 05000368/2016001]

The NRC team noted that the above violations occurred during the period of performance decline. Additionally, between 2008 and 2012 ANO received two substantive cross cutting issues for trends in findings caused by a lack of conservative decision making. Conservative decision making is an aspect related to risk management. To address the substantive cross-cutting issues, ANO initiated CR-ANO-C-2012-0596. As corrective action, ANO developed a risk recognition worksheet. This tool provided risk recognition guidance, but in 2015, ANO removed this worksheet without providing replacement guidance.

Following the stator drop event in 2013, ANO initiated CR-ANO-C-2014-2318 and performed an RCE to discover the causes and corrective actions. One of the root causes identified that project management procedures provided insufficient guidance to identify and manage risk. The NRC team noted that actions were not taken to raise the level of risk awareness, knowledge, or recognition for station personnel.

The NRC team determined that external plant stakeholders made note of the station's deficiencies in risk knowledge. In 2014, the Entergy Safety Review Committee noted that licensee management of integrated risk was weak and needed improvement. Also in 2014, a third party assessment concluded that managers did not verify degraded conditions were evaluated and therefore were unaware of operational plant risk.

ANO identified risk and decision making as an FPA and performed RCE CR-ANO-C-2015-02382. The RCE had the following problem statement: "Decisions at all levels in the organization have sometimes failed to recognize, evaluate, and manage risk." The root cause and corrective actions focused on conservative decision making.

ANO had multiple indications of deficient risk management practices. The NRC team concluded that ANO failed to recognize the need to develop and implement corrective actions to improve knowledge and recognition of risk. The NRC team reviewed current performance of risk aspects at the site. The NRC team noted the following instances of deficiencies in implementation of risk programs:

- In July 2015, ANO identified a non-cited violation of 10 CFR 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Section (a)(4), for the failure to assess the risk associated with removing and cleaning the Unit 2 SW system pre-screens for maintenance. The licensee had historically been performing this activity without assessing the risk. This licensee identified violation is documented in Section 8.4.

- In October 2015, the NRC resident inspector identified a non-cited violation of 10 CFR 50.65(a)(4), for failure to assess the risk impact of switchyard maintenance. Specifically, the station failed to properly classify some switchyard work and assess risk as specified in Procedure COPD-024, Revision 055, during multiple periods of switchyard work between October 2 and 15, 2015. The work involved the repair of damaged conduit on the voltage regulators, transformer refurbishment, relay calibrations, and motor operated disconnect replacement. This violation was documented in NRC Inspection Report 05000313/2015004 and 05000368/2015004.

- On December 15, 2015, prior to the replacement of a power supply in the electrohydraulic control system for the Unit 1 main turbine, ANO failed to fully consider all risk aspects of the activity. While ANO management considered the risk associated with transitioning the plant from full power operations to a lower power level, they did not brief operators on a previous failure to help mitigate that risk.

- In January 2016, NRC resident inspectors identified a non-cited violation of 10 CFR 50.65(a)(4), for the failure to assess and manage the increase in risk due to hot work near the Unit 1 risk-significant non-vital switchgear. Specifically, ANO failed to identify the work as "low integrated risk," and take prescribed risk management actions

to protect the available fire pumps, and brief the fire brigade. This violation was documented in NRC Inspection Report 05000313 and 05000368/2016001.

- In February 2016 after commencement of work, ANO identified a non-cited violation of 10 CFR 50.65(a)(4), "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," for failure to assess the risk impact of switchyard maintenance. Specifically, the station failed to properly classify some switchyard work and assess risk as specified in Procedure COPD-024, Revision 056. This licensee identified violation was documented in NRC Inspection Report 05000313 and 05000368/2016001.

The NRC team considered that these recent examples were indicative of continued deficiencies in risk knowledge and recognition at the station which had long been documented but never fully addressed by ANO. The NRC team determined that actions to improve knowledge of risk was missed in the assignment of corrective actions for the Decision Making and Risk Management FPA. In response, ANO revised the Decision Making and Risk Management AAP to add actions DM-5 through DM-11 (see Section 5.5.2.3).

5.5.3 Nuclear Fundamentals Problem Area
(IP 95003 Section 02.03.d)

Background

ANO identified that a significant contributor to performance problems at the station was that worker performance had been inconsistent in fundamental behaviors including procedure adherence, risk awareness, and questioning attitude. In particular, ANO identified Nuclear Fundamentals as a PA that contributed to degraded performance.

ANO Evaluation Results

ANO's collective evaluation analysis determined Nuclear Fundamentals was "driven" by Leadership Fundamentals, CAP, Organizational Capacity, and Decision Making/Risk Management. The corrective action plan was developed based on the findings of the Synergy Safety Culture Survey, the TPNSCA, and the FPA root cause evaluations listed above. No separate evaluation was performed for the Nuclear Fundamentals PA.

Planned Corrective Actions

ANO credited some of the corrective actions identified in the related FPA's that would directly address Nuclear Fundamentals. The following corrective actions were identified in the Nuclear Fundamentals AAP:

Actions to Reset Nuclear Professional Standards

- Implement a What It Looks Like sheet for nuclear professional behaviors based on objectives in "Performance Objectives and Criteria." Include a continued focus on the following four performance issues: (NF-1)

    - Procedure use and adherence
    - Challenging assumptions and decision making
    - Conservative bias and risk recognition
    - Low threshold for reporting issues.

- Develop content for the Employee Handbook that addresses procedure use and adherence. (NF-3)

- Develop content for the NSC observation process that addresses procedure use and adherence. (NF-4)

- Develop content for the ANO supervisor training that addresses procedure use and adherence. (NF-5)

- Revise procedure EN-OM-126 to ensure that supplemental employees receive the Site Handbook. (NF-6)

- Develop and provide training to ANO leaders, including supervisory training on NSC and SCWE, constructive conversation skills, and how to foster a strong NSC within their organizations. (NF-7)

- Develop and present training to ANO workforce to include case studies that illustrate the "right picture" of NSC. Include what it means to be an engaged and thinking individual nuclear worker. (NF-8)

Actions to Reinforce Nuclear Professional Standards through Improved Field Presence and Coaching Quality

- Develop and implement a "field presence" initiative that promotes and measures leader field presence. The objective is to drive and verify field presence by leaders to engage with employees and reinforce high standards. (NF-9)

- Establish and implement a Paired Observation Program. This is a "coach the coach" program to improve coaching interaction quality. (NF-10)

ANO also planned to implement a voluntary behavior-based nuclear safety program that was similar to an ANO program focusing on industrial safety (NF-11). The program included a "score card" of behaviors with a point value assigned to each. Leaders and workers could voluntarily perform observations and provide coaching, then anonymously submit the completed score cards. The NRC team suggested that the plans to implement a voluntary peer-based observation process would likely not be effective in achieving the necessary improvements in worker behavior because a voluntary program does not ensure the setting and enforcing of standards.

Inspection Team Observations and Findings

The NRC team identified that the CRP had limited actions to directly address improving worker behaviors or increasing field presence of managers to set and enforce expectations. In response, ANO developed improved actions to strengthen field presence and set expectations for worker behaviors. Also, the NRC team noted that procedure adherence problems were identified in the RCEs for the White Unplanned Scrams performance indicator and the two Yellow findings, but ANO did not perform any cause evaluation for procedure adherence problems. Corrective actions developed by ANO to improve procedure adherence were focused on establishing clear standards and improving procedure quality and human factoring.

The NRC team concluded that the combination of actions were appropriate to improve procedure adherence.

The NRC team reviewed CR-ANO-C-2015-3031, "Nuclear Fundamentals," corrective actions and planned effectiveness review measures. The NRC team concluded that ANO's actions related to Nuclear Fundamentals were appropriate and should address the identified concerns. The planned effectiveness review measures were appropriate to assess completed corrective actions.

Interim Actions

Condition Report CR-ANO-C-2015-3031 included an interim action in the Operations Human Performance Plan to improve procedure use and adherence, and address procedure quality issues during the fall 2015 Unit 2 refueling outage. The NRC team reviewed closeout documentation associated with this interim action and confirmed that actions in the Operations Human Performance Plan addressed procedure use and adherence errors and procedure quality issues. As discussed in Section 5.5.6, the NRC team concluded that operations personnel exhibited good human performance behaviors, peer checking, oversight, and field presence.

Completed and In-Progress Corrective Action Review

The NRC team reviewed the following corrective actions that were credited in the CRP in addressing issues identified in the Nuclear Fundamentals AAP:

- CR-ANO-C-2015-02829, CA-25: Establish an ANO employee handbook based on the EN-PL-100 nuclear excellence model but with specifics supporting ANO's vision, strategy, goals, values, attributes and behaviors. [In-Progress]

- CR-ANO-C-2015-02829, CA-34: Establish and implement an interim Paired Observation Guideline tailored to support 95003 recovery. [Complete]

- CR-ANO-C-2015-03031, CA-12: Develop and implement a behavior based safety program and guidance in a site level procedure for nuclear professional attributes. [In-Progress]

For CA-34, the closure package and associated documentation provided an adequate basis for closure. In reviewing the implementation of the current industrial safety-focused behavior-based observation program, the NRC team identified two aspects that were of potential concern. The first aspect was that the program was voluntary for non-supervisors, and as such, unless there is a high participation rate, the overall impact of the program would be limited. The second aspect was that the actual participation rate varied between departments. For example, the NRC team concluded that the Operations Department participation had significantly declined after about 6 months because the program champions had been reassigned to new positions. Additionally, although participation in the behavior-based observation program was required for supervisors, not all supervisors in the Operations Department participated if they were performing a support role (i.e., not on-shift).

The NRC team noted that the industrial safety behavior-based observation program was applicable to ANO employees only, and that long-term contractors were either enrolled in a separate program dictated by their contract employer, or were not enrolled in a program at all.

The NRC team was concerned that this corrective action may not be applied to a significant fraction of the workforce at ANO. The only corrective action addressing nuclear fundamentals for long-term contractors and shared resources (i.e., Entergy employees from other sites working at ANO temporarily) was the ANO handbook. ANO has a large number of contractors performing safety significant work on site (e.g., temporary design engineers, maintenance workers, safety culture observers, etc.). In response, ANO agreed to revise the planned corrective actions.

5.5.4 Procedure and Work Instruction Quality Problem Area
(IP 95003 Section 02.03.c and d)

Background

ANO identified that a significant contributor to performance problems at the station was a lack of consistent procedure structure for human factoring, and procedures and work instructions that were technically inaccurate or incomplete. Following a review of several consequential historical conditions, the adequacy of guidance provided in procedures and work instructions was noted to be a factor. During the ANO recovery project, Procedure and Work Instruction Quality (PQ) was determined to be a PA.

ANO did not identify procedure use and adherence as a separate FPA or PA; however, issues related to procedure use and adherence were grouped under the Nuclear Fundamentals PA. ANO determined that worker performance was inconsistent in fundamental behaviors including procedure adherence, risk awareness, and questioning attitude; which contributed to plant events, bottom decile industry safety performance, and ineffective implementation of industry guidance entitled “Engaged, Thinking Organizations.”

ANO Evaluation Results

Following the Unit 1 outage in 2015, ANO determined that 170 operations procedure improvement forms were overdue. This condition alerted ANO to assess if a problem related to resource limitations for maintenance of operating procedures existed. ANO performed a number of follow-up evaluations as part of the recovery project to further investigate the causes and impacts related to procedure and work instruction quality, including:

- ANO IP 95003 KAR and Assessment of Procedure Quality
- Historical Data Review
- Collective Evaluation

ANO identified the following insights:

- Inaccurate procedures and work instructions have contributed to consequential conditions.

- ANO procedures have lacked consistent structure for human factoring.

- Procedures and work instructions have been technically inaccurate or incomplete.

- The current station organizational capacity is challenged to address the backlog of procedure change requests.

Although ANO did not perform a formal RCE associated with this PA, as an output of the Collective Evaluation process ANO identified two primary performance issues as stated in the PQ AAP:

- The ANO leadership team has not consistently provided the organizational structure, staff priorities, or dedicated resources to support high quality procedures and work instructions.

- ANO has not consistently applied current industry guidance for procedure content, structure, and human factoring.

Key Corrective Actions

The following key corrective actions were identified by ANO under the PQ AAP:

- Develop and implement a site procedure writer's guide based on applicable industry standards. (PQ-1)

- Develop and implement a work order instruction guide based on applicable industry standards. (PQ-2)

- Perform scoping reviews to assess extent of procedure and work instruction quality issues. (PQ-3)

- Conduct a Procedure Professionals Association certification course for selected plant personnel. (PQ-4)

- Risk rank station procedures as safety significant, important, or normal to facilitate procedure upgrade project scoping. (PQ-5)

- Upgrade "safety significant" procedures (PQ-6), "important" procedures (PQ-7), and "normal" procedures. (PQ-8)

- Upgrade all critical 1-4 model work orders with a frequency of 2 years and/or two refueling outages, including associated procedures. (PQ-9)

- Review and correct station procedures with respect to gaps in use of notes and cautions, and ensure needed corrections are entered into the appropriate station processes for completion. (PQ-10)

- Establish a periodic review and validation of station procedures. This will also support a systematic approach to revising the station procedures not included in other actions to the standards contained in the new writers' guide. (PQ-11)

Inspection Team Observations and Findings

The NRC team assessed ANO performance in multiple areas related to procedure and work instruction quality and ANO's proposed improvement plan to determine whether it was sufficient to support safe operation and whether planned corrective actions would promote sustained

performance improvement. The NRC team's review of work instruction quality is documented in Section 5.3.7.

The NRC team conducted interviews with personnel in charge of the procedure improvement project, and personnel in the Operations and Maintenance Departments. The NRC team verified during plant tours that copies of procedures and other procedural guidance (e.g., laminated operator aid sheets) that were available in the plant at remote locations were the correct revisions. The NRC team assessed the quality of a sample of Unit 1 AOPs and EOPs by comparing them to the same AOP or EOP at another Babcock and Wilcox reactor plant. The NRC team compared a similar sample of ANO Unit 2 AOPs and EOPs to the same procedures at a different Combustion Engineering (CE) reactor plant. The NRC team performed detailed reviews of the various ANO recovery project assessments and other recovery project documents related to procedures and work orders in order to assess the effectiveness of plans at correcting deficiencies.

The NRC team identified the following:

- The ANO Phase I recovery assessments provided ANO with a thorough and detailed assessment of procedural problems.

- The CRP addressed procedure quality of all groups of significant procedures except the top two groups, EOPs and AOPs. The recovery team stated that EOP quality is maintained by complying with owners' group standards, and AOPs receive frequent checks during the conduct of simulator training. The NRC team agreed with the recovery team that AOPs and EOPs received adequate technical reviews, but noted that human factoring in the examples the NRC team examined were not up to the level that is typical in the nuclear industry.

- Several CRs associated with the Phase I procedure quality evaluation were closed without addressing the procedural deficiencies identified by the assessment teams. In response, ANO performed an extent of condition review and initiated 11 new Procedure Improvement Forms.

- The CRP did not included actions to provide training to the planners in the Maintenance Department to teach them how to write work orders. This was addressed by adding action PQ-4 (see above).

The NRC team noted that the procedural improvement plan was well-defined, clearly-focused, and resource-loaded. The NRC team noted that ANO's plan to develop a full time procedure writers group to develop and leverage experience will help ensure continued procedural improvements. The NRC team concluded that the processes ANO intended to implement appeared appropriate and sufficiently complete in scope that its actions would ensure prompt and sustained improvement in the area of procedure and work order quality.

5.5.5 Vendor Oversight Fundamental Problem Area

ANO Evaluation Results

ANO identified that vendor oversight should be treated as an FPA because deficient vendor design and testing had gone undetected by station personnel. ANO performed an initial RCE

following the stator drop event (CR-ANO-C-2013-0888). The RCE did not fully evaluate deficiencies in ANO's oversight of vendors. A corrective action for the stator drop RCE was to perform a gap analysis of the ANO vendor oversight fundamental problem to CR-ANO-C-2014-02318, "Stator Lift Assembly Collapse." This gap analysis was documented in RCE-ANO-C-2015-02838, and concluded that an additional cause evaluation should be performed because corrective action for the stator drop RCE contained potential gaps in the actions taken for vendor oversight and the CAPR actions were designed to correct the conditions associated with project management. As a result, ANO revised the stator drop RCE and developed corrective actions to address the gaps.

The RCE team for CR-ANO-C-2014-02318 applied Barrier Analysis and Why Staircase techniques to evaluate the condition. The RCE identified the following causes:

Root Cause 1 – The Stator Rewind Project was not organized or managed in a manner that provided sufficient oversight of the vendor's design and testing for the temporary lift assembly. This resulted in insufficient supervision and technical oversight of personnel assigned to evaluate and monitor the vendor's work, and insufficient engagement with engineering and the material handling process owner to ensure detection of flaws in the vendor's design and prior-use certification. This resulted in failure to perform steps of EN-MA-119, "Material Handling Program," revision 16, related to design approval and load testing.

Root Cause 2 – Procedure EN-DC-114 provided insufficient guidance to identify and manage risk items with high consequence, particularly for cases where the probability of the event was judged to be very low.

Contributing Cause 1 – Weak implementation of administrative controls applicable to the project contributed to the failure to adequately implement a number of administrative requirements. This contributed to weaknesses in oversight and risk management that resulted in the failure to detect flawed vendor design and certification of the temporary lift assembly.

Contributing Cause 2 – Procedure EN-MA-119 did not provide clear guidance regarding the level of review required to approve the design and testing of vendor-supplied special lift equipment, including how an alternate standard should be identified and approved for use. This contributed to the failure to identify flaws in the vendor's design and certification because additional reviews that could have detected the errors were not performed.

Contributing Cause 3 – ANO placed undue confidence in the vendor's capabilities. This contributed to the responsible ANO personnel perceiving the risk of structural failure of the lift assembly as low because an expert vendor had certified the design, similar lifts had been made before, and the vendor asserted the lift assembly had been used for heavier lifts in the past. This contributed to the lack of verification of vendor representations.

Contributing Cause 4 – The corrective action plan developed and implemented for CR-ANO-C-2012-0596, "Conservative Assumptions in Decision Making (H.1.b) Substantive Cross-Cutting Issue," was not effective in changing behaviors of personnel involved in high risk decisions (including project management). This cause contributed to the failure to detect the deficient vendor design and faulty decision not to perform a load test, which resulted in a non-compliance with EN-MA-119 requirements.

Planned Corrective Actions

The following corrective actions were identified in the Lift Rig Failure and Vendor Oversight AAP related to improving vendor oversight:

- Designate a subject matter expert to oversee implementation of the procedures for management and oversight of supplemental personnel and contractor oversight for ANO. (VO-1)

- Establish a vendor oversight team to drive continuous improvement in vendor oversight. (VO-4)

- Develop and implement a process for monitoring of supplemental oversight plan compliance. (VO-5)

- Establish specific templates/guidance/examples to support consistent development of supplemental oversight plans. (VO-6)

- Develop and implement initial and continuing training on the procedure for management and oversight of supplemental personnel. Training is for site contract managers and project managers. (VO-7)

- Develop and implement a contract management familiarization guide" to include determination and documentation of work scope, risk assessment, incentives and penalties, and performance monitoring. Include review of OE, such as the contractual aspects of the stator lift rig failure and other related industry events in the familiarization guide. (VO-8)

- Perform an organizational capacity assessment for vendor oversight, including contract management and administration, critical procurements and department-specific resource impacts. (VO-9)

- Evaluate span of control with regard to responsible oversight of vendors, and place actions to address identified weaknesses in the CAP. (VO-10)

- Revise the "Supplemental Personnel Expectations Brief Checklist" to include supplemental personnel receiving a site employee handbook and a discussion by responsible management on the site employee handbook and expectations for use. (VO-11)

- Establish a fleet charter team or ANO team to address weaknesses in the procedures for contractor oversight. Specifically, identify gaps in the procedures to align with industry guide AP-930, "Supplemental Personnel Process Description." Assign additional actions as warranted to address any gaps identified. (VO-14)

- Review current processes in engineering related to the Vendor Oversight FPA. Determine if additional actions are required to address less formal interfaces with suppliers of contract services. Assign additional actions as warranted to address any gaps identified. (VO-15)

- Benchmark an industry leader outside the Entergy fleet to capture best practices in vendor oversight. (VO-16)

Inspection Team Observations and Findings

The NRC observed vendor oversight activities during the Unit 2 refueling outage between September 20 and November 14, 2015, and identified weaknesses in the requirements and implementation of the qualification and oversight of supplemental personnel.

The Entergy business model did not contain sufficient site staffing to be able to perform all work required by ANO employees, nor did it allow enough site personnel to oversee all supplemental workers directly. As a result, ANO relied upon over 400 supplemental workers between outages, and more during outages and large projects. Entergy assigned a responsible manager for each project, and then implemented a qualification process to allow the use of supplemental supervisors to perform most supervisory duties. Procedure EN-OM-126 contained the requirements for oversight, while procedure EN-OM-126-03, "Qualification of Supplemental Supervisors," contained the requirements for the qualification of supplemental supervisors.

During the outage, the NRC team reviewed oversight plans and qualification documentation for the containment ILRT project, the fire protection modification project, the FLEX modification project, and the main steam isolation valve replacement project. While reviewing qualification documentation for the ILRT project, the Entergy test coordinator provided documentation that indicated that the dayshift supplemental supervisor for the ILRT had not completed supervisory qualification, even though he was actively supervising the test preparation in the plant and the test was several hours from starting. The NRC team noted that the responsible supervisor was not aware of the current test status. The NRC team then discussed the qualification observations with the Entergy responsible supervisor, who was not aware of the test status or that the qualification records were incomplete. The Entergy responsible supervisor stated that EN-OM-126 allowed 14 days to complete supplemental supervisor qualifications, so they were still meeting the procedural requirements. The NRC team pointed out that this response was not consistent with the intent of the procedure because the ILRT would be completed and the individual would leave ANO before the 14 day limit was reached. ANO management later agreed that this answer did not meet the intent of the procedure. However, further investigation identified that the supplemental supervisor had actually completed the qualification requirements, and the documentation provided was not a current copy.

The NRC team noted the following with respect to the oversight of supplemental personnel:

- Procedure EN-OM-126 required the development of a supplemental oversight plan using the checklist in Attachment 9.3. The checklist appropriately required the identification of specific areas of concern and required a plan to address each of those areas. However, there was insufficient guidance to develop an adequate oversight plan or how oversight should be adjusted when areas of concern were present. For example, the requirement to develop how oversight would be implemented contained allowances where the plan could specify oversight without any physical presence (e.g., using only document reviews), or without prohibiting such choices when risks might dictate physical presence. There was no guidance on how to identify adequate plans for frequency and duration of oversight. The checklist required identifying if any supplemental supervisors would be used, but the procedure did not contain guidance on how to adjust oversight by Entergy personnel if supplemental supervisors were used.

- The sample of oversight plans approved by ANO for the four Unit 2 outage projects were vague and did not meet the intent of the procedure. Attachment 9.3 appropriately

delineates the requirements of who will provide the oversight and the frequency and duration of the oversight. Contrary to this requirement, the sample of plans frequently used statements such as, “Observations are required by the designated project manager or Entergy project manager,” or “intermittent” with no objective measure of the terms defined in the plan. As an example, shortly before the ILRT was to commence pressurizing the containment building the Entergy responsible supervisor, the Entergy project manager, and the test coordinator did not know the current status of the work. The oversight plan required the test coordinator and the project manager to be continuously supervising.

- Procedure EN-OM-126 specified that the required reading list in Attachment 9.2 be filled out and assigned to each supplemental worker. The responsible manager decided whether the workers needed to read and understand each policy or program, or simply acknowledge awareness that a program or policy existed. The NRC team concluded that the program did not establish a minimum standard, nor was there a connection between this decision and the oversight plan. For example, if the required reading list allowed some workers to not read the CAP procedure and be responsible for initiating CRs for problems they observe, then the oversight plan should require assignment of those responsibilities to Entergy oversight personnel, and adjust the frequency of interaction accordingly.

- Procedure EN-OM-126 did not contain guidance to ensure that supervisors or oversight personnel had appropriate technical expertise to be fully capable of providing oversight for the specific project or work. Interviews with ANO personnel assigned oversight roles for supplemental workers commented that they did not have the technical expertise to provide oversight of supplemental employees assigned to them.

The NRC team observed the following with respect to the qualification of supplemental supervisors:

- Entergy procedure EN-OM-126-03 required that each supplemental supervisor pass an oral qualification board. However, the procedure allowed two of the three board members to be filled by supplemental personnel who had achieved the same qualification, without further requirements. This did not appear to ensure that the purpose of the board, being able to recognize compliance with ANO management expectations and awareness of expected actions, would be met.

- Procedure EN-OM-126-03 allows supplemental supervisor candidates to supervise work for up to 2 weeks before the rest of the qualification requirements have been completed. This procedure allowance does not meet the intent of the procedure.

- Procedure EN-OM-126-03 allows supplemental supervisor qualifications to transfer between Entergy sites without any additional evaluation or board, at the discretion of the responsible manager. Since management expectations vary from site to site, this allowance does not ensure that an individual would be aware of the management expectations at the new site.

- Procedure EN-OM-126-03 allows conducting oral qualification boards for up to six candidates at a time. The NRC team concluded that this practice would make it difficult to recognize knowledge weaknesses in individual candidates.

- Common Cause Evaluation (CCE) CR-ANO-C-ANO-2015-04461, “Misjudgment – Wrong Assumptions Trend Analysis in Maintenance and Projects Organizations,” and focused self-assessment LO-ALO-2014-00094, “Maintenance Services Supplemental Worker Oversight,” were completed after the gap analysis of ANO vendor oversight fundamental problem was completed. The evaluations identified shortfalls in supplemental supervisor observations and field presence. The corrective actions were not tracked as part of ANO’s CRP.

The NRC team concluded that actions to improve contractor oversight have not yet been fully effective; further action is needed because oversight plans for contract outage workers were inadequate, qualification requirements for contractors to act as supervisors did not have a consistent standard, and designated ANO oversight personnel lacked adequate guidance and training to perform their oversight role. ANO wrote CR-ANO-C-2015-03788 to enter all of these issues into the CAP. The NRC team concluded that the correction actions and processes ANO had established for vendor oversight were not yet fully effective, and further action is needed to ensure they adequately addressed the supervision of supplemental employees who perform work at ANO.

5.5.6 Operator Performance Assessment
(IP 95003 Section 02.03.c)

Background

ANO identified multiple examples of poor operator knowledge, behavior, and culture. The NRC team performed observations of on-shift operator performance and conducted interviews with all levels of operations personnel to independently assess operator fundamentals.

ANO Evaluation Results

The licensee did not perform a separate evaluation of operator performance. However, other evaluations captured site-wide trends relevant to operators, such as the Nuclear Fundamentals PA report, Human Performance KAR, causal analyses for reactor trips, etc. Procedure use and adherence issues were identified, and gaps in operator fundamental behaviors have been documented. Field mentoring and on-the-job coaching have not been fully effective in reducing worker errors or enhancing workforce proficiency. The Nuclear Fundamentals PA addresses foundational behaviors for nuclear professionals and was supported by FPAs in Leadership Fundamentals and Decision Making/Risk Management.

In the 95003 Inspection Readiness Assessment Report dated December 4, 2015, the area of nuclear fundamentals was addressed. This readiness assessment consisted of observations of the Operations Department turnovers and shift briefings. ANO concluded that the activities demonstrated a careful and deliberate transfer of shift responsibilities.

Inspection Team Observations and Findings

Operations Department fundamental behaviors were improving. The NRC team completed over 70 hours of direct observation of operations activities for both units. Activities included control room observations during the Unit 2 shutdown, eight shift turnovers, licensed operator rounds on each unit, non-licensed operator rounds on each watch station for both units, Unit 1 auxiliary

building water transfer evolutions, Work Control Center operations, control room response to unexpected alarms, and auxiliary building tours with a CRS on each unit.

The NRC team noted the following observations:

- Shift turnovers were conducted with formality, the on-coming shift personnel challenged the off-going shift on plant conditions, asking for clarification of events, CRs that had been written, evolutions in progress, and planned activities for the day. On-coming shift personnel utilized the shift relief sheet and ensured that each of the required items had been reviewed prior to relieving the watch. During one watch turnover, the evolution of transferring water was in progress and both off-going and on-coming personnel were engaged in the water plan for the unit and displayed a high level of ownership. Watch relief methodology was consistent across all watch stations.

- Watch station rounds were conducted in a deliberate manner and equipment readings were recorded as required by procedure. Operators demonstrated ownership for their watch stations, displayed a good understanding of plant conditions, and noted problems. One inside auxiliary operator identified that a turbine building exhaust fan had a broken belt, causing it to run on only one belt, because he investigated an abnormal sound. Control room rounds were conducted in a diligent manner and the use of redundant indications was evident. The control room operators had a good understanding of equipment status.

- During auxiliary building tours with two different CRSs, both verbalized high standards for their expectations of the non-licensed operator round performance. The Unit 2 CRS enforced standards as he coached a radiation protection technician and laborers on the requirements of the high energy line break protection door entering the turbine-driven EFW pump room. He removed a dogging tool that was found hanging on an instrument line, and called the fire watch supervisor to ensure that the tool was stored in the correct location in the future. The Unit 2 CRS took action to ensure that the transient combustible program was not being used as a work-around to create a long-term storage area for chemistry.

- The control room was maintained in a professional manner and free of distractions. Control room operators used alarm response instructions when annunciators were received. Procedures were followed using place-keeping. Peer checks were used when available. During the Unit 2 shutdown on February 23, 2016, communications between control room staff were good and the crew worked effectively as a team to reduce power.

- Interviews conducted with operations personnel indicated that the Operations Department was aligned and motivated to improve performance. Three different CRS's cited examples of improving performance during the most recent Unit 2 outage. When the shutdown cooling heat exchangers (SDCHX) were determined to have significant wall-thinning and reduced capability, the site made the decision to re-draw a pressurizer bubble and restore reactor coolant pumps. The CRS's believed that in the past there would have been more resistance to extend an outage in order to resolve deficiencies.

The NRC team concluded that operator performance was improving.

5.5.7 Lifting and Handling Loads
(IP 95003, Section 02.03.c)

Background

The 2013 stator drop event and problem trending indicated that ANO had problems with safely lifting and rigging loads near plant equipment. ANO continues to rely on supplemental workers to perform lifting and rigging. The initial ANO evaluation of lifting and rigging was contained in RCE CR- ANO-C-2014-02318, and focused on the stator drop event lifting deficiencies. On October 27, 2015, ANO identified that deficiencies in lifting and rigging practices occurred at ANO during the Unit 2 fall 2015 outage, and conducted a new review, "Deficiencies in Lifting and Rigging Practices," documented in CR-ANO-C-2015-03996.

ANO Evaluation Results

As a result of the new lifting and rigging RCE, ANO identified:

Direct Cause: Inadequate decision making in the field by the assigned persons in charge.

Root Cause: The lifting and rigging program does not require identifying the risk level (high, medium, or low) for heavy or non-standard lifts and does not require the identification of risk mitigation actions based on the risk analysis.

Contributing Cause 1: Failure of persons in charge to follow the applicable procedure requirements as written.

Contributing Causes 2 and 3: Inadequacies in specific procedures in regards to lifting instructions (temporary reactor vessel head and reactor coolant pump).

Contributing Cause 4: Procedure EN-MA-119 does not contain guidance on supporting heavy loads when placed in temporary locations (cribbing).

Planned Corrective Actions

The following corrective actions were identified under the Deficiencies in Lifting and Rigging Practices RCE:

- Revise procedure OP-1005.002, "Control of Heavy Loads," or develop a ANO lifting and rigging site procedure that includes a checklist to identify risk and mitigation actions, persons in charge selection, the use of a master load cell based on risk analysis, and master rigging training for material handling coordinators and supervisors that will be providing field oversight of lifting and rigging activities.

- Appoint a single person as a site material handling coordinator with no additional duties assigned.

Inspection Team Observations and Findings

The NRC team assessed ANO performance in the area of lifting and rigging. The NRC team observed multiple lifting and rigging evolutions inside and outside the plant during the onsite

weeks of January 25 through February 5, 2016, and February 22 through 26, 2016. These included:

- Rigging and removal of the end bells of a Unit 2 component cooling heat exchanger (CCHX)
- Lifting of components with the intake structure crane to support diver inspection of Unit 1 circulating water intake bay
- Rigging and lifting of manhole cover number 6 to support a manhole inspection
- Operation of a Genie personnel lifting device to repair roof flashing
- Forklift operation

The manhole cover lift was supported by a team of all supplemental employees and was under the supervision of an ANO supervisor. The rigging of the CCHX end bells was conducted by a supplemental employee. The operation of the intake structure crane was conducted by ANO employees. No concerns were identified.

The NRC team sampled the testing results of lifting slings and below the hook lifting devices and had the following observations:

- There are spreader beams mounted on two fish baskets at the intake structure which are classified as below the hook lifting devices in accordance with ASME B30.20, "Below the Hook Lifting Devices". These devices did not meet the labeling and periodic inspection requirements of Entergy procedure EN-MA-119 or ASME B30.20. In response, ANO wrote CR-ANO-C-2016-00735.
- ANO did not maintain a list of all below the hook lifting devices to facilitate tracking of inspections and tests. ANO relied on work orders that requires the use of the device to ensure that periodic inspections are performed prior to use. In response, the ANO material handling coordinator decided to create a list of all the below the hook lifting devices.

The NRC team concluded that corrective actions for lifting and rigging appeared appropriate and are being tracked in CR-ANO-C-2015-03996.

5.6 Training Use and Effectiveness
(IP 95003 02.03.c)

Background

Training was identified as a contributor to the performance decline in both NSC assessments, and appeared as a significant contributor to many of the FPAs and PAs. Training was not originally identified as a separate PA. Following NRC engagement, ANO created Training as a dedicated PA, and performed an ACE that was completed on January 26, 2016.

ANO Evaluation Results

ANO performed the following evaluations related to training:

- Commonality Review of the ANO Fundamental Problem Cause Analysis
- ACE CR-ANO-C-2015-04626, "Training to Improve Organizational Performance"

ANO's focus was to collect and refine the issues that were identified in other recovery project assessments. This ACE did not include the accredited Operations and Maintenance/Technical Training Programs because the accreditation process provided information that performance was acceptable.

ANO determined that employees and leaders have not valued training as a useful tool for organizational performance improvement. Following the HCM initiative, the training organization was staffed to support accredited training only; line managers became responsible for designing, developing, and delivering non-accredited training. The training staff was limited in their ability to support training outside the accredited programs. ANO identified that with the limited resources available to perform work, leaders often cancelled training to respond to priority or emergent work. Weaknesses in training on NSC and CAP implementation were not identified until after significant performance decline. ANO's Training ACE identified the following causes:

Direct Cause: Leaders are not consistently and effectively using the performance analysis worksheet to identify training as a solution for some organizational performance issues.

Apparent Cause 1: Leaders are not sufficiently committed to training as a solution for weaknesses in organizational performance.

Apparent Cause 2: Leaders have not maintained a strong continuous improvement organization.

The Training AAP documented that the two primary performance issues were:

- Leaders are not sufficiently committed to training as a solution for weaknesses in organizational performance.

- Continuous learning processes are not consistently used to identify when and how training should be used to address organizational performance issues.

The leadership aspects were addressed in the Leadership Fundamental RCE, and the organizational capacity issues were addressed in the Organizational Capacity RCE.

Planned Corrective Actions

The following corrective actions were identified under the Training to Improve Organizational Performance AAP:

- Define and incorporate guidance in the CR screening and review process to prompt discussion and/or action for conditions potentially warranting a training solution. (TR-2)

- Define and incorporate practical guidance in EN-LI-121 to support consideration of training as a potential solution for organizational performance issues. (TR-3)

- Training Manager provide presentation(s) to managers and DPICs on the use of training to support organizational performance improvement. (TR-4)

- Factor training needs into resources for key departments, including the training department, to ensure that resources support training for organizational performance improvement. This action refers to staffing to support training beyond that necessary for accredited programs. (TR-5)

Inspection Team Observations

The NRC team noted that the 2013 HCM initiative cut 25 percent of ANO's training personnel. The HCM model supported continuing training needs only, and necessitated hiring contractors to be able to support initial training for new hires, operator pipeline training, and other training needs. HCM also shifted significant responsibility to line managers to develop and provide training to their departments with little support from the Training department.

After HCM, the Training Department was primarily providing training within the accredited programs. The accreditation processes result in significant reviews, and those programs functioned well.

ANO did not recognize a need to evaluate training as part of the recovery effort. The NRC team noted that the early evaluations of station performance indicated that ANO was not meeting the training needs of the organization. When ANO performed an evaluation of the use of training, accredited training programs were excluded, which excluded most of the scope of the Training Department's responsibilities. The subsequent performance of the organizational capacity staffing study caused the Training Department to examine the full scope of their responsibilities.

The NRC team noted that the Training ACE provided good insights. However, the NRC team identified that ANO did not assess the specific shortfalls in advanced qualifications in engineering and maintenance that were identified during the safety culture assessments. This shortfall needs to be assessed to ensure resources will be identified and provided. ANO stated that the action for the Training Manager to provide presentations to managers (TR-4) would help line managers identify and account for the organizational capacity needed to ensure continuing and advanced qualifications would be supported.

The NRC team's observations indicated that the technical training programs are performing within the guidelines of their accreditation. Instructors were knowledgeable and kept the students engaged in the lessons. Lesson plans were detailed and clearly written; Operations System Training Manuals in particular were found to be of a high quality and facilitated easy reference. Presentation techniques were sound, and performance feedback was provided to the trainees during simulator training.

The NRC team reviewed three accredited training programs: Operations Continuing Training, Mechanical Maintenance Initial and Continuing Training, and Engineering Support Personnel Continuing Training, using the guidance in NUREG-1220, "Training Review Criteria and Procedures." The NRC team had the following observations:

Operations Training

- Performed in accordance with the Systems Approach to Training process.
- Support the continued needs of ANO.
- Implemented to ensure high operator standards and level of knowledge.

Operations Department personnel interviewed were satisfied with the quality of technical training they received, and felt that the station was responsive to emergent needs and requests. The NRC team observed a qualification board for a Waste Control Operator (non-licensed operator), and concluded that questions were thorough and challenging.

Mechanical Maintenance

- Performed in accordance with the Systems Approach to Training process.

- Knowledge management and knowledge transfer is adequate due to the high level of experience of the Training Department and contractors who supplement training needs.

- Craft employees felt that some aspects of initial training were not delivered at the appropriate level; for example an instructor led a class on the use of grease guns, but internal combustion engine training was computer-based.

- The method used to identify training needs is not consistently applied. One maintenance shop does not initiate Training Evaluation Action Requests and relies on the designated member of the Training Advisory Committee to present the training request. Some craft did not know where or how to write a Training Evaluation Action Request.

- Resolution of training feedback is not consistently given to the originator.

- Maintenance personnel felt that changes to the initial training program under a corporate initiative resulted in newly-qualified maintenance personnel with less hands-on experience than they received under the old system. Previously, trainees would complete the bulk of their qualifications while assigned to the line organization in-plant, working alongside qualified journeymen. Now the bulk of qualifications are attained while still assigned to training.

Engineering Support Personnel Training

Engineering Support training sessions were not observed due to cancellation of the session originally scheduled for the onsite week of February 22, 2016. Observations were developed from inspection of program records and interviews with supervisors and workers.

- Engineering support personnel continuing training is being conducted within the Systems Approach to Training process.

- While the continuing training program meets requirements, it provides limited benefit. Topics are covered at a high level, and are not providing practical benefit to specific job functions of new engineering personnel. Training is delivered to large groups of disparate functional engineers, without any accompanying specialized training.

- The initial fleet training program is not offered frequently enough to allow ANO to promptly train new engineers; some do not attend these classes for 6 to 8 months after hiring, by which time they have already learned the course material on their own.

- ANO engineers feel that in order to gain needed job-specific skills to perform their roles as system experts, they are left on their own to identify and acquire training opportunities. Supervisors are required to act as contract managers for arranging external training, a role for which they do not receive adequate training or support.

- Several new engineers received their system turnovers prior to completing qualification, which limited the benefit of knowledge transfer and knowledge management. Other engineers received no turnover for their position because their predecessor had left the site.

- ANO initial on-the-job training for engineers relied on assigning a single mentor who signs off the entire qualification card. This may limit the breadth of experience gained during the qualification process.

5.7 Emergency Preparedness
(IP 95003 Section 02.03.g)

Background

As part of the Reactor Safety Strategic Performance Area, the NRC team assessed the performance of ANO's emergency preparedness (EP) programs. There were no indications of degraded performance in EP programs. However, a Severity Level III Notice of Violation was identified in June 2013, for deliberately falsified documents related to drills and communication surveillances required by the Emergency Plan.

ANO Evaluation Results

ANO performed a KAR of ERO Readiness as part of the overall recovery project that evaluated ERO readiness, staffing, station augmentation system design, and equipment that identified seven problems:

- Ineffective use of the CAP by the EP staff;

- Deficiencies in the controls and maintenance of the ERO augmentation processes;

- Deficiencies in incorporating new industry guidance associated with NRC rule changes into the Emergency Plan;

- EP drills do not always identify gaps to excellence and non-compliances;

- Errors, missing information, and inappropriately human factored Emergency Plan implementing procedures;

- Initial and continuing EP training program is ineffective to improve drill control and performance, dose assessment proficiency, and equipment operation knowledge; and

- Deficiencies identified related to EP procedure adherence and meeting the intent of procedure requirements.

ANO identified in the Audits and Assessments Performance Area Report that the NIOS/Quality Assurance (QA) organization had documented shortfalls in ERO/EP program implementation from 2007 through 2013. The Procedure Quality KAR identified that procedure writers were not recognizing and correcting procedures with usability and human performance challenges, including several examples from Emergency Plan implementing procedures and EOPs.

As part of the Collective Evaluation process, the recovery team determined that the initial ERO Readiness KAR was not of sufficient scope. As a result ANO contracted a third-party assessment by EP subject matter experts to independently assess the ANO EP program using the inspection guidance in the Emergency Preparedness attachment to IP 95003. The third-party assessment concluded that the ANO EP program: 1) met the objectives of the NRC IP; 2) was capable of implementing adequate measures to protect the public health and safety in the event of a radiological emergency; and 3) complies with applicable NRC regulations and commitments in the ANO Emergency Plan. The assessment noted a number of issues with the evaluation and closure of some items in the CAP.

Inspection Team Observations and Findings

The NRC team reviewed the ERO Readiness KAR, Audits and Assessment Performance Area Report, and Procedure Quality KAR relative to the ERO and EP programs and concluded that the evaluations of the ERO/EP program were comprehensive and self-critical. The NRC team concluded that the ERO/EP-related problems identified in the recovery evaluations were consistent with the types of ERO/EP issues identified at other sites. The NRC team confirmed that all of the ERO/EP-related problems were entered into the CAP for resolution.

5.7.1 Changes to the Emergency Plan
(IP 95003 Section 02.03.g)

Background

Emergency Plans are required by 10 CFR 50.54(q), and licensees may make changes to its Emergency Plan without prior NRC approval if the licensee performs and retains an analysis demonstrating that the changes do not reduce the effectiveness of the plan and the plan, as changed, continues to meet the requirements of 10 CFR Part 50, Appendix E, and the planning standards described in 10 CFR 50.47(b). ANO's independent "95003 inspection readiness team," identified that ANO did not evaluate proposed Emergency Plan changes against the last version of the Emergency Plan approved by the NRC in a Safety Evaluation Report (SER). By not comparing the Emergency Plan changes to the NRC-approved version, ANO introduced the potential for changes over several revisions to combine and create a reduction in effectiveness which could exceed the limits for self-approval per 10 CFR 50.54(q)(3).

The requirement to evaluate plan changes against the last NRC-approved version is required by 10 CFR 50.54(q). In 2012 the NRC implemented changes to the rule to specifically describe this requirement in Regulatory Guide 1.219, "Guidance on Making Changes to Emergency Plans for Nuclear Power Reactors," and Regulatory Issue Summary (RIS) 2005-02, "Clarifying the Process for Making Emergency Plan Changes," Revision 1. RIS 2005-02 provided clarification that station Emergency Plans are defined to include, in part, "The emergency plan

as originally approved by the NRC at initial licensing," and "changes to the emergency plan explicitly reviewed and approved by the NRC through a Safety Evaluation Report." ANO documented this deficiency in CR-ANO-C-2015-04521, and attempted to identify which Emergency Plan revision was the last NRC-approved plan. ANO was unable to identify which revision was last approved by a SER from the NRC. As a result, ANO considered Revision 0 of the Emergency Plan (dated August 1984) to be the last approved plan, and initiated 10 CFR 50.54(q) reviews for all revisions to the Emergency Plan since the rule was clarified in 2012 (Revisions 36 through 40) against the elements in Revision 0. While ANO identified several changes in Revisions 36 through 40 of the plan in comparison to Revision 0, no reductions in effectiveness were identified.

Inspection Team Observations and Findings

The NRC team assessed procedure EN-EP-305, "Emergency Planning 10 CFR 50.54(q) Review Program," which was used to conduct the reviews of the changes made in Revisions 36 through 40 of the Emergency Plan, and determined that ANO's reviews did not identify any reductions in effectiveness. The NRC team determined that ANO had three prior opportunities to incorporate the rule changes into its processes.

- In 2010, a QA Surveillance of Emergency Preparedness documented in CR-ANO-C-2010-00977 that ANO's 10 CFR 50.54(q) evaluations did not meet the intent of RIS 2005-02. The corrective action to address the QA observation included an EP Department information sharing session to discuss the contents of procedure EN-EP-305, Revision 1, which had been revised in 2007 to include the following note "…For the purposes of determining whether a change to a licensee's emergency plan constitutes a DIE [decrease in effectiveness], the licensee may use the last emergency plan reviewed and approved by the NRC."

- In 2011, procedure EN-EP-305, Revision 2, modified the note to more closely align the procedure with the NRC guidance.

- In early 2012, procedure EN-EP-305, Revision 3, was issued to incorporate the requirements of the revised NRC rule on 10 CFR 50.54(q). The revision quotes from Regulatory Guide 1.219, directing EP personnel to compare proposed changes to the Emergency Plan to the original and any subsequent Emergency Plans approved by the NRC in an SER.

Despite these previous opportunities to change the process, ANO EP staff completed 10 CFR 50.54(q) change reviews for Emergency Plan Revisions 37 (2012) through 40 (2015) against the immediately prior revision, not the last NRC-approved plan.

The NRC team determined that ANO's failure to conduct reviews of Emergency Plan changes for reductions in effectiveness against the last version of the Emergency Plan approved by the NRC in an SER was a violation of 10 CFR 50.54(q). However, ANO identified the issue as part of its inspection readiness activities, completed 10 CFR 50.54(q) reviews for Emergency Plan Revisions 37 through 40 comparing the changes versus the original NRC-approved Revision 0 of the plan, with no reductions in effectiveness identified. Therefore, consistent with the guidance in Inspection Manual Chapter 0612, "Issue Screening," and Enforcement Policy, Section 6.6, the NRC team determined the issue was a violation of minor safety significance, documented in the CAP as CR-ANO-C-2016-00563.

5.7.2 Condition of ERO Equipment and Facilities
(IP 95003 Sections 02.03.e.4 and 02.03.g)

Background

A key attribute of the EP program is the licensee's ability to maintain emergency response facilities, equipment, and supplies in ready and functional conditions, as required, in part, by the planning standards in 10 CFR 50.47(b); 10 CFR Part 50, Appendix E; and commitments in the Emergency Plan which reflect the guidance in NUREG-0654, "Criteria for Preparation and Evaluation of Radiological Emergency Response Plans and Preparedness in Support of Nuclear Power Plants," Revision 1.

ANO Evaluation Results

The ERO Readiness KAR documented corrective actions for ERO readiness and equipment inadequacies. None of the problems identified indicated an issue with the readiness of ERO equipment and facilities.

Inspection Team Observations and Findings

The NRC team reviewed ANO's procedures used to ensure the readiness of the emergency response facilities, and conducted walkdowns of the operations support center (OSC), emergency operations facility (EOF), and alternate EOF. The NRC team verified a selection of procedures and equipment staged for use in each of the facilities against the requirements in the Emergency Plan and implementing procedures. The NRC team verified that corrective actions were completed and maintained, based on a sample of CRs reviewed relative to previous deficiencies identified with facility and/or equipment readiness. The NRC team concluded that ANO's emergency response facilities were maintained "ready to activate" in accordance with the Emergency Plan, and previously identified deficiencies were corrected.

5.7.3 Oversight of Siren Testing and Maintenance
(IP 95003 Section 02.03.g)

Background

Systems to alert and notify the public in the surrounding communities regarding emergencies at commercial nuclear power plants are required, in part, by 10 CFR 50.47(b)(5) and 10 CFR 50, Appendix E. The ANO Emergency Planning Zone alert and notification system (ANS) includes both an outdoor siren warning system and the use of NOAA weather radios. The State of Arkansas Department of Health Office of Nuclear Planning and Response Programs (ADH-NPRP) owns, maintains, and tests the ANS to support ANO's regulatory commitments. The NRC team independently assessed ANO's oversight of ADH-NPRP relative to the maintenance, readiness, and testing of the ANS needed to meet NRC requirements and the ANO Emergency Plan.

Inspection Team Observations and Findings

The NRC team reviewed the Federal Emergency Management Agency (FEMA) approved design report, addenda, and ANO procedures for the oversight of the ANS using the guidance in NUREG-0654, Revision 1, and FEMA document FEMA-REP-10, "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plant." The NRC team reviewed a sample of

test results and maintenance records supplied by ADH-NPRP, including corrective action documents written by ANO when deficiencies with elements of the ANS were identified. The NRC team did not identify and concerns and concluded that ANO's oversight of the State of Arkansas relative to the ANS supported the functionality and capability of the system.

5.7.4 Ability to Staff and Supplement Emergency Response Functions
(IP 95003 Section 02.03.g)

Background

ANO is required to be able to respond to a range of events and emergencies with sufficient on-shift staff and the ability to augment the on-shift response staff for protracted events. The ERO Readiness KAR identified one problem related to deficiencies in the controls and maintenance of the ERO augmentation processes.

ANO Evaluation Results

ANO's ERO Readiness Assessment team identified the following:

- In 2013, ANO reduced the number of augmented positions, but did not provide sufficient evidence that the change did not involve a reduction of effectiveness.
- The process and documentation for on-shift staffing analyses of EOP and AOP changes were not robust.
- ANO processes do not require responders to state whether they are fit for duty.
- The shift roster does not include a verification that Emergency Plan positions for radiation protection and chemistry personnel are met.

Inspection Team Observations and Findings

The NRC team reviewed the following documents to access ANO's ability to staff and supplement Emergency Response Functions: 1) current on-shift staffing information (rosters, staffing plan, and qualifications) for the operations crews and other departments to assess ANO's ability to meet the Emergency Plan Table B-1 minimum staffing requirements; 2) the 2012 on-shift staffing analysis required by 10 CFR 50, Appendix E, IV.A.9; 3) the 2014 revision to the Emergency Plan (and associated 10 CFR 50.54(q) change package) which modified the staffing of one member of the Fire Brigade; 4) ANO's primary and backup means to callout ERO staff to the station's primary and alternate emergency response facilities; and 5) reports for ERO off-hours augmentation drills since 2011, and a sample of five quarterly ERO call-in drills.

The NRC team concluded that ANO on-shift staffing provides sufficient coverage for unexpected staff unavailability. The NRC team determined that ANO is maintaining four qualified ERO Teams to staff the emergency response facilities, as well as augmenting the control room with two additional staff upon ERO activation. The NRC team concluded that quarterly and annual augmentation drills met the requirements to include a wide variability in off-hours scenarios, and that all Emergency Plan Table B-1 positions were usually able to meet response times for the sample of drills reviewed. For those few deficiencies in which ERO staff did not respond in a

timely manner, the NRC team confirmed that CRs were written, causes were assessed, and corrective actions addressed the causes.

5.7.5 Classification and Reporting of Emergency Action Levels
(IP 95003 Section 02.03.c)

Background

In mid-2015, ANO Operations identified a trend in shift managers incorrectly identifying and declaring emergency action levels (EALs) during training evolutions, and initiated ACE CR-ANO-C-2015-01493 to assess the causes and implement corrective actions. Specifically, over the period of late 2012 through May 2015, the evaluation documented that during training evolutions shift managers had incorrectly classified EALs on twelve occasions.

Inspection Team Observations and Findings

The NRC team concluded that ANO evaluated the problem and extent of condition, and determined two apparent causes contributed to the decline: (Apparent Cause 1) insufficient shift manager practice of the behaviors that reinforce appropriate prioritization and utilization of the operating crew to handle competing priorities, and (Apparent Cause 2) insufficient establishment of shift manager standards for use of EAL bases and insufficient practice of validation behaviors. The NRC team determined that the corrective actions for Apparent Cause 1 to develop and implement continuing training that promotes the fundamentals of effective crew utilization during emergency plan-related scenarios, including using the Shift Technical Advisor to provide an independent assessment of the EAL classification, were reasonable.

However, the NRC team identified that the corrective action for Apparent Cause 2 failed to correct the cause. Specifically, the corrective action was to add a note in procedure OP 1903.010, “Emergency Action Level Classification,” directing the user to refer to the EAL bases as needed. The NRC team concluded that adding such a note does not set standards or expectations, nor does it establish methods to check and adjust behaviors. In response ANO documented this concern in the CAP as CR-ANO-C-2016-00582.

5.7.6 Identification and Correction of Emergency Preparedness-Related Deficiencies
(IP 95003 Section 02.03.g)

Background

An aspect of the ERO and EP program is the licensee’s ability to identify, assess, and correct deficiencies related to EP drills, exercises, and other critical elements of the EP program, in accordance with the requirements of 10 CFR 50.47(b)(14), and 10 CFR 50, Appendix E, IV.F. The ERO Readiness KAR identified several problems related to the station’s ability to address drill/exercise and EP program deficiencies in the past, including:

- Ineffective use of the CAP by the EP staff;
- EP drills did not support continuous improvement through identification of gaps to excellence and non-compliances; and
- Initial and continuing EP training program was ineffective to improve drill control and performance, dose assessment proficiency, and equipment operation knowledge.

Inspection Team Observations and Findings

The NRC team observed the December 9, 2015, full scale ERO drill from the Control Room Simulator and EOF, as well as the facility critique for the EOF. The NRC team reviewed the critique report to assess if the drill deficiencies identified by the NRC team were documented in the critique and the CAP. The NRC team reviewed the corrective action closure information for several deficiencies from select drills and exercises since 2006, including all four NRC-identified non-cited violations from drill/exercise inspections and several NIOS/QA-identified problems.

The NRC team concluded that the critique report for the December 9, 2015, drill was comprehensive, self-critical, and captured the key deficiencies. The NRC team confirmed that all deficiencies identified in the critique report had been entered into the CAP. The NRC team determined that corrective actions were timely and appropriate for drill/exercise deficiencies and NRC-identified non-cited violations from drill/exercise inspections since 2006. The NRC team identified evidence that in 2014 some corrective action products written by the EP Department required further work to meet the quality standards for thorough evaluation and objective closure information as maintained by the ANO Performance Improvement and Regulatory Assurance Departments. However, the NRC team determined that corrective action products which were written by the EP Department in mid-to-late-2015 were improved and met the quality standards.

5.7.7 Review of Corrective Actions for Falsified Emergency Plan Records

Background

The NRC team reviewed the corrective actions associated with a Severity Level III Notice of Violation issued to ANO in 2013, following the identification by ANO management that a senior emergency planner had falsified documents related to the conduct of a post-accident sampling EP drill conducted in 2011. The NRC's Office of Investigations conducted an investigation into the apparent wrongdoing by the ANO senior emergency planner and subsequently substantiated that the individual had falsified drill records for several out-of-sequence EP drill activities from 2008 through 2011. Additional details of the investigation and violation may be found in NRC Inspection Reports 05000313/2013503 and 05000368/2013503 (ML13070A478) and 05000313/2013504 and 05000368/2013504 (ML13162A100).

Inspection Team Observations and Findings

The NRC team reviewed four CRs written to address the falsification, which included the following actions:

- Conduct the drills which were not completed as documented.
- Conduct a personnel investigation involving potential willfulness.
- Completing two separate extent of condition reviews.
- Revising ANO EP staff guidance to re-enforce procedure EN-EP-306, "Drills and Exercises," requirements for the EP Manager to review all drill/exercise reports within 30 days of completion.

- Communication of the OE to the Entergy fleet regarding the issue after completion of the NRC investigation and receipt of the violation.

- Institutionalizing additional peer checks within the ANO EP Department, and for the EP Manager to conduct special oversight of ANO EP staff activities for a period of approximately 2 years (to confirm that cultural aspects within the EP Department did not contribute to the falsification).

The NRC team concluded that the corrective actions taken by ANO were adequate and had been institutionalized into the EP Department culture. However, the NRC team noted that the closure information for the corrective action developed from the corporate personnel investigation did not provide objective evidence as to its completion. In response, ANO initiated CR-ANO-C-2016-00418 to address this observation.

6. SAFETY CULTURE ASSESSMENT

6.1 NRC Independent Safety Culture Assessment
(IP 95003 Section 02.08 and 02.09)

Background

The NRC's Safety Culture Policy Statement defines NSC as, "the core values and behaviors resulting from a collective commitment by leaders and individuals to emphasize safety over competing goals to ensure the protection of people and the environment." The NRC assesses safety culture using the safety culture traits and cross-cutting aspects in IMC 0310, "Aspects within the Cross-Cutting Areas."

Scope

The NRC team performed a graded NSC assessment at ANO. The NRC team met with 151 individual contributors, 23 supplemental workers, and 36 supervisory personnel, or approximately 17 percent of the workforce at ANO. The NRC team conducted 27 focus group discussions with ANO personnel, supplemental workers, and first-line supervisors, as well as 24 individual interviews with managers above first-line supervisors. Focus group discussions and interviews were conducted using questions related to all 10 safety culture traits. The NRC team conducted behavioral observations to gain insights into how safety culture attributes are implemented while work is being performed in the field. Additional insights were gathered by reviewing: documents related to ANO's safety culture, including safety culture assessment reports, RCEs, policies and procedures, and training documentation; ANO's ECP; and the process for screening disciplinary actions. The NRC team evaluated the NSCMP and Site Leadership Team (SLT) meetings to verify whether they were effective methods for continuously monitoring the safety culture at ANO. The NRC team also assessed the findings from this inspection for safety culture insights using the full set of safety culture attributes in IMC 0310.

Inspection Team Observations and Findings

Based on the results of the NRC's graded NSC assessment, which is discussed in detail below, the team concluded:

- ANO's safety culture is adequate to support continued safe operation.

- ANO identified the existing safety culture weaknesses, assessed the causes, and developed corrective actions to improve and monitor safety culture.

- The results of the NRC team's independent safety culture assessment were consistent with ANO's results.

- The recovery team's decisions not to treat safety culture as a separate problem area, and not to perform causal evaluations for the safety culture attributes identified in the Synergy safety culture survey, the TPNSCA, and the RCEs, resulted in ANO failing to address the full scope of safety culture weaknesses. In response, ANO performed a common cause analysis, an ACE.

The NRC team assessed ANO behaviors and performance in each of the 10 safety culture traits. In order to preserve anonymity for the individuals and groups that met with the NRC team, the following discussions quantify the degree of responses as either "most," meaning all but a few respondents/focus groups, or "some," meaning a small fraction of respondents/focus groups.

Assessment of the Leadership Safety Values and Actions Trait

The Leadership Safety Values and Actions trait states that leaders demonstrate a commitment to safety in their decisions and behaviors. The associated attributes include:

- Resources (H.1): Leaders ensure that personnel, equipment, procedures, and other resources are available and adequate to support nuclear safety.

- Field Presence (H.2): Leaders are commonly seen in working areas of the plant observing, coaching, and reinforcing standards and expectations. Deviations from standards and expectations are corrected promptly.

- Incentives, Sanctions and Rewards (X.1): Leaders ensure incentives, sanctions, and rewards are aligned with nuclear safety policies and reinforce behaviors and outcomes that reflect safety as the overriding priority.

- Strategic Commitment to Safety (X.2): Leaders ensure plant priorities are aligned to reflect nuclear safety as the overriding priority.

- Change Management (H.3): Leaders use a systematic process for evaluating and implementing change so that nuclear safety remains the overriding priority.

- Roles, Responsibilities, and Authorities (X.3): Leaders clearly define roles, responsibilities, and authorities to ensure nuclear safety.

- Leader Behaviors (X.5): Leaders exhibit behaviors that set the standard for safety.

Most personnel at all levels indicated that resource challenges impacted their ability to accomplish work. Most focus groups described examples of: insufficient numbers of qualified personnel to perform specialized tasks; training being rescheduled due to workload; inadequate transfer of knowledge for new personnel; and insufficient site staff to oversee supplemental personnel. Most personnel at all levels interviewed indicated that hiring to replace retiring

employees was not sufficiently timely to allow knowledge transfer. Individuals in one focus group indicated their work group was overstaffed, but only two thirds of the group was actually qualified to perform work. Some non-supervisory personnel indicated that there was an apparent lack of incentive to pursue additional qualifications because there was no increased compensation for the added responsibility that accompanied being qualified on multiple systems. Views on performance recognition were mixed, and some non-supervisory personnel thought reward programs were not consistently applied, providing examples where station-wide programs were only being utilized by a few departments.

Most supervisory personnel indicated a perception that there was a lack of human resource assistance available to support hiring, and that senior management in general had little presence in the field. Most personnel at all levels indicated that senior management was present during all-hands meetings, and that management was encouraging employees to voice concerns, write CRs in response to any problem or concern they have, and put their primary focus on safety. Most personnel interviewed indicated that they thought performance was beginning to improve. However, most personnel interviewed believed there was not alignment between corporate and site leadership on ANO's problem areas and recovery needs.

The NRC team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the Leadership Safety Values and Actions safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to Leadership Safety Values and Actions:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to evaluate a SFP pressure boundary flaw	H.1	2014003
Failure to evaluate reactor coolant sample system pressure boundary flaw	H.1	2014003
Failure to ensure procedure directing reactivity manipulations met the procedure standards	H.1	2014008
Failure to update Level 1 PRA model because failed to submit accurate PRA model maintenance information	H.1	2016007
Unit 1 Failure to follow materials handling program for main generator stator move	H.2	2013012
Unit 2 Failure to follow materials handling program for main generator stator move	H.2	2013012
Failure to identify and evaluate conditions adverse to quality	H.3	2016007
Failure to establish adequate effectiveness review success criteria to verify the intended results for corrective actions to prevent recurrence	X.2	2016007
Failure to implement the MIC Monitoring Program in a manner that would monitor for pipe wall loss in the service water system	X.2	2016007
Failure to correct conditions adverse to quality associated with Unit 2 service water flow to the B emergency diesel generator heat exchangers and the Unit 1 reactor containment building coatings	X.2	2016007
Failure to properly evaluate condition reports for classification and operability determination	X.2	2016007

Failure to complete two of the extent of condition reviews associated with the stator drop event specified in the associated corrective action plan	X.3	2016007

ANO's safety culture evaluations identified Leadership Safety Values and Actions as the most significant area of NSC concern, with Resources (H.1), Leader Behaviors (X.5), Field Presence (H.2), and Strategic Commitment to Safety (X.2) among the priority NSC attributes to be improved.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Leadership Safety Values and Actions. The NRC team noted that ANO's evaluations documented that Change Management (H.3) was among the most significant causes for resource reductions during the Alignment and HCM initiatives, which contributed to declining station performance. ANO developed appropriate corrective actions, even though Change Management was not identified as a frequent cause of problems. The NRC team concluded that ANO identified behaviors to improve and developed appropriate corrective actions for each of these five attributes.

Assessment of the Decision Making Trait

The Decision Making trait states that decisions that support or affect nuclear safety are systematic, rigorous, and thorough. The associated attributes include:

- Consistent Process (H.13): Individuals use a consistent, systematic approach to make decisions. Risk insights are incorporated as appropriate.

- Conservative Bias (H.14): Individuals use decision making practices that emphasize prudent choices over those that are simply allowable. A proposed action is determined to be safe to proceed, rather than unsafe in order to stop.

- Accountability for Decisions (X.12): Single-point accountability is maintained for nuclear safety decisions.

Most personnel stated that they have seen improvements in conservative decision making over the past year. In particular, there were positive opinions about the decision to extend the Unit 2 fall 2015 refueling outage in order to make equipment repairs, rather than deferring the work. Most personnel saw this management behavior as a change from previous outages when schedule pressure appeared to take precedence, but they were not yet convinced that this behavior would be sustained.

While the NRC team was onsite, Unit 2 commenced an unplanned outage to replace a check valve on the safety injection system inside containment. The decision to shut down the unit was made in lieu of reducing power and performing a temporary repair to the leaking valve. During an interview with a supervisor, the NRC team heard that a member of the Maintenance Department participated in the decision meetings with senior managers and presented facts as to why he believed that shutting down the unit and completely replacing the valve instead of performing a temporary leak repair was the prudent decision. It appeared to the NRC team that ANO management listened to experienced station personnel and took their advice regarding the repair. The NRC team considered this to be a positive example of conservative decision making.

The NRC team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the Decision Making safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to Decision Making:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to maintain AAC governor per vendor guidance	H.13	2014002
Failure to assess risk for switchyard work	H.13	2015004
Failure to promptly identify and correct design deficiency with breaker auxiliary switch binding	H.13	2015008
Failure to adequately test emergency lights	H.14	2013009
Failure to correct through-wall flaw in SFP piping	H.14	2014003
Failure to perform testing of diesel fuel oil transfer piping	H.14	2015002
Failure to identify, document, and mitigate risk from long-term deficient conditions in EDG, AAC and non-vital switchgear	H.14	2015008
Failure to properly evaluate OE reports to determine if there were sufficient barriers	H.14	2016007
Failure to implement MIC monitoring program that would monitor for pipe wall loss in the SW system	H.14	2016007

ANO's safety culture evaluations identified Decision Making as an area of concern, with Consistent Process (H.13) and Conservative Bias (H.14) among the priority NSC attributes to be improved.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Decision Making. The NRC team concluded that ANO identified behaviors to improve and developed appropriate corrective actions.

Assessment of the Problem Identification and Resolution Trait

The PI&R trait states that issues potentially impacting safety are promptly identified, fully evaluated, and promptly addressed and corrected commensurate with their significance. The associated attributes include:

- Identification (P.1): The organization implements a CAP with a low threshold for identifying issues. Individuals identify issues completely, accurately, and in a timely manner in accordance with the program.

- Evaluation (P.2): The organization thoroughly evaluates problems to ensure that resolutions address causes and extent of conditions, commensurate with their safety significance.

- Resolution (P.3): The organization takes effective corrective actions to address issues in a timely manner, commensurate with their safety significance.

- Trending (P.4): The organization periodically analyzes information from the CAP and other assessments in the aggregate to identify programmatic and common cause issues.

All ANO personnel and contractors expressed a willingness to identify issues and enter them into the CAP by writing CRs. There was widespread familiarity with how to write a CR, and personnel indicated that their supervisors were supportive of the CAP. However, some personnel expressed skepticism regarding whether CRs are appropriately prioritized and resolved in a timely manner. While most personnel believed that high priority items were addressed in a timely manner, medium and low priority items were regularly deferred. Some personnel expressed the belief that sometimes multiple CRs must be written over the course of many months before a low priority condition is resolved.

The NRC team noted a lack of understanding regarding how the CAP process works once a CR is initiated. Station-wide training focused on how to use the station's software to initiate a CR, but did not fully address the rest of the CAP processes. Although all personnel reported receiving feedback when a CR they wrote was closed, the feedback was typically an automated email indicating the CR had been closed without providing details regarding what was done in response to the problem. Some non-supervisory personnel expressed frustration over the recent change in station processes to automatically populate work order requests from CRs. Some non-supervisory personnel felt that the basis for this change was not communicated well to employees, the change had resulted in a reduction in the quality of work order requests, and rework was sometimes required once a work order was initiated.

The team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the PI&R safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to PI&R:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to identify emergency response weaknesses	P.1	2014403
Failure to perform predictive maintenance thermography on medium-voltage safety-related switchgear	P.1	2016007
Failure to ensure containment equipment installed properly to prevent damaging containment liner	P.1	2016007
Failure to include security equipment in the maintenance and testing program	P.2	2013404
Failure to correct weaknesses identified during an evaluated exercise	P.2	2013012
Failure to establish PM for Unit 2 main steam isolation valves	P.2	2014004
Failure to correct interlock feature for containment spray pump to start room cooler	P.2	2015008
Failure to repair intermittent card failure before returning cards to service causes feedwater transient and subsequent reactor trip	P.2	2016001
Failure to complete extent of condition reviews for stator drop event	P.3	2016007

ANO's safety culture evaluations identified PI&R as an area of concern, with Resolution (P.3) and Trending (P.4) among the priority NSC attributes to be improved.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of PI&R. The NRC team noted that Identification (P.1) and Evaluation (P.2) were frequently documented as causes for NRC inspection findings, and multiple ANO RCEs documented these attributes as contributors. The NRC team concluded that ANO identified behaviors to improve and developed appropriate corrective actions for each of the PI&R attributes.

Assessment of the Continuous Learning Trait

The Continuous Learning trait states that opportunities to learn about ways to ensure safety are sought out and implemented. The associated attributes include:

- Operating Experience (P.5): The organization systematically and effectively collects, evaluates, and implements relevant internal and external OE in a timely manner.

- Self-Assessment (P.6): The organization routinely conducts self-critical and objective assessments of its programs and practices.

- Benchmarking (X.8): The organization learns from other organizations to continuously improve knowledge, skills, and safety performance.

- Training (H.9): The organization provides training and ensures knowledge transfer to maintain a knowledgeable, technically competent workforce and instill nuclear safety values.

Most personnel indicated that they had concerns about the continuous learning environment at ANO. Some personnel were concerned about a perceived lack of quality training, and training that was only focused on passing qualification tests. Most non-supervisory personnel stated that there was little training available above the minimum requirements, and it was difficult to take the time away from their jobs to attend training classes due to work scope exceeding the available resources needed to accomplish the work.

Most personnel indicated that there were many senior employees retiring or nearing retirement, but that ANO was not consistently filling positions before the individuals left. ANO was not proactive in managing knowledge transfer to new employees. As a short-term action to fill these gaps, ANO rehired some retirees to support the organization as contractors. Non-supervisory personnel commented that the strategy to use supplemental employees increased the burden on the staff because of the additional contractor oversight responsibilities. In addition, most personnel indicated that contract rehires are used to support the regular workload and do not have time to transfer knowledge to new personnel.

When questioned about the recent safety culture assessments conducted at ANO, most personnel indicated a general awareness of the outcomes, including the high level themes. However, non-supervisory personnel were not aware of the specific results or specific actions being taken by ANO in response to the assessments.

Most management and non-supervisory personnel stated that benchmarking was not a common practice at ANO. If benchmarking occurred, it was typically within the Entergy fleet. Also, personnel commented that if benchmarking resulted in suggestions for improvements, improvement items typically have not received priority due to limited resources.

The NRC team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the Continuous Learning safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to Continuous Learning:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to establish adequate instructions for ECCS filling and venting	P.5	2014003
Failure to provide appropriate instructions for replacement of main feedwater regulating valve linear variable differential transformer	P.5	2013012
Motor operated valve not installed in the qualified configuration	P.5	2016007
Failure to assess whether corrective actions achieved the intended results during effectiveness reviews	P.6	2016007
Failure to evaluate plant impact associated with leaking safety injection check valve bonnet	P.6	2016007
Failure to maintain light fixture above EFW pump in a seismically qualified configuration	H.9	2013005
Inadequate operability determination due to failure to characterize a weld flaw	H.9	2013005
Failure to assess leaks in reactor coolant sample system	H.9	2014003
Failure to maintain axial shape index with limits	H.9	2014004

ANO's safety culture evaluations identified Continuous Learning as an area of concern, with Operating Experience (P.5) and Training (H.9) among the priority NSC attributes to be improved.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Continuous Learning. The NRC team concluded that while Operating Experience and Training had a direct impact on declining station performance, this inspection and ANO's evaluations provide evidence that weaknesses in Self-Assessment (P.6) and Benchmarking (X.8) delayed ANO's recognition that performance was not consistent with industry standards. The NRC team concluded that ANO identified the decision making behaviors to improve and developed appropriate corrective actions for each of the Continuous Learning attributes.

Assessment of the Effective Safety Communication Trait

The Effective Safety Communication trait states that communications maintain a focus on safety. The associated attributes include:

- Work Process Communications: Individuals incorporate safety communications in work activities. (X.9)

- Bases for Decisions (H.10): Leaders ensure that the basis for operational and organizational decisions is communicated in a timely manner.

- Free Flow of Information (S.3): Individuals communicate openly and candidly, both up, down, and across the organization, and with oversight, audit, and regulatory organizations.

- Expectations (X.10): Leaders frequently communicate and reinforce the expectation that nuclear safety is the organization's overriding priority.

Most personnel felt that site management had improved in communicating their focus on improving safety, and identified the use of additional communication tools such as site newsletters, emails, and quarterly all-hands meetings. While communication methods and frequency have improved, some personnel stated that the information provided is general in nature and lacks detail on specific actions that are being taken or are planned to improve the safety culture at ANO. Senior management had informed station personnel that changes were forthcoming, but they had not provided details of those changes. This resulted in some skepticism on the part of ANO employees on whether the planned changes will be substantive and sustainable.

Most non-supervisory personnel stated that most communication comes from the supervisor level and that messages from senior management are not communicated consistently to the organization. Opportunities to hear from the site vice president are limited to all-hands meetings. Some non-supervisory personnel, including most of the Security and Operations Departments, indicated that they do not have the opportunity to interact with site senior leadership due to the inability to attend the all-hands meetings while standing watch.

The NRC team noted that there were no NRC inspection findings that were assigned cross-cutting aspects within the Effective Safety Communication safety culture trait since 2013. Of the attributes that are included under this trait, only Bases for Decisions is used for cross-cutting attributes during baseline NRC inspections. None of the findings in this report had causes related to Effective Safety Communication attributes.

ANO's safety culture evaluations identified Effective Safety Communication as an area of concern, with Bases for Decisions (H.10) as the attribute of concern.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Effective Safety Communication. The NRC team concluded that ANO developed appropriate corrective actions to improve performance in the Effective Safety Communication trait.

Assessment of the Questioning Attitude Trait

The Questioning Attitude trait states that individuals avoid complacency and continuously challenge existing conditions and activities in order to identify discrepancies that might result in error or inappropriate action. The associated attributes include:

- Nuclear Is Recognized as Special and Unique (no NRC code): Individuals understand that complex technologies can fail in unpredictable ways.

- Challenge the Unknown (H.11): Individuals stop when faced with uncertain conditions. Risks are evaluated and managed before proceeding.

- Challenge Assumptions (X.11): Individuals challenge assumptions and offer opposing views when they think something is not correct.

- Avoid Complacency (H.12): Individuals recognize and plan for the possibility of mistakes, latent problems, or inherent risk, even while expecting successful outcomes.

All personnel stated they have the ability to stop work when faced with uncertain conditions. All non-supervisory personnel felt free to raise concerns to their management, and felt supported by management to maintain a questioning attitude. However, there was evidence that some levels of the organization do not consistently challenge assumptions. For example, non-supervisory personnel gave multiple examples where they questioned among themselves and their supervisors whether some action was correct, but were told not to worry about it because the "experts" determined it was acceptable. Examples provided by focus group participants included:

- Engineering and maintenance personnel raised concerns about the decision to repair and not replace the instrument cable for startup nuclear instrument NI-6 during the 2015 Unit 1 outage. Management decided to startup with the repaired cable, which subsequently failed during plant heat-up.

- Workers raised concerns about performing rounds near a leaking transformer, which subsequently exploded.

- Workers had concerns about ANO's actions to respond to the Unit 1 reactor vessel head seal leak in 2015.

Field observations by the NRC team suggested that although personnel have the ability to stop work, they may not always recognize when they are in an uncertain condition, such as when using a procedure that can be interpreted in multiple ways. Some personnel did not consistently stop and confirm the intent of the procedure or get the procedure changed before proceeding. This problem seems to have been exacerbated by the transition to fleet procedures, which are generally more generic than station-specific procedures, and the lack of sufficient knowledge transfer to less experienced personnel. Examples raised by non-supervisory personnel or observed by NRC staff included:

- Instrumentation and controls maintenance technicians continue to use procedures that require use of drawings that are no longer available. While some older workers have personal knowledge of the drawing information, newer workers continue to use the procedures without having the knowledge or the drawings.

- The NRC resident inspectors observed an operator clearing a tagout that was unclear about how to perform a step, but he proceeded to remove the tags, discussing his question with his supervisor later.

- The NRC team observed surveillance testing of the plant protection system. Workers discussed concerns about the trip risk associated with operating the test matrix switch, but the trip risk was not described in the procedure or the pre-job brief. The workers did not stop to get guidance or provide procedure feedback.

- Most personnel indicated that Entergy fleet procedures are unclear because they apply to many sites, and prefer to use ANO site-specific procedures.

The NRC team noted that cross-cutting aspects within the Questioning Attitude safety culture trait are only assigned for two of the attributes during baseline NRC inspections. The NRC team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the Questioning Attitude safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to Questioning Attitude:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to correctly install control room emergency chiller breaker	H.12	2013003
Failure to develop adequate guidance for extreme damage mitigation	H.12	2014005
Failure to follow procedure resulted in increased reactor coolant activity	H.12	2015003
Failure to identify and correct rain water accumulation in EDG system exhaust	H.12	2015004
Failure to follow chemistry control program requirements to control corrosion in service water system	H.12	2016001
Failure to establish operational decision making issue guidance per procedure EN-OP-111 to address safety injection tank check valve 2SI-13D leakage	X.11	2016007

ANO's safety culture evaluations identified Questioning Attitude as an area of concern, with Challenge Assumptions (X.11) and Challenge the Unknown (H.11) among the priority NSC attributes to be improved.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Questioning Attitude. The NRC team concluded that ANO developed appropriate corrective actions to improve performance in the Questioning Attitude trait in areas where opportunities to improve were identified.

Assessment of the Personal Accountability Trait

The Personal Accountability trait states that all individuals take personal responsibility for safety. The associated attributes include:

- Standards (X.6): Individuals understand the importance of adherence to nuclear standards. All levels of the organization exercise accountability for shortfalls in meeting standards.

- Job Ownership (X.7): Individuals understand and demonstrate personal responsibility for the behaviors and work practices that support nuclear safety.

- Teamwork (H.4): Individuals and workgroups communicate and coordinate their activities within and across organizational boundaries to ensure nuclear safety is maintained.

All personnel demonstrated a high commitment to nuclear safety and accountability. This was primarily attributed to their pride in ownership for the site. All personnel expressed a desire to return ANO to a top performing site and stressed the need for all individuals to be held accountable for their personal performance. While most non-supervisory personnel believed site leadership was making changes that promoted personal accountability, some expressed mixed opinions regarding whether all employees are held to the same standards. One area where some non-supervisory personnel expressed concern was the perception that outage and short-term contractors are not held accountable to the same standards as ANO employees. Some non-supervisory personnel in the Maintenance Department expressed frustration with contractors who were not properly performing work, resulting in ANO personnel performing rework. Examples include rework on reactor coolant pumps, re-venting the reactor vessel head, and a lack of procedural compliance that resulted in lifting a reactor coolant pump motor while still attached to its trailer. Conversely, ANO personnel expressed more confidence in contractors hired for recovery efforts or to provide long-term support.

The NRC team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the Personal Accountability safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to Personal Accountability:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to terminate access authorization	H.4	2014403
Inadequate extent of condition review for degraded flood protection features	H.4	2015008
Failure to assess the risk for hot work	H.4	2016001
Failure to evaluate operating experience	X.6	2016007
Failure to ensure that numerous structural components inside Units 1 and 2 reactor containment buildings were properly installed	X.7	2016007
Failure to properly calibrate radiation monitor RE-7460	X.7	2016007

ANO's safety culture evaluations did not identify Personal Accountability as an area of concern.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Personal Accountability. The NRC team noted that two of the three Personal Accountability attributes are not used for cross-cutting attributes during baseline NRC inspections, so there is limited data from NRC inspections. Nevertheless, focus group discussions, individual interviews, and field observations support the conclusion that Personal Accountability is not a significant NSC problem at ANO.

Assessment of the Work Processes Trait

The Work Process trait states that the process of planning and controlling work activities is implemented so that safety is maintained. The associated attributes include:

- Work Management (H.5): The organization implements a process of planning, controlling, and executing work activities such that nuclear safety is the overriding priority. The work process includes the identification and management of risk commensurate to the work.

- Design Margins (H.6): The organization operates and maintains equipment within design margins. Margins are carefully guarded and changed only through a systematic and rigorous process. Special attention is placed on maintaining fission product barriers, defense-in-depth, and safety-related equipment.

- Documentation (H.7): The organization creates and maintains complete, accurate and up-to-date documentation.

- Procedure Adherence (H.8): Individuals follow processes, procedures, and work instructions.

Most personnel commented that in the past, outages were schedule-driven and that too much emphasis was placed on finishing outages on time instead of focusing on solving problems correctly and thoroughly. ANO had previously opted to defer work when difficulty, unexpected conditions, or emergent work was encountered. Most personnel indicated that safety focus during outages was improving, citing the thoroughness of work and the increased emphasis on safety during the Unit 2 outage in the fall of 2015.

Most personnel indicated that relationships between departments were well maintained. However, some non-supervisory personnel expressed frustration that work was occasionally poorly planned, mainly due to ineffective communication. Examples included: operations personnel removing a system from service only to discover that the job couldn't be performed because parts had not yet been procured, and a scaffold erected for one job that blocked access needed for another job which was already in progress. The NRC team's observations of work processes are documented in Sections 5.3.3 and 5.3.4.

Most personnel indicated fleet-wide corporate procedures do not provide sufficient information, and at times provide conflicting information with respect to ANO site-specific procedures. Some non-supervisory personnel indicated that there are plant drawings and prints that need updating, and they were skeptical as to the timeliness of revisions due to the low priority placed on them combined with a lack of personnel resources.

All personnel interviewed indicated that they would stop work without hesitation if they perceived a potential safety concern associated with any activity. However, the NRC team identified examples where workers were unsure about procedures or work instructions, but they did not stop work and obtain guidance on the proper way to proceed, see Section 5.5.2.2 and 5.5.2.3.

The NRC team reviewed the following NRC inspection findings that were assigned cross-cutting aspects within the Work Processes safety culture trait since 2013, as well as findings documented in this report that had a contributing cause related to Work Processes:

Finding Description	Cross-Cutting Aspect	NRC Inspection Report
Failure to reassess the effects of aging	H.5	2014007
Inadequate procedure for severe weather preparation	H.5	2015002
Failure to establish a test program for monitoring Unit 1 emergency feedwater pump casing wall thickness loss	H.5	2016007
Untimely corrective action for condition adverse to fire protection	H.6	2013009
Failure to protect safety-related equipment from flooding	H.6	2014009

Failure to correct long-term degradation of Unit 1 containment building coatings and Unit 2 SW flow to safety-related EDG heat exchanger	H.6	2016007
Failure to develop procedures for internal flooding	H.7	2013012
Failure to properly calibrate Unit 1 reactor building atmospheric particulate radiation monitor	H.7	2016007
Failure to justify changes in the Offsite Dose Calculation Manual	H.8	2014003

ANO's safety culture evaluations did not identify Work Processes as an area of concern.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Work Processes. The NRC team noted that Work Process attributes were documented as causes for a number of recent NRC inspection findings, and multiple ANO RCEs documented these attributes as contributors. Nevertheless, focus group discussions, individual interviews, and field observations support the conclusion that Work Processes is not a significant NSC problem at ANO. The NRC team concluded that ANO developed appropriate corrective actions to improve performance in Work Processes in areas where opportunities to improve were identified.

Assessment of the Environment for Raising Concerns Trait

The Environment for Raising Concerns trait states that a safety-conscious work environment is maintained where personnel feel free to raise safety concerns without fear of retaliation, intimidation, harassment, or discrimination. The associated attributes include:

- Safety-Conscious Work Environment Policy (S.1): The organization effectively implements a policy that supports individuals' rights and responsibilities to raise safety concerns, and does not tolerate harassment, intimidation, retaliation, or discrimination for doing so.

- Alternate Process for Raising Concerns (S.2): The organization effectively implements a process for raising and resolving concerns that is independent of line-management influence. Safety issues may be raised in confidence and are resolved in a timely and effective manner.

All personnel stated they felt free to raise nuclear safety concerns through many avenues including: their supervisors, the open door policy, the CAP, the ECP, and the NRC. However, the NRC team noted that ANO had identified that some mid-level managers were hesitant to challenge senior level management in open meetings. For example, in CR-ANO-C-2016-0194, ANO documented multiple examples of station managers not demonstrating teamwork. The NRC team noted that one of the contributing causes documented by NIOS was that senior leadership had not created a safe environment for managers to openly discuss performance shortfalls, and to openly challenge each other. Section 6.8 describes a concern with the Safety Culture Leadership Team (SCLT) not addressing recommendations from the NSCMP.

The NRC team noted that there were no NRC inspection findings that were assigned cross-cutting aspects within the Environment for Raising Concerns safety culture trait since 2013. None of the findings in this report had causes related to Environment for Raising Concerns attributes.

ANO's safety culture evaluations did not identify Environment for Raising Concerns as an area of concern.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Environment for Raising Concerns. The NRC team concluded that ANO developed appropriate corrective actions to improve performance in the Environment for Raising Concerns trait in areas where opportunities to improve were identified.

Assessment of the Respectful Work Environment Trait

The Respectful Work Environment trait states that trust and respect permeate the organization. The associated attributes include:

- Respect is Evident (no NRC code): Everyone is treated with dignity and respect.
- Opinions are Valued (no NRC code): Individuals are encouraged to voice concerns, provide suggestions, and offer questions. Differing opinions are respected.
- High Level of Trust (no NRC code): Trust is fostered among individuals and workgroups throughout the organization.
- Conflict Resolution (no NRC code): Fair and objective methods are used to resolve conflict.

Most personnel felt that they were treated with respect by coworkers and supervisors. However, both the security organization and long-term contactors did not feel that they were respected by other plant personnel. Security personnel gave examples of inappropriate language being directed toward them by personnel during security screenings. Some long-term contractors felt that they were held to different standards than Entergy employees, and were more likely to be disciplined or terminated if they made a mistake that led to negative consequences.

Most non-supervisory personnel indicated that they trusted management up to the functional area managers for their department. However, they indicated a lack of trust in senior management at ANO, primarily due to lack of visibility.

The NRC team noted that cross-cutting aspects within the Respectful Work Environment safety culture trait are not assigned during baseline NRC inspections. None of the findings in this report had causes related to Respectful Work Environment attributes. Also, ANO's safety culture evaluations did not identify Respectful Work Environment as an area of concern.

The NRC team's independent safety culture assessment confirmed the results of ANO's NSC assessments and cause evaluations within the NSC trait of Respectful Work Environment. The NRC team concluded that ANO developed appropriate corrective actions to improve performance in the Respectful Work Environment trait in areas where opportunities to improve were identified.

6.2 Safety Culture Reviews in Fundamental Problem Area Root Causes
(IP 95003 Section 02.09)

ANO Evaluation Results

For each FPA and significant performance deficiency associated with the NRC-issued Yellow findings, ANO performed an RCE that included an assessment of whether any safety culture attributes contributed to the problems described in each RCE problem statement. The ANO recovery team reviewed the corrective actions to ensure that the actions would address the safety culture attributes that caused or significantly contributed to the subject problems. ANO used the RCE results to assess which safety culture traits and attributes (see Section 6.1) were identified most often. This information was used to confirm that corrective actions were addressing the most-impacted safety culture traits and attributes.

Inspection Team Observations and Findings

Review of Individual RCEs

The NRC team reviewed seven individual RCEs to determine if safety culture was appropriately addressed as required by procedure EN-LI-118. The NRC team reviewed the RCEs in order to determine if the identified problems and proposed corrective actions were consistent with information being provided in the focus group discussions and individual interviews, as well as the results from the Synergy Safety Culture Survey and the TPNSCA.

- CR-ANO-C-2015-2829, Leadership Fundamentals: ANO identified 12 NSC attributes that were related to either a root cause or a contributing cause, and were associated with the safety culture traits of Leadership Safety Values and Actions, Continuous Learning, Safety Communication, Respectful Work Environment, and Environment for Raising Concerns. However, the NRC team noted that as part of the RCE, ANO identified four safety culture attributes that were not associated with the identified causes, so ANO did not prescribe any corrective actions.

- CR-ANO-C-2015-2831, Organizational Capacity: ANO identified five NSC attributes that were related to either a root cause or a contributing cause, and were associated with the safety culture trait of Leadership Safety Values and Actions. However, the NRC team noted that as part of the RCE, ANO identified 16 safety culture attributes that were not associated with the identified causes, so ANO did not prescribe any corrective actions.

- CR-ANO-C-2015-1240, Corrective Action Program Implementation: ANO identified seven NSC attributes that were related to either a root cause or a contributing cause, and were associated with the safety culture traits of Leadership Safety Values and Actions, Problem Identification and Resolution, Work Processes, Continuous Learning, and Personal Accountability. However, the NRC team noted that as part of the RCE, ANO identified five safety culture attributes that were not associated with the identified causes, so ANO did not prescribe any corrective actions.

- CR-ANO-C-2015-2832, Decision Making and Risk Management: ANO identified 12 attributes that were related to either a root cause or a contributing cause, and were associated with the safety culture traits of Leadership Safety Values and Actions, Safety Communication, and Continuous Learning. However, the NRC team noted that as part of

the RCE, ANO identified six safety culture attributes that were not associated with the identified causes, so ANO did not prescribe any corrective actions.

- CR-ANO-C-2015-2836, Corporate and Independent Oversight: ANO identified 12 attributes that were related to either a root cause or a contributing cause, and were associated with the safety culture traits of Leadership Safety Values and Actions, Decision Making, and Problem Identification and Resolution. However, the NRC team noted that as part of the RCE, ANO identified one safety culture attribute that was not associated with the identified causes, so ANO did not prescribe any corrective actions.

- CR-ANO-C-2014-2318, Stator Lift Collapse: ANO identified seven attributes that were related to either a root cause or a contributing cause, and were associated with three safety culture traits of Leadership Safety Values and Actions, Personal Accountability, Questioning Attitude, Decision Making, Problem Identification and Resolution, and Work Processes. However, the NRC team noted that as part of the RCE, ANO identified eight safety culture attributes that were not associated with the identified causes, so ANO did not prescribe any corrective actions.

- CR-ANO-C-2014-0259, Flood Protection Issues: ANO identified six attributes that were related to either a root cause or a contributing cause, and were associated with three safety culture traits of Leadership Safety Values and Actions, Work Processes, Continuous Learning, and Questioning Attitude. However, the NRC team noted that as part of the RCE, ANO identified four safety culture attributes that were not associated with the identified causes, so ANO did not prescribe any corrective actions.

The seven RCEs documented 26 root or contributing causes. Each of the 10 safety culture traits was identified as a contributing cause in at least one of the RCEs reviewed. The most frequently impacted safety culture traits were:

- Leadership Safety Values and Actions (39)
- Continuous Learning (14)
- Decision Making (12)
- PI&R (10)
- Questioning Attitude (6)

The NRC team concluded that the safety culture attributes identified in the seven RCE reports referenced above were consistent with the safety culture problems described by ANO personnel in focus group discussions and individual interviews, as well as with the TPNSCA results. Each RCE report documented how safety culture attributes related to the root and contributing causes of the performance deficiencies. The NRC team concluded that ANO addressed the safety culture attributes identified in the seven RCEs that the recovery team concluded either caused or significantly contributed to the associated performance deficiencies. However, the NRC team concluded that ANO did not adequately evaluate or develop corrective actions to address the collective impact of the remaining safety culture attributes that, while not relating specifically to a root or contributing cause, nonetheless contributed to the problems described in each of the RCE problem statements. The NRC team noted that ANO identified that some safety culture attributes were contributors to several of the RCE problem statements, but ANO did not consider the collective significance. The NRC team concluded that identifying a safety culture attribute that contributed to multiple significant performance deficiencies was an adequate basis to conduct further evaluations, however, as described above, this was a gap in ANO's approach.

The NRC team also identified that ANO had not evaluated the causes for the safety culture weaknesses documented in the Synergy Safety Culture Survey and the TPNSCA reports.

Subsequent Safety Culture Cause Evaluations

In response to the NRC team's concerns, ANO performed a common cause analysis of all of the safety culture attributes that were identified in the recovery RCEs in order to assess the collective significance and causes. Those results were then used to perform ACE CR-ANO-C-2016-0748. The ACE was intended to determine the common causes by evaluating the attributes and behaviors identified in the FPA RCEs, significant performance deficiency RCEs, Synergy Safety Culture Survey and TPNSCA reports, safety culture priority group assessments, and safety culture cross-functional focus groups. Based on the results from this ACE, ANO identified the following:

> Apparent Cause: ANO did not have an adequate explicit management focus on safety culture and the associated infrastructure to support a healthy NSC. This apparent cause allowed the specific NSC weaknesses to exist at ANO and to impact the ability of the leadership team to recognize and address the overall decline in NSC.
>
> The primary performance issues identified by ANO were:
>
> - Leadership failed to recognize that distractions and competing priorities caused an erosion of safety culture over time. A strategic commitment to safety was not maintained.
>
> - Pressures to economize available resources were allowed to compromise nuclear safety needs.
>
> - Leadership did not align on what a strong NSC at ANO looks like and their personal impact on the workforce through their actions or inactions.
>
> - Leadership did not effectively engage and align the ANO workforce on individual responsibilities for nuclear safety.
>
> - Leadership did not create an environment where input and feedback are consistently sought out, valued, and rewarded. The free flow of information up, down, and across the organization is not cultivated or used by leaders to positively influence the culture, to learn, and to understand organizational health.

Planned corrective actions to improve safety culture performance contained in the NSC AAP included:

- Revise procedure EN-QV-136 to define the roles and responsibilities of the ANO NSC Manager. (SC-2)

- Revise procedure EN-QV-136 to add NSC monitor orientation training for NSCMP and SCLT members. (SC-3)

- Conduct a structured off-site meeting among the ANO Senior Leadership Team to align on what a strategic commitment to safety looks like at ANO and the leader behaviors that will demonstrate that commitment. (SC-4)

- Create an ANO Employee Handbook that includes NSC, SCWE, and CAP standards and expectations, and provide orientation and expectations to ANO personnel on the contents and use of this handbook as a daily tool for communicating, reinforcing, and demonstrating NSC and CAP expectations. (SC-5)

- Conduct meetings facilitated by members of site management to familiarize personnel with the contents of the ANO Employee Handbook and expectations for its use. (SC-6)

- Establish a small group meeting schedule to facilitate face-to-face interaction between ANO senior leadership and station employees. This activity should span a minimum period through the end of 2016 and include the following attributes: 1) purpose is open dialogue on safety performance with emphasis on employee questions and feedback; and 2) schedule should be coordinated to facilitate broad exposure, with emphasis on workers on shift rotation who can't routinely participate in other communication forums. (SC-7)

- Develop and implement a "field presence" initiative that promotes and measures leader field presence. The objective is to drive and verify field presence by leaders to engage with employees and reinforce high standards. (SC-8)

- Develop and provide training to ANO leaders, including supervisory training on NSC, SCWE, and constructive conversation skills. (SC-9)

- Develop and present training to the ANO workforce to include case studies that illustrate the "right picture" of NSC. Include what it means to be an engaged and thinking individual nuclear worker. (SC-10)

- Implement priority group specific action plans to address safety culture issues. (SC-11)

- Establish and implement an NSC observation process including elements of leader behaviors, NSC, and SCWE. The observer monitors leader performance on a daily basis and provides feedback to correct adverse trends in behaviors. (SC-14)

- Raise the priority and visibility of NSC at the fleet level by revising the Corporate Oversight Model to include station NSC output from the NSCMP as input to fleet oversight analysis meetings and oversight review boards. (SC-15)

The NRC team reviewed the safety culture common cause assessment, the ACE, and the NSC AAP. The NRC team concluded that ANO's evaluations considered the full set of available safety culture data and identified the common causes associated with safety culture at ANO that had contributed to the problems identified in the FPAs and PAs. The corrective actions identified in the NSC AAP were comprehensive and appropriate to address the causes for safety culture weaknesses. The NRC team noted that a dedicated safety culture manager position was created at ANO to focus attention and priority on monitoring and improving ANO's safety culture.

6.3 Independent Third Party Nuclear Safety Culture Assessment and Other Safety Culture Assessments
(IP 95003 Section 02.07)

The NRC team evaluated the TPNSCA report to determine whether: 1) the associated assessment was comprehensive; 2) the assessment methodology was sound; 3) the assessment team members were independent and qualified; 4) the data collected supported the conclusions derived from the assessment; and 5) ANO's corrective actions in response to the assessment findings were appropriate.

In addition to the TPNSCA, the team reviewed the results of ANO's independent safety culture surveys conducted in 2012 and 2014, and the Integrated Nuclear Safety Culture Assessment Report (INSCAR). The INSCAR integrated results from the 2014 safety culture survey and 2015 TPNSCA, and mapped the findings to the FPAs and corrective actions in the CRP. The NRC team reviewed results from periodic safety culture surveys (referred to as organizational engagement surveys) conducted by a third party vendor in August 2015 and December 2015, in order to evaluate whether more recent survey results indicated improving trends in safety culture.

Inspection Team Observations and Findings

The NRC team concluded that the TPNSCA was comprehensive and provided appropriate indications of the safety culture that existed at ANO at the time of the assessment in 2014 and 2015. The members of the TPNSCA team were independent from ANO and had appropriate qualifications to conduct the assessment. The TPNSCA used multiple data collection methods, which consisted of reviewing results from the 2012 and 2014 independent safety culture surveys, performing document reviews, observing meetings and work activities, and conducting focus group discussions and individual interviews with over 26 percent of ANO personnel and long-term contractors at the station. The response rate for the 2014 independent safety culture survey was 80 percent, which was a large enough sample to provide confidence that the survey results accurately reflected the safety culture perceptions at the site.

For the INSCAR, ANO chartered a team of internal personnel and external consultants to review and consolidate the results from the 2014 independent safety culture survey and the 2015 TPNSCA into a set of problem descriptions. The INSCAR identified nine site organizations requiring priority attention based on the safety culture assessment results, and 10 problem descriptions for topical areas that should be addressed by safety culture improvement efforts. Attachment E of the INSCAR outlined how each of the safety culture topical areas were being addressed by corrective actions associated with other FPAs in ANO's CRP. The INSCAR identified a reasonable set of safety culture topical areas to be improved, but resulted in very few new corrective actions beyond those already identified within other FPAs. The NRC team noted that the contents of the INSCAR reflected a recovery team strategy to address safety culture weaknesses indirectly by correcting other problems identified in the FPA RCE reports, rather than taking a direct and holistic approach to addressing safety culture problems.

One of the performance monitoring tools included in ANO's CRP to evaluate the effectiveness of safety culture improvement initiatives was to conduct periodic surveys. Periodic organizational engagement surveys were administered in August and December 2015, and February 2016. Survey results were used as the basis for five of the inputs to the CRP performance metrics: CAP Behaviors, Conservative Decision Making Behaviors, Effective Use of Resources, Leadership Behaviors, and Engagement Survey Results. The metrics derived from the survey

spanned all of the FPA performance metrics. The NRC team identified multiple concerns with the reporting of the results from the safety culture surveys that could limit ANO's ability to detect evidence of an improving or declining trend. For example:

- Each of the five performance metrics consisted of combined and weighted responses to multiple survey questions. The NRC team identified that some of the questions were not always related to the assigned category. For example, one question about whether supervisors enforce adherence to policies and procedures appears under the "Effective Use of Resources" category, and another question about the CAP appears under "Conservative Decision Making Behaviors" rather than "CAP Behaviors".

- The survey results that feed into the metrics were averaged across all respondents, including supervisors and managers, who tend to respond more favorably. For example, the December 2015 report indicated there was an overall improvement in the survey results from August 2015. However, a more detailed review of the results indicated the response from supervisors and managers were more positive than the previous survey, but slightly more negative from the much larger population of non-supervisory personnel.

- ANO planned to use metrics to monitor safety culture improvement that combined multiple questions to provide a numerical result. The NRC team was concerned that negative responses to one question could get missed due to positive responses from other questions.

- One of the two criteria used for changing the color of the performance metrics was whether the most recent quarterly survey result indicates a positive or negative trend from the initial survey conducted in August 2015. The NRC team was concerned that using this criterion could bias the metric to be overly optimistic, because even a minor change in the score was considered a positive trend.

- The survey results were distributed to multiple managers and there was no single point of contact at ANO who was responsible for reviewing the survey to identify insights and develop corresponding corrective actions.

In response, ANO improved the metric thresholds and the way it assesses the quarterly safety culture survey results. At the conclusion of the inspection, ANO was considering whether there was a need to change the way metrics combined questions.

One of the interim actions to address safety culture weaknesses focused on developing a plan to improve communications from senior leadership to site employees. Although the NRC team noted progress in improving communication and alignment from senior leadership down to first-line supervisors, there was less communication to non-supervisory personnel. The periodic survey from December 2015 confirmed that first and second-line supervisors perceived an improvement in communication from senior leadership, whereas non-supervisory personnel perceived a decline in communication from senior leadership since August 2015. Other interim actions to improve safety culture, i.e., including increasing staffing, improving CAP performance, and improving decision making, are discussed in Sections 5.1, 5.4.1 and 5.5.1 respectively.

The NRC team concluded that the TPNSCA was of sufficient quality to identify weaknesses in ANO's safety culture and facilitate the development of corrective actions. The NRC team's graded safety culture assessment independently confirmed the results from the TPNSCA. At

the time of the inspection, limited progress had been achieved in addressing the identified safety culture weaknesses. Interim actions to improve safety culture were mostly limited to the four priority areas listed in the TPNSCA (resources, communication, CAP, and conservative decision making).

6.4 Executive Review Board
(IP 95003 Section 02.09)

The NRC team evaluated the executive review board (ERB) process to determine whether ANO employees are encouraged to report safety-related concerns without fear of retaliation, and that control measures or policies are being implemented. The NRC team reviewed procedure EN HR-138, "Executive Review Board Process for Employees," Revision 5; reviewed a selection of seven ERB files from the last six months; interviewed the human resources representative from ANO; and reviewed procedure EN-HR-138-1, "Executive Review Board Process for Supplemental Personnel," Revision 1. The ERB process is used by ANO to ensure that employees who engaged in protected activities are not subject to inappropriate disciplinary action.

Inspection Team Observations and Findings

The NRC team noted that the ERB documented actions in accordance with the ERB process, including identifying if an individual had participated in a protected activity. In addition, the team verified that the ERB identified the potential for creating chilling effects when appropriate. The NRC team reviewed the "Chilling Effect Mitigation Plan," resulting from one ERB meeting. The plan documented appropriate actions to prevent potential chilling effects that could have resulted from the ERB actions. Based on comments from affected individuals, ANO's actions appeared to be effective.

The NRC team concluded that the process and procedures used to guide the ERB were appropriate.

6.5 Technical Dispute Resolution
(IP 95003 Section 02.09)

The NRC team assessed ANO's technical dispute resolution program by reviewing the technical dispute resolution procedures; conducting focus group discussions and individual interviews with various ANO personnel; reviewing ECP records; and reviewing CAP records.

ANO Evaluation Results

ANO identified that Entergy did not have a formal program or process for responding to and resolving technical disputes and differing professional opinions. ANO entered this issue into both the site and corporate CAPs as CR-ANO-C-2105-01711 and CR-HQN-2015-00566, respectively. The CRs stated, "ANO does not have a documented mechanism for all members of the workforce to suggest improvements and explain their disagreements with technical resolutions of identified deficiencies. Additionally, ANO does not have a feedback mechanism in which the evaluation of deficiencies and follow-up corrective actions are reported back to the identifying workers."

On November 10, 2015, Entergy issued procedure EN-EC-101, "Differing Professional Opinion Resolution Process," Revision 0, to provide employees and supplemental workers with an

alternate means for identifying and resolving professional/technical issues. As an interim action, ANO credited the availability of existing alternate mechanisms such as using the CAP, ECP, and the Ethics Hotline, as venues for raising concerns while the new procedure was being developed.

Inspection Team Observations and Findings

The NRC team determined that with the implementation of the new corporate procedure EN-EC-101, ANO has appropriate means for individuals to raise issues and concerns as well as a process for resolving technical disputes. The effectiveness of this new process could not be evaluated due to the lack of any case files associated with this new process.

As previously discussed in other sections of this report, during focus group discussions and individual interviews, ANO staff demonstrated a willingness to raise issues or concerns without fear of retaliation.

6.6 Employee Concerns Program
(IP 95003 Section 02.09)

ANO Evaluation Results

ANO completed a "limited review" of the ECP using NRC IP 40001, "Resolution of Employee Concerns," including a review of program guidance, documentation, corrective actions, feedback to the employee, and ECP training.

Based on the results of the ECP review, ANO identified the following:

- Weaknesses exist with implementing program guidance.
- ANO has not conducted SCWE training for employees and leaders for several years.
- Oversight and management of the ECP has not been effective.

Inspection Team Observations and Findings

The NRC team reviewed aspects of the ECP, including governing procedures, documentation of concerns, documentation of corrective actions, feedback to employees, evaluation of concerns, and any hesitancy to raise safety concerns. In addition, the NRC team evaluated the self-assessment process and the expertise to determine whether weaknesses in the ECP existed that could adversely impact ANO's ability to maintain a safety conscious work environment.

The NRC team reviewed a select sample of ECP files from 2014 and 2015, and interviewed the ANO ECP Manager and Entergy Corporate ECP Manager. The documentation in the ECP files was sufficiently detailed to demonstrate appropriate processing of the concern, including resolution and feedback to the employee. ECP records were maintained in a secure location accessible only to the ECP staff.

The NRC team noted that ANO had not conducted a self-assessment since 2012, contrary to procedure EN-EC-100, "Guidelines for Implementation for the Employees Concerns Program." ANO credited the safety culture assessment completed in 2014 as an ECP self-assessment. In response, ANO initiated a learning organization tracking item LO-ALO-2016-00038 to document the need to perform a snapshot self-assessment of the ECP at ANO.

The NRC team concluded that ANO did not always document meetings of the ECP Training Review Committee in accordance with procedure EN-EC-100-01, "Employee Concern Coordinator Training Program." This committee is responsible for meeting once a year to develop and document a training plan for the ECP coordinators. Although this committee did not document the training plan for the ECP staff, the ANO ECP coordinator participated in continuing training each year.

The NRC team concluded that ANO conducted limited benchmarking of other ECP programs outside of Entergy. Benchmarking included discussions with other ECP managers concerning promotion and response to the NRC allegations program, but it did not include visiting another site to observe implementation of the ECP.

In addition, the NRC team noted that the ECP files for substantiated cases included documentation of recommended actions from the ECP coordinator to the Site Vice President. However, information regarding the disposition of the recommendations was not included in the file. The ECP coordinator was responsible for ensuring that the recommendations approved by the Site Vice President were completed.

The NRC team noted that the closure timeliness of ECP cases exceeded the timeliness metrics during five out of the last six months. The NRC team also noted that there had been a recent increase in the number of concerns reported to the ECP. ANO had not assigned additional resources at the time of the inspection in order to address the increase in concerns received by the ECP. The NRC team concluded that the process and procedures used to implement the ECP function were appropriate. The results from focus group discussions conducted by the NRC team indicated that station personnel were willing to raise concerns using the ECP.

6.7 Safety Culture and Safety Conscious Work Environment Policies
(IP 95003 Section 02.09)

The NRC team reviewed the procedures and training governing safety culture and safety conscious work environment (SCWE) to determine whether they are adequate to support a robust safety culture and encourage personnel to report safety concerns without fear of retaliation. The NRC team reviewed procedures EN-PL-190, "Maintaining a Strong Safety Culture," and EN-PL-187, "Safety Conscious Work Environment." In addition, the NRC team reviewed training modules on SCWE to support future training for ANO supervisors and above.

The 2015 TPNSCA team identified that management behaviors were affecting worker trust in the ANO leadership team, and safety culture survey results indicted a slowly declining trend for response to all questions related to SCWE since 2012.

Inspection Team Observations and Findings

The NRC team concluded that the procedures for safety culture and SCWE were appropriate and were updated to include all safety culture traits from NUREG-2165, "Safety Culture Common Language."

The NRC team concluded that most ANO personnel may not understand the difference between safety culture and SCWE. In response, ANO planned to establish an employee handbook to be used to communicate, reinforce, and demonstrate expectations for NSC and SCWE (SC-5). In addition, ANO planned to develop NSC training for leaders and the ANO workforce (SC-9 and SC-10).

The NRC team noted that the training presentation planned for supervisors and above, was limited to discussions of SCWE and discrimination. The presentation lacked a thorough discussion on all of the NSC traits and how managers can promote a healthy safety culture. In response, ANO planned to revise the training to have a more thorough scope.

6.8 Nuclear Safety Culture Monitoring Panel and Safety Culture Leadership Team
(IP 95003 Section 02.09)

The NRC team assessed the site's NSCMP and SCLT programs and activities by reviewing the site's Safety Culture Monitoring procedures; reviewing NSCMP and SCLT meeting minutes for meetings conducted between January 2014 and January 2016; performing interviews with the NSCMP Chairman, Director of Recovery, Manager of Recovery, and various department managers; observing emergent and quarterly NSCMP meetings and Leadership and Alignment meetings; and conducting focus group discussions with ANO personnel.

Inspection Team Observations and Findings

ANO used procedure EN-QV-136 to establish the NSCMP and monitor trends in NSC. The NRC team identified that the NSCMP did not identify weaknesses or a declining trend in NSC until receiving the results of the external safety culture assessments (i.e., 2014 Synergy Safety Culture Survey and 2015 TPNSCA). The NRC team concluded that prior to spring 2015, the NSCMP did not demonstrate a rigorous, consistent process for evaluating the available information concerning ANO's safety culture. The NRC team concluded that a lack of specific training for NSCMP members and guidance regarding how to assess the site's safety culture, contributed to assessment results that were overly subjective. In response, ANO wrote CR-ANO-C-2015-01445, CA 120 and CA 121.

The NRC team observed an NSCMP meeting on February 23, 2016. The chairman and panel members performed a critical review of information as required by the site's safety culture monitoring procedure, and demonstrated an effective analysis of the site's safety culture traits. Traits identified as weaknesses resulted in the initiation of CRs to facilitate the development of corrective action recommendations.

During the August 2015 SCLT briefing, the NSCMP presented its report showing a broad decline in safety culture. This report was consistent with the results of the TPNSCA. However, the meeting minutes indicated that the SCLT decided to rate safety culture at ANO as "acceptable." Based on interview responses, some meeting participants disagreed with the decision of senior leadership that the safety culture at ANO was acceptable, but did not challenge the decision. At the next meeting in December 2015, the SCLT concluded that safety culture was not acceptable.

The NRC team was concerned that the SCLT's conclusion that ANO's safety culture was "adequate" in August 2015 did not appropriately reflect the data provided by, or the recommendations from, the NSCMP. This SCLT conclusion did not reflect the declining condition with respect to safety culture and indicated a lack of awareness that improvements in safety culture at ANO were needed.

The NRC team identified that the NSCMP was not provided with all of the information they were supposed to consider when assessing ANO's SCWE. Procedure EN-EC-100 states that the NSCMP was to be informed of nuclear safety/quality, harassment, chilled work environment,

and hostile environment concerns upon receipt; however, this type of information from HR and the ECP was not being shared due to privacy concerns. As a result, the NSCMP did not have information needed to identify early signs of problems. The NRC team noted that the ECP identified a potential chilling effect associated with the change of a contractor used for fire watches. A Chilling Effect Mitigation Plan was created by the ECP and enacted. The NSCMP was informed of the issue after the plan was enacted and therefore did not have an opportunity to provide input.

6.9 Fatigue Management
(IP 95003 Section 02.09)

The NRC team's independent safety culture assessment included reviewing ANO's fatigue management program. The NRC team reviewed procedure EN-OM-123, "Fatigue Management Program;" fatigue management work hour waiver records; corrective action documents; and information gathered through management interviews and focus group discussions. The NRC team independently assessed the implementation of the site's fatigue management program for the period from January 1, 2014, through January 1, 2016. During this period, ANO only used the work hour rule waiver process on one occasion (CR-ANO-C-2015-00813). The NRC team determined that ANO performed the required fitness for duty assessments and waiver approval process.

The NRC team determined that the ANO fatigue management program was being implemented in compliance with regulatory requirements. The NRC team did not identify any concerns with ANO exceeding the work hour control limits or using work hour control waivers.

7. FINDINGS

7.1. Failure to Complete Extent of Condition Reviews for the Stator Drop Significant Condition Adverse to Quality Event

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," because ANO failed to follow CAP requirements during two of the extent of condition reviews for the stator drop event. Specifically, the associated corrective actions were closed although the actions did not meet the intended scope.

Description: ANO initiated RCE CR-ANO-C-2014-02318 to determine ANO's contribution to the stator drop event. This evaluation documented ANO's failure to review and approve work performed by contractors. As part of the extent of condition review of the significant condition adverse to quality, CA-9 required a review of other contracted services procured within the previous 3 years. Specifically the corrective action required: review of vendor contracted technical services not bound by the design change process, the scope of the review shall address services procured in the last 3 years that have the potential to affect nuclear safety, and review these services relative to controls in place to assure quality and technical requirements were/are met.

Following completion of CA-9, the CARB performed a review of the completed actions and identified that ANO had excluded contracts with a monetary value of less than $250,000. To address this deficiency, ANO created CA-89, which stated the following: review vendor contracted technical services not bound by the design change process not reviewed under CR-ANO-C-2014-02318 CA-9, the scope of the review shall address services procured in the last 3

years that have the potential to affect nuclear safety, review these services relative to controls in place to assure quality and technical requirements were/are met.

The results of CA-89 were reviewed by the CARB and found to be acceptable, so CA-9 and CA-89 were closed. The team reviewed the scope of contracts included in the extent of condition review for CA-9 and identified that 62 contracts that had already been completed were inappropriately excluded from review by ANO. Examples of the type of projects excluded from review included the following:

- ANO Independent Spent Fuel Storage Installation Pad Concrete Commercial Dedication (Contract 10405065). The contract was to prepare commercial grade independent spent fuel storage installation pads 1 and 2 and a turning pad.

- 2F13-02 Unit 2 UAT Installation (Contract 10401070). The contract provided personnel, equipment, and supervision of the transport and placement of the UAT on the final pad, as well as final acceptance testing.

- Perform Identification of Flood Barriers and Walkdowns (Contract 10358239). The contract provided engineering support for the identification and walkdown of barriers in the support of the NRC Fukushima Orders.

The team reviewed the scope of contracts included in the extent of condition review for CA-89 and identified 125 non-safety contracts, where the work scope had the potential to affect nuclear safety, that were inappropriately excluded from review. Examples of the type of contracts excluded from this review included the following:

- Transient Stability Study, ANO Unit 2 Main Transformers and ANO Unit 1 Generator Stator (Contract 10348871). The analysis was used to verify that with the new Unit 2 Main Transformer and Unit 1 stator, the existing ANO grid stability analysis was bounding.

- Fukushima Site Specific Hydrodynamic Analysis for ANO (Contract 1039705). NRC Order EA-12-051 required that SFP instrumentation be functional following a seismic event. The contract provided the qualification of the non-safety instrument used in the spent fuel pool.

- Flow Accelerated Corrosion Manager Calculator Upgrade (Contract 10415293). The contract prescribed a software revision used to analyze pipe minimum wall thickness.

The team concluded that ANO had inappropriately excluded contracts from the extent of condition review prescribed by CA-9 and CA-89. Quality procedure EN-LI-102 Step 5.8[1](f) and (g) required, in part, that the responsible manager, or designee, closing corrective actions verify that the required action has been taken and the corrective action is completed as intended. Contrary to this requirement, the team noted that ANO's responsible manager or designee had failed to verify that required corrective actions specified in CR-ANO-C-2014-02318 had been taken prior to closing those actions.

Analysis: The failure to complete two of the extent of condition reviews associated with the stator drop event specified in the corrective action plan was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with

the design control attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to complete actions related to identifying and correcting the extent of condition for a significant condition adverse to quality could potentially lead to an initiating event. The finding was evaluated using IMC 0609, "Significance Determination Process," Attachment 0609.04, "Initial Characterization of Findings," and Appendix A, "The Significance Determination Process (SDP) for Findings At-Power," Exhibit 1 – "Initiating Events Screening Questions," dated June 19, 2012. The team determined the finding was of very low safety significance (Green) because the inadequate closure of CA-9 and CA-89 did not cause a reactor trip or the loss of mitigation equipment relied upon to transition the plant from the onset of a trip to a stable shutdown condition. This finding had a problem identification and resolution cross-cutting aspect of Resolution because ANO did not take effective corrective actions to address issues in a timely manner commensurate with their safety significance. Specifically, the scope of the actions taken as part of the corrective actions did not resolve the issue as described in the corrective action statement [P.3].

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Procedure EN-LI-102, Revision 24, a procedure affecting quality, Step 5.8[1](f) and (g) required, in part, that the responsible manager, or designee, closing corrective actions verify that the required action has been taken and the corrective action is completed as intended.

Contrary to the above, as of February 26, 2016, the responsible manager or designee failed to verify that required corrective actions specified in CR-ANO-C-2014-02318 had been taken and were completed as intended prior to closing those actions. Specifically, the scope of both CAs included reviewing services procured within the prior 3 years that had the potential to affect nuclear safety to assure quality and technical requirements were met. ANO excluded 187 contracts from the scope of the required reviews. ANO's corrective actions included re-performing the actions directed in CA-9 and CA-89, with no additional issues identified. Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-C-2016-00479 and CR-ANO-C-2016-00480, this violation is being treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-01 and 05000368/2016007-01, "Failure to Complete Extent of Condition Reviews for the Stator Drop Significant Condition Adverse to Quality Event."

7.2 Inadequate Effectiveness Reviews for Corrective Actions to Prevent Recurrence

Introduction: The team identified a Green finding for ANO's failure to ensure that effectiveness review to assess the adequacy of corrective actions as required by procedure EN-LI-118-ANO-RC, "Cause Evaluation Process," were appropriate. Specifically, the team identified multiple examples in which effectiveness reviews for CAPRs failed to assess whether corrective actions achieved the intended results.

Description: In response to the Unit 1 stator drop Yellow finding documented in NRC Inspection Report 05000313/2014008 and 05000368/2014008, ANO performed RCE CR-ANO-C-2014-02318 in accordance with procedure EN-LI-118-ANO-RC. Step 5.13 requires, in part, that "Effectiveness reviews should verify not only that actions were taken but that they had the desired effect." Due to the significance of the stator drop event, ANO determined that an

effectiveness review of the actions and the overall corrective action plan was required. The plan included two reviews, effectiveness review LO-ALO-2015-001, CA-7 and CA-8, to be performed at 6 month intervals following the plan implementation. Four criteria were established to determine the success of the plan. Three of the criteria involved checking the completion of actions, including: 1) NRC closing the items identified in the Notice of Violation, 2) all corrective actions being closed, and 3) items previously identified as "off- track" being closed. The fourth criteria required that "Sufficient progress had been made." The team concluded that none of the criteria related to ensuring the corrective actions were achieving the desired effect.

The team identified additional examples where ANO substituted corrective action closure reviews for effectiveness reviews, including:

- Effectiveness review LO-ALO-2015-001, CA-37 is associated with CAs 25-34 of RCE CR-ANO-C-2015-2831 (Organizational Capacity). The success criteria in the effectiveness review for each of the corrective actions was to verify that the corrective action was completed. For example, CA-29 directed ANO to "Review and update the critical spare list to identify items that should be included in the 2017 and 2018 business cycles." The effectiveness review associated with CA-29 specified the success criteria as ensuring that the critical spare list is accurate, have owners assigned to each item, and have actions assigned as appropriate.

- Effectiveness review LO-ALO-2015-001, CA-30 is associated with RCE CR-ANO-C-2015-2833 (Design and Licensing Basis). The effectiveness review consisted of a focused area self-assessment of the implementation of the corrective actions with success defined as all objectives of the self-assessment have been successfully completed. All but one objective consisted of a verification of the completion of corrective actions.

- Effectiveness review LO-ALO-2015-001, CAs 27-29 are associated with RCE CR-ANO-C-2015-2832 (Decision-Making). The effectiveness review consisted of the successful closure of corrective actions, "off-track" items, and the return to the Licensee Response Column (Column 1) of the NRC's Reactor Oversight Process Action Matrix.

The team concluded that in the examples identified, the effectiveness review did not assess the overall effectiveness of the corrective actions, but simply verified that the corrective actions were implemented. Additionally, for the stator drop event, the team determined that because the criteria of "sufficient progress," ANO would not be able to assess via the effectiveness review whether the corrective action plan was effective.

These concerns were documented in the CAP as CR-ANO-C-2016-00482 and CR-ANO-C-2016-01013. ANO's corrective actions included revising the effectiveness review to ensure that the corrective actions achieve the desired effect.

Analysis: The failure to establish adequate effectiveness review success criteria to verify the intended results for CAPRs were achieved, was a performance deficiency. The performance deficiency was determined to be more than minor because, it impacted the human performance attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to perform adequate effectiveness review related to corrective actions for a significant condition adverse to quality could potentially lead to an initiating event. The finding was evaluated using IMC 0609,

Attachment 0609.04, and Appendix A, Exhibit 1 – "Initiating Events Screening Questions." The team determined the finding was of very low safety significance (Green) because it did not cause a reactor trip or the loss of mitigation equipment relied upon to transition the plant from the onset of the trip to a stable shutdown condition. This finding had a problem identification and resolution cross-cutting aspect of Self-Assessment because ANO did not ensure that the organization routinely conducted self-critical and objective assessments of its programs and practices. Specifically, the CARB tasked with validating the effectiveness of the overall corrective action plans did not ensure that the effectiveness review plans involved an assessment of whether the implemented corrective actions were effective [P.6].

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance, it is identified as: FIN 05000313/2016007-02 and 05000368/2016007-02, "Inadequate Effectiveness Reviews for Corrective Actions to Prevent Recurrence."

7.3 Inadequate Operating Experience Evaluations

Introduction: The team identified a Green finding for ANO's failure to evaluate OE as required by procedure EN-OE-100-02, "Operating Experience Evaluations." Specifically, the team identified that ANO had not correctly verified the barriers credited to address OE.

Description: Procedure EN-OE-100-02 requires that OE applicable to ANO shall be evaluated. The team determined that certain types of OE identified as applicable to the station were classified as level "A2." This classification allowed the OE evaluator to determine that actions were not needed if there were sufficient "barriers" to prevent the identified vulnerability from affecting ANO. The procedure required the evaluator to verify the adequacy of barriers, ensure procedures credited as barriers included information needed to address the concern, and issue an action for any gaps or weaknesses identified. The team reviewed several evaluations and identified two examples in which barriers credited by ANO to address OE were inadequate and, as a result, represented a vulnerability to a similar event occurring at ANO. Specifically:

Example 1: RCE CR-IP3-2015-03795: "Manual Reactor Trip Due to Erroneous Track and Hold of Main Boiler Feed Pump Speed Following Trip of Condensate Pump on December 22, 2015." The aspect of the OE applicable to ANO was associated with the failure of another Entergy site to perform testing of a condensate pump motor stator following offsite vendor maintenance, which had resulted in an in-service failure and a reactor trip. ANO correctly identified this OE as requiring further evaluation, but categorized it as "A2" (Applicable – No Action Required) due to the conclusion that multiple barriers existed at ANO. After reviewing the credited barriers, the team identified the following issues:

- Staff at the Entergy site where this event occurred wrote CR-IP3-2015-03795, CA-17 to add a requirement to perform testing following a motor core repair conducted in accordance with the Entergy fleet maintenance procedure for large motors. However, the team identified that CR-IP3-2015-03795, CA-17 was subsequently cancelled and the fleet maintenance procedure was not revised; since ANO was not actually performing motor stator testing, such testing was not a barrier.

- At the Entergy site where the event occurred, motor winding temperature increases were identified as a precursor to the condensate pump motor failure. ANO credited motor winding temperature monitoring prescribed in the LMP Performance Monitoring Program

as a barrier to a similar event at ANO. However, the team identified that the implementation of the LMP was deficient, and performance monitoring of large motors, including the condensate pump motors had not been performed for over a year, so this program was not a credible barrier.

- Over-reliance on vendors was identified at the Entergy site where this event occurred. ANO credited the planned corrective actions documented in CR-ANO-C-2013-0888 as a barrier to a similar event at ANO. The team identified that the corrective actions in the CR had not been compared to the specifics of the event and had not been implemented, so those actions were not a credible barrier.

- ANO credited the large motor engineer's regular attendance at the EPRI Large Electric Motor User Group meetings as a barrier to a similar event at ANO. The team concluded that participation in this type of meeting was not a credible barrier.

Example 2: NRC Information Notice (IN) 2014-15, "Inadequate Controls of Respiratory Protection Accessibility, Training and Maintenance," dated December 10, 2014. This NRC IN documented a number of deficiencies regarding the control of respiratory protection equipment in the control room. ANO correctly identified this OE as requiring further evaluation, but categorized it as "A2" due to multiple pre-existing barriers. After reviewing the barriers, the team identified the following issues:

- NRC IN 2014-15 identified that a licensee incorrectly excluded some control room operators from a list of those required to be respirator-qualified. ANO credited procedure EN-TQ-212, "Conduct of Training and Qualification," which required supervisors to verify respirator qualifications were current. The team determined that this barrier did not verify all operators were respirator qualified, therefore this action was not a credible barrier.

- NRC IN 2014-15 identified that a licensee had stored respirator bottles in the control room that were not incorporated into the testing program and therefore were not being tested. ANO credited procedure EN-RP-502, "Inspection and Maintenance of Respiratory Protection Equipment," as a barrier because this procedure required the inspection and testing of self-contained breathing apparatus bottles. The team determined that this barrier failed to address the issue of bottles not incorporated in the testing program since the procedure only addresses those bottles that were already in the program, therefore this procedure was not a credible barrier.

- NRC IN 2014-15 identified that an operator did not have self-contained breathing apparatus prescription eyeglass inserts in the storage area. ANO credited procedure EN-OP-115-03, "Shift Turnover and Relief," which required operators to have respirator glasses before beginning a shift. The team determined that the procedure did not specifically require that an operator have respirator glasses in the correct storage area; and that the procedure only referred to eyewear. The team noted that the fire brigade had two dress-out areas, but procedure EN-OP-115-03 did not ensure an operator had respirator glasses at both locations. As a result, the team concluded that this procedure was not a credible barrier.

These OE examples were screened as "A2" due to the assumed presence of pre-existing barriers. ANO failed to verify the adequacy of the above barriers. In addition, the evaluation

was not challenged by the CRG which was responsible for screening OE evaluations. In response, ANO re-performed the OE evaluations and documented the issue in the CAP as CR-ANO-C-2016-00463 and CR-ANO-C-2016-00782.

Analysis: The failure to evaluate the OE examples as required by procedure EN-OE-100-02 was a performance deficiency. Both examples of the performance deficiency was determined to be more than minor. The first example was more than minor because it was associated with the protection against external factors attribute of the Initiating Events cornerstone and adversely affected the cornerstone objective to limit the likelihood of events that upset plant stability and challenge critical safety functions during shutdown as well as power operations. Specifically, the failure to generate corrective actions to address the large motor OE could result in a similar adverse condition or event at ANO. This example was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 1 – "Initiating Events Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding would not result in exceeding the RCS leak rate for a small loss of coolant accident or affect systems used to mitigate a loss of coolant accident, did not cause a reactor trip and loss of mitigation equipment, did not involve the loss of a support system, did not involve a degraded steam generator tube condition, and did not impact the frequency of a fire or internal flooding event.

The second example was more than minor because it was associated with the human performance attribute of the Occupational Radiation Safety cornerstone and adversely affected the cornerstone objective of ensuring adequate protection of employee health and safety. Specifically, the failure to verify control room operators respiratory protection could result in unintended dose consequence to control room operators. This example was evaluated using IMC 0609, Attachment 0609.04, and Appendix C, "Occupational Radiation Safety Significance Determination Process," dated August 19, 2008. The team determined that the finding was of very low safety significance (Green) because it was not an as-low-as-reasonably-achievable (ALARA) issue, there was no overexposure or substantial potential for an overexposure, and the ability to assess dose was not compromised.

These examples had a human performance cross-cutting aspect of Conservative Bias because ANO failed to ensure that individuals used decision making-practices that emphasized prudent choices over those that were simply allowable. Specifically, individuals performing evaluations rationalized assumptions rather than verifying the actual conditions [H.14].

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance, it is identified as: FIN 05000313/2016007-03 and 05000368/2016007-03, "Inadequate Operating Experience Evaluations."

7.4 Inadequate Control of Monitoring for Wall Loss in the Service Water System

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," because ANO failed to implement the MIC Monitoring Program in a controlled manner that would monitor for pipe wall loss in the SW System. Specifically, the team identified that ANO had not maintained representative monitoring points and did not monitor pipe wall thickness frequently enough to prevent through-wall leaks.

Description: The team reviewed ANO's MIC procedures for monitoring for pipe wall loss in the SW system and identified several deficiencies in the program. Quality-related engineering

report A-EP-2005-001, "ANO Microbiological Influenced Corrosion Program," stated that the objective of this program was to maintain the structural integrity of the monitored piping and that the program would not ensure that pinhole leaks at localized pits were avoided. The ANO MIC Program database was the primary tool used to monitor and establish the re-inspection intervals. This database included pipe wall thickness readings and determined the margins available until a pipe segment wall thickness degraded below the minimum allowed by the design ASME Code. The MIC Program database tracked pipe wall thickness data measurements for 88 pipe segments (e.g., segment = 1 foot length of pipe selected as a monitoring point) in the Unit 1 and Unit 2 SW systems.

The team identified several errors in the licensee's implementation of the MIC Program that affected SW system pipe thickness monitoring, and could result in a corrosion-induced SW system piping failure. For example:

- A maximum time limit between wall thickness inspections was not established. Consequently, some monitored points had not been re-examined for wall thickness in more than 18 years.

- ANO did not relocate or re-evaluate the monitored points after replacing pipe. Therefore, ANO monitored newly replaced pipe segments that did not represent the original pipe segments still in service with respect to pipe thickness or corrosion rate.

- ANO removed monitored points from the MIC Program database for pipe segments that were replaced with stainless steel without selection of an alternate (e.g., adjacent) carbon steel monitoring point.

- For the SW to EFW pipe segments, ANO selected only one monitoring point. Based upon guidance in engineering report A-EP-2005-001, this segment represented a higher risk pipe segment and required more than one monitoring point. Specifically, this pipe segment was normally isolated and stagnant, which created more aggressive environment for corrosion- induced pipe wall loss, meeting the definition for Risk Category 1.

The team did not identify a loss of structural integrity in any SW system pipe caused by these errors and therefore did not have an operability concern.

Analysis: The failure to implement the Microbiologically Influenced Corrosion Monitoring Program was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone objective and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to monitor SW system pipe locations for MIC could result in a loss of pipe structural integrity resulting in the loss of a SW train and adversely affecting safety-related equipment. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating SSC, but the SSC maintained its operability. This finding had a human performance cross-cutting aspect of Conservative Bias because ANO failed to ensure that individuals used decision making practices that emphasized prudent choices over those that were simply allowed.

Specifically, the MIC Program Database contained errors related to non-conservative decisions regarding the impact of monitoring points following pipe replacement and limiting the maximum time between monitoring for wall loss [H.14].

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, or drawings, of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, or drawings. Procedure EN-DC-184, "NRC Generic Letter 89-13 Service Water Program," Revision 3, a procedure affecting quality, Section 5.03.b, "SW Program Goals," requires, in part, that "The SW Program activities must ensure that degradation due to mud, silt, MIC, general corrosion, erosion, protective coating failure, and macroscopic biological fouling species is identified, trended, and managed in a controlled fashion."

Contrary to the above, as of February 26, 2016, the Service Water Program did not ensure that degradation due to MIC and general corrosion was identified, trended, and managed in a controlled fashion. Specifically, the MIC Program database, which was used to identify monitoring locations, schedule inspections, and trend and manage degradation was deficient in that ANO: failed to define the maximum time limit between wall thickness inspections to ensure allowable wall thickness was maintained; failed to reassign monitoring locations after susceptible pipe was replaced with non-susceptible pipe; and failed to assign the required number of monitored points to higher risk pipe segments. ANO's corrective actions included performing an operability determination and concluding that the SW system was operable, documenting these errors in implementation of the MIC Program database in the CAP, and was evaluating corrective actions. Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-C-2016-00435, CR-ANO-C-2016-00524 and CR-ANO-C-2016-00546, this violation is being treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-04 and 05000368/2016007-04, "Inadequate Control of Monitoring for Wall Loss in the Service Water System."

7.5 Failure to Include Unit 2 Service Water Pump Supports in the ASME Code Section XI Inservice Inspection Program

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR 50.55a(g)(4) for ANO's failure to inspect Unit 2 SW pump supports in accordance with the ASME Code Section XI. Specifically, ANO failed to include Unit 2 SW pump supports in the ISI Program and consequently, had not completed a visual VT-3 examination to monitor for degradation.

Description: The team reviewed the procedures and database used to implement ANO's ASME Code Section XI ISI Program and identified that the Unit 2 SW pump lateral supports installed in 1991 were not included within the scope of the program as required by ASME Code Section XI, TABLE IWF-2500-1, Examination Categories, Category F-A, Supports - Item F1.40, "Supports Other Than Piping Supports." Consequently, a visual VT-3 examination of these supports had not been performed since initial installation.

The ASME Code Section XI, Article IWA-2213 describes a VT-3 as a visual examination conducted to determine the general mechanical and structural condition of components and their supports by verifying parameters such as clearances, settings, and physical displacements to detect discontinuities and imperfections (e.g. loss of integrity at bolted or welded connections, loose or missing parts, debris, corrosion, wear, or erosion); and to detect conditions that could

affect operability or functional adequacy of snubbers and constant load and spring-type supports. This code article identifies the examination quality standards and personnel qualification requirements to conduct a visual VT-3 examination.

In 1991, ANO installed lateral supports on the Unit 2 SW pump suction columns within the SW bays in accordance with DCP-90-2032 and performed a preservice VT-3 examination as required by ASME Code Section XI. The ASME Code Section XI also required at least one of the three pumps' supports to be VT-3 examined inservice during each Code Interval (10 year period). The team identified that ANO did not include these pump supports in the scope of the ASME Code Section XI ISI Program, and consequently the VT-3 examination of these supports did not occur during the third Code ISI Interval which ended on March 25, 2010. Because these supports were made of carbon steel and are located inside the SW bays, the humidity levels would tend to create a corrosive environment. The team reviewed pictures taken inside the Unit 2 Service Water A and C bays during a cleaning activity that occurred in October 2015. Based upon the limited views of the supports in these pictures, ANO concluded and the team agreed there was observed corrosion, but did not identify deficiencies (such as excessive gaps or missing hardware) that would indicate the supports were not operable.

Analysis: The failure to inspect the Unit 2 SW pump supports in accordance with the ASME Code Section XI was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the design control attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to periodically inspect the pump supports could result in the failure to identify a nonfunctional support that would increase the risk of a pump failure. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating SSC, but the SSC maintained its operability. The team did not identify a cross-cutting aspect for this finding because the cause of this performance deficiency was not reflective of current performance.

Enforcement: Title 10 CFR Part 50.55a(g)(4), "Inservice Inspection Standards Requirement for Operating Plants," requires that, "Throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements…set forth in Section XI of editions and addenda of the ASME Boiler and Pressure Vessel Code…that become effective subsequent to editions specified in paragraphs (g)(2)…" ASME Code Section XI, TABLE IWF-2500-1 Examination Categories, Category F-A, Supports - Item F1.40, "Supports Other Than Piping Supports," identifies that a visual VT-3 examination is required during each inspection interval.

Contrary to the above, from March 25, 2000, through March 25, 2010 (3rd ASME Section XI Code Interval), for the safety-related Unit 2 SW pump lateral supports (classified as ASME Code Section XI Class 3), ANO failed to complete a visual VT-3 examination as required during the third inspection interval. ANO's corrective actions included incorporating the supports into the Unit 2 ISI program, performing an immediate operability determination, and assigning a corrective action to determine the past operability for the prior ISI interval. Because this finding is of very low safety significance, and has been documented in the CAP as CR-ANO-2-2016-00361 and CR-ANO-2-2016-00421, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000368/2016007–05,

"Failure to Include Unit 2 Service Water Pump Supports in the ASME Code Section XI Inservice Inspection Program."

7.6 Failure to Correct Degraded Unit 2 Train B Emergency Diesel Generator Heat Exchangers Service Water Flow and Degraded Unit 1 Containment Coatings

Introduction: The team identified two examples of a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," for ANO's failure to correct conditions adverse to quality. Specifically, ANO failed to correct long term degraded SW flow to the Unit 2 safety-related B train EDG heat exchangers, and Unit 1 reactor containment building coatings.

Description:

First example. On October 12, 2006, ANO reduced the required design SW flow to the Unit 2 EDG heat exchangers by reducing the available flow margin. Each EDG has three heat exchangers cooled by an associated train of SW: the air cooler, the lube oil cooler, and the jacket water cooler.

ANO implemented a change to reduce the minimum flow rate due to difficulty maintaining SW flow to the EDG heat exchangers at design flow rates, as documented in engineering request ER-ANO-2005-0149-004. In 2006, ANO identified that corrosion of the carbon steel piping, system configuration, and emergency cooling pond design requirements were all contributing to the unit's low SW flow margin. Corrective and preventive maintenance, including chemical cleaning, hydro lancing, and limited piping replacements had not restored design flow rates. Consequently, ANO concluded that replacing the carbon steel piping with stainless steel would restore the design; however, ANO did not promptly implement this corrective action.

As early as 2003, ANO reduced the required design SW flow to the Unit 2 shutdown cooling heat exchangers (SDC HXs) to increase flow to the EDG heat exchangers. The SDC HXs are safety-related heat exchangers cooled by SW to remove decay heat during shutdown as well as to mitigate design basis events. The SDC HXs are the largest load on SW and are configured in parallel to the EDG heat exchangers, so reducing flow to the SDC HXs was used to increase flow to the EDG heat exchangers. Currently, ANO continues to reduce the safety-related SDC HX flow to maintain acceptable EDG flow on the B train.

ANO implemented performance monitoring in accordance with procedure EN-DC-159, "Component and System Monitoring." A performance monitoring action level is, "[a] parameter value which, when reached, indicates that preventive or corrective maintenance is required." These values were established in each component or system performance monitoring plan. For a safety-related component or system, performance beyond an action level constitutes a condition adverse to quality.

The team identified that SW system performance monitoring has documented SW flows to the EDG heat exchangers which exceeded the designated action level since 2008. Recognizing that past PM did not correct the condition, ANO replaced some train A service water carbon steel piping with stainless steel piping in 2015. This improved the train A service water header flows and restored the design flow to the train A EDG heat exchangers. ANO disapproved funding for similar piping replacements to the B train. Therefore, since April 10, 2008, train B service water flows have remained beyond the component and system monitoring program action level.

Second example. On February 2-3, 2016, the team conducted extensive walkdowns and visual inspections of accessible areas inside the Unit 1 and 2 reactor containment building while the units were operating at 100 percent power. The team focused on containment liner and component coatings, piping insulation, and loose or potentially transportable debris. The team selected the Unit 1 ECCS containment sump as a sample because during the January 2015 refueling outage, ANO identified new containment coating deficiencies that were determined to exceed the available coatings debris margin.

ANO documented the evaluation in CR-ANO-1-2015-0861. ANO concluded the primary contributor to reduced sump screen margin was uncoated carbon steel inside containment. Procedure OP 5000.025 was used to determine the amount of corrosion particulate debris that can be generated due to the uncoated carbon steel during a design basis accident. Although some degraded coatings were repaired during the outage, no net increase in margin resulted because new uncoated carbon steel was identified.

ANO determined the ECCS sump screen debris margin had been exceeded based on the 2015 outage inspection results for degraded coatings. To address this condition, ANO revised the calculational method and conducted more precise field measurements of uncoated carbon steel surfaces to determine reasonable and bounding estimates. The revised information was documented in Engineering Change EC-55658 and ANO concluded that the containment sump screen remained operable and the sump screen debris margin was slightly positive. The team reviewed ANO's revised calculational method and completed evaluations and agreed that ANO provided a conservative debris estimate.

The team noted that for over 10 years, ANO had not taken corrective action to resolve degraded coatings inside both containment buildings. ANO had allowed the problem to grow until a substantial reduction in ECCS sump screen margin had occurred (margin was reduced during each of the last several outages), and then adopted a new analysis method to justify starting up at the end of an outage with a degraded condition rather than resolving degraded coatings issues in a timely manner. ANO scheduled corrective actions for restoring containment coatings during the next outage.

Analysis: The failure to correct conditions adverse to quality associated with Unit 2 SW flow to the B EDG heat exchangers and the Unit 1 reactor containment building coatings was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to correct long term degraded: 1) SW flow beyond the action limit in accordance with procedure EN-DC-159 to the B EDG heat exchangers, which challenged the capability of EDG response to design basis events; and 2) containment coatings, which challenged the Unit 1 emergency core cooling system capacity. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2, "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of mitigating SSCs, but the SSCs maintained operability. This finding had a human performance cross-cutting aspect of Design Margins because ANO failed to place special attention on maintaining margins in safety-related equipment. Specifically ANO has repeatedly: 1) throttled SW flow away from the safety-related SDC HXs, reducing the shutdown cooling design margins to maintain minimally acceptable flow to the EDG heat exchangers since 2008; and 2) reduced the

available containment sump margin rather than correct containment coating deficiencies [H.6]. (Section 7.6)

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XVI, "Corrective Action," requires, in part, that measures shall be established to assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances are promptly identified and corrected.

Contrary to the above, from 2008 to February 25, 2016, ANO did not assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances were promptly identified and corrected. Specifically, ANO failed to promptly correct a longstanding and continuing trend in degraded SW flow rates to the Unit 2 EDG B heat exchangers.

Also contrary to the above, since 2009, ANO did not assure that conditions adverse to quality, such as failures, malfunctions, deficiencies, deviations, defective material and equipment, and non-conformances were promptly identified and corrected. Specifically, ANO failed to promptly correct a longstanding and continuing trend in degraded Unit 1 containment coatings to restore ECCS sump margin.

ANO's corrective actions included performing an operability determination and concluding that the SW system and Unit 1 containment sump were operable. Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-C-2016-00946 and CR-ANO-1-2015-00200, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-06 and 05000368/2016007-06, "Failure to Correct Degraded Unit 2 Train B Emergency Diesel Generator Heat Exchangers Service Water Flow and Degraded Unit 1 Containment Coatings."

7.7 Failure to Maintain Service Water Design Cooling to the Unit 2 High Pressure Safety Injection Pump Seal and Bearing Coolers

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for ANO's failure to assure that the design basis SW cooling flow for the Unit 2 high pressure safety injection (HPSI) pump bearing and seal coolers was correctly translated into operating and surveillance procedures. Specifically, the HPSI pump surveillance and operating procedures were inadequate to monitor for or correct degraded SW flow to the pump seal and bearing coolers.

Description: The team reviewed ANO's procedures established to monitor for degraded flow in the SW system to evaluate compliance with the station's commitments made in response to GL 89-13, "Service Water Problems Affecting Safety-Related Equipment." The team identified that ANO had not established an adequate analysis to ensure that the Unit 2 HPSI pumps would operate for accident mitigation without SW flow to the seal and bearing coolers. The team identified that ANO had not established a scheduled frequency for disassembly and inspection of the pump seal and bearing coolers. Instead, ANO waited until indications of flow blockage were identified in the SW lines prior to initiating corrective actions.

During 2015, HPSI pump 2P89A remained in service with reduced SW flow to the pump bearing and seal coolers (2E-53A and 2E-53D). On April 13, 2015, ANO identified that the differential pressure gage for 2P89A HPSI seal cooler SW inlet strainer was indicating 25 psid, the maximum indicated value on the gage. This condition was documented in CR-ANO-2-2015-

00797 and was closed to a work request. This work request was not implemented, and on July 6, 2015, ANO again identified that the differential pressure gage was reading at the maximum indicated value. ANO documented this condition in CR-ANO-2-2015-01826, and closed it to a new work request. For each of these conditions, ANO concluded that the SW inlet strainer was plugged and needed to be cleaned. ANO did not consider having this filter clogged to be a degraded or nonconforming condition because Procedure OP 2104.039, "HPSI System Operation," contained a precaution that allowed pump operation without SW cooling. Specifically, Precaution 5.4 stated that an evaluation of HPSI pump operability without SW cooling was submitted to the NRC and concluded that loss of SW cooling during an accident would not cause bearing or seal failure. The team reviewed the submittal and determined that it was not part of a license amendment and the NRC did not approve a change to flow rate. Similarly, in procedure OP 2311.02, "Service Water System Flow Test," ANO identified that flow readings may be omitted as directed by the system engineer since zero flow is allowable. However, drawing M-2250, Sheet 1, specified the required SW flow to the HPSI seal coolers as 20 gpm per pump or pair of coolers.

On December 16, 1993, ANO approved Revision 31 to procedure OP 2104.039 which incorporated a precaution to allow operation of HPSI pumps without SW seal or bearing cooling based on report ANO-81-2-0722, "Evaluation of ANO - Unit 2 HPSI Operability Without Service Water Cooling." This report described low flow rates observed during a September 1980 outage which were caused by silt and corrosion products that plugged the SW lines and resulted in little or no cooling water flow for pump seal and bearing cooling. The report documented a test performed on each of the three Unit 2 HPSI pumps with SW flow secured to the bearing and seal coolers. Based upon this testing, ANO concluded that the HPSI pumps could have accomplished their accident function without SW flow through the pump coolers.

The team reviewed report ANO-81-2-0722 and identified that the test results did not support a change in the HPSI pump operating or surveillance procedures because the report lacked design margins necessary to ensure reliable pump operation for accident mitigation. ANO documented the team's concerns in CR-ANO-2-2016-01132, examples of which include ANO's use of non-conservative temperature values; not accounting for the uncertainty in the test instruments, test methodology, test lineup/configuration, and thrust loads; and not quantifying the heat loss from the bearings through the metal pump shaft due to the use of low temperature source water from the refueling water storage tank during the test.

In 1999, ANO issued report ER 974487 E201, "Isolation of SWS Cooling for HPSI Pumps," which replaced report ANO-81-2-0722 and updated the result using higher room temperatures, sump fluid temperature, and bearing temperatures than were evaluated in the 1981 test. However, report ER 974487 E201 still concluded that zero flow to the pump bearing and seal coolers was acceptable because the pump bearing oil specifications were revised to include use of a higher temperature lubricant (e.g., synthetic oil). ANO continued to rely on report ANO-81-2-0722 tests as supplemented by correspondence (memorandum or letters) from the pump vendor or lubricant vendor. However, they did not calculate a bounding temperature for the pump bearings or seals under accident conditions or determine design margins necessary to supplement the 1981 pump tests. Further, the vendor letters did not include data or test results to resolve the lack of design margins in the original pump tests. For example, ANO did not evaluate the capability of the vendor's synthetic oil to provide lubrication under a bounding maximum bearing temperature, and the team noted a six-fold decrease in viscosity of the selected lubricant from room temperature to 212°F, which may adversely impact bearing life. ANO did not validate the seal vendor's assumption that the pump seal would continue to operate for the short duration at elevated temperatures based upon the vendor's "flush lineup,"

which the vendor assumed would be similar to the accident mitigation operating conditions. ANO concluded that based on the November 2015 surveillance test data that recorded flow values above 20 gpm, the pumps were operable.

Analysis: The failure to incorporate the design basis SW cooling flow for the Unit 2 HPSI pump coolers into the operating and surveillance procedures was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the design control attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to incorporate the design basis SW cooling flow into the operating and surveillance procedures could result in the failure of the HPSI pumps during accident mitigation. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating SSC, but the SSC maintained its operability. The team did not identify a cross-cutting aspect for this issue because the cause of this performance deficiency was not reflective of current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, from December 16, 1993, to February 25, 2016, for the safety-related Unit 2 HPSI pump seal and bearing coolers, to which 10 CFR Part 50, Appendix B applies, ANO failed to assure that applicable regulatory requirements and the design basis, as specified in the license application, were correctly translated into specifications, drawings, procedures, and instructions. Specifically, ANO failed to ensure that the design minimum SW flow rate was correctly translated into procedures OP 2104.039 and OP 2311.02. ANO's corrective actions included performing an immediate operability determination and concluding the pumps were operable based on the November 2015 surveillance flow tests, requesting a prompt operability determination, and scheduling inspection of the seal and bearing coolers. Because this finding is of very low safety significance, and has been documented in the CAP as CR-ANO-2-2016-00672 and CR-ANO-2-2016-00674, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000368/2016007-07, "Failure to Maintain Service Water Design Cooling to the Unit 2 High Pressure Safety Injection Pump Seal and Bearing Coolers."

7.8 Inadequate Flow Monitoring of Unit 2 Service Water to Emergency Feedwater Pump Suction Supply

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for ANO's failure to establish a test program for the Unit 2 SW supply to the EFW pump suction.

Description: The team reviewed ANO's procedures to implement NRC GL 89-13, "Service Water System Problems Affecting Safety-Related Equipment," and ANO's Service Water Program for monitoring of flow blockage caused by biofouling. Procedure EN-DC-184 defined biofouling as marine growth that adversely affects cooling water systems, categorized as

microfouling (slime) that degrades heat transfer surface effectiveness, and macrofouling (e.g., mussels, barnacles, asiatic clams) that can restrict pipe flow or block heat exchanger tubes. This procedure stated that SW flushing and flow testing surveillance methods are used to help ensure flow blockages from biofouling do not form within infrequently used (standby or intermittent) flow paths. Specifically, Attachment 9.2, "Service Water Program Element Details," Step 2 stated "a SW flushing and flow testing program element shall be established to define the test and surveillance methods used to help ensure flow blockages do not form within infrequently used (standby or intermittent) flow paths."

The team identified that ANO had not established a surveillance procedure to monitor for biofouling induced flow loss in the two normally-isolated Unit 2 SW supply lines to EFW pump suction lines. The team was concerned that lack of periodic monitoring and trending of flow through these lines could result in biofouling induced flow blockage that results in insufficient SW flow to the EFW pumps for accident mitigation.

EPRI technical report TR-101541 "Electric Utility Service Water System Reliability Improvement," discussed that biofouling-induced flow blockage occurs when the chemicals added to the SW system to mitigate biological buildup are not effective for stagnant/isolated dead leg branch connections. For Unit 1, the SW supply lines to the EFW pumps are normally isolated, drained, and vented to preclude biofouling. For Unit 2, the SW supply lines (2HCC-2003-6" and 2HCC-2004-6") to the EFW pumps are stagnant, as a result, biofouling-induced flow blockage would occur and could challenge the ability of these lines to pass the minimum required flow rate to support the EFW pumps for accident mitigation.

ANO performed flushes of the SW supply lines to the Unit 2 EFW pumps every 18 months in accordance with procedure OP 2305.020, "Service Water to EFW System Flush and Motor Operated Valve Differential Pressure Tests." For this flush, ANO installs temporary flowmeters and a hose connected to a blank-flange at the end of the SW pipe run to the EFW pumps. The purpose of this flush was to demonstrate full flow (open) stroke test for the check valves installed in these lines and not to confirm or trend flow rates to identify potential blockage. The team noted that the procedure was not adequate to monitor the SW lines for biofouling-induced flow loss because of inadequate acceptance criteria and an uncontrolled test configuration. Specifically:

- The acceptance criteria for the flush flow rate is 550 gpm, which is below the UFSAR design value of 615 gpm. Therefore, the test results would not assure the identification of a degraded/non-conforming flow condition.

- The measured data could not be trended due to the large variation in flow rates (560 – 1348 gpm) recorded over the past 10 years. The large variation in flow rates was attributed to the changes in SW system demands elsewhere in the system, pump available net positive suction head, and/or differences in temporary hose routing. Therefore, the test did not provide a consistent/stable configuration necessary to support trending of flow data.

The team confirmed the latest check valve test alignment could be used to compare the measured flow rate against the required flow rate and that the flow rate exceeded the UFSAR values required for the EFW pumps with additional margin (greater than 1000 gpm).

Analysis: The failure to establish a test program for the Unit 2 SW to EFW pump suction supply line was a performance deficiency. The performance deficiency was more than minor because,

it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to monitor the flow through the Unit 2 SW to EFW pump suction supply line could result in the failure to promptly detect the loss of adequate flow rate to support EFW pumps for accident mitigation. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating SSC, but the SSC maintained its operability. The team did not identify a cross-cutting aspect for this finding because the error that caused this deficiency occurred during scoping of the Unit 2 SW lines to meet NRC GL 89-13 commitments, which occurred more than three years ago and was not reflective of current performance.

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents.

Contrary to the above, prior to February 18, 2016, for the two safety-related Unit 2 SW lines, 2HCC-2003-6" and 2HCC-2004-6", to which 10 CFR Part 50, Appendix B, applies, ANO failed to establish a test program to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Specifically, ANO failed to periodically verify the minimum SW flow rate was available to the EFW system. ANO's corrective actions included performing an operability determination and determining that the last performance of the check valve test procedure in 2015 documented a flow rate greater than the UFSAR required value, and was evaluating the lack of a surveillance test program for monitoring flow rate loss in these lines. Because this finding is of very low safety significance, and has been documented in the CAP as CR-ANO-2-2016-00670, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000368/2016007–08, "Inadequate Flow Monitoring of Unit 2 Service Water to Emergency Feedwater Pump Suction Supply."

7.9 Emergency Feedwater Pump Casing Wall Loss Not Monitored

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," for ANO's failure to establish a test program for monitoring the Unit 1 EFW pumps casing wall thickness loss to demonstrate that the pumps would remain satisfactory for service.

Description: The team reviewed ANO's procedures for implementing the EFW system inspections in support of the Wall Thinning Aging Management Program. The Unit 1 UFSAR Chapter 16.1.7, "Wall Thinning Inspection," described an AMP designed to manage the aging effect from a loss of material due to corrosion of the internal surfaces of carbon steel piping and components by monitoring a sample of safety-related components for wall thinning. ANO implemented these requirements using with Procedure SEP-WTI-ANO-001, "Wall Thinning Inspection (WTI) Program," which stated:

Wall thinning inspections are performed to ensure pipe/component wall thicknesses remain above the minimum required wall thickness in order to avoid leaks or failures under normal conditions and postulated transient and accident conditions, including seismic events. Wall thinning inspections are similar in nature to FAC inspections. Currently these inspections are performed by the same personnel that are inspecting and evaluating FAC components and may share similar processes.

The scope of the Wall Thinning Aging Management Program included the EFW pumps casing and carbon steel discharge piping and valves, steam supply components downstream of steam admission valves, and steam exhaust piping. The team noted that the scope of procedure SEP-WTI-ANO-001 did not include wall thickness measurements of the EFW pumps casings.

In calculation CALC-ANO1-ME-11-00027, "Review of the Wall Thinning Inspection Aging Management Program for License Renewal Implementation," ANO stated, "Emergency feedwater pump casing and carbon steel discharge piping and valves: Pump casing visual inspections per OP 1402.009 when disassembled for rotating element removal, no wall thickness measurements." The team identified that procedure OP 1402.009 lacked guidance to provide for monitoring pump casing wall loss. Specifically:

- No guidance was included on how minimum wall thickness would be determined, correlated, tracked, or trended based upon the results of an internal visual examination.

- No quality standard for the visual examination (e.g., ASME Code Section XI, VT-1 or VT-3) was specified, nor was there a qualification standard for personnel conducting the internal visual examination.

- A minimum frequency for conducting the internal visual examination was not defined nor had the licensee completed an analysis to determine the maximum acceptable period between visual examinations.

The team did not observe leakage from the Unit 1 EFW pumps casings and ANO reported that the most recent pump surveillance tests were completed satisfactorily. Therefore the team did not have an operability concern.

Analysis: The failure to establish a test program for monitoring the Unit 1 EFW pumps casing wall thickness loss was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to monitor the Unit 1 EFW pumps casing wall thickness could result in a corrosion- or erosion-induced pump casing failure. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating SSC, but the SSC maintained its operability. This finding had a human performance cross-cutting aspect of Work Management for failing to implement a process of planning, controlling, and executing work activities such that nuclear safety is an overriding priority. Specifically, ANO entered the period of extended operation in May 2014 and had not established a surveillance procedure to monitor the corrosion induced wall loss of the two pump casings. [H.5]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents.

Contrary to the above, from May 21, 2014 through February 25, 2016, for the safety-related Unit 1 EFW pumps casings, to which 10 CFR Part 50, Appendix B, applies, ANO failed to establish a test program to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Specifically, ANO failed to have adequate procedures for monitoring of the corrosion induced wall loss of the EFW pumps casings to demonstrate these components would perform satisfactorily in service. ANO's corrective actions included performing an immediate operability determination and determining the pumps were operable. Because this finding is of very low safety significance, and has been documented in the CAP as CR-ANO-1-2016-00606, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-09, "Emergency Feedwater Pump Casing Wall Loss Not Monitored."

7.10 Failure to Develop an Operability Decision-Making Issue for Degraded Condition on Safety Injection Tank

Introduction: The team identified a Green finding for ANO's failure to create an ODMI document per procedure EN-OP-111, "Operability Decision-Making Issue Process." Specifically, ANO failed to evaluate the plant impact and operational challenges associated with a leaking safety injection check valve bonnet.

Description: On November 12, 2015, during a Unit 2 refueling outage, ANO performed work order WO-349489-07 to hot-torque SIT check valve 2SI-13D, which is part of the safety-related high pressure safety injection system. After ANO performed maintenance, the valve leaked 6 drops per minute at the bonnet, documented in CR-ANO-2-2015-04756. ANO initiated a boric acid evaluation in accordance with procedure EN-DC-319, "Boric Acid Corrosion Control Program," to evaluate the acceptability of the leak until the next outage; because component monitoring was considered impractical, and repairs would not be performed prior to outage completion. ANO concluded in evaluation EC 61455 that the leak rate on valve 2SI-13D was not expected to increase over the cycle.

The Purpose Section and Section 5.3[1] of procedure EN-OP-111 required, in part, creation of an ODMI to determine the operational significance and consider potential consequences of the continuing leak, such as operational challenges and equipment issues that might deteriorate further and force a unit into an unplanned plant shutdown or forced outage.

Leakage from valve 2SI-13D slowly increased from the initial 6 drops per minute rate. On February 3, 2016, the team entered Unit 2 containment and noted the leakage had increased to 100 drops per minute and was cascading down through the grating to the containment sump area. By February 12, 2016, the leakage had increased to 23 gallons per day. ANO initiated a Precursor ODMI on February 18, 2016, which established an action threshold of 96 gallons per day. Later on February 18, 2016, the leakage increased to 110 gallons per day. At this rate Unit 2 operators were filling the 2T-2D SIT every shift to compensate for the increased valve 2SI-13D leakage.

A Precursor ODMI is used to address degraded conditions that fall below the scope of the ODMI process, but which the shift manager determines require further evaluation beyond that provided by the work management system and the CAP. A precursor ODMI does not require the same level of rigor or review as an ODMI. All precursor ODMIs have three decision options, 1) close precursor ODMI to the existing Work Request, 2) invoke compensatory measures and/or contingency actions as required, or 3) initiate the ODMI process per procedure EN-OP-111. ANO chose option 2, to continue with the compensatory measures to monitor and refill the 2T-2D SIT as a result of the leakage past valve 2SI-13D. Contrary to procedure EN-OP-111 an ODMI was not developed to determine the operational significance and consider potential consequences of the continuing leak.

By February 22, 2016, check valve 2SI-13D leakage had increased to over 200 gallons per day. ANO decided to commence an unplanned shut down of Unit 2 to repair the check valve. ANO initiated CR-ANO-2-2016-00546 to document valve 2SI-13D leakage and operational response issues, CR-ANO-C-2016-0948 to document the failure to develop an ODMI and untimeliness of the precursor ODMI, and CR-ANO-C-2016-01348 to document potential programmatic weaknesses.

Analysis: The failure to establish ODMI guidance per procedure EN-OP-111 to address SIT check valve 2SI-13D leakage was a performance deficiency. The performance deficiency was more than minor because it was associated with the equipment reliability attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the leak became an operational challenge, in that, operators were filling the SIT for the majority of each shift. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time, and did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic, flooding, or severe weather initiating event. This finding had a problem identification and resolution cross-cutting aspect of Self-Assessment because ANO has not conducted self-critical and objective effectiveness reviews of its implementation of the ODMI program. Specifically, ANO did not reevaluate the decisions and compensatory actions when the leak grew in magnitude [P.6].

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance, it is identified as: FIN 05000368/2016007-10, "Failure to Develop an Operability Decision-Making Issue for Degraded Condition on Safety Injection Tank."

7.11 Pressurizer Block Valve Not Installed in the Qualified Environmental Configuration

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR 50.49(f) for ANO's failure to ensure that a Unit 1 pressurizer block valve was installed in the qualified configuration. Specifically, the safety-related motor operated block valve was installed with the limit switch compartment (LSC) facing downward.

Description: On January 25, 2016, during a review of photographs taken from a containment walkdown in Unit 1, the team identified the LSC for the safety-related Unit 1 pressurizer motor operated block valve CV-1000 was facing downward and did not have T-drains installed. This

orientation was different from the qualified configuration with the LSC vertically up. ANO did not have an analysis to demonstrate the acceptability of the installed configuration, and this configuration has likely existed since original installation.

Title 10 CFR Part 50.49(f) requires that each item of electrical equipment important to safety be qualified via testing and/or supporting analysis. The team reviewed the Limitorque Environmental Qualification test reports and noted that Limitorque valves were tested with the LSC vertically up with T-drains installed on the motor to equalize pressure and to vent the condensation resulting from the gradual cooling following a high energy line break. The team noted the Limitorque reports showed that the external environment (e.g., steam) entered the actuator in all the tests performed, and that condensate accumulation in the LSC would potentially affect operability when terminal blocks, switches, uninsulated wiring, or other electrical devices became submerged. Limitorque indicated that when external sources of significant amounts of water enter the LSC (e.g., via drainage through long vertically oriented conduit runs), it may be advantageous to provide LSC drains or minimize the potential for accumulation of water in the LSC.

The team was concerned that since the LSC for valve CV-1000 was installed at the lowest point in the actuator assembly and does not have a T-drain, water may enter the LSC during a design basis accident and important electric components may become submerged. ANO could not provide a test or analysis to demonstrate that the existing configuration was acceptable. The team noted that the installed configuration increased the possibility that grease could leak into the LSC due to the increased temperature caused by a design basis accident. The leakage of grease or accumulation of condensation could cause limit switches to fail, cause electrical shorts or lead to erratic operation. Environmental Qualification Data Record Summary Sheet A013, Revision 5, for valve CV-1000 did not specify a T-drain for the LSC. ANO performed an operability determination to address the concerns raised by the team. The team reviewed the evaluation and determined that ANO addressed water condensation, water spray, and grease migration.

In 1993, Unit 1 experienced an issue where the EFW pump turbine steam admission valve actuator (CV-2663) filled with water due to condensation from a steam leak. At the time, a detailed engineering analysis determined the turbine had been inoperable for a period of 21 hours. ANO committed to install T-drains in the LSC of steam admission valves CV-2663 and CV-2613, and that all Limitorque operators in the valve testing program within Units 1 and 2 would be evaluated to determine if additional T-drains were needed in the LSC (CR-1-93-0048). This was a commitment to the NRC documented in LIR 93-175 and is referenced in procedure OP 1412.001, “Preventive Maintenance of Limitorque SB/SMB Motor Operators,” Section 4.2.1. Corrective actions to add T-drains did not include valve CV-1000.

In 1996, ANO evaluated NRC IN 92-59, “Horizontally-Installed Motor-Operated Gate Valves,” as documented in PIE-92-0201-B, and determined that 16 safety-related motor operated valve (MOV) gate valves were installed in a non-vertical orientation, 11 in Unit 1, and five in Unit 2. However, the evaluation did not include valve CV-1000. This notice stated that MOVs in horizontal positions may be especially susceptible to performance problems. For example, if the LSC is at the lowest point, grease leaking into the compartment from the gear case may affect MOV operation or increase the difficulty of maintenance. The team noted recent OE was available for ANO to evaluate for applicability. Specifically, industry experience has shown that MOVs with the LSC at lowest point has resulted in a failure at Susquehanna during normal plant operation due to grease migration (NCV 05000387, 388/2001006-01); a failure at Oconee (NCV

05000269, 270, 287/2010004-03); and water intrusion via the electrical conduits at Sequoyah (LER 05000327/2013003) and Braidwood (LER 050000456/2009002).

For valve CV-1000, ANO performed an inspection and PM every 18 months per procedure OP 1412.001. The team reviewed the last three completed inspections (2011, 2013 and 2015), and verified the LSC inspection did not show indication of grease migration during normal plant operating temperatures. The team reviewed the last three completed quarterly valve stroke tests and verified the valve was operating properly. However, because the postulated accident condition temperature (285 °F to 330 °F) is much higher than normal operating temperatures (160 °F) the team was concerned that ANO had not provided justification for why the current installation was capable of performing its intended safety function under accident conditions.

In response, ANO updated the operability determination to include information on the temperature difference and grease migration. Each of the inspections documented that valve CV-1000 was using qualified MOV Long Life (MOVLL) grease. ANO Engineering Request ER-ANO-2003-0258-001 provided a review of the documentation supporting the use of MOVLL grease including Limitorque Tech Update 02-01 (ANO DOCNO V-33-079) which specifically states that MOVLL grease is a replacement grease that will not invalidate qualification. EPRI report 1003058 (ANO DOCNO V-33-077) concluded that testing identified that the MOVLL has a lower dropping point but is acceptable for use. The dropping point of the grease is the temperature at which the grease will flow out or drop through a small grease cup. It states the dropping point of MOVLL reduced to 430 °F after thermal aging and irradiation, well above the ANO maximum accident temperature for CV-1000. The team reviewed the revised operability determination and had no additional concerns.

Analysis: The failure to ensure the pressurizer motor operated block valve was in the qualified configuration was a performance deficiency. The performance deficiency was more than minor because, it was associated with the design control and equipment performance attributes of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, not being installed in the qualified configuration increased the possibility of grease leaking or accumulation of condensation into the limit switch compartment which could cause failure, electrical shorts, erratic operation when required to perform its safety-related function during a design basis accident. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – “Mitigating Systems Screening Questions.” The team determined the finding was of very low safety significance (Green) because the finding was a deficiency affecting the design or qualification of a mitigating SSC, but the SSC maintained its operability. This finding had a problem identification and resolution cross-cutting aspect of Operating Experience because ANO failed to systematically and effectively collect, evaluate, and implement relevant internal and external OE in a timely manner [P.5].

Enforcement: Title 10 CFR Part 50.49(f) requires that each item of electric equipment important to safety shall be qualified by one of the following methods:

1. Testing an identical item of equipment under identical conditions or under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

2. Testing a similar item of equipment with a supporting analysis to show that the equipment to be qualified is acceptable.

3. Experience with identical or similar equipment under similar conditions with a supporting analysis to show that the equipment to be qualified is acceptable.

4. Analysis in combination with partial type test data that supports the analytical assumptions and conclusions.

Contrary to the above, since initial construction, Unit 1 pressurizer motor operated block valve CV-1000, an item of electrical equipment that is safety-related, was not qualified by: testing under identical conditions or under similar conditions with a supporting analysis; testing a similar item with supporting analysis; experience with identical or similar equipment under similar conditions with a supporting analysis; or analysis in combination with partial test data. Specifically, the valve was installed in a configuration that did not match the qualified configuration without a supporting analysis for the installed configuration. ANO's corrective actions included performing a prompt operability determination based on the current configuration and determining it was operable, and was determining the total population of valves that have the limit switch compartments mounted facing downward and or without T-drains. Because this finding is of very low safety significance, and has been documented in the CAP as CR-ANO-C-2016-00884, this violation is being treated as an NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-11, "Pressurizer Block Valve Not Installed in the Qualified Environmental Configuration."

7.12 Failure to Perform Predictive Maintenance on Safety-Related Medium-Voltage Switchgear

Introduction: The team identified a Green finding for ANO's failure to fully implement procedure EN-DC-310, "Predictive Maintenance Program," Revision 7. Specifically, ANO failed to perform predictive maintenance thermography on medium-voltage safety-related electrical switchgear.

Description: ANO used procedure EN-DC-310 to monitor and trend the performance or functional condition of equipment and to warn of impending failure or degradation of components through the application of inspection and diagnostic-based analysis methods. The Predictive Maintenance Program required ANO to perform several types of predictive maintenance, including: vibration monitoring, oil analysis, and thermography on plant equipment included in the Predictive Maintenance Program; to review, trend, and analyze data to detect any degradation of equipment condition; and to initiate corrective actions. Procedure EN-DC-310 stated that the thermography monitoring program included monitoring of motor control centers, switchgear, high voltage transformers (unit main and auxiliary), high voltage connections and disconnects, large safety-related motors, balance of plant large motors/pumps, and medium voltage motors. The procedure expects each site to develop a predictive maintenance equipment list to be included in the program.

Through interviews and document reviews, the team identified that the predictive maintenance equipment list included the medium-voltage switchgear as components in the predictive maintenance program. However, the monitoring interval had been set to zero, indicating that predictive maintenance thermography was not being scheduled or performed. No trending of data was being performed to detect degradation of equipment condition on the switchgear. Preventive maintenance basis template, "EN- Switchgear - Medium Voltage - 1kV to 7kV," Revision 3, discussed thermography of medium voltage buses as part of a PM strategy, but had no discussion of predictive maintenance strategies or requirements.

Procedure EN-DC-310 referred to several EPRI reports and industry standards as inputs to the program, which include recommendations for periodic thermal imaging of medium-voltage electrical equipment. The team identified that ANO was performing predictive maintenance thermography on some electrical equipment, but had not included safety-related and non-safety medium voltage switchgear. ANO's corrective actions included performing an operability determination and determining that there was no impact to the performance of the switchgear, creating tasks to perform the missing thermography inspections, and documenting the issue in the CAP as CR-ANO-C-2016-00571.

Analysis: The failure to perform predictive maintenance thermography on medium-voltage safety-related electrical switchgear in accordance with procedure EN-DC-310 was a performance deficiency. The performance deficiency was more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, degradation of safety-related medium voltage switchgear could go unidentified for extended periods, reducing system reliability. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time, and did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic, flooding, or severe weather initiating event. This finding had a problem identification and resolution cross-cutting aspect of Identification because ANO did not identify issues completely, accurately, and in a timely manner. Specifically, ANO did not identify that the implementation of the Predictive Maintenance Program did not appropriately address safety-related medium-voltage switchgear as requiring periodic thermography inspections. [P.1]

Enforcement: This finding does not involve enforcement action because no violation of a regulatory requirement was identified. Because this finding does not involve a violation and is of very low safety significance, it is identified as: FIN 05000313/2016007-12 and 05000368/2016007-12, "Failure to Perform Predictive Maintenance on Safety-Related Medium-Voltage Switchgear."

7.13 Failure to Update Probabilistic Risk Assessment Model in a Timely Manner Results in Failure to Submit Complete and Accurate Information

Introduction: The team identified a Green finding for ANO's failure to update the Level 1 PRA model as required by procedure EN-DC-151, Revision 5. This finding involved a Severity Level IV non-cited violation of 10 CFR 50.9, "Completeness and Accuracy of Information," because ANO failed to submit complete and accurate PRA model maintenance information in the license amendment request for the extension of the ILRT for the Unit 1 reactor building.

Description: Procedure EN-DC-151 established requirements to ensure that ANO's PRA models represent the as-built, as-operated plant in a manner sufficient to support the applications for which they are used. One of the requirements was to perform a periodic update within four years of the previous update. ANO has not updated the internal events model for Unit 1 since July 2009 and for Unit 2 since 2008.

The internal events model for each unit is used as the basis for daily risk assessments used by work planners and operators to ensure that the risk increase due to maintenance activities is

properly assessed and managed. The team noted the risk assessments for planned and emergent maintenance activities may have been inadequate since the internal events model no longer reflected current plant conditions. An assessment of the extent of the inaccuracy of the risk assessments could not be accurately estimated because of the complexity and dependencies in the models, but the team concluded that there was a high likelihood that some daily risk assessments were not conservative.

The internal events models for each unit are also used for input to the calculation of the Mitigating Systems Performance Indicator (MSPI). These performance indicators provide input into regulatory assessment of licensee performance. The team noted that an inaccurate internal events model could cause non-conservative MSPI results. An assessment of the extent of the inaccuracy of the calculated MSPI results could not be accurately estimated because of the complexity and dependencies in the models.

Because the use of the PRA models covered more than one area, the team considered the failure to maintain the PRA models current to be a finding. One additional aspect to this condition was that the internal event models were used to support risk-informed license amendment requests. On December 20, 2013, ANO submitted license amendment request 1CAN121302, "Technical Specification Change to Extend the Type A Frequency to 15 Years." In that submittal in Section 4.5.2, "PRA Quality," ANO stated that the model was maintained in accordance with Entergy PRA procedures. The team determined that this statement was inaccurate because the Unit 1 internal events model had not been updated for approximately four and a half years.

On February 3, 2015, the NRC approved Amendment 252 for ANO Unit 1 to extend the Type A primary containment integrated leak rate frequency to 15 years (ML15014A071). In this approval, the NRC considered PRA information to inform the decision. The SER for Amendment Number 252, Section 3.4.1.1, "Technical Adequacy of the PRA," stated that, "The licensee further stated that the model is maintained in accordance with Entergy PRA procedures." After consultation with the NRC technical reviewer for this license amendment, the team determined that it was unlikely that using a more recently updated version of the PRA would increase the risk measures enough to have changed the conclusions in the safety evaluation or that any further substantial inquiry would have been required.

Analysis: The failure to perform PRA updates as required by procedure EN-DC-151 was a performance deficiency and therefore a finding. An NRC-identified violation of 10 CFR 50.9 was associated with this finding because it impacted the regulatory process in that inaccurate information was provided to the NRC that was material in making a licensing decision. Therefore, in accordance with IMC 0612, Appendix B, "Issue Screening," this issue was evaluated using both the finding and traditional enforcement processes. This violation is associated with a finding that has been evaluated by the significance determination process and communicated with a significance determination process color reflective of the safety impact of the deficient licensee performance. The significance determination process, however, does not specifically consider the regulatory process impact. Thus, although related to a common regulatory concern, it is necessary to address the violation and finding using different processes to correctly reflect both the regulatory importance of the violation and the safety significance of the associated finding.

The performance deficiency was determined to be more than minor because it was associated with the equipment performance and procedure quality attributes of the Mitigating Systems cornerstone objective and adversely affected the cornerstone objective to ensure the

availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the lack of a formal process to ensure that PRA model updates were performed as scheduled was an indication of a programmatic weakness that impacted license amendment requests, performance indicator accuracy, and daily maintenance risk evaluations for planned and emergent maintenance activities since the internal events model was not reflective of current plant conditions. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because it did not represent an actual loss of function of at least a single train for greater than its technical specification allowed outage time, and did not involve the loss or degradation of equipment or function specifically designed to mitigate a seismic, flooding, or severe weather initiating event.

Consistent with Section 6.9 of the NRC Enforcement Policy, this violation was determined to be a Severity Level IV violation because inaccurate information was provided, but it would not have likely caused the NRC to reconsider its regulatory position or undertake substantial further inquiry.

This finding had a human performance cross-cutting aspect of Resources because ANO did not ensure that sufficient personnel resources were available to perform all PRA duties, including PRA model maintenance. [H.1]

Enforcement: Title 10 CFR Part 50.9(a), "Completeness and Accuracy of Information," requires, in part, that information provided to the Commission by a licensee shall be complete and accurate in all material respects.

Section 4.5.2, "PRA Quality," of Attachment 1 to License Amendment Request 1CAN121302, "License Amendment Request, Technical Specification Change to Extend the Type A Test Frequency to 15 Years, Arkansas Nuclear One, Unit 1, Docket No. 50-313, License No. DPR-51," dated December 20, 2013, stated: "The model is maintained in accordance with Entergy PRA procedures."

Procedure EN-DC-151, Revision 5, effective November 21, 2013 was the pertinent Entergy procedure for PRA model maintenance and it stated in Section 5.5 [1]: "A periodic update should be performed at least once every four years."

Contrary to the above, on December 20, 2013, ANO failed to provide information to the Commission that was complete and accurate in all material respects. Specifically, ANO provided information to the Commission as part of License Amendment Request 1CAN121302 that was not complete and accurate in all material respects in that the Unit 1 PRA model had not been maintained in accordance with procedure EN-DC-151, since the last PRA model update was not within the required four year period. ANO's corrective actions included completing the PRA model update for Unit 1 on April 15, 2016, and for Unit 2 on February 29, 2016. This is a Severity Level IV violation consistent with Section 6.9 of the NRC Enforcement Policy. Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-C-2016-01573, this violation is being treated as a NCV consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-13, "Failure to Update Probabilistic Risk Assessment Model in a Timely Manner Results in Failure to Submit Complete and Accurate Information."

7.14 Failure to Properly Implement the Corrective Action Program

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for ANO's failure to follow CAP procedures. Specifically, the team identified a programmatic issue with the failure to implement procedure EN-LI-102-ANO-RC.

Description: The team identified multiple examples where ANO failed to correctly identify and evaluate conditions adverse to quality using the CAP CR classification process and the operability determination process. The team determined that ANO failed to classify some CRs in accordance with procedure EN-LI-102-ANO-RC. The procedure required CRs evaluated as "adverse" to be categorized as level "A," "B," "C," or "D" for additional action. Conditions that were not evaluated as "adverse" (i.e., "non-adverse") were categorized as either "NC," "NA," or "N," and were considered to be outside the CAP, and could be closed without any further action. Therefore, any CR improperly evaluated as non-adverse could be closed without any follow-up corrective actions.

On January 28, 2016, the team observed a routine CRG meeting, during which the classification of CRs was discussed. The team identified that four of the CRs reviewed were incorrectly classified as non-adverse, with no follow-up actions. A review of other CR evaluations identified multiple additional cases in which CRs were incorrectly classified as non-adverse. For example, CR-ANO-2-2015-01671 documented an unexplained floor drain level alarm in the safety-related 2A Engineered Safety Features room which was improperly categorized as "non-adverse, closed to reference," with no actions taken beyond draining the water in the room. The alarm condition returned several months later and was determined to be caused by a leak in the SW system that supplied cooling water to the room cooler. Therefore, the failure to properly evaluate the condition as adverse resulted in the condition being uncorrected for about six months. In addition, it was determined to have been a maintenance rule functional failure.

The team reviewed a number of CRs that had been improperly evaluated for operability, and identified that two of these CRs were also incorrectly evaluated as non-adverse. The team reviewed two CRG meeting minutes from January 2016, and reviewed selected CRs that had been classified as non-adverse. Out of approximately 78 CRs classified as non-adverse in this sample, the team identified 11 that should have been classified as adverse. The team determined through additional observations of CR Screening Meetings and discussions with ANO that the staff who were evaluating CRs did not understand the criteria for determining whether a condition was adverse or non-adverse after procedure EN-LI-102-ANO-RC had been revised to add these criteria on September 5, 2014. The team verified that none of the incorrectly categorized CRs required immediate actions.

The team identified that CRs were not being reviewed in accordance with procedure EN-OP-115-03, Step 5.1.[11], that required, "[T]he off-going shift manager (or designated SRO [senior reactor operator]) will review all CRs written on their watch to ensure no operability issues are missed." ANO believed that Step 5.1.[11] was being accomplished by routing all CRs to an electronic "inbox" and assigning an operability review of these CRs to the Shift Technical Advisor. ANO's CR form included a block for the CR initiator to identify whether an operability review was believed to be required. However, the team identified that CRs with the operability review block marked "No" were not automatically forwarded to the Operations electronic inbox for review.

The team concluded that ANO failed to follow Step 5.1.[11] of procedure EN-OP-115-03, and from June 28, 2015, to February 20, 2016, the team identified 12 CRs written to document a total of 43 other CRs that inappropriately bypassed the initial control room screening for operability review. In each case, ANO addressed the issue by performing the required screening, but failed to recognize and correct an adverse trend of CRs bypassed the control room operability reviews. The team verified that none of the 43 CRs resulted in the inoperability or non-functionality of a SSC.

The team concluded that by not assigning the appropriate significance level, problems were not always sufficiently understood so that corrective actions would be effective.

Analysis: The failure to properly evaluate CRs for classification and operability determination was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the equipment performance attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to properly evaluate CRs in accordance with applicable procedures was a programmatic issue occurring over a long period of time that could result in conditions adverse to quality being left uncorrected or not being evaluated to ensure operability was maintained. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." The team determined the finding was of very low safety significance (Green) because the performance deficiency affected the design or qualification of a mitigating SSC, but the SSC maintained its operability. This finding had a human performance cross-cutting aspect of Change Management because ANO failed to adequately implement changes, including the training of staff concerning those changes, so that nuclear safety remained an overriding priority. Specifically, ANO failed to ensure that station personnel were able to identify the difference between an "adverse" and "non-adverse" condition following the change which added these criteria to procedure EN-LI-102-ANO-RC. [H.3]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that activities affecting quality shall be prescribed by documented instructions, procedures, and drawings of a type appropriate to the circumstances and shall be accomplished in accordance with these instructions, procedures, and drawings. Quality procedure EN-LI-102-ANO-RC, Step 5.4 [6](c), requires the CRG to classify the CR based on risk significance as identified in Attachment 9.

Contrary to the above, from approximately 2014 until 2016, the CRG did not always classify CRs based on risk significance as identified in Attachment 9 of procedure EN-LI-102-ANO-RC. Specifically, the team identified multiple examples where the CRG classified CRs describing adverse conditions as non-adverse. As a result, adverse conditions that should have been addressed in the CAP were misclassified as non-adverse and removed from the CAP. ANO's corrective actions included performing an operability determination for each condition identified and determining that no degraded condition was missed. Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-C-2016-00359, CR-ANO-C-2016-00400, and CR-ANO-C-2016-00558, this violation is being treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-14 and 05000368/2016007-14, "Failure to Properly Implement the Corrective Action Program."

7.15 Failure to Maintain Structural Design Clearances Inside the Units 1 and 2 Reactor Containment Buildings

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for ANO's failure to ensure that multiple components located inside the Unit 1 and 2 reactor containment buildings were installed per structural drawings. Specifically, improper installation could result in damage to the safety-related containment liner or the containment liner leak test channels during a postulated seismic event and or during normal plant operation.

Description: On February 2 and 3, 2016, during at-power containment walkdowns of Units 1 and 2, the team identified that multiple sections of floor grating and ¼ inch plate steel supports were in contact with the containment liner and some of the containment liner leak test channels. Additionally, in Unit 2 the team identified sections of loose floor grating that were vibrating and rubbing against the containment liner plate. In some cases, contact between the containment liner and the components resulted in damage to the liner and the liner protective coating (i.e., scratches, gouges and removal of protective coatings). In Unit 1 the team identified two steel pipe supports and several concrete floor slabs that were in close proximity (less than 1 inch) to the liner plate, creating a potential concern for liner damage during a seismic event.

The reactor containment building is required to be operable in Modes 1 through 4 by Unit 1 Technical Specification 3.6.1 and Unit 2 Technical Specification 3.6.1. ANO determined that, based on a review of applicable drawings, a 1 inch clearance was required for metal gratings for both units (drawings C-174 and C-175 for Unit 1, and C-2116 and C-2173 for Unit 2), and a 1 to 2 inch clearance was required for concrete structures (drawings C-148, C-149, C-150, C-152, C-155, and C-161 for Unit 1 and C-2148, C-2151, and C-2152 for Unit 2). The clearance was designed to provide isolation between the liner plate and the containment building internals due to the different seismic response spectrum of each. The gap also served to provide clearance for the thermal expansion of any internal structures, and allowed inspection of the liner plate.

Based on a review of the pictures taken during the team inspection activities and visual examination by a civil engineer, there did not appear to be any fretting of the liner plate. The outer shell of the containment building and the containment building internals had different seismic response spectra. Calculation CALC-1.1.1 calculated the design basis earthquake maximum displacement of the containment building internals relative to the outer shell to a maximum displacement of less than 3/16 of an inch. Therefore, the liner damage potential was low due to the limited energy that would have resulted in impact during a seismic event, the robust liner (¼ inch thick carbon steel plate); and the thickness of the containment concrete. The structural capacity of the individual grating bar ends was much less than the capacity of the flat liner plate backed by solid concrete. The same was true for the areas where the toe plates were in contact with the liner plate. As a result, the grating would be expected to deform to allow for the displacement of the containment building and internals during a seismic event.

The engineering evaluation documented that damage to the liner plate was minor and operability of the containment was not affected. In addition, during normal operation of the plant, the current configuration did not represent a condition that would affect the functionality of the liner plate or the operability of the containment building. Additionally, the Unit 2 integrated containment leakage rate test was successfully performed during the last refueling outage (2015). ANO determined this condition was a non-conforming condition between the plant and design drawings for the required clearance between components inside containment and the containment liner. The team verified that ANO planned to modify the metal grating for both units

during the next corresponding refueling outage and planned to revise applicable containment liner inspection procedures to ensure the required clearance to the containment liner was achieved and maintained.

Analysis: The failure to ensure that structural components inside the Unit 1 and 2 reactor containment buildings were properly installed was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the configuration control attribute of the Barrier Integrity cornerstone and adversely affected the cornerstone objective to provide reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accident or events. Specifically, the failure to ensure that items inside the Unit 1 and 2 reactor containment buildings were installed per structural drawings could result in damage to the safety-related containment liner and challenge its function to protect the public from radionuclide releases. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 3 – "Barrier Integrity Screening Questions." The team determined the finding was of very low safety significance (Green) because the finding did not represent as actual open pathway in the physical integrity of reactor containment and did not involve an actual reduction in function of hydrogen ignitors. This finding had a problem identification and resolution cross-cutting aspect of Identification because ANO failed to implement a CAP with a low threshold for identifying issues. Specifically, ANO failed to identify multiple containment liner stand-off clearance deficiencies during the required containment liner inspections. [P.1]

Enforcement: Title 10 CFR Part 50, Appendix B, Criterion III, "Design Control," requires, in part, that measures shall be established to assure that applicable regulatory requirements and the design basis, as defined in 10 CFR 50.2 and as specified in the license application, for those structures, systems, and components to which this appendix applies are correctly translated into specifications, drawings, procedures, and instructions.

Contrary to the above, since initial construction for the Units 1 and 2 containment liner, to which 10 CFR 50, Appendix B applies, ANO failed to assure that applicable regulatory requirements and the design basis, as specified in the license application, were correctly translated into specifications, drawings, procedures, and instructions. Specifically, the containment liner stand-off clearance for structural components inside the Unit 1 and 2 reactor containment buildings was not correctly translated into specifications, procedures, and instructions, such that multiple structural components were improperly installed in a manner in which they could damage the safety-related containment liner during a postulated seismic event or during normal plant operation. ANO's corrective actions included performing an operability determination and determining that the Units 1 and 2 containment liner was operable but degraded and nonconforming, and establishing plans to correct the deficiencies in each unit's next refueling outage. Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-1-2016-00492, CR-ANO-2-2016-00397, and CR-ANO-2-2016-00413, this violation is being treated as an NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-15 and 0500368/2016007-15, "Failure to Maintain Structural Design Clearances Inside Units 1 and 2 Reactor Containment Building."

7.16 Failure to Properly Calibrate Unit 1 Reactor Building Atmospheric Particulate Radiation Monitor RE-7460

Introduction: The team identified a Green finding and an associated non-cited violation of 10 CFR 20.1501(c) because ANO failed to ensure that instruments and equipment used for quantitative radiation measurements were calibrated periodically for the radiation measured.

Specifically, ANO did not properly calibrate the Unit 1 reactor building atmospheric particulate radiation monitor RE-7460.

Description: On February 24, 2016, the team reviewed data associated with the Unit 1 RCS leak detection equipment and identified issues with the calibration of Unit 1 reactor building atmospheric particulate radiation monitor RE-7460. Radiation monitor RE-7460 was designed to support the detection of RCS leakage by identifying increased concentrations of particulate airborne radioactivity inside the Unit 1 reactor building. As described in the vendor manual, the radiation monitor was designed to draw an air sample from the Unit 1 containment atmosphere and process the sample through a moving particulate filter tape moving past the detection window on a drum assembly. A beta scintillation radiation detector then measured the activity deposited on the filter tape and generated an electrical signal whose count rate was proportional to the collected activity. A critical element of the monitor's design was the distance between the detector's window and the filter paper; which for this detector was designed to be 3/16 inch. This critical dimension also ensured that the detector satisfied its design sensitivity of 1×10^{-11} microCuries per square centimeter for Cesium-137 in a background of 2.5 millirem per hour.

American National Standards Institute (ANSI) N323D-2002, "American National Standard for Installed Radiation Protection Instrumentation," approved on September 3, 2002, described standard methods and conditions for the calibration of installed radiation instruments. This ANSI standard requires installed instrument calibrations to be performed in reproducible geometries (calibration assemblies) representative of the instruments' as-used configuration. ANO calibrated the Unit 1 leakage detection system per procedure 1304.182, "Unit 1 RCS Radiation Leak Detection System 18 Month Calibration." During calibration, the detector is removed from the housing assembly and placed in a calibration assembly, which is required to be designed to emulate the source-to-detector face geometry in the installed detector. However, the calibration procedure failed to ensure that the required 3/16 inch distance between the detector face and the filter paper was maintained.

The radiation monitor was re-calibrated on March 26, 2014, in accordance with procedure 1304.182. The team determined that the calibration was inadequate, because the procedure did not include a verification that the radiation detector was re-installed with the correct critical dimensions after instrument maintenance and/or calibration. On December 29, 2015, ANO identified that radiation monitor RE-7460 had erratic indication and determined that the wrong model beta scintillator radiation detector had been installed in 1997. Installation of the wrong detector increased the distance between the face of the detector and the filter paper from the required 3/16 inch to approximately 5½ inches. The change in detector model was not assessed for impact on the monitor's calibration. Additionally, upon monitor reassembly, ANO's procedure failed to ensure that the critical parameter of a 3/16 inch distance between the detector face and the filter paper was maintained. Consequently, the team concluded that radiation monitor RE-7460 was not properly calibrated and was therefore inoperable since the wrong model beta scintillator radiation detector was installed in 1997.

Analysis: The failure to properly calibrate radiation monitor RE-7460 was a performance deficiency. The performance deficiency was determined to be more than minor because it was associated with the plant instrumentation attribute of the Occupational Radiation Safety cornerstone and adversely affected the cornerstone objective of ensuring adequate protection of employee health and safety. Specifically, the failure to properly calibrate radiation monitor RE-7460 adversely impacted its ability to be used to identify RCS leakage and the ability to assess radioactive airborne concentrations and dose rates. The finding was evaluated using IMC 0609, Attachment 0609.04, and Appendix C, "Occupational Radiation Safety Significance

Determination Process," dated August 19, 2008. The team determined that the finding was of very low safety significance (Green) because it was not an as-low-as-reasonably-achievable (ALARA) issue, there was no overexposure or substantial potential for an overexposure, and the ability to assess dose was not compromised. This finding had a human performance cross-cutting aspect of Documentation because ANO failed to create and maintain complete, accurate and up-to-date documentation. Specifically, ANO personnel failed to translate the vendor manual instruction to ensure the detector was installed against the hard stop so that it was in the correct position to make the calibration valid. [H.7]

Enforcement: Title 10 CFR Part 20.1501(c) states, in part, that the licensee shall ensure that instruments and equipment used for quantitative radiation measurements (e.g., dose rate and effluent monitoring) are calibrated periodically for the radiation measured.

Contrary to the above, since November 1997, ANO failed to ensure that instruments used for quantitative radiation measurements were calibrated periodically for the radiation measured. Specifically, in 1997 ANO installed the wrong size radiation detector and failed to calibrate radiation monitor RE-7460. ANO's corrective actions included removing radiation monitor RE-7460 from service and instituting compensatory measures for assessing RCS leak detection in accordance with Technical Specification 3.4.15, "RCS Leakage Detection Instrumentation." Because this finding is of very low safety significance and has been documented in the CAP as CR-ANO-1-2016-00056 and CR-ANO-1-2016-01087, this violation is being treated as a NCV, consistent with Section 2.3.2.a of the NRC Enforcement Policy: NCV 05000313/2016007-16, "Failure to Properly Calibrate Unit 1 Reactor Building Atmospheric Particulate Radiation Monitor RE-7460."

7.17 Unresolved Item (URI) 05000313/2016007-17, and 05000368/2016007-17, Determine Impact of Modifying Fire Seals for Flood Protection

Introduction: The team identified an unresolved item related to ability to meet the requirements of License Condition 2.C.(8) and 2.C.(3)(b), Fire Protection Program, in Units 1 and 2, respectively. Specifically, the team identified ANO had modified numerous fire rated seals to also provide a flood protection barrier without ensuring existing fire protection requirements continued to be met.

Description: ANO Units 1 and 2 used a 3- hour fire rated silicon foam material to seal floor and walls penetrations in order to provide adequate separation to prevent the spread of fire between fire areas. ANO determined that numerous exiting fire seals were also required to provide flood protection. To provide an 3-hour fire barrier and also be capable of withstanding a design basis flood, ANO issued design changes to use several materials, such as Polywater FST Foam Sealant, Promatec Product 12 (P12), Sylgard, and Promatec High Density Silicone Elastomer (HDSE and HDSE-IR), to create dual purpose seals.

The team determined that HDSE, HDSE-IR and Sylgard have been tested as a 3-hour fire barrier and tested satisfactorily to provide adequate flood protection. However, ANO could not produce documentation to show that fire rating testing or qualification testing had been performed for the new dual function seals using P12 and Polywater. This was documented in CR-ANO-C-2016-00490. ANO has determined that the population of the non-qualified seals was 139 (96 containing Polywater and 43 containing P12).

ANO stated that all of the new dual function seals using P12 consist of the flood protective layer of P12 being placed on top of the existing originally qualified 10 inch fire silicone seal, and that

no credit was given to the P12 layer to provide any additional fire protection capabilities. The P12 has been tested by Promatec with silicone seals for flood and was flood tested by the station for use with silicone foam seals. Therefore, ANO believes that no negative chemical reactions can be expected.

ANO installed Polywater material either on top of the currently installed fire barrier seal, or in electric conduits that are not required to have a fire seal present. Polywater is designed to create an air and watertight barrier suitable for use in conduits. ANO did not remove any portion of the originally qualified silicon foam fire seals, therefore the flood protection layer of Polywater was applied on top of the existing qualified fire seal.

As part of the approved Fire Protection Program, a periodic visual inspection of fire penetration seals is required by TRM 3.7.12.3 and TRM 3.7.5, for Units 1 and 2 respectively, such that 10 percent of the total fire seal population is inspected each year. These inspections are conducted per Unit 1 procedure OP 1405.016, “U-1, Penetration Fire Barrier Visual Inspections,” and Unit 2 procedure OP 2405.016, “U-2, Penetration Fire Barrier Visual Inspections.” The team reviewed the inspection procedures and interviewed the fire protection engineers. The team was concerned that for many of the new dual function seals, the original fire rated and qualified seal was no longer accessible for performance of required visual inspections. The team was concerned that because the silicone fire seals are no longer accessible for inspection, the intent of the required fire seal inspection to detect surface flaws or damage to indicate potential underlying damage has occurred to the qualified fire penetration system per the fire protection program could not be met.

The team concluded that not having fire rating qualification testing for the existing configuration of some fire seals, and the inability to perform required periodic visual inspections for newly modified fire seals, was a performance deficiency that was reasonably within ANO’s ability to foresee and prevent. Since ANO has not yet completed the evaluation or fire testing qualification of the modified seals, the team was unable to evaluate the overall impact of this condition or classify the performance deficiency. ANO intended to complete the evaluation of these issues and document the results in CR-ANO-C-2016-00490. Some of the actions being considered include performing required 3-hour fire testing in representative dual function configurations containing Polywater or P12; and doing a feasibility study for removal and replacement of these seals with fire and flood qualified materials.

The team concluded that further review is necessary in order to properly evaluate and disposition the significance of this condition. Specifically, the NRC will need to review the following: ANO’s evaluation, extent of condition, and disposition and/or testing results of the non-qualified dual function fire/flood seals; and the significance of the non-qualified population (139 seals containing Polywater or P12). This item is being treated as an unresolved item (URI) 05000313/2016007-17 and 05000368/2016007-17, “Fire Seals Modified for Flood with Material not Qualified for Fire and Inability to Perform Required Periodic Visual Inspection.”

8. LICENSEE-IDENTIFIED VIOLATIONS

The following violations of very low significance (Green) were identified by the licensee and are violations of NRC requirements which meet the criteria of the NRC Enforcement Policy for being dispositioned as a non-cited violation.

8.1 Lack of Periodic Audits for the In-Service Inspection Program

Title 10 CFR Part 50, Appendix B, Criterion XVIII, "Audits," requires, in part, that a comprehensive system of planned and periodic audits shall be carried out to verify compliance with all aspects of the QA program and to determine the effectiveness of the program. Quality Assurance Program Manual Section C.2.a.(2) requires biennial audits of site programs, including the ASME Code Section XI ISI Program. Contrary to these requirements, ANO identified that from 2011 through December 17, 2015, a periodic audit of the ASME Code Section XI ISI Program was not carried out to verify compliance with all aspects of the QA program and to determine the effectiveness of the program. ANO documented this violation in the CAP as CR-ANO-C-2015-05011. The team determined that this issue was of very low safety significance (Green) after reviewing IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 1 – "Initiating Events Screening Questions." Specifically, the team answered "no" to each of the questions in Exhibit 1.

8.2 Inadequate Surveillance on Unit 1 Service Water to Spent Fuel Pool Makeup Line

Title 10 CFR Part 50, Appendix B, Criterion XI, "Test Control," requires, in part, that a test program shall be established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service is identified and performed in accordance with written test procedures which incorporate the requirements and acceptance limits contained in applicable design documents. Test results shall be documented and evaluated to assure that test requirements have been satisfied. Contrary to these requirements, from April 16, 2009, through January 31, 2015, ANO identified that a test program had not been established to assure that all testing required to demonstrate that structures, systems, and components will perform satisfactorily in service was identified and performed in accordance with written test procedures which incorporated the requirements and acceptance limits contained in applicable design documents. Specifically, the failure to monitor the flow rate through the Unit 1 SW to SFP makeup line, which is subject to biofouling, to demonstrate this line would perform satisfactorily in service to meet the design flow rate. The 18 month surveillance flow test was not sufficient to monitor, predict and take actions to correct for the loss of flow caused by biofouling, consequently, line blockage occurred that resulted in the loss of the capability to provide full design makeup flow rates. ANO documented this violation in the CAP as CR-ANO-1-2014-01628. The team determined that this issue was of very low safety significance (Green) after reviewing IMC 0609, Attachment 0609.04, and Appendix A, Exhibit 3 – "Barrier Integrity Screening Questions." Specifically, the team answered "no" to each of the SFP questions in Exhibit 3.

8.3 Failure to Perform Risk Assessment When Cleaning Unit 2 Service Water Pre-Screens

Title 10 CFR Part 50.65, "Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants," Section (a)(4), requires, in part, that before performing maintenance activities, the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. Contrary to these requirements, on July 8, 2015, ANO identified that they failed to assess and manage the increase in risk that may result from the proposed maintenance activities. Specifically, ANO failed to assess and manage the risk associated with removing and cleaning the Unit 2 SW system pre-screens for maintenance. ANO documented this violation in the CAP as CR-ANO-2-2015-01865. Additionally, ANO added guidance to procedure COPD-024 to address this issue. The team determined that this issue was of very low safety significance (Green) after reviewing IMC 0609 Attachment 0609.04, and Appendix K, "Maintenance Risk Assessment and Risk Management Significance

Determination Process," dated May 19, 2005. Specifically, the team determined the incremental core damage probability deficit was not greater than 1E-6.

8.4 Torque Values Not Recorded for Breaker Mounting Hardware

Title 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," requires, in part, that instructions, procedures, or drawings include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Contrary to this requirement, ANO identified that in 2010, maintenance work orders installing safety-related circuit breakers in motor control centers D-15 and D-25 did not have appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Specifically, Engineering Change 5832 was completed to replace seven safety-related existing and obsolete Gould circuit breakers inside safety-related motor control centers D-15 and D-25 with Siemens ED6 series molded case circuit breakers, using work orders 122821 and 122823. Subsequent review of these work orders confirmed that the installation instructions properly included specific torque values for the breaker mounting hardware, but the specified torque values were not recorded in the work orders, and the torqueing operations were not verified by quality control as required by procedures. ANO documented this issue in the CAP as CR-ANO-1-2015-02230. The team determined that this issue was of very low safety significance (Green) after reviewing IMC 0609, Attachment 0609.04, Appendix A, Exhibit 2 – "Mitigating Systems Screening Questions." Specifically, the team answered "no" to each of the questions in Exhibit 2.

9. EXIT MEETINGS

On April 6, 2016, the team and regional personnel held a public meeting with Mr. J. Browning, Site Vice President and other members of the ANO staff to discuss the results of the 95003 inspection at the Ritchie E. Reeves Training Center at ANO.

On May 12, 2016, the team conducted a telephonic exit meeting to discuss changes to the characterization of three findings with Mr. J. Browning, Site Vice President and other members of the ANO staff.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee Personnel

T. Arnold, Training Manager
R. Barnes, Director, Regulatory Affair and Performance Indicators
B. Bayer, Senior Manager Maintenance
L. Blocker, Nuclear Independent Oversight Manager
J. Browning, Site Vice President
P. Butler, Design and Program Engineering Manager
R. Carey, Emergency Preparedness Manager
T. Chernivec, Performance Improvement Manager
B. Daiber, Recovery Manager
B. Davis, Director, Engineering
D. Edgell, Recovery Manager
T. Evans, General Manager Plant Operations
K. Gaston, Systems and Components Engineering Supervisor
B. Gordon, Senior Manager Site Projects
B. Greeson, Engineering Supervisor
S. Groesbeck, Fire Protection Manager
J. Hall, Probabilistic Risk Assessment Engineer
M. Harris, Design Engineering Supervisor
R. Harris, Probabilistic Risk Assessment Consultant
T. Hatfield, Systems and Components Engineering Supervisor
J. Hathcote, Unit 2 Assistant Operations Manager
G. Hudnall, Corrective Action Program Manager
D. James, Director, Regulatory Affairs and Recovery
K. Jones, Corporate Functional Area Manager
D. Marvel, Radiation Protection Manager
L. Marvin, Employee Concerns Program Coordinator
D. Oertling, Assistant Operations Manager Training
D. Pehrson, Unit 1 Assistant Operations Manager
D. Perkins, Senior Manager Operations
S. Pyle, Regulatory Assurance Manager
T. Sherrill, Maintenance Manager
F. Shewmake, Assistant Operations Manager
M. Skartvedt, Systems and Components Engineering Manager
P. Sullivan, Senior Manager Production
G. Sullins, Senior Manager Project Management
J. Toben, Senior Manager, Project Management Regulatory and Performance Improvement
T. Woodson, Engineering Supervisor

NRC Personnel

S. Dinsmore, Senior Reliability and Risk Analyst, NRR
A. George, Project Manager, NRR
M. Reisifard, Reliability and Risk Analyst, NRR

LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

Opened and Closed

05000313/2016007-01 05000368/2016007-01	NCV	Failure to Complete Extent of Condition Reviews for the Stator Drop Significant Condition Adverse to Quality Event (Section 7.1)
05000313/2016007-02 05000368/2016007-02	FIN	Inadequate Effectiveness Reviews for Corrective Actions to Prevent Recurrence (Section 7.2)
05000313/2016007-03 05000368/2016007-03	FIN	Inadequate Operating Experience Evaluations (Section 7.3)
05000313/2016007-04 05000368/2016007-04	NCV	Inadequate Control of Monitoring for Wall Loss in the Service Water System (Section 7.4)
05000368/2016007-05	NCV	Failure to Include Unit 2 Service Water Pump Supports in the ASME Code Section XI Inservice Inspection Program (Section 7.5)
05000313/2016007-06 05000368/2016007-06	NCV	Failure to Correct Degraded Unit 2 Train B Emergency Diesel Generator Heat Exchangers Service Water Flow and Degraded Unit 1 Containment Coatings (Section 7.6)
05000368/2016007-07	NCV	Failure to Maintain Service Water Design Cooling to the Unit 2 High Pressure Safety Injection Pump Seal and Bearing Coolers (Section 7.7)
05000368/2016007-08	NCV	Inadequate Flow Monitoring of Unit 2 Service Water to Emergency Feedwater Pump Suction Supply (Section 7.8)
05000313/2016007-09	NCV	Emergency Feedwater Pump Casing Wall Loss Not Monitored (Section 7.9)
05000368/2016007-10	FIN	Failure to Develop an Operability Decision-Making Issue for Degraded Condition on Safety Injection Tank (Section 7.10)
05000313/2016007-11	NCV	Pressurizer Block Valve Not Installed in the Qualified Environmental Configuration (Section 7.11)
05000313/2016007-12 05000368/2016007-12	FIN	Failure to Perform Predictive Maintenance on Safety-Related Medium-Voltage Switchgear (Section 7.12)
05000313/2016007-13	NCV	Failure to Update Probabilistic Risk Assessment Model in a Timely Manner Results in Failure to Submit Complete and Accurate Information (Section 7.13)
05000313/2016007-14 05000368/2016007-14	NCV	Failure to Properly Implement the Corrective Action Program (Section 7.14)
05000313/2016007-15 05000368/2016007-15	NCV	Failure to Maintain Structural Design Clearances inside the Unit 1 and 2 Reactor Containment Buildings (Section 7.15)
05000313/2016007-16	NCV	Failure to Properly Calibrate Unit 1 Reactor Building Atmospheric Particulate Radiation Monitor RE-7460 (Section 7.16)

Opened

05000313/2016007-17 05000368/2016007-17	URI	Determine Impact of Modifying Fire Seals for Flood Protection (Section 7.17)

LIST OF ACRONYMS

AAC	Alternate AC
AAP	Area Action Plan
ACE	Apparent Cause Evaluation
ADH-NPRP	State of Arkansas Department of Health Office of Nuclear Planning and Response Programs
AIT	Augmented Inspection Team
ALARA	As-Low-as-Reasonably-Achievable
AMP	Aging Management Program
ANII	Authorized Nuclear Inservice Inspector
ANO	Arkansas Nuclear One
ANS	Alert and Notification System
ANSI	American National Standards Institute
AOP	Abnormal Operating Procedure
APHC	ANO People Health Committee
APRM	Aggregate Performance Review Meetings
ASME	American Society of Mechanical Engineers
ASI	Axial Shape Index
AV	Apparent Violation
CAL	Confirmatory Action Letter
CAP	Corrective Action Program
CAPR	Corrective Actions to Prevent Recurrence
CAQ	Condition Adverse to Quality
CARB	Corrective Action Review Board
CCDP	Conditional Core Damage Probability
CCW	Component Cooling Water
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CR	Condition Report
CRG	Condition Review Group
CRP	Comprehensive Recovery Plan
CRS	Control Room Supervisor
DPIC	Department Performance Improvement Coordinator
DPRM	Department Performance Review Meeting
EAL	Emergency Action Level
ECCS	Emergency Core Cooling System
ECP	Employee Concern Program
EDG	Emergency Diesel Generator
EFW	Emergency Feedwater
EOF	Emergency Operations Facility
EOL	End of Core Life
EOP	Emergency Operating Procedure
EP	Emergency Preparedness
EPRI	Electric Power Research Institute
ERO	Emergency Response Organization
FAC	Flow Accelerated Corrosion
FEMA	Federal Emergency Management Agency
FIN	Finding
FPA	Fundamental Problem Area
GL	Generic Letter

HCM	Human Capital Management
HDSE	High Density Silicone Elastomer
I&C	Instrumentation and Controls
IACPD	Identifying, Assessing and Correcting Performance Deficiencies
ILRT	In-Leakage Rate Test
IMC	Inspection Manual Chapter
IN	Information Notice
INSCAR	Integrated Nuclear Safety Culture Assessment Report
IP	Inspection Procedure
ISI	Inservice Inspection
KAR	Key Attribute Review
LMP	Large Motor Program
LOOP	Loss of Offsite Power
MIC	Microbiologically Influenced Corrosion
MOV	Motor Operated Valve
MOVLL	Motor Operated Valve Long Life
NCV	Non-Cited Violation
NFPA	National Fire Protection Association
NIOS	Nuclear Independent Oversight
NOV	Notice of Violation
NRC	Nuclear Regulatory Commission
NSC	Nuclear Safety Culture
NSCMP	Nuclear Safety Culture Monitoring Panel
ODA	Outside Design Agency
ODMI	Operational Decision Making Issue
OE	Operating Experience
PA	Problem Area
PI	Performance Indicator
PI&R	Problem identification and Resolution
PM	Preventive Maintenance
PRA	Probabilistic Risk Assessment
QA	Quality Assurance
RCE	Root Cause Evaluation
RCS	Reactor Coolant System
ROP	Reactor Oversight Process
RR	Repair and Replacement
SCLT	Safety Culture Leadership Team
SDP	Significance Determination Process
SER	Safety Evaluation Report
SFP	Spent Fuel Pool
SIPD	Site Integrated Planning Database
SIT	Safety Injection Tank
SPV	Single Point Vulnerability
SRO	Senior Reactor Operator
SSCs	Systems, Structures and Components
SU	Start Up
SW	Service Water
TPNSCA	Third Party Nuclear Safety Culture Assessment
UAT	Unit Auxiliary Transformer
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item

Documents Reviewed

A list containing the documents reviewed during this inspection can be found in ADAMS Accession No. ML16145A339.