

## Summer 4Q/2013 Plant Inspection Findings

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### Initiating Events

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### Mitigating Systems

**Significance:**  Nov 22, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

#### **Failure to Design the Safety-related Chiller Modification to Appropriate Quality Standards**

Green: The team identified a non-cited violation of 10 CFR 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to review the application of design processes prescribed for the heating, ventilation, and air conditioning (HVAC) system chillers for suitability, to assure that appropriate quality standards were specified and included in design documents, and to ensure that deviations from such standards were controlled. This was a performance deficiency. The licensee entered this issue into their corrective action program as condition reports 13-04803, 13-04804, and 13-04665. The licensee performed an operability evaluation and determined the 'A' chiller was inoperable with the two remaining operable chillers providing compliance with technical specifications.

The performance deficiency was more than minor because it was associated with the Design Control attribute of the Mitigating Systems cornerstone and adversely affected the cornerstone objective of ensuring availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences. Specifically, the failure to establish adequate design control measures that required the review of applicable design processes for suitability resulted in a failure to meet specified quality objectives, which decreased the availability and reliability of the 'A' chiller. The team determined the finding to be of very low safety significance (Green) because although the finding was a deficiency affecting the design of a mitigating system, structure, or component which failed to maintain its operability, it did not represent a loss of the system function or a single train for greater than its technical specification allowed outage time. The HVAC system remains operable with the two remaining chillers, 'B' and 'C', in operation. The team determined the finding involved the cross-cutting aspect of supervisory and management oversight, within the Work Practices component of Human Performance area which states that, "the licensee ensures supervisory and management oversight of work activities, including contractors, such that nuclear safety is supported." Specifically, V. C. Summer management did not ensure management oversight of work activities that provided for the administration of quality assurance necessary to support nuclear safety. [H.4(c)] (Section 1R17.b.i)

Inspection Report# : [2013008](#) (pdf)

**Significance:**  Nov 22, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

#### **Failure to Prevent a Water Hammer Event in the RBCU SW Discharge Piping**

Green: The team identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion III, "Design Control," for the licensee's failure to verify the adequacy of design to prevent water hammer on the reactor building cooling unit

(RBCU) service water (SW) return lines following a potential design basis accident and a delayed closure of SW valves 3107A/B. This was a performance deficiency. The licensee entered this issue into their corrective action program as condition reports 13-04877 and 13-05139. The licensee restricted the alignment of SW to the RBCUs during normal plant operation until changes to procedures or additional control circuit interlocks between 3107A/B and the service water booster pump (SWBP) could be implemented to mitigate the consequences of a delayed closure of the valves.

The performance deficiency was more than minor because it was associated with the Structures, Systems and Components and Barrier Performance attribute of the Barrier Integrity cornerstone and affected the cornerstone objective to provide reasonable assurance that physical design barriers (i.e. containment) protect the public from radionuclide releases caused by accident or events. Specifically, startup of the SWBP following a delayed closure of 3107A/B would cause a water hammer event on the RBCU SW return lines inside containment. The water hammer loads would challenge SW piping and/or valve integrity and could compromise containment isolation. The team determined the finding to be of very low safety significance (Green) because the finding did not represent an actual open pathway in the physical integrity of reactor containment, containment isolation system, or heat removal components, and it did not involve a reduction in function of hydrogen igniters in the reactor containment. No cross-cutting aspect was assigned to this finding because the team determined that the cause of the finding was not indicative of current licensee performance. (Section 1R17.b.ii)

Inspection Report# : [2013008](#) (*pdf*)

**Significance:**  Nov 01, 2013

Identified By: NRC

Item Type: FIN Finding

**Failure to Meet Training Program Standards on Job Performance Measures for the Annual Licensed Operator Requalification Operating Examination (Section 1R11.1)**

Inspection Report# : [2013010](#) (*pdf*)

**Significance:**  Nov 01, 2013

Identified By: NRC

Item Type: FIN Finding

**Failure to Meet Training Program Standards for the Biennial Licensed Operator Requalification Written Examination (Section 1R11.2)**

Inspection Report# : [2013010](#) (*pdf*)

**Significance:**  Nov 01, 2013

Identified By: NRC

Item Type: FIN Finding

**Failure to Meet Training Program Standards for Administration of the Annual Licensed Operator Requalification Operating Examination (Section 1R11.3)**

Inspection Report# : [2013010](#) (*pdf*)

**Significance:**  Sep 30, 2013

Identified By: NRC

Item Type: FIN Finding

**Failure to develop adequate corrective action for a condition adverse to quality involving the loss of the alternate AC transformer**

The inspectors identified a Green finding of licensee procedure, SAP-999, "Corrective Action," Revision 11 for the failure to develop corrective actions for a Level 3 condition report (CR) which described a condition adverse to quality (CAQ) associated with the loss of transformer, XTF-5052, alternate AC source.

The inspectors determined that the failure to develop corrective actions for a Level 3 CR as required by their corrective action program (CAP) procedure was a performance deficiency (PD). The inspectors reviewed inspector manual chapter (IMC) 0612 and determined the PD is more than minor and therefore a finding because it adversely impacted the Mitigating Systems cornerstone objective to ensure the availability, reliability and capability of systems that respond to initiating events to prevent undesirable consequences and the respective attribute of equipment performance. Specifically, a system component, XTF-5052, associated with recovery of an offsite power circuit and installed to reduce core damage frequency, was rendered unavailable. The inspectors reviewed IMC 0609, Attachment 4, and Appendix A – Exhibit 2, and determined the finding was of very low safety significance or Green because the finding was not a design deficiency or a loss of function during a required alignment per Technical Specifications. The inspectors reviewed IMC 0310 and determined the cause of the finding involved the cross-cutting area of problem identification and resolution, the component of corrective action program, and the aspect of appropriate corrective actions, P.1(d), because the licensee failed to develop corrective actions for the Level 3 CR associated with the loss of XTF5052. (Section 40A2.3)

Inspection Report# : [2013004](#) (*pdf*)

**Significance:**  Sep 30, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

**Failure to adequately evaluate new fire hoses for post-loss coolant accident conditions.**

The NRC inspectors identified a NCV of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to adequately accomplish engineering services procedure, ES-0419, "Equal To/Better Than (ETBT) Evaluation Process," Revision 9, for new fire hoses located in the reactor building. The issue was entered into the licensee's CAP as condition report CR-12-05730.

The inspectors determined that the failure to adequately accomplish ES-0419 for new fire hoses in the reactor building was a PD. The inspectors reviewed IMC 0612 and determined that the PD is more than minor and therefore a finding because if left uncorrected it would have the potential to lead to a more significant safety concern in that degradation of the fire hoses in post loss of coolant accident (LOCA) conditions would adversely impact the emergency core cooling system (ECCS) containment sump screens. The inspectors reviewed IMC 0609, Attachment 4, and Appendix A – Exhibit 2, and determined the finding was of very low safety significance or Green because the finding was not a design deficiency or represented a loss of function. Specifically, the inspectors identified the problem prior to the licensee incurring actual risk exposure time. The inspectors reviewed IMC 0310 and determined the cause of the finding involved the cross-cutting area of human performance, the component of resources, and the aspect of adequate emergency equipment, H.2(d), because the licensee failed to ensure the new fire hoses would not impact safety-related components such as ECCS sump screens during post-LOCA conditions. (Section 40A5.2)

Inspection Report# : [2013004](#) (*pdf*)

**Significance:**  Jun 30, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

### **Failure to Perform a Past Operability Evaluation of the Service Water Outlet Header to 'B' Component Cooling Water Cross-Connect Valve**

The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to accomplish a past operability evaluation for the 'B' component cooling water (CCW) train as required by corrective action program (CAP) procedures; consequently, the licensee did not recognize that the Technical Specification 3.7.3 allowed outage time was exceeded. The issue was entered into the licensee's CAP as condition report CR-13-00930.

The inspectors determined that the failure to evaluate past operability as required by the licensee's CAP procedures was a performance deficiency (PD). The inspectors reviewed inspector manual chapter (IMC) 0612 and determined the PD is more than minor and therefore a finding because if left uncorrected it would have the potential to lead to a more significant safety concern in that the licensee would not have performed a past operability evaluation. Consequently, the licensee would not have realized technical specifications were exceeded, would not have performed as thorough of an extent of condition review and would not have submitted a LER. Additionally, the inspectors also considered IMC 0612, Appendix E, Example 4.a in which the PD is more than minor if the later evaluation determined that safety related equipment was adversely affected. The inspectors reviewed IMC 0609, Attachment 4, and Appendix A – Exhibit 2, and determined the finding was of very low safety significance or Green because the finding did not contribute to the likelihood of both a reactor trip and the unavailability of mitigation equipment and associated functions. The cause of the finding involved the cross-cutting area of problem identification and resolution, the component of corrective action program, and the aspect of complete and thorough evaluation, P.1(c), because the licensee failed to evaluate past operability for the 'B' CCW train. (Section 1R15)

Inspection Report# : [2013003](#) (*pdf*)

**Significance:**  Jun 30, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

### **Failure to Adequately Design, Install and Maintain Oil Collection Devices for Reactor Coolant Pump Motors**

The inspectors identified three examples of a non-cited violation of the Virgil C. Summer Nuclear Station, Unit No. 1, Renewed Facility Operating Licensee No. NPF-12, Condition 2.C(18), Fire Protection System, associated with 10 CFR 50, Appendix R, Section III.O, for problems associated with reactor coolant pump (RCP) motor oil collection system. Specifically, the inspectors identified (1) a split in the sealing boot for the 'B' reactor coolant pump (RCP) motor oil cooler enclosure, (2) a failure to ensure an adequate design for the oil lift pump enclosure, and (3) a failure to have oil collection components for internally leaked oil escaping the RCP motor discharge air ductwork flange area. The licensee entered the problem into their corrective action program as condition reports 12-05736 and 12-05756.

The inspectors determined that the aforementioned problems with RCP motor oil enclosures and ductwork were performance deficiencies (PD). The inspectors reviewed inspector manual chapter (IMC) 0612 and determined that the PDs were more than minor and therefore a finding because they impacted the mitigating systems cornerstone objective to ensure the availability, reliability, and capability of systems that respond to initiating events to prevent undesirable consequences, and the related attribute of protection against external factors such as fire. This finding has a credible impact on safety because the failure to adequately install, maintain and design the oil collection system presented a degradation of a fire confinement component which has a fire prevention function of not allowing an oil leak to reach hot surfaces. The inspectors reviewed IMC0609, Attachment 4, and Appendix F and determined that the following for each example.

Example 1 was assigned a high degradation rating because the split in the boot on the bottom of the oil enclosure would allow significant leakage to occur. The duration was greater than thirty days because the condition had existed for the previous operating cycle and this yields a duration factor of 1.0. Combining this with a generic fire frequency for a pressurized water reactor (PWR) containment or 1E-2 results in a fire frequency of 1E-2 which requires a phase

2 evaluation.

Example 2 was assigned a moderate degradation rating due to openings which would allow the escape of high pressure oil based on the location and orientation of the leak within the enclosure on each of the three RCPs. However, since the oil lift pumps are only operated for approximately five minutes before the start of a RCP, the duration is less than three days yielding a duration factor of .02. Combining this with a generic fire frequency for a PWR containment or  $1E-2$  results in a fire frequency of  $2E-4$  which requires a phase 2 evaluation.

Example 3 was assigned a low degradation rating due to minimal leakage potential which screens to a Green or very low safety significance.

A phase 2 Significance Determination Process (SDP) risk evaluation was performed by a regional SRA for PD examples 1 and 2 using NRC IMC 0609 Appendix F, with data from NUREG/CR 6850, the licensee's fire protection engineering report and the latest NRC VC Summer SPAR PRA risk model. The major assumptions for example 1 included: a one year exposure period, the ignition frequency from NUREG /CR 6850 for reactor coolant pump oil fires increased by one order of magnitude to account for the PD, the probability of non-suppression (PNS) from NUREG/CR 6850 for containment with detection at 5 minutes and damage at 10 minutes, and a base reactor trip transient conditional core damage probability (CCDP). The Example 2 assumptions included: a one hour exposure period to account for oil lift system operation for all three RCPs, the ignition frequency from NUREG/CR 6850 for reactor coolant pump oil fires increased by an order of magnitude to account for the PD, the PNS from NUREG/CR 6850 for containment with detection at 5 minutes and damage at 10 minutes, and a CCDP assumed for a small loss of coolant accident (LOCA) given the potential target cables in the RCP enclosures. The dominant sequence for example 1 was an oil leak in the B RCP oil cooler enclosure which leaked onto hot surfaces causing an oil fire on B RCP which was assumed to lead to a reactor trip if not rapidly suppressed. The dominant sequence for example 2 was an oil fire in any of the 3 RCPs upon startup due to spray from the oil lift system enclosure causing a fire on contact with hot surfaces. The fire is assumed to damage cables associated with reactor coolant system boundary valves if not rapidly suppressed leading to a small LOCA. For PD example 1 the risk was mitigated by the absence of safe shutdown equipment in the vicinity of the B RCP and PD example 2 risk was mitigated by the short exposure period. The risk of the three examples together represented an increase in core damage frequency of  $<1E-6$ /year a GREEN finding of very low safety significance.

The cause example 1 relating to ensuring collection devices are leak-free involved the cross-cutting area of human performance, the component of resources, and the aspect of complete and accurate procedures, H.2(c), because the procedure for inspection of the oil collection enclosures was inadequate to detect the degraded condition. The other examples were not indicative of current licensee performance. (Section 40A5.2)

Inspection Report# : [2013003](#) (pdf)

**Significance:**  Jun 30, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

**Failure to Assess and Manage the Risk Impact of Time to Core Boil With Reactor Vessel Upper Internals Installed and Cavity Level is Greater Than Reactor Vessel Flange**

The inspectors identified a non-cited violation of 10 CFR 50.65 (a)(4) which requires in part that the licensee assess and manage the increase in risk that may result from proposed maintenance activities. Specifically, the licensee failed to assess and manage the increase in risk for shutdown operations and corresponding maintenance activities during Refueling Outage 20 because the qualitative risk evaluation failed to correctly update the time to core boil (TTCB), as determined by a computer program, for a plant operating state (POS) consisting of upper reactor vessel (RV) internals installed, RV head removed, and reactor cavity level greater than RV flange. The licensee entered this problem in their corrective action program as condition report 12-04757.

The inspectors determined that the failure to assess and manage the increase in risk for shutdown operations and corresponding maintenance activities because the qualitative risk evaluation failed to correctly update the TTCB, as determined by a computer program, for the above POS was a performance deficiency (PD). The inspectors reviewed inspector manual chapter (IMC) 0612, Appendix B and determined the PD is more than minor and therefore a finding because if left uncorrected it would have to the potential to lead to a more significant safety concern. Specifically, the above POS results in a TTCB measured in minutes as opposed to hours, and the failure to accurately calculate and track for increase in risk and procedure applications would impact operator response to loss of the residual heat removal system.

The finding was screened using IMC 0609 Attachment 4 which routed the significance determination to IMC 0609 Appendix K. Since the licensee used a qualitative risk assessment process during shutdown conditions, a bounding risk assessment was done in accordance with IMC 0609 Appendix M requirements. A risk assessment was performed by a regional senior risk analyst using the shutdown risk methodology of IMC 0609 Appendix G. The major assumptions included: a 39 hour exposure period within Plant Operating State 2 (POS-2 early time window), Loss of Inventory, Loss of Offsite Power and Loss of residual heat removal (RHR) initiators were evaluated, both trains of RHR and emergency core cooling system including both emergency diesel generators were available, base case results were increased by a factor of 5 to account for the procedure SSP-004 not providing guidance that TTCB should be adjusted while the upper internals were installed (this was determined using the NRC standardized plant risk analysis – human (SPAR-H) error methodology for “Available but poor” procedure within the Diagnosis HEP performance shaping factors). The dominant sequence was Loss of RHR with failure to recover RHR and failure to initiate injection. The risk was mitigated by the short exposure period and the availability of both trains of RHR. The result of the risk evaluation was an increase in core damage frequency of  $<1E-6$ /year a GREEN finding of very low safety significance.

This finding impacts the cross-cutting area of human performance, the component of work control, and the aspect of planning work activities by incorporating risk insights, H.3(a), because the licensee failed to recognize the TTCB for the identified POS caused a high risk evolution or a Yellow risk condition. (Section 40A5.3)

Inspection Report# : [2013003](#) (pdf)

## Barrier Integrity

**Significance:**  Dec 31, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

### **Inadequate Procedure for Control of containment Penetrations**

An NRC-identified Green non-cited violation of 10 CFR 50, Appendix B, Criterion V, “Instructions, Procedures, and Drawings,” was identified for the licensee’s failure to prescribe an adequate procedure for control of temporary containment penetration devices. The violation is in the licensee’s corrective action program as condition report 13-00739.

The inspectors determined that the failure to have an adequate procedure for control of temporary containment penetration devices was a performance deficiency (PD). The PD is more than minor and therefore a finding because it impacted the barrier integrity cornerstone objective to provide reasonable assurance that physical design barriers such as the containment, protect the public from radionuclide releases caused by accidents or events and the attribute of procedure quality because the affected procedure allowed the use of silicone foam in configurations which did not provide adequate pressure retention capabilities. The inspectors evaluated the finding in accordance with NRC

Inspection Manual Chapter 0609, “Significant Determination Process,” attachment 4, appendix G, and appendix H and determined that an analysis was required by a senior reactor analyst. A regional SRA performed an SDP assessment of this finding. The licensee containment penetration testing and results were reviewed as well as the licensee's risk evaluation. The conclusion was that the finding represented a condition B finding which would only impact large early release fraction (LERF) and not core damage frequency. The test results showed that the finding would not meet the leakage criteria necessary for the finding to be >GREEN per NRC IMC 0609 Appendix H. The conditions necessary to achieve the leakage criteria were determined to be <1E-7 for LERF which represented a GREEN finding of very low safety significance. There are no cross-cutting aspects because the finding was not representative of current licensee performance. (Section 40A5.2)

Inspection Report# : [2013005](#) (pdf)

**Significance:** G Mar 31, 2013

Identified By: NRC

Item Type: NCV NonCited Violation

### **Failure to Perform Examinations of Reactor Pressure Vessel Supports**

The inspectors identified a non-cited violation (NCV) of Code of Federal Regulation (CFR) 10 CFR Part 50.55a, “Codes and Standards,” involving the licensee’s failure to include the reactor pressure vessel supports in the scope of the V. C. Summer Inservice Inspection Program (ISI) program. 10 CFR 50.55a requires that licensees develop an Inservice Inspection (ISI) program and update that program every 10 years in accordance with the approved edition of American Society of Mechanical Engineers (ASME) Section XI in effect 12 months prior to the beginning of the 10 year interval. The inspectors identified that the nuclear Class 1 reactor pressure vessel supports were not included in the scope of the V. C. Summer Unit 1 ISI Program for the third interval. The licensee’s ISI program was prepared in accordance with the 1998 Edition of the ASME Section XI Code, with addenda through 2000, as modified by 10 CFR 50.55a. As required by Article IWF 1000, Table 2500-1, Examination Category Item Number F1.40, the Reactor Pressure Vessel (RPV) supports are required to be periodically VT-3 visually examined. Also as required by Subsection IWB of Section XI, Table IWB-2500-1, Examination Category B-K, Item No. B10.10, the support integral attachment weld is to be periodically subjected to a surface examination. This issue was entered into the licensee’s corrective action program as Condition Report (CR) 13-00138 and CR-13-00737. The licensee took action and performed an operability determination and conducted remote visual examinations to assess the condition of the reactor vessel supports.

The failure to include the RPV supports in the scope of the ISI program and the failure to conduct the required examinations was a performance deficiency that was within the ability of the licensee to foresee and correct. This finding was of more than minor significance because it was associated with the Design Control attribute of the Barrier Integrity Cornerstone and affected the cornerstone objective of providing reasonable assurance that physical design barriers protect the public from radionuclide releases caused by accidents or events. Specifically, examinations of the RPV supports provide assurance that the structural boundary of the reactor coolant system remains capable of performing its intended safety function. The inspectors used IMC 0609, “Significance Determination Process,” Attachment 0609.04, “Phase 1 – Initial Screening and Characterization of Findings,” and determined that the finding was of low safety significance (Green) because it did not represent an actual failure of the RPV supports.

The cause of the finding involved the cross-cutting area of problem identification and resolution, the component of operating experience (OE), and the aspect of implements and institutionalizes OE through changes to station process, procedures and programs, P.2(b). Specifically, the licensee failed to implement and institutionalize OE for RPV supports into station processes and procedures. (Section 40A5.4)

Inspection Report# : [2013002](#) (pdf)

## Emergency Preparedness

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## Occupational Radiation Safety

**Significance:**  Sep 30, 2013

Identified By: Self-Revealing

Item Type: NCV NonCited Violation

### **Failure to evaluate radiological conditions**

A Green, self-revealing, NCV was identified for the failure to perform radiological surveys required by 10 CFR 20.1501(a) to ensure the potential radiological hazards and extent of radiation levels were understood and controlled before disassembling pressurizer spray valve PCV-444C. The issue was entered in the licensee's CAP as CR-12-05132.

The inspectors determined that the failure to perform radiological surveys required by 10 CFR 20.1501(a) was a PD. The inspectors determined that the PD was more than minor because it impacted the program and process attribute of the Occupational Radiation Safety Cornerstone and adversely affected the cornerstone objective of ensuring adequate protection of worker health and safety from exposure to radiation in that the licensee failed to adequately evaluate potential radiological hazards that could be present in a work area. The finding was assessed using the Occupational Radiation Safety significance determination process and was determined to be of very low safety significance (Green) because it was not an ALARA planning issue, there was no overexposure nor substantial potential for an overexposure, and the licensee's ability to assess dose was not compromised because the workers were wearing electronic dosimetry that was remotely monitored and intermittent on-site HP coverage was provided. This finding had a crosscutting aspect associated with human performance, work control, H.3(a). When licensee personnel failed to identify potential changes in expected radiological conditions and incorporate those changes into the RWP requirements prior to beginning work on valve PCV-444C, appropriate radiological work controls were not established. (Section 2RS1)

Inspection Report# : [2013004](#) (*pdf*)

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## Public Radiation Safety

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## Security

Although the Security Cornerstone is included in the Reactor Oversight Process assessment program, the Commission has decided that specific information related to findings and performance indicators pertaining to the Security Cornerstone will not be publicly available to ensure that security information is not provided to a possible adversary. Other than the fact that a finding or performance indicator is Green or Greater-Than-Green, security related information will not be displayed on the public web page. Therefore, the [cover letters](#) to security inspection reports may be viewed.

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## **Miscellaneous**

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