



**UNITED STATES  
NUCLEAR REGULATORY COMMISSION**  
REGION II  
245 PEACHTREE CENTER AVENUE NE, SUITE 1200  
ATLANTA, GEORGIA 30303-1257

August 6, 2013

Mr. Thomas D. Gatlin  
Vice President – Nuclear Operations  
South Carolina Electric & Gas Company  
Virgil C. Summer Nuclear Station  
P.O. Box 88  
Jenkinsville, SC 29065

**SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1 – NRC INTEGRATED  
INSPECTION REPORT 05000395/2013003**

Dear Mr. Gatlin:

On June 30, 2013, the U.S. Nuclear Regulatory Commission (NRC) completed an inspection at your Virgil C. Summer Nuclear Station, Unit 1. The enclosed inspection report documents the inspection results, which were discussed on July 22, 2013, with you and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Three NRC-identified findings of very low safety significance (Green) were identified during the inspection. The findings were determined to involve violations of NRC requirements. The NRC is treating these violations as non-cited violations (NCVs) consistent with Section 2.3.2 of the NRC Enforcement Policy. If you contest the violations or significance of these NCVs, you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, United States Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the Virgil C. Summer Nuclear Station.

Additionally, if you disagree with a cross-cutting aspect assignment 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 II, and the NRC Resident Inspector at the Virgil C. Summer Nuclear Station, Unit 1.

T. Gatlin

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In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the NRC Public Document Room or from the Publicly Available Records (PARS) component of NRC's Agencywide Document Access and management System (ADAMS). ADAMS is accessible from the NRC Website at <http://www.nrc.gov/reading-rm/adams.html> (the Public Electronic Reading Room).

Sincerely,

*/RA/*

Gerald J. McCoy, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

Docket No.: 50-395  
License No.: NPF-12

Enclosure: NRC Integrated Inspection Report 05000395/2013003  
w/Attachment: Supplemental Information

cc w/encl: (See page 3)

T. Gatlin

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**/RA/**

Gerald J. McCoy, Chief  
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cc w/encl:

J. B. Archie  
Senior Vice President  
Nuclear Operations and Chief Nuclear  
Officer  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

George A. Lippard, III  
General Manager  
Nuclear Plant Operations  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Andy T. Barbee  
Director  
Nuclear Training  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Wayne D. Stuart  
General Manager  
Engineering Services  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Robin R. Haselden  
General Manager  
Organizational Development &  
Effectiveness  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Shaun M. Zarandi  
General Manager  
Nuclear Support Services  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Robert L. Justice  
Manager  
Nuclear Operations  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Bruce L. Thompson  
Manager  
Nuclear Licensing (Mail Code 830)  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Donna W. Railey  
Licensing Technician  
Nuclear Licensing  
South Carolina Electric & Gas Company  
Electronic Mail Distribution

Jason W. Williams  
Nuclear Coordinator  
S.C. Public Service Authority Mail Code 802  
Electronic Mail Distribution

Susan E. Jenkins  
SC Department of Health & Environmental  
Control  
Bureau of Land and Waste Management  
Electronic Mail Distribution

Sandra Threatt, Manager  
Nuclear Response and Emergency  
Environmental Surveillance  
Bureau of Land and Waste Management  
Department of Health and Environmental  
Control  
Electronic Mail Distribution

Kathryn M. Sutton, Esq.  
Morgan, Lewis & Bockius LLP  
Electronic Mail Distribution

Division of Radiological Health  
TN Dept. of Environment & Conservation  
401 Church Street  
Nashville, TN 37243-1532

Senior Resident Inspector  
Virgil C. Summer Nuclear Station  
U.S. NRC  
576 Stairway Road  
Jenkinsville, SC 29065

T. Gatlin

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Letter to Thomas D. Gatlin from Gerald J. McCoy dated August 6, 2013

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1 - NRC INTEGRATED  
INSPECTION REPORT 05000395/2013003

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C. Evans

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**U. S. NUCLEAR REGULATORY COMMISSION**

**REGION II**

Docket No. 50-395

License No. NPF-12

Report No. 05000395/2013003

Licensee: South Carolina Electric & Gas (SCE&G) Company

Facility: Virgil C. Summer Nuclear Station, Unit 1

Location: P.O. Box 88  
Jenkinsville, SC 29065

Dates: April 1, 2013 through June 30, 2013

Inspectors: J. Reece, Senior Resident Inspector  
E. Coffman, Resident Inspector

Approved by: Gerald J. McCoy, Chief  
Reactor Projects Branch 5  
Division of Reactor Projects

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## SUMMARY OF FINDINGS

IR 05000395/2013003; 4/01/2013 - 6/30/2013: Virgil C. Summer Nuclear Station, Unit 1; Operability Evaluations and Other Activities

The report covered a three month period of inspection by resident inspectors. Three NRC-identified findings were identified and were determined to be non-cited violations (NCV). The significance of most findings is indicated by their color (Green, White, Yellow, Red) using Inspection Manual Chapter (IMC) 0609, "Significance Determination Process" (SDP). The cross-cutting aspect was determined using IMC 0310, "Components Within the Cross Cutting Areas." Findings for which the SDP does not apply may be Green or be assigned a severity level after NRC management review. The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process" Revision 4, dated December 2006.

### Cornerstone: Mitigating System

- Green. 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 licensee event report. 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)

- Green. 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,

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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' 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 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 senior risk analyst for PD examples 1 and 2 using 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

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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 of 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 4OA5.2)

- Green. 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)

## REPORT DETAILS

### Summary of Plant Status

Unit 1 began the inspection period in a planned outage and returned to service on April 2, 2013. On April 3, 2013, the unit returned to full rated thermal power (RTP) and remained at or near RTP for the remainder of the inspection period.

#### 1. REACTOR SAFETY

##### **Cornerstones: Initiating Events, Mitigating Systems, Barrier Integrity**

#### 1R01 Adverse Weather Protection

##### .1 Offsite and Alternate Alternating Current (AC) Power

###### a. Inspection Scope

The inspectors evaluated the readiness of the offsite and alternate AC power systems by reviewing the licensee's procedures that address measures to monitor and maintain the availability and reliability of the offsite and alternate AC power systems. The procedures reviewed included those involved with the communication protocols between the plant and transmission system operator to verify that the appropriate information was being exchanged when issues arose that could impact the offsite power system. In addition, the inspectors monitored switchyard upgrade activities relative to new construction for Units 2 and 3 to ensure any degradations or adverse material conditions were identified in the licensee's corrective action program (CAP) and were being appropriately addressed in a manner commensurate with their significance. The documents reviewed during this inspection are listed in the attachment.

###### b. Findings

No findings were identified.

##### .2 Seasonal Weather Susceptibilities

###### a. Inspection Scope

The inspectors performed one adverse weather inspection for readiness of hot weather conditions and walked down two safety-related areas, the emergency diesel generator (EDG) building and the service water (SW) pumphouse, to verify the proper operation of cooling systems for these areas. Specifically, the inspectors verified the licensee had implemented applicable sections of operations administrative procedure (OAP)-109.1, Revision (Rev.) 3, Change C, "Guidelines for Severe Weather." Additionally, the inspectors reviewed licensee plant computer data associated with the aforementioned areas to ensure that temperatures were within their expected operational range to prevent any challenge to equipment operation. The inspectors also verified the licensee took appropriate actions for temperatures exceeding administrative limits. The

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inspectors reviewed the licensee's CAP database to verify that high temperature weather related problems were being identified at the appropriate level, entered into the CAP, and appropriately resolved.

b. Findings

No findings were identified.

.3 Tornado Watch

a. Inspection Scope

On June 10, 2013, a tornado watch was issued for Fairfield County and the inspectors performed a reactive weather related inspection. The inspectors reviewed licensee adverse weather response procedure, OAP-109.1, "Guidelines for Severe Weather," Rev. 3, and related site preparations including work activities that could impact the overall maintenance risk assessments.

b. Findings

No findings were identified.

.4 External Flooding

a. Inspection Scope

The inspectors reviewed the licensee's external flood design mitigation plans to determine consistency with design requirements, updated final safety analysis report (UFSAR) and flood analysis documents. The inspectors performed walkdowns of the station to verify flood protection features remained generally as described in the UFSAR and flood analysis documents. Specifically, the inspectors performed visual examinations of the plant yard areas impacted by independent spent fuel storage installation (ISFSI) modification. Documents reviewed are listed in the Attachment.

b. Findings

Unresolved Item (URI) for Independent Spent Fuel Storage Installation (ISFSI) Modification Leading to an Auxiliary Building (AB) Flood Scenario

Introduction: A URI was identified by the inspectors for an AB flood scenario created during implementation of the ISFSI modification.

Description: On April 30, 2013, the licensee initiated condition report (CR) 13-01917 for water exceeding 17 inches in non-safety electrical manhole (EMH) number 8 as identified by their normal inspection process. On May 6, 2013, the licensee initiated CR-13-01973 for excessive rain that in combination with a trench previously excavated for a modification associated with the new ISFSI project resulted in water intrusion into the AB and a Hi-Hi alarm on the floor drain tank. The resident inspectors expressed a concern

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regarding these two events and the licensee took immediate actions to back-fill the section of the trench adjacent to EMH-8. The inspectors also expressed a concern regarding the modification review process which failed to identify the creation of a flood vulnerability for site structures housing safety related components. The licensee subsequently initiated CR-13-02022 to evaluate the modification program for any necessary corrections.

Pending completion of additional evaluations in determining the performance deficiency (PD) and associated significance, this is identified as URI 05000395/2013003-01, Modification Leads to Auxiliary Building Flood Vulnerability.

#### 1R04 Equipment Alignment

##### .1 Partial System Walkdowns

###### a. Inspection Scope

The inspectors conducted three partial equipment alignment walkdowns which are listed below, to evaluate the operability of selected redundant trains or backup systems with the other train or system inoperable or out of service (OOS). Correct alignment and operating conditions were determined from the applicable portions of drawings, system operating procedures (SOP), and technical specifications (TS). The inspections included review of outstanding maintenance work orders (WO) and related condition reports (CR) to verify that the licensee had properly identified and resolved equipment alignment problems that could lead to the initiation of an event or impact mitigating system availability.

- Partial walkdown of 'A' reactor building (RB) spray during planned maintenance on 'B' RB spray pump
- Partial walkdown of 'B' residual heat removal (RHR) train during planned maintenance on 'A' RHR train
- Partial walkdown of 'B' emergency feedwater (EFW) and turbine driven emergency feedwater (TDEFW) during scheduled maintenance on 'A' EFW

###### b. Findings

No findings were identified.

##### .2 Complete System Walkdown

###### a. Inspection Scope

The inspectors performed a detailed review and walkdown of the service water system to identify any discrepancies between the current operating system equipment lineup and the designed lineup. In addition, the inspectors reviewed SOPs, applicable sections of the final safety analysis report (FSAR), design basis document, plant drawings, completed surveillance procedures, outstanding WOs, system health reports, and related CRs to verify that the licensee had properly identified and resolved equipment

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problems that could affect the availability and operability of the system. Documents reviewed are listed in the Attachment.

b. Findings

No findings were identified.

1R05 Fire Protection

Quarterly Fire Protection Walkdowns

a. Inspection Scope

The inspectors reviewed recent CRs, WOs, and impairments associated with the fire protection system. The inspectors reviewed surveillance activities to determine whether they supported the operability and availability of the fire protection system. The inspectors assessed the material condition of the active and passive fire protection systems and features, and observed the control of transient combustibles and ignition sources. The inspectors conducted routine inspections of the following five areas (respective fire zones also noted):

- Diesel generator rooms 'A' and 'B' (fire zones DG-1.1, 1.2, 2.1 and 2.2)
- 1DA switchgear room (fire zone IB-20)
- 1DB switchgear rooms and heating, ventilation, and air conditioning (HVAC) rooms (fire zones IB-16, IB-17, IB-22.2)
- Auxiliary building switchgear room 1DA2Y (fire zone AB-1.10)
- Auxiliary building switchgear room 1DB1 and 1DB2Y (fire zone AB-1.29)

b. Findings

No findings were identified.

1R06 Flood Protection Measures

Annual Review of Electrical Manholes

a. Inspection Scope

The inspectors reviewed and observed licensee periodic inspection of two safety-related electrical manholes, EMH-001 and EMH-002 (containing 'A' and 'B' 7.2 kV cables to service water pumps), to assess for leaks and perform repairs, inspect cable supports and structures, and to verify integrity following flooded conditions. The inspectors verified by direct observation and review of the associated inspection documents that the cables, splices, support structures, and sump pumps located within the manholes appeared intact and the cables were not being impacted by water. In addition, the inspectors reviewed several past periodic licensee inspection results for each of the

above mentioned manholes to ensure that any degraded conditions identified were appropriately resolved. Documents reviewed are listed in the attachment.

b. Findings

No findings were identified.

1R11 Licensed Operator Regualification Program and Licensed Operator Performance

.1 Resident Quarterly Review of Operator Regualification

a. Inspection Scope

The inspectors observed an operator regualification simulator exam occurring on May 20, 2013. The scenario involved the following failures/events: a steam pressure channel, a power range channel, a loss of generator stator cooling flow turbine runback, and a small break loss of cooling accident (SBLOCA). The inspectors observed crew performance in terms of communications; ability to prioritize failures in order to take timely and proper actions; prioritizing, interpreting, and verifying alarms; correct use and implementation of procedures, including the alarm response procedures; timely control board operation and manipulation, including high-risk operator actions; and oversight and direction provided by the shift supervisor, including the ability to identify and implement appropriate TS actions and when required, emergency action levels as the Site Emergency Director. The inspectors reviewed the licensee's critique comments to verify that performance deficiencies were captured for appropriate corrective

b. Findings

No findings were identified.

.2 Resident Quarterly Observation of Control Room Operations

a. Inspection Scope

During the inspection period, the inspectors conducted observations of licensed reactor operator activities to ensure consistency with licensee procedures and regulatory requirements. For the three listed activities, the inspectors observed the following elements of operator performance: (1) operator compliance and use of plant procedures including technical specifications; (2) control board component manipulations; (3) use and interpretation of plant instrumentation and alarms; (4) documentation of activities; (5) management and supervision of activities; and (6) control room communications.

- Observation of unit startup activities
- Observation of anticipated transient without scram (ATWS) mitigating system actuation circuitry (AMSAC) testing
- Observed steam generator 'A' narrow range transmitter testing

b. Findings

No findings were identified.

1R12 Maintenance Effectivenessa. Inspection Scope

The inspectors evaluated two equipment issues described in the CRs listed below to verify the licensee's effectiveness with the corresponding preventive or corrective maintenance associated with SSCs. The inspectors reviewed Maintenance Rule (MR) implementation to verify that component and equipment failures were identified, entered, and scoped within the MR program. Selected SSCs were reviewed to verify proper categorization and classification in accordance with 10 CFR 50.65. The inspectors examined the licensee's 10 CFR 50.65(a)(1) corrective action plans to determine if the licensee was identifying issues related to the MR at an appropriate threshold and that corrective actions were established and effective. The inspectors' review also evaluated if maintenance preventable functional failures or other MR findings existed that the licensee had not identified.

The inspectors reviewed the licensee's controlling procedures consisting of engineering services procedure (ES)-514, Rev. 5, "Maintenance Rule Program Implementation," and station administrative procedure (SAP)-0157, Rev. 0, Change A, "Maintenance Rule Program," to verify consistency with the MR program requirements.

- CR-13-00026, During refueling outage, the refueling water (RW) system exceeded maintenance rule unavailability
- CR-13-00566, Maintenance Rule (a)(1) goal setting is established on new alternate seal injection system MR function, reactor coolant pump (RCP) Alternate Seal Injection

b. Findings

No findings were identified.

1R13 Maintenance Risk Assessment and Emergent Work Controla. Inspection Scope

The inspectors performed risk assessments, as appropriate, for the six selected work activities listed below: (1) the effectiveness of the risk assessments performed before maintenance activities were conducted; (2) the management of risk; (3) that, upon identification of an unforeseen situation, necessary steps were taken to plan and control the resulting emergent work activities; and, (4) that emergent work problems were adequately identified and resolved. The inspectors evaluated the licensee's work prioritization and risk characterization to determine, as appropriate, whether necessary steps were properly planned, controlled, and executed for the planned and emergent work activities.

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- Work Week 15, switchyard grid modifications
- Work Week 17, yellow risk condition for 'C' service water (SW) pump discharge valve testing
- Work Week 18, yellow risk condition for 'A' SW pump planned maintenance and Parr Hydro alternate AC unplanned maintenance
- Work Week 22, work activities associated with 'A' RHR train resulting in a yellow risk condition
- Work Week 24, yellow risk condition for 'B' SW pump planned maintenance
- Work Week 26, yellow risk condition for 115kV offsite power circuit planned maintenance

b. Findings

No findings were identified.

1R15 Operability Evaluations

a. Inspection Scope

The inspectors reviewed three operability evaluations listed below, affecting risk significant mitigating systems to assess, as appropriate: (1) the technical adequacy of the evaluations; (2) whether operability was properly justified and the subject component or system remained available, such that no unrecognized increase in risk occurred; (3) whether other existing degraded conditions were considered; (4) that the licensee considered other degraded conditions and their impact on compensatory measures for the condition being evaluated; and, (5) the impact on TS limiting conditions for operations and the risk significance in accordance with the significance determination process. The inspectors also verified that the operability evaluations were performed in accordance with SAP-209, Rev. 1, "Operability Determination Process," and SAP-999, Rev. 10, "Corrective Action Program."

- CR-13-01418, Issue with conformance of reactor vessel supports to ASME inservice inspection requirements
- CR-13-01635, EDG fuel oil tank man-way entry tubes are not sand-filled as per respective drawings
- CR-13-00930, NRC identified past operability issue with SW outlet header to component cooling loop 'B' cross-connect valve

b. Findings

Introduction: The inspectors identified a non-cited violation of 10 CFR Part 50, Appendix B, Criterion V, "Instructions, Procedures, and Drawings," for the failure to perform a past operability evaluation for the 'B' component cooling water (CCW) train as required by CAP procedures whereby the licensee failed to identify that the train was inoperable for greater than the allowed technical specification outage time.

Description: On October 31, 2012, the licensee initiated work order (WO) 1113262-001 due to the SW system outlet header to CCW cross-connect valve (XVG09627B-CC) failing to open during surveillance testing as per STP-130.005M, "XVG09627B-CC Valve Operability Testing (MODE 5)." The licensee also initiated CR-12-05011 and subsequently freed the valve which was re-tested under WO 1113262-002.

On February 22, 2013, the inspectors reviewed the completed apparent cause evaluation (ACE) and operability determinations under CR-12-05011, and determined that the licensee had failed to perform a past operability evaluation contrary to their CAP requirements. Specifically, the inspectors determined that the licensee incorrectly answered the past operability block of CR-12-05011 as "No," and that this was a failure to follow station administrative procedure (SAP) 0999, "Corrective Action Program," Rev. 10, which states in part "PAST OPERABILITY: Is the condition emergent or has the condition possibly existed for a period of time?...If no, generate an Action for PSE to evaluate past operability." Inspectors also determined that the licensee failed to follow SAP-1356, "Cause Evaluation," Rev. 5, which states in part, "The ACE shall...Identify issues that may question or challenge the current or past operability evaluation of the event, as applicable. If new information discovered during the evaluation would challenge current or past operability, then initiate a new CR per SAP-999 and notify Operations."

The inspectors reviewed FSAR section 9.2.2.2 (CCW) "System Description," and design basis document (DBD), "Component Cooling Water System," Rev. 12, section 2.3, and noted that the SW to CCW cross-connect valves (XVG09627 A-CC and XVG09627B-CC) provides a safety-related make up source of SW in the event of a pipe crack or other loss of inventory to the CCW system, and that the 'B' CCW loop was past inoperable. The inspectors determined that prior to the failed surveillance on October 31, 2012, the last successful surveillance test for XVG09627B-CC was on May 3, 2011, under WO 1002029-002. Inspectors concluded that the associated Technical Specification (TS) 3.7.3, "Component Cooling Water System," was exceeded as the plant was in Modes 1-4 for greater than 72 hours with one train of CCW inoperable.

On February 22, 2013, the inspector's brought their concerns of past operability to the licensee. Subsequently, the licensee initiated CR-13-00930 to evaluate past operability and on April 16, 2013, determined that the 'B' CCW loop was past inoperable for greater than the allowable outage time of 72 hours of TS 3.7.3. Consequently, on June 19, 2013, the licensee submitted licensee event report (LER) 2013-002-00.

The inspectors noted that 10 CFR Part 50, Appendix B, Criterion V, states in part that activities affecting quality shall be accomplished by documented procedures. Inspectors also noted that both SAP-0999 and SAP-1356 are Appendix B procedures, and that valve XVG09627B-CC and the 'B' CCW loop are safety-related. The inspectors concluded that the licensee failed to adequately accomplish both SAP-0999 and SAP-1356 because past operability was not evaluated as required.

Analysis: The inspectors determined that the failure to evaluate past operability as required by the licensee's CAP procedures was a PD. The inspectors reviewed inspector manual chapter (IMC) 0612 and determined the PD is more than minor and

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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.

Enforcement: 10 CFR Part 50, Appendix B, Criterion V, states in part that activities affecting quality shall accomplished by documented procedures. Contrary to the above, on February 22, 2013, the licensee failed to adequately accomplish procedures SAP-0999 and SAP-1356 which required a past operability evaluation be performed for failure of the 'B' SW to CCW cross-connect valve. Because this finding is of very low safety significance and has been entered into the licensee's corrective action program as condition report CR-13-00930, this violation is being treated as a non-cited violation, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000395/2013003-02, Failure to Perform a Past Operability Evaluation of the Service Water Outlet Header to 'B' Component Cooling Water Cross-Connect Valve.

#### 1R19 Post Maintenance Testing

##### a. Inspection Scope

For the six maintenance activities listed below, the inspectors reviewed the associated post-maintenance testing (PMT) procedures and either witnessed the testing and/or reviewed test records to assess whether: (1) the effect of testing on the plant had been adequately addressed by control room and/or engineering personnel; (2) testing was adequate for the maintenance performed; (3) test acceptance criteria were clear and adequately demonstrated operational readiness consistent with design and licensing basis documents; (4) test instrumentation had current calibrations, range, and accuracy consistent with the application; (5) tests were performed as written with applicable prerequisites satisfied; (6) jumpers installed or leads lifted were properly controlled; (7) test equipment was removed following testing; and, (8) equipment was returned to the status required to perform its safety function. The inspectors verified that these activities were performed in accordance with general test procedure (GTP)-214, "Post Maintenance Testing Guideline," Rev. 5, Change B.

- WO 1301143-002, test SW and CCW 'B' cross connect valve following gag adjustment
- WO 1301074-006, perform external leakage test on pressurizer manway

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- WO 1306696-001, PMT on XVT08109C-CS after motor operated valve analysis and test system (MOVATS) testing (CR-13-01819)
- WO 1304687-001, PMT on 'B' RB spray sump isolation valve following MOVATS testing and breaker replacement
- WO 1307827-001, PMT on 'B' RHR pump, refueling water storage tank (RWST) suction valve
- WO 1305404-001, PMT on RHR heat exchanger 'A' outlet valve

b. Findings

No findings were identified.

1R20 Refueling and Other Outage Activities

Planned Outage

a. Inspection Scope

The inspectors performed the the inspection activities described below for a planned outage to effect seal repairs on 'C' RCP. The outage began on March 23, 2013, continued into the second quarter, and completed when the unit returned to full RTP on April 3, 2013. The inspectors used Inspection Procedure (IP) 71111.20, "Refueling and Outage Activities," to observe portions of the startup activities to verify that the licensee maintained defense-in-depth commensurate with the outage risk plan and applicable TS. The inspectors monitored licensee controls over the outage activities listed below.

- Reactivity controls
- Reactor heat up, mode changes, initial criticality, startup and power ascension activities

The inspectors reviewed the licensee's CAP to verify that the licensee was identifying problems related to outage activities at an appropriate threshold.

b. Findings

No findings were identified.

1R22 Surveillance Testing

a. Inspection Scope

The inspectors observed and/or reviewed the five surveillance test procedures (STPs) listed below to verify that TS or risk significant surveillance requirements were followed and that test acceptance criteria were properly specified to ensure that the equipment could perform its intended safety function. The inspectors verified that proper test conditions were established as specified in the procedures, that no equipment preconditioning activities occurred, and that acceptance criteria were met.

In-Service Tests:

- STP-112.003, "Reactor Building Spray System Valve Operability Test," Rev. 9C
- STP-121.002C, "Turbine Driven Emergency Feedwater Pump Main Steam Supply Valve Operability Test," Rev. 0
- STP-220-001A, "Motor Driven Emergency Feedwater Pump and Valve Test," Rev. 9A

Other:

- STP-125.002A, "Diesel Generator 'A' Operability Test," Rev. 2B
- STP-345.037, "Solid State Protection System Actuation Logic and Master Relay Test Train A," Rev. 18

b. Findings

No findings were identified.

Cornerstone: Emergency Preparedness

1EP6 Drill EvaluationEmergency Preparedness (EP) drilla. Inspection Scope

On May 22, 2013, the inspectors reviewed and observed the performance of an EP drill that involved a steam generator tube rupture, miscellaneous control rods failure to trip, an EDG failure following auto-start, failed fuel, a containment isolation valve failure, and a feedwater pipe break which required entry into increasing emergency action levels starting with an Alert and ending in a General Emergency. The drill additionally included a turnover between two different EP staffs. The inspectors assessed abnormal and emergency procedure usage, emergency plan classifications, protective action recommendations, respective notifications, and the adequacy of the licensee's drill critique. The inspectors verified that drill deficiencies were captured into the licensee's corrective action program.

b. Findings

No findings were identified.

#### 4. OTHER ACTIVITIES

##### 4OA1 Performance Indicator (PI) Verification

Cornerstone: Reactor Safety Barrier Integrity

###### a. Inspection Scope

The inspectors verified the accuracy of the licensee's PI submittals listed below for the period April, 2012, through March, 2013. The inspectors used the performance indicator definitions and guidance contained in Nuclear Energy Institute (NEI) 99-02, Rev. 6, "Regulatory Assessment Performance Indicator Guideline," and licensee procedure SAP-1360, Rev. 2, "NRC and INPO/WANO Performance Indicators," to check the reporting of each data element. The inspectors sampled licensee event reports (LERs), operator logs, plant status reports, CRs, and performance indicator data sheets to verify that the licensee had properly reported the PI data. Also, the inspectors discussed the PI data with the licensee personnel associated with the performance indicator data collection and evaluation.

- RCS Specific Activity
- RCS Identified Leak Rate

###### b. Findings

No findings were identified.

##### 4OA2 Identification and Resolution of Problems

###### .1 Review of Items Entered into the Corrective Action Program

###### a. Inspection Scope

As required by IP 71152, "Identification and Resolution of Problems," and in order to help identify repetitive equipment failures or specific human performance issues for follow-up, the inspectors performed a daily screening of items entered into the licensee's CAP. This review was accomplished by either attending daily screening meetings that briefly discussed major CRs, or accessing the licensee's computerized corrective action database and reviewing each CR that was initiated.

###### b. Findings

No findings were identified.

.2 Annual Operator Work-Around Review

a. Inspection Scope

The inspectors reviewed the licensee's list of identified operator workarounds associated with mitigating system equipment to determine whether any new items since the previous review conducted in 2012 would adversely affect any mitigating system function or affect the operators' ability to implement abnormal or emergency operating procedures. In addition, the inspectors performed an independent review of outstanding control board WOs and known problems with mitigating system equipment to identify any potential workarounds that had not been formally identified and evaluated by the licensee.

b. Findings

No findings were identified.

4OA3 Event Followup

(Closed) LER 05000395/2013-002-00: Component Cooling System Emergency Makeup Valve Failed to Stroke Open

On October 31, 2012, during a Unit 1 refueling outage surveillance test, the normally closed CCW system emergency makeup valve XVG09627B-CC failed to open. The licensee entered this problem into their CAP as CR-12-05011 and performed an apparent cause evaluation (ACE). Inspectors reviewed the ACE and CR-12-05011, but concluded that a required past operability evaluation was not performed. Subsequently, the licensee performed a past operability evaluation under CR-13-00930, and on April 22, 2013, identified that XVG09627B-CC was inoperable for a period of time greater than allowed by Technical Specification 3.7.3, "Component Cooling Water System." The licensee may generate a supplemental report after examining the valve during a future refueling outage; the inspectors will further review any supplemental report at that time. The enforcement aspects of this LER are discussed in Section 1R15 of this report. This LER is closed.

4OA5 Other Activities

.1 Quarterly Resident Inspector Observations of Security Personnel and Activities

a. Inspection Scope

During the inspection period, the inspectors conducted observations of security force personnel and activities to ensure that the activities were consistent with licensee security procedures and regulatory requirements relating to nuclear plant security. These observations took place during both normal and off-normal plant working hours. These quarterly resident inspector observations of security force personnel and activities did not constitute any additional inspection samples. Rather, they were considered an integral part of the inspectors' normal plant status review and inspection activities.

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b. Findings

No findings were identified.

2. (Closed) URI 05000395/2012005-01, Nonconformance of RCP Motor Oil Collection System with the Fire Protection Program

a. Inspection Scope

The inspectors opened the above URI in NRC integrated inspection report 05000395/2012005 to allow further review of the three identified PDs to determine if the significance was more than minor. The inspectors have completed their review of the aforementioned URI which is hereby closed as discussed below.

b. Findings

Introduction: 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 a reactor coolant pump (RCP) motor oil collection system.

Description: On November 28, 2012, during containment walkdowns the inspectors identified the following performance deficiencies (PDs) associated with RCP motor oil enclosures:

1. a split in the seal boot for the 'B' RCP motor oil external heat exchanger 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 dripping from the motor air discharge ductwork flange.

The inspectors reviewed electrical maintenance procedure (EMP) 295.006, "Inspection and PM of RCP Motors," Rev. 13, and noted that step 7.33 directed the use of a flashlight for the detection of degraded seams or gaskets. The inspectors determined the procedure was not adequate for inspections to detect the aforementioned seal boot problem for the 'B' RCP motor.

The inspectors noted that the oil lift pump enclosures utilized a small rectangular flap to allow observation of the lift pump pressure gauge, and that the flap, which opened outward, did not have seals or a latch to prevent opening if exposed to a fitting leak at the pressure gauge. The inspectors also noted that the lift pumps are used only for RCP starts and provide pressure at a nominal 1200 psig to the RCP motor bearings. The inspectors concluded that the design was faulty because the pressure was sufficient to open the inspection flap if exposed to a gauge fitting leak. The inspectors later identified an opening in the top of the enclosure that allowed passage of conduit. This opening was sufficiently large to allow the escape of pressurized oil spray and had no sealing device to ensure the requirement of complete isolation of potential oil leaks.

The inspectors identified white silicone caulk at some flange connections associated with the RCP motor air discharge ductwork. Oil drips were observed at these locations, and the caulking was obviously applied in an attempt to prevent leakage. The inspectors noted that there were no provisions to capture the oil leakage. The inspectors had previously processed a problem involving RCP motor internal oil leakage, resulting entrainment in motor cooling air flow, and discharge from the motor in a North Anna Integrated Inspection Report 05000338/2009004, 05000339/2009004. The inspectors concluded that the licensee's design was also faulty in that no provisions were provided to capture accumulated oil from internal leakage escaping the motor via the air discharge ductwork flange.

The inspectors reviewed in detail the fire protection requirements associated with the RCP motor oil collection system. The Virgil C. Summer Nuclear Station, Unit No. 1, Renewed Facility Operating Licensee No. NPF-12, Condition 2.C(18), Fire Protection System, states in part that the licensee shall implement and maintain in effect all provisions of the approved Fire Protection Program as stated in the FSAR of which Section 9.5.1.1 includes 10 CFR 50, Appendix R, Section III.O, which requires in part that the RCP motor shall be equipped with an oil collection system which shall be so installed that failure will not lead to fire during normal or design basis accident conditions and such collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the RCP lube oil systems.

Additionally, Section 9.5.1.1 states, "The fire protection systems are also addressed in the Fire Protection Evaluation Report (FPER), which is considered a part of this FSAR." The inspectors reviewed the FPER and noted that the RCP motor oil collection system is discussed in Section 4.1.1.1, subsection 2, "Description of Fire Zone RB-1.2," and is referred as the "Westinghouse reactor coolant pump motor oil spillage protection and control system." Specific statements and requirements pertinent to the aforementioned PDs are:

- The system is provided to collect any leakage.
- The system includes an oil-tight enclosure around the high pressure oil lift system and an oil-tight enclosure around the external heat exchanger.
- The oil lift system enclosure completely isolates high pressure oil components from the environment and prevents a high pressure oil leak spraying on hot components.
- The oil cooler enclosure completely isolates the external heat exchanger from the environment and prevents oil leakage from dripping or spraying on hot components.

The inspectors concluded that the three PDs discussed above were contrary to the licensee's Fire Protection Program requirements for RCP motor oil collection systems as required by the operating license Section 2.C(18) and delineated in FSAR Chapter 9, and the FPER.

Analysis: The inspectors determined that the aforementioned problems with RCP motor oil enclosures and ductwork were PDs. The inspectors used IMC 0612 and determined that the PDs were more than minor and therefore a finding because it 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

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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 of 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.

Enforcement: The Virgil C. Summer Nuclear Station, Unit No. 1, Renewed Facility Operating Licensee No. NPF-12, Condition 2.C(18), Fire Protection System, states in part that the licensee shall implement and maintain in effect all provisions of the approved Fire Protection Program as stated in the FSAR of which section 9.5.1.1 includes 10 CFR 50, Appendix R, Section III.O, which requires in part that the RCP motor shall be equipped with an oil collection system which shall be so installed that failure will not lead to fire during normal or design basis accident conditions and such collection systems shall be capable of collecting lube oil from all potential pressurized and unpressurized leakage sites in the RCP lube oil systems. Contrary to the above, on November 28, 2012, the licensee failed to adequately design, install and maintain an adequate oil collection system that was capable of collecting oil from pressurized and unpressurized leakage sites which included the RCP motor stator air discharge ductwork flanges. Because the finding is of very low safety significance and has been entered into the licensee's CAP as CRs12-05736 and 12-05756, this violation is being treated as an NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000395/2013003-03, Failure to Adequately Design, Install and Maintain Oil Collection Devices for Reactor Coolant Pump Motors.

.3 (Closed) URI 05000395/2012005-04, Failure to Consider the Risk Impact of Time to Core Boil With Reactor Vessel Upper Internals Installed and Cavity Level is Greater Than Reactor Vessel Flange

a. Inspection Scope

The inspectors opened the above URI in NRC integrated inspection report 05000395/2012-005. The inspectors reviewed licensee evaluations conducted in accordance with their CAP and consulted with NRC risk analysts to determine the significance of the PD discussed in detail in the aforementioned report. The results are documented below; this URI is closed.

b. Findings

Introduction: 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

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a plant operating state (POS) consisting of upper reactor vessel (RV) internals installed, RV head removed, and reactor cavity level greater than RV flange.

Description: The details of URI 05000395/2012005-04 are discussed in the above report. The licensee completed their evaluations of the above POS and documented their results in CR-12-04757. The inspectors reviewed the results and noted that the licensee's conclusion stated, "The calculation module does not differentiate between when the upper internals are in or out of the vessel and, because the heat calculations are based on complete mixing, the module may over predict the time-to-boil if water in the cavity (i.e., above the flange) is credited with the upper internals installed. For this configuration, it would be more appropriate to assume the water level is 9" below the reactor vessel flange when using the calculation module."

The inspectors noted that with RCS level at 9" below the RV flange, this respective plant condition was identified as a high risk evolution or Yellow risk condition due to reduced TTCB of approximately 22 minutes. Given a similar TTCB for the POS involving a higher cavity level up to and including normal refueling level, the inspectors concluded that the licensee's qualitative risk assessment was, therefore, incorrectly identified as a Green risk condition and was more appropriately a high risk evolution or Yellow risk condition.

Analysis: 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 PD. The inspectors reviewed IMC 0612, Appendix B 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. 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 RHR initiators were evaluated, both trains of RHR and emergency core cooling system including both EDGs 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.

Enforcement: 10 CFR 50.65 (a)(4) states 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 this, on October 23, 2012, the licensee failed to assess and manage the increase in risk, qualitatively, due to the failure to recognize the significance of the aforementioned POS and correctly update the TTCB computer program for refueling outage 20 maintenance activities involving reactor vessel component disassembly. Because this finding is of very low safety significance and because it was entered into the licensee's CAP as CR-12-04757, this violation is being treated as a NCV, consistent with Section 2.3.2 of the NRC Enforcement Policy: NCV 05000395/2013003-04, 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.

#### 40A6 Meetings, Including Exit

On July 22, 2013, the resident inspectors presented the integrated inspection report results to Mr. T. Gatlin and other members of the licensee staff. The licensee acknowledged the results of these inspections. The inspectors confirmed that inspection activities discussed in this report did not contain proprietary material.

ATTACHMENT: SUPPLEMENTAL INFORMATION

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## **SUPPLEMENTAL INFORMATION**

### **KEY POINTS OF CONTACT**

#### **Licensee Personnel**

J. Archie, Senior Vice President, Nuclear Operations  
A. Barbee, Director, Nuclear Training  
M. Browne, Manager, Quality Systems  
M. Coleman, Manager, Health Physics and Safety Services  
G. Douglass, Manager, Nuclear Protection Services  
T. Gatlin, Vice President, Nuclear Operations  
K. Gore, Manager, Organization Development and Performance  
M. Harmon, Manager, Chemistry Services  
R. Haselden, General Manager, Organizational / Development Effectiveness  
R. Justice, Manager, Nuclear Operations  
G. Lippard, General Manager, Nuclear Plant Operations  
M. Mosley, Manager, Nuclear Training  
M. Roberts, Supervisor, Health Physics II, New Plant, Environmental, Rad Waste  
D. Shue, Manager, Maintenance Services  
W. Stuart, General Manager, Engineering Services  
B. Thompson, Manager, Nuclear Licensing  
D. Weir, Manager, Plant Support Engineering  
B. Wetmore, Design Engineering  
R. Williamson, Manager, Emergency Planning  
S. Zarandi, General Manager, Nuclear Support Services

## LIST OF ITEMS OPENED, CLOSED, AND DISCUSSED

### Opened

05000395/2013003-01	URI	Modification Leads to Auxiliary Building Flood Vulnerability (Section 1R01.4)
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### Opened and Closed

05000395/2013003-02	NCV	Failure to Perform a Past Operability Evaluation of the Service Water Outlet Header to 'B' Component Cooling Water Connect Valve (Section 1R15)
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05000395/2013003-03	NCV	Failure to Adequately Design, Install and Maintain Oil Collection Devices for Reactor Coolant Pump Motors (Section 4OA5.2)
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05000395/2013003-04	NCV	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 (Section 4OA5.3)
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### Closed

05000395/2013-002-00	LER	Component Cooling System Emergency Makeup Valve Failed to Stroke Open (Section 4OA3)
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05000395/2012005-01	URI	Nonconformance of RCP Motor Oil Collection System with the Fire Protection Program (Section 4OA5.2)
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05000395/2012005-04	URI	Failure to Consider the Risk Impact of Time to Core Boil With Reactor Vessel Upper Internals Installed and Cavity Level is Greater Than Reactor Vessel Flange (Section 4OA5.3)
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## LIST OF DOCUMENTS REVIEWED

### **Section 1R01: Adverse Weather Protection**

AOP-301.1, Response to Electrical Grid Issues, Rev 0  
 EOP-6.0, Loss of All ESF AC Power, Rev 27  
 OAP-100.4, Communication, Rev 2  
 OAP-102.1, Conduct of Operations Scheduling Unit, Rev 7  
 SAP-0703, Control of Switchyard/Transformer Yard Activities, Rev 1  
 SOP-301, Main Generator System, Rev 15  
 SOP-304, 115KV/7.2KV Operations, Rev 13  
 Nuclear Electric Transmission Interface Agreement Rev 5  
 Summer Nuclear Station Transmission Agreement, November 1978  
 VCS-1 Impacting Facilities Diagram and List, Rev 3  
 V.C. Summer Nuclear Power Station Large Power Transformer and Switchyard Reliability Interface Agreement, Rev 3  
 Floor Drain Tank level graph for May 5 & 6, 2013  
 FSAR Section 3.4.1, Flood Protection

### **Section 1R04: Equipment Alignment**

STP-112.001, Reactor Building Spray Monthly Valve Inspection, Rev. 3A  
 D-302-661, Reactor Building Spray, Rev. 35  
 D-302-641, Residual Heat Removal, Rev.20  
 SOP-117, Service Water System, Rev. 22G  
 D-302-222, Service Water Cooling, Sheets 1&2, Rev. 7  
 D-302-221, Service Water Cooling, Rev. 28

### **Section 1R05: Fire Protection**

WO 1306537-001, Monitor phase current at XMC1DA2Y-07AB to determine current at next overload trip  
 CR-13-02238, NRC identified a plastic cart and test equipment used for monitoring XMC1DA2Y-07AB had no fire protection permit

### **Section 1R11: Licensed Operator Regualification Program and Licensed Operator Performance**

WO 1307213-001, SG 'A' narrow range level transmitter test

### **Section 1R15: Operability Evaluations**

SAP-0999, Corrective Action Program, Rev. 10  
 SAP-1356, Cause Determination, Rev. 5  
 Enhanced Design Basis Document, Component Cooling Water system, Rev. 12  
 ES-120, Operability Recommendation and JCO Development, Rev. 0  
 TWR LS11312, Condition Evaluation for CER-01-2077, Dated 3/21/2002  
 CR-12-05011, XVG09627B-CC failed its stroke open test  
 CR-13-00930, NRC identified-past operability evaluation was not performed in CR-12-05011  
 GOP-5, Reactor Shutdown from Startup to Hot Standby (Mode 2 to Mode

**Section 40A53: Event Follow Up**

CR-13-02601, Not clear when past operability evaluation for XVG09627B-CC was approved

**Section 40A5.2: Other Activities**

TRP-15, Reactor Coolant Pump Oil Spillage Enclosures and Collection Tanks, Rev 3, which includes multiple drawing and related document references

**Section 40A5.3: Other Activities**

SAP-208, Integrated Risk Assessment, Rev 0

SAP-1403, Outage Management and Execution, Rev 1

SAP-1404, Pre-Outage Preparation and Milestones, Rev 1

SSP-004, Outage Safety Review Guidelines, Rev 3

TQP-907, Shutdown Safety Advisor Training, Rev 0

TR07800-008, Rev 0, Non-Power Operational Modes Transition Review

OAP-100.6, Control Room Conduct and Control of Shift Activities, Rev 3

Management Directive 76, Senior Management Shutdown Safety Policy Statement

**LIST OF ACRONYMS**

AB	Auxiliary Building
AC	Alternating Current
ACE	Apparent Cause Evaluation
ADAMS	Agency Document Access and Management System
ASME	American Society of Mechanical Engineers
CAP	Corrective Action Program
CCW	Component Cooling Water
CFR	Code of Federal Regulations
CR	Condition Report
DG	Diesel Generator
EDG	Emergency Diesel Generator
EFW	Emergency Feedwater
EMH	Electrical Manhole
EP	Emergency Preparedness
ES	Engineering Services Procedure
FSAR	Final Safety Analysis Report
GTP	General Test Procedure
IB	Intermediate Building
IMC	Inspection Manual Chapter
INPO	Institute of Nuclear Power Operations
IP	Inspection Procedure
IR	Inspection Report
ISFSI	Independent Spent Fuel Storage Installation
kV	Kilovolt
LER	Licensee Event Report
MOVATS	Motor Operated Valve Analysis and Test System
MR	Maintenance Rule
NCV	Non-Cited Violation
NEI	Nuclear Energy Institute
NPF	Nuclear Power Facility
NRC	Nuclear Regulatory Commission
NUREG	Nuclear Regulatory
OAP	Operations Administrative Procedure
OOS	Out of Service
PARS	Publicly Available Records
PD	Performance Deficiency
PI	Performance Indicator
PMT	Post-Maintenance Testing
RB	Reactor Building
RCP	Reactor Coolant Pump
RCS	Reactor Coolant System
REV.	Revision
RF20	Refueling Outage Number 20
RHR	Residual Heat Removal
RTP	Rated Thermal Power
SAP	Station Administrative Procedure

SCE&G	South Carolina Electric and Gas
SDP	Significance Determination Process
SOP	System Operating Procedure
SRI	Senior Resident Inspector
SSC	System, Structures, and Components
STP	Surveillance Test Procedure
SW	Service Water
TDEFW	Turbine Driven Emergency Feedwater
TI	Temporary Instruction
TS	Technical Specification
UFSAR	Updated Final Safety Analysis Report
URI	Unresolved Item
VCSNS	V.C. Summer Nuclear Station
WANO	World Association of Nuclear Operators
WO	Work Order