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April 7, 1981

NUCLEAR PRODUCTION DEPARTMENT

Mr. Robert L. Tedesco,
Assistant Director for Licensing
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Tedesco:

SUBJECT: Grand Gulf Nuclear Station
Units 1 and 2
Docket Nos. 50-416 and 50-417
File 0260/0277/0755/L-860.0
TMI Action Item I.G.1, Training During Low Power Testing
AECM-81/84

This letter is in reply to your letter, received January 26, 1981, which provided additional guidance in regard to NUREG-0737 Item I.G.1 as applied to BWR OL applications. That letter asked that we conduct during the Grand Gulf startup testing a simulated loss of AC power test. We were also asked to commit to augmented operator training by their participation in the preoperational and startup test programs.

In regard to the proposed simulated loss of AC power test, the only significant experience to be gained over testing already planned and described to you in FSAR Chapter 14.2 is in the area of RCIC operation. Therefore, for reasons provided below, extensive testing of RCIC under loss of AC power conditions is proposed as an alternative to your simulated loss of AC power test.

Your letter suggests performing the loss of AC power test with a "real or simulated source of decay heat." In order to simulate decay heat, the reactor must remain critical at approximately 5 percent rated power. This would require that certain systems remain energized to assure the simulated decay heat can be generated. All other systems would be "blacked out" from loss of AC power (loss of offsite power and loss of emergency diesel generators).

The first point which should be made is that testing or operation in such a degraded operational state is beyond the scope of existing safety analyses and are not allowed by current Technical Specifications. Thus, additional safety analyses and waivers of certain Technical Specifications would be required.

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Second, despite the results of such safety analyses, we feel it would be difficult if not impossible to maintain the 5 percent power condition and simulate other relevant reactor and plant conditions under loss of AC power simultaneously. For example, on a loss of AC

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condition, the Reactor Protection System (RPS) MG sets would trip on undervoltage resulting in a loss of power to the RPS trip circuitry which would cause a reactor scram. Power to the RPS would have to be maintained to prevent a reactor scram in order to maintain the simulated decay heat. Another normal and relevant action that would occur upon loss of RPS power would be the actuation of the Nuclear Steam Supply Shutoff System (NS4) and the closure of the MSIV's. With the reactor mode switch in the Startup/Hot Standby position a direct scram from MSIV closure would be avoided. However, upon closing the MSIV's there is no exit for the steam flow, and it is extremely likely that the resulting pressurization transient would cause a reactor scram on high reactor pressure and/or high neutron flux resulting from void collapse (IRM hi-hi). This scram would also terminate the "simulated decay heat" and make any further testing futile. Since the results of the test depend upon the continued generation of steam at 5 percent power, it appears that any attempt to conduct a test with "simulated decay heat" is impractical and would not achieve the desired results.

The remaining proposed alternative is performing the loss of AC test with actual decay heat within the first 1500 MWD/T core exposure immediately following 7 days of operation at 80% rated power or above.

Initiation of a loss of AC from these conditions would result in a coast down of the RPS MG sets within a few seconds which would result in a reactor scram and loss of power to the NS4 which again results in MSIV closure. The decay heat causes rapid pressurization and subsequent actuation of safety/relief valves blowing steam to the suppression pool. From this point on, the transient is similar to a MSIV closure with no loss of AC power. Steam blowdown to the suppression pool lowers reactor water level to level 2 initiating RCIC. The design basis for RCIC is that it be capable of recovering water level to normal from precisely this condition. Therefore, RCIC would return reactor water level to level 8 and then trip on high level. This cycle (starting and tripping RCIC) would continue for several hours with adequate RCIC suction supply from the condensate storage tank backed by the suppression pool. The addition of heat to the suppression pool through the SRV's would be less than that assumed in the LOCA analyses since the initial test power level would be less than or equal to rated thermal power. Thus, up to the point at which suppression pool cooling is established in an accident, the loss of AC test is essentially identical (from the reactor response standpoint) to the MSIV closure transient.

A review of plant instruments has established that reactor vessel pressure and level instrumentation does exist which is powered from DC or uninterruptible AC power sources. This would allow adequate monitoring of reactor vessel conditions during the test. While a loss of AC power test represents an unanalyzed condition of operation, a preliminary assessment shows that expected plant response is within the design basis of key systems, e.g., RCIC and important reactor instrumentation. The only operation which is essential in responding to this transient is the injection of water to the reactor by RCIC with no AC power present. The operational characteristics and capabilities of

RCIC under loss of AC present the only operationally significant portion of this transient which is different from the MSIV full closure test already planned as part of the power ascension test program (see FSAR section 14.2.12.3.22.1). Therefore, the extended operational tests of RCIC included in Appendix C of the enclosure to this letter are proposed as an alternative to the loss of AC power test.

These tests will be conducted in conjunction with the Integrated ECCS testing and thus will be combined with the actual partial loss of AC power conditions which are effectively the same as a complete loss of AC power for RCIC.

Two additional tests, also described in Appendix C of the enclosure, are planned. The first is an integrated reactor pressure vessel level instrument functional test which will test the proper operation of all RPV level instruments during the preoperational test phase. The second is an integrated drywell and containment pressure instrumentation test to be done in conjunction with the containment integrated leak rate test (ILRT). This test will prove the proper operation of all drywell and containment pressure instruments.

These new tests including the expanded RCIC tests will be incorporated into existing detailed, written preoperational test procedures.

The enclosure also describes MP&L's program for augmented operator training during the preoperational and startup test phases. This program is based on guidelines which were developed by the BWR Owners' Group in which MP&L actively participated. The Owners' Group guidelines have been specifically adapted for the GGNS startup and training programs.

As previously committed in FSAR Appendix 3A, the completed test procedures, data forms, graphs, photographs, etc. constitute the official historical record of the preoperational test program during which the additional tests required by item I.G.1 are conducted. Copies of this preoperational test documentation will be made available to the NRC for their review. A Startup Summary Report describing startup test phase activities will be submitted in accordance with Regulatory Guide 1.16.

We believe the program of additional testing and augmented operator training which we have described constitutes a complete and satisfactory response to item I.G.1 of NUREG-0737.

Yours truly,

John D Richardson for

L. F. Dale
Nuclear Project Manager

MRW/CLT/JDR:lm
Enclosure
cc: (See Next Page)

cc: Mr. N. L. Stampley
Mr. G. B. Taylor
Mr. R. B. McGehee
Mr. T. B. Conner

Mr. Victor Stello, Jr., Director
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Washington, D.C. 20555

GRAND GULF NUCLEAR STATION PROGRAM

FOR

TRAINING DURING LOW POWER TESTING

NUREG-0737, ITEM I.G.1

GRAND GULF NUCLEAR STATION PROGRAM
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TRAINING DURING LOW POWER TESTING
NUREG-0737, ITEM I.G.1

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INTRODUCTION

The NRC has identified new requirements for GE BWR plant testing and training. These requirements in NUREG-0737, item I.G.1, are applicable to near-term operating license (NTOL) facilities. The following quotes are from the earlier NUREG documents addressing these requirements:

NUREG-0660 May, 1980

TASK I.G PREOPERATIONAL AND LOW-POWER TESTING

A. OBJECTIVE: Increase the capability of the shift crews to operate facilities in a safe and competent manner by assuring that training for plant evolutions and off-normal events is conducted. Near-term operating license facilities will be required to develop and implement intensified training exercises during low-power testing programs. This may involve the repetition of startup tests on different shifts for training purposes. Based on experiences from the near-term operating license facilities, requirements may be applied to other new facilities or incorporated into the plant drill requirement (Item I.A.2.5). Review comprehensiveness of test programs.

NUREG-0694 June, 1980

I.G.1 TRAINING DURING LOW-POWER TESTING

Define and commit to a special low-power testing program approved by NRC to be conducted at power levels no greater than 5 percent for the purposes of providing meaningful technical information beyond that obtained in the normal startup test program and to provide supplemental training.

NUREG-0737 reiterated the requirements set forth in NUREG-0694.

Review of the present BWR Preoperational and Startup Test Programs against the above listed requirements has identified a number of areas where increased emphasis on operator training can be beneficial. Additionally, several new tests have been identified that are responsive to the NRC requirements. As a result of this review, a program has been developed for the Grand Gulf Nuclear Station and is described herein.

The test program has been divided into five sections for purposes of this report. They are:

I - Preoperational Testing
II - Cold Functional Testing
III - Hot Functional Testing
IV - Startup Testing
V - Additional Training and Testing

The first four sections briefly discuss the present test program and changes made to improve the training benefit. The last section contains new testing proposed to provide meaningful technical information and enhance training.

I PREOPERATIONAL TESTING

The preoperational test program serves a two-fold purpose. Primarily, it controls and documents the preoperational test effort. A secondary benefit of the program is that during the test phase, a detailed knowlege of the systems and their performance characteristics will be obtained by the plant operating personnel.

Plant operating personnel will obtain hands on experience by testing of these systems thereby helping to satisfy the training concerns of NUREG-0737. The preoperational test program described in FSAR Section 14.2.12.1 will be conducted by plant operations personnel where operation of plant equipment is involved and thus contributes significantly to operations personnel training on these systems. The Integrated ECCS with Loss of Offsite Power test is one of the more significant tests performed during the preoperational test phase which significantly supports operator training. FSAR Section 14.2.12.1.44 describes this test.

To enhance the training benefit of this test, Integrated ECCS testing will be scheduled so that each shift will participate in at least one of these tests to obtain training. Operators will obtain an appreciation and feel for control room and plant conditions/limitations and will be required to resolve operational problems associated with the loss of emergency battery and diesel generators during a time when emergency equipment is required to operate.

II COLD FUNCTIONAL TESTING

Cold Functional Tests are performed on a plant for several reasons. Some of the more important reasons are as follows:

A. Assure that plant systems are available to support fuel loading.

B. Assure that shift personnel have operating experience with plant equipment.

C. Assure that certain plant operating procedures and surveillance procedures have been tried and are usable.

D. Assure that each shift has functioned together to operate the plant systems on an integrated basis.

E. Assure that specified plant equipment has been tested and the plant and personnel are ready for fuel loading.

The Cold Functional Tests are performed using plant procedures and are controlled and documented by use of checklists. The checklist provides a signoff sheet to assure that each shift has received training and experience on some of the specified systems. The Shift Supervisor will be responsible to ensure, by signing the checklist, that his shift has performed the operation specified. Systems to be included are found in Appendix A.

III HOT FUNCTIONAL TESTING

Hot Functional Tests are performed to assure that as much as possible the system, procedures, and personnel are ready for operation at various power levels. This verification is done by operating systems in an integrated fashion at operating temperatures and pressures at the earliest opportunity for meaningful checks.

The Hot Functional Tests cover those areas of the plant systems which are not tested by the Startup Test Procedures, but where it is felt that additional data over and above the Cold Functional Tests is beneficial.

Typically, the Hot Functional Tests will begin after fuel is loaded when nuclear heat is available. Startup testing provides two phases which offer Hot Functional Test opportunities. These phases are listed below:

A. During heatup from ambient temperature and 0 psig reactor pressure to rated reactor temperature and pressure.

B. After increase from rated reactor temperature and pressure to 30 percent reactor power.

The Hot Functional Tests are not intended to replace any of the startup test procedures, although there are portions which will be conducted simultaneously.

Those systems whose environment does not change during ascension to rated temperature and pressure will not receive additional testing.

Hot Functional Tests to be performed on systems are listed in Appendix B.

During the performance of this testing the Operations Superintendent shall cause a review to be performed of the applicable system operating procedures and ensure that necessary changes are made to these procedures as specified by administrative procedures. The Training Superintendent will additionally verify that operations personnel on each shift have been familiarized with the changes to procedures through the use of information acknowledgements.

IV STARTUP TESTING

A typical startup test program is composed of phases characterized by differences in plant and test conditions. Startup tests are comprised of four phases which include fuel loading and subsequent tests:

A. Open Vessel Testing
B. Initial Heatup
C. Power Tests
D. Warranty Tests

Tests to be performed during open vessel, reactor heatup and power ascension are described in FSAR Section 14.2.12.3.

All manipulation of controls for startup testing purposes will be conducted by qualified operations personnel. This testing will provide many beneficial opportunities for operator training. In particular, this training shall verify that each operating shift observes or performs the following:

1. At least one reactor scram transient.

2. At least one pressure controller transient.

3. At least one turbine trip or load rejection transient.

4. Operation of the RCIC system.

5. At least one water level setpoint transient.

Since testing will, in general, be conducted on a round the clock basis, the other testing will be balanced as much as practicable to ensure even exposure to testing for all operating shifts.

V ADDITIONAL TRAINING AND TESTING

Because of our efforts to provide as comprehensive a test program as possible several new tests will be added to the test program. These tests will provide additional technical information to aid in system and plant operational readiness evaluations. The tests will also provide some operator training by the operator participation in the conduct of the testing.

Appendix C contains test descriptions defining the scope of the new tests to be added to the preoperational test program. Detailed test procedures will be written from the scope of those descriptions.

CONCLUSIONS

As explained in this report, each phase of the testing program provides a building block for the next phase and provides the necessary overlap and depth to ensure that the operating staff will obtain maximum meaningful inplant training to assure that crews will operate their facilities in a safe and competent manner and that all safety related systems are thoroughly tested. The increased emphasis on operator training, described in this submittal, and the addition of new testing, when coupled with the present testing and training programs, more than adequately satisfies the requirements of I.G.1 of NUREG-0737.

APPENDIX A

Systems to be included as part of this program are:

Reactor Vessel & Auxiliary Systems

- Recirculation System
- Reactor Water Cleanup System
- Control Rod Drive System
- Reactor Vessel Level Instrumentation
- Standby Liquid Control
- Remote Shutdown System

ECCS System

- LPCS
- RHR (including LPCI, Shutdown Cooling, and Suppression Pool Cooling)
- HPCS

Emergency Electrical System

- Standby Diesel Generators and Emergency Buses
- Emergency Batteries

Plant Support Systems

- Standby Service Water
- Component Cooling Water
- Turbine Building Cooling Water
- Makeup Water Treatment System
- Fuel Pool Cooling and Cleanup System
- Condensate/Refueling Water Transfer System
- Instrument and Service Air
- Plant Service Water
- Circulating Water
- Auxiliary Steam System

Other Systems

Standby Gas Treatment System

Auxiliary Building HVAC

Fuel Handling HVAC

Control Room HVAC

APPENDIX B

DURING HEATUP FROM AMBIENT TEMPERATURE AND 0 PSIG REACTOR PRESSURE TO RATED REACTOR TEMPERATURE AND PRESSURE

SYSTEM	MODE OF OPERATION AND HOT FUNCTIONAL TESTS
CRD System	In continuous normal operation, check each fully withdrawn CRD for coupling as it is withdrawn. Observe that temperatures are in limits. Observe proper position indication. Record rod patterns.
Containment and Drywell Cooling	Both should be in continuous operation per procedure.
Process Radiation Monitors	In continuous operation. Check for response to increasing power levels.
Ventilation Systems	In continuous operation. Check that steam tunnel temperature is within temperature limits at rated temperature and pressure. Verify proper operation of leakage detection systems.
Turbine EHC Pressure Controls	Start heatup with pressure controller set at 150 psig and by-pass opening jack at 0. When reactor pressure is greater than 150 psig check that controller responds to setpoint changes.
Rod Pattern Controller	In continuous operation. Verify proper operation as rods are withdrawn.
Main Steam Relief Valves	Record the discharge thermocouple readings from recorder and determine that the valves do not have seat leakage.
Condensate Cleanup System	Verify performance of system to control adequately water quality by observing that water quality stays within limits specified by plant chemist.
TIP System	Make traces when flux level permits. Verify air/nitrogen purge.
Reactor Water Cleanup System	In continuous operation at approximately 50 percent to 100 percent flow. Place cleanup recirculation pumps in operation at pressure and operate in all modes. Check that valves operate properly. Reject reactor water back to condenser and radwaste to check reject valve for proper operation.

APPENDIX B

Reactor Recirculation System	In continuous operation per operating procedure. Check that seal cavity, bearing and winding temperatures are within limits. Check that cavity pressures follows heatup pressure. Check that recirc. loop temperature recorder indicates the proper temperature increase.
Condensate and Feedwater	In continuous operation to maintain reactor level. Start standby feed pump turbine per procedure, place in service and remove replaced turbine from service.
SRM and IRM	In continuous operation. Check for proper retract operation as they are withdrawn. Insert and check for proper operation/indication.
Turbine Seal	Place in continuous operation per operating procedure. Check that seal steam regulator controls seal pressure.
Vacuum Pump	Place in service per operating procedure.
Steam Jet Air Ejectors	Place in service per operating procedure. Place backup air ejectors in service.
Reactor Vessel Temps and Head Leak Detection	Should be in continuous service. Head seal leak detector should be valved per operating procedure.
Circulating Water	Continuous operation to maintain adequate condenser vacuum.

APPENDIX B

AFTER INCREASE FROM RATED TEMPERATURE AND PRESSURE TO 30% POWER

A few significant system environmental changes occur between arrival at rated temperature and pressure and completion of 30 percent testing which requires the following additional hot functional checks.

SYSTEM	MODE OF OPERATION AND HOT FUNCTIONAL CHECKS
Turbine Generator	During this period the turbine generator will be placed in operation on nuclear steam for the first time and the following checks should be performed which are not part of the formal test program. Verify procedure for turbine warmup and roll to 1,800 rpm. Perform the turbine generator no-load tests. Check turbine vibration at critical speed and 1,800 rpm. Verify proper operation of primary cooling system (rotor and stator) and generator seal oil systems. Verify operator familiarization with turbine generator instrumentation and controls both local and remote. Verify oil flow indication at each bearing inspection spout. Verify that expansion (stretchout) is satisfactory. Perform overspeed checks.
Feedwater Heater Controls	Put feedwater heaters in service, and establish level control. Feedwater temperature will rise. Inspect feedwater line and feedwater pump casings to assure thermal expansion has not opened flanges or affected mechanical seal operation.
CCW System	Check temperatures of cooled components. Readjust as necessary to maintain proper temperature in components as specified in the operating procedures.

APPENDIX C

TEST: Startup of the RCIC system after loss of AC power to the system.

PURPOSE: Verify the design basis ability of the system to start without the aid of AC power with the exception of the RCIC DC/AC inverters.

INITIAL CONDITIONS:

- o Preoperational test has been performed on RCIC system.
- o If test is performed prior to the availability of nuclear steam, sufficient auxiliary boiler capacity and piping to run the RCIC turbine/pump must be available.
- o System valves in normal standby lineup (suction from CST)

  NOTE: 1) If the auxiliary boiler is used as the turbine steam supply, tag closed the steam supply isolation valves E51-F064 and E12-F052A & B.

  2) Flow can either be directed to the reactor pressure vessel or back to the condensate storage tank.

- o Power to all RCIC components fed by site AC power shall be secured.
- o Station batteries shall be fully charged.
- o Instrument air shall be available for operation and control of applicable valves.
- o Instruments shall be calibrated and setpoints, where applicable, shall be verified.

TEST DESCRIPTION:

- o Perform a manual initiation of the RCIC system utilizing the manual initiation switch and verify the proper operation of all components required for the RCIC startup transient to rated flow.

  NOTE: Manual manipulation of some valves will be required if flow is returned to the CST or auxiliary boiler steam is used.

ACCEPTANCE CRITERIA:

- o Proper operation of all components for the RCIC startup transient until rated flow is obtained.

APPENDIX C

TEST: Operation of the RCIC system with a sustained loss of AC power to the system.

PURPOSE: To verify the operation of RCIC to evaluate the limits of system operation with extended loss of AC power to it and support systems with the exception of the RCIC DC/AC inverters.

INITIAL CONDITIONS:

- o Preoperational test has been performed on RCIC system.
- o If test is performed prior to the availability of nuclear steam, sufficient auxiliary boiler capacity and piping to run the RCIC turbine/pump must be available.
- o System valves in normal standby lineup (suction from CST).

  NOTE: 1) If the auxiliary boiler is used as the turbine steam supply, tag closed the steam supply isolation valves, E51-F064 and E12-F052 A & B.

- o Power to all RCIC components fed by site AC power shall be secured, including RCIC area coolers and battery chargers supplying the station battery from which RCIC DC loads are powered.
- o RCIC batteries shall be fully charged.
- o Instrument air shall be available for operation and control of applicable valves.
- o Instruments shall be calibrated and setpoints, where applicable, shall be verified.

TEST DESCRIPTION:

- o Start and operate the RCIC system with return to the CST and run for 2 hours or until any system limiting parameter is approached (e.g., high RCIC area temperature, low battery voltage, or high suppression pool temperature). During this period of RCIC system operation, shutdown the system and restart two times to verify system restart capability.

  NOTE: Testing will be conducted in a manner such that equipment is not placed in jeopardy of damage and such that equipment qualification is not degraded.

ACCEPTANCE CRITERIA:

- o None

APPENDIX C

TEST: RCIC operation to prove DC separation.

PURPOSE: Verify proper operation of the RCIC DC components when non-RCIC station batteries are disconnected.

INITIAL CONDITIONS:

- o Preoperational test has been performed on RCIC system.
- o Test to be performed prior to fuel load.
- o This test is performed prior to the availability of nuclear steam, sufficient auxiliary boiler capacity and piping to run the RCIC turbine/pump must be available.
- o System valves in normal standby lineup (suction from CST).
- o Steam supply isolation valves E51-F064 and E12-F052A & B tagged shut.
- o Station batteries shall be fully charged.
- o Instrument air shall be available for operation and control of applicable valves.
- o Instruments shall be calibrated and setpoints, where applicable, shall be verified.

TEST DESCRIPTION:

- o Start and operate the RCIC system with return to the CST. During system operation disconnect, each non-RCIC station battery from its bus and verify proper operation of each RCIC DC component.

ACCEPTANCE CRITERIA:

- o Proper operation of RCIC DC components with non-RCIC station batteries disconnected.

APPENDIX C

TEST: Integrated reactor pressure vessel level functional test.

PURPOSE: Verify that instruments connected to the RPV are tubed properly, that the tubing is not blocked and that instrument tracking is proper.

INITIAL CONDITIONS:

- o All instruments connected to the RPV have been calibrated and are operable.
- o RPV has been flushed and is clean.
- o All RPV instrument tubing has been filled, all instruments are vented, and proper valve lineup verified.
- o A source of demineralized water is available to fill the RPV.
- o Fuel has not been loaded into the RPV.
- o RPV head removed or adequately vented to prevent pressurization.

TEST DESCRIPTION:

- o Raise and lower (or lower and raise, whichever is most convenient) the RPV water level through the range of RPV levels necessary to verify the proper operation and tracking of each RPV connected instrument.

  NOTE: The temperature and pressure conditions at which this test will be performed are not the conditions for which the various instruments are calibrated. There will not be a one-to-one correspondence between actual reactor vessel level change and indicated level change.

ACCEPTANCE CRITERIA:

- o Each affected RPV instruments operation and tracking is satisfactory.

APPENDIX C

TEST: Integrated drywell and containment pressure instrumentation test (test to be performed in conjunction with containment integrated leak rate testing).

PURPOSE: Verify proper connection and tracking of drywell and containment pressure instruments and that the tubing supplying these instruments is not blocked.

INITIAL CONDITIONS:

- o All initial conditions for containment integrated leak rate testing have been established.
- o Drywell and containment pressure instruments have been calibrated and are valved into service.

TEST DESCRIPTION:

- o As containment pressure is increased, during the containment integrated leak rate test, verify proper operation of specified drywell and containment pressure instruments.

ACCEPTANCE CRITERIA:

- o Specified drywell and containment instruments perform their design function.