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803.345.4214



June 15, 2006

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 05-3666_ALTERNATE AC POWER
SUPPLY - RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

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 information dated March 15, 2006, related to the above referenced amendment request.

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

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

6/15/06
Executed on

Dan Setts for JA
Jeffrey B. Archie

PAR/JBA/dr

Attachments:

- I. Response to Request for Additional Information
- II. Sketch of the VCSNS, Parr Hydro, and Parr CT Switchyards
- III. Assumptions and Supporting Calculation
- IV. UPS Application White Paper
- V. List of Commitments

c: K. B. Marsh
S. A. Byrne
N. S. Carns
J. H. Hamilton (w/o Attachments)
R. J. White
W. D. Travers
R. E. Martin
NRC Resident Inspector

P. Ledbetter
K. M. Sutton
T. P. O'Kelley
NSRC
RTS (C-05-3666)
File (813.20)
DMS (RC-06-0110)

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Original Signed By Dan Gatlin for
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Request for Additional Information

TECHNICAL SPECIFICATIONS 3.8.1, AC SOURCES - OPERATING, EXTENSION OF THE
EMERGENCY DIESEL GENERATOR ALLOWED OUT OF SERVICE TIME
VIRGIL C. SUMMER NUCLEAR STATION (VCSNS)

1. *The Nuclear Regulatory Commission staff has identified that the licensee's compensatory measures do not sufficiently address the availability of needed systems or components. Provide a discussion of the following topics:*
 - a. *Verification of the operability of the turbine driven emergency feedwater pump before entering the extended emergency diesel generator (EDG) allowable outage time (AOT).*
 - b. *Maintain daily communication with the system dispatcher regarding the status of the EDG along with the power needs of the facility.*
 - c. *Control of discretionary maintenance on the main and unit auxiliary transformers associated with the unit during the extended out of service time.*
 - d. *A test program for the black-start diesel at the Parr Hydro station to assure reliability and availability of that portion of the system.*
 - e. *The development and completion of a test to assure availability and capability prior to declaring the alternate ac (AAC) system available the first time.*
 - f. *Dedication of the Parr Hydro units as an AAC power source each time the 14-day AOT is entered.*

- a. *No additional commitment is being made.*

The V. C. Summer Nuclear Station (VCSNS) Technical Specifications (TS), Action 3.8.1.1.b.3, includes a requirement to verify Operability of the Turbine Driven Emergency Feedwater (TDEFW) Pump, in Modes 1, 2, and 3, within 2 hours of declaring the Emergency Diesel Generator (EDG) inoperable. If the pump cannot be verified Operable at that time, there is a 6 hour shutdown requirement.

- b. No additional commitment is being made.

VCSNS has an interface agreement with the system dispatcher. Per an existing commitment in procedure OAP-100.4, Communications, a daily and weekly phone call is initiated to discuss both planned maintenance as well as emergent maintenance. Additionally, since the EDG is a Grid Risk Sensitive component as discussed in Generic Letter 2006-02, VCSNS will contact the system dispatcher immediately prior to commencing maintenance on this component.

- c. No additional commitment is being made.

10 CFR 50.65(a)(4) requires that a risk assessment be performed prior to taking equipment in the scope of the Maintenance Rule out of service for maintenance or testing. The Maintenance Rule program established at VCSNS assures the plant's configuration risk monitoring (CRM) program assess the risk increase of taking equipment out of service. Should the increase in risk be above threshold values, specific levels of management involvement and approval is required prior to taking the equipment out of service. The plant enters a moderate risk (yellow) condition with a safety function degraded (i.e., EDG out of service). In a moderate risk level, plant procedures currently state that work that would lead to degradation of any other safety function should be avoided. VCSNS management is sensitive to risk assessment results providing a high level of scrutiny with an EDG out of service

The main station generator step-up transformer is not used for any safeguards services. Only minor maintenance such as oil sampling and fan replacement can be performed while in service. For the Emergency Auxiliary transformer (XTF 31) and the Engineered safety Features transformers (XTF 4, 5, and 6), being dedicated station feeds to the safeguards buses, anything beyond minor maintenance requires taking the transformer out of service which is addressed by the VCSNS Technical Specifications.

- d. No additional commitment is being made.

Testing and maintenance will be controlled by the Parr facility with maintenance being performed by SCE&G personnel per the response to question 6.B.11. VCSNS will track the testing and maintenance through our plant programs.

The VCSNS Surveillance Test program will direct the performance of required testing (NUMARC 87-00, Appendix B), and monitor the results to assure acceptable availability and reliability of the Parr diesel.

The reliability of the Parr diesel is discussed in a white paper (Attachment IV) from Active Power Corporation. Active Power specifically manufactures Flywheel Un-interruptible Power Supply (UPS) systems supported by Caterpillar diesel engines.

The reliability statements for the Parr diesel centers around IEEE standard 493, Appendix L, which documents the average starting performance of maintained diesel generators is greater than 99%. SCE&G testing and maintenance practices are expected to produce similar reliability results

- e. A testing scheme that meets the requirements of NUMARC 87-00, Appendix B will be developed and implemented prior to declaring the alternate AC power (AAC) source available for the first time. This testing will be developed to assure the AAC system has sufficient availability and capacity within one hour of a simulated loss of offsite power.
- f. No additional commitment is being made.

The Parr Hydro units are dedicated as an AAC power source in the event of a loss of grid, however, the preferred configuration utilizes Parr Hydro connected to the grid as described below.

The Parr generating complex consists of the Parr Hydro and the Parr Combustion Turbines (Parr CT). These two facilities are electrically separated by a transformer and two switchyard breakers. As such, should the VCSNS General Design Criteria (GDC) -17 source from the 115kV line (from the Parr CT substation) fail, the AAC source will not be connected (the breaker from the Parr Hydro to the Parr 115 kV CT substation will be opened which will isolate Parr Hydro from the grid) and can supply power to VCSNS within 1 hour.

For normal operations, during an extended EDG AOT, the breaker from Parr Hydro to VCSNS will be maintained closed (the breaker at switchgear 1DX will be maintained open), but staff at Parr will be available to open the breakers connecting Parr Hydro to Parr CT prior to supplying power to VCSNS as necessary (Parr Hydro will be staffed 24/7 during all extended EDG AOTs).

The voltage study performed, Calculation DC-08010-025, Revision 0, (Attachment III) demonstrates that the most limiting case for voltage supply to VCSNS is when there is no Parr Hydro connection to the grid and Parr Hydro is supplying all of the power to VCSNS (using three generators). In this configuration, Parr Hydro is capable of meeting the VCSNS power requirements, but the loads have to be placed onto the source one at a time in a controlled manner (not using the sequencer per NUMARC 87-00, Appendix B). Voltage support is improved with Parr Hydro connected to the grid and supplying power to VCSNS. In that case, there would be power from the Parr hydro generators (could potentially use all six) and from the Parr 115 kV substation, 115/13.2 kV tap changing transformer which would provide the potential to power both the VCSNS safeguards busses up to the limitations of the 13.8/7.2 kV transformer (approximately 7000 kVA).

2. *Provide a discussion regarding the licensee's administrative processes, including its commitment management program, that will provide reasonable controls for the implementation and for subsequent evaluation of proposed changes pertaining to the regulatory commitments.*

VCSNS has controls in place to manage commitments made to the NRC. A Station Administrative Procedure, SAP-630, Procedure / Commitment Accountability Program (PCAP), controls how commitments are added and deleted to plant procedures. Any time a procedure change is initiated, the originator is required to review the PCAP database to determine if a commitment is affected. In addition, specific reviews are performed to verify the commitment is accurately captured in the procedure steps. The commitment is uniquely identified in the procedure and in the database.

Should a change to the commitment be desired or required, SAP-630 requires a review of the database to provide understanding of the reasons behind the procedure steps. Additionally, the discipline supervisor and the Licensing Specialist have to review and approve the commitment change before the procedure change can be approved.

3. *Provide a single line diagram showing emergency buses and offsite and AAC power sources including Parr Hydro and Parr Combustion Turbine Generators. Also, indicate overhead and underground installations.*

A single line drawing is included in this letter as Attachment II. In the drawing provided, all power lines are overhead except for the new line from Parr Hydro to VCSNS.

4. *Discuss what types of communication protocol have been established between the control room operator at VCSNS and transmission system operator (TSO). Discuss whether the TSO is notified in advance that an EDG is going to be taken out for extended period of time.*

As a response to Generic Letter 2006-02, Grid Reliability and the Impact on Plant Risk and the Operability of Offsite Power, SCE&G stated that there is an Interface Agreement (IA) between VCSNS and the Transmission System Operator (TSO). This IA provides for responsibilities and interactions between VCSNS and the TSO. It also specifically calls out when notifications are to be made from one entity to the other. These include notifications from VCSNS to the TSO on a weekly and daily basis to discuss activities that could affect grid stability. Additionally, the IA requires communication immediately before performing maintenance on equipment that was discussed as grid-risk-sensitive or is required to mitigate the effects of a Loss of Offsite Power (LOOP). These discussions should include the expected length of time the equipment will be out of service and the need to assure the grid remains stable during this period. This equipment includes the EDG and the TDEFW pump.

5. *Discuss whether the TSO will notify the plant operators when degraded grid conditions could occur and what action will be taken if degraded grid conditions occur during the EDG extended AOT.*

The IA identifies specific notifications to VCSNS by the TSO for actual or predicted grid conditions. Should VCSNS receive such a notification during maintenance on equipment required to mitigate the effects of a LOOP event, an Abnormal Operating Procedure for grid issues would apply. In addition, a re-evaluation of the plant risk due to the emergent condition would occur. Depending on the amount of increased risk, actions taken may be anything from backing out of the maintenance to getting management approval to continue.

6. *One of the commitments states that "The design of the AAC meets the requirements of NUMARC 8700, Appendix B." Provide a brief description how NUMARC 8700, Appendix B criteria B1 through B13 are met. Criterion B.9 states that "The AAC power system shall be sized to carry the required shutdown loads and be capable of maintaining voltage and frequency within limits consistent with established industry standards that will not degrade the performance of any shutdown system or component." Provide supporting calculations for the above requirements.*

Reference is to the criteria of NUMARC 87-00, Appendix B, sections B1-13 (Alternate AC [AAC] Power Source Criteria).

B1. The power source at Parr Hydro plant and any of its supporting systems (including the Parr diesel generator) are all Non-Safeguards.

B2. The Parr Hydro plant is remote to the VCSNS location and as such is not susceptible to any of the failures of B2.1. The site is located on bedrock of solid granite (no active fault lines in the area) in a low seismic activity/amplitude area.

B3. All of the structures being installed associated with the AAC project are being designed to meet the Uniform Building Codes (UBC). UBC accepted the International Building Code (IBC). Existing structures like the VCSNS Turbine Building and the Parr Hydro plant will not be modified. All other structures or components of the project are either located underground (750 mcm cable) or were designed to meet IBC 2005 codes (i.e., 13.8/7.2KV transformer was purchased 'hardened' to meet IBC).

B4. The VCSNS AAC will be located offsite, the only area where separation criteria is applicable is where the 750 mcm cable enters the VCSNS Turbine Building. All cable installation is non safety-related and all applicable 10 CFR 50, Appendix R and train separation requirements will be satisfied.

B5. The 1DX bus that the AAC is being routed to is already designed to meet the two breaker separation for all class 1E systems, and this criterion will be maintained. Reverse

power sensing relaying is being installed to preclude the possibility of power flowing from the 1E busses to the AAC except for short periods of time and small loads during swapping of the AAC source to an EDG. All other source swaps to/from the AAC source are 'dead bus' transfers.

B6. The 1DX bus is a normal source of power to the 1E bus 1DA (alternate source to 1DB). As such, the design of the electrical supply meets all criteria in having a 1E rated breaker on the 1E busses (1DA & 1DB) to separate from the source and a non-safeguards breaker on each of the sources to bus 1DX (XTF 4&6, XTF 5 and the AAC).

B7. The AAC source will normally be energized and capable of having its breaker to the 1DX bus closed, but the breaker will remain OPEN. As this is a 'dead bus' transfer, the sources from XTF 4&6 and XTF 5 must have their respective breakers open to close the AAC source breaker and feed the 1DX bus. As the AAC source is NOT rated for the full capability of the normal sources, it may not be utilized as a normal connection to the 1DX bus. Additionally, an Operations procedure for the AAC source is being developed specifically to load the ECCS equipment onto the AAC fed safeguards bus. This activity will occur manually with one load added at a time and communication occurring between VCSNS and Parr for each additional load.

B8. With the AAC located offsite, there is not any requirement for support from VCSNS in the form of power, personnel, or fuel to allow for the AAC to support VCSNS. The only items in common between the AAC and normal sources to VCSNS are the 1DX bus and the feed cables to the 1DA and 1DB busses. This is allowed per AAC configuration 3A of NUMARC 87-00, Appendix C. All weather exposed equipment of the AAC is being designed to function during and after IBC rated weather events.

B9. See calculation DC08010-025, Revision 0, (Attachment III) for details on voltage and frequency support of this AAC.

B10. Operations procedures are being developed to verify the operation of the AAC to supply the 1DA and 1DB busses each refueling outage (presently every 18 months). The AAC source will normally be energized and monitored at the VCSNS site on a continuous basis and will be verified as an appropriate source at least weekly. Additionally, the voltage from a potential transformer off of the AAC will be captured in the site computer system (IPCS) and monitored with computer based alarms generated if voltage falls outside of limits specified in the calculation.

The only item in the entire AAC system that requires quarterly operation is the Parr diesel generator at the Parr station. VCSNS will supply a work control document to Parr personnel to verify that the diesel is run a minimum of one hour every quarter. The testing and maintenance will be performed by SCE&G personnel. All other Parr equipment associated with the AAC is already in a maintenance program performed by Parr personnel and there are no plans to change that maintenance.

B11. Parr personnel are placing the Parr diesel generator into the corporate diesel maintenance program which utilizes similar diesels throughout the SCANA/SCE&G territory. All other equipment at Parr is already in a maintenance program. The underground cable between Parr and VCSNS will be energized and loaded only with the charging current of the transformer (except for outage testing). The cable will be in the SCE&G underground cable maintenance/repair program. Similarly, the 13.8/7.2KV transformer will be monitored along with all of the other outdoor substation equipment on a normal 90-day periodicity (can be up to 180 days dependent on need for storm recovery crews).

B12. The planned test to verify the operation of the AAC source is to load the AAC onto first one and then the other ESF bus during refueling outage RF-16. The testing will verify capability to supply the required power to start and maintain the required loads during the worst case scenario. This test will be performed in simulation of a system wide blackout (not limited to VCSNS).

B13. The availability of the Parr Hydro station to meet the 95% availability goal has been previously demonstrated through use of on-line performance records for the station that included the 2002-2003 drought period. As the Parr Hydro station is a normally operating station, there are no reliability standards that are applicable per NUMARC 87-00, Appendix B.

7. *Provide the current reliability and unavailability of the EDGs at VCSNS. Also, evaluate how these actual values relate to the target values committed for station blackout conditions.*

The unavailability values for the EDGs at VCSNS through February, 2006, are 115.2 hours for the A EDG and 125.3 hours for the B EDG. The reliability number for the EDG system is 96%.

These values exceed the reliability target values committed to in the Station Blackout Rule (SBO) response. As such, the reliability of the EDGs at VCSNS continues to satisfy the regulatory requirements associated with SBO.

8. *The VCSNS license has been extended to 60 years. Provide a discussion regarding the impact of AAC power source (specifically cables and connections) on the extended license.*

VCSNS has evaluated the AAC modification and has determined that all items were purchased to meet the 40 year in-service life to provide the needed support for the Alternate AC Power (per NUMARC 87-00, Appendix B) system to the end of life for the plant. The AAC source is not being installed to meet or revise the VCSNS position on loss of all alternating current power (10 CFR 50.63). Equipment and systems being

utilized, installed, or modified are considered non safety-related. The AAC system is not being credited for any function within the scope of License Renewal as defined in 10 CFR 54.4. Therefore, this change does not meet the reporting requirements of 10 CFR 54.37.

SCE&G has procured specific direct burial cable for installation between Parr and VCSNS. This type of cable is extensively used through out the SCE&G service area as direct burial cable with significant success. The same cable has been used for over 20 years with zero failures.

A 1995 IEEE paper, 95 WM 016-6 PWRD, titled "105°C/140°C Rated EPR Insulated Power Cables Testing Under Overload Temperatures," demonstrates that under the conditions (buried, energized with little current flow, rated for 25kV but being used for 13.8 kV service) that cable will be under, the expected life of the cable should exceed 40 years. The connectors and splices used are the limiting factors and were demonstrated to exhibit an extended cable life and excellent thermal aging characteristics at the temperatures created by rated continuous ampacity loading and overload conditions. Between the materials used and the expected conditions the cable will see for much of its service life, the expected life will be in excess of 40 years.

9. *On page 3 of Enclosure 1, it is stated that "An agreement is being made with the management of Parr. Personnel will be available to staff the plant during preplanned maintenance activities and personnel will be able to staff the plant within one hour for emergent conditions." Discuss whether the Parr Hydro station is manned 24 hours per day, 7 days a week. Explain how the AAC power will be available within one hour if Parr Hydro Station is not manned 24 hours per day, 7 days a week.*

Currently, the Parr Hydro facility is staffed five days a week from 6:30 am to 3:30 pm and on Saturdays and Sundays for 4 hours per day. When Parr is being depended on as the AAC source due to extended maintenance on one of the EDGs, Parr will be staffed with sufficient personnel to assure power remains available to VCSNS 24 hours a day, 7 days a week. This will be a central part of the agreement between VCSNS and the management over the Parr Hydro.

10. *On page 2 of Enclosure 1, it is stated that "There are six 3.0 MVA units at Parr and only three are required..." Please clarify whether any three units will be adequate for the AAC source. If not, please explain how the capacity of the AAC power source will be verified.*

Unit numbers 2 and 6 of the Parr Hydro facility have fixed regulators installed. The other four units do not have these regulators. Five of the six units have the same nominal voltage and power ratings (2400 VAC, 2.5 MW, 0.8 power factor), while unit 6 can produce up to 3750 kVA (3.0 MW, 0.8 power factor). To supply the VCSNS loads when a LOOP occurs and one EDG is unavailable, three units are required. One of either unit 2 or unit 6 and any two of the other four units are required. Planned maintenance at the Parr Hydro station is limited to one unit at a time due to the available staffing.

The capacity of the AAC source will be verified by communicating with personnel at Parr (a fiber optic communication line is being installed between VCSNS and Parr Hydro) to discuss which units are/will be supplying power to VCSNS as the AAC source.

11. *On page 2 of Enclosure 1, it is indicated that, "An underground cable will be installed between the Parr switchgear and a new weather protected transformer at the VCSNS switchyard. From the transformer, a cable will be run into 1DX switchgear..."*

Provide the following:

- a) *Parr switchgear voltage rating and its location (indoor or outdoor).*
 - b) *Transformer rating (MVA, Voltages).*
 - c) *How the cable from transformer to 1DX switchgear will be protected against severe weather.*
 - d) *Location of 1DX switchgear.*
-
- a. A new switchgear breaker will be installed inside the Parr hydro facility building, rated for 13.8kV.
 - b. The new weather protected transformer being installed at the VCSNS switch yard will be a 13.8/7.2kV, 7.5MVA transformer.
 - c. The cable from the new transformer to the 1DX switchgear is run underground in a duct bank for all but a few feet. Where the cable emerges from the ground and enters into the Turbine Building, a short section of cable is protected by a metal enclosure.
 - d. The 1DX switchgear is located on the 463 foot elevation of the Turbine Building, in a room separate from the turbine-generator and oriented to be out of the way of potential turbine missiles.

SKETCH
of the
VCSNS, PARR HYDRO, and PARR CT SWITCHYARDS

**THIS PAGE IS AN
OVERSIZED DRAWING OR
FIGURE,
THAT CAN BE VIEWED AT THE
RECORD TITLED:
"SKETCH OF THE VCSNS,
PARRHYDRO, AND PARR CT
SWITCHYARDS"**

WITHIN THIS PACKAGE

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