UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

Report No.: 50-395/89-22

Licensee: South Carolina Electric & Gas Company
Columbia, SC 29218

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

Facility Name: V. C. Summer

Inspection Conducted: November 1 - 30, 1989

Inspectors: Peter A Balmain 12-20-89
for Richard L. Prevatte Date Signed

Peter A Balmain 12-20-89
for Leo P. Modenos Date Signed

Approved by: [signature] 12/20/89
Floyd S. Cantrell, Section Chief Date Signed
Division of Reactor Projects

SUMMARY

Scope:

This routine inspection was conducted by the resident inspectors onsite in the areas of monthly surveillance observations, monthly maintenance observation, operational safety verification, onsite follow-up of events and subsequent written reports, cold weather preparation, installation and testing of modifications, and other areas. Selected tours were conducted on backshift or weekends. Backshift or weekend tours were conducted on 15 days during this inspection period.

Results:

The unit was operated at 100 percent power throughout the reporting period. No major deficiencies were identified in the areas of surveillance and operational safety verification (paragraphs 2 and 4). In the area of maintenance, an IFI which requires a revision of MOVATS procedures was identified (paragraph 3b). The licensee also identified a failure to follow procedures while retesting a chiller pump after repair. This item will be tracked as a NCV (paragraph 3c). In the area of onsite follow-up of events (paragraph 5), the licensee identified that an inadequate procedure had resulted in the failure to verify that an

alarm would be received in the control room under all low flow conditions on the main plant vent and reactor building purge radiation monitors. This item will also be tracked as a NCV. The inspectors independently verified that the licensee had completed the necessary preparations for extreme cold weather (paragraph 7). The inspectors commenced inspection on the installation and testing of recent modifications. The design and work activities completed to date for modification to provide biocide treatment of the service water system (MRF 20629) were reviewed (paragraph 6). The inspectors performed a review to verify the licensee's quality assurance program implementation (paragraph 8). The inspectors reviewed the licensee's implementation of the installation of a non-safety grade battery charger to be used for occasional equalization charging of a limited number of battery cells of the station battery banks. A safety evaluation which includes recommendations for use of this single cell charger is attached (paragraph 9).

REPORT DETAILS

1. Persons Contacted

Licensee Employees

*W. Baehr, Manager, Chemistry and Health Physics
C. Bowman, Manager, Scheduling and Modifications
O. Bradham, Vice President, Nuclear Operations
M. Browne, Manager, Systems Engineering & Performance
W. Higgins, Supervisor, Regulatory Compliance
*S. Hunt, Manager, Quality Systems
*A. Koon, Manager, Nuclear Licensing
G. Moffatt, Manager, Maintenance Services
*D. Moore, General Manager, Engineering Services
*K. Nettles, General Manager, Nuclear Safety
*C. Price, Manager, Technical Oversite
M. Quinton, General Manager, Station Support
J. Shepp, Associate Manager, Operations
*J. Skolds, General Manager, Nuclear Plant Operations
*G. Soult, General Manager, Operations and Maintenance
G. Taylor, Manager, Operations
D. Warner, Manager, Core Engineering and Nuclear Computer Services
M. Williams, General Manager, Administrative & Support Services
K. Woodward, Manager, Nuclear Operations Education and Training

Other licensee employees contacted included engineers, technicians, operators, mechanics, security force members, and office personnel.

*Attended exit interview

Acronyms and initialisms used throughout this report are listed in the last paragraph.

2. Monthly Surveillance Observation (61726)

The inspectors observed surveillance activities of safety related systems and components to ascertain that these activities were conducted in accordance with license requirements. The inspectors observed portions of seven selected surveillance tests including all aspects of the Solid State Protection System Actuation Logic and Master Relay Test for Train B, STP 345.074. The inspectors verified that required administrative approvals were obtained prior to initiating the test, testing was accomplished by qualified personnel, required test instrumentation was properly calibrated, data met TS requirements, test discrepancies were rectified, and the systems were properly returned to service.

No major discrepancies were identified while observing the above surveillance test. However, the licensee discovered a problem relating to an inadequate surveillance test procedure that was used to calibrate the flow switches and low flow alarms for the radiation atmospheric monitors. This item is discussed in detail in paragraph 5b and in LER 89-18.

No violations or deviations were identified.

3. Monthly Maintenance Observation (62703)

a. The inspectors observed maintenance activities of safety related systems and components to ascertain that these activities were conducted in accordance with approved procedures, TS, industry codes and standards. The inspectors determined that the procedures used were adequate to control the activity, and that these activities were accomplished by qualified personnel. The inspectors independently verified that the equipment was properly tested before being returned to service. Additionally, the inspectors reviewed several outstanding job orders to determine that the licensee was giving priority to safety related maintenance and not developing a backlog which might affect a given system's performance. The following specific maintenance activities were observed:

PMTS P0124839	Sample oil and analyze oil sample - change oil and oil filter on main generator circuit breaker air compressor
MWR 89I0348	Adjust sample flow differential pressure switches on RMA4 per NCN 3489
MWR 89I0347	Adjust sample flow differential pressure switches on RMA3 per NCN 3489
PMTS P0128183	Change MOV rotor contacts for valve position indication from rotor 2 to rotor 4 on XVG 3005B-0-SP
PMTS P0128187	Change MCV rotor contacts for valve position indication from rotor 2 to rotor 4 on XVG 3001B-0-SP
MWR 8901923	Repair DG B air start compressor relief valve
MWR 206290008	Prepare and install concrete pad and protective posts for MRF-20629
PMTS P0127777	Visual inspection of freeze protection and heat tracing
MWR 89M0387	Replace bearings and adjust belt on ventilation fan for IDA switchgear room
MWR 89E0156	Replace motor bearing on XFN0050-M for IDA switchgear room

PMTS P0127795 Perform 18 month CC system temperature/flow tests

No major discrepancies were identified during the above observations. Some minor discrepancies were identified. These were discussed with the immediate job supervisors and corrective actions were taken to correct the deficiencies and prevent recurrence. Overall, the technicians and mechanics performing each job appeared to be well trained and knowledgeable on all aspects of each assigned task.

b. On November 9, 1989, the inspector accompanied an electrician and his supervisor to witness EMP 445.007, MOVATS Testing of Limitorque Valves, on the C SWIV.

In order to perform this test, the electrician needed to bypass certain electrical interlocks for automatic valve closure. This was accomplished by lifting electrical leads at the MCC. Once this was completed the test proceeded as required. At the conclusion of the test the NRC inspector questioned why there was no QC inspector present to witness the de-termination of the leads to the motor control cabinet. Step 5.2 of procedure EMP 445.007 requires that QC witness all de-terminations and reterminations on safety related valves. After questioning by the inspector, the electrician reviewed the procedure and realized that a QC inspector was required to be present. He stopped all work, located a QC inspector and completed the retermination of the wiring leads to the MCC. Follow-up discussions with the electrical supervisors and operations manager revealed that the de-terminations and reterminations were conducted as per Attachment 1 of SAP-300, Conduct of Maintenance. The licensee claims that step 5.2 in EMP 445.007 was not necessary and confusing. Therefore, the licensee is revising procedure EMP 445.007 to eliminate any confusion on QC participation. Until the licensee approves the procedure change, this item will be tracked as IFI 89-22-01, Revise electrical procedure EMP 445.007.

c. On September 13, 1989, the licensee wrote an off-normal occurrence for failure to perform post maintenance testing of the chiller water pump B prior to restoring the pump to operable status. The maintenance work was performed on August 21 - 24, 1989. When the work request was initiated, it stated "Repair and adjust seal leakage", and the "No" on the retest block was checked off. In order to complete the work, the pump had to be disassembled and the seal replaced. The pump was then reassembled and eventually returned to service on September 3, 1989. On September 13, 1989, the post maintenance reviewer identified that the pump should have been retested in accordance with STP 129.001, HVAC Chilled Water Pump Test. The test was then performed and the pump was returned to operable condition.

This event occurred due to a generalized job description on the work request and the failure of maintenance personnel to recognize the difference between adjust and repair. When a pump is disassembled it requires a retest. There was no safety significance since the pump was proven to be operable and passed the retest.

The licensee is currently preparing a LER on this event.

This LIV is not being cited because the criteria specified in Section V.G.1 of the NRC Enforcement Policy were satisfied. This will be tracked as NC4 89-22-02, Failure To Follow Procedures For Retest of Chiller Pump.

No violations or deviations were identified.

4. Operational Safety Verification (71707)

a. The inspectors conducted daily inspections in the following areas: control room staffing, access, and operator behavior; operator adherence to approved procedures, TS, and limiting conditions for operations; examination of panels containing instrumentation and other reactor protection system elements to determine that required channels are operable; and review of control room operator logs, operating orders, plant deviation reports, tagout logs, jumper logs, and tags on components to verify compliance with approved procedures.

The inspectors conducted weekly inspections in the following areas: verification of operability of selected ESF systems by valve alignment, breaker positions, condition of equipment or component(s), and operability of instrumentation and support items essential to system actuation or performance.

Plant tours included observation of general plant/equipment conditions, fire protection and preventative measures, control of activities in progress, radiation protection controls, physical security controls, plant housekeeping conditions/cleanliness, and missile hazards.

The inspectors conducted biweekly inspections in the following areas: verification review and walkdown of safety related tagout(s) in effect; review of sampling program (e.g., primary and secondary coolant samples, boric acid tank samples, plant liquid and gaseous samples); observation of control room shift turnover; review of implementation of the plant problem identification system; verification of selected portions of containment isolation lineup(s); and verification that notices to workers are posted as required by 10 CFR 19.

Selected tours were conducted on backshifts or weekends. Inspections included areas in the cable vaults, vital battery rooms, safeguards areas, emergency switchgear rooms, diesel generator rooms, control room, auxiliary building, containment, cable penetration areas, service water intake structure, and other general plant areas. Reactor coolant system leak rates were reviewed to ensure that detected or suspected leakage from the system was recorded, investigated, and evaluated; and that appropriate actions were taken, if required. On a regular basis, RWP's were reviewed and specific work activities were monitored to assure they were being conducted per the RWP's. Selected radiation protection instruments were periodically checked, and equipment operability and calibration frequency were verified.

In the course of monthly activities, the inspectors included a review of the licensee's physical security program. The performance of various shifts of the security force was observed in the conduct of daily activities to include: protected and vital areas access controls; searching of personnel, packages and vehicles; badge issuance and retrieval; escorting of visitors; and patrols and compensatory posts.

b. On November 29, 1989, the plant experienced a small transient. An instrument air line to the heater dump valve 2B ruptured resulting in the dump valve failing open on loss of air. With the valve open the steam from the heater was diverted from the deaerate tank to the condenser. With the control rods in automatic the reactor power was reduced to approximately 88 percent. The auxiliary operator ramped the turbine back to compensate for the reduction in the reactor power. Within ten minutes the dump valve was manually closed and reactor power was returned to 100 percent power. The cause of the event was copper tubing failure. The tubing was repaired and the air line was returned to service. The licensee is continuing to review this event to determine the root cause of the failure.

No violations or deviations were identified.

5. Onsite Follow-up of Events and Subsequent Written Reports (92700, 93702)

a. The inspectors reviewed the following LER's to ascertain whether the licensee's review, corrective action and report of the identified event or deficiency was in conformance with regulatory requirements, TS, license conditions, and licensee procedures and controls.

(Closed) LER 87-15, Reactor trip, failure of inverter. This failure resulted from a blown output fuse which caused a loss of power to nuclear instrumentation power range channel (NI-44). Failure of this

channel resulted in a low low SG level and reactor trip. Licensee short term corrective action was completed prior to unit restart. Long term corrective action included a redistribution of loads on channel III to reduce the potential for unit trip on a loss of inverter. This work was completed under MRF 21316 on October 30, 1989. MRF 21432 has been approved for testing to verify loading of inverters during a ESF actuation. This work is scheduled for refueling outage No. 5 in 1990. After this testing is completed, the MRF will add an alternate regulated AC power supply to the inverter channels and static transfer switches between the inverter output and the regulated power AC supplies. This will prevent a loss of power to the protection and control cabinets on a loss of the inverter. It will also provide sufficient fault current through the regulated AC supply to blow the fuses on a short circuit and thereby prevent this inverter from locking up on current limit. This installation is scheduled to be completed during refueling outage No. 6 in late 1991 or early 1992.

(Closed) LER 88-014, Two pressurizer safety valves inoperable, places plant in TS 3.0.3. This event was reported by the licensee in a letter dated January 19, 1989. It was the result of the licensee testing two safety valves and finding them outside the allowable limit of 2485 psig +/- 1 percent lift setting pressure. This event occurred while the plant was in Mode 3. The valves had their set point adjusted and were returned to an operable status within three hours. To prevent recurrence, a change was made to the surveillance procedure STP 401.001 that will allow testing of only one safety valve at a time. This should prevent having more than one safety valve inoperable at a time.

b. On October 27, 1989 the licensee identified that the control room did not receive a low flow alarm when the sample pumps on radiation monitors for the main plant vent (RM-A3) and the reactor building purge system (RM-A4) were stopped. An investigation by the licensee revealed that a low flow alarm was operable, but was only received when a high differential pressure condition was sensed across installed filters. This signal relates to a clogged filter. The design of the system also provides a differential pressure switch that can be set to detect low differential pressure across the filter. This signal relates to a low flow condition. The low differential pressure switch for low flow was not addressed in the licensee's STP 360.036, used to perform this ACOT on this equipment.

The surveillance for RM-A3 and RM-A4 specified in TS 4.3-9 notes (1) 3 and (2) 3 requires the ACOT verify operation of the low flow alarm in the control room. STP 360.036 did not contain steps to verify this low flow alarm condition.

Upon discovery of this deficiency, the licensee declared RM-A3 and RM-A4 inoperable, entered the TS action statement and used alternate means to verify system flow. The calibration and ACOT procedures were revised to address both the high and low flow differential pressure switches. The switches were set and successfully tested on November 10, 1989.

This event occurred due to an inadequate procedure. The safety significance was minimal since both radiation monitors are non-safety related installations that provide a backup for administratively controlled releases from the waste gas decay tanks and the reactor building purge system. RM-A3 is additionally backed up by RM-A10.

The licensee is currently preparing a modification, MRF 2781, which will enhance the overall operation of this system. They are additionally preparing a LER 89-18 on this event.

This LIV is not being cited because the criteria specified in Section V.G.1 of the NRC Enforcement Policy was satisfied. This will be tracked as NCS 89-22-03, Inadequate STP for Radiation Monitors.

No violations or deviations were identified.

6. Installation and Testing of Modifications (37828)

The inspectors started a review of recently performed plant modifications to ascertain that activities which are not submitted for approval to the NRC are in conformance with the requirements of the TS, 10 CFR 50.59 and 10 CFR Part 50, Appendix B, Criteria III, Design Control.

MRF-20629, Service Water System Biocide Treatment, is being reviewed and work has been observed to assure that it is being performed in accordance with approved instructions, procedures and drawings. The modification has been submitted to the South Carolina Department of Health and Environmental Control and has received approval to treat the service water system with Betz "CT-1" to control Asiatic clams and microbiologically induced corrosion. The licensee has also submitted the modification to NRR and is awaiting approval before placing the system in operation.

The inspectors will continue to follow work activities until the work package is completed.

No violations or deviations were identified.

7. Cold Weather Preparation (71714)

The inspectors conducted a review of the licensee's cold weather preparations to ascertain that adequate measures were implemented for extreme cold weather.

The inspectors verified that the licensee had inspected and prepared systems susceptible to freezing by verifying the operability of heat tracing, space heaters and installed insulation. In addition, the

inspectors reviewed the completed EMP 0120.002, Freeze Protection and Heat Tracing Inspection, and verified that all work had been completed and documented on task sheet PMTS: P0127777 dated November 10, 1989.

The inspectors also verified that systems which had been subjected to maintenance or modification during the past year had the heat tracing and insulation returned to operable conditions. External liquid systems that provide cooling during hot weather only, have been drained to preclude freezing. External doors were verified closed.

No violations or deviations were identified.

8. Licensee Quality Assurance Program Implementation (35502)

An internal office evaluation was conducted of the licensee's quality assurance program by reviewing recent inspection reports, SALP reports, open items, licensee corrective actions for NRC inspection findings, and licensee event reports. Particular emphasis was placed on all new items and findings since the last SALP period ended (December 31, 1989). A recommendation to maintain NRC inspection effort at its present level was made.

9. Other Areas

The licensee made a plant modification to the V. C. Summer Station under 10 CFR 50.59 which installed a non-safety grade battery charger to provide occasional equalizing charges for battery cells of the 125 VDC station battery banks that have or may experience problems with individual cell voltage. The resident inspectors conducted an inspection of this modification and discussed this installation with NRR. As a result, NRR performed an analysis of this design and issued a Safety Evaluation which is attached. This evaluation recommends that the licensee revise their administrative procedures to include the three recommended limits for the use of the single cell charger specified on pages 5 and 6 of the attached SER.

A NRR team inspection to follow-up on the licensee's implementation of NRC Bulletin's 79-02 and 79-14 started on November 27, 1989. This inspection will be documented in inspection report 395/89-200.

The NRC Regulatory Impact Team visited the V. C. Summer Plant on November 29, 1989.

On November 30, 1989, the inspector observed the licensee's semi-annual emergency practice drill. The practice drill involved only licensee personnel.

9. Exit Interview (30703)

The inspection scope and findings were summarized on December 1, 1989, with those persons indicated in paragraph 1. The inspectors described the areas inspected and discussed the inspection findings. The two NCV's identified in the area of maintenance and onsite follow-up of events were discussed in detail. The licensee was made aware of the information needed to close out IFI 89-22-01 associated with the procedural changes being made to the electrical work procedure. The inspectors noted the licensee's promptness in correcting minor deficiencies identified during inspections conducted in surveillance testing and preparations for cold weather. No dissenting comments were received from the licensee. The licensee did not identify as proprietary any of the materials provided to or reviewed by the inspectors during the inspection.

10. Acronyms and Initialisms

ACOT	Analog Channel Operational Test
CC	Component Cooling
DG	Diesel Generator
EMP	Electrical Maintenance Procedure
ESF	Engineered Safety Feature
IFI	Inspector Follow-up Item
LER	Licensee Event Reports
LIV	Licensee Identified Violation
MCC	Motor Control Center
MOVATS	Motor Operated Valve Analysis Testing System
MRF	Modification Request Form
MWR	Maintenance Work Request
NCN	Non Conformance Notice
NCV	Non Cited Violation
NRC	Nuclear Regulatory Commission
NRR	Nuclear Reactor Regulation
PMTS	Preventive Maintenance Task Sheet
QC	Quality Control
RCS	Reactor Coolant System
RCSLK9	Reactor Coolant System Leak Rate
RWP	Radiation Work Permits
SPR	Special Reports
STP	Surveillance Test Procedures
SWIV	Service Water Isolation Valve
TS	Technical Specifications

ATTACHMENT

SAFETY EVALUATION REPORT
VIRGIL C. SUMMER NUCLEAR STATION
SINGLE CELL BATTERY CHARGING

BACKGROUND

The licensee for the Virgil C. Summer Nuclear Station has made a plant modification to permit the use of a non-safety grade 40 volt d.c. (VDC) battery charger to be used for occasional equalization charging of a limited number of battery cells of the 125 VDC Class 1E station battery banks. At times, the charger s essentially operated in parallel with a limited number of cells (minimum of 4, maximum of 17) of the battery bank, and thereby is also partially in parallel with the full capacity battery charger.

The 40 VDC battery charger, referred to as a single cell charger, is electrically isolated from the Class 1E system by isolation fuses. Thus, the 125 VDC station battery is considered to be "Operable" while the single cell charger is connected to it.

The station battery manufacturer, C&D Batteries, Inc., states that for some applications sufficient equalizing potentials may not be available for equalization charging and that in such cases a single cell charger with complete a.c. line isolation may be paralleled across a single cell while still a part of the overall battery to provide an overvoltage to that cell. C&D further notes that an equalization charge continuing for several weeks need not be cause for alarm since the currents passing through the cells are very small.

The licensee states that they are limited by procedures to a 24 hour equalization charge using the station's full capacity charger. Further, they are limited to 140 VDC maximum on the station buses (2.33 VDC per cell on the 60 cell battery). Thus, they use the single cell charger to obtain longer equalization periods and higher equalization voltages.

The Virgil C. Summer Station Technical Specifications require weekly surveillance of each pilot cell and quarterly surveillance of each cell of the 125 VDC station batteries. If an individual cell, or average of all cell voltages or specific gravities go below a specified minimum, the battery may be considered operable if the parameters are restored within limits within 7 days. The Technical Specifications do not place any limits on how often, how long or under what conditions an equalization charge may be applied. However, Regulatory Guide 1.129 references IEEE Std. 450-1975 as an acceptable standard with minor changes. IEEE Std. 450 indicates that an equalizing charge should be applied if the specific gravity of an individual cell drops more than 0.010 or if the voltage deviates more than 0.04 V from the average of all cells at the time of inspection. Neither the Regulatory Guide nor the IEEE Standard discusses the length of time that the equalization charge should be applied or the method of implementing the equalization charge.

The application of the single cell charger is not discussed in the Virgil C. Summer FSAR and presumably was not considered during the licensing reviews of the plant. It is reasonable to conclude that the reviewers assumed that the full capacity battery chargers would be used for equalization charging. Thus, it is appropriate to consider at this time whether the use of the single cell charger will degrade the Class 1E batteries or the 125 VDC system. A 10 CFR 50.59 assessment (attachment A) for the licensee by their consultant Gilbert/Commonwealth, Inc. concluded that it would not.

EVALUATION

A simplified electrical diagram of the modification is shown on attachment B. The single cell battery charger and the 3 disconnect switches, one for each of three batteries, are located in a separate room. The three fuse panels are wall mounted in their respective battery rooms. The single cell battery charger stand, terminal box, disconnect switches, fuse panels, fuses, and cable racks are

seismically mounted. The three disconnect switches are padlocked and controlled administratively to prevent more than one being closed at a time. Only two of the three batteries are safety related.

The fuses and fuse mounting components were supplied by Bussman Division, McGraw Edison. They are qualified in accordance with Report No. 470-7 "Product Qualification Specification For Class 1E Equipment." However, they do not meet all of the requirements for Class 1E equipment because Bussman no longer complies with the paperwork involved in Report 470-7(1).

The fuses are 150 amperes fast acting (0.75 seconds at 300 amperes) to clear battery fed faults between the fuses and charger.

Flexible cables with clip terminal connectors are coiled on wall mounted racks near the fuse panels for connecting to the battery terminals when needed for equalization charging. These cables and clips are not class 1E but would be administratively controlled by inspection and placement to insure that they are in good condition and do not contact the battery rack or battery terminals.

One of our initial concerns with the single cell charger application was with a possible fault between the fuses and the charger which could result in a fault current slightly less than the 150 ampere rating of the fuses. The licensee provided additional information (2) as to why such an event was improbable. The reasons given included the following:

(1) Letter from Jim Calzone, Bussman Division, to Senath Dasgupta, Gilbert Associates, Inc., October 21, 1986.

(2) Letter, O. S. Bradham, South Carolina Electric and Gas Company to U.S. Nuclear Regulatory Commission, August 15, 1988.

- Cables are run in conduit only.
- The majority of the cable length is run in separate conduits for each pole.
- Cables are separated by a minimum 5" spacing where possible in the disconnect switches and fuse panels.
- Cables are purchased nuclear safety related.
- There is fault detection by ground indicating lights.
- Positive and negative cables must fail simultaneously.

Another concern was with a possible voltage regulator failure and a resultant overvoltage on the limited number of battery cells receiving an equalizing charge. The licensee responded that C&D Batteries, Inc. calculated that a cell passing 150 amps would take approximately eight hours to reach the cells low water level due to the heat generated and the breakdown of the water through electrolysis. Therefore, the licensee has committed to a battery check every six hours during such an equalizing charge to assure that the battery will not be damaged by such an event.

A third concern was with a loss of input power to the single cell charger and a resulting drain on the battery. The licensee responded that the maximum drain would be 7.9 amps or 47.4 ampere hours (AH) over the 6 hours that could occur between checks of the single cell battery charger. The 47.4 AH is 4.5% of a connected cells 1050 AH capacity.

A fourth concern was with the possibility of the cables between the fuse panels and batteries, or the cable clips to the battery, causing a battery short. The

licensee's administrative procedures require inspection of the battery cables to insure their integrity and careful placement of the cables and battery clips to insure that the cables do not cross the battery terminals and that the clips will fall to the ground if they become dislodged.

Based on the licensee's responses and our review of the modification details, we conclude that utilization of the non-class 1E battery charger will not significantly increase the exposure of the Class 1E system to additional hazards. Also, we recognize the advantage in some instances of an equalization charge to a limited number of cells in improving overall battery reliability. However, we are concerned that over utilization of the single cell charger may mask a problem with an individual cell or cells in the battery. In response to a staff question as to the average number of hours that the single cell charger would be connected to a safety-related battery during a year, the licensee estimated 100 hours, but noted that there was no limit on the number of hours that it could be connected. We believe that some limit should be imposed. The licensee states that the single cell charger must be disconnected for surveillance testing of the battery under the Technical Specifications. However, the Technical Specifications allow up to 92 days between surveillance tests of each connected cell. One or more degraded cells could be temporarily corrected using the single cell charger and the true degraded condition of the cell undetected until the next 92 day surveillance, at which time the single cell charger could be applied again. Although such a problem could be detected by a cell-trending program, the licensee states that there is no formal trending program that reviews individual cell data. Thus, we conclude that a limit should be placed on the number of occasions and amount of time that the single cell charger can be used on a safety-related battery as follows.

First, on the safety-related battery banks the single cell charger should not be used in place of the normal Class 1E full capacity charger if adequate equalization of cell voltages can be maintained using the full capacity charger. Second, the single cell charger should not be used more than once a year on any individual cell. Adequate records should be kept to assure this condition is

satisfied. After equalization charging of a limited number of cells using the single cell charger, in addition to the normal surveillance of those cells for operability following the equalization charge, they should be checked again in two weeks, plus or minus 2 days, to assure that they have held the charge by maintaining a voltage of $\geq$ 2.13 volts corrected for average electrolyte temperature. If not, the battery should be declared inoperable. Third, for a constant voltage equalization charge, the charging time after the charging current has stabilized should not significantly exceed the values indicated below for a lead-calcium battery.

	TIME-IN HOURS	
Charger Volts Per Cell*	1.215 sp. gr. Battery	1.250 sp.gr. Battery
2.24	222	---
2.27	166	---
2.30	105	---
2.33	75	~~106~~ 166
2.36	50	118
2.39	34	80

*Charger voltage divided by number of cells being charged.

We find the use of the single cell charger to be acceptable provided provisions equivalent to those above are included in the administrative provisions for use of the single cell charger.

SUMMARY AND CONCLUSION

The licensee for the Virgil C. Summer plant has made a plant modification to electrically isolate and utilize a non-class 1E battery charger for placing an equalizing charge on a limited number of cells of the 125 volt d.c. Class 1E station batteries. The battery manufacturer has found the practice to be acceptable, and a 10 CFR 50.59 assessment concludes that the application imposes no unreviewed safety questions. The NRC staff has reviewed the plant

modification and finds that utilization of the non-class 1E battery charger will not significantly expose the Class 1E system to any additional hazard, and the small increase in exposure is offset by an expected improvement in battery reliability, provided the non-class 1E battery charger is not used excessively to mask possible individual cell degradation. We therefore find the application of the non-class 1E battery charger to be acceptable provided certain additional provisions are included in the administrative procedures for use of the non-class 1E battery charger. The provisions should be equivalent to those listed above in the body of this evaluation. The licensee should include such provisions in their administrative procedures and submit them for staff review.

SALP INPUT

FACILITY NAME: Virgil C. Summer

SUMMARY OF REVIEW:

Safety review of licensee's proposed use of a non-class 1E battery charger for equalization charging of a limited number of cells in the station 125 volt safety-related battery banks. The review was conducted by NRR/DEST/SELB during the latter half of 1988. The staff found the use of the non-class 1E charger acceptable provided the licensee includes additional provisions in their administrative procedures for its use.

NARRATIVE DISCUSSION OF LICENSEE'S PERFORMANCE
FUNCTIONAL AREA - ENGINEERING/TECHNICAL SUPPORT:

The safety review was relatively complicated in that it required a review of the design provisions of the non-class 1E battery charger installation to assure that it was adequately electrically isolated from the Class 1E battery bank and also to determine the acceptability of equalization charging of a limited number of cells rather than the total number of connected cells. This is not done elsewhere at nuclear power plants and could be precedent setting. Therefore, the staff conducted a thorough investigation which required several contacts with the licensee.

During telecon contacts, we found that the technical personnel contacted in some instances could not respond immediately to some staff questions indicating that they were not completely familiar with the technical aspects. However, in evaluating this aspect of the licensee's performance, we need to consider that this was a 50.59 review conducted by an outside consulting firm. Given time, the licensee responded completely and satisfactorily to our questions, thus indicating proper responsiveness and adequate management involvement and control.

V. C. SUMMER NUCLEAR ST ION
G/C MODIFICATION SAFETY EVALUATION
10 CFR 50.59 ASSESSMENT

A. Evaluation applicable to: MRF 20827 - Single Cell Battery Charger

B. Answer Questions 1 thru 4.

Does this design change/modification constitute:

1. Yes X No ___ A change to the plant as described in the FSAR/FPER?
2. Yes ___ No X A change to procedures as described in the FSAR/FPER?
3. Yes ___ No X A test or experiment not described in the FSAR/FPER?
4. Yes ___ No X A change to the plant Technical Specification?

C. Answer Unreviewed Safety Questions 1 thru 7.

1. Yes ___ No X Will the probability of an occurrence previously evaluated in the FSAR/FPER be increased?
2. Yes ___ No X Will the consequence of an accident previously evaluated in the FSAR/FPER be increased?
3. Yes ___ No X Will the probability of a malfunction of equipment important to safety previously evaluated in the FSAR/FPER be increased?
4. Yes ___ No X Will the consequences of a malfunction of equipment important to safety previously evaluated in the FSAR/FPER be increased?
5. Yes ___ No X May the possibility of an accident which is different from any already evaluated in the FSAR/FPER be created?
6. Yes ___ No X May the possibility of a malfunction of equipment important to safety different from any already evaluated in the FSAR/FPER be created?
7. Yes ___ No X Will the margin of safety as defined in the bases to any Technical Specification be reduced?

D. Provide justification for answers in Part C of the Safety Evaluation?*

This modification permanently installs a single cell battery charger used for temporarily providing an equalizing charge in excess of 2.33 Volts per cell (VPC) to assure required battery capacity and for battery life extension.

All equipment will be seismically mounted in accordance with anti-fall down criteria.

Isolation fuses between the batteries and charger are provided to prevent a fault downstream of the fuses from draining the connected cells. The fuses are located in each battery room to minimize the amount of cable between the battery and fuses. The fuses are of a semiconductor type application that clear on small overcurrents in a small amount of time (.75 seconds at 200% of 150A rating).

See attached sheets: (Yes) X (No)

Discipline Review and Concurrence
Interface Signature Required

DISCIPLINE	RESPONSIBLE ENGINEER	DATE
Electrical:	Stephen R. Cuit	2/5/87
Structural:	L.C. Beiman	2-5-87
Mechanical:		
Control Systems:		
Other:		
Task Engineer:	Stephen R. Cuit	2/5/87
Reviewer:	D. F. Gulett	2/5/87

TECH SPEC CHANGE/REFERENCE*

Change	Reference	Section	Page
	X	4.8.2.1	3/4 8-9

FSAR/FPER CHANGE/REFERENCE*

Change	Reference	Section	Page
	X	8.3.2.1	8.3-25, 26
	X	8.3.2.1.2	8.3-27, 28
	X	8.3.2.1.3	8.3-28
	X	8.3.2.1.5.1	8.3-29
	X	8.3.2.1.5.2	8.3-29, 30
	X	Appendix 3A	3A-42a, 43
X		Table 3.11-0A	3.11-100

* Use additional sheets if necessary.

A Evaluation applicable to: MRF 20827 - Single Cell Battery Charger

D Provide justification for answers in Part C of the Safety Evaluation? (Continued)

Upon loss of a.c. input power to the charger, the charger will not act as a "short" across the battery cells being equalize charged. The reason for this is the output SCR's are turned "off" due to loss of their gate control voltage. The charger's output shunt resistors plus the external circuit resistance is a high resistance path relative to the battery cells resistance causing insignificant load current to flow to the charger.

If the battery charger current limiter controls fail, the output current will exceed 175A. The isolation fuses (150A) will clear the faulted charger before cell damage occurs. No credit has been taken for the internal charger circuit breaker to clear this condition, which in fact it will attempt to do.

If the battery charger voltage regulator controls partially fail, the voltage impressed on each cell being charged may exceed the manufacturer's recommended maximum equalizing voltage. This condition will be handled by an administrative procedure that requires checking the voltage every 12 hours. If this voltage value is exceeded, the charger is disconnected and a visual inspection of the cell and water level are required. No damage to the cells should occur as each cell can withstand 2.9V carrying 52.5A for approximately 24 hours.

If the charger voltage regulator controls completely fail and call for maximum output voltage, the charger would go to current limit in an attempt to raise the cell's voltage beyond 2.9V. 2.9V is the maximum that can be impressed on a cell due to its physical characteristics. The charger's output current will exceed 175A and the isolation fuses (150A) will clear the faulted charger. The charger's current limit controls will be set at maximum to allow a current valve that can clear the fuses in the event the voltage controller fails but the current limiter controls remain operable.

The disconnect switches (one per battery) will be padlocked and controlled administratively to prevent more than one being closed at a time and thus tying two batteries together. Signs will be installed on the isolation fuse panels stating the maximum and minimum number of battery cells to be charged simultaneously due to charger output or acceptable fault current level, and to maintain a minimum of 6" space between the (+) and (-) cables.

One set of isolation fuses per battery are provided. The 125V d.c. system is a floating system (no system ground). A fault is generated when both the (+) and (-) cable conductors come in contact. The fault current must pass through both the (+) and (-) fuses. If either fuse clears, the fault path is interrupted. The (+) fuse is therefore back-up protection for the (-) fuse and vice versa.

The use of NNS battery cable and NNS battery clips is acceptable for the single cell battery charger application based on the requirements of an administrative procedure to be developed. This procedure will require a visual inspection of the cable prior to its connection to the battery, and direct the placement of the cables such that they do not cross over any cell or cell connectors. The procedure will also direct the placement of the clips such that one cable will not touch the battery rack and during a seismic event the weight of the cable attached to a clip that has become loose, will cause the clip to fall to the floor and not across cell posts or connectors.

A Evaluation applicable to: MRF 20827 - Single Cell Battery Charger

D Provide justification for answers in Part C of the Safety Evaluation?(Continued)

A single cable failure such that it contacts the battery rack while connected to a cell will not short out the battery as the 125V d.c. system is an ungrounded system. A fault is generated when both the (+) and (-) cables come in contact or are connected together by a common ground path. The administrative procedure described in the previous paragraph will direct cable and clip placement such that a battery fault will not be possible for the charger leads failure.

ATTACHMENT B