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A SCANA COMPANY

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RC-06-0087

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

ATTN: Mr. Robert E. Martin

Dear Sir / Madam:

Subject: VIRGIL C. SUMMER NUCLEAR STATION
DOCKET NO. 50/395
OPERATING LICENSE NO. NPF-12
LICENSE AMENDMENT REQUEST - LAR 05-2926
IMPLEMENTATION OF WCAP-14333-P-A, REV. 1, "PROBABILISTIC RISK ANALYSIS OF THE RPS AND ESFAS TEST TIMES AND COMPLETION TIMES"
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

Reference:
1. J. B. Archie, SCE&G, Letter RC-05-0143, to Document Control Desk, USNRC, dated 11/15/2005
2. R. E. Martin, NRC, Letter to J. B. Archie, SCE&G, dated March 21, 2006

South Carolina Electric & Gas Company (SCE&G), acting for itself and as agent for South Carolina Public Service Authority, hereby submits a response to your request for additional information dated March 21, 2006, related to the above referenced amendment request. The LAR proposes changes to the V. C. Summer Nuclear Station (VCSNS) Reactor Trip System Instrumentation and Engineered Safety Feature Actuation System Instrumentation Allowed Outage and Bypass Test Times.

If you have any questions or require additional information, please contact Mr. Robert G. Sweet at (803)-345-4080.

I certify under penalty of perjury that the foregoing is true and correct.

5/31/06
Executed on

Jeffrey B. Archie

AJC/JBA/dr

A001

Attachments:

1. Response to the Request for Additional Information
2. VCS PRA Model Revision History
3. Changes Made As A Result of the IPE

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RTS (C-05-2926)
File (813.20)
DMS (RC-06-0087)

REQUEST FOR ADDITIONAL INFORMATION
RISK INFORMED JUSTIFICATION FOR EXTENDING
ALLOWED OUTAGE TIME (AOT) BYPASS TEST TIMES
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

1. Westinghouse Commercial Atomic Power report (WCAP) -14333-P-A, Rev. 1, "Probabilistic Risk Analysis of the RPS [reactor protection system] and ESFAS [engineered safety feature actuation system] Test Times and Completion Times," dated October 1998, Section 11.0, "Implementation of the Proposed Technical Specification Changes," Item 3, notes that a change to the action for an inoperable slave relay to "following the expiration of the salve relay AOT, the component affected by the inoperable slave should be declared inoperable and the TS [Technical Specification] action for this component should be followed." Is this modification required for the Virgil C. Summer Nuclear Station (VCSNS) TS? Explain why or why not.

RESPONSE:
This change was not incorporated in the proposed changes to the VCSNS Technical Specifications in this License Amendment Request (LAR). The changes to the Standard Technical Specifications (NUREG-1431) that reflect the implementation of WCAP-14333-P-A, Rev. 1 are contained in TSTF-418, Rev. 2, which was approved by the NRC. The above change was not included in TSTF-418, Rev. 2. The proposed changes to the VCSNS Technical Specifications in this LAR are consistent with TSTF-418, Rev. 2.

The change discussed above, "following the expiration of the slave relay AOT, the component affected by the inoperable slave should be declared inoperable and the TS action for this component should be followed." was initially going to be pursued in the Technical Specification changes associated with WCAP-14333, Rev. 0. However, after discussions with the NRC staff, it was agreed to not pursue this change, which is not reflected in TSTF-418, Rev. 2 or in the changes proposed by this LAR, as discussed above.

2. Confirm that the VCSNS RPS utilizes the solid state protection system for the logic portion of the RPS.

RESPONSE:
VCSNS utilizes the SSPS for the logic portion of the RPS. Please see the first column, "Logic Cabinet Type (1)," in Table 1 on page 11 of 26 of the LAR.

3. Regulatory Guide (RG) 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Section 2.3 and RG 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specification," Section 3, as part of the key principles in implementing risk-informed decisionmaking, establishes the need for an implementation and monitoring program to ensure that extensions to TS AOT or surveillance test intervals do not degrade operational safety over time and that no adverse degradation occurs due to changes in the licensing basis 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 structures, systems and components impacted by the change. Provide information on the VCSNS implementation and monitoring program as applied to the incorporation of WCAP-14333 at VCSNS.

RESPONSE:
VCSNS will develop a procedure specifically to monitor the components affected by this LAR, including the 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-P-A, Rev. 1 will be evaluated to ensure that the intent of these assumptions is met at VCSNS. It should be noted that no Surveillance Test Intervals (STI) are proposed to be changed by this LAR.

4. The analysis for WCAP-14333 assumed that maintenance on master and slave relays, logic cabinets, and analog channels while at power occurs only after a component failure, and that preventive maintenance does not occur. The topical report does not preclude the practice of at-power preventive maintenance but limits the total time a component is unavailable due to corrective or preventive maintenance to the values used in the analysis. If preventive maintenance is to be performed at VCSNS, confirm that the unavailability for components evaluated in WCAP-14333 are consistent with the plant specific estimates at VCSNS and do not exceed those assumed in the analysis.

   See the submittal, "Implementation Guideline," Table 1, "Analog Chanel Calibration" as an example.

RESPONSE:
SCE&G has verified that the assumptions listed on Table 5.1 in WCAP-14333-P-A, Rev. 1 regarding maintenance and testing on the instrumentation evaluated in the WCAP are consistent with the current maintenance and testing practices at VCSNS, as identified in the "Plant Specific Parameter" column in Table 1 on page 11 of 26 of the LAR.

Additionally the response to RAI #3 ensures that the WCAP assumptions regarding testing and maintenance activities would be met for any potential future changes to the current VCSNC testing and maintenance practices. The important parameter to the monitoring activity is the total time the component (logic cabinets, master relays, slave relays, or analog

channels) is out of service. The out of service time includes contributions from testing, repairs (corrective maintenance), preventive maintenance, and calibration. To remain consistent with the analysis assumptions, the total out of service time for each component is the important parameter and this will be monitored as noted in the response to RAI #3. The specific reason the component is out of service is not important since an out of service component, which can be out of service for any reason, impacts the system in the same way.

5. Provide the date of the VCSNS probabilistic risk assessment (PRA) industry peer review and date of certification.

RESPONSE:
The VCSNS PRA industry peer review was conducted the week of August 5, 2002. The final report for this peer review was issued in December of 2002. The specific Facts and Observations (F&Os) that could potentially impact this LAR and the assessment of the impact of these F&Os on this LAR are discussed on pages 18, 19, and 20 of the LAR. All but one 'B' level F&O on internal flooding has now been addressed; however it does not impact this LAR. Refer to response RAI #7 below.

A review was also conducted with respect to the ASME standard for the Mitigating Systems Performance Index (MSPI). This review concluded that only three ASME F&Os remain to be met for the MSPI program. These F&Os have now been included in the model.

The VCSNS PRA model has also been reviewed twice against the NRC SPAR model. Comments from the first review were incorporated as necessary and the latest review did not result in unresolved issues with the use of the VCSNS PRA model.

6. Confirm that the WCAP-14333 reference plant assumptions for human reliability are applicable to VCSNS. As an example, see the "B" level Facts and Observations (F&Os) discussion for HR-06 on pages 18 and 19 of the submittal.

RESPONSE:
Tables 2 and 3 in the LAR confirm that the assumptions in WCAP-14333-P-A Rev. 1 are applicable to the plant specific features at VCSNS.

'B' F&O HR-06 was addressed by reviewing the VCSNS PRA cutsets, interviewing one of the Senior Reactor Operators (SRO) in the VCSNS training department, and incorporating the interview results into the VCSNS PRA model. The SRO indicated that the action to open the switchgear room doors for a loss of switchgear room cooling would be a lower priority if the initiating event was the loss of one train of DC bus. This dependence is now modeled in the PRA. No other new dependencies were noted in the review. Therefore F&O HR-06 has no impact on this LAR.

7. The licensee's submittal states that due to the generic analysis of WCAP-14333 the second F&O concerning internal floods has no impact on the proposed changes. The Nuclear Regulatory Commission (NRC) staff notes that internal flooding may have unique plant specific vulnerabilities and may not be bounded by the generic analysis. Internal floods were not part of the implementation guidance for WCAP-14333. Provide a plant-specific assessment (either qualitative or quantitative) to confirm that VCSNS internal flooding results are bounded by WCAP-14333 for this F&O.

RESPONSE:
A review of the VCSNS Individual Plant Examination (IPE) Internal Flooding Analysis Notebook included a screening process based on eliminating areas where flooding and/or spraying would cause a failure of safe shutdown equipment but would not affect components whose failure would cause a reactor trip. No ESFAS instrumentation was identified as flooding or spray targets in the areas that survived screening. Reactor Trip System (RTS) instrumentation was also not identified as spray targets. Therefore, having ESFAS or RTS instrumentation out of service or bypassed for a longer period of time as requested in the LAR will not impact the IPE internal flooding analysis. Since the current VCSNS PRA flood analysis is based on the IPE, there is no impact on the PRA flood analysis.

In order to address F&O DE-03 for the LAR, a walk-down was performed for the Relay Room in the control building where much of the ESFAS equipment resides. The flood source for the relay room is a 3 inch fire main. A large leak from this source of water would set off an alarm when the Electric Fire Pump started to maintain Fire Water system pressure. Floor drains in the relay room and water leaking out under doors would slow down the flooding. This leak would be expected to be isolated before flood levels reached a point where they could possibly challenge doors. The Relay Room is isolated from other areas by card reader doors or "do not use" doors. These doors are normally closed. Based on this discussion, flooding from within the Relay Room is bounded by the IPE.

The Technical Support Center (TSC) Equipment Room is next to the Computer Room which is next to the Relay Room. The TSC Equipment Room contains a post accident monitoring panel; however, its loss will not be immediately important in flooding scenarios.

Of the areas adjacent to the Relay Room, only the Turbine Building contains large flood sources (other areas or adjacent to the Relay Room contain 3 or 4 inch fire mains). The Turbine Building contains safe shutdown equipment (some equipment for turbine trip). However, a flood on elevation 436' of the Turbine Building (the relay room elevation) would be expected to drain through floor grates and not enter the Relay Room or challenge the door or walls of the relay room.

For floods of ESFAS equipment outside of the Relay Room, actuation of redundant equipment will still be available from the Control Room.

Based on the discussion above, there are no plant-specific vulnerabilities at VCSNS with respect to the LAR and internal flood concerns.

8. Provide an assessment of the external events risk impact including seismic, fire, and external floods and high wind risk with respect to the proposed completion time and bypass time extensions in RG 1.177 Section 2.3.2, "Scope of the PRA for TS Applications."

Response:

A factored approach was used to assess seismic events and high winds events with respect to the LAR using the assumption that the seismic or high wind event impact is a loss of offsite power and the additional impact of an AOT for the LAR is bounded by a loss of function of one Motor-Driven Emergency Feedwater pump and the Turbine-Driven Emergency Feedwater Pump. Emergency Feedwater loss of function is a conservative assumption since no credit is taken for manually starting these pumps. This approach is shown below:

Fraction of the year for AOT: 78/8760 based on WCAP-14333-P-A, Rev. 1, Table 5.1.
Safe Shutdown Earthquake (SSE) Frequency: 1.3E-04/yr.
CDP for LAR during SSE (LOSP & Loss of EFW): 5.31E-02.
LERP for LAR during SSE (LOSP & Loss of EFW): 8.58E-04.

$ICCDP_{seismic}$	=	78/8760*1.3E-04*5.31E-02	=	6.15E-08.
$ICLERP_{seismic}$	=	78/8760*1.3E-04*8.58E-04	=	9.93E-10.

Similarly, ICCDP and ICLERP can be estimated for high winds using the tornado point strike probability of 1.52E-04/yr.

$ICCDP_{High\ Winds}$	=	78/8760*1.52E-04*5.31E-02	=	7.19E-08.
$ICLERP_{High\ Winds}$	=	78/8760*1.52E-04*8.58E-04	=	1.16E-09.

Based on these evaluations, the ICCDP and ICLERP are below the values in Reg. Guide 1.177 (5.0E-07 for ICCDP and 5.0E-08 for ILERP).

Also the ICCDP and ICLERP values above are within the normal fluctuations of plant risk.

A report on South Carolina Hurricanes from 1973 was used to estimate Hurricane tracks. The average track of the most "memorable" hurricanes from this report was from the south-south west to the north-north east. Hurricanes on this average track would pass east of Columbia and would have crossed more than 200 miles inland before reaching that point.

Hurricanes entering the state from the east heading west are less frequent (based on communication with the local television weather forecaster) in South Carolina, but this would be the shortest distance (approximately 120 miles) from the coast to VCSNS.

Of recent hurricanes, Hurricane Hugo (1989) brought the most damaging winds to South Carolina. This hurricane traveled from east to west passing 40 miles east of VCSNS. It brought winds of 50-55 miles per hour to the station.

The IPEEE external flooding analysis consisted of evaluating probable maximum floods (PMFs) from river flooding, lake flooding coincident with a 50 mile per hour wind, upstream dam failures and probable maximum precipitation. The study concluded that VCSNS was not vulnerable to external flood hazards. There are no features in the LAR that would affect the IPEEE conclusions with respect to external flooding because the LAR does not include new flood pathways into VCSNS buildings.

An evaluation was performed for fire in the Relay Room I&C processing racks that was assumed to fail one train of ESFAS equipment and cause a reactor trip. To model an ESFAS AOT, automatic starting of equipment on the opposite train was failed. Manual action to start this equipment was credited, however, the failure rates for manual actuation were doubled compared to the baseline values. The results were an ICCDP of 1.68E-09 and an ICLERP of 2.50E-10. These very low results are well within the limits of Reg. Guide 1.177. These representative results demonstrate that there are no plant specific issues for fire with respect to the LAR.

9. Provide a discussion on the following aspects of PRA quality as applicable to the VCSNS PRA.

   1. The plant-specific PRA reflects the as-built, as-operated plant.

   RESPONSE:
   A recent study to benchmark the VCSNS PRA against the ASME standard concluded that the PRA reflected the as-built as-operated plant. Major updates to the VCSNS PRA include incorporation of plant modifications as appropriate into the PRA model. The last major update took place on March 30, 2004. Procedures were also reviewed at that time to ensure that the PRA reflected current plant procedures.

   2. Applicable PRA updates conducted since completion of individual plant examination (IPE) and individual plant examination of external events (IPEEE) and the status of any improvements identified by the IPE and IPEEE.

   RESPONSE:
   Attachment 2 lists PRA updates since the completion of the IPE and IPEEE.

   Attachment 3 lists the plant improvements made as a result of the IPE.

Improvements from the IPEEE included a number of insights regarding Fire Emergency Procedures (FEPs) and their implementation. These included several minor procedural enhancements and communication to the plant operations staff about the nature of risk-significant fire scenarios. Another enhancement as a result of the IPEEE was communication to the plant fire brigade about the details of risk-significant fire scenarios including location, equipment to be protected, and time available.

3. Reference PRA quality assurance programs/procedures, including expected PRA revision schedules.

RESPONSE:
VCSNS PRA design guide PSA-08 "PRA Model Updates" states that the need for a PRA update is periodically evaluated and updates should be performed every other refueling cycle. Major PRA updates include a comprehensive revision of the PRA model to ensure the model reflects the current configuration and operational philosophy. The update process includes a review of plant changes, selected plant procedures, and plant operating and equipment history data to determine the effect of revisions on the PRA model.

VCSNS PRA major updates and minor maintenance updates are controlled to meet the intent of the Engineering Services calculation procedure including verification and approval.

Minor PRA revisions (called model maintenance) occur between the major updates. These involve the identification of information for minor changes, and the incorporation of this information into the PRA on an as-needed basis.

The risk monitor model at VCSNS, called Equipment Out of Service (EOOS) utilizes the same fault tree and data base used for the PRA model. EOOS updates that only involve mapping or display changes do not require calculations. They are performed by PRA Evaluations which are reviewed in accordance with Nuclear Licensing PRA and Engineering Services review and verification procedures.

4. PRA adequacy and completeness with respect to evaluating the proposed AOT and bypass time extensions with emphasis on Tier 3.

RESPONSE:
The VCSNS PRA model was reviewed to confirm its adequacy and completeness with respect to Tier 3 evaluations related to implementation of WCAP-14333-P-A, Rev. 1.

Representative signals will be included to model the reactor trip and engineered safety features actuation signals to the appropriate depth to do Tier 3 evaluations. Signals not explicitly modeled will either be added to the model or addressed by surrogates. This

will provide appropriate modeling in the PRA to complete Tier 3 evaluations related to implementation of WCAP-14333-P-A Rev. 1.

5. Plant design or operational modifications not reflected in the WCAP-14333 PRA used in this application that are related to or could impact this license amendment application. Justify the acceptability of not including these modifications in the PRA as part of this application.

RESPONSE:
During Refueling Outage 15 in April and May of 2005, a modification was performed to automate the switch-over to sump recirculation for the Refueling Water Storage Tank (RWST) by including automatic closure of the valves from the RWST to the suction of the Charging Pumps. This function requires the 2 of 4 energize to actuate logic on RWST low-low level, which is included in this LAR. The modification is not currently modeled in the VCSNS PRA because the modification occurred after the last major PRA update. When modeled, a positive benefit will be realized because of eliminating the need for a modeled PRA Human Reliability event. This modification will be incorporated into the next major PRA update.

A PRA evaluation was performed in support of LAR 05-3666, Alternate AC Power Supply. The availability of an alternate AC power source is estimated to reduce Core Damage by approximately 31 percent and reduce Large Early Release Frequency by approximately 10 percent.

LAR 05-0677, On-line Monitoring of Instrument Channel Performance, was reviewed for impact on implementation of WCAP-14333-P-A, Rev.1. The review determined that since the LAR uses a performance based approach versus a risk based approach, no impact is expected.

There have been no PRA updates since the submittal of these LARs. One minor PRA revision has been made since the submittal that changed the mapping in the risk monitor computer program (EOOS) and some documentation. This minor revision did not change the CDF or LERF PRA models or the values used for quantification.

10. RG 1.174 states that as part of the evaluation of risk, the cumulative risk of the present TS change in light of past applications should be understood. Cumulative risks were not addressed by VCSNS. Provide an evaluation of the cumulative risk impact of previous TS changes (including WCAP-10271) per RG 1.174, Section 3.3.2, as applicable to the implementation of WCAP-14333.

RESPONSE:
The Risk-Informed In Service Inspection (RI-ISI) program is the only previously approved risk-informed change at VCSNS. There is no accumulated risk as a result of RI-ISI. The original IPE and IPEEE included incorporation of WCAP-10271 which was not a risk-informed change.

All of the risk associated with WCAP-10271 implementation is part of the base-line risk in the IPE and IPEEE analyses.
SCE&G submitted LAR 05-0677 to the NRC to change the Technical Specifications for VCSNS to enable the use an On-Line Monitoring System on a number of channels. Use of this On-Line Monitoring System impacts the instrument channel calibration frequency. As stated in the LAR, "Application of this program will require an additional surveillance for each of the transmitters included in the program. This additional verification of channel performance will allow extension of the channel calibration from its current 'every refueling cycle' to 'once every 6 years'". The implementation of an On-Line Monitoring System is based on guidance from the Electric Power Research Institute's Technical Report TR-104965.

The change being implemented by the On-Line Monitoring System only impacts the calibration frequency of the channels. Since calibration activities are independent of the analog channel operational tests, the calibration interval change does not impact the analog channel operational tests which will remain at the current intervals. Analog channel operational tests will continue to be done on the current intervals so there will be no impact on channel reliability or unavailability due to testing.

The calibration frequency will be extended from once per refueling (18 months) for each channel to an interval of up to 6 years. WCAP-14333-P-A, Rev. 1, provides the justification for completing the channel calibration while at-power and includes an unavailability contribution of 4 hours every 18 months for each channel for this purpose. Extending the calibration interval of 18 months will reduce the calibration unavailability contribution.

Implementation of the On-Line Monitoring System does not follow a risk-informed approach and Regulatory Guides 1.174 and 1.177 are not used. The approach to extend the channel calibration frequency is dependent on adding frequent on-line monitoring performance to detect instrument calibration problems prior to the refueling (18 month) calibration interval. This is not a risk-informed approach, but more of a performance based approach. Therefore, a risk impact is not expected and the risk-informed approach that assesses the impact of proposed changes on core damage frequency and large early release frequency were not required or provided. Additionally, implementation of the On-Line Monitoring System to extend the channel calibration interval will have no impact on implementation of WCAP-14333-P-A, Rev.1, and does not provide a justification for extending the analog channel operational test interval.

11. Regarding page 9 of 26 of the application, for the restriction listed under Tier 2 provide a procedure reference that incorporates these changes. Are these restrictions considered licensee commitments?

RESPONSE:
The restrictions listed on page 9 of 26 are commitments and are listed as such on Attachment 3 of the LAR. These restrictions will be incorporated into plant procedures within the 60 day implementation time as referenced in the cover letter of the LAR.

12. Page 9 of 26 of the licensee's submittal states that the VCSNS Tier 3 requirements are addressed through VCSNS Operations Administrative Procedures, consistent with the requirements Title 10 of the Code of Federal Regulations (10 CFR), section 50.65(a)(4). Provide a discussion on the applicability of the VCSNS 10 CFR 50.65(a)(4) configuration risk management program (CRMP) to the additions and clarifications provided in RG 1.177, Section 2.3.7.2, "Key Components 1 through 4, for CRMP programs that implement section a(4) of 10 CFR 50.65(a)(4) and the guidance provided by RG 1.182, "Assessing and Managing Risk Before Maintenance Activities at Nuclear Power Plants." In addition, identify the programs and procedures in place to implement the CRMP at VCSNS.

RESPONSE:

RG 1.177 Key Components #1 (Implementation of CRMP) and #3 (Level 1 Risk-Informed Assessment)

OAP-102.1, "Conduct of Operations Scheduling Unit," provides guidance for using the risk monitor computer program (EOOS) to meet the requirements of 10CFR50.65(a)(4), Maintenance Rule. SAP-0157, "Maintenance Rule Program," describes monitoring of equipment under the Maintenance Rule. OAP-102.0 and SAP-0157 will be used to implement the configuration risk management program for the LAR.

The provisions of 10CFR50.65(a)(4) are implemented at VCSNS by using EOOS during scheduling of maintenance and by station administrative procedures for plant alterations. EOOS is also used in the control room to capture emergent conditions. EOOS uses the same fault tree and data base model as the plant PRA model, with the following exception. EOOS is a zero-maintenance model, whereas the PRA model uses average maintenance and testing performed over a year. Components are taken out of service individually in EOOS.

When scheduled maintenance or testing on the RTS and ESFAS instrumentation associated with the proposed changes in this LAR, Operations Scheduling at VCSNS will perform a risk analysis using the EOOS program. This analysis will ensure that risk significant configurations are evaluated prior to scheduled RTS or ESFAS instrumentation maintenance or testing.

For planned entries into the Technical Specification action statements associated with this LAR, a risk analysis using EOOS will be performed by the Operations Scheduling Unit. This, combined with station administrative procedures for plant alterations, will evaluate risk significant configurations. Configurations that meet certain thresholds for instantaneous Core Damage Frequency or Large Early Release Frequency require higher levels of approval or may not be allowed, depending on the risk associated with the activity.

Also, for unusual configurations Operations Scheduling may ask PRA personnel to perform an independent review and suggest compensatory measures.

For unplanned entries into Technical Specification action statements associated with this LAR, the control room personnel will enter the condition(s) into the on-line EOOS model to assess

the risk of these emergent conditions. If additional components become inoperable and could contribute to a risk-significant configuration, they will also be taken out of service in the EOOS model to evaluate plant risk.

RG 1.177 Key Component #2 (Control and Use of the CRMP Assessment Tool)

Procedure NL-126, "Probabilistic Risk Assessment Activities", requires a review of procedures for PRA updates and requires plant modifications to be reviewed as appropriate for incorporation into the PRA model (Refer to response to 9.3 above).

Plant configurations outside the scope of the configuration risk management program assessment tool (EOOS) are governed by procedures for plant alterations (for example CMP-100.009, "Scaffolding Request, Evaluation, and Erection" for scaffolding modifications and SAP-148, "Temporary Bypass, Jumper and Lifted Lead Control" for temporarily lifting leads).

RG 1.177 Key Component #4 (Level 2 Issues and External Events)

Much of the equipment of interest for external events at VCSNS is modeled for impact on internal events in EOOS. Taking this equipment out of service can trigger action thresholds in EOOS. Weather conditions, such as tornado warnings or hurricane warnings, are modeled in EOOS by "activities" that impact the modeled Loss of Offsite Power initiating event frequency. Additionally, administrative procedures are used to limit the risk associated with items which can impact external events but are not explicitly modeled in EOOS, such as snubbers, transient combustibles and fire doors. Also, refer to RAI #8 above for a discussion of external events impacts on this LAR.

The VCSNS configuration risk management program assessment tool (EOOS) includes both CDF and LERF quantifications. As required by OAP-102.1, both CDF and LERF increases are used to determine levels of approval.

Attachment 2: VCSNS PRA MODEL REVISION HISTORY

MODEL REVISION	Month/Year	CDF	LERF	CALC NUMBER
IPE MODEL	3/93	2.00E-04		IPE SUBMITTAL
DATA UPDATE	10/94	1.80E-04		DC00300-033
VU/CCW MOD	9/94	1.20E-04		DC00300-034
EFW CK VLV MOD, EXPAND IA MODELING AND OTHER MODELING CHANGES	11//94 4/96	9.60E-05		DC00300-035 DC00300-037
CONVERSION TO SINGLETOP MODEL AND REMOVED EXCESS CONSERVATISM TO SINGLETOP MODEL	4/99	8.4444E-05	1.8806E-06	DC00300-131
CREATE STAND ALONE LERF MODEL	7/99	8.4444E-05	1.8806E-06	DC00300-132
UPDATED COMMON CAUSE FAILURE PROBABILITY	8/99	8.60E-05	1.10E-06	DC00300-133
DEMODULARIZED SPECIAL INITIATORS	8/99	8.60E-05	1.10E-06	DC00300-136
HUMAN RELIABILITY ANALYSIS UPDATE	9/99	1.30E-04	2.20E-06	DC00300-134, Rev. 0
SECOND UPDATE (CHANGES PRIMARILY DUE TO LOCA FREQ CHANGES, NUREG/CR5750 AND LOSP)	9/99	5.80E-05	8.90E-07	DC00300-135
THIRD DATA UPDATE, COMMON CAUSE UPDATE AND MODEL CORRECTIONS	1/00	5.5949E-05	6.9994E-07	DC00300-137

Attachment 2: VCSNS PRA MODEL REVISION HISTORY

MODEL REVISION	Month/Year	CDF	LERF	CALC NUMBER
MINOR CORRECTIONS TO GATES	4/00	5.5949E-05	6.9994E-07	DC00300-138
UPDATE MUTUAL EXCLUSIVE MODEL, SLO_2 AND SLO_3, BOR CALCULATION, CHARGING PUMP ALTERNATE COOLING	3/01	5.6017E-05	6.5782E-07	DC00300-143, Rev. 0
ADDDED VESSEL RUPTURE INITIATOR	4/01	5.6117E-05	6.5853E-07	DC00300-143, Rev. 1
IMPROVED TBCCC MODELING	5/01	5.6171E-05	6.5756E-07	DC00300-143, Rev. 2
ADDED FAILURE TO CCW BOOSTER PUMP	11/01	5.6208E-05	6.5964E-07	DC00300-143, Rev. 3
INCORPORATED REV. 2 OF THE HRA ANALYSIS. THIS ALSO INCLUDES AN UNCERTAINTY STUDY.	5/02	5.5190E-05	6.6508E-07	DC00300-134, Rev. 2
INCORPORATED REV. 3 OF THE HRA ANALYSIS.	6/02	4.5686E-05	5.9142E-07	DC00300-134, Rev. 3
INCORPORATED 17 CHANGES TO ADDRESS PRE-PEER REVIEW ITEMS.	7/02	4.7442E-05	6.5435E-07	DC00300-143, Rev. 5 (Rev. 4 is a sensitivity study)
INCORPORATED SOME PEER REVIEW AND SPAR MODEL COMMENTS.	3/04	6.0751E-05	1.1604E-06	DC00300-146, Rev. 0
MODEL COMP ACTIONS FOR TDEFW STPS AND CORRECT A SERVICE WATER GATE. ENHANCE RCP SEAL INJECTION MODELING.	7/04	6.0941E-05	1.1617E-06	DC00300-144, Rev. 4

Attachment 2: VCSNS PRA MODEL REVISION HISTORY

MODEL REVISION	Month/Year	CDF	LERF	CALC NUMBER
CHANGE MAINTENANCE MODELING FOR MSPI. CORRECT CNU VALUES CHANGE ENERGIZE TO ACTUATE LOGIC. OTHER MINOR CHANGES.	5/05	4.9277E-05	1.0651E-06	DC00300-146, Rev. 1
NEW ISLOCA MODEL. ADDRESSED "PLANT WIDE EFFECTS" FOR HRA. IMPROVEMENTS FOR MSPI (CCW SYMMETRY & MORE CREDIT FOR 'C' CHARGING PUMP)	8/05	4.9238E-05	1.1244E-05	DC00300-146, Rev. 2

Attachment 3: Changes Made As a Result of the IPE (updated table from the IPE RAI response)

Plant Improvement	Improvement Description	Date Implemented
1. Alternate Charging Pump Cooling	Developed Abnormal Operating Procedure "Total Loss of Chilled Water". Use AOP following loss of both trains of chilled water. Alternate cooling for charging pumps is established, using the preferred Demineralized Water System or the Fire Service System, so RCP seal injection can be maintained.	7/93
2. Chilled Water System Reliability	A "chiller rotation" policy to reduce the time a chiller will be down has been implemented. Data has indicated a correlation between chiller downtime and failure to start probability.	1/93
3. Diesel Generator Temperature Monitoring	The Fire Service System is a backup to the Service Water System for DG cooling, but the Fire Service System is not sized to maintain the DG at rated load. Steps were added to an Emergency Operating Procedure to monitor DG temperature and reduce load if temperatures increase.	9/92
4. Energizing Pressurizer PORV Block Valves	Revised EOP "Response to Loss of Secondary Heat Sink" to direct operators to re-energize any PZR PORV block valves that were closed and racked out. The steps were moved up in the procedure to allow operators more time to prepare for feed and bleed before complete loss of heat sink.	8/92
5. Bypasses and Inoperable Status Indication (BISI)	The computerized BISI System, which provides a graphic control room indication of critical system operability, was reviewed and updated based on insights gained during the IPE system analyses.	6/91
6. Reactor Building Instrument Air Supply	Operators are required to re-establish instrument air to the pressurizer PORVs to ensure sufficient air supply is available for multiple openings of the PORVs during feed and bleed. Locally opening of the valve dominating failure to re-establish instrument air was included as an improvement.	12/93

Attachment 3: Changes Made As a Result of the IPE (updated table from the IPE RAI response)

Plant Improvement	Improvement Description	Date Implemented
7. Training and Emergency Planning Input	The IPE results have been used to identify drill scenarios that can be used in training and emergency planning.	2/93
8. New RCP Seal O-rings	Use of new RCP seal O-ring to provide better performance under loss of thermal barrier cooling and seal injection conditions.	In place for all pumps as of 1/05
9. Fire Water Connection for RCP Thermal Barrier Cooling	Alternate and diverse cooling source for RCP thermal barrier to address loss of RCP seal cooling events.	Not Planned
10. Elimination of CCW and Charging/SI Pump Chilled Water Dependency	Change the cooling dependency of the CCW pumps and charging pumps from the chilled water system to the CCW system.	11/94
11. Installation of key switches to allow use of condensate feed during a loss of EFW.	Key switches have been provided, with the keys kept in the control room, to bypass FW isolation signals during a loss of heat sink accident. (1)	11/94

1 - The switches eliminate the need to install jumpers and remove a fuse, in order to re-open the FW isolation valves after an SI has occurred. See the response to front end question number 5 for more details on the procedure to establish condensate feed after a loss of all EFW. The original HRA analysis of the time available to establish condensate feed and the required actions to enable condensate feed (i.e., jumpers & fuses) led to the conclusion that the required actions could not be completed in time. Therefore, the HEP for OAF(Establish Condensate Feed) was set to a value of 1.0 (i.e., assumed to fail). The use of the new switches will be included in a future PRA model update. No impact on CDF is available at this time.