October 24, 2006

Mr. Jeffery B. Archie
Vice President, Nuclear Operations
South Carolina Electric & Gas Company
Virgil C. Summer Nuclear Station
Post Office Box 88
Jenkinsville, SC 29065

SUBJECT: VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1 — ISSUANCE OF AMENDMENT REGARDING WCAP-14333, "PROBABILISTIC RISK ANALYSIS OF THE RPS AND ESFAS TEST TIMES AND COMPLETION TIMES" (TAC NO. MC8898)

Dear Mr. Archie:

The Nuclear Regulatory Commission has issued the enclosed Amendment No. 177 to Renewed Facility Operating License No. NPF-12 for the Virgil C. Summer Nuclear Station, Unit 1. The amendment changes the technical specifications (TSs) in response to your application dated November 15, 2005, as supplemented on May 31, August 31, and September 29, 2006.

This amendment revises TS 3/4.3.1, "Reactor Trip System Instrumentation," and TS 3/4.3.2, "Engineered Safety Feature Actuation System Instrumentation," to implement the allowed outage time and bypass test time changes approved in WCAP-14333-P-A, revision 1, "Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times," dated October 1998 and makes additional changes to ACTION 8 of TS 3/4.3.1.

A copy of the related Safety Evaluation is enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Robert E. Martin, Senior Project Manager
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-395

Enclosures:
1. Amendment No. 177 to NPF-12
2. Safety Evaluation

cc w/enclosures: See next page

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SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

DOCKET NO. 50-395

VIRGIL C. SUMMER NUCLEAR STATION, UNIT NO. 1

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 177
Renewed License No. NPF-12

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by South Carolina Electric & Gas Company (the licensee), dated November 15, 2005, as supplemented on May 31, August 31, and September 29, 2006 complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications, as indicated in the attachment to this license amendment; and paragraph 2.C.(2) of Renewed Facility Operating License No. NPF-12 is hereby amended to read as follows:

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. 177, and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. South Carolina Electric & Gas Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This amendment is effective as of its date of issuance and shall be implemented within 60 days of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Evangelos C. Marinos, Chief
Plant Licensing Branch II-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: October 24, 2006

ATTACHMENT TO LICENSE AMENDMENT NO. 177

TO RENEWED FACILITY OPERATING LICENSE NO. NPF-12

DOCKET NO. 50-395

Replace page 3 of Renewed Facility Operating License No. NPF-12 with the attached revised page 3.

Replace the following pages with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove Page	Insert Page
Technical Specifications	Technical Specifications
3/4 3-6	3/4 3-6
3/4 3-7	3/4 3-7
3/4 3-8	3/4 3-8
3/4 3-23	3/4 3-23
3/4 3-24	3/4 3-24
Bases	Bases
B 3/4 3-1	B 3/4 3-1
B 3/4 3-1a	B 3/4 3-1a
B 3/4 3-1b	B 3/4 3-1b
B 3/4 3-1c	B 3/4 3-1c
B 3/4 3-1d	B 3/4 3-1d

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 177 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-12

SOUTH CAROLINA ELECTRIC & GAS COMPANY

SOUTH CAROLINA PUBLIC SERVICE AUTHORITY

VIRGIL C. SUMMER NUCLEAR STATION, UNIT 1

DOCKET NO. 50-395

1.0 INTRODUCTION

By application dated November 15, 2005, as supplemented on May 31, August 31, and September 29, 2006, (References 1, 2, 3 and 4), South Carolina Electric & Gas Company (SCE&G, the licensee) requested changes to the technical specifications (TSs) for the Virgil C. Summer Nuclear Station, Unit 1 (VCSNS). The May 31, August 31, and September 29, 2006, letters provided clarifying information that did not change the November 15, 2005 application and the initial proposed no significant hazards consideration determination.

1.1 Proposed Changes

The proposed changes would revise TS 3/4.3.1, "Reactor Trip System Instrumentation" (RTS), and TS 3/4.3.2, "Engineered Safety Feature Actuation System Instrumentation" (ESFAS), to implement the extensions of restoration times for inoperable instrument channels and the extensions of channel bypass times that have been approved by the Nuclear Regulatory Commission (NRC) staff in WCAP-14333-P-A, Revision 1, "Probabilistic Risk Analysis of the RPS [reactor protection system] and ESFAS Test Times and Completion Times," (WCAP-14333, Reference 9). The proposed changes in the license amendment request are similar to those in the NRC-approved Technical Specification Task Force (TSTF) change traveler TSTF-418, Revision 2, "RPS and ESFAS Test Times and Completion Times (WCAP-14333)" (TSTF-418, Reference 10). This license amendment is not related to, or in response to, any ongoing NRC activities (e.g., generic letters).

1.2 Background

The proposed TS modifications affect the RPS (i.e., RTS and ESFAS). The RTS is designed to shutdown the reactor when a limit to permissible operation is reached. The ESFAS is designed to actuate for transients that challenge the normal control and heat removal systems.

The RPS comprises several major functions including instrumentation, logic, reactor trip, and ESFAS actuation. Instrumentation consists of sensors, power supplies, signal processing and bistable outputs and typically consists of three or four channels. The logic (i.e., logic cabinets) includes two parallel logic blocks consisting of two trains (A and B) of RPS logic where the input coincidence for various trip functions is determined. The RPS logic provides two parallel outputs for ESFAS actuation. Each output is actuated by its associated RPS logic train, which initiates the ESFAS function through master and slave relays.

Additionally, two parallel actuation paths are provided from the RPS logic to the reactor trip breakers (RTBs). Normally, a RTB receives its signal from its associated RPS logic train. Bypass breakers are provided for when a breaker is out of service. In this configuration, the bypass breaker is associated with the logic train of the operable RTB. The RPS utilizes two normally closed RTBs and two normally open bypass breakers. RPS logic train A actuates RTB A and train B logic actuates RTB B. Opening of either RTB will disconnect power from the control rods, causing a reactor trip.

The Westinghouse Owners Group (WOG) Technical Specification Optimization Program evaluated changes to surveillance test intervals (STIs) and allowed outage times (AOTs) for the analog channels, logic cabinets, master and slave relays, and reactor trip breakers and requested relaxations in TS requirements as follows. In 1983, the WOG submitted WCAP-10271-P, “Evaluation of Surveillance Frequencies and Out-of-Service Times for the Reactor Protection Instrumentation System,” which provided a methodology to be used to justify revisions to a plant’s RPS TS. The methodology evaluated increases in surveillance intervals, test and maintenance out-of-service times, and the bypassing of portions of the RPS during test and maintenance. The NRC staff approved WCAP-10271 and its supplements in references 5, 6, 7 and 8. These actions were part of the implementation of the recommendations for review of surveillance test requirements made in NUREG–1024, "Technical Specifications - Enhancing the Safety Impact," wherein the NRC suggested that TS action statements be reviewed to assure that they have an adequate technical basis and do indeed minimize plant risk. TSs approved in WCAP-10271 were incorporated into NUREG-1431, Revision 0, "Standard Technical Specifications, Westinghouse Plants" (STS). Further details on the development of the STS and TSTF 418 may be found in Reference 10.

In WCAP-10271, the WOG performed fault tree analyses to calculate the reactor trip unavailability, with consideration for surveillance intervals and test and maintenance times. The sensitivity to variations in surveillance intervals and test and maintenance times were also evaluated with respect to maintaining or revising current surveillance intervals. The WOG concluded that the results of the analyses for the RPS were adequate to justify a revision of the STS. WCAP-10271 including Supplement 1, was accepted, with conditions, by NRC in 1985, in which the NRC staff approved the following changes for plant-specific TS:

- Increase the surveillance interval for RTS analog channel operational tests from once per month to once per quarter.

- Increase the time in which an inoperable RTS analog channel may be maintained in an untripped condition from 1 hour to 6 hours.

- Increase the time an inoperable RTS analog channel may be bypassed to allow testing of another channel in the same function from 2 hours to 4 hours. Also, the channel test may be done in the bypass mode, leaving the inoperable channel in a tripped condition.

- Allow testing of the RTS analog channels in a bypass condition instead of a tripped condition.

On February 22, 1989, (Reference 7), the NRC staff issued a safety evaluation (SE) for WCAP-10271, Supplement 2, that approved similar relaxations for the ESFAS. An additional supplemental SE was issued on April 30, 1990, (Reference 8), that provided consistency between RTS and ESFAS STIs and AOTs.

Subsequent to the approval of WCAP-10271 and its supplements, the WOG submitted WCAP-14333-P, “Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times,” dated May 1995. On July 15, 1998, in Reference 9, the NRC staff issued an SE approving WCAP-14333 for reference in license applications based on stated acceptance criteria. The NRC staff's SE included approval of draft TS for Specifications 3.3.1, and 3.3.2. The TS for WCAP-14333 were incorporated into NUREG-1431, Revision 2. The purpose of this topical report was to provide justification for the following additional TS relaxations beyond those approved in WCAP-10271.

- Increase the bypass times and repair AOTs for both the solid-state and relay protection system RPS and ESFAS designs. TSs changes of this type increase the test bypass times and the times to restore inoperable channels to operable status for both the solid state protection system (SSPS) and relay protection system RTS and ESFAS designs. For analog channels, this increases the action statement AOT from 6 hours to 72 hours, and the test bypass time from 4 hours to 12 hours.

- Increase the AOT repair times for the logic cabinets, master relays, and slave relays. TS changes of this type increase the action statement AOTs from 6 hours to 24 hours for maintenance plus 6 additional hours for a plant mode change.

- Revise the reactor trip breaker and logic cabinet bypass repair AOTs. TS changes of this type specify that reactor trip breakers can be bypassed during test or maintenance for a period of time equivalent to the bypass time for the logic cabinets provided both are tested at the same time and provided the plant design is such that both the reactor trip breaker and the logic cabinet cause their associated electrical trains (buses) to be inoperable during test or maintenance.

In the case of VCSNS, only WCAP-10271 has been incorporated into the VCSNS TS by previous NRC-approved license amendment requests. The VCSNS RPS utilizes the SSPS for the logic portion of the RPS.

Proposed changes were not evaluated generically in WCAP-14333 for several instrument functions that included; (1) Reactor Coolant Pump Breaker Position, (2) Automatic Swithchover to Containment Sump (RWST Level-Low Low Coincident with Safety Injection and Coincident with Containment Sump Level-High, and (3) Loss of Power Emergency Diesel Start. The VCSNS TSs do not include item (1) and there were no changes proposed for item (3). The analogous change to item (2) for VCSNS is discussed in section 3.2.2.

2.0 REGULATORY ANALYSIS

2.1 Applicable Regulations

Section 182a of the Atomic Energy Act requires applicants for nuclear power plant operating licenses to include TSs as part of the license. In Section 50.36 of Title 10 of the *Code of Federal Regulations* (10 CFR 50.36), the Commission establishes the regulatory requirements related to the content of TSs. 10 CFR 50.36 does not specify particular requirements to be included in TSs, but does, in part, require that TSs include items in the following five specific categories:

(1) safety limits, limiting safety system settings and limiting control settings
(2) limiting conditions for operation (LCOs)
(3) surveillance requirements
(4) design features
(5) administrative controls

The Maintenance Rule,10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants,” requires licensees to monitor the performance or condition of structures systems and components (SSCs) against licensee-established goals, in a manner sufficient to provide reasonable assurance that SSCs are capable of fulfilling their intended functions as applicable to the implementation and monitoring program guidance of RG 1.174, Section 2.3, and RG 1.177, Section 3. In addition,10 CFR 50.65(a)(4), as it relates to the proposed AOT extension, requires the assessment and management of the increase in risk that may result from the proposed maintenance activity.

General Design Criterion (GDC) 13, “Instrumentation and Control,” requires that appropriate controls be provided to maintain the applicable variables and systems within prescribed operating ranges.

GDC 21, “Protection System Reliability and Testability,” requires the protection system to be designed for high functional reliability and inservice testability, commensurate with the safety functions to be performed. The protection system shall be designed to permit periodic testing of its functioning when the reactor is in operation, including a capability to test channels independently to determine failures and losses of redundancy that may have occurred.

2.2 Applicable Regulatory Criteria and Guidance

The NRC staff review of the November 15, 2005 application and its supplements, made use of the following applicable regulatory guidance:

- NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Revision 2, and
- TSTF-418, Revision 2, "RPS and ESFAS Test Times and Completion Times (WCAP-14333).”

General guidance for evaluating the technical basis for proposed risk-informed changes is provided in Chapter 19.0, "Use of Probabilistic Risk Assessment (PRA) in Plant-Specific, Risk-Informed Decisionmaking: General Guidance," of the NRC Standard Review Plan (SRP), NUREG-0800. More specific guidance related to risk-informed TS changes is provided in SRP Section 16.1, "Risk-Informed Decisionmaking: Technical Specifications," which includes AOT changes as part of risk-informed decisionmaking. Chapter 19.0 of the SRP states that a risk-informed application should be evaluated to ensure that the proposed changes meet the following five key principles:

1. The proposed change meets the current regulations, unless it explicitly relates to a requested exemption or rule change.

2. The proposed change is consistent with the defense-in-depth philosophy.

3. The proposed change maintains sufficient safety margins.

4. When proposed changes increase core damage frequency or risk, the increase(s) should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.

5. The impact of the proposed change should be monitored using performance measurement strategies.

Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," dated November 2002, describes a risk-informed approach, acceptable to the NRC, for licensees to assess the nature and impact of proposed permanent licensing basis changes by considering engineering issues and applying risk insights.

RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," dated August 1998, identifies an acceptable risk-informed approach, including additional guidance geared toward the assessment of proposed permanent TS AOT changes. Specifically, RG 1.177 identifies a three-tiered approach for the licensee's evaluation of the risk associated with a proposed AOT TS change, as shown below.

- Tier 1 assesses the risk impact of the proposed change in accordance with acceptance guidelines consistent with the Commission's Safety Goal Policy Statement, as documented in RG 1.174 and RG 1.177. The first tier assesses the impact on operational plant risk based on the change in core damage frequency (ΔCDF) and change in large early release frequency (ΔLERF). It also evaluates plant risk while equipment covered by the proposed AOT is out-of-service, as represented by incremental conditional core damage probability (ICCDP) and incremental conditional large early release probability (ICLERP). Tier 1 also addresses PRA quality, including the technical adequacy of the licensee's plant-specific PRA for the subject application. Cumulative risk of the present TS change in light of past (related) applications or additional applications under review are also considered along with uncertainty/sensitivity analysis with respect to the assumptions related to the proposed TS change.

- Tier 2 identifies and evaluates any potential risk-significant plant equipment outage configurations that could result if equipment, in addition to that associated with the proposed license amendment, are taken out of service simultaneously, or if other risk-significant operational factors, such as concurrent system or equipment testing, are also involved. The purpose of this evaluation is to ensure that there are appropriate restrictions in place such that risk-significant plant equipment outage configurations will not occur when equipment associated with the proposed AOT is implemented.

- Tier 3 addresses the licensee's overall configuration risk management program (CRMP) to ensure that adequate programs and procedures are in place for identifying risk-significant plant configurations resulting from maintenance or other operational activities and appropriate compensatory measures are taken to avoid risk-significant configurations that may not have been considered when the Tier 2 evaluation was performed. Compared with Tier 2, Tier 3 provides additional coverage to ensure risk-significant plant equipment outage configurations are identified in a timely manner and that the risk impact of out-of-service equipment is appropriately evaluated prior to performing any maintenance activity over extended periods of plant operation. Tier 3 guidance can be satisfied by the Maintenance Rule (10 CFR 50.65(a)(4)), which requires a licensee to assess and manage the increase in risk that may result from activities such as surveillance testing and corrective and preventive maintenance, subject to the guidance provided in RG 1.177, Section 2.3.7.1, and the adequacy of the licensee's program and PRA model for this application. The CRMP is to ensure that equipment removed from service prior to or during the proposed extended AOT will be appropriately assessed from a risk perspective.

More specific methods and guidelines acceptable to the staff are also outlined in RG 1.177 for assessing risk-informed TS changes. Specifically, RG 1.177 provides recommendations for utilizing risk information to evaluate changes to TS AOTs and surveillance test intervals, with respect to the impact of the proposed change on the risk associated with plant operation.

RG 1.174 and RG 1.177 also describe acceptable implementation strategies and performance monitoring plans to help ensure that the assumptions and analysis used to support the proposed TS changes will remain valid. The monitoring program should include means to adequately track the performance of equipment that, when degraded, can affect the conclusions of the licensee's evaluation for the proposed licensing basis change. RG 1.174 states that monitoring performed in accordance with the Maintenance Rule,10 CFR 50.65, can be used when the monitoring performed under the Maintenance Rule is sufficient for the SSCs affected by the risk-informed application.

3.0 TECHNICAL EVALUATION - TRADITIONAL ENGINEERING REVIEW

3.1 Reactor Trip System Instrumentation Changes

All discussions in this section refer to VCSNS TS 3/4.3.1, "Reactor Trip System Instrumentation."

3.1.1 Increased Bypass Allowance and Repair AOTs for Instrumentation Channels

The VCSNS TS changes increase the AOTs for analog channels from 6 hours to 72 hours, and the test bypass time from 4 hours to 12 hours as listed below.

ACTION 2 is revised to increase the AOT to restore an inoperable RTS analog channel to operable status before it must be placed in the tripped condition from 6 hours to 72 hours and the time allowed for an RTS analog channel to be bypassed for testing is increased from 4 hours to 12 hours. Action 2 applies to Function 2.A, Power Range Neutron Flux - High Setpoint, Function 2.B, Power Range Neutron Flux - Low Setpoint, and Function 3, Power Range Neutron Flux Rate - High Positive Rate.

ACTION 6 is revised to increase the AOT to restore an inoperable RTS analog channel to operable status before it must be placed in the tripped condition from 6 hours to 72 hours and the time allowed for an RTS analog channel to be bypassed for testing is increased from 4 hours to 12 hours. Action 6 applies to Function 7, Overtemperature ΔT, Function 8, Overpower ΔT, Function 9, Pressurizer Pressure - Low, Function 10, Pressurizer Pressure - High, Function 11, Pressurizer Water Level - High, Function 12A, Loss of Flow - Single Loop, Function 12B, Loss of Flow - Two Loops, Function 13, Steam Generator Water Level Low-Low, and Function 14, Steam /Feedwater Mismatch and Low Steam Generator Water Level, Function 15, Undervoltage Reactor Coolant Pumps, Function 16, Underfrequency Reactor Coolant Pumps, and Function 17A, Turbine Trip - Low Fluid Oil Pressure.

3.1.2 Revised Reactor Trip Breaker and Logic Cabinet Bypass Repair AOTs

The VCSNS TSs reactor trip breakers bypass time during test or maintenance can be changed to be equivalent to the bypass time for the logic cabinets provided both are tested at the same time and provided the plant design is such that both the reactor trip breaker and the logic cabinet cause their associated electrical trains (buses) to be inoperable during test or maintenance. On this basis, the test bypass time may be changed from 2 hours to 4 hours.

ACTION 8 is revised to increase the time allowed for an RTB to be bypassed from 2 hours to 4 hours for concurrent surveillance testing of the RTB and automatic trip logic.

ACTION 12 is revised to increase the AOT to restore an inoperable train of automatic trip logic to operable status before the unit must be shutdown from 6 hours to 24 hours for Safety Injection Input from ESF (RTS Functions 18) and Automatic Trip Logic (RTS Function 21).

3.1.3 Conclusion - RTS Changes in Sections 3.1.1 and 3.1.2

The NRC staff concludes that: (1) increase the required action completion time to 72 hours and the test bypass times to 12 hours, (2) revise the reactor trip breaker and logic cabinet bypass required action completion time to be equivalent to the 4 hour bypass time for the logic cabinets (for the case where logic cabinets and trip breakers both cause their train to be inoperable when in test or maintenance) provided both are tested at the same time, and (3) increase the logic cabinets, master relays and slave relays required action completion time to 24 hours, are consistent with the approved allowances accepted by the NRC staff based on WCAP-14333 and are, therefore, acceptable.

In addition, proposed TSs Bases provide an adequate basis or reason for the approved TS changes.

3.1.4 RTS Changes Unrelated to WCAP-14333

ACTION 8 for RTS Function 20, RTBs, is also revised to include a requirement to restore an inoperable breaker to operable status within 1 hour. Currently Action 8 does not include such an Action, and a unit shutdown must be initiated immediately if an RTB is inoperable. A note is also added that a RTB may be bypassed for up to 2 hours for maintenance on the undervoltage or shunt trip mechanisms.

The NRC staff finds that the revision to add a one hour AOT to restore an inoperable RTB to operable status is equal to the time allowed by LCO 3.0.3 for shutdown actions in the event of a complete loss of RTS function. Applying the one hour AOT allowance to the condition of one RTB train inoperable is conservative and allows for an orderly transition to shutdown and is acceptable. The revision to add a 2 hours bypass AOT for maintenance on the undervoltage or shunt trip mechanisms provided the other train is operable was reviewed by the NRC staff in WCAP-10271-P-A, Supplement 1, May 1986. By letter dated June 18, 1991, the NRC staff issued Amendment No. 101 to Renewed License No. NPF-12, revising the VCSNS TS to include WCAP-10271-P-A, Supplement 1. The addition of the 2-hour bypass allowance is therefore approved.

3.2 ESFAS Instrumentation Changes

All discussions in this section refer to the proposed changes to VCSNS TS 3/4.3.2, "Engineered Safety Feature Actuation System Instrumentation."

3.2.1 Increased Repair Times for Logic Cabinets, Master Relays and Slave Relays

These TS changes increase the AOTs from 6 hours to 24 hours for maintenance.

ACTION 14 is revised to increase the AOT for Function 1.b, Safety Injection Automatic Actuation Logic and Actuation Relays; Function 2.b, Reactor Building Spray Automatic Actuation Logic and Actuation Relays; Function 3.a.3, Containment Isolation - Phase A Isolation Automatic Actuation Logic and Actuation Relays, and Function 3.b.1, Containment Isolation - Phase B Isolation Automatic Actuation Logic and Actuation Relays.

ACTION 21 is revised to increase the AOT for Function 4.b, Steam Line Isolation Automatic Actuation Logic and Actuation Relays; Function 6.b, Emergency Feedwater Automatic Actuation Logic and Actuation Relays; and Function 8.b, Automatic Switchover to Containment Sump Automatic Actuation Logic and Actuation Relays.

ACTION 25 is revised to increase the AOT for Function 5.B, Turbine Trip and Feedwater Isolation Automatic Actuation Logic and Actuation Relays.

3.2.2 Increased Bypass Allowance and Repair AOTs for Instrumentation Channels

The VCSNS TS changes increase the AOTs for analog channels from 6 hours to 72 hours, and the test bypass time from 4 hours to 12 hours as listed below.

ACTION 24 is revised for Function 1.c, Safety Injection on Reactor Building Pressure - High; Function 1.d, Safety Injection on Pressurizer Pressure Low; Function 1.e, Safety Injection on

Differential Pressure Between Steam Lines - High; Function 1.f, Safety Injection on Steam Line Pressure - Low; Function 4.c, Steam Line Isolation on Reactor Building Pressure - High 2; Function 4.d, Steam Line Isolation on Steam Flow in Two Steam Lines - High and Coincident with Tavg - Low - Low; Function 4.e, Steam Line Isolation on Steam Line Pressure Low; Function 5.a, Turbine Trip and Feedwater Isolation on Steam Generator Water Level High - High; Function 6.c.i, Emergency Feedwater on Steam Generator Level Low - Low, Start Motor Driven Pumps; and Function 6.c.ii, Emergency Feedwater on Steam Generator Level Low - Low, Start Turbine Driven Pump.

3.2.3 Conclusion - ESFAS Changes in Sections 3.2.1 and 3.2.2

The NRC staff concludes that the proposed changes to TS 3/4.3.2 that (1) increase the required action completion time to 72 hours and the test bypass time to 12 hours and, (2) that increase the logic cabinets, master relays and slave relays required action completion time to 24 hours are consistent with the approved allowances accepted by the NRC staff based on WCAP-14333, and are, therefore, acceptable.

In addition, proposed TSs Bases provide an adequate basis or reason for the approved TS changes.

3.3 Administrative TS Changes

The Summer TSs changes related to administrative non-technical changes are listed below. These changes are acceptable on the bases stated in the following discussions.

Action 21 is also revised from "restore the inoperable channels," to "restore the inoperable channel" since there are only two trains of automatic actuation logic, and this Action only addresses one inoperable train of actuation logic.

Action 25 is also revised from "restore the inoperable channels," to "restore the inoperable channel" since there are only two trains of automatic actuation logic, and this Action only addresses one inoperable train of actuation logic.

4.0 TECHNICAL EVALUATION - PROBABILISTIC RISK ASSESSMENT

An AOT extension increases the unavailability of a component due to the increased time the component is down for maintenance. For AOTs, the designated AOTs may not provide adequate time for repair, but longer AOTs may incur a relatively larger risk. There are two components to the risk impact: (1) the single event risk when the AOT is invoked and the component is down for maintenance, and (2) the yearly risk contribution based on the expected number of times the AOT will be implemented. The yearly AOT risk contribution is reflected in the *frequency* per year based on adjusting the component unavailability due to estimated yearly mean outage time. The yearly AOT risk impact is represented by the CDF and LERF metrics referenced in RG 1.174. The single event risk is represented by the ICCDP and the ICLERP metrics referenced in RG 1.177 and reflects the *probability* of core damage or large early release during the period a component is down for maintenance.

4.1 Detailed Description of the Proposed Change

The proposed AOT and bypass times are based on WCAP-14333, (Reference 9), and Nuclear Energy Institute TSTF-418, (Reference 10).

The specific changes to TS 3/4.3.1, 3/4.3.2 proposed by the licensee are provided in Sections 2.1 through 2.10 of the licensee's submittals (References 1, 2, 3, and 4). The licensee also included in its submittal, for information, a revised Bases for TS 3/4.3.1 and 3/4.3.2. The proposed WCAP-14333 changes, applicable to VCSNS, are summarized in the table below.

RPS/ESFAS Components	AOT		Bypass Test Time	
	Current (Hour)	Proposed (Hour)	Current (Hour)	Proposed (Hour)
Analog Channels	6+6[1]	72+6	4	12
Logic Cabinets	6+6	24+6	4	No Change
Master Relays	6+6	24+6	4	No Change
Slave Relays	6+6	24+6	4	No Change
Reactor Trip Breakers	6	No change	2	No Change[2]

1. The +6 hours is the time allowed for the specified mode change

2. The RTB AOT and bypass times are not revised directly by WCAP-14333 and it is assumed that the bypass times for the RTBs and the logic cabinets are separate and independent. However, WCAP-14333 assumed that with either a logic cabinet or RTB in test or maintenance, their associated train is also unavailable. Based on this, the analysis presented in WCAP-14333 included a provision to accept a bypass time of the RTBs equivalent to the bypass time for the logic cabinets (4 hours) provided that both are tested concurrently. Therefore, the RTB bypass time for VCSNS is extended for this maintenance configuration. If the RTB is tested independently of the logic cabinets, the bypass time remains unchanged, at 2 hours.

   The deterministic evaluation of the licensee's proposed 1-hour AOT to restore an inoperable RTB to operable status and the 2-hour bypass test time for maintenance of the undervoltage or shunt trip mechanisms, is provided in section 3.1.4 of this SE.

ESFAS Changes Unrelated to WCAP-14333

In addition, the licensee proposed increasing the ACTION 16 AOT and bypass test times to 72 hours and 12 hours, respectively, for the following functional units not specifically evaluated by WCAP-14333. Specifically, the functions evaluated were Functions 2.c and 3.b.2, Reactor Building Pressure - High - 3; Function 6.h, Emergency Feedwater Suction Transfer on Low Pressure; and Function 8.a, Automatic Switchover to containment Sump on RWST level low-low. The licensee evaluated the above functional units using the guidance of RG 1.174 and

RG 1.177 and the VCSNS PRA to evaluate the change in ΔCDF, ΔLERF, ICCDP and ICLERP. The risk impacts for all three functional units were well within the RG 1.174 ΔCDF and ΔLERF acceptance guidelines for a very small change. The results for ICCDP and ICLERP were also well within the RG 1.177 acceptance guidelines. Accordingly, the proposed changes to ACTION 16 are acceptable.

4.2 Review of Methodology

Per SRP Chapter 19 and Section 16.1, the NRC staff reviewed the VCSNS incorporation of WCAP-14333 using the three-tiered approach and the five key principles of risk-informed decisionmaking presented in RG 1.174 and RG 1.177 and the SE conditions and limitations for WCAP-14333.

4.3 Key Information Used in the Review

The key information used in the NRC staff's review is contained in Enclosure 1 of the license amendment request, as supplemented by the licensee's submittals dated May 31, August 31, and September 29, 2006, TSTF-418, and the conditions/limitations identified in WCAP-14333 and the associated NRC staff SE. The NRC staff also utilized previous staff SEs related to WCAP-10271, the licensee's individual plant examination (IPE) and individual plant examination of external events (IPEEE), and the associated staff SEs.

4.4 Comparison Against Regulatory Criteria/Guidelines

The NRC staff's evaluation of the licensee's proposed amendment to extend AOTs and bypass times using the three-tier approach and the five principles outlined in RGs 1.174 and 1.177 are presented in the following sections.

4.4.1 Traditional Engineering Evaluation

The traditional engineering evaluation addresses key principles 1, 2, 3, and 5 of the NRC staff's philosophy of risk-informed decisionmaking, which concerns: (1) compliance with current regulations, (2) evaluation of defense-in-depth, (3) evaluation of safety margins, and (5) performance measurement strategies.

With respect to key principles 1, 2 and 3, the NRC staff previously performed a generic evaluation of WCAP-14333 and documented its results as discussed in Section 3 of this report. The NRC staff's review of WCAP-14333 found that it was consistent with the guidelines of the draft predecessor to RG 1.177. From traditional engineering insights, the NRC staff finds that the proposed changes in WCAP-14333 continue to meet the regulations, have no impact on the defense-in-depth philosophy, and would not involve a significant reduction in the margin of safety.

With respect to the fourth key principle, risk evaluation, the changes proposed by the licensee employ a risk-informed PRA approach using risk insights to justify changes to AOTs and bypass times. The risk metrics ΔCDF, ΔLERF, ICCDP, and ICLERP developed in the topical report and used by the licensee to evaluate the impact of the proposed changes are consistent with those presented in RGs 1.174 and 1.177. The evaluation of the licensee's risk evaluation is provided in section 4.4.2 of this SE.

With respect to the fifth key principle, performance measurement strategies, implementation and monitoring programs, RG 1.174 and RG 1.177 also establish the need for an implementation and monitoring program to ensure that extensions to TS AOTs do not degrade operational safety over time and that no adverse degradation occurs due to unanticipated degradation or common cause mechanisms. An implementation and monitoring program is intended to ensure that the impact of the proposed TS change continues to reflect the reliability and availability of SSCs impacted by the change. The evaluation of the licensee's implementation and monitoring program is provided in Section 4.4.3 of this SE.

4.4.2 Staff Technical Evaluation (PRA)

4.4.2.1 Applicability of WCAP-14333 to VCSNS.

To determine that WCAP-14333 is applicable to VCSNS, the licensee addressed the conditions and limitations of the staff SE and the implementation guidance developed by the WOG that compares plant specific data to the generic analysis assumptions. The evaluation compared the general baseline assumptions including surveillance, maintenance, calibration, actuation signals, procedures, and operator actions to confirm the WCAP generic evaluation assumptions were also applicable to VCSNS.

The licensee's evaluation of each of the WCAP-14333 conditions and limitations is discussed below.

1. Confirm the applicability of WCAP-14333 analyses for their plant.

   To demonstrate the applicability of WCAP-14333 to VCSNS, the licensee performed a comparison of WCAP-14333 generic assumptions and data with VCSNS plant specific parameters. This comparison included the base component bypass, test and maintenance intervals to those assumed by WCAP-14333. The evaluation also included confirmation that procedures are in place for operator actions assumed by the generic analysis and are applicable to VCSNS. The contribution from anticipated transient without scram (ATWS) events were also confirmed to be consistent with that assumed in the generic analysis. The applicability of the reactor trip actuation signals in the topical report were also confirmed for VCSNS. Component failure probabilities were compared to the topical report assumptions and found to be applicable to VCSNS. The applicability of WCAP-14333 is discussed further in Section 4.4.2.2 Tier 1: PRA Capability and Insights.

   Based on the evaluation presented under Sections 4.4.2.2, "Tier 1" of this SE the staff considers this condition satisfied for VCSNS.

2. Address the Tier 2 and Tier 3 analyses including CRMP insights, by confirming that these insights are incorporated into the referencing licensee's decisionmaking process before taking equipment out of service.

   Based on the evaluation presented under Sections 4.4.2.3, "Tier 2" and Section 4.4.2.4, "Tier 3" of this SE the NRC staff considers this condition satisfied for VCSNS.

4.4.2.2 Tier 1: PRA Capability and Insights

The first tier evaluates the impact of the proposed changes on plant operational risk based on the VCSNS/WCAP-14333 PRA model. The Tier 1 staff review involves two aspects: (1) evaluation of the validity of the PRA and its application to the proposed changes and (2) evaluation of the PRA results and insights based on the licensee's proposed application.

PRA Technical Adequacy

The objective of the PRA technical adequacy review is to determine whether the VCSNS/WCAP-14333 PRA used in evaluating the proposed RTS and ESFAS AOT and bypass time extensions are of sufficient scope and detail for this application. For this safety evaluation, WCAP-14333 provided a generic PRA model used for the evaluation. This generic model and the WCAP-14333 evaluation were found by the NRC staff to be acceptable on a generic basis in the WCAP-14333 SE dated July 15, 1998. In the SE, the NRC staff stated that although the use of a representative model is generally reasonable, a degree of uncertainty is introduced when the representative model and the associated results are applied to a specific plant due to modeling, design, and operational differences. Therefore, each licensee adopting WCAP-14333 needs to confirm that the WCAP-14333 analysis and results are applicable to their plant.

The NRC staff reviewed the information provided in the proposed license amendment request, as well as the findings and conditions of the staff WCAP-14333 SER. The WCAP-14333 conditions and limitations identified by the staff were considered limiting by VCSNS in that WCAP-14333 does not specify the use of the VCSNS PRA or plant-specific estimates of ΔCDF, ΔLERF, ICCDP, or ICLERP in the implementation of WCAP-14333. However, the NRC staff, in its SER for WCAP-14333, found the applicability of the generic PRA analysis for the proposed AOT to other Westinghouse plants may not be representative based on design variations in actuated systems and the contribution to plant risk from accident classes impacted by the proposed change. The NRC staff therefore concluded that each licensee would need to address any differences between their plant and the representative plant that could increase the AOT risk significance. To address this, VCSNS reviewed of the scope and detail of the VCSNS PRA and performed a cross comparison on the representative WCAP-14333 PRA model parameters (a modified version of the Vogtle Electric Generating Plant (VEGP) to demonstrate the plant specific applicability of the proposed VCSNS RPS and ESFAS AOTs and test bypass times. Cross comparisons were performed on actuation logic; component test, maintenance, and calibration times/intervals; at-power maintenance; ATWS; total internal events CDF; transient events; operator actions; RTS trip actuation signals; and ESFAS actuation signals. Based on the cross comparison per the implementation guidelines for WCAP-14333, the licensee concluded that WCAP-14333 is applicable to VCSNS.

The approach used in WCAP-14333 is similar to that used in the earlier WCAP-10271 TS optimization program. As stated in WCAP-14333, this includes the fault tree models, signals, component reliability, and most of the test and maintenance assumptions. WCAP-14333 is differentiated from the earlier WCAP-10271 analysis by the use of different common cause modeling for analog channels and the use of licensee surveys to estimate component unavailability. Operator actions for either manual trips or to initiate safety injection were also modeled in WCAP-14333 and ATWS mitigation system actuation circuitry (AMSAC) is credited

for emergency feedwater pump start. In addition, unlike WCAP-10271, the generic model used for WCAP-14333 is based on the VEGP PRA.

The NRC staff also reviewed the VCSNS IPE and IPEEE. The VCSNS IPE and IPEEE were developed in response to Generic Letter (GL) 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities." The NRC staff concluded that the VCSNS IPE and IPEEE met the intent of GL 88-20.

Peer Review

The VCSNS PRA underwent industry peer review August 5, 2002 by the Westinghouse Owners Group (WOG) with the Peer review final report issued in December of 2002. The licensee stated that all level “A” facts and observations (F&Os) have been addressed and all but two level B F&Os. The licensee provided a discussion of the remaining level B F&Os in the amendment request. The first F&O addressed a concern that the full plant level perspective of the symptom and plant conditions that may influence the time available to perform Type C actions were adequately addressed. The licensee stated that due to the generic nature of the WCAP-14333 analysis and the operator actions credited, this F&O has no impact on the incorporation of WCAP-14333 at VCSNS. The licensee provided additional information in their RAI response demonstrating that this F&O does not adversely impact the proposed AOT and bypass times and has been incorporated into the VCSNS PRA. For the licensee functional units that were not originally within the scope of WCAP-14333, the licensee provided additional information indicating that the PRA did not credit these actions, or in the case of ESFAS functional unit 8.a, the operator action was not dependent on prior operator actions and the concern of the F&O was not applicable to these functional units.

The second F&O concerned the internal flooding analysis and assumptions made in the internal flooding analysis notebooks. The licensee stated that due to the generic analysis of WCAP-14333, the F&O had no impact on the proposed changes. The NRC staff noted that internal flooding may have unique plant specific vulnerabilities and may not be bounded by the generic analysis. Additional review indicated that internal floods were not part of the implementation guidance for WCAP-14333. The NRC staff noted in the SE for WCAP-14333 that the proposed TS changes will have only a small impact on external event risk. The licensee’s RAI response provided additional information confirming the applicability of the WCAP-14333 analysis to VCSNS and that flooding events are not impacted by the proposed ESFAS or RTS instrumentation AOTs or bypass times. For the functional units not originally part of the WCAP-14333 analysis, the licensee provided an evaluation that showed the identified flooding events will not impact the availability of these signals.

The licensee also indicated that a review of the VCSNS PRA was performed to the American Society of Mechanical Engineers standard for the mitigating systems performance index. The F&Os from this review have been included in the VCSNS PRA.

In addition to the peer review, the NRC staff reviewed the results of the benchmarking of the VCSNS Significance Determination Process (SDP) notebook that was performed in May of 2003. During the benchmark visit, the NRC staff identified some modeling differences that resulted in more overestimations than typically found following benchmarking of a SDP notebook. The NRC staff recommended that the SDP notebook be benchmarked to the licensee’s revised PRA following the licensee’s evaluation and resolution of the teams

comments. The licensee incorporated the NRC staff's comments as needed and indicated that the latest staff benchmarking did not result in any unresolved issues with the VCSNS PRA model.

PRA Update/Procedures

The licensee stated that a recent effort to benchmark the VCSNS PRA demonstrated that the PRA reflected the as-built as-operated plant. The last major update to the VCSNS PRA occurred on March 30, 2004, with additional updates identified through August 2005. The licensee also provided, as part of their RAI response, the PRA updates since the completion of the IPE and IPEEE. The licensee also provided an implementation record of changes to the PRA based on the IPE findings. VCSNS design guide PSA-08 states that the PRA should be periodically updated and updates should be implemented every other refueling outage. The update review includes plant changes, procedures and plant operating and equipment history.

PRA Results and Insights

The WCAP-14333 PRA model used data reported in previous studies for WCAP-10271 and plant surveys. The STI times were not revised by WCAP-14333 and therefore are also representative of WCAP-10271 and VCSNS. The model was based on a plant with an SSPS instead of a relay protection system. WCAP-14333 concluded that the signal unavailability values for a relay plant were consistently smaller than those for a plant equipped with an SSPS such as VCSNS and therefore a SSPS analysis was considered bounding.

The WCAP-14333 risk impacts were found to be within the RG 1.174 acceptance guidelines of less than 1.0E-6 for ΔCDF and less than 1E-7 for ΔLERF for the proposed bypass times and AOTs. The ICCDP for the proposed changes were found to be within the RG 1.177 acceptance guideline of less than 5E-7. The acceptance guideline of less than 5E-8 for ICLERP were also met for the proposed changes in WCAP-14333.

The licensee also estimated the risk impacts for the TS functional units not generically evaluated by WCAP-14333. Considering these additional functional units, the risk impact is also within the RG 1.174 and 1.177 acceptance guidelines for ΔCDF, ΔLERF, ICCDP and ICLERP.

Cumulative Risk

The cumulative CDF risk was evaluated in WCAP-14333 from the pre-TOP to WCAP-14333 (i.e., includes WCAP-10271). In this case, the cumulative impact on CDF for 2 out of 4 and 2 out of 3 logic was found to be within the RG 1.174 acceptance guidelines for a very small change.

The licensee identified design or operational modifications that are not reflected in the WCAP-14333 PRA evaluation for VCSNS. A review of the licensee's RAI responses shows that the these modifications and previous risk-informed applications do not impact the proposed AOT and bypass times. The licensee did not identify any additional license amendment requests (LARs) under review that would impact the proposed AOTs and bypass times.

External Events

The licensee evaluated the proposed RPS and ESFAS AOT and bypass times for their potential impact on external events including fire, seismic events, high winds, floods and other (HFO) events. These events are discussed below. In the SE for WCAP-14333 the NRC staff considered the impact of the proposed TS changes on the risk from external events, such as fire and earthquakes, qualitatively with insights from NUREG-1150 " Severe Accident Risks: An Assessment of Five U.S. Power Plants." Based on its review, the NRC staff concluded that the proposed AOT and bypass time TS changes would have only a very small impact on risk from external events.

Fires

In lieu of a fire PRA, the VCSNS IPEEE fire analysis used Revision 1 of the NUMARC/EPRI Fire Induced Vulnerability Evaluation (FIVE) Methodology and performed plant walkdowns, fire area screening, and quantification of fire sequences for fires in unscreened fire areas. The IPEEE estimated the fire contribution to plant CDF to be about 8.5E-5/year. The licensee did not identify any potential vulnerabilities associated with fire events in the IPEEE. The IPEEE identified the 1DA and 1DB switchgear rooms, control room, relay room, and turbine building as not meeting the screening value of 1E-6. The IPEEE also notes that VCSNS is a self induced loss of offsite power plant. Based on the IPEEE, the VCSNS response to a fire is to trip offsite power to avoid hot shorts or spurious actuation of equipment. The unscreened fire areas result in a single train shutdown. A higher risk will result since unaffected equipment may not be available per procedure.

To further estimate the impact of the LAR on fire risk and to assure that the change in risk is very small, the licensee evaluated a relay room fire scenario that included the proposed SSC AOT and test bypass times. The licensee considered a large fire in the instrumentation and process control racks to be a representative case for a relay room fire and this was modeled in the PRA. The scenario was modeled by assuming the failure of one train of ESFAS equipment with the associated fire suppression also failed. The impact of the proposed AOTs and test bypass times was incorporated by assuming the failure of the automatic actuation of the remaining ESFAS train. Manual action was credited for the remaining train. The base case included one train of ESFAS OOS because of the fire with a reactor trip as the initiating event. The ICCDP and ICLERP results were estimated to be about 1.7E-9 and 2.5E-10, respectively, for the proposed AOT and test bypass times. The estimates for ICCDP and ICLERP demonstrate that the proposed AOT and test bypass times have a negligibly small impact on fire risk for VCSNS.

Further, the licensee stated that the IPEEE fire analysis significant sequences included controlled removal of offsite power and securing a single EDG. Additional failures of starting signals associated with the proposed AOT and test bypass times would have a negligible impact on the significant sequences since these sequences credited only manual actuation of the turbine-driven emergency feedwater (TDEFW) pump. Therefore, based on the above, the proposed AOT and test bypass times are expected to have a negligible impact on the IPEEE fire risk results.

Seismic Events

VCSNS did not develop a seismic PRA, but rather employed a seismic margins assessment (SMA) for the IPEEE submittal. Therefore, no quantitative estimate of the seismic contribution to plant CDF was provided. Four plant walkdowns were performed on the safe shutdown equipment list, using the review level earthquake of 0.3g peak ground acceleration (PGA). The high confidence of a low probability of failure (HCLPF) was found to be greater than 0.3g PGA for all equipment and structures, with the exception of the service water pond dams that have a HCLPF of 0.22g PGA. The VCSNS IPEEE did not identify any significant seismic concerns. The VCSNS IPEEE resulted in no outliers that involve operability issues at VCSNS. Issues identified during the IPEEE included a missing pipe support, cabinet seismic interactions, and the seismic qualification of a neutral grounding resistor. These items were corrected by the licensee subsequent to the IPEEE. There were no replacements or corrective actions necessary for relays. The IPEEE did not identify any seismic issues/vulnerabilities associated with the electrical and instrumentation and control logic areas.

As a result of using the SMA approach, the licensee did not quantify a seismic CDF. To confirm that the total seismic risk at VCSNS is sufficiently small, the staff performed an independent simplistic calculation to estimate the magnitude of the seismic risk. The NRC staff used the approximation method provided in a paper by Robert P. Kennedy entitled, *"Overview of Methods for Seismic PRA and Margin Analysis Including Recent Innovations*." This approach uses the plant's HCLPF value that is determined by the licensee's SMA and the site's seismic hazard curve that is based on NUREG-1488, "Revised Livermore Seismic Hazard Estimate for Sixty-Nine Nuclear Power Plant Sites East of the Rocky Mountains," to derive an approximation of the magnitude of the risk associated with seismic events. The staff's independent simplistic calculation, using a plant HCLPF value of 0.22g PGA, estimated a seismic CDF of about 4E-5/year.

As a confirmatory measure, the licensee evaluated the proposed extended AOT on seismic risk qualitatively using the assumption that a seismic event would result in a non-recoverable LOOP. The evaluation assumed the loss of function of the one motor driven emergency feedwater pump and the loss of the TDEFW pump. The licensee estimated the ICCDP using the seismic event frequency of the safe-shutdown earthquake (SSE) and conditional core damage probability (LOOP and loss of emergency feedwater) during the proposed extended AOT. The licensee's results for ICCDP and ICLERP for the proposed AOT and test bypass times were within the limits of the RG 1.177 acceptance guidelines. Based on the IPEEE seismic margin evaluation, the low probability of an earthquake greater than the SSE occurring during the proposed AOT and test bypass times, and the licensee's qualitative estimates for ICCDP and ICLERP, the seismic contribution to core damage due to the increased AOT and test bypass times is expected to be negligible.

To provide additional perspective on the licensee's assessment that the seismic contribution for this application is negligible, the staff performed an additional simplistic calculation assuming a non-recoverable LOOP occurs at a HCLPF of 0.1g PGA, which is the traditional HCLPF value used for the failure of the switchyard transformer ceramic insulators. At this magnitude of earthquake, no other seismic-related failures are expected (i.e., to lead to core damage would require additional non-seismic failures of other equipment, such as the emergency diesel generators and emergency feedwater pumps). Using the methodology described above, and the HCLPF value of 0.1g PGA, the frequency of a seismically-induced non-recoverable LOOP is

estimated to be about 2E-4/year. Based on the information provided in the licensee's submittal, the staff estimated that the plant may be in the proposed AOT and test bypass configurations no more than about 1 percent of the year (less than 80 hours per year). Thus, the probability of a seismically-induced LOOP while in the proposed AOT or test bypass configurations is about 2E-6/year. When combined with the failure of the other train, the ICCDP is less than 1E-7/year. This confirms the impact of the LAR on seismic risk is negligibly small.

HFO External Events

The IPEEE for HFO external events were screened according to the 1975 SRP (NUREG 75/087) screening criteria. The licensee did not identify any plant vulnerabilities and did not identify improvements associated with HFO events. The IPEEE submittal states that the plant's licensing basis for high winds, tornado loads, and tornado missiles, conforms to the 1975 SRP criteria. The IPEEE noted that per NUREG-1407, if a plant meets the 1975 SRP criteria, HFO external events can be screened out as a significant contributor to total core damage frequency. The licensee also qualitatively evaluated high winds similar to the seismic evaluation with the assumption that high winds would result in a LOOP. The ICCDP and ICLERP results were less that the RG 1.177 acceptance guidelines for the proposed AOTs and bypass times. Based on the IPEEE HFO evaluation results and the licensee's qualitative estimates for ICCDP and ICLERP for HFO events, the contribution to core damage due to the increased AOT and bypass times is also expected to be minimal.

Shutdown and Transition Risk

The staff SE for WCAP-14333 indicates that transition risk would be decreased with incorporation of a longer AOT since mode transitions (i.e. avoiding potential reactor trips) may be decreased with a longer AOT. WCAP-14333 estimated that the risk avoided is comparable to the risk increase of the proposed AOT and bypass times and concluded that the averted risk associated with avoiding one reactor trip is comparable to the increased risk of the proposed AOTs and bypass times.

Based on the above, the NRC staff finds that the evaluation provided by VCSNS has shown the reference plant to be applicable to the VCSNS plant specific case, supportive of the proposed AOT and bypass times requested for VCSNS, that the PRA reflects the as-built and as-operated plant, and the licensee's estimates for ΔCDF, ΔLERF, ICCDP and ICLERP are within the acceptance guidelines of RG 1.174 and RG 1.177 and are, therefore, acceptable.

Total Risk Contribution

The staff was concerned that the estimated fire and seismic risk, in conjunction with the VCSNS internal event risk, would exceed the RG 1.174 base CDF of 1E-4/year with the implementation of WCAP-14333. The combined total CDF is estimated to be about 1.7E-4/year (4.9E-5/year + 8.5E-5/year + 4E-5/year). However, RG 1.174 further states that while there is no requirement to calculate the total CDF, if there is an indication that the CDF may be considerably higher that 1E-4/year, the focus should be on finding ways to decrease, rather than increase risk. Given the typically conservative nature of the FIVE analysis methodology and the estimation of the seismic risk, the staff finds that the total CDF is not expected to be considerably higher than 1E-4/year and is acceptable for this application.

4.4.2.3 Tier 2 - Avoidance of Risk-Significant Plant Configurations

A licensee should provide reasonable assurance that risk-significant plant equipment outage configurations will not occur when specific pant equipment is taken out of service in accordance with the proposed TS change. WCAP-14333 evaluated system importance for plant configurations with ongoing test and maintenance on the analog channels, logic cabinets, master relays, and slave relays. Based on the RAI responses to WCAP-14333 the risk significance did not change significantly with an analog channel out of service. Similar results were also found with master relays and slave relays. A more significant change in the order of risk significant systems occurs when a logic cabinet is removed from service. With a logic cabinet out of service the automatic actuation signals from one complete train of actuation logic are unavailable increasing the importance of RPS and ESFAS actuation signals and the associated actuated systems. To address this, the WCAP-14333 staff SE stated that each licensee referencing WCAP-14333 must, therefore, examine the need to place necessary restrictions on concurrent equipment outages when entering proposed AOTs to avoid risk significant configurations. Based on WCAP-14333 and licensee evaluations, including the functional units not evaluated generically by WCAP-14333, the only Tier 2 conditions identified by the licensee concern the situation when a logic cabinet out of service. The Tier 2 restrictions are presented below and were identified by the licensee as a regulatory commitment.

- To preserve ATWS mitigation capability, activities that degrade the availability of the emergency feedwater system, RCS pressure relief system (pressurizer power-operated relief valves (PORVs) and safety valves), AMSAC, or turbine trip, should not be scheduled when a logic cabinet is unavailable.

- To preserve large loss-of-coolant accident mitigation capability, one complete emergency core cooling system (ECCS) train that can be actuated automatically must be maintained.

- To preserve reactor trip and safeguards actuation capability, activities that cause master relays or slave relays in the available train and activities that cause analog channels to be unavailable should not be scheduled when a logic cabinet is unavailable.

- Activities on electrical systems (e.g., AC and DC power) and cooling systems (e.g., service water and component cooling water) that support systems of functions listed in the first three bullets should not be scheduled when a logic cabinet is unavailable. That is, one complete train of a function that supports a complete train of a function noted above must be available.

The licensee evaluated concurrent component outage configurations and confirmed the applicability of the Tier 2 restrictions for VCSNS. Based on the above, the NRC staff finds the licensee's Tier 2 analysis supports the implementation of WCAP-14333 at VCSNS and satisfies condition 2 of the Staff SE for WCAP-14333 regarding Tier 2.

4.4.2.4 Tier 3 - Risk-Informed Configuration Risk Management

VCSNS utilizes the Equipment Out of Service (EOOS) risk monitor and utilizes the same fault tree and data base used for the PRA model. To provide an adequate Tier 3 evaluation for SSCs incorporating the proposed WCAP-14333 AOT and bypass times, the licensee will include representative RTS and ESFAS actuation signals in the VCSNS PRS and EOOS risk monitor

sufficient to perform Tier 3 evaluations. Actuation signals not specifically included in the PRA will be added or surrogates will be used to ensure that Tier 3 evaluations will reflect the implementation of WCAP-14333.

The risk impact of maintenance and testing activities conforms to the requirements of the Maintenance Rule, 10 CFR 50.65(a)(4) and the RG 1.177 key components for a CRMP. The risk management process is controlled and implemented through procedures at VCSNS including the establishment of risk thresholds. The licensee utilizes a risk monitor that employs the same fault tree and database as the plant PRA but in the form of a zero maintenance model to assess configuration risk. Both planned and emergent conditions may be assessed under the licensee's CRMP. Licensee procedures require reviews of the procedures and that plant modifications be evaluated for PRA updates. External events are considered in the CRMP and administrative procedures are used for components not modeled. The licensee stated that the VCSNS CRMP assesses both CDF and LERF.

A review of recent inspection reports that evaluated the licensee's assessment of plant risk, scheduling, and configuration control for selected planned and emergent work activities found them acceptable and monitored in accordance with the requirements of 10 CFR 50.65(a)(4) and plant procedures.

The NRC staff finds that, based on the licensee's conformance to the requirements of the Maintenance Rule, 10 CFR 50.65, and the RG 1.177 key components of a CRMP and based on the VCSNS PRA being modified per plant PRA update procedures such that proposed WCAP-14333 AOT and bypass times are represented in the plant PRA and plant risk monitor (EOOS), the licensee's Tier 3 program is adequate to support the implementation of WCAP-14333 and satisfies condition 2 of the staff SE to WCAP-14333 with regards to Tier 3.

4.4.3 Implementation and Monitoring Program

RG 1.174 and RG 1.177 also establish the need for an implementation and monitoring program to ensure that extensions to TS AOT or bypass times do not degrade operational safety over time and that no adverse degradation occurs due to unanticipated degradation or common cause mechanisms. An implementation and monitoring program is intended to ensure that the impact of the proposed TS change continues to reflect the reliability and availability of SSCs impacted by the change. In addition, the application of the three-tiered approach in evaluating TS AOT changes provides additional assurance that the changes will not significantly impact the key principle of defense-in-depth.

WCAP-14333 assumed that maintenance on master and slave relays, logic cabinets, and analog channels while at power occurs only after component failure (i.e. corrective maintenance). The licensee clarified this in their RAI response stating that the WCAP-14333 assumptions for testing and maintenance are consistent with current VCSNS practices and that the proposed AOT includes contributions from testing, repair, and calibration.

The licensee will also develop a procedure to specifically monitor the SSCs that are affected by the proposed AOT and bypass times. The scope of the components monitored will include the logic cabinets, master relays, slave relays, and analog channels. The procedure provides a means to confirm that the component unavailability assumptions due to test and maintenance used in the WCAP-14333 analysis will remain valid for VCSNS. Based on the above, VCSNS

satisfies the RG 1.174 and 1.177 guidelines for an implementation and monitoring program for the proposed TS change.

4.4 Comparison With Regulatory Guidance

The proposed changes are based on TSTF 418 and WCAP-14333, as approved by the NRC staff, including limitations and conditions identified in the NRC staff SE. As such, the implementation of the topical report at VCSNS reflects the RG 1.174 and 1.177 acceptance guidance for ΔCDF, ΔLERF, ICCDP and ICLERP.

4.5 Regulatory Commitment

The licensee will implement administrative controls to include the following restrictions when a logic cabinet is unavailable.

- Activities that degrade the availability of the emergency feedwater system, RCS pressure relief system (pressurizer PORVs and safety valves), AMSAC, or turbine trip, should not be scheduled when a logic cabinet is inoperable for maintenance.

- One complete ECCS train that can be actuated automatically must be maintained when a logic train is inoperable for maintenance.

- Activities that cause master relays or slave relays in the available train and activities that cause analog channels to be unavailable should not be scheduled when a logic train is inoperable for maintenance

- Activities on electrical systems (e.g., AC and DC power) and cooling systems (e.g., service water and component cooling water) that support systems of functions listed in the first three bullets should not be scheduled when a logic cabinet is inoperable for maintenance. That is, one complete train of a function that supports a complete train of a function noted above must be available.

In addition:

- VCSNS will develop a procedure specifically to monitor the components affected by this LAR including logic cabinets, master relays, slave relays, and analog channels. The assumptions regarding component unavailability due to test and maintenance activities in the analysis supporting WCAP-14333 will be evaluated to ensure that the intent of these assumptions are met at VCSNS.

- The VCSNS PRA and EOOS will be updated to include representative signals to model the reactor trip and ESFAS to the appropriate depth to perform Tier 3 evaluations. Signals not explicitly modeled will either be added to the model or addressed by surrogates.

The NRC staff finds that reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the above regulatory commitment(s) are best provided by the licensee's administrative processes, including its commitment management program. The above regulatory commitments do not warrant the creation of regulatory requirements (i.e., items requiring prior NRC approval of subsequent changes).

4.5 NRC Staff Findings and Conditions

The NRC staff finds that the licensee has demonstrated the applicability of WCAP-14333 to VCSNS and has met the limitations and conditions as outlined in the staff SE. The risk impacts for ΔCDF, ΔLERF, ICCDP, and ICLERP, as estimated by WCAP-14333, were found to be within the acceptance guidelines for RG 1.174 and 1.177. The plant-specific functional units were shown to be applicable to the topical report evaluations and results. Additional analysis was provided by the licensee for those functional units not evaluated generically by WCAP-14333. The licensee's Tier 2 analysis evaluated concurrent outage configurations and confirmed the applicability of the risk significant configurations identified by the staff SE limitations and conditions and topical report analysis to ensure these configurations are controlled. The licensee's Tier 3 CRMP was found to be consistent with the RG 1.177 CRMP guidelines, and the Maintenance Rule, 10 CFR 50.65(a)(4), for the implementation of WCAP-14333. The VCSNS PRA will be modified per plant PRA udate procedures such that proposed WCAP-14333 AOT and bypass times are represented in the plant PRA and plant risk monitor (EOOS). The licensee will develop procedures specifically to monitor the SSCs affected by the proposed AOT and bypass times. Therefore, the NRC staff finds that the TS revisions proposed by the licensee are consistent with the extended bypass times and AOTs approved for WCAP-14333 and that they meet the staff SE conditions and limitations for WCAP-14333.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the State of South Carolina official was notified of the proposed issuance of the amendment. The State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (70 FR 75496, December 20, 2005). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

8.0 REFERENCES

1. Letter, J. B. Archie, SCE & G, to NRC Document Control Desk, “Implementation of WCAP-14333-P-A, Revision 1, Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times,” November 15, 2005 (ML053220309 [Agencywide Document Access and Management System Accession Number]).

2. Letter, J. B. Archie, SCE&G, to NRC Document Control Desk, “Implementation of WCAP-14333-P-A, Revision 1, Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times, Response to Request for Additional Information,” May 31, 2006 (ML061570275).

3. Letter, J. B. Archie, SCE&G, to NRC Document Control Desk, “Implementation of WCAP-14333-P-A, Revision 1, Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times, Response to Request for Additional Information,” August 31, 2006 (ML062490524).

4. Letter, J. B. Archie, SCE&G, to NRC Document Control Desk, “Implementation of WCAP-14333-P-A, Revision 1, Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times, Summarized List of Commitments,” September 29, 2006 (ML062760318).

5. Letter, C. O. Thomas, NRC, to J. J. Sheppard, WOG, “Acceptance for Referencing of Licensing Topical Report WCAP-10271, Evaluation of Surveillance Frequencies and Out of Service Times for the Reactor Protection Instrumentation Systems,” February 21, 1985.

6. Letter, H. R. Denton, NRC to L. D. Butterfield, WOG, providing comments on WOG guidelines for preparing submittals requesting NRC approval of RTS TSs, July 24, 1985.

7. Letter, C. E. Rossi, NRC, to R. A. Newton, WOG, “WCAP-10271, Supplement 2 and WCAP-10271, Supplement 2, Revisin 1, Evaluation of Surveillance Frequencies and Out of Service Times for the Engineered Safety Features Actuation System,” February 22, 1989.

8. Letter, C. E. Rossi, NRC, to G. T. Goering, WOG, “Westinghouse Topical Report WCAP-10271, Supplement 2, Revision 1, Evaluation of Surveillance Frequencies and Out of Service Times for the Engineered Safety Features Actuation System,” April 30, 1990.

9. WCAP [Westinghouse Commercial Atomic Power]-14333-P-A, Revision 1, “Probabilistic Risk Analysis of the RPS and ESFAS Test Times and Completion Times,” October 1998, as approved by NRC letter dated July 15, 1998.

10. Letter, W. D. Beckner, NRC, to A. Pietrangelo, Nuclear Energy Institute, approving changes to TSTF-418, Revision 2, “RPS and ESFAS Test Times and Completion Times (WCAP-14333),” April 2, 2003 (ML030920633).

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