110 MECHANICAL ENGINEERING

110.62 (3.9.2.5)

Previous analyses for other nuclear plants have shown that certain reactor system components and their supports may be subjected to previously underestimated asymmetric loads under the conditions that result from the postulation of ruptures of the reactor coolant piping at various locations. It is therefore necessary to reassess the capability of these reactor system components to assure that the calculated dynamic asymmetric loads resulting from these postulated pipe ruptures will be within the bounds necessary to provide high assurance that the reactor can be brought safely to a cold shutdown condition. The reactor system components that require reassessment shall include:

(1) Reactor pressure vessel

(2) Core support and other reactor internals

(3) Control rod drives

(4) ECCS piping that is attached to the primary coolant piping.

(5) Primary coolant piping

(6) Reactor vessel, steam generator, pressurizer, and pump supports.

The following information should be included in the FSAR about the effects of postulated asymmetric LOCA loads on the above mentioned reactor system components and the various cavity structures.

(1) Provide arrangement drawings of the reactor vessel support systems in sufficient detail to show the geometry of all principal elements and materials of construction.

(2) If a plant-specific analysis will not be submitted for your plant, provide supporting information to demonstrate that the generic plant analysis under consideration adequately bounds the postulated accidents at your facility. Include a comparison of the geometric, structural, mechanical and thermal-hydraulic similarities between your facility and the case analyzed. Discuss the effects of any differences.

(3) Consider all postulated breaks in the reactor coolant piping system, including the following locations:

(a) Reactor vessel hot and cold leg nozzle to piping terminal ends.

(b) Pump suction and discharge nozzles to piping terminal ends.

(c) Steam generator inlet and outlet nozzles to piping terminal ends.1/

(4) Provide an assessment of the effects of asymmetric pressure differentials 2/ on the systems and components listed above in combination with all external loadings including safe shutdown earthquake loads and other faulted condition loads for the postulated breaks described above. This assessment may utilize the following mechanistic effects as applicable:

(a) limited displacement break areas

(b) fluid-structure interaction

(c) actual time-dependent forcing function

(d) reactor support stiffness

(e) break opening times.

(5) If the results of the assessment in item (4) above indicates loads leading to inelastic action in these systems or displacement exceeding previous design limits, provide an evaluation of the inelastic behavior (including strain hardening) of the material used in the system design and the effect on the load transmitted to the backup structures to which these systems are attached.

(6) For all analyses performed, include the method of analysis, the structural and hydraulic computer code employed, drawings of the models employed, and comparisons of the calculated to allowable stresses and strains or deflections with a basis for the allowable values.

(7) Demonstrate that active components will perform their safety function when subjected to the combined loads resulting from the loss-of-coolant accident and the safe shutdown earthquake.

(8) Demonstrate the functional capability of any essential piping when subjected to the combined loads resulting from the loss-of-coolant accident and the safe shutdown earthquake.

1/ Postulated steam line breaks may control the design of certain steam generator supports and therefore must also be considered in support design.

2/ Blowdown jet forces at the location of the rupture (reaction forces), transient differential pressures in the annular region between the component and the wall, and transient differential pressures across the core barrel within the reactor vessel.

423.0 QUALITY ASSURANCE BRANCH - Initial Test Program

423.1 Section 14.2.2 states that the organization and responsibility for the initial test program will be as described in Chapter 17 of the FSAR. Chapter 17 in turn references the Commonwealth Edison Quality Assurance Topical Report CE-1-A. The topical report does not specifically identify the responsibilities and authority of the onsite organizations and the CE staff and the interfaces with Westinghouse, Sargent and Lundy, and other major contractors participating in the initial test program. It also does not identify the persons with responsibility for review and approval of test procedures and test results. These areas should be expanded in Chapter 14.

423.2 For the staff to complete its review of the organization and staffing for the test program, we require that you provide the minimum qualification requirements (educational, overall technical experience, and nuclear experience) for the following categories of personnel at the time they are assigned to the task. Your response should address all personnel performing the tasks listed and should not be limited to only CE personnel (e.g., augmenting personnel). Note that ANSI N45.2.6, although applicable to some categories of personnel during the construction, preoperational, and startup phases, was not intended to cover personnel in the categories listed below.

1. Personnel that supervise or direct the conduct of individual preoperational tests.

2. Personnel that review and/or approve preoperational test procedures.

3. Personnel that approve preoperational test results.

4. Personnel that supervise or direct the conduct of individual startup tests.

5. Personnel that review and/or approve startup test procedures.

6. Personnel that approve startup test results.

423.3 The FSAR provides a test schedule for Braidwood Unit 1 only. Provide sufficient information to ensure that any initial test schedule overlap at the Byron and Braidwood stations will not result in significant divisions of responsibilities or dilutions in the staff provided to implement the test programs.

423.4 Describe the training program for personnel participating in the initial test program that will familiarize them with the special procedures and administrative controls applicable to preoperational and startup test activities.

423.5 Section 14.2.1 states that preoperational testing will, in some cases, be performed after core load on essentially completed systems. Identify those preoperational tests which will be conducted after core load.

423.6 Section 14.2.4, Conduct of Test Program, should be expanded to clarify what controls will be placed on verification of prerequisites and completion of data forms to identify the test personnel and indicate the completion dates.

423.7 The information in Section 14.2.5 on modification and rework of systems required to resolve test deficiencies should include a description of the controls to ensure the modifications or rework is accomplished, that retesting is conducted, and that the original design organization or designated design organization reviews the modifications. It should also indicate who is responsible for implementing these controls.

423.8 Expand the description in Section 14.2.8 to indicate how operating experience at other utility's facilities has been accounted for in the Byron/Braidwood initial test program. Indicate briefly the sources of information which were considered.

423.9 Expand section 14.2.11, Test Program Schedule, to indicate that individual preoperational and startup tests will be conducted as early in the test program as practical and that at no time will the safety of the plant be totally dependent on the performance of untested systems, components, and features. Also indicate that individual startup tests will, insofar as possible, be conducted prior to exceeding 25% power. This section should also include a commitment to have test procedures available for review by IE inspectors at least 60 days prior to their intended use, or for fuel loading and startup test procedures, at least 60 days prior to fuel loading.

423.10 Our review of your test program description disclosed that the operability of several of the systems and components listed in Regulatory Guide 1.68 (Revision 2) Appendix A may not be demonstrated by your initial test program. Expand your test description to address the following listed items:

1. Preoperational Testing

   1.a(3) Reactor Coolant System Vibration tests
   1.a(4) Pressure Boundary Integrity test (Note Table 14.2-57 was deleted by Amendment 18 to the FSAR.)
   1.d(1) Turbine Bypass Valves
   1.d(2) Steam Line Atmospheric Dumps
   1.d(9) Condensate Storage System
   1.d(10) Emergency Cooling Towers (Byron)
   1.e(2) Main Steam System

1.e(4) Steam generator pressure relief and safety valves
1.e(5) Steam extraction system
1.e(6) Turbine stop, control, bypass and intercept valves
1.e(7) Main condenser hotwell level control system
1.e(8) Condensate system
1.e(9) Feedwater system
1.e(10) Feedwater heater and drain systems
1.e(11) Makeup water and chemical treatment systems
1.e(12) Main condenser auxiliaries used in maintaining vacuum
1.f(2) Cooling towers and associated auxiliaries (Byron)
1.f(3) Raw water and service water cooling systems
1.g(2) Emergency AC Power Distribution System
1.h(1)(b) ECCS demonstration using normal and emergency power supplies
1.h(1)(c) ECCS demonstration of operability in all modes of operation
1.h(1)(d) ECCS demonstration of interlocks and isolations
1.h(5) Cold water interlocks
1.i(2) Containment isolation valve functional and closure timing tests
.i(8) Primary containment isolation initiation logic tests
1.i(21) Containment penetration cooling system
1.j(2) Main, auxiliary, and emergency feedwater control systems
1.j(3) Secondary system steam pressure control system
1.j(5) Reactor coolant system leak detection systems
1.j(6) Loose parts monitoring system
1.j(7) ECCS and containment spray leak detection systems
1.j(8) Automatic reactor power control system, integrated control system, and Tave control system
1.j(9) Pressure control systems
1.j(14) Instrumentation and controls that effect transfers of water supplies to auxiliary feedwater pumps, ECCS pumps, and containment spray pumps
1.j(15) Automatic dispatcher control systems
1.j(16) Hotwell level control
1.j(17) Feedwater heater temperature, level, and bypass control systems
1.j(20) Instrumentation used to detect internal and external flooding
1.j(21) Reactor mode switch and associated functions
1.j(22) Instrumentation to track the course of postulated accidents
1.j(23) Post accident hydrogen monitors
1.j(24) Annunciators for reactor control and engineered safety features
1.j(25) Process computers
1.k(2) Personnel monitors and radiation survey instrument tests
1.k(3) Laboratory equipment used to analyze or measure radiation levels and radioactivity concentrations
1.k(4) HEPA filter and charcoal absorber efficiencies and leak tests
1.l(1) Liquid radwaste handling systems
1.l(3) Solid radwaste handling systems
1.l(6) Isolation features for ventilation systems
1.l(7) Isolation features for liquid radwaste effluent systems
1.l(8) Plant sampling systems
1.m(3) Refueling canal and fuel storage pool sectionalizing devices and drains
1.m(6) Fuel handling building HVAC
1.n(6) Primary and secondary chemistry control
1.n(9) Contaminated or potentially contaminated vent and drain systems

1.n(13) Communication Systems (Note Table 14.2-10 was deleted by Amendment 18 to the FSAR.)

1.n(14) Heating, cooling, and ventilating systems (for Miscellaneous Electrical Equipment Room, Switchgear Heat Removal Systems, Essential Switchgear Room, Battery Rooms, and Byron's Cooling Tower Substation)

2. Initial Fuel Loading and Pre-critical Tests

2.g Final calibration of source-range neutron flux measuring instrumentation.

4. Low Power Testing

4.g Response of process and effluent radiation monitors.
4.i Operability of rod withdrawal and insertion sequencers and control rod withdrawal inhibit or block function.
4 Primary containment ventilation demonstration at rated temperature.
4.k Operability of steam driven ESF, auxiliary and power conversion system equipment.
4.l Operability of main steam line and branch steam line valves and bypass valves at rated temperature.
4.n Control room computer.
4.q Residual or decay heat removal systems.
4.r Reactor coolant purification system.
4.s Reactor internals and reactor coolant system vibration measurements, if not previously conducted.
4.t Natural circulation test.
4.u Major plant control systems.

5. Power Ascension Tests

5.d Xenon transient control tests.
5.g Rod sequencers and withdrawal blocks.
5.j Plant runback.
5.k ECCS high pressure systems.
5.l Residual or decay heat removal demonstration.
5.m Reactor coolant system tests.
5.n Loose parts monitoring system.
5.o Reactor coolant leak detection systems.
5.p Reactor internal vibration monitoring.
5.r Verification of printout/CRT displays and process computer.
5.s Calibration of major plant controls.
5.t Pressurizer and main steam reliefs and safeties, atmospheric dump, turbine stop intercept, control, and bypass valves.
5.u MSIV's and branch line isolation valves operability.
5.v Operability of main steam and feedwater systems.
5.w Containment penetration cooling system.
5.x ESF auxiliaries and environmental controls.
5.y Instrument calibrations.
5.cc Gaseous and liquid radwaste.

5.ff HVAC demonstrations.
5.gg ATWS equipment as applicable.
5.kk Feedwater heater bypass test.
5.mm MSIV closure test.
5.nn Full load rejection test.
5.oo Piping expansion, vibration and movement tests.

423.11 Modify Table 14.2-1, Typical Format, Initial Startup Test Procedures to include Preoperational Test Procedures. Also include Environmental Conditions, the means of collecting data (in addition to the data sheets), and Documentation of Test Results, as described in Appendix C to Regulatory Guide 1.68, Rev. 2.

423.12 We could not conclude from our review of the preoperational test phase description and the test summaries provided in Tables 14.2-2 through 14.2-61 that comprehensive testing is scheduled for several systems and components. Therefore, clarify or expand the description of the preoperational test phase to address the following:

1. Table 14.2-4, Auxiliary Startup Instrumentation. Plant Condition or Prerequisites should indicate the reactor pressure vessel will be filled to normal refueling level with water containing refueling boron concentration. The Test Summary and Acceptance Criteria should be modified to include testing of the annunciation functions.

2. Table 14.2-5, Seismic Instrumentation. Expand the test description to identify the systems and equipment which will be tested, including recorders as appropriate.

3. Table 14.2-6, Reactor Protection. Expand the test description to describe testing to ensure electrical independence and safe failure on loss of power. Verify that the acceptance criteria of the protection channels account for the response time of the associated hardware between the measured variable and the input to the sensor (snubbers, sensing lines, flow limiting devices, etc.) for all channels for which response time limits are included in your technical specifications. (The delay times of instrument lines may be accounted for analytically.) Describe testing to be conducted on the Solid State Logic Protection System.

4. Table 14.2-7, Engineered Safety Features. The test should be titled Engineered Safety Features Actuation System and should identify the subsystems included in the test. Modify the test summary to include testing to demonstrate redundancy, electrical independence, coincidence, and safe failure on loss of power. Verify that acceptance criteria for the actuation channels account for the response time of the associated hardware between the measured variable and the input to the sensor (snubbers, sensing lines, flow limiting devices, etc.) for all channels for which response time limits are included in your technical specifications. (The delay times of instrument lines may be accounted for analytically.)

5. Table 14.2-8, Area Radiation Monitors. Expand the test summary and acceptance criteria to include operation with check sources, annunciation and alarm on both high radiation and circuit failure, tests of indicating and recording features, and functioning of interlocks, if required.

6. Table 14.2-9, Process Radiation Monitors. Expand the test summary and acceptance criteria to include operation with check sources, annunciation and alarm on high radiation and circuit failures, tests of indicating and recording features, and functioning of interlocks, if required. State whether this test includes effluent radiation monitors and, if so, include testing of isolation functions.

7. Table 14.2-11, Auxiliary Power System. Expand the test description to include testing of protective features and interlocks, particularly those that prevent inadvertently powering an auxiliary power bus from a Class 1E AC power bus. Include testing of redundancy and electrical independence, where appropriate. Ensure an integrated system test demonstrates that the systems will perform as designed for simulated full or partial loss of offsite power and demonstrate the design capability to transfer from onsite to offsite power sources. State your plans to perform full load tests using all sources of power to each bus.

8. Table 14.2-12, Instrument Power System. Include in the test summary and acceptance criteria your plans for demonstrating the capability of the inverters to transfer to the alternate power source on loss of normal power and verify that the transfer is initiated at the correct setpoint. Describe the testing planned for the SOLA transformers to be used while maintenance is conducted on the inverters. Verify that the Instrument Power System corresponds to the Instrument and Control Power System described in the FSAR.

9. Table 14.2-13, D-C Power. Identify the D-C systems that will be tested. Modify the test summary to confirm that battery capacity will be verified independent of the battery chargers, that individual cell limits are not exceeded during the design discharge test, and demonstrate that D-C loads will function as necessary to assure plant safety at a battery terminal voltage equal to the acceptance criteria that has been established for minimum battery terminal voltage for the discharge load test. Describe your plans to demonstrate proper calibration and trip settings of protective devices, alarms, and ground detection devices.

10. Table 14.2-15, Essential Service Water System. Expand the test summary to include proper operation of screens or strainers in the systems for Braidwood and proper operation of cooling towers and fans for Byron. Describe the testing planned for the Essential Service Water Makeup Systems for Byron, including qualification testing for the diesel driven pumps. Describe testing of water tight features in the ESW or ESW makeup systems, as appropriate.

Expand the acceptance criteria to ensure that system operation extrapolated to worst case design conditions provides adequate cooling to components and systems cooled by ESW.

11. Table 14.2-16, Component Cooling System. Expand the test summary and acceptance criteria to provide for testing of the surge tank reliefs and the auto isolation feature of the surge tank atmospheric vent. Verify the automatic start feature of the standby CCS pump. Demonstrate automatic isolation of the CCS pump thermal barrier cooling lines on high flow. Demonstrate all automatic and manual system realignments can be accomplished per the procedures.

12. Table 14.2-17, Residual Heat Removal System. Expand the test summary to describe how each mode of system operation will be demonstrated. Describe testing of the RHR pump automatic start on a safety injection signal and testing to verify that the pumps will perform satisfactorily when run for extended periods on the miniflow recirc lines (i.e., do not overheat, cavitate, etc.), and proper operation of the miniflow line isolation valve. Describe testing to verify automatic suction switchover to the containment sump on low RWST level.

13. Table 14.2-18, Containment Spray System. Expand the test summary to indicate whether the recirculation mode, the injection mode, or both will be tested. Describe the method and acceptance criteria for setting the caustic flow control valve per Section 6.5 of your FSAR. Describe the flow path for water and whether or not injection through the spray nozzles is planned. Describe the tests planned for the spray nozzels. Clarify whether system actuation is on containment hi-hi pressure (per the test summary) or hi-hi-hi pressure (per Section 6.5 of your FSAR).

14. Table 14.2-19, Auxiliary Feedwater System. Modify the test summary and acceptance criteria to verify that auxiliary feedwater flow to each steam generator under worst case conditions is in accordance with safety analysis requirements. Describe qualification testing for the diesels which power the diesel driven pumps. Describe your plans to demonstrate proper manual and automatic operation of suction and discharge valves including the Emergency Service Water Switchover and Emergency Service Water booster pumps. Describe your plans for verifying the proper sizing and installation of flow restricting orifices. Describe the tests to ensure that the AFW pumps will perform satisfactorily when run for extended periods on the recirculation lines (i.e., do not overheat, cavitate, etc.). Describe the tests planned to verify that the pumps will start on a lo-lo water level signal if in the local control mode, that the pumps can be restarted from the control room following a trip due to protective relay actuation or low suction pressure, and that the setpoints for these trips are verified.

15. Table 14.2-21, Leak Detection System. Describe your plans to test the systems which detect leaks from portions of the RCS, other than the safety valves and head seals, and from ECCS systems and cooling water systems interfacing with the RCS, (i.e., Containment floor drains, Reactor Cavity Sump, Totalizing meters, Intersystem leakage).

16. Table 14.2-22, Fuel Pool Cooling and Cleanup System. Expand the test summary and acceptance criteria to include testing of the anti-siphon feature in the return line, the operation of the filters and demineralizers in purifying the Refueling Water Storage Tank, and testing of the leakage detection system.

17. Table 14.2-23, Fuel Handling and Transfer System. Expand the test abstract to identify the major subsystems to be tested (i.e., cranes, hoists, etc.) and to verify that indexing can be accomplished.

18. Table 14.2-25, Diesel-Generator. Expand the test summary and acceptance criteria to show that your tests conform to Regulatory Guide 1.108, Rev. 1, regulatory position 2. Also include a description of testing for diesel auxiliaries such as cooling and heating systems, starting systems and lubricating oil. Ensure that the qualification tests committed to in Section 8.1.2 of your FSAR are included in testing.

19. Table 14.2-26, Diesel Fuel Oil Transfer System. Modify the acceptance criteria to ensure that the capability of the fuel oil transfer pumps to deliver at least three times the normal demand, as indicated in Section 9.5 of your FSAR, is verified.

20. Table 14.2-27, ECCS - Expansion and Restraint. Expand the test description to include testing of the emergency core cooling systems other than the Safety Injection System.

21. Table 14.2-28, ECCS - Safety Injection Pumps; Table 14.2-29, Centrifugal Charging Pumps; and Table 14.2-30, RHR Pumps. Modify each test description, as appropriate, to describe the testing planned to ensure that the high pressure systems function as designed with suction aligned to the discharge of the RHR pumps. For the Centrifugal Charging Pumps, modify the test description to describe how the tests will demonstrate the automatic suction switchover to the RWST and the automatic isolation of the miniflow bypass and normal charging lines. For the Safety Injection Pumps and RHR Pumps, change Reactor Water Storage Tanks to Refueling Water Storage Tanks.

22. Table 14.2-31, ECCS - Accumulators. Modify the test description and test objectives to indicate that the maximum differential pressure test will verify that the accumulator isolation valves will open. Also include a description of testing to verify proper operation of the nitrogen fill, venting and relief valves, accumulator drains, and accumulator makeup.

23. Table 14.2-32, ECCS-Recirculation Phase. Specify what maximum differential pressure conditions are. Modify the test description to indicate how the test will be initiated.

24. Tables 14.2-28 through 14.2 34. Modify these test descriptions or provide a separate test abstract to describe the hot functional testing of ECCS systems in accordance with Regulatory Guide 1.79.

25. Table 14.2-35, Auxiliary Building HVAC. Expand the test summary to ensure that damper testing will demonstrate automatic damper operation on high radiation. Describe testing of the automatic trip and restart of the system on a LOCA signal. Modify the test summary and acceptance criteria to show that testing of the filtration and absorption units will be performed in accordance with Regulatory Guide 1.52.

26. Table 14.2-36, Control Room HVAC. Expand the test description to include testing of automatic system actions on toxic gas, high radiation, and combustion product detection. Demonstrate the outside purge mode and damper response to loss of air. Modify the test summary and acceptance criteria to show that testing of filtration and absorption units will be performed in accordance with Regulatory Guide 1.52. Modify the test description to include testing of the system's ability to establish and maintain the required differential pressure in normal and accident modes, complete recirculation on chlorine detection, and 100% purge operation. Include a description of testing planned for the Control Room Chilled Water System.

27. Table 14.2-37, Diesel-Generator Room Ventilation System. Modify the test description to include testing of the supply fans, automatic start features, tripping of the system on diesel trip or fire protection system actuation and operation of the storage room fans and heat and smoke ventilators. Identify the source of compressed air for the heat and smoke ventilators. Modify the acceptance criteria to ensure that the system can maintain temperatures in the Diesel Generator Rooms and Oil Storage Rooms at or below the temperatures indicated in Section 9.4 of your FSAR. Modify the test description to show that testing of the filtration and absorption units will be performed in accordance with Regulatory Guide 1.52.

28. Table 14.2-40, Hydrogen Recombiner. Identify the startup interlocks mentioned in Section 6.2 and modify the test abstract to ensure testing of the interlocks. Modify the test abstract to describe the testing to be conducted to verify leak tightness of the system outside containment.

29. Table 14.2-41, Containment Ventilation. Modify the test description to identify the subsystems included in this test. For those systems identified, include a description of testing to verify fan speed shifts, cooling water supplies and isolation, and filter and absorber tests.

30. Table 14.2-42, Main Steam Isolation Valves. Expand the test summary to indicate the method of operation of the valves, ensuring that both local and remote operations are tested. Clarify the acceptance criteria to clearly indicate that both maximum and minimum closure times must be met. Describe testing to ensure the valves perform properly in response to isolation signals.

31. Table 14.2-44, Reactor Coolant Pumps. Expand the acceptance criteria to ensure that maximum and minimum flows are within design requirements. Describe testing to verify operation of the anti-reverse rotation devices.

32. Table 14.2-46, CVCS-RCP Seal Water Supply. Expand the test description to specify testing of seal water pressure and flow, seal water return and bypass, and flow splitting. Modify the acceptance criteria to reference safety analysis or design requirements.

33. Table 14.2-47, CVCS-Charging and Letdown. Expand the test abstract to include testing of the automatic diversion of letdown flow and automatic switch of charging pump suction on Volume Control tank levels. Also include testing of the heat tracing and flow to the pressurizer spray line.

34. Table 14.2-48, CVCS-Reactor Makeup Control. Expand the test description to include testing of the thermal regeneration system, the ability to control RCS hydrogen concentration, proper operation of the batching controls and totalizer, and operation in the auto makeup, dilution, alternate dilution, boration and manual modes. Verify that makeup flow to the RCS is precluded in the manual mode.

35. Table 14.2-50, Primary Safety and Relief Valves Test. Expand the test summary to describe how proper actuation and operation of the power-operated relief valves is demonstrated. Expand your test to include in-plant preoperational testing of the pressurizer safety valves (and modify your test summary as appropriate) or justify not performing in-plant tests. Include testing to ensure seat leakage is within acceptable limits.

36. Table 14.2-51, Steam Generator Safety and Relief Valves. Expand the test summary to ensure safety valves will be tested in-plant or justify not performing in-plant tests. Describe testing of the controls for the modulating reliefs.

37. Table 14.2-52, Pressurizer. Expand the test description to include testing of pressurizer spray flow and bypass flow controls.

38. Table 14.2-56, Containment Leak Rate. Expand the test description to identify whether type A, B, or C tests will be performed, how the isolation valves will be shut, the condition of piping systems, and what methods are to be used.

39. Table 14.2-59, Integrated Hot Functional At Temperature. The acceptance criteria does not relate to the stated test objective and test summary. Modify the acceptance criteria to correspond to the tests indicated in the summary.

40. Table 14.2-59, Integrated Hot Functional Testing Cooldown. The acceptance criteria does not relate to the stated test objective and test summary. Modify the acceptance criteria to correspond to the tests indicated in the summary.

41. Table 14.2-61, Reactor Equipment or Fuel Handling Cranes and Hoists. Expand the test description to identify the equipment, cranes, and hoists to be tested, the interlocks to be verified, and provide acceptance criteria consistent with these tests.

423.13 The staff notes your position relative to Regulatory Guide 1.80 contained in Appendix A1 of your application and disagrees with your position. This guide is applicable since your service and instrument air systems are used as sources of air for systems and components that provide a safety function. Therefore, modify your application to show that your test program will be consistent with the guide or to show that you will conduct equivalent testing for the air systems and supplied loads.

423.14 Our review of recent licensee event reports disclosed that a significant number of reported events concerned the operability of hydraulic and mechanical snubbers. Provide a description of the inspections or tests that will be performed following system operation to assure yourself that the snubbers are operable. These inspections or tests should be performed preoperationally if system operation can be accomplished prior to generation of nuclear heat.

423.15 Provide test descriptions or modify existing test descriptions to assure that tests will be performed to demonstrate (1) that the plant's ventilation systems are adequate to maintain all ESF equipment within its design temperature range during normal operations and (2) that the emergency ventilation systems are capable of maintaining all ESF equipment within its design temperature range with the equipment operating in a manner that will produce the maximum heat load in the compartment. If it is not possible to operate equipment to produce maximum heat loads, describe how the tests performed satisfy the objectives listed above.

423.16 Recently, questions have arisen concerning the operability and dependability of certain ESF pumps in PWR's. Upon investigation, the staff found that some completed preoperational test procedures did not describe the test conditions in sufficient detail. Provide assurance that the preoperational test procedures for ECCS and containment cooling pumps will require recording the status of the pumped fluid (e.g., pressure, temperature, chemistry, amount of debris) and the duration of testing for each pump.

423.17 Provide a description of the electrical lineup for Unit No. 2 of each station during preoperational tests that will be conducted to satisfy regulatory positions in Regulatory Guide 1.41 for Unit No. 1. Provide a description of the lineup for both plants of each station during similar preoperational testing on Unit No. 2 subsequent to initial criticality of Unit No. 1. The descriptions should address both normal and emergency power distribution systems. Provide assurance that crossties will not exist which could cause loss of emergency bus power to one unit due to testing of the other unit.

423.18 Identify any of the initial startup tests described in Table 14.2-62 through 14.2-89 which are not essential towards the demonstration of conformance with design requirements for structures, systems, components, and design features that:

1. will be relied upon for safe shutdown and cooldown of the reactor under normal plant conditions and for maintaining the reactor in a safe condition for an extended shutdown period; or

2. will be relied upon for safe shutdown and cooldown of the reactor under transient (infrequent or moderately frequent events) conditions and postulated accident conditions, and for maintaining the reactor in a safe condition for an extended shutdown period following such conditions; or

3. will be relied upon for establishing conformance with safety limits or limiting conditions for operation that will be included in the facility technical specifications; or

4. are classified as engineered safety features or will be relied upon to support or assure the operations of engineered safety features within design limits; or

5. are assumed to function or for which credit is taken in the accident analysis for the facility (as described in the Final Safety Analysis Report); or

6. will be utilized to process, store, control, or limit the release of radioactive materials.

423.19 We could not conclude from our review of the startup test summaries in Table 14.2-3 that all of the tests will be comprehensive. Therefore, clarify or expand the summaries to address the following:

1. Table 14.2-63, Control Rod Drives. Modify the test description to include the testing committed to in Section 4.2.4.3 of your FSAR. Modify the acceptance criteria to include verification of rod speeds. Describe your plans for testing control rod drive response to signals from the rod control system.

2. Table 14.2-64, Rod Position Indicators. Expand the test description to include testing of the bank insertion monitor, deviation alarms, and rod bottom bistable setpoints and alarms.

3. Table 14.2-65, Reactor Trip Circuit. Expand the test description to include testing to ensure that control rod drive latching mechanisms will unlatch upon opening of the trip breakers; that simulated trip signals will open the trip breakers; that if the associated trip breaker bypass is shut, opening of the trip breaker does not cause a reactor trip; and that interlocks to prevent closing of both reactor trip bypass breakers simultaneously function properly. Also describe testing you have planned to demonstrate that the turbine trips on reactor trip and to demonstrate operation of rod motion blocks and turbine runbacks.

4. Table 14.2-66, Rod Drop Measurements. It appears that you do not intend to conduct this test in accordance with Regulatory Guide 1.68 or in accordance with the commitments in Section 4.2.4.3 of your FSAR which includes drop time measurements of each rod at cold no-flow, hot no-flow, cold full-flow, and hot full-flow. Modify your test summary to show that the test will be conducted in accordance with the regulatory guides or provide technical justification for any exceptions. Also describe the additional drop tests that will be required for the fastest and slowest dropped rods or rods falling outside the two-sigma limit and state whether these requirements apply to these rods at each test condition. Also describe the tests planned to demonstrate proper operation of the decelerating devices.

5. Table 14.2-69, Reactor Coolant System Pressure. The test summary refers to preoperational testing which has been deleted in the current amendment. Resolve the inconsistencies in the test program.

6. Table 14.2-70, Reactor Coolant System Flow. Revise the test summary and acceptance criteria to reflect the stated test objectives. Include sufficient detail to ensure that testing will include determination that loop and core flows are within the required minimum and maximum flows, that flow coastdown times are in accordance with accident analysis assumptions and that pump power, rotational speed, and indicated flow are consistent with performance curves, and that flow measuring devices are properly calibrated. Describe your plans for vibration monitoring.

7. Table 14.2-74, Effluent Radiation Monitors. Modify the test description to include demonstration of proper operation of Effluent, Process, and Area Radiation Monitors under operating conditions. Provide acceptance criteria for verification by performing independent laboratory or other analyses.

8. Table 14.2-75, Initial Criticality. Revise the test procedure to correspond to the description in Section 14.2.10.2 and Regulatory Guide 1.68, Appendix A, Section 3.

9. Table 14.2-76, Power Ascension. Expand the test description to identify the low power physics tests and testing at various power level plateaus and provide acceptance criteria and test summaries for these tests if not already included in other test descriptions.

10. Table 14.2.78, Control Rod Reactivity Worth Measurements. State how you will determine which RCCA is most reactive.

11. Table 14.2-82, Power Reactivity Coefficient Measurement. In the test summary, describe how reactor power and associated reactivity changes will be measured.

12. Table 14.2-85, Turbine Trip. Expand the test summary to specify how the reactor will be tripped and to identify the parameters to be recorded and control functions which will be observed. The acceptance criteria should be expanded to ensure that the recorded parameters and observed transient results will be compared with predicted results for the actual test case, and quantitative values should be provided for the required convergence of actual test results with predicted values. The basis for these criteria should be provided.

13. Table 14.2-86, Shutdown from Outside the Control Room. Expand the test description to show that the test will be conducted in accordance with Regulatory Guide 1.68.2, Revision 1, July 1978.

14. Table 14.2-87, Loss of Offsite Power. Modify the test summary to indicate that the test will be initiated by opening the generator output breakers in order to simulate a loss of offsite power. The test should demonstrate for approximately 30 minutes that the necessary equipment, controls, and indication are available following the station blackout to remove decay heat from the core using only emergency power supplies.

15. Table 14.2-88, 10% Load Swing. Expand the test summary to describe how the 10% step load change will be initiated. Specify the modes that major control systems will be tested in. Expand the acceptance criteria to address acceptable overshoot, undershoot, or oscillation.

16. Table 14.2-89, 50% Load Reduction. Expand the test summary to describe how the 50% load reduction will be initiated. Specify the modes that major control systems will be tested in.

1 Tables 14.2-77, 78, 79, 80, 82, and 83. The acceptance criteria for these tests contain the phrase "compatible with values used in the safety analysis report." Explain what this phrase means and verify that acceptance criteria ensure conservatism is demonstrated.

423.20 Describe your plans to test the accuracy of the Reactor Coolant Syste RTD bypass loops and linearity of ΔT measurements as described in Section 7.2.2.3.2 of your FSAR. Provide additional test descriptions or revise existing tables as necessary.

423.21 Provide a commitment to include in your test program any design features to prevent or mitigate anticipated transients without scram (ATWS) that may be incorporated in your plant design.