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MAY 18 1983

Docket Nos. 50-458/459

Mr. William J. Cahill, Jr.
Senior Vice President
River Bend Nuclear Group
Gulf States Utilities Company
Post Office Box 2951
Beaumont, Texas 77704
ATTN: Mr. J. E. Booker

Dear Mr. Cahill:

Subject: Draft Safety Evaluation Report - Auxiliary Systems - River Bend Units 1 and 2

Enclosed as Enclosure 1 are the auxiliary systems sections for the River Bend draft SER. Our review has highlighted open items as listed in Enclosure 2. The staff has encountered difficulty in performing the auxiliary systems review due to the illegibility of some drawings. Some of these problems are characterized in Enclosure 3.

NRC Project Manager, Edward Weinkam, will contact you in the near future concerning scheduling meetings to resolve these open items.

Sincerely,

Original signed by

A. Schwencer, Chief
Licensing Branch No. 2
Division of Licensing

Enclosures:
As stated

cc w/enclosures:
See next page

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River Bend

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ENCLOSURE 1

DRAFT SAFETY EVALUATION REPORT

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RIVER BEND STATION

3.4.1 Water Level (Flood) Design (Flood Protection)

The water level (flood) design was reviewed in accordance with Section 3.4.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the water level (flood) design with respect to the applicable regulations of 10 CFR 50.

In order to assure conformance with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," with respect to protection against flooding, we reviewed the overall plant flood protection design, including systems and components whose failure due to flooding could prevent safe shutdown of the plant or result in uncontrolled release of significant radioactivity.

The applicant has established plant grade at elevation 94 ft. - 6 inches; this level is approximately 30 ft. above

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the probable maximum flood (PMF) level of the Mississippi River (elevation 60 ft.); this is a dry site with regard to the Mississippi River as defined by Regulatory Guide 1.59. "Design Basis Floods For Nuclear Power Plants," as discussed in Section 2.4 of this SER. The calculation of local stream flooding due to a probable maximum precipitation (PMP) is shown to flood the plant yard to a depth of 7 inches above the plant grade (to 95 ft. 1 inch), which is the Design Basis Flood Level. The applicant states that these calculations were made in accordance with the guidelines of Regulatory Guide 1.59.

Safety-related systems and components that must be protected against flooding have been identified and are located in safety-related seismic Category I structures. All penetrations in these structures are watertight to the Design Basis Flood Level. Further, the structures are provided with waterstops in all construction joints below the Design Basis Flood Level.

Within these structures, protection against internal flooding from failures in fluid piping systems as identified in the guidelines of Branch Technical Position ASB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment," is provided by placing critical equipment in watertight cubicles. This matter is discussed in

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more detail in Sections 3.6.1 and 9.3.3 of this SER. However, the applicant has not considered the effect of a break in a moderate energy line within the control building. [The applicant must show that all safety related equipment in the control building is protected against flooding as a result of a moderate energy line within the control building.] ~~- see Section 9.4.1 of this SER.]~~

Based on our review of the design criteria and bases, and of the safety classification of safety-related structures, systems, and components necessary for a safe plant shutdown during flood conditions, we conclude that the design of the facility provides adequate protection against flooding as a result of the PMP which will attain a level of 95 ft. 1 inch. (Compliance with Regulatory Guides 1.59, "Design Basis Floods For Nuclear Power Plants," and 1.102, "Flood Protection for Nuclear Power Plants" is discussed in Section 2.4 of this SER). The plant is protected from flooding as a result of a high or moderate energy break within a structure except for the possibility of flooding within the control building as noted above. With that exception the plant complies with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena." However because of this exception we cannot conclude that the applicant's submittal is acceptable since the water level (flood) design does not comply with the requirements of SRP Section 3.4.1.

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3.5.1.1 <u>Internally Generated Missiles (Outside Containment)</u>

Internally Generated Missiles (Outside Containment) were reviewed in accordance with Section 3.5.1.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of Internally Generated Missiles (Outside Containment) with respect to the applicable regulations of 10 CFR 50.

General Design Criterion 4, "Environmental and Missile Design Bases," requires that plant structures, systems, and components required for safe shutdown be protected against damage from postulated missiles associated with plant operation or when such ~~failure~~ damage could lead to inoperability of these systems and/or to offsite radiological consequences. The missiles outside containment considered in this evaluation include those missiles generated by rotating or pressurized (high energy fluid system) equipment. Protection is provided by any one or a combination of compartmentalization, barriers, separation, and equipment design. The primary means of providing protection to safety-related equipment from

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damage resulting from internally generated missiles is through the use of plant physical arrangement. Safety-related systems are physically separated from nonsafety-related systems and redundant components of safety-related systems are physically separated such that potential missiles could not damage both trains of safety-related equipment. Stored spent fuel in the fuel building is protected from damage by internal missiles which could result in radioactive release in accordance with the guidelines of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis," by the fuel pool walls and by not locating high energy piping systems or rotating machinery in the vicinity of new or spent fuel.

The applicant's evaluation of potential missile sources from rotating equipment and pressurized equipment is incomplete since only missiles from the main turbine were considered. The applicant did not provide sufficient justification for not taking into account such items as valve bonnets, thermowells, nuts, bolts, studs and valve stems as possible missiles. (The applicant should justify this position.) We are also concerned with possible failure of fans and the

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possibility of fan blades becoming missiles in the heating, ventilating and air conditioning systems reviewed in Sections 9.4-1 through 9.4.5 of this SER. (The applicant should justify the position that parts of fans rotating at high speed will either not become missiles or that such missiles will not have any effect on plant safety.) (The applicant should evaluate the potential for gravitational missiles.) The submittal does not show that gravitational missiles were considered.

Protection of safety-related equipment and stored fuel from the effects of turbine missiles including compliance with the guidelines of Regulatory Guide 1.115, "Protection Against Low-Trajectory Turbine Missiles," is discussed in Section 3.5.1.3 of this SER.

We have reviewed the adequacy of the applicant's design to maintain the capability for a safe plant shutdown and prevent unacceptable radiological release in the event of internally generated missiles outside containment. We conclude that the design is in conformance with the guidelines of Regulatory Guide 1.113 as it relates to protection of spent fuel

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from internal missiles. However, until the question of potential missiles such as valve bonnets, thermo-wells, valve stems, and gravitational missiles parts of fans is resolved, we cannot find that the applicant's design is in conformance with the requirements of General Design Criterion 4. Therefore, we cannot conclude that the applicant's submittal is acceptable. The design of the plant for protection against internally generated missiles does not comply with the requirements of SRP Section 3.5.1.1.

3.5.1.2 Internally Generated Missiles (Inside Containment)

Internally Generated Missiles (Inside Containment) were reviewed in accordance with Section 3.5.1.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of Internally Generated Missiles (Inside Containment) with respect to the applicable regulations of 10 CFR 50.

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All plant structures, systems, and components inside containment whose failure could lead to offsite radiological consequences or that are required for safe plant shutdown require protection against the effects of internally generated missiles in accordance with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases." Potential missiles that could be generated inside containment are from failures of rotating components, pressurized components, and high energy fluid system failures.

(The applicant should evaluate the potential for gravitational missiles inside containment.) The applicant's submittal does not show that gravitational missiles were considered.

Spent fuel within the containment is stored in an area that is not located in the vicinity of any high energy lines or rotating machinery. The upper containment pool walls also provide protection from potential internally generated missiles. Thus, the guidelines of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis," are satisfied.

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The information provided by the applicant does not address, in detail, missiles resulting from the failure of pressurized equipment such as valve bonnets, thermowells, nuts, bolts, studs, and valve stems. [The applicant should justify the position that the items addressed above are not considered potential missiles or provide the results or analyses which show that such failures and the resulting missiles are not a problem.] (The applicant should also address the concern that failure of fans within containment could result in missiles which could endanger safety-related equipment.)

The applicant must provide further information to address the concerns of potential falling missiles, potential missiles generated by pressurized equipment and potential missiles generated by the failure of fans in order to comply fully with the requirements of General Design Criterion 4. Therefore, we cannot find the applicant's design regarding internally generated missiles inside containment to be acceptable nor that the design complies with the criteria of SRP Section 3.5.1.2.

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3.5.1.4 Missiles Generated by Natural Phenomena

The section of the FSAR regarding missiles generated by natural phenomena was reviewed in accordance with Section 3.5.1.4 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of missiles generated by natural phenomena with respect to the applicable regulations of 10 CFR 50.

General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," requires that structures, systems and components essential to safety be designed to withstand the effects of natural phenomena, and General Design Criterion 4, "Environmental and Missile Design Bases," requires that these same plant features be protected against missiles. The missiles generated by natural phenomena of concern are those resulting from tornadoes. The applicant has identified a spectrum of missiles for the tornado region in which the site is located (Region I) as identified in Regulatory Guide 1.76, "Design Basis Tornado For Nuclear Power Plants." The spectrum includes the weight, velocity and impact

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area. The missile spectrum chosen is identical to missile Spectrum A of Standard Review Plan 3.5.1.4 (NUREG-0800). We have evaluated this spectrum and conclude it is representative of missiles at the site and is, therefore, acceptable. A discussion of the protection afforded safety-related equipment from the identified tornado missiles including compliance with the guidelines of Regulatory Guide 1.117, "Tornado Design Classification," is provided in Section 3.5.2 of this SER. A discussion of the adequacy of barriers and structures designed to withstand the effects of the identified tornado missiles is provided in Section 3.5.3.

Based upon our review of the tornado missile spectrum, we conclude that the spectrum was properly selected and meets the requirements of General Design Criteria 2 and 4 with respect to protection against natural phenomena and missiles and the guidelines and Positions C.1 and C.2 of Regulatory Guides 1.76 and the guidelines of Regulatory Guide 1.117 with respect to identification of missiles generated by natural phenomena and is, therefore, acceptable. The tornado missile spectrum complies with the acceptance criteria of SRP Section 3.5.1.4.

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3.5.2 <u>Structures, Systems, and Components To Be Protected From Externally Generated Missiles</u>

Structures, systems and components to be protected from externally generated missiles was reviewed in accordance with Section 3.5.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the structures, systems and components to be protected from internally generated missiles with respect to the applicable regulations of 10 CFR 50.

General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," requires that all structures, systems and components essential to the safety of the plant be protected from the effects of natural phenomena, and General Design Criterion 4, "Environmental and Missile Design Bases," requires that all structures, systems and components essential to the safety of the plant be protected from the effects

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of externally generated missiles. The River Bend site is located in tornado Region I as identified in Regulatory Guide 1.76, "Design Basis Tornado for Nuclear Power Plants." The tornado missile spectrum is discussed in Section 3.5.1.4 of this SER.

The applicant has identified all safety-related structures, systems and components requiring protection from externally generated missiles. All safety-related structures are designed to withstand postulated tornado-generated missiles without damage to safety-related equipment. All safety-related systems and components and stored fuel are located within tornado-missile-protected structures or are provided with tornado missile barriers. Buried safety-related systems such as piping and electrical circuits are adequately protected by the overlying earth. The ultimate heat sink consists of a water storage basin and standby cooling tower which is designed to seismic Category I and Safety Class 3 criteria and to withstand the effects of natural phenomena including tornadoes and tornado missiles. (Compliance of the design of the ultimate heat sink with the guidelines of Positions C.2 and C.3 of

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Regulatory Guide 1.27 is discussed in Section 9.2.5 of this SER.) Thus, the requirements of General Design Criteria 2 and 4 with respect to missile protection and the guidelines of Position C.2 of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis," Positions C.2 and C.3 of Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants," and Positions C.1, C.2, C.3 and the Appendix of Regulatory Guide 1.117, "Tornado Design Clsssification," concerning tornado missile protection for safety-related structures, systems and components including stored fuel and the ultimate heat sink, are met. Protection from low trajectory turbine missiles, including compliance with Position C.1 of Regulatory Guide 1.115, "Protection Against Low Trajectory Turbine Missiles," is discussed in Section 3.5.1.3 of this SER.

Based on the above, we conclude that the applicant's identification of safety-related structures, systems and components to be protected from externally generated missiles and the protection provided in the plant design is in accordance with the requirements of General Design Criteria 2 and 4 with respect to missile

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and environmental effects by compliance with the guidelines of Regulatory Guides 1.13, 1.27, and 1.117 concerning protection of safety-related plant features including stored fuel and the ultimate heat sink from tornado missiles. The applicant has identified the structures, systems and components to be protected from externally generated missiles and and the protection provided in the plant design, ~~are therefore, acceptable~~ ~~The submittals~~

The design of the River Bend facility for providing protection from tornado generated missiles meets the acceptance criteria of SRP Section 3.5.2, and, therefore, is acceptable.

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3.6.1 Protection Against Dynamic Effects Associated With The Postulated Rupture of Piping (Outside Containment)

Protection against dynamic effects associated with the postulated rupture of piping (Outside Containment) was reviewed in accordance with Section 3.6.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of protection against dynamic effects associated with the postulated rupture of piping (outside containment) with respect to the applicable regulations of 10 CFR 50.

The staff's guidelines for meeting the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," concerning protection against postulated piping failure in high-energy and moderate-energy fluid systems outside containment are contained in Branch Technical Position ASB 3-1, "Protection Against Postulated Failures in Fluid Systems Outside Containment." The applicant has identified all high

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and moderate-energy piping systems in accordance with these guidelines and has also identified those systems requiring protection from postulated piping failures. The plant design accommodates the effects of postulated pipe breaks in high energy fluid piping systems outside containment with respect to pipe whip, jet impingement, and other environmental effects, and the effects of postulated cracks in moderate-energy fluid systems outside containment with respect to jet impingement, flooding and other environmental effects. The means used to protect safety-related systems and components throughout the plant include physical separation, enclosure in suitably designed structures or compartments, drainage systems, pipe whip restraints, equipment shields, and necessary equipment and environmental qualification.

The applicant has not completed the analysis of the rupture of high energy piping systems, specifically, the high pressure core spray (HPCS), reactor core isolation cooling (RCIC), reactor water cleanup (RWCU), main steam, feedwater, and recirculation systems. (The applicant has stated that the complete analysis will be submitted in a future amendment.) For moderate

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energy systems, protection of safety-related systems from the jet, flooding and other environmental effects due to critical cracks is incorporated into the plant design. (The applicant has stated that the results of the compartment flooding analysis will be submitted in a future amendment.)

The main steam lines, including the outboard isolation valves, and the feedwater lines are all located in the common auxiliary building steam tunnel and have been classified as part of the break exclusion boundary. The applicant has performed a subcompartment analysis for the steam tunnel and the main steam lines in order to assure that the resulting jet impingement ard environmental effects from a postulated nonmechanistic crack with an area equal to the pipe area in one of these lines or a feedwater line will not result in adverse consequences. The results of this analysis indicate that the steam tunnel structural integrity is not affected by the pressure increase from the resulting blowdown. The analysis also indicated that the MSIV closure is expected to terminate the blowdown from the reactor vessel at 5.5 seconds. (The applicant should provide detailed

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information from this analysis for our review. Qualification of equipment in the steam tunnel subject to the resultant environment is discussed in Section 3.11 of this SER.

Since the applicant's submittal is not complete, we cannot complete our evaluation of whether the plant design provides adequate protection for all systems required for safe plant shutdown following postulated events, including the combination of pipe failure and single active failure. Further, we cannot conclude that the plant's design meets the requirements of General Design Criterion 4 and the criteria set forth in Branch Technical Position ASB 3-1 with regard to the protection of all safety-related systems and components from a postulated high energy or moderate energy line failure. Therefore, we cannot conclude that the applicant's submittal relating to the plant design for the protection of safety-related equipment against dynamic effects associated with the postulated rupture of piping inside containment is acceptable. The plant provisions for protection against the dynamic effects associated with the postulated rupture of piping outside containment does not comply with the acceptance criteria of SRP Section 3.6.1.

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4.6 Functional Design of Reactivity Control Systems

The reactivity control systems were reviewed in accordance with Section 4.6 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the reactivity control systems with respect to the applicable regulations of 10 CFR 50.

The control rod drive system (CRDS) and recirculation flow control system (RFCS) are designed to control reactivity during power operation. The RFCS controls reactivity over a limited range by changing the coolant flow rate and concomitant coolant void content. The CRDS can affect reactivity by the insertion or removal of control rods interspersed throughout the core which contain a neutron absorber (poison). The CRDS is capable of controlling reactivity over a large range and serves to accommodate both the slow reactivity changes caused by core burnup and the rapid changes resulting from fast transients. The CRDS is the principal mechanism for shutting the reactor down

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safely and effectively. In the event of the inability of the CRDS to shut down the reactor, the standby liquid control system (SLCS) may be used to pump a solution of sodium pentaborate into the primary system in order to shut the reactor down. An evaluation of the SLCS is given in Section 9.3.5 of this SER.

The control rod drive hydraulic system is used to move control rods in and out of the core. Each control rod is moved by a separate hydraulic control unit (HCU). A supply pump provides each HCU with water from the condensate treatment system. In the event the condensate treatment system is not available, the condensate storage tank is used as an alternate water source for the CRDS. This water is used to cool the control rods and to move them in and out of the core. The pump also provides water to a scram accumulator in each hydraulic control unit to maintain the desired water inventory. When necessary, the accumulator forces water into the drive system to scram the control rod connected to that hydraulic control unit; at lower pressures the volume of water in the scram accumulator is sufficient to scram the rod. At higher pressures, most of the water to scram is provided from the reactor

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vessel. A single failure in a hydraulic control unit would result in the failure of only one rod. There is a spare pump on standby, in the event of failure of the operating pump. (The applicant must test the scram accumulators to show that the scram function capability will be preserved for at least 20 minutes in the event of loss of both CRD pumps in order to comply fully with General Design Criterion 29, "Protection Against Anticipated Operational Occurrences.")

The CRDS has been desiged to permit periodic functional testing during power operation with the capability to test individual scram channels and motion of individual control rods independently. The CRDS is designed so that failure of all electric power or loss of air to the scram inlet and outlet valves will cause the control rods to scram, thereby protecting the reactor. (The applicant must show that the scram function is maintained in the event of slowly decaying air pressure to the scram discharge inlet and outlet valves in order to comply with the requirements of General Design Criterion 23, "Protection System Failure Mode.")

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Preoperational tests of the control rod drive hydraulic system will be conducted to determine capability of the system. Startup tests will be conducted over the range of temperatures and pressures from shutdown to operating conditions in order to determine compliance with applicable technical specifications. Each rod that is partially or fully withdrawn during operation will be exercised one notch at least once each week. Control rods will be tested for compliance with scram time criteria, from the fully withdrawn position, after each refueling shutdown.

A malfunction in the CRDS could result in a reactivity change. The applicant demonstrated in his safety analyses (Section 15 of the FSAR) that the CRDS limits postulated transients resulting from a single failure of the CRDS so that acceptable fuel design limits are not exceeded, as required by General Design Criterion 25, "Protection System Requirements for Reactivity Control Malfunction."

The CRDS is designed to provide reactivity control under normal operation and anticipated operational occurrences with an appropriate allowance for a stuck rod. This

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capability is demonstrated by the safety analyses discussed in Section 15 of the FSAR. However, the applicant must show scram capability upon loss of both CRD pumps in order to comply fully with the requirements of General Design Criterion 29. This system is also capable of accommodating reactivity changes during normal operating conditions (i.e., power changes and xenon burnout). The standby liquid control system is capable of bringing the reactor subcritical under cold shutdown conditions in the event the control rods cannot be inserted. These systems taken together, satisfy the requirements of General Design Criteria 26, "Reactivity Control System Redundancy and Capability," and 27, "Combined Reactivity Control System Capability."

The CRDS is capable of providing reactivity control following postulated accidents with an appropriate margin for a stuck rod. This capability is demonstrated by the loss-of-coolant accident and rod dropout analyses presented by the applicant which, in turn, show that the consequences are acceptable and core cooling is maintained, as required by General Design Criterion 28, "Reactivity Limits."

The applicant has committed to provide modifications to the scram discharge system to comply with the criteria contained in the Generic Safety Evaluation Report - BWR

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Scram Discharge System of December 1, 1980, as indicated in Position 1 - ASB of LRG II. In addition, the plant will comply with the applicable recommendations regarding the control rod drive return line (CRDRL) specified in NUREG-0619, "BWR Feedwater Nozzle and Control Rod Drive Return Line Nozzle Cracking," as follows:

(1) Equalizing valves will be installed between the cooling water header and exhaust water header,

(2) Flush ports will be installed on the exhaust header in the event the exhaust header is composed of carbon steel piping,

(3) The flow stabilizer loop will be composed of stainless steel and will be rerouted directly to the cooling water header.

Based on our review, we conclude that the functional design of the reactivity control systems meets the requirements of General Design Criteria 25, 26, 27, and 28. (However, the applicant must show that decaying air pressure will not adversely affect the scram function, in order to comply with the provisions of General Design Criterion 23.) (The applicant must also test the scram

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accumulators to assure scram capability for at least 20 minutes in the event of loss of both CRD pumps, in order to comply fully with General Design Criterion 29.)

Testing of the control rod drive hydraulic system to assure adequate flow into the reactor vessel (Recommendation 6, Section 8.1, NUREG-0619) is not required as stated in Position 5 - ASB of LRG II.

In view of the foregoing, we cannot find the applicant's submittal acceptable. The functional design of reactivity control systems does not comply with the acceptance criteria of SRP Section 4.6.

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5.2.5 Reactor Coolant Pressure Boundary (RCPB) Leakage Detection

The reactor coolant pressure boundary (RCPB) leakage detection systems were reviewed in accordance with Section 5.2.5 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the RCPB leakage detection system with respect to the applicable regulations of 10 CFR 50.

A limited amount of leakage is to be expected from components forming the reactor coolant pressure boundary. Means are provided for detecting and identifying this leakage in accordance with the requirements of General Design Criterion 30, "Quality of Reactor Coolant Pressure Boundary." Leakage is classified into two types - identified and unidentified. Components such as valve stem packing, pump shaft seals, and flanges are not completely leaktight; this leakage is expected. Unidentified leakage may be symptomatic of an unexpected

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failure of the reactor coolant pressure boundary, and therefore, is considered separately from leakage which is expected (identified) and is carefully measured and monitored. Both identified and unidentified leakage are kept separate by directing each to a different system designed to maintain this separation, in accordance with the guidelines of Position C.1 of Regulatory Guide 1.45, "Reactor Coolant Pressure Boundary Leakage Detection Systems." Sensitivity of detection methods for unidentified leakage (1 gpm) and leakage limits (5 gpm) are selected to detect a potential through-wall flaw (crack) in the reactor coolant pressure boundary before such a crack can grow sufficiently to threaten the safety of the plant and its environment.

Concern with reactor coolant system pressure boundary leakage involves three main areas; leakage within containment, intersystem leakage and leakage outside of containment which are discussed below. A fourth section, also discussed below, covers testing of leak detection methods.

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~~These are discussed below.~~

1. Leakage within containment

   a. Identified leakage

      Within the drywell, the drywell equipment drain sump collects leakage from several potential sources, as follows:

      (1) Reactor recirculation pump seal drain line,

      (2) Valve stem leakoff drain lines,

      (3) Reactor head seal drain line.

Leakage from these sources is monitored by means of different parameters. The recirculation pump leakage is monitored by drain line flow rate, valve stem leakage is monitored by means of drain line temperatures, and the head seal leakage is monitored by means of drain line pressure. All of these parameters with the exception of recirculation pump seal leakage flow rate are monitored in the control room; all of these (including pump seal leakage) will activate an alarm in the control room upon detection of leakage from the components.

Outside of the drywell, but still within containment, identified leakage is collected by the containment equipment drain sump.

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Increases in the fillup and or drainout times for either the drywell equipment drain sump or the containment equipment drain sump will be used to detect an increase in identified leakage with a sensitivity of 50% of the normal background identified leakage. Each sump system is provided with an alarm in the control room which is designed to operate when the leakage rate reaches 25 gpm. In addition, the temperature in the discharge line from each safety/relief valve (SRV) to the suppression pool is monitored in the control room to detect SRV leakage; an alarm in the control room is activated upon detection of a leaking SRV. This meets the guidelines of Position C.7 of Regulatory Guide 1.45.

Leakage from the upper containment pool liner is monitored manually - by opening individual drain line valves and looking for leakage. If there is leakage it will be collected in the drywell equipment drain sump where it will be measured as part of the total.

Leakage from the upper pool bellows seals is monitored by a flow transmitter located on the upper pool drain line. Indication of flowrate is provided in the main

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control room with an alarm to indicate an excess flow rate.

b. Unidentified Leakage

Unidentified leakage in the drywell is detected by the following:

(1) Drywell floor drain sump,

(2) Pedestal floor drain sump,

(3) Drywell coolers,

(4) Airborne gaseous and particulate radioactivity monitor.

The applicant stated that the unidentified leakage rate is detected by the rate at which either sump fills up, by the increase in flow rate of condensate from the drywell cooler, or by the increase in airborne gaseous and particulate radioactivity. The use of these methods (drywell floor drain sump, pedestal floor drain sump, drywell coolers, and airborne gaseous and particulate radioactivity monitor) complies with the guidelines of Position C.3 of Regulatory Guide 1.45 regarding number of type of leakage detection methods. In addition, these systems can reasonably be expected to

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function following seismic events which do not shut the plant down. The airborne gaseous and particulate radiation monitor is powered from a 1E power source and is designed to seismic Category standards, in order to ~~ascertain~~ assure functioning following an SSE. This complies with the guidelines of Position C.6 of Regulatory Guide 1.45.

The FSAR states that "---the sensitivity of these primary detection methods for unidentified leakage within the drywell is 1 gpm within one hour---." The applicant also states that an alarm is activated in the control room when the unidentified leak rate reaches 5 gpm, as measured by the foregoing method(s), thus complying with the requirements of Position C.7 of Regulatory Guide 1.45.

Unidentified leakage within containment collected by the drywell and pedestal floor drain sumps includes leakage from the control rod drives (CRDs), from valve flanges, from the component cooling system, from the service water system and any leakage not connected to the equipment drain sump.

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A process line break within containment will be detected by a lowering of the water level inside the reactor vessel and/or indication of high drywell pressure; for a steam line break downstream of the steam flow measuring devices the break will be detected by the increase in steam flow rate. These breaks may also be detected by the temperature monitor in the drywell. These methods may be utilized for detection of gross leakage - other methods, discussed above, are used to detect small leaks. These measurements all have indicators or readouts in the control room with alarms or annunciators to indicate when the particular parameter measured is out of normal operating limits.

Unidentified leakage within containment but outside of the drywell will be detected by increases in the containment floor drain sump fillup and pump-out time. The FSAR states that the sensitivity of measurement is 50% of the background leak rate and that an alarm will be activated when the total leakage rate reaches 5 gpm. (The applicant must provide assurance that use of this sump will

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provide an accuracy of leak rate measurement of 1 gpm or better and the capability to detect a leakage rate of 1 gpm in less than one hour in accordance with the provisions of Positions C.2 and C.5 of Regulatory Guide 1.45.)

The applicant reported that leakage from thermally hot sources within the drywell is piped to a common header and then through the drywell equipment drain cooler to condense the steam contained in this fluid stream. The cooled fluid is then routed to the drywell equipment drain sump to be included in the measurement of unidentified leakage within the drywell.

The applicant noted that periodic testing will be conducted to detect blocked lines in the floor drain system, as part of the preventative maintenance program.

2. Intersystem Leakage

Detection of leakage into systems connected to the reactor coolant system and damage to those systems

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could result from intersystem leakage. The systems of concern are:

a. High pressure core spray (HPCS) system,

b. Low pressure core spray (LPCS) system,

c. Low pressure coolant injection (LPCI) system (which also serves as the RHR system),

d. Reactor core isolation coolant system (both water and steam turbine sides),

e. Secondary side of reactor water cleanup (RWCU) system heat exchangers (Reactor plant component cooling water (RPCCW) system),

f. Secondary side of residual heat removal (RHR) heat exchangers (Service water system).

A radiation monitor in the service water effluent from the two RHR heat exchangers detects leakage from the RHR system. A radiation monitor in the common reactor plant component cooling water (RPCCW) return line detects leakage from the two RWCU heat exchangers, from the seal coolers for the RHR pumps and from the seal coolers for the recirculation pumps into the RPCCW. In addition, the applicant noted that leakage from the LPCS, HPCS,

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RCIC and RHR systems outside containment is detected by a combination of methods which include high area temperature, high area radiation, high sump level and water level in the reactor vessel. (The applicant must also show how leakage from the primary system into the HPCS, LPCS, RCIC, (both water and steam sides) and RHR systems is detected when these systems are supposedly isolated from the primary system. This assurance is needed to show that the design meets the guidelines of Position C.4 of Regulatory Guide 1.45.)

The plant has another means of detecting leakage from the RWCU system. The flow to the RWCU system from the reactor vessel can be compared with that returning to the reactor vessel from the RWCU system. A high differential flow is alarmed in the control room.

3. Leakage Outside of Containment

a. Identified Leakage

Steam flow to the RHR system (when in the steam condensing mode) and to the RCIC turbine is monitored. Abnormal flows exceeding preset

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values result in annunciation in the control room and isolation of the steam line(s) involved. Thermocouples are installed in equipment areas and in inlet and outlet ventilation ducts of equipment rooms for the RHR, RCIC and RWCU systems. High ambient temperatures and high differential temperatures are alarmed in the main control room. This is also true for the main steam tunnel, both inside and outside of containment, i.e., temperature monitors with high temperature and high differential temperature alarms are used to detect leakage. The high temperature/ high differential temperatures also cause isolation valves in that particular area to close.

b. Unidentified Leakage

Sumps are provided in the rooms outside of containment in which equipment is located that is part of the reactor coolant pressure boundary. The sumps collected unidentified and identified leakage. Normal leakage to all sumps is identified during preoperational testing. Sump

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levels and sump pump operation are indicated in the control room and high sump level is alarmed. Operability is tested by continuously monitoring floor drain sump level.

The applicant stated that limiting conditions for leakage are 25 gpm for identified leakage and 5 gpm for unidentified leakage, thus complying partially with the guidelines of Position C.9 of Regulatory Guide 1.45. (In addition, the applicant must specify the availability of the leakage detection methods and the limiting conditions for operation based upon this availability, in order to comply fully with the guidelines for Position C.9.)

There are other sensors - temperature, pressure and radioactivity (gaseous and particulate) - within containment but outside of the drywell which appear to be intended for use or are capable of being used to detect leakage within containment outside of the drywell. No discussion of these sensors is contained in this

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section of the FSAR. (The applicant should revise the FSAR to include a discussion of these sensors in this section of the FSAR. The applicant should verify that all systems and measurements which are part of the reactor coolant pressure boundary leakage detection system are accounted for.)

4. Testing of Leak Detection Methods

The leak detection methods may be tested during operation for operability and calibration by the following methods:

a. Sump levels may be monitored and compared with flow rates of fluids into the sump,
b. Methods may be compared,
c. Channels may be compared when more than one channel is used for any one detection method,
d. Simulated signals may be used to trip monitors designed for that purpose.

These provisions for testing for operability and calibration comply with the guidelines of Position C.8 of Regulatory Guide 1.45.

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Summary and Conclusions

The airborne gaseous and particulate radiation monitor is designed to seismic Category I standards and is powered from a 1E power source, thus is capable of operating following an SSE. This meets the guidelines of Position C.6 of Regulatory Guide 1.45 and Position C.1 of Regulatory Guide 1.29, "Seismic Design Criteria." Failure of any of the other systems used to detect RCPB leakage will not affect the airborne gaseous and particulate radiation monitor, thus satisfying the guidelines of Position C.2 of Regulatory Guide 1.29. Therefore, by meeting the guidelines of Positions C.1 and C.2 of Regulatory Guide 1.29, RCPB leakage detection complies with the requirements of General Design Criterion 2, "Design Basis for Protection Against Natural Phenomena." The methods used for RCPB leakage detection meet the guidelines of Positions C.1, C.3, C.6, C.7, and C.8 of Regulatory Guide 1.45; further information must be provided to show that the RCPB leakage detection methods comply with Positions C.2, C.4, C.5, and C.9 of Regulatory Guide 1.45. Thus, the system does not comply with the criteria of General Design Criteria 30, "Quality of Reactor Coolant Pressure Boundary."

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Without further information, as noted above, we cannot conclude that reactor coolant pressure boundary leakage detection is acceptable. The reactor coolant pressure boundary leakage detection does not comply with the acceptance criteria of SRP Section 5.2.5.

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6.7 Main Steam Positive Leakage Control System

The main steam positive leakage control system (MS-PLCS) was reviewed in accordance with Section 6.7 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the bases for our evaluation of the MS-PLCS with respect to the applicable regulations of 10 CFR 50.

The main steam positive leakage control system (MS-PLCS) is designed to control and minimize the release of radioactivity which could leak through the closed MSIVs after a loss-of-coolant accident. The system consists of two separate and redundant subsystems. One subsystem functions to maintain the steam lines between the outboard MSIVs and the inboard MSIVs and the corresponding drain lines at a modest positive air pressure following system actuation. The other subsystem functions to maintain the steam lines between the outboard MSIVs and the main steam line shut-off valves, and the outboard MSIV's drain lines and valve steam packing glands at a modest positive air pressure with respect to reactor vessel pressure following system actuation. Each subsystem receives power from a separate division of the emergency power supplies. Both subsystems are actuated manually and simultaneously.

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The MS-PLCS is supplied with compressed air by two separate and redundant seismic Category I compressed air supply systems which are integral components of the penetration valve leakage control system. These compressed air supply systems are described in Section 9.3.6 of this SER. Each compressor receives power from a separate 1E onsite power supply.

The main steam positive leakage control system is designed to be manually initiated twenty minutes after a postulated design basis loss-of-coolant accident in accordance with Position C.7 of Regulatory Guide 1.96, "Design of Main Steam Isolation Valve Leakage Control Systems for Boiling Water Reactor Nuclear Power Plants." This actuation time period is consistent with loading requirements on the emergency electrical buses, with reasonable times for operator information gathering, decision making and action, and is consistent with the time required for main steam line pressure decay following a postulated loss-of-coolant accident.

The system is located in the reactor building and auxiliary building which are seismic Category I flood- and tornado-protected buildings. The MS-PLCS itself is designed in accordance with sesimic Category I (Regulatory Guide 1.29, Position C.1) and Quality Group B criteria with the exception that the portion of the MS-PLCS piping that connects to the

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main steam line between the inner and outer containment isolation valves is designed in accordance with seismic Category I and Quality Group A criteria in accordance with the criteria of Position C.1 of Regulatory Guide 1.96. Thus, the MS-PLCS meets the requirements of General Design Criterion 2 since the system is designed in accordance with the requirements of Regulatory Guide 1.29, Position C.1 and Regulatory Guide 1.96, Position C.1. The system would be called on to function in the event of a loss-of-coolant accident (LOCA) and is designed to be capable of performing its safety function under the expected LOCA environmental conditions appropriate to the system equipment location (refer to Section 3.11 of this SER) and in the event of a single active failure, thus complying with Position C.3 of Regulatory Guide 1.96. The components of each subsystem are protected by separation and barriers against potential missiles generated inside and outside of containment, and dynamic effects associated with pipe breaks so that their function would not be impaired under postulated LOCA conditions, thus complying with the criteria of Position C.2 of Regulatory Guide 1.96. In addition, no single active failure can affect the integrity or operability of the main steam lines or main steam isolation valves, thus complying with the criteria of Position C.4 of Regulatory Guide 1.96.

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In this way the MS-PLCS complies with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases."

The MS-PLCS is capable of performing its function following loss of all offsite power coincident with a design basis LOCA, thus complying with the criteria of Position C.5 of Regulatory Guide 1.96.

The MS-PLCS is designed to control and minimize leakage through the main steam isolation valves for up to 30 days. [However, the applicant has not submitted an acceptable MSIV allowable leak rate.] Therefore, we cannot be sure that enough compressed air can be provided to maintain the desired pressure in the MS-PLCS system. Consequently, we cannot determine that the MS-PLCS complies with Position C.6 of Regulatory Guide 1.96.

The instrumentation and circuits necessary for proper operation of the MS-PLCS are designed to comply with standards applicable to engineered safeguards components (Class 1E). In this way the MS-PLCS complies with the requirements of Position C.8 of Regulatory Guide 1.96.

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The MS-PLCS isolation valves do not open in the event the main steam line pressure is higher than the pressure interlock setpoint, thus preventing the MS-PLCS from being damaged by high pressure. A pressure control valve maintains the required pressure differential between the reactor vessel and main steam line. (The applicant must establish this differential pressure.) In the event of high flow or low pressure differential, an alarm is sounded. Further flow increase or drop in pressure differential will result in automatic isolation of that part of the MS-PLCS. This, together with the fact that there are two MS-PLCS systems, prevents direct access of the containment atmosphere to the MS-PLCS. However, we cannot determine that compliance with Position C.9 of Regulatory Guide 1.96 is complete until the applicant determines the required differential pressure.

The applicant states that complete functional testing is performed during extended plant shutdown or during refueling. This complies with Position C.10 of Regulatory Guide 1.96.

The MS-PLCS complies with Position C.11 of Regulatory Guide 1.96 since the use of compressed air as the fluid medium does not result in stresses adversely affecting the integrity or operability of the main steam lines or main steam isolation valves nor induce leakage in the main steam isolation valves greater than the capacity of the MS-PLCS.

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The MS-PLCS is designed to control stem leakage from the outboard main steam isolation valves by connecting the MS-PLCS process line to the socket weld provided on the inlet side of the outboard main steam isolation valve, thus complying with Position C.12 of Regulatory Guide 1.96.

The MS-PLCS complies with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," by meeting the guidelines of Position C.1 of Regulatory Guide 1.29. The MS-PLCS complies with the criteria of General Design Criterion 4, "Environmental and Missile Design Bases," by meeting the guidelines of Positions C.2 and C.4 of Regulatory Guide 1.96. However, we cannot determine whether the MS-PLCS meets the guidelines of Positions C.6 and C.9 of Regulatory Guide 1.96; therefore, we cannot determine whether the MS-PLCS complies fully with the requirements of General Design Criteria 54, "Piping Systems Penetrating Containment." Therefore, the system does not comply with the requirements of SRP Section 6.7.

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9.0 Auxiliary Systems

We have reviewed auxiliary systems in the River Bend Station necessary to assure the safety of the stored fuel, auxiliary systems needed for transient or accident mitigation or for safe plant shutdown and auxiliary systems not required for transient or accident mitigation or for safe plant shutdown. The latter have been reviewed to assure that their failure will not prevent safe shutdown or the mitigation of transients and accidents.

The systems reviewed to assure the safety of the stored fuel included both new and spent fuel storage, fuel pool cooling and cleanup, light load and overhead heavy load handling systems.

Systems required to function in the event of an accident or to aid in plant shutdown include the following systems:

(1) Reactor plant component cooling water*,
(2) Ultimate heat sink,
(3) Standby service water,
(4) Control building chilled water,

*A portion of these systems are not required for safe shutdown or mitigation of transients or accidents; these portions are reviewed to assure that their failure will not adversely affect proper functioning of systems required for such purpose.

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(5) Compressed gas systems,*

(6) Standby liquid control system,

(7) Control room heating, ventilating and air conditioning,*

(8) Spent fuel pool heat ventilating and air conditioning,[redacted]*

(9) Auxiliary and radwaste area ventilation,*

(10) Engineered safety features ventilation

Those systems which have been reviewed to assure that their failure would not affect systems required for safe shutdown and/or accident or transient mitigation include:**

(1) Normal service water,

(2) Makeup water treatment,

(3) Domestic water and sanitary drains and disposal,

(4) Condensate storage facilities,

(5) Turbine plant component cooling water,

(6) Ventilation chilled water,

*A portion of these systems are not required for safe shutdown or mitigation of transients or accidents; these portions are reviewed to assure that their failure will not adversely affect proper functioning of systems required for such purposes.

**Some of these systems have interfaces with safety systems and/or containment penetrations which are required to be safety-related to provide suitable isolation.

(7) Cooling tower makeup water,

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(8) Equipment and floor drainage,

(9) Turbine building ventilation,

(10) Miscellaneous buildings heating, ventilating and air conditioning.

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9.1 Fuel Storage Facility

9.1.1 New Fuel Storage

The new fuel storage facility was reviewed in accordance with Section 9.1.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the plans for new fuel storage with respect to the applicable regulations of 10 CFR 50.

The new fuel storage facility consists of a new fuel storage vault located in the fuel building of each unit. Each storage vault provides dry storage for a maximum of 220 fuel assemblies (30% of a core load) and includes the new fuel assembly storage racks and the concrete storage vault that contains the storage racks. There is no sharing of storage space. Therefore, the requirements of General Design Criterion 5, "Sharing of Structures, Systems, and Components" are not applicable.

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The fuel building which houses the facility, the storage racks and vault is designed to seismic Category I criteria. This building is also designed against flooding and tornado missiles (refer to Sections 3.4.1 and 3.5.2 of this SER). Thus, the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," and the guidelines of Regulatory Guide 1.29, "Seismic Design Classification," are satisfied.

The vault housing the new fuel storage racks is not located in the vicinity of any moderate or high energy lines or rotating machinery. This separation from such potential missile sources protects the new fuel from internally generated missiles and the effects of pipe breaks (refer to Section 3.5.1.1, 3.5.1.2 and 3.6.1 of this SER).

The facility is designed to store unirradiated, low emission fuel assemblies. Accidental damage to the fuel would release relatively minor amounts of radioactivity that would be accommodated by the spent fuel area ventilation system. Thus, the requirements of General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control," are satisfied.

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The racks are designed to preclude the inadvertent placement of a new fuel assembly in other than the prescribed spacing - a center-to-center spacing of 12.25 inches between rows, 7.00 inches within rows. This spacing permits the stored new fuel to be maintained with K_{eff} equal to or less than 0.95 when dry or completely flooded with water. The applicant noted, however, that the new fuel racks were not designed for optimum moderation; for example, foam or mist. As a result, a K_{eff} less than or equal to 0.98 cannot be assured with a completely filled array of fuel assemblies in the racks with the highest anticipated reactivity. Therefore, the applicant has proposed solid, noncombustible [redacted] covers over the fuel and administrative controls to preclude the entrance of foam or mist which [redacted] could result in a K_{eff} greater than 0.98. [The applicant must provide assurance that K_{eff} in excess of 0.98 will not be attained in the new fuel storage racks. The nature of the administrative controls and the times and conditions under which the new fuel covers will be removed should be addressed.]

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Based on our review, we conclude that the new fuel storage facility is in conformance with the requirements of General Design Criteria 2, 5, 61, as they relate to new fuel protection against natural phenomena, missiles, shared functions, and radiation protection and the guidelines of Regulatory Guide 1.29 relating to seismic classification. The applicant must provide further information regarding controls used to prevent conditions of optimum moderation in order to show compliance with General Design Criterion 62, "Prevention of Criticality in Fuel Storage and Handling."

Therefore, we cannot find that the applicant's submittal regarding new fuel storage is acceptable. The design for new fuel storage does not comply with the acceptance criteria of SRP Section 9.1.1.

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9.1.2 Spent Fuel Storage

The spent fuel storage facility was reviewed in accordance with Section 9.1.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the spent fuel storage with respect to the applicable regulations of 10 CFR 50.

The acceptance criteria for the fuel storage facility includes meeting the guidelines of ANS 57.2, "Design Objectives for Light Water Reactor Spent Fuel Storage Facilities at Nuclear Power Stations." The guidelines contained in the "Review Procedures" were used in lieu of ANS 57.2. Additionally, the acceptance criteria includes Regulatory Guide 1.115, Protection Against Low-Trajectory Turbine Missiles;" turbine missiles are evaluated separately in Section 3.5.1.3.

Each unit of the plant has its own spent fuel storage facility. Low density storage racks located in the dryer storage pool (one of the four containment pools) of each unit have a capacity of 200 fuel assemblies (30% of a full core). The high density storage racks in the fuel building spent fuel storage pool have a capacity of 3,288 fuel assemblies (525% of a full core)⊙, ~~[illegible]~~

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~~the criteria of Paragraph 5.1.15 of ANS 57.2, "Design Objectives for Light Water Spent Fuel Storage Facilities at Nuclear Power Plants."~~

The structures housing the fuel building and containment are designed to seismic Category I criteria as are the storage racks and storage pools, pool liners, and gates. These structures are also designed to withstand flooding and tornadoes (refer to Sections 3.4.1 and 3.5.2 of this SER). We conclude that the spent fuel storage satisfies the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," by compliance with the guidelines of Regulatory Guides 1.13, "Spent Fuel Storage Facility Design Basis," and 1.29, "Seismic Design Classification."

The spent fuel pools are not located in the vicinity of any high-energy lines or rotating machinery. Therefore, physical protection by means of separation is utilized to protect the spent fuel from internally generated missiles and the effects of pipe breaks (refer to Sections 3.5.1.1 and 3.6.1 of this SER). The spent fuel building provides protection against tornado missiles (see Section 3.5.2 of this SER). Thus, the requirements of General Design Criteria 4, "Environmental and Missile Design Bases," and the guidelines of Regulatory Guide 1.17 are satisfied.

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There is no sharing of storage facilities. Therefore the requirements of General Design Criterion 5, "Sharing of Structures, Systems, and Components," are not applicable.

The applicant stated that both the low density storage area (The containment pool) and the high density (the fuel building pool) storage area of the facility are each designed to store the fuel assemblies in an array which limits K_{eff} to 0.95 or less, in order to comply with the requirements of General Design Criterion 62, "Prevention of Criticality in Fuel Storage and Handling." [The applicant has not provided a criticality analysis to confirm the criticality limits to be attained in the spent fuel storage facility.] The low density storage racks are aluminum with a fuel assembly nominal center-to-center storage spacing of 7 inches. The high density racks are stainless steel with a neutron poison material between storage spaces and provide a fuel assembly minimum center-to-center storage spacing of 6 1/4 inches. The racks are designed to preclude the inadvertent placement of a fuel assembly in other than the prescribed spacing. The racks can withstand the impact of a dropped fuel assembly without unacceptable damage to the stored fuel and can withstand the maximum uplift forces exerted by the fuel handling machine. Thus, the requirements of General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control," and the guidelines of Regulatory Guide 1.13 concerning fuel storage facility design are satis-

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fied. The design of the storage pools includes leakage detection systems for indication of pool liner leakage, water level monitoring systems, and radiation monitoring systems. These features satisfy the requirements of General Design Criterion 63, "Monitoring Fuel and Waste Storage." Further discussion of compliance with Position C.3 of Regulatory Guide 1.13 regarding crane interlocks is contained in Section 9.1.4 of this SER.

Based on our review, we conclude that the spent fuel storage facility is in conformance with the requirements of General Design Criteria 2, 4, 5, 61 and 63 with respect to protection of spent fuel from the effects of natural phenomena, missiles, environmental effects, shared functions, prevention of unacceptable radioactivity releases, and monitoring of the facility, and the guidelines of Regulatory Guides 1.13, 1.29 and 1.117 relating to the facility's design, seismic classification and protection against tornado missiles. [However, until the applicant provides a criticality analysis we cannot determine whether the spent fuel storage is in compliance with General Design Criterion 62.]

In view of the foregoing, we cannot find that the applicant's submittal regarding spent fuel storage is acceptable nor that the design for spent fuel storage complies with the criteria of SRP Section 9.1.2.

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9.1.3 Fuel Pool Cooling and Cleanup System

The fuel pool cooling and cleanup system was reviewed in accordance with Section 9.1.3 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP Section. Conformance with the acceptance criteria formed the basis for our evaluation of the fuel pool cooling and cleanup system with respect to the applicable regulations of 10 CFR 50.

The fuel pool cooling and cleanup system is designed to maintain water quality and clarity and remove decay heat generated by spent fuel assemblies in the pools. The system includes all components and piping from inlet to exit from the storage pools, piping used for fuel pool makeup, and the cleanup/filter/demineralizers to the point of discharge to the radwaste system. The fuel pool cooling system consists of two 100%-capacity fully redundant fuel pool cooling pump/heat exchanger trains while the cleanup system consists of one cleanup system train containing two 50% capacity pumps, two 50% capacity filters and one 100% capacity mixed bed demineralizer with post-demineralizer strainer.

The fuel pool cooling system is housed in the seismic Cagegory I, flood and tornado protected fuel building and containment (refer to Sections 3.4.1 and 3.5.2 of this SER). The cooling system trains are completely separate from the cleanup train and are designed to Quality Group C and seismic Category I requirements. The cleanup train is designed to Quality Group D and nonseismic requirements. It is located to assure that failure in any portion of the train would have no adverse effect on safety-related equipment. This design satisfies the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," by compliance with the guidelines of Regulatory Guide 1.13 (Positions C.1 and C.2), "Spent Fuel Storage Facility Design Bases," 1.26 (Position C.2), "Quality Group Classifications and Standards for Water-, Steam-, and Radioactive-Waste-Containing Components of Nuclear Power Plants," and 1.29 (Positions C.1 and C.2), "Seismic Design Classification."

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The various components of the fuel pool cooling systems are located in shielded cubicles or are separated from other moderate and high energy piping systems and are thus protected against the effects of internally generated missiles and the effects of pipe whip and jets (refer to Sections 3.5.1.1 and 3.6.1 of this SER). The system is located within the fuel building, a seismic Category I structure which is protected against tornadic winds and missiles, thus meeting with the guidelines of Regulatory Guide 1.13 (Position C.2). In this manner, the fuel pool cooling system complies with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases."

Each unit of the plant is provided with a separate spent fuel pool cooling and cleanup system; thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

Provisions have been made for routine visual inspection of the fuel pool cooling system components. One fuel pool cooling train is in operation at all times.

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The spare train will be operated periodically in accordance with plant Technical Specifications. Thus, the requirements of General Design Criteria 45, "Inspection of Cooling Water System," and 46, "Testing of Cooling Water System," are satisfied.

The nonsafety-related reactor plant component cooling water system provides cooling water to the fuel pool heat exchanger under normal conditions. The maximum normal heat load is based on storage of 4.25 spent cores. Space for an emergency core off-load is available. Under normal refueling conditions, a refueling batch will be placed in the spent fuel pool 150 hours after reactor shutdown. Using the reactor plant component cooling water system, the pool temperature would be maintained at or below 129°F with one pump and one fuel pool cooler in operation which is acceptable since it is less than our acceptance criterion of a maximum temperature of 140°F for a "normal heat load."

Under abnormal heat load conditions, the reactor plant component cooling water (RPCCW) system provides cooling water to the fuel pool heat exchangers. The maximum abnormal heat load is based on a full core off-load 10 days after the last normal refueling outage and a maximum storage load of 4.25 cores (maximum storage conditions). Under these conditions, the cooling system will maintain the temperature of the water at or below 156°F. If the reactor plant component cooling water system is not available, the safety-related standby service water system may be used to cool the heat exchangers through the portion of the RPCCW piping to the standby service water system which is designed to seismic Category I and Quality Group C standards for this purpose. While the FSAR states that Branch Technical Position ASB 9-2, "Residual Decay Energy for Light Water Reactors for Long Term Cooling," was used to calculate the heat loads, this cannot be verified because the size of the refueling batch and frequency were not given by the applicant. (The applicant should provide the number of fuel assemblies and frequency assumed for a "normal" refueling so that the heat load calculations for the spent fuel pool may be verified.) (The applicant should also show that spent fuel stored in

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the dryer storage pool can be cooled in the event of DBA or loss of offsite power combined with the worst single active failure.)

The residual heat removal (RHR) system can be utilized to augment the fuel pool cooling system. (However, the applicant has not shown the interconnection of the RHR system with the fuel pool cooling system.) We, therefore, cannot verify that the spent fuel pool cooling systems meet the requirements of General Design Criterion 44, "Cooling Water," nor whether the interconnecting piping is of the proper seismic category, in accordance with the criteria of Regulatory Guide 1.29, "Seismic Design Classification."

All lines that connect to the pool and extend below the safe level of the pool water (10 ft. above the top of the fuel) are equipped with syphon breakers, check valves or other means to prevent inadvertent pool drainage. (The applicant must show that the syphon breaker design precludes failure so as to cause a reduction in the level of the spent fuel pool in the fuel building below 10 ft. above the top of the fuel.)

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[The applicant should explain why syphon breakers are not required for the dryer storage pool.] Both of these concerns must be addressed adequately in order to show compliance with Position C.6 of Regulatory Guide 1.13. Normal makeup to the pool is provided by the nonsafety-related condensate and refueling water storage and transfer system to replace losses due to leakage through the liner and evaporation. Emergency makeup is supplied by the redundant loops of the safety-related standby service water system.

The nonsafety-related spent fuel pool cleanup subsystem is designed to maintain water quality in both spent fuel storage pools by filtration and demineralization; the system can filter, simultaneously, the water in both pools at a rate sufficient to change the fuel building coolant volume twice per day and the containment pools water once per day. The cleanup subsystem is designed to remove radionuclides to maintain a safe working level in the associated fuel building areas while retaining the radioactive material in the demineralizer and filter so as to comply with Positions C.2.f(2) and (3) of Regulatory Guide 8.8.

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Thus, the requirements of General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control," are met by compliance with the guidelines of Regulatory Guide 1.13.

The system incorporated control room alarmed pool water level, water temperature, and building radiation level monitoring systems, thus satisfying the requirements of General Design Criterion 63, "Monitoring Fuel and Waste Storage."

Based on our review, we conclude that the spent fuel pool cooling and cleanup system is in conformance with the requirements of General Design Criteria 2, 4, 45, 46, 61, and 63 and the guidelines of Regulatory Guides 1.13 and 1.26 and BTP ASB 9-2 with respect to protection against natural phenomena, missiles, pipe break effects, inservice inspection, functional testing, radiation protection and performance monitoring, and quality group classification. The applicant has not presented sufficient information to enable us to determine whether the system is in conformance with the requirements of General Design

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Criteria 44 and 61 and the guidelines of Regulatory Guide 1.29 with respect to its ability to remove decay heat and its seismic classification. Therefore, we cannot conclude that the fuel pool cooling and cleanup system complies with the acceptance criteria of SRP Section 9.1.3.

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9.1.4 <u>Fuel Handling System (Sections Related to Standard Review Plan Section 9.1.4, "Light Load Handling System")</u>

The fuel handling system was reviewed in accordance with Section 9.1.4 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the fuel handling system with respect to the applicable regulations of 10 CFR 50. Note that a light load is considered any load of less weight than a fuel assembly and its handling tool.

The fuel handling system provides the means of transporting, handling, and storing fuel (both new and spent fuel) in the fuel buildings and containment. The fuel handling system consists of equipment necessary to facilitate the periodic refueling of the reactor. The transfer of new fuel assemblies between the uncrating area and the new fuel storage vault is accomplished using the 15-ton fuel building crane. The auxiliary hoist on the fuel handling platform is used with an

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auxiliary fuel grapple to transfer the new fuel from the storage vault to the new fuel storage pool. From there the fuel is handled by telescoping grapples on the fuel handling platform (which is provided for fuel building fuel movement and servicing) or on the refueling platform (which is provided for containment building fuel movement and servicing). The inclined fuel transport system is used to move new or spent fuel, control rods and other small components between containment and the fuel building.

The transfer operation (when utilizing the inclined fuel transfer system) is an automatic sequencing function with capability for manual override. Interlocks assure the correct sequencing of the transfer operation in the automatic or manual mode. Additional interlocks prevent the refueling platform and the fuel handling platform from moving in the transfer area during operations of the transfer system which would be adversely affected by the presence of either platform. Compliance of the portion of the transfer tube serving for containment isolation with the guidelines of Regulatory Guide 1.29 is discussed in Section 6.2 of this SER. The

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refueling platform is a gantry crane used to move fuel and reactor components to and from containment fuel storage and the reactor vessel. The fuel handling platform is a gantry crane used to move fuel within the fuel building storage pool. The applicant stated that the fuel grapple hoist on the refueling platform and both the main fuel hoist and monorail auxiliary hoist on the fuel handling platform are designed so that no single component failure can result in dropping a fuel bundle. During transfer of fuel the grapple on each platform provides a minimum water shielding of 8 ft. 6 inches over the active fuel when in the fully retracted position. Limit switches on the end trucks minimize the possibility of having the fuel handling platform run into pool obstacles.

A fuel building bridge crane is provided to handle the transport of new fuel between the receiving areas and the new fuel inspection stand and/or new fuel storage vault. The refueling and fuel building platforms are designed to seismic Category I and Quality Group B standards. The fuel building bridge crane, however, is not designed to seismic Category I standards but does have seismic restraints which are designed to

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prevent the bridge and trolley from leaving the rails during a seismic event. During construction the rails extend over the spent fuel pool for placement of the high density fuel racks; after construction the fuel building bridge crane will be prevented from moving over the spent fuel by physical blocks. [Nevertheless, because of the proximity of the crane to the spent fuel pool, the applicant should show that damage to the crane is sufficiently limited in the event of an SSE so that either the crane retains its integrity or failing that, that any parts of the crane becoming dislodged would not result in damage to the spent fuel, the spent fuel pool, or the spent fuel cooling system in order to meet the criteria of Position C.2 of Regulatory Guide 1.29.] The fuel handling equipment is not required to function after an SSE. The jib crane which is mounted along the edge of the containment fuel pool is used to aid in fuel movement in the containment by serving in the fuel preparation area, thus leaving the refueling platform free for use in fuel shuffling. It is designed in accordance with seismic Category I criteria as is the stand for the inspection of new fuel.

Each unit of the plant has its own fuel handling system and there is no sharing of facilities. Thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

The entire system is housed within the fuel building and the containment which are seismic Category I flood and tornado protected structures (refer to Sections 3.4.1 and 3.5.2 of this SER). This meets the guidelines of Position C.1 of Regulatory Guide 1.29, "Seismic Design Classification," relating to protection of safety-related equipment and spent fuel from the effects of an earthquake. Failure of this equipment will not affect spent fuel or safety-related equipment, with the exception of the concern regarding failure of the fuel building bridge crane. Compliance of the design of the spent fuel storage facility with seismic Category I criteria as required by Position C.1 of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Bases" is discussed in Section 9.1.3 of this SER. In view of our concern that a failure of the building bridge crane during an SSE could result in

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damage to spent fuel, to the spent fuel pool or to the spent fuel cooling system, we cannot conclude that the light load handling system complies with the provisions of Position C.2 of Regulatory Guide 1.29 nor the criteria of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

[The applicant should discuss what provisions are made for cooling the maximum number of spent fuel assemblies in the fuel transfer tube during normal transfer operations and in the event subassemblies become lodged in the tube. The possibility of coolant drainage from the tube, resulting in a dry tube should also be discussed, in order to show that this meets the guidelines of Section 6.2.4.1.13 of ANSI 57.1 and Position C.3 of Regulatory Guide 1.13, in compliance with the provisions of General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control."]

The applicant notes (in FSAR Section 9.1.2) that the design of the containment spent fuel storage facility provides a subcritical multiplication factor (K_{eff} = 0.95) for abnormal storage which includes dropping of equipment; however, for the new fuel building spent

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storage facility, the applicant has not yet provided a criticality analysis (see Section 9.1.2 for this concern).

The applicant has responded to our concern regarding elimination of the possibility of handling a load with the light load handling system lighter than a fuel assembly with its handling tool but raised to a greater height so that its kinetic energy would exceed that of the fuel assembly and handling tool. The applicant stated that control would be by administrative procedures and training. [In addition, however, the applicant must provide an analysis to show that the maximum kinetic energy resulting from a fall of any object handled by the light load handling system when over spent fuel in either containment or fuel building storage facilities will not exceed that obtained in the fall of a fuel assembly and its handling tool.]

In view of the foregoing, we conclude that the fuel handling system is in conformance with the requirements of General Design Criterion 5. However, we cannot conclude that the system is in conformance with the

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requirements of General Design Criterion 2, 61, and 62. Therefore, we cannot find the applicant's submittal to be acceptable. The portion of the fuel handling system related to handling of light loads does not comply with the acceptance criteria of SRP Section 9.1.4.

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9.1.5 Fuel Handling System (Sections Related to Standard Review Plan 9.1.5, Overhead Heavy Load Handling System)

The fuel handling systems (parts related to overhead handling of heavy loads) was reviewed in accordance with Section 9.1.5 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the bases for our evaluation of the fuel handling system (parts related to overhead handling of heavy loads) with respect to the applicable regulations of 10 CFR 50.

The acceptance criteria for the overhead heavy load handling system include meeting the guidelines of ANS 57.1 and 57.2. The guidelines in the SRP review procedures and NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," were used in lieu of ANS 57.1 and 57.2.

NUREG-0612 was transmitted to the applicant for action by generic NRC letters dated December 22, 1980 and February 3, 1981. NUREG-0612 resolved Generic Task A-36 and provides guidelines for necessary changes to ensure safe handling of heavy loads once a plant becomes operational. Enclosure 2 of the December 22, 1980 generic letter identified a number of interim measures dealing with safe load paths, procedures,

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operator training, and crane inspections, testing, and maintenance. The applicant committed to comply with these interim actions. [The staff will require that the applicant implement the ~~final~~ guidelines contained in NUREG-0612 before any operating license can be issued.]

The applicant has provided a discussion only of the portion of the heavy load handling system dedicated to the handling of fuel; thus is reviewed below.

Insert

Each unit of the station has its own polar crane and spent fuel cask trolley and there are no shared components. Thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems, and Components," are not applicable.

The spent cask fuel trolley and polar crane are housed within the fuel building and containment, respectively, both of which are seismic Category I, flood and tornado protected structures (refer to Sections 3.4.1 and 3.5.2 of this SER). The 125 ton spent fuel cask trolley is used for handling the spent fuel shipping cask, and is designed to seismic Category I requirements. The containment polar crane is used to move the portable refueling shield, drywell head, reactor vessel head, steam separator, and steam dryer, and is designed to seismic Category I requirements. Therefore, the design meets the guidelines of Position C.1 of Regulatory Guide 1.29, "Seismic ~~Deisgn~~ Design Classification."

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Insert

The portion of the handling system dedicated to handling heavy loads consists of equipment necessary for the safe handling of the spent fuel cask and for safe disassembly and reassembly of the reactor vessel head and internals during refueling operations. The containment polar crane is used for handling of heavy loads in containment and the spent fuel cask trolley is used for handling of heavy loads in the fuel building.

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The spent fuel cask pool is separated from the fuel storage pool by a common wall with a gate. The spent fuel cask trolley rails do not extend over any portion of the spent fuel storage pool or transfer pool, thereby preventing cask transportation over spent fuel. A ɔpped cask cannot, therefore, result in damage to spent fuel stored in the fuel pool. The trolley coverage area does not include any area over safety-related equipment. Procedures and design limitations prevent the cask from being lifted more than 30 ft. [The applicant is currently performing a spent fuel cask drop analysis a~~nd polar crane load drop analysis~~ to verify that a cask drop ~~or load drop from the polar crane~~> does not result in unacceptable damage to the spent fuel storage facility or to safety-related equipment. Therefore, the cask trolley meets the guidelines of Position C.3 of Regulatory Guide 1.13, "Spent Fuel Storage Facility Design Basis." (However, the applicant should verify that the polar crane will not be moved over stored fuel when refueling is not in progress, to meet the guidelines of Position C.3). (In addition, the applicant should show that the polar crane meets the guidelines of Position C.5 of Regulatory Guide 1.13 with regard to the effect of a load drop on spent fuel in the containment pool in order to comply with with requirements of General Design Criterion 4, "Environmental and Missile Design Bases." In this analysis the applicant should also consider the effect of a polar crane load drop on the level of water in the containment

DRAFT

spent fuel storage pool in order to meet the guidelines of Position C.6 of Regulatory Guide 1.13 so as to comply with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."] Note that the polar crane must meet the guidelines of Positions C.3 and C.5 of Regulatory Guide 1.13 in order to comply with the criteria of General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control."

The applicant has made calculations to show the results of a drop of the reactor vessel head onto the vessel head flange; the calculations show that there is no release of radioactivity or production of vessel leaks. [The applicant should show the results of calculations of other polar crane load drops (where the loads could drop into the vessel) to determine their effect on spent fuel in the core.)

Based on the foregoing, we conclude that the portion of the heavy loads handling system dedicated to fuel handling complies with the requirements of General Design Criterion 2 with regard to protection against seismic events. The applicant has not shown that the system complies with the requirements of General Design Criteria 2 (in maintaining containment pool water level in the event of a polar crane load drop, and 4 (with respect to dropped polar crane loads acting as missiles), 61 (relating to release of ~~release of~~ radioactivity). In addition, the applicant must implement the ~~final~~ guidelines of NUREG-0612 before an operating

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license can be issued. Therefore, we cannot find the applicant's submittal to be acceptable. The overhead heavy loads handling system does not comply with the acceptance criteria of SRP Section 9.1.5.

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9.2.1 Normal Service Water System (SWS)

The normal service water system was reviewed in accordance with Section 9.2.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section relating to the nonsafety-related system was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section relating to nonsafety-related system. Conformance with the acceptance criteria formed the basis for our evaluation of the normal service water system with respect to the applicable regulations of 10 CFR 50.

The normal service water system (SWS) is used to provide cooling water for turbine plant and reactor plant auxiliary systems and components during all phases of normal plant operation. The standby service water system (discussed in Section 9.2.7) provides water to safety related equipment during emergencies. Power for the SWS is provided by a safety related, noninterruptable diesel generator so that the service water system is operable upon loss of offsite power. The SWS may also be used to supply cooling water to the residual heat removal heat exchangers when the standby service water system is not in use.

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The normal service water system consists of three pumps, each with a pumping capacity of 31,500 gpm. Two pumps operate under normal conditions with the third used as a spare in the event of inoperability of one of the operating pumps. Water is pumped from the cooling water basin of the circulating water system into a common header and then to the systems requiring cooling water. Check valves and automatic block valves in the normal service water return lines are used to isolate safety-related lines from the normal service water system; these valves are designed in accordance with the criteria for seismic Category I (in conformance with Position C.3 of Regulatory Guide 1.29) and Quality Group C criteria (except for containment isolation valves and associated piping which are designed to seismic Category I, Quality Group B criteria). Piping and valves common to both the normal and standby service water systems are designed to seismic Category I, Quality Group C criteria. Valves used to isolate the normal service water system from the standby service water system are designed to the same criteria: seismic Category I, Quality Group C in conformance with Positions C.2 and C.3 of Regulatory Guide 1.29. The remainder of the normal service water system is designed in accordance with applicable industry codes and standards. This meets the requirements of General Design Criteria 2, "Design Bases for Natural

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Phenomena" by compliance with the guidelines of Positions C.2 and C.3 of Regulatory Guide 1.29, "Seismic Design Classification.

A separate normal service water system is supplied for each unit however, the system need not comply with the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," since the SWS is not safety-related.

The normal service water system has no safety function, therefore, the requirements of General Design Criterion 44, "Cooling Water," 45, "Inspection of Cooling Water Systems," 46, "Testing of Cooling Water System" do not apply.

We ~~fond~~ found that the normal service water system has been designed in accordance with the applicable criteria of Section 9.2.1 of the Standard Review Plan, "Station Service Water System" and that this system is, therefore, acceptable.

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9.2.2 Reactor Plant Component Cooling Water System (Reactor Auxiliary Cooling Water System)

The reactor plant component cooling water (RPCCW) system was reviewed in accordance with Section 9.2.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the RPCCW system with respect to the applicable regulations of 10 CFR 50.

The reactor plant component cooling water (RPCCW) system includes pumps, heat exchangers, valves and piping, expansion tank, makeup piping and the points of connection with other systems. The RPCCW provides cooling water to the spent fuel pool heat exchangers, reactor recirculating pump seals, bearing and winding coolers, reactor water cleanup pump coolers, reactor water cleanup heat exchangers, process sampler coolers, control rod drive pump oil coolers, drywell sump coolers and pump seal coolers during normal operation.

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The reactor plant component cooling water system is mainly a nonseismic, nonsafety-related system with no functions necessary to mitigate transients or accidents and none necessary to achieve safe shutdown conditions. However, there is some piping in the RPCCW system which is used to convey water from the safety-related standby service water system (described in Section 9.2.7 of this SER) to the spent fuel coolers and to the residual heat removal pump seals and bearings when the normal service water system is not available. These portions of the piping, together with the valves used to isolate the standby service water system from the normal service water, are safety-related and are designed to seismic Category I and Quality Group C criteria, in accordance with Positions C.1 and C.2 of Regulatory Guide 1.29, "Seismic Design Criteria," thus complying with General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena." The RPCCW system has no other heat loads that are related to safe shutdown or accident prevention or mitigation. Thus, the requirements of General Design Criterion 44, "Cooling Water," 45, "Inspection of Cooling Water System," ^Insert are not applicable.

Insert and 46, "Testing of Cooling Water System,"

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When operation of the standby service water system is initiated in the event of an accident, the safety-related portion of the RPCCW system is automatically isolated from the nonessential portion of the RPCCW system by redundant seismic Category I, Quality Group C isolation valves. Redundant seismic Category I, Quality Group B isolation valves are provided at the RPCCW system piping containment penetrations. Thus, the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," as related to seismic design in accordance with the criteria of Positions C.1, C.2 and C.3 of Regulatory Guide 1.29, "Seismic Design Classification," are met.

There are redundant lines in the reactor plant component cooling water system used to convey water to the RHR pump seals and bearings and to the spent fuel pool coolers and to return water to the standby service water pumps. Therefore, the standby service water system will be able to cool the pump in one RHR train and one fuel pool cooler in the event of a single failure, thus providing the minimum cooling needed in the event of an accident or loss of offsite power.

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The safety-related portion of the RPCCW system is located in buildings which are protected against earthquakes (as noted in Section 3.7 of this SER) and tornadoes (as noted in Section 3.3 of this SER). Therefore, the safety-related portion of the RPCCW system is in compliance with the criteria of General Design Criteria 2, "Design Bases for Protection Against Natural Phenomena."

The applicant stated that the safety-related portions of the RPCCW system are protected against environmental conditions in the surrounding areas including those resulting from moderate energy pipe cracks and flooding resulting from such cracks. [The applicant must show that the safety-related portion of the RPCCW will not fail as a result of high energy pipe breaks.]

[In addition, the applicant must show that the safety-related portion of the RPCCW is protected against internally generated missiles because the FSAR Section relating to internally generated missiles (Section 3.5.1) does not list the RPCCW as one of the systems which need to be protected against internally generated missiles.] Therefore, we cannot conclude that the

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safety-related portion of the RPCCW conforms with the requirements of General Design Criterion 4 - "Environmental and Missile Design Bases."

The RPCCW system contains a radiation monitor in the pump suction header to detect in-leakage from radioactive systems. Each unit of the plant has its own RPCCW system. Thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

Based on the above, we conclude that the RPCCW system meets the requirements of General Design Criteria 2, and the guidelines of Regulatory Guide 1.29 as it relates to seismic events and with respect to General Design Criterion 5 in regards to shared functions between units and that General Design Criteria 44, 45, and 46 do not apply. ~~However, the applicant must provide further information to verify the statement that "---Interruption of coolant to the recirculation pump does not result in unacceptable consequences" (which is contained in Section 9.2.2.1 of the FSAR) in order to show compliance with Section II.K.3.25 of the TMI Task Action Plan regarding the loss of coolant~~

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~~inventory due to pump seal failure as a result of loss of offsite power.~~ The applicant must also show conformance with the requirements of General Design Criterion 4 regarding possible damage as a result of high energy line breaks. Therefore, we cannot find the reactor plant component cooling water system to be acceptable. The reactor plant component cooling water system does not comply with the criteria of SRP Section 9.2.2.

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9.2.3 Makeup Water Treatment System (Demineralized Water Makeup System)

The makeup water treatment system was reviewed in accordance with Section 9.2.3 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Prcoedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the makeup water treatment system with respect to the applicable regulations of 10 CFR 50.

The nonsafety-related makeup water treatment system includes all components and piping associated with the system from the plant makeup water source (deep wells) to the points of discharge to other systems. The system has no safety-related function. The system is capable of fulfilling the normal operating requirements of the facility for acceptable makeup water with the necessary component redundancy. The applicant states that entry of potentially radioactive water into [illegible] system is precluded by assuring a greater pressure for the makeup water treatment system than in the potentially radioactive sources to which it discharges. [The applicant should show whether this greater pressure is maintained under all conditions, including a design basis accident or loss of offsite power. If

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not, the applicant must explain how, as the result of a seismic event, adjacent or continguous safety-related systems (including the control building chilled water system) and control room personnel are protected against the intrusion of radioactive water which has passed into the makeup water system, in order to comply fully with Position C.2 of Regulatory Guide 1.29, "Seismic Design Classification.] Conductivity of the water leaving each demineralizer exchange unit is monitored continuously; an alarm is sounded in the auxiliary control room to alert the operators when the effluent has a high conductivity denoting an abnormal condition. The applicant stated that makeup water is supplied only to one safety-related system the control building chilled water system and only during normal operating conditions; the safety-related standby service water systems takes over this function during accidents. Safety-related valves designed to seismic Category I, Quality Group C standards operate automatically during a LOCA to isolate the makeup water treatment system from the safety-related systems; the valves may be operated manually at other times. This meets the requirements of General Design Criterion 2 with regard to seismic events by being in compliance with Position C.3 of Regulatory Guide 1.29, "Seismic Design Classification."

Each unit has a separate makeup water treatment system. However, the system has no safety-related function, and

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therefore, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components" do not apply. For the same reason, (no safety-related function) General Design Criteria 44, 45 and 46, entitled respectively, "Cooling Water," "Inspection of Cooling Water System," and "Testing of Cooling Water System." are not applicable.

Based on the above, we conclude that the makeup water treatment does not fully comply with the requirements of General Design Criterion 2 with respect to the need for protection of other systems which are safety-related in the event of failure of this system as a result of a seismic event because it does not meet the guidelines of Position C.2 of Regulatory 1.29. Therefore, we cannot find that the applicant's submittal with regard to the makeup water system is acceptable. The makeup water treatment system does not comply with the acceptance criteria of SRP Section 9.2.3.

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9.2.4 Domestic Water and Sanitary Drains and Disposal Systems (Potable and Sanitary Water System)

The domestic water and sanitary drains and disposal systems were reviewed in accordance with Section 9.2.4 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria ~~as noted below~~ formed the basis for our evaluation of the domestic water and sanitary drains and disposal systems with respect to the applicable regulations of 10 CFR 50.

The nonsafety-related (Quality Group D, nonseismic-Category I) domestic water and sanitary drains and disposal systems provide water for human consumption and sanitary waste water treatment. There are no cross-connections between these systems and any systems which contain radioactive material or which have the potential for carrying such material. One of these systems, the domestic water supply system, provides potable water to all installed plumbing fixtures.

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The water is pumped from deep wells by two operating pumps; the system contains three pumps with the third pump maintained as a spare. The pumps alternate in operation so all three pumps get equal wear. A controlled amount of sodium hypochlorite is added to the water in order to disinfect the well water. The disinfected, potable water is then transferred to the plant buildings through an underground piping system.

The sanitary drains and disposal system conveys the sanitary waste from the appropriate buildings to a waste treatment plant by means of two sewage pumps. The waste treatment plant treats the sewage by aeration after which the sewage is separated into sludge and clarified liquid. The sludge is trucked offsite for disposal while the clarified liquid is chlorinated in a dry tablet chlorination unit and then discharged into the storm drainage system.

The systems have no safety-related function. Since these systems have no contact with systems which contain radioactive products or which could carry radioactive products, the requirements of General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment," are met.

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Based upon our review, we conclude that the domestic water and sanitary drains and disposal systems meet the requirements of General Design Criterion 60 with respect to prevention of release of potentially radioactive water, and are, therefore, acceptable. The domestic water and sanitary drains and disposal systems comply with the criteria of SRP Section 9.2.4.

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9.2.5 Ultimate Heat Sink

The ultimate heat sink was reviewed in accordance with Section 9.2.5 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the bases for our evaluation of the ultimate heat sink with respect to the applicable regulations of 10 CFR 50.

The ultimate heat sink (UHS) provides cooling water to the standby service water systems for both units only during accident conditions and/or loss of off-site power for cooling of essential plant auxiliary components. The UHS for each unit consists of a separate mechanical draft standby service water cooling tower and its associated water basin. Each tower has four independent fan cells with five vaneaxial fans in each cell. Two operating fan cells are required for safe shutdown. The fans dissipate heat to the atmosphere from the warm standby service water returned to the tower after cooling plant

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components. The UHS is designed so that each cooling tower can provide adequate heat removal capability to safely shut down its own unit. The fans in each tower are powered from redundant essential power supplies with each providing power to two fan cells. The standby service water system pumps take suction from the cooling tower basins. The standby service water system is described in Section 9.2.7 of this SER.

The concrete cooling towers and basins are designed to seismic-Category I requirements and are designed to withstand the effects of floods and tornadoes, thus complying with the guideline contained in Position C.2.a of Regulatory Guide 1.27, "Ultimate Heat Sink for Nuclear Power Plants." The UHS can withstand reasonably probable combinations of less severe events, thus complying with the guideline contained in Position C.2.c of Regulatory Guide 1.27 and with credible single failure of manmade structural features, thus complying with the guideline contained in Position C.2.d of Regulatory Guide 1.27.

Compliance with Position C.2.b of Regulatory Guide 1.27 is discussed in Section 2.2.3 of this SER.

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The cooling tower fans are seismic Category I, Quality Group C. The UHS has four standby service water lines withdrawing water from the cooling tower basin and two lines returning water, thus meeting the guidelines of Position C.3 of Regulatory Guide 1.27. Thus, the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," and the guidelines of Regulatory Guides 1.29 (Position C.1), "Seismic Design Classification" and 1.27, "Ultimate Heat Sink for Nuclear Power Plants," related to protection against natural phenomena are satisfied.

There are no high-energy systems or other sources of potential internally generated missiles in the vicinity of the UHS. The tower walls are designed against the effects of externally (tornado) generated missiles. The cooling tower plenum openings are equipped with concrete baffles to protect the fans from possible damage. The fan motors are enclosed in the missile-protected concrete structure. Thus, the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," and the guidelines of Regulatory Guide 1.117, "Tornado Design Classification," are satisfied.

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There is no sharing of UHS facilities between units. Therefore, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

The applicant has used Branch Technical Position ASB 9-2, "Residual Decay Energy for Light-Water Reactors for Long Term Cooling," to establish the heat input to the UHS due to fission product and heavy element decay. The applicant performed analyses to verify the performance capability of the UHS assuming worst one-day and 30-day site meterology. [We are reviewing these analyses in order to ascertain whether the UHS provides adequate heat transfer capability to remove ~~decsy~~ decay heat without makeup water for a 30-day period in accordance with the requirements of General Design Criterion 44, "Cooling Water."] Primary makeup can be provided from the nonsafety-related makeup water system (see this SER, Section 9.2.3) if this system is available. Other sources include the Mississippi River by means of a temporary pump and piping into the storage basin or by the use of tank trucks to convey the river

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water from the barge slip, and the use of a new drilled well which, the applicant stated, could be put into operation within a few days. Protection of the system against freezing is discussed in Section 2.4.5 of this SER.

Based on the above, we conclude that UHS meets the requirements of General Design Criteria 2, 4, 5, 45, and 46 with respect to protection against natural phenomena, missiles, environmental effects, shared systems function, inservice inspection and functional testing, and the guidelines of Regulatory Guides 1.27, 1.29, 1.102, and 1.117 and Branch Technical Position ASB 9-2 with respect to seismic classification, ultimate heat sink design ~~capability,~~ capability and flood and tornado missile protection. [However, we are reviewing the capability of the plant to provide the required heat removal with the available water supply in order to show compliance with General Design Criterion 44.] Therefore, we cannot conclude that the applicant's submittal relating to the UHS is acceptable. The ultimate heat sink does not comply with the acceptance criteria of SRP Section 9.2.5.

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9.2.6 Condensate Storage Facilities

The condensate storage facilities were reviewed in accordance with Section 9.2.6 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the condensate storage facilities with respect to the applicable regulations of 10 CFR 50.

The nonsafety-related (Quality Group D, nonseismic Category I) condensate storage and transfer system includes all components and piping associated with the system from the storage tanks to the points of connection or interfaces with other systems. The primary functions of the condensate storage system are to provide makeup to the condenser hotwell and to provide a dedicated water supply for the reactor core isolation cooling (RCIC) and the high pressure core spray (HPCS) systems and as an alternative source for the control rod drive system (the primary source is the condensate water treatment system). The alternative water supply for the RCIC and HPCS systems for safe shutdown is the safety-related suppression pool. Additionally, the 620,000-gallon condensate storage tank (including a total of 125,000 gallons reserved for use by both the RCIC and

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HPCS) provides demineralized water for the fuel pool cooling and cleanup system, the refueling water system and other miscellaneous uses.

A separate condensate storage and transfer system is provided for each unit of the plant. Thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems, and Components," are not applicable.

The valves at the suction of the HPCS and RCIC pumps operate automatically on receipt of a condensate storage tank (CST) low water level signal to isolate the CST from the HPCS and RCIC pumps and to open the valves leading from the safety-related suppression pool to the suction sides of the HPCS and RCIC pumps thereby protecting these pumps in the event of failure of either the CST or piping from the CST to the valves which isolate the CST from the HPCS and RCIC. The CRD hydraulic system only uses the CST an an alternate source of water. In the event of loss of both water supply sources, the scram accumulators provide for insertion of control rods. The other safety-related systems which use the CST as a source of water, are the spent fuel pool cooling system, the residual heat removal system, and the standby liquid control system. All of these systems are capable of performing their safety-related functions without the condensate storage facilities. Therefore, the

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criteria of General Design Criteria 44, "Cooling Water," 45, "Inspection of Cooling Water Systems" and 46, "Testing of Cooling Water Systems," do not apply to the condensate storage facilities.

The level instruments which provide for shift of RCIC and HPCS pump suction are safety-related, as are their power supply transmitters and other auxiliary equipment. The level instruments are attached to that portion of the piping leading to the RCIC and HPCS pumps which is safety-related. Containment isolation boundaries between the condensate storage facilities and safety-related systems are designed in accordance with the guideline of Position C.1 of Regulatory Guide 1.29, "Seismic Design Classification," and are in buildings designed to resist tornadoes and the safe shutdown earthquake. The condensate storage facilities are designed to comply with the guidelines of Positions C.2 and C.3 of Regulatory Guide 1.29 in that valves serving as isolation boundaries between the condensate storage facilities and safety-related systems are designed in accordance with the criteria for seismic Category I components and that failure of the condensate storage facilities as a result of a seismic event would not result in damage to any safety-related system. This complies with the guidelines of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

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The applicant has stated in Section 15.7.3 of the FSAR that condensate storage tank failure would not affect the NSSS. (In order to verify this statement, the applicant should show that a catastrophic failure of the CST would not cause flooding of any safety-related systems, including electrical power supplies and controls, in the vicinity of the CST.) (The applicant must also show that a crack in the piping from the CST to the HPCS/RCIC would not adversely affect the operation of these or other safety-related systems.)

We conclude that the condensate storage facilities comply with the guidelines of Positions C.1, C.2, and C.3 of Regulatory Guide 1.29, thus complying with the requirements of General Design Criterion 2. (However, the applicant must show that failure of the CST and a crack in the piping does not prevent satisfactory operation of the HPCS and RCIC pumps nor does the CST failure or piping crack constitute a danger to these other safety-related equipment in order to comply with General Design Criterion 4, "Environmental and Missile Design Bases.)" Therefore, we cannot conclude that the design of the condensate storage facilities is acceptable nor that the design complies with the acceptance criteria of SRP Section 9.2.6.

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9.2.7 Standby Service Water System

The standby service water system (SSW) was reviewed in accordance with Section 9.2.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the standby service water system with respect to the applicable regulations of 10 CFR 50.

The standby service water system (SSWS) supplies cooling water to the plant from the basin of the ultimate heat sink cooling tower as discussed in Section 9.2.5 of this SER. The system ~~operated~~ operates during accident and/or loss of offsite power conditions. Under these conditions, it provides cooling to the following essential plant components: standby diesel-generator coolers, HPCS diesel-generator cooler, control building A/C chillers, RHR heat exchangers, RHR pump seal coolers, fuel pool cooling heat exchangers, penetration valve leakage control compressors, and unit cooler coils in the containment and the auxiliary building. In addi.ion,

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the SSWS provides emergency makeup to the fuel pool. The SSWS coolant leaving the residual heat removal heat exchangers is monitored for radiation and can be isolated on a high-radiation alarm. A separate redundant SSWS is provided for each of the two units. Thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

The SSWS consists of two independent piping loops per unit labeled "A" and "B", one of which is required to assure safe shutdown. The "A" and "B" loops serve redundant heat exchanger equipment. Diesel generator heat exchangers are served by the loop they power. The HPCS diesel generator heat exchanger and room cooler are served by either loop. Each loop is provided with two 50-percent capacity pumps located in a separate cubicle in the standby service water pumphouse. The SSWS pumps circulate water in a closed cycle from the ultimate heat sink cooling tower basin through the components to be cooled and back to the cooling tower. Each division is powered from its associated diesel generator emergency bus.

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The system is housed in seismic Category I, flood and tornado protected structures (refer to Sections 3.4.1 and 3.5.2 of this SER). It is designed to seismic Category I, Quality Group C requirements. Underground piping of the SSWS, which connects the parts of the system in these structures, is also protected from these natural phenomena.

The SSWS shares piping and valves with the nonsafety-related normal service water system (described in Section 9.2.1 of this SER). In the event of a design basis accident (DBA) automatic block valves and check valves act to isolate the safety-related SSWS from the nonsafety-related service water system. These shared components, as well as the isolation valves, are designed in accordance with the guidelines of Quality Group C and seismic Category I. Any valves which serve as containment isolation valves, however, are designed in accordance with the guidelines of Quality Group B and seismic Category I. This complies with the guidelines of Position C.1 and C.2 of Regulatory Guide 1.29, "Seismic Design Classification." Thus, the requirements of General Design Criterion 2,

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"Design Bases for Protection Against Natural Phenomena," are satisfied.

The SSWS is protected against internally and externally generated missiles (see Section 3.5.1 of this SER) and against the effects of pipe whip and jet impingement resulting from high and moderate energy line breaks (as discussed in Section 3.6.1 of this SER). Therefore, the SSWS complies with the guidelines of General Design Criterion 4, "Environmental and Missile Design Bases."

In the event of a DBA two standby service water pumps, each powered by a different onsite essential (Class 1E) power source are started. Only one is required in the initial phases of a DBA. In the event one of these two pumps fail when two are required, i.e., later in the DBA, when the residual heat exchangers are needed to cool the plant, another pump can be started manually.

The applicant has provided ~~calculations~~ calculations to show that the SSWS is capable of transferring heat loads from safety-related components to the ultimate heat sink under ~~all~~ emergency ~~modes of operation~~ conditions in order to show compliance with

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General Design Criterion 44, "Cooling Water." We are reviewing these calculations and will report on the results of that review.]

The availability of the SSWS pumps is assured by periodic functional tests and inspections as delineated in the plant Technical Specifications. The system design also incorporates provisions for accessibility to permit in-service inspection as required. Thus, we conclude that the requirements of General Design Criterion 45, "Inspection of Cooling Water System," and 46, "Testing of Cooling Water System," are satisfied.

Based on the above, we conclude that the SSWS meets the requirements of General Design Criteria 2, 4, 45 and 46 with respect to the system's protection against natural phenomena, environment and missiles, inservice inspection and functional testing. [We are reviewing the capability of the system to transfer the required heat loads in accordance with the requirements of General Design Criterion 44.] Therefore, we cannot find the applicant's submittal acceptable with regard to the standby service water system. The system does not comply with the acceptance criteria of SRP Section 9.2.7.

9.2.8 Turbine Plant Component Cooling Water (TPCCW) System

The nonsafety-related turbine plant component cooling water (TPCCW) system was reviewed in accordance with applicable portions of Section 9.2.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of SRP section was performed, according to the guidelines provided in the "Review ~~Prcoedices~~ Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the bases for our evaluation of the turbine plant component cooling water system with respect to the applicable regulations of 10 CFR 50.

The TPCCW system is designed to remove heat from designated heat exchangers in the turbine and radwaste buildings. The TPCCW system is not a safety-related system; it is not required for operation during accidents nor for safe shutdown of the plant. It is designed in accordance with Quality Group D standards; it has no interfaces with any seismic Category I systems and is not designed in accordance with seismic Category I standards; therefore, Regulatory Guide 1.29, "Seismic Design Classification," is not applicable except for Position C.2. [In order to meet the guidelines of Position C.2 thus complying with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," the applicant must demonstrate that all safety-related systems are protected against flooding in the event of a pipeline break in the TPCCW system.]

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Since the TPCCW system has no safety function nor interfaces with a safety system, General Design Criterion 44, "Cooling Water," 45, "Inspection of Cooling Water" and 46, "Testing of Cooling Water" and 46, "Testing of Cooling Water System," do not apply.

The TPCCW system has no safety function and thus, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components" are not applicable.

[The applicant must demonstrate that all safety-related systems are protected against flooding in the event of a break in the TPCCW system in order to show compliance with General Design Criterion 2.]

Therefore, we cannot find the applicant's submittal acceptable regarding the turbine plant component cooling water system. The TPCCW does not comply with the acceptance criteria of SRP Section 9.2.2.

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9.2.9 Ventilation Chilled Water System

The nonsafety-related ventilation chilled water system (VCWS) was reviewed in accordance with applicable portions of Section 9.2.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP Section. Conformance with the acceptance criteria formed the basis for our evaluation of the ventilation chilled water system with respect to the applicable regulations of 10 CFR 50.

The ventilation chilled water system consists of two subsystems, one located in the turbine building, the other in the radwaste building. The subsystem in the turbine building serves the turbine building, turbine building sample room, condensate demineralizer offgas building and the containment. The second subsystem serves the radwaste and fuel buildings.

The FSAR states that the subsystems are not designed in accordance with seismic Category I or Quality Group A, B, or C standards because they are not required to operate during accident conditions or for safe shutdown. However, piping and valves required for containment and drywell isolation are designed to seismic Category I and Quality Group C standards, thus meeting the guidelines of Position C.3 of Regulatory Guide 1.29, "Seismic Design Classification." The applicant must show that the VCWS meets the

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guidelines of Position C.2 of Regulatory Guide 1.29, in order to comply fully with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena." [In order to meet the guidelines of Position C.2 of Regulatory Guide 1.29, the applicant must demonstrate that all safety-related systems are protected against flooding in the event of a pipe break in the VCWS.]

The requirements of General Design Criterion 44, "Cooling Water," 45, "Inspection of Cooling Water System," and 46, "Testing of Cooling Water System" do not apply since the system is not required to mitigate any accidents nor is it required for safe shutdown of the plant.

Since the ventilation chilled water system is nonsafety-related, the requirements of General Design Criteria 5, "Sharing of Structures, Systems and Components" are not applicable.

[The applicant must demonstrate compliance with General Design Criterion 2.] Therefore, we cannot find the ~~applicant;s~~ applicant's submittal acceptable with regard to the ventilation chilled water system. The VCWS does not comply with the acceptance criteria of SRP Section 9.2.2.

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9.2.10 Control Building Chilled Water System (CBCWS)

The control building chilled water system (CBCWS) was reviewed in accordance with Section 9.2.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Prcoedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the control building chilled water system with respect to the applicable regulations of 10 CFR 50.

This system is designed to remove heat from the main control room, standby switchgear room and chiller equipment room. It is designed in accordance with the criteria of seismic Category I and Quality Group C. The CBCWS will not be discussed further in this section as it is discussed fully in Section 9.4.1, including its compliance with the criteria of Section 9.2.2.

9.2.11 Cooling Tower Makeup Water System (CTMWS)

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The nonsafety-related cooling tower makeup water system was reviewed in accordance with the applicable portions of Section 9.2.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the cooling tower makeup water system with respect to the applicable regulations of 10 CFR 50.

The cooling tower makeup water system provides water from the Mississippi River as makeup to the normal service water system and to the circulating water system; it supplies water to replenish blowdown of 220 gpm from each River Bend Station unit. The CTMWS uses clarifiers to remove the solids suspended in the water supplied to each unit. The system contains three pumps to supply water; one for each unit with one on standby.

The system is nonsafety-related, it is not required to mitigate accidents nor for plant safe shutdown. It is designed to nonseismic Category I standards, and Quality D standards in accordance with the requirements of Regulatory Guide 1.26, "Quality Group Classifications and

Standards for Water-, Steam-, and Radioactive Waste Containing Components of Nuclear Power Plants." The CTMW system has no interface with any safety system; therefore Regulatory Guide 1.29, "Seismic Design Classification," is not applicable except for Position C.2. [In order to meet the guidelines of Position C.2, thus complying with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," the applicant must demonstrate that all safety-related systems are protected against flooding in the event of a pipeline break in the TPCCW system.] Since the system is not safety-related, General Design Criterion 4, "Environmental and Missile Design Bases," is not applicable.

General Design Criterion 5, "Sharing of Structures, Systems and Components," does not apply because the system has no safety function. Since the CTMW system has no safety function General Design Criterion 44, "Cooling Water," 45, "Inspection of Cooling Water" and 46, "Testing of Cooling Water System" are not applicable.

[The applicant must demonstrate that all safety-related systems are protected against flooding resulting from a break or rupture of the CTMW system in order to comply with the requirements of General Design Criterion 2.] Therefore, we cannot find the applicant's submittal acceptable with regard to the cooling tower makeup water system. The system does not comply with the acceptance criteria of SRP Section 9.2.2.

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9.3.1 Compressed Air Systems

The compressed air system was reviewed in accordance with Section 9.3.1 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the compressed air system with respect to the applicable regulations of 10 CFR 50.

The compressed air system contains two compressed air subsystems. One is safety-related and supplies compressed air to the safety relief valves (SRVs), to the main steam positive leakage control system (MS-PLCS), and to the penetration valve leakage control system (PVLCS); the other is nonsafety-related and provides compressed air for three subsystems composed of the instrument air system, the service air system and the breathing air system.

The safety-related compressed air system for each unit consists of two redundant trains each containing an inlet filter, air compressor aftercooler, moisture separator, and accumulator tank. The compressors continuously maintain a set pressure in the accumulator tanks which in turn supply the ADS accumulators, the MS-PLCS and the PVLCS. Each unit

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of the plant is provided with a separate safety-related compressed air system. Therefore, the requirements of General Design Criterion 5, "Sharing of Structures, Systems, and Components," are not applicable.

The safety-related compressed air system is an integral part of the PVLCS. The compressors supplying air to the safety-related compressed air system are seismic Category I, Safety Class 2 as are the components and piping in the PVLCS. However, the seismic category and quality group of the piping and components that interface with the safety/relief valves cannot be determined because the figures provided by the applicant (Figures 5.2-14a, 5.2-14b, and 9.3-13a) do not show their safety class. (Therefore, we cannot determine whether the interface complies with the appropriate guidelines of Positions C.1 and C.3 of Regulatory Guide 1.29, "Seismic Design Classification.")

The safety-related compressed air system is located within seismic Category I, flood and tornado-protected structures (refer to Sections 3.4.1 and 3.5.2 of this SER). The system is also protected from the effects of missiles and pipe breaks (refer to Sections 3.5.1.1, 3.5.1.2, and 3.6.1 of this SER). Thus, the system satisfies the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena" with the exception of compliance of the interface between the compressed air system and the safety/relief valves with seismic criteria as contained in Regulatory Guide 1.29.

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The applicant stated that the MS-PLCS and PVLCS do not require dry air because the systems are wet when the compressed air is provided to them. The applicant noted that the inlet air to the compressors was filtered through a 5 micron filter. Regarding the safety/relief valves the FSAR Section 5.2.2 indicates that the air supplied to these valves from the PVLCS is dried to a dewpoint of 0 F and filtered to a maximum particle size of 3 micron. However, the 3 micron filter does not appear in the P&ID of the PVLCS (Figures 9.3.13a and b). (The applicant should show how the compressed air supply to the safety/relief valves complies with the requirements of ANSI MC 11.1-1976 (ISA-S7.3), "Quality Standard for Instrument Air," with regard to dew point, oil or hydrocarbon content, and freedom from corrosive or hazardous contaminants in order to comply with the criteria of General Design Criterion 1, "Quality Standards and Records.") ~~The applicant should correct the narrative in the FSAR in Sections 9.3.1 and 9.3.6, wherein both the nonsafety-related and safety-related compressed air systems appear to take credit for providing compressed air to the safety/relief valves.)~~ It is our position that a periodic check, at least yearly, be made to assure that air being provided to the safety/relief valves complies with the standards of ANSI MC 11.1-1976. (The applicant should commit to this periodic testing.)

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The nonsafety-related compressed air systems for each unit consists of three 50% capacity trains, each containing an air compressor, inlet filter, coolers, and receiver tank, all feeding a common manifold. The nonsafety-related service air system takes air from the manifold and distributes it throughout the unit. Air from the manifold is fed to two 50% capacity package dessicant air dryers and filters to produce clean, dry, oil-free air for the nonsafety-related instrument air system in accordance with ANSI Standard MC 11.1-1976 (ISA-S7.3), thus complying with the requirements of General Design Criterion 1. This air is distributed throughout the unit by a nonseismic Category I, Quality Group D piping system.

The nonsafety-related instrument and service air systems have no function necessary for achieving safe reactor shutdown conditions or for accident prevention or mitigation. Instruments, controls and services required for safe shutdown of the plant such as those controlling MSIVs and certain ventilation system dampers are provided with seismic Category I passive air accumulators to assure their proper function in case of a loss of instrument air. All other air-operated valves including the scram discharge inlet and outlet valves and other devices are designed for a fail-safe mode upon loss of instrument air and do not require a continuous air supply under emergency

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or abnormal conditions. Additionally, all instrument and service air system containment penetrations are provided with redundant seismic Category I, Quality Group B isolation valves, thus complying with the guidelines of Position C.1 of Regulatory Guide 1.29. Since a failure of the instrument and service air systems will not prevent safe reactor shutdown, we conclude the requirements of General Design Criteria 2 and 5 are not applicable.

The review of preoperational testing of the compressed air systems and compliance with Regulatory Guide 1.68.3, "Preoperational Testing of Instrument Air Systems," is contained in Section 14.0 of this SER.

Based on the above, we conclude that the safety-related compressed air system meets the requirements of General Design Criteria 2 regarding protection against natural phenomena and the guidelines of Regulatory Guide 1.29 concerning the seismic classification with the exception noted above regarding the interface between the safety/relief valves and PVLCS. Further, we cannot conclude that the safety-related compressed air system meets the criteria of General Design Criterion 1 and the guidelines of ANSI MC 11.1 regarding instrument air quality. In view of the foregoing, we cannot

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conclude that the applicant's submittal concerning the safety-related compressed air system is acceptable. However, we conclude that the applicant's submittal regarding tne nonsafety-related compressed air system is acceptable. Also, the applicant must commit to periodic testing of the air quality of the safety-related compressed air system and must correct the FSAR as noted above. The nonsafety-related compressed air system meets applicable acceptance criteria of SRP Section 9.3.1; the safety-related compressed air system does not comply with the applicable acceptance criteria of SRP Section 9.3.1.

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9.3.3 Equipment and Floor Drainage Systems

The equipment and floor drainage systems were reviewed in accordance with Section 9.3.3 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the equipment and floor drainage systems with respect to the applicable regulations of 10 CFR 50.

The equipment and floor drainage systems are nonsafety-related and are designed to transfer both effluents which are radioactive or potentially radioactive and those which are not radioactive or potentially radioactive. Systems which convey the radioactive effluents are separated from systems which convey the nonradioactive effluents except in the case of the equipment drain sumps in the turbine building, fuel building and reactor building where the sump discharges are monitored by the plant computer. When the conductivity of any of these three equipment drain sump discharges

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is low, the effluent is directed to the condenser; when high, (indicating high radiation), to the radwaste system. Extreme high sump discharge conductivity or high or low sump water level activates a control room equipment drain sump alarm to alert plant operators. With these exceptions, radioactive effluents from various parts of the plant are conveyed in drainage subsystems which are separated from those conveying nonradioactive effluents. Each drainage sump receiving radioactive effluents is provided with a nonporous liner to prevent transport of its contents through the sump wall. Radioactive drainage is collected in floor and equipment drain sumps in each building and discharged to the radwaste processing system. Drainage from nonradioactive sources such as plumbing fixtures and roof drains is discharged to the sanitary waste treatment systems and discharge basin, respectively.

We cannot determine that there is no potential for inadvertent transfer of radioactive drainage to nonradioactive collection areas, since the description and P&IDs for floor drains in several areas of the plant have not yet been submitted by the applicant.

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[The applicant should provide drawings and narrative to complete the description of the equipment and floor drainage systems.]

Containment penetrations for the equipment and floor drainage system are designed to seismic Category I and Quality Group B requirements. Each unit has its own equipment and floor drainage systems; therefore, the guidelines of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

The LPCS, HPCS, RHR-A (Train A), RHR-B (Train B), RHR-C (Train C) and RCIC pumps are located in individual watertight cubicles at the lowest elevation in the auxiliary building. Each cubicle contains a sump with duplex sump pumps. Collected leakage in the cubicle is automatically pumped to the radwaste system. Back-flooding of the ECCS rooms is prevented by two check valves on the piping penetrating the cubicle wall with one inside, one outside the cubicle; the valves and intervening piping are designed in accordance with seismic Category I and Quality Group B criteria. Each

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cubicle sump contains a wall-mounted level transmitter (designed to seismic Category I, Quality Group B criteria) which sounds an alarm and provides level indication in the control room in case of rising water level. We therefore conclude that this portion of the system meets the requirements of General Design Criteria 2, "Design Bases for Protection Against Natural Phenomena," 4, "Environmental and Missile Design Bases," and 60, "Control of Releases of Radioactive Materials to the Environment," and the guidelines of Regulatory Guide 1.29, "Seismic Design Classification."

Section 9.2.6, "Condensate Storage Facilities," indicates that a sump collects leakage from the condensate storage tank and pumps it to the radwaste system. This sump is not shown on the P&IDs. Further, there does not appear to be a seismic Category I dike around this large outside storage tank. [Therefore, the applicant must explain how, in the event of rupture of the nonseismic Category I condensate storage tank, the radioactive contents of the tank are prevented from entering the environment and how flooding of safety-related equipment is prevented.]

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Since the description of the equipment and floor drainage system is incomplete, we cannot conclude that the systems meet the guidelines of Positions C.1 and C.3 of Regulatory Guide 1.29 (indicating seismic Category I design for both containment isolation and interfaces with safety-related systems); thus we cannot conclude that the systems comply with the requirements of General Design Criterion 2. Again, because of the incomplete submittal and lack of information regarding catastrophic failure of the condensate storage tank, we cannot conclude that the plant is protected against flooding, in compliance with the requirements of General Design Criterion 4 nor can we conclude that the systems comply with the requirements of General Design Criterion 60 with regard to release of radioactive material to the environment. Therefore, we cannot conclude that the applicant's submittal is acceptable. The equipment and floor drainage systems do not comply with the acceptance criteria of SRP Section 9.3.3.

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9.3.5 Standby Liquid Control System

The standby liquid control system was reviewed in accordance with Section 9.2.5 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the standby liquid control system with respect to the applicable regulations of 10 CFR 50.

The standby liquid control system (SLCS) is a reactivity control system. Its purpose is to inject sodium pentaborate solution into the primary system to provide an independent means for shutting down the reactor. The SLCS can bring the reactor from rated power to cold shutdown any time during core ~~like~~ life should the normal reactivity control system become inoperable. Thus, it (together with the control rod system) satisfies the requirements of General Design Criterion 26, "Reactivity Control System Redundancy and Capability." (Refer to Section 4.6 of this SER for a discussion of reactivity control.)

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The system consists of a storage tank, a test tank, and two trains, each containing a positive displacement pump, and an explosive-actuated valve at each pump discharge, a motor operated valve at each pump suction together with piping and controls all located within the containment. The maximum temperature at which the solid material would precipitate from solution 59°F while the room in which the equipment containing the borated solution is maintained at a temperature of 70 to 100°F. An electrical resistance heating system maintains the solution in the storage tank at a temperature between 75 and 85 degrees Fahrenheit to prevent precipitation of the sodium pentaborate from solution during storage. Both the high and low tank liquid level and temperature are alarmed in the control room. The two explosive-actuated valves provide assurance that they will open when needed, and the design of the valve assures that boron will not leak into the reactor during SLCS pump testing. The two pumps in parallel trains draw the solution from the storage tank via a common suction line and discharge it into the reactor vessel via a common injection line. The discharge from each pump is provided with a check valve (to prevent backflow), and a crossover line.

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Similarly, the piping at the pump suctions is also connected by a crossover.

Each pump and its associated valves are powered from separate emergency AC power supplies. They are arranged so that failure of a single pump or valve will not prevent adequate amounts of sodium pentaborate solution from entering the reactor vessel to effect shutdown.

System initiation is accomplished by manual actuation of either of two key-locked switches on the control room panel. Changing either switch status to "run" starts an injection pump, actuates an explosive valve on the pump discharge, opens a pump suction valve (which is also the tank outlet valve) and closes the reactor cleanup system isolation valves to prevent loss or dilution of boron. Should the instrumentation provided indicate that the solution is not entering the reactor vessel, the operator can turn the other key-operated switch to the "run" position to actuate the alternate train.

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The SLCS is located in a compartment within the seismic Category I, flood- and tornado-protected containment building outside of the drywell and below the refueling floor. All portions of the SLCS necessary for injection of sodium pentaborate solution into the reactor are seismic Category I, Quality Group B (or Quality Group A if they are part of the reactor coolant pressure boundary). Thus, the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," are complied with by meeting the guidelines of Regulatory Guide 1.29, "Seismic Design Classification."

The containment compartment in which the system is located provides protection against external or internally generated missiles. The SLCS is separated from nonseismic system components and from the effects of breaks in other high- and moderate-energy piping systems. (Refer to Section 3.5.1.2 and 3.6.1 of this SER). Thus, the SLCS complies with the criteria of General Design Criterion 4, "Environmental and Missile Design Bases."

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The SLCS is redundant so that no single active failure will compromise its functional capability. The injection portion of the system can be functionally tested by injecting demineralized water from a test tank into the reactor. In addition, the reactivity control systems have the capability of reliably controlling reactivity changes resulting from postulated accident conditions with allowance for the most reactive control rod withdrawn so that core cooling is maintained, thus satisfying the requirements of General Design Criterion 27, "Combined Reactivity Control Systems Capability" (See Section 4.6, of this SER for further details).

Based on the above, we conclude that the standby liquid control system is in conformance with the requirements of General Design Criteria 2, 4, 26, and 27 as they relate to protected against natural phenomena, system function and system redundancy and testability. The SLCS is, therefore, acceptable. The standby liquid control system complies with the criteria of SRP Section 9.3.5.

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9.4.1 Control Building Ventilation System (Control Room Area Ventilation System

The control building ventilation system was reviewed in accordance with Section 9.4.1 (Section 9.2.2 for the portion of the system known as the Control Building Chilled Water System) of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria except as noted below formed the basis for our evaluation of the control building ventilation system with respect to the applicable regulations of 10 CFR 50.

The control building ventilation system is composed of three separate ventilating systems and a common chilled water system. These systems are, as follows:

(1) Main Control Room Air-Conditioning System

(2) Standby Switchgear Rooms Air-Conditioning System,

(3) Chiller Equipment Room Air-Conditioning System,

(4) Control Building Chilled Water System (CBCWS).

The main control room air conditioning (MCRAC) system covers the control room and the extended term habitability area of the control building. (Refer to

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Section 6.4 of this SER for further discussion of control room habitability.)

The control building in each unit is served by its own ventilation system and there is no sharing between units. Therefore, the requirements of General Design Criterion 5, "~~Sharing of General Design Criterion 5,~~ "Sharing of Structures, Systems and Components," are not applicable.

Each of the systems comprising the control building ventilation system is described below, as is each system's compliance with the applicable acceptance criteria found in the SRP.

1) Main Control Room Air Conditioning System (MCRAC)

   The main control room air conditioning system consists of two fully redundant trains, each containing filters, chilled water cooling coils, a fan, an electrical heating coil, the ductwork associated with each train and common ductwork, isolation dampers and tornado-missile protected inlet and exhaust louvers. There is also a parallel emergency recirculation system containing charcoal filtration trains for the removal of radioactive particles and noxious gases in the event

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of an accident or high radiation signal. Nonredundant ductwork serves the areas to be cooled. Each train is supplied with power from a separate ESF bus. Chilled water to the cooling coils is provided by a safety-related chilled water system described later in this section. An indication of low flow from the operating train automatically starts the redundant train, repositions the pertinent dampers and sounds an alarm in the control room.

The main control room air conditioning system (MCRAC) is designed to maintain the control room within the environmental limits required for operation of plant controls and for uninterrupted safe occupancy during all operating modes including LOCA conditions. The system is designed to maintain the control room under positive pressure, except in the event of a chlorine release in which case the control room is isolated.

The main control room air is normally exhausted through the kitchen and lavatory; isolation of this exhaust is provided by redundant isolation dampers which are designed to actuate in the event of a LOCA, high outdoor radioactivity or chlorine signal (concentration

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of 5 ppm or greater). The outside air supply is diverted automatically, through one of the two charcoal filtration trains in the event of a LOCA (as a precaution) or high radiation signal and is closed, to completely isolate the main control room area, on a high chlorine signal. The main control room air conditioning system also provides cooling for the rooms containing the standby & switchgear rooms air conditioning subsystem.

The emergency recirculation system in the MCRAC system consists of two parallel charcoal filtration trains. Each train contains a charcoal filter unit containing a demister, electric heating coil, HEPA filter, charcoal filter and HEPA filter, a main fan (capacity 4000 cfm) and a decay heat fan (capacity 100 cfm) which exhausts to the MCRAC exhaust duct. The ductwork for both filtration units is joined before the charcoal filter units and after the main (~~400~~ 4000 cfm) fan so that either MCRAC system train may use either filtration unit. Each charcoal filter unit contains a deluge water spray system to extinguish fires in the unit should they occur. A thermistor detection system is installed in the charcoal beds set to alarm in the main control room.

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The MCRAC system is seismic Category I in accordance with the guidelines of Position C.1 of Regulatory Guide 1.29, "Seismic Design Classification." The MCRAC system is located in a seismic Category I building, the control building, thus, is protected against tornadoes, floods and other natural phenomena.

Smoke is removed from the control room by a separate subsystem which is sesimically supported but is not designed to operate after a design basis accident; this meets ~~with~~ Position C.2 of Regulatory Guide 1.29, "Seismic Design Classification." Therefore, the main control room air-conditioning system complies with the criteria of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena by virtue of its location within the control building and by meeting Positions C.1 and C.2 of Regulatory Guide 1.29.

By virtue of its location in the control building, the MCRAC system is protected against damage resulting from high energy pipe breaks. The air intakes and exhaust are protected against damage resulting from hign energy pipe breaks. The air intakes and exhaust are protected against damage resulting from high energy breaks. The air intakes and exhaust are protected against tornado missiles. Thus, the main control air conditioning subsystem complies with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases."

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The applicant has considered the accidental release of hazardous chemicals stored onsite in excess of 100 lbs in the design of the MCRAC, thus complying with the requirements of Position C.3 (in regard to reviewing the toxic chemicals stored onsite) of Regulatory Guide 1.78, "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release (a detailed discussion of this position is provided in Section 6.4 of this SER).

The applicant has also provided redundant isolation systems, air supply equipment and filtration equipment; this complies with the applicable portion of Position C.14 of Regulatory Guide 1.78. However, the detection instrumentation has been provided solely for chlorine and radioactivity. The need (or lack thereof) for detection of concentrations of other toxic or hazardous chemicals is discussed in Section 6.4 above of this SER. (The applicant must also show that the worst single failure of the radiation detection system will not allow entrance of radioactive material into the

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control room, in order to satisfy the single failure criterion in compliance with Section C.14 of Regulatory Guide 1.78).

It is not clear whether the recirculating charcoal filter or equivalent is used when the control room is isolated in the event of a chlorine release as recommended in the guidelines of Section C.4.a of Regulatory Guide 1.95, "Protection of Nuclear Power Plant Control Room Operators Against An Accidental Chlorine Release." (The applicant should justify this position.)

Compliance with the guidelines of Section C.4.d of Regulatory Guide 1.95 is discussed in Section 6.4, above, of this SER.

Therefore, we cannot find that the MCRAC system complies with the requirements of GDC 19, "Control Room," because of lack of information showing compliance with Positions C.7 and C.14 of Regulatory Guide 1.78 and Position C.4.a of Regulatory Guide 1.95.

The applicant notes that the charcoal ~~filttarion~~ filtration trains in the MCRAC systems complies with the guidelines of Positions ~~C.2.a through C.2.a~~ C.2.a through C.2.f and C.2.k of Regulatory Guide 1.52, "Design, Testing, and Maintenance Criteria for

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Post Accident Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants." [The applicant must provide a detailed response to show compliance with the guidelines of Positions C.2.a through C.2.f and C.2.k of Regulatory Guide 1.52.]

The applicant notes, with regard to compliance with Regulatory Guide 1.52, that an abnormal pressure drop across all critical components of each charcoal filtration train in the MCRAC system is alarmed in the control room and that flow through the charcoal filter train is indicated in the control room but have provided no facilities to record these readings. [The applicant must show how these readings will be recorded, in order to comply with the guidelines of Position C.2.g.]

[The applicant should justify use of associated Air Balance Council tests (as noted in Table 6.5.1 of the FSAR) in determining duct leakage in lieu of testing in accordance with Section 6 of ANSI N510-1975 in order to show compliance with the guidelines of Position C.2.1 of Regulatory Guide 1.52.]

A discussion of compliance with the guidelines of Position C.2.h of Regulatory Guide 1.52 is found in Sections 7 and 8 of this SER; compliance with the guidelines of Position C.2.j is discussed in Section 12 of this SER.

The charcoal filtration trains of the MRCAC system do not operate during normal operation; therefore the guidelines of Regulatory Guide 1.140, "Design, Testing, And Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration And Absorption Units of Light-Water-Cooled Nuclear Power Plants" are not applicable.

In view of the foregoing, i.e., incomplete compliance with Regulatory Guide 1.52, the MRCAC system fails to comply with the requirements of Regulatory Guide 60, "Control of Releases of Radioactive Materials to the Environment."

2. Standby Switchgear Rooms Air Conditioning (SSRAC) System

The standby switchgear rooms air conditioning system consists of two fully redundant 100% trains, each containing an air filter, electric heating coil, air cooling coils, fan, ductwork associated with each train, and redundant isolation dampers. Each of the three battery rooms served by this system contains two 100% exhaust fans. Nonredundant ductwork serves the areas to be cooled.

Both trains are powered from ESF buses so that emergency power is available from the diesel generator if offsite power is lost. Chilled water for the cooling coils is supplied by the safety-related control building chilled water system

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described later in this section. An indication of low flow from the operating train automatically starts the redundant train, repositions the pertinent dampers and sounds an alarm in the control room. This design prevents the failure of both trains due to a single active failure. Purging of smoke, carbon dioxide, or other contaminants from the areas served by the standby switchgear rooms air conditioning system may be accomplished by using a separate subsystem consisting of a fan and associated ductwork. The system serving to remove smoke from areas served by the SSRAC also serves to remove smoke from the main control room; it is seismically supported but it is not intended for use after a DBA, thus complying with Position C.2 of Regulatory ~~Gude~~ Guide 1.29.

The SSRAC system is designed to remove the heat generated in the areas served and maintain the environmental conditions within the limitation of the equipment involved during all operating modes including LOCA conditions. All essential portions of the system are located in the control building which is a seismic Category I, flood and tornado protected structure. The system itself is designed to seismic Category I, Quality Group C requirements. Therefore, the system complies with the guidelines of Position C.1 of Regulatory Guide 1.29. The SSRAC system thus complies with the criteria of General Design Criterion 2 by meeting Positions C.1 and C.2 of Regulatory Guide 1.29 and by virtue of its location in the control building.

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[The applicant noted that the standby switchgear equipment is contained in three separate room (each of which includes an associated, walled-off battery room) but did not state where the standby switchgear room AC trains were situated; the FSAR narrative and P&ID should be corrected to show their locations.) [The applicant should also explain whether there is any significance to having two feed lines from the SSRAC system to battery room 1C while the other two rooms have only one.]

The system air intakes and exhausts are provided with tornado missile barriers. Thus, the applicant has shown that the standby switchgear rooms air conditioning system complies with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases."

The equipment in the motor control center, switchgear and miscellaneous electrical areas is not required for control of releases of radioactive materials to the environment, and thus the requirements of General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment," and the guidelines of Regulatory Guides 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants," and 1.140, "Design, Testing and Maintenance Criteria

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for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light Water Cooled Nuclear Power Plants," are not applicable.

The SSRAC system contains an exhaust subsystem which includes redundant full capacity exhaust fans to serve ~~to~~ the battery rooms. One fan in each redundant set is powered from a separate ESF bus. An indication of low flow from the operating fan automatically starts the redundant fans, repositions the pertinent dampers and sounds an alarm in the control room. Thus, each battery room is protected against inoperability due to a single active failure of the SSRAC system. The air passing through each battery room is not recirculated; it passes through the room once, carrying with it any gas generated by the batteries (usually hydrogen) to prevent a dangerous concentration from accumulating.

The equipment in the battery rooms is not required for control of releases of radioactive material to the environment; thus, the requirements of General Design Criterion 60, as reflected in the guidelines of Regulatory Guides 1.52 and 1.140 are not applicable.

This portion of the SSRAC system, that provided ventilation for the three battery rooms meets the guidelines of Position C.1 of Regulatory Guide 1.29, "Seismic Design Classification,"

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thus complying with the requirements of General Design Criteria 2, "Design Bases for Protection Against Natural Phenomena," and 4, "Environmental and Missile Design Bases."

3. Chiller Equipment Room Air Conditioning System

The chiller equipment room air conditioning system consists of an outside air supply system and room exhaust system, constituting the ventilation system. In addition redundant full capacity unit coolers are supplied to cool the room. Both unit coolers are powered from ESF buses so that emergency power is available from the diesel generators if offsite power is lost. Chilled water for the cooling coils is supplied by a safety-related chilled water system described later in this section. An indication of low flow from the operating cooler automatically starts the redundant cooler and sounds an alarm in the control room. The unit coolers are safety-related and designed to maintain conditions so that equipment in the chiller equipment room may be kept operable and is designed to operate during normal conditions, shutdown, loss of offsite power and DBA conditions. The ventilation equipment, however, is not safety-related and is not designed to operate upon loss of offsite power but is seismically supported thus complying with Position C.2 of Regulatory Guide 1.29.

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The chiller equipment room air conditioning system is designed to remove the heat generated in the areas served and to maintain the environmental conditions within the limitations of the equipment in the areas involved during all operating modes including LOCA conditions. All essential portions of the system are located in the control building which is a seismic Category I flood and tornado protected structure. The coolers are designed to seismic Category I, Quality Group C requirements. The outside supply and room exhaust components are nonseismic, Quality Group D and are not powered from ESF buses. However, their loss during normal operating, accident or loss of offsite power conditions does not affect the cooling capability of the systems because the unit coolers continue to cool the rooms, thus meeting ~~with the~~ guidelines of Positions C.1 and C.2 of Regulatory Guide 1.29. The unit coolers have no interfaces with other systems and, therefore, the guidelines of Position C.3 of Regulatory Guide 1.29 do not apply. Thus the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," are complied with by meeting the guidelines of Positions C.1 and C.2 of Regulatory Guide 1.29.

The chiller room air conditioning system is protected against tornado missiles by virtue of its location in the control building. Thus, the system design complies with the criteria of General Design Criterion 4, "Environmental and Missile Design Bases."

4. Control Building Chilled Water System (CBCWS)

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The control building chilled water system consists of two redundant, closed-loop chilled water trains. Each train is capable of meeting the total chilled water needs of the building thus complying with the criteria of General Design Criterion 44, "Cooling Water." Each train contains two 50 percent capacity electric motor driven centrifugal liquid chillers, two 100% capacity chilled water recirculation pumps, two 100% capacity condenser cooling water pumps and one chilled water compression tank. Both trains are powered from ESF buses so that emergency power is available from the diesel generators if offsite power is lost. Operating parameters are indicated in the control room with off normal conditions alarmed. Switchover from faulted to standby equipment is manual. Cooling water for the chiller condensers is supplied by the normal service water system for normal operation and by the safety-related standby service water system for operation during accident or loss of offsite power conditions.

Because of crossties, it is possible to circulate standby service water through this system to provide emergency cooling should the chillers and/or chilled water recirculating pumps in both trains fail. However, neither this arrangement nor the condenser cooling water pumps are shown on the P&IDs. [The applicant must provide this information so that we may determine if the arrangement is acceptable.]

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The system is designed to remove the heat generated in the control building and maintain the environmental conditions within the limitations of the equipment involved during all operating modes including LOCA conditions. All essential portions of the system are located in the control building which is a seismic Category I, flood and tornado protected structure. All parts of the system are designed to seismic Category I, Quality Group C standards. This meets the guidelines of Position C.1 of Regulatory Guide 1.29. Therefore, we conclude that the system complies with the requirements of General Design Criteria 2, "Design Bases for Protection Against Natural Phenomena," and ~~General Design Criterion~~ 4, "Environmental and Missile Design Bases."

Controls are provided to permit periodic testing of the performance of individual system components and the performance of the entire system during normal operation and during shutdown. Water flow rates may be balanced during testing and set to design conditions. These provisions for testing comply with the requirements of General Design Criterion 46, "Testing of Cooling Water System." Instrumentation has been provided to determine proper system operation during performance testing. In addition, periodic inspections of equipment are scheduled to assure proper operation, thus complying with the requirements of General Design Criterion 45, "Inspection of Cooling Water System."

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CONCLUSION

Based on the foregoing, we conclude that the main control room air conditioning system, the standby switchgear rooms air conditioning system, the chiller equipment room air conditioning system, and the control building chilled water system of the Control Building Ventilation System comply with the requirements of General Design Criteria 2, 4 and 5.

The control building chilled water system complies with the criteria of General Design Criteria 44, 45 and 46 as required. The main control room air conditioning system (the only one of the four systems comprising the control building ventilation system required to comply with the criteria of General Design Criteria 19 and 60) does not comply with the criteria of General Design Criteria 19 and 60.

In view of the foregoing, we cannot find the applicant's submittal with regard to the control building ventilation system acceptable. The control building ventilation system does not comply with the acceptance criteria of SRP Section 9.4.1.

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9.4.2 Fuel Building Ventilation System (Spent Fuel Pool Area Ventilation System)

The fuel building ventilation system was reviewed in accordance with Section 9.4.2 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria except as noted below formed the basis for our evaluation of the fuel building ventilation system with respect to the applicable regulations of 10 CFR 50.

The fuel building ventilation system, which serves the entire fuel building, is designed to maintain a suitable environment for equipment operation and to limit potential radioactive release to the atmosphere during normal operation and postulated fuel handling accident conditions. The system is not required for safe shutdown of the plant in the event of a LOCA but is only required to mitigate the consequences of a fuel handling accident. The essential parts of the system are classified as seismic Category I, Quality

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Group C. All essential parts of the system are powered from independent standby emergency (Class 1E) power sources.

The system consists of four subsystems: the supply air system, the unit coolers system, the exhaust air system, and the charcoal filtration system. The supply air system consists of tornado protected outside air intake louver, with redundant isolation dampers, inlet air filter, electric heating coil, chilled water cooling coil, two 100 percent capacity supply fans, supply air ductwork, dampers, and discharge air openings. The system is seismic Category I, Quality Group C from the air intake louver through the second isolation damper. The balance of the supply system is nonseismic Quality Group D. However, seismic Category I, Quality Group C ductwork with redundant isolation dampers serves as an emergency outside air intake subsystem to distribute air throughout the building whenever the normal distribution system is shut down or unavailable. This system is also connected to the intake louver via its connection to the supply air system downstream of the intake louver.

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There are eight separate unit coolers comprising the unit coolers system; the coolers are located in various areas of the building to provide additional cooling for areas of high heat load. Each unit cooler consists of a housing, filter, chilled water cooling coil, fan and ductwork. Each unit cooler is designed to standards consistent with those for nonseismic Category I, Quality Group D components. During emergency or accident conditions, outside air is provided by the emergency air intake and is drawn into the charcoal filter rooms, spent fuel pool area and fuel pool cooling pump room to cool these areas; the air is exhausted by means of the charcoal filter exhaust fans.

The exhaust air system consists of air collection ductwork, two 100 percent capacity exhaust fans, redundant isolation dampers, and a tornado missile protected roof exhaust plenum. The system is seismic Category I, Quality Group C with the exception of the exhaust fans, dampers and ductwork between the four isolation dampers (two upstream, two downstream of the exhaust fans) that are nonseismic Category I, Quality Group D.

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The charcoal filtration system is an emergency safety feature consisting of two redundant filtration trains each containing an exhaust fan, ductwork, dampers and a filter unit. Each filter unit includes a moisture separator, electrical heating coil, pre-filter, HEPA filter, charcoal filter, and another HEPA filter. This entire system is seismic Category I, Quality Group C. There is a small fan (100 cfm capacity) designed to remove the decay heat originating in the radioactive materials captured and retained within the train. Each charcoal filtration unit contains a water spray to extinguish fires should they occur.

Ventilation of the spent fuel pool is maintained by a push-pull system in which outside air is supplied to one end by the normal air intake and exhausted from the other and by means of the normal exhaust fans. In the event of accident or emergency conditions, air for the spent fuel pool, spent fuel pool cooling pump room and charcoal filter rooms is drawn in from the outside through the emergency intake and exhausted through the charcoal filtration system by means of the charcoal filtration unit exhaust fans.

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The fuel building is maintained at a slight negative pressure (1/4 inch W.G.) to prevent escape of any contaminated air to the atmosphere. During normal operation the charcoal filter unit is bypassed. Upon a radiation level higher than a preset level in the exhaust duct, the exhaust stream is automatically diverted so that it passes through the charcoal filtration system which is automatically started. Both charcoal filtration units in the charcoal filtration system are automatically actuated and the intake air supply diverted to the emergency outside air intake in the event of any of the following isolation signals:

1. High drywell pressure
2. Reactor vessel low-low water level, and
3. A manual containment isolation signal.

These signals also isolate the normal exhaust fans. The operator can stop one of the two charcoal filtration units from the main control room, after startup, in the event only one unit is required.

During fuel handling operations exhaust air from the spent fuel pool and fuel cask areas are routed through the charcoal filter units. When only one

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unit is operating control logic causes the redundant charcoal filter unit to start automatically when the air flow drops to a preset low level.

The airflow pattern is from potentially low radioactivity areas to potentially higher radioactivity areas. Slightly more air is exhausted than is supplied, thereby preventing short-circuiting of air flow and assuring that no radioactivity escapes from the fuel building.

All essential parts of the fuel building ventilation system are seismic ~~Category I~~ Category I, Quality Group C, thereby satisfying the guidelines of Position C.1 of Regulatory Guide 1.29, "Seismic Design Classification." The system is located in the fuel building which is seismic Category I, flood and tornado protected. This satisfies the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena." There are no high or moderate energy systems located near the fuel building ventilation system and adequate protection against internally generated missiles and the effects of pipe whip and fluid jets is provided by separated

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equipment locations (refer to Section 3.5.1.1 and 3.6.1 of this SER), thus complying with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases."

Each unit of the plant has its own fuel building and fuel building ventilation system. There is no sharing of ventilation system functions. Therefore, the requirements of General Design Criterion 4, "Sharing of Structures, Systems and Components," are applicable.

The applicant stated that the charcoal filtration system complies with the guidelines of Sections C.2.a through C.2.f and C.2.k of Regulatory Guide 1.52, "Design, Testing, And Maintenance Criteria For Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration And Adsorption Units of Light-Water-Cooled Nuclear Power Plants." [The applicant must provide a detailed response to show compliance with the guidelines of Positions C.2.a through C.2.f and C.2.k of Regulatory Guide 1.52.]

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The applicant stated that an abnormal pressure drop across all critical components of the charcoal filtration system is alarmed in the control room and flow through units are indicated in the control room but have provided no facilities to record these readings as specified in Position C.2.g of Regulatory Guide 1.52. [The applicant must verify that records of volumetric flow and pressure drop will be kept to assure charcoal train operability in the event they need to be used, in order to comply with Position C.2.g.]

[The applicant should verify that use of Associated Air Balance Council methods in conducting duct leak tests is equivalent to compliance with Position C.2.1 of Regulatory Guide 1.52.]

A discussion of compliance with Section C.2.h of Regulatory Guide 1.52 is found in Sections 7 and 8 of this SER; compliance with Section C.2.i is discussed in Section 7 of this SER; compliance with Section C.2.j is discussed in Section 12 of this SER.

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The charcoal filtration subsystem of the fuel building ventilation system does not operate during normal operation; therefore, the guidelines of Regulatory Guide 1.140, "Design, Testing, And Maintenance Criteria For Normal Ventilation Exhaust System Air Filtration And Adsorption Units of Light-Water-Cooled Nuclear Power Plants" are not applicable.

In view of incomplete information with regard to compliance with Regulatory Guide 1.52, we cannot conclude that the fuel building ventilation system complies with the requirements of General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment."

The fuel building internal pressure is maintained at -1/4 inch W.G. so that any air containing radioactivity which is inside the building cannot be exhausted to the atmosphere without passing through the charcoal filtration units to remove the radioactive material. This negative pressure is maintained during all operating and accident conditions including refueling, thus meeting the guidelines of the portion of Position C.4 of Regulatory Guide 1.13, "Spent Fuel Storage

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Facility Design Basis." The remaining portion of Position C.4 relating to a fuel handling accident is addressed in Section 15.7.4 of this SER. This complies with the requirements of General Design Criterion 61, "Fuel Storage and Handling and Radioactivity Control."

We conclude that the fuel building ventilation system is in compliance with General Design Criteria 2, 4, 5, and 61; however, [redacted] the applicant must provide the information indicated to show compliance with General Design Criterion 60. Therefore, we cannot find that the applicant's submittal is acceptable. The applicant's submittal with regard to the fuel building ventilation system does not comply with SRP Section 9.4.2.

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9.4.3 Auxiliary and Radwaste Area Ventilation System

The auxiliary and radwaste area ventilation system was reviewed in accordance with Section 9.4.3 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria except as noted below formed the basis for our evaluation of the auxiliary and radwaste area ventilation system with respect to the applicable regulations of 10 CFR 50.

The auxiliary and radwaste area ventilation system serves the radwaste building and the auxiliary building with a separate system for each area. The radwaste building ventilation system provides ventilation for the radwaste building (which is shared by Units 1 and 2) while identical auxiliary building ventilation systems in each unit provide ventilation for the auxiliary building in that unit.

The radwaste building ventilation system (RBVS) has no safety function and does not operate on loss of offsite

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power. Accordingly, the system has been designed in accordance with Quality Group D and nonseismic Category I standards. The RBVS is separated into two major sections - the air supply system and air exhaust system. The former contains an air intake filter unit, unit coolers and distribution ductwork. Each unit cooler contains an electric heating coil, cooling coil and vaneaxial fan; water is supplied to the cooling coil from the radwaste building chilled water system (see Section 9.2.9 of this SER for further discussion of the radwaste building chilled water system). The air from the outside is filtered, conditioned by the coolers and then transported throughout the ductwork to the various parts of the radwaste building by means of the vaneaxial fans in each of the six unit coolers.

The RBVS exhaust system processes air in two separate paths; the air from tanks, centrifuges and other contaminated equipment is processed through a charcoal filter train containing (in order) a demister, electric heating coil, prefilter, HEPA filter bank, charcoal filter and HEPA filter bank all mounted within a welded steel housing. Each charcoal filter is provided with an integrally mounted water spray to extinguish any fires arising in the filtration unit.

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A centrifugal fan (4000 cfm capacity), downstream of the charcoal filter unit in the RBVS, draws the air through the ductwork and charcoal filter unit and ejects it through the roof exhaust duct. A small (100 cfm) centrifugal fan is mounted in parallel with the larger fan to remove decay heat generated in the charcoal filter unit which arises as a result of decay of radioactive material captured in the components of the charcoal filtration unit. A thermistor detection unit is installed in each charcoal filter unit to annunciate an alarm in the event of a fire. There are two parallel charcoal filter/fan units with one unit in operation and one in standby. Each charcoal filter unit contains a water spray system to extinguish fires in the unit should they occur.

The air from the general areas and equipment areas in the radwaste building utilizes a portion of the exhaust ductwork separate from that utilizing the charcoal filter units and is drawn through the ductwork by two vaneaxial 50% fans (a third fan is mounted in standby condition) and then ejected through the roof exhaust duct (the ductwork from the charcoal filtration units

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and from the vaneaxial fans is joined before the roof exhaust duct). The exhaust air system is maintained at a slight negative pressure in order to prevent unmonitored leakage of contaiminated material to the environment. Radiation monitors in the combined exhaust duct are used to detect high concentrations of radioactive particulate and/or gaseous matter in the exhaust. The applicant stated that "in the event of detection of high airbone radioactivity in the building, administrative control is required to shut down the system." [The applicant should explain whether this means that the building is to be shutdown or whether such detection requires determination by an administrative official before the building could be shutdown.]

The radwaste building ventilation system P&ID, (Figure 9.4-3a) shows that the single outlet damper leading to the roof exhaust duct is closed upon a high radiation signal. [The applicant should explain what would be the effect of an open damper (resulting from damper failure).]

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Since the radwaste building ventilation system is not safety-related nor does its failure affect any safety-related system, the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," (except for Position C.2 of Regulatory Guide 1.29, which it meets), 4, "Environmental and Missile Design Bases," and 5, "Sharing of Structures, Systems and Components" do not apply.

The applicant notes that the charcoal filtration system in the RBVS complies with the guidance of Positions C.1.a through C,1.d and C.2.b, C.2.c and C.2.e of Regulatory Guide 1.140, "Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants." A discussion of compliance with Position C.2.d is contained in Section 12 of this SER. Further, the applicant notes that housing leak tests were performed in accordance with the guidelines of Position C.2.f but the duct leak tests were not. The duct leak tests were performed in accordance with the methods of the Associated Air Balance Council. [The applicant must verify that use of the methods of ~~the~~

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the Associated Air Balance Council is equivalent to compliance with Position C.2.f of Regulatory Guide 1.140.] [The applicant must also show, how the system complies with the guidelines of Positions C.1.a through C.1.d, C.2.a, C.2.b, C.2.c, and C.2.e.]

The auxiliary building ventilation system (ABVS) is used to maintain an environment with controlled temperature and flow of air to assure personnel comfort and integrity of equipment during normal operation. Some parts of the system are required to operate during accident conditions and in the event of high radiation in the auxiliary building. The ABVS is comprised of three relatively independent parts which are:

1. The supply air system,
2. The exhaust air system, and
3. The unit coolers system

The ABVS supply air system consists of two 100% capacity (10000 cfm) vaneaxial fans (in parallel) to a prefilter, high efficiency filters, dampers and ductwork. The inlet is protected against the effects of missiles and tornadoes; the ductwork from the inlet dampers up

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to and including the two isolation dampers in series is manufactured to meet the requirements of Quality Group C and seismic Category I standards. The rest of the supply air system including the vaneaxial fans, filters and the rest of the ductwork serving to distribute the incoming air throughout the auxiliary building is designed to nonseismic Category I, and Quality Group D standards. Each inlet duct ends in the particular area served. There is also a part of the intake system which serves the auxiliary building electrical tunnel and is separate from the rest of the supply system. The ductwork serving this system connects to the intake ductwork downstream of the isolation dampers. The ductwork ends in the area served, the electrical tunnel. This portion of the supply system contains a vaneaxial fan (capacity 3600 cfm) to draw air from the intake and to blow it into the electrical tunnel.

Each duct in the ABVS exhaust system starts in the area of the auxiliary building which it serves. These ducts are combined into a single duct which is connected to the suction of the two vaneaxial fans in parallel (capacity 10000 cfm) which take the air in and blow it into the exhaust duct. The duct from the auxiliary building electrical tunnel has its own vaneaxial fan (capacity 3600 cfm), however. As a consequence, the duct from the electrical tunnel bypasses the parallel vaneaxial fans, combining directly with the downstream duct leading to the exhaust duct. An alternate avenue for exhaust which may be used in the event of high radiation in the auxiliary building or a DBA is through the standby gas treatment system (SGTS); here the single exhaust duct to the suction of the parallel vaneaxial fans branches into two ducts with a single isolation damper on each duct leading to the SGTS and additional isolation dampers on the SGTS. [The applicant should show that no single failure of the isolation dampers between the auxiliary building ventilation system and SGTS either during normal operation or accident conditions will damage or defeat the SGTS so that it could not function as required.]

The third system in the ABVS, the unit coolers systems, serves to cool the following areas in the auxiliary building:

1. Switchgear areas,
2. Main ~~steam~~ steam pipe tunnel, north end,

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3. East and west general areas, annulus mixing system, and charcoal filter room,
4. Charcoal filter rooms,
5. HPCS pump cubicle,
6. RHR pump room and heat exchanger cubicle,
7. RPCCW pumps and heat exchanger cubicles,
8. RWCU pump cubicle,
9. RCIC pumps and turbine cubicle,
10. General areas
11. LPCS pump cubicle

Each ABVS unit cooler is comprised of throwaway filters, cooling coils, a vaneaxial fan and ductwork. Cooling water is normally supplied by the service water system, described in Section 9.2-1. In the event of a loss of offsite power or a DBA, water is supplied by the safety-related standby service water system (described in Section 9.2.7 of this SER) and power to operate each cooler is supplied by an onsite safety-related power supply. The applicant states that three unit coolers serve safety-related pump rooms, as follows: one room cooler serves the room containing the HPCS pump, one unit cooler serves the room containing RHR heat

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exchangers A and C, pump room A, the LPCS pump room and RCIC pump room, and one serves the room containing RHR heat exchangers B and D, room B and pump room C. It is not clear what safety-related equipment is contained in each room. [The applicant should provide the necessary clarification.]

Each unit cooler protecting an ECCS component is powered from the same emergency power source as the ECCS component. Therefore, the HPCS and RCIC rooms are cooled whenever their respective pumps operate which includes operation upon loss of offsite power, thus complying with the provisions of Item II.K.3.24 of the TMI action plan. Note that these unit coolers are considered part of the ESF ventilation systems (see SER Section 9.4.5). Table 3.2-1, Item XXXI shows that ductwork and dampers for the coolers are designed to Quality Group C and seismic Category I standards but omits the standards for the unit cooler fans. [The applicant should add this information to the table.] Table 3.2-1 shows that all unit coolers are designed to Quality Group C and seismic Category I standards. [The applicant should verify the information in Table 3.2-1.] [The applicant should show the area(s) each

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cooler serves and the number of unit coolers on the P&ID for this system.] [The applicant should provide justification for areas in the auxiliary building not cooled in the event of a DBA or high radiation signal.]

The applicant notes that the ABVS supply air system is designed to bring in fresh, clean air from outside into the various portions of the auxiliary building; the exhaust system is designed to remove the air from these areas, together with any contaminants which the room may contain by suitably separating the inlet and exhaust ducts. The building is maintained at a slight negative pressure (1/4 inch W.G.) to prevent contaminants inside the building from entering the environment without proper treatment.

Thus, during operation, the air enters the auxiliary building as fresh air containing little or no contaminants such as radioactive particles or gases. The concentration of contaminants gradually increases as it passes through the building, into the exhaust system. However, on a LOCA signal (including a manual containment isolation signal) or high radiation level within the auxiliary building, the intake is isolated from

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the rest of the supply air systems by means of the two isolation dampers in series.

As noted above, the air in the building, is normally transported to the exhaust duct. However, in the event of radioactivity in the exhaust attaining a preset level, the normal exhaust is automatically isolated and exhaust dampers to the standby gas treatment (SGTS) are opened automatically to permit treatment of the exhaust stream by the SGTS (see Section 6.5 of this SER for a more complete discussion regarding the standby gas treatment system). All of the components of the ABVS are protected against floods and tornadoes by virtue of being located within the auxiliary building.

The auxiliary building ventilation system meets the guidance of Position C.1 and C.3 of Regulatory Guide 1.29, "Seismic Design Classification," since the safety-related portions are designed in accordance with seismic Category I criteria, and the interfaces with nonseismic Category I features are designed in accordance with seismic Category I criteria, with the exception of a lack of information regarding the design of the unit cooler fans. Therefore, we cannot determine whether

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the ABVS is in compliance with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

The auxiliary building ventilation system is protected against functional failure as a result of internally generated missiles by separation of redundant equipment. The applicant notes (in FSAR Section 3.4-1) that this system is protected against flooding as a result of a break of a fluid line within the building. Therefore, the system complies with the guidelines of General Design Criterion 4, "Environmental and Missile Design Bases."

Each unit has its own auxiliary building ventilation system and, therefore, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable. It is noted that part of the exhaust system of the auxiliary building ventilation serves to exhaust air from the auxiliary building which is potentially radioactive during a DBA or which actually contains radioactive material (in the event of a high radiation signal in the auxiliary building), thus serving as part of the standby gas

DRAFT

treatment system. (As such, the applicant should show how this portion of the ABVS meets the guidelines of applicable portions of Position C.2 of Regulatory Guide 1.52, "Design, Testing and Maintenance Criteria for Post Accident Engineered Safety Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants," in order to comply with the requirements of General Design Criterion 60, "Control of Releases of Radioactive Materials to the Environment.") No part of the ABVS is used as part of a cleanup system during normal operation, and so, the provisions of Regulatory Guide 1.140, "Design, Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants" do not apply.

[The applicant should also show how the auxiliary building temperature will be maintained at the minimum level of 40°F in the winter, as specified in Table 9.4-1, and also how this minimum temperature would permit normal operation and maintenance of the auxiliary building and its contents by operating personnel.]

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We find, also, that the radwaste building ventilation system does not comply with Position C.2 of Regulatory Guide 1.29, thus is not in compliance with General General Design Criterion 2 and is not in complete accordance with Position C.2 of Regulatory Guide 1.140, thus failing to comply fully with the criteria of General Design Criterion 60. [The applicant should also discuss the effect of an open outlet damper when high radioactivity is encountered in the discharge duct.]

In view of the concerns noted above, we cannot find the applicant's submittal with regard to the auxiliary ventilation and radwaste ventilation system acceptable. The auxiliary and radwaste area ventilation system does not comply with the acceptance criteria of SRP Section 9.4.3.

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9.4.4 Turbine Building Ventilation System

The turbine building ventilation system was reviewed in accordance with Section 9.4.4 of NUREG-0800 (SRP. An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria except as noted below formed the basis for our evaluation of the turbine building ventilation system with respect to the applicable regulations of 10 CFR 50.

The turbine building ventilation system (TBVS) is comprised of the following subsystems:

1. Main supply system,
2. Unit coolers system,
3. Offgas area/condensate demineralizer area ventilation system,
4. Exhaust air system,
5. Charcoal filtration system,
6. Sample room air conditioning system.

The main supply system provides filtered, conditioned air for ventilation of the various areas of the

DRAFT

turbine building. The outside air enters through a single duct passing through the air conditioning unit which consists of a filter, electric heating coil, and water cooling coil. The duct is then divided in two to accommodate two vaneaxial 50% capacity (1700 cfm) fans which serve to distribute the conditioned air through the duct system leading to the various parts of the turbine building.

The unit coolers system provides air conditioning for various areas of the turbine building. Each cooler is independent of the others; each consists of a housing, throwaway type filter, cooling coil, vaneaxial fan and ductwork. Chilled water for the cooling coils is supplied by the ventilation chilled water system (see Section 9.2.9 of this SER for a further discussion of the ventilation chilled water system).

The offgas/condensate demineralizer area ventilation system is supplied with air transferred from the turbine building. The applicant states that the vault holding the offgas charcoal absorber tanks is cooled by low temperature refrigeration trains, each consisting of a compressor, refrigerant condenser, cooler, air handling

DRAFT

equipment, liquid receiver, regeneration equipment together with the necessary equipment and controls. One train operates to keep the vault cool while one train remains in standby. Unit coolers are provided for some areas while some areas contain exhaust ducts leading to the separate exhaust air system which contains two 100% capacity (8300 cfm) vaneaxial fans in parallel (one operating, one on standby) blowing air into the plant exhaust duct.

The turbine building exhaust system contains exhaust ductwork from various portions of the plant combined into one duct leading to the three 50% capacity fans, each with a capacity of 22000 cfm, operating in parallel (two operating, one on standby) which blow the exhaust air into the plant exhaust duct.

The charcoal filtration system exhausts air from the two mechanical vacuum pumps used to remove air and radioactive gases from the main condenser on startup. The air is drawn through a charcoal filter unit consisting of a demister, electric heating coil, prefilter, HEPA filter, charcoal filter and HEPA filter with a 5000 cfm centrifugal fan downstream which draws the air

DRAFT

through the charcoal filtration unit and blows it into the plant exhaust duct. A small centrifugal fan (100 cfm) is provided to remove the decay heat generated in the charcoal filtration unit by radioactive material captured in the unit. The charcoal filtration unit contains a water spray system to extinguish fires should they occur.

The applicant stated that the charcoal filtration system complies with the guidelines of Position C.1.a through C.1.d, C.2.a through C.2.c and C.2.e of Regulatory Guide 1.140, "Design Testing and Maintenance Criteria for Normal Ventilation Exhaust System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants." (The applicant should provide detailed information to show compliance with Positions C.1.a through C.1.d, C.2.a through C.2.c and C.2.e.)

Compliance with the guidelines of Position C.2.d is discussed in Section 12 of this SER. The applicant notes that duct leak tests are performed in accordance with the methods of the Associated Air Balance Council in lieu of Section 6 of ANSI N510-1975 as specified in Position C.2.f. (The applicant should verify that use

DRAFT

of the methods of the Associated Air Balance Council in conducting duct leak tests is equivalent to compliance with Position C.2.f of Regulatory Guide 1.140.)

The applicant states that the sample room is provided with a self-contained air conditioning system consisting of throwaway filter, direct expansion cooling coil, heat coil and distribution ductwork. This unit supplies 1300 cfm for ventilation. However, this unit does not appear on the P&ID (Figure 9.4-4) for the TBVS. (The applicant should include this unit in the figure.)

The applicant states that the turbine building ventilation system is used during normal operation and is not required to operate during a design basis accident. (The applicant must show that the system meets the guidelines of Position C.2 and C.3 of Regulatory Guide 1.29, thus complying with the requirements of General Design Crierion 2, "Design Bases for Protection Against Natural Phenomena.") The system has no safety-related function, therefore the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," and General Design Criterion 5, "Sharing of Structures,

DRAFT

Systems and Components," are not applicable. The applicant must meet the applicable guidelines of Regulatory Guide 1.140 in order to show compliance with the requirements of General Design Criterion 60.

In view of the foregoing, we cannot find that the applicant's submittal regarding the TBVS is acceptable. The turbine building ventilation system does not comply with the acceptance criteria of SRP Section 9.4.4.

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9.4.5 <u>Engineered Safety Features Ventilation Systems</u>

The engineered safety features (ESF) ventilation systems were reviewed in accordance with Section 9.4.5 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria ~~except as noted below~~ formed the basis for our evaluation of the engineered safety features ventilation systems with respect to the applicable regulations of 10 CFR 50.

The ESF ventilation systems provide cooling for various ESF systems or functions which include:

1. Standby switchgear and battery rooms,
2. Safety-related pump rooms and the exhaust of the auxiliary building by standby gas treatment system (when high radioactivity found in exhaust stream),
3. Fuel building ventilation system (charcoal filtration units),
4. Annulus mixing system,
5. Containment ventilation system,

6. Diesel generator building ventilation system, and
7. Standby service water pumphouse ventilation system.

Items 1, 2, 3, 4 and 5 above are reviewed in other sections of this SER; for discussion of those items see the following SER sections: For Items 1 and 2, SER Section 9.4.1; for Item 3, SER Section 9.4.2; and for Items 4 and 5, see SER Section 9.4.6. The remaining items (6 and 7) will be discussed in this Section.

<u>Diesel Generator Building Ventilation System</u>

Each unit has its own diesel-generator building. Each of the three diesel generators in each unit is located in a separate room within the building. The diesel generator building ventilation system consists of six independent subsystems, two for each diesel generator, to assure adequate air flow in the event of a single failure. Each subsystem has an exhaust fan for the diesel generator room automatically controlled by a temperature switch to start on high ambient temperature. The diesel generator control room (one for each diesel generator) is ventilated by a dedicated supply fan, filters, and ductwork and exhausts to the diesel generator room through

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fire dampers. Each diesel generator room is also provided with a nonsafety-related and nonseismic exhaust fan to prevent stagnation of room air; each system is powered by the emergency bus served by its diesel generator. However, we cannot determine how the design accommodates minimum and maximum outside temperatures; thus, we cannot determine whether the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," are met with regard to accommodating environmental conditions during normal operation and during accidents. (The applicant must provide information to show that the desired temperature range can be obtained during all operating and accident conditions and how damage from freezing during winter time is prevented when the diesel generations are not operating.)

The system is designed to seismic Category I, Quality Group C requirements and is housed in the seismic Category I, flood and tornado protected diesel generator building, thereby satisfying the requirements of General Design Criterion 2 and the guidelines of Regulatory Guide 1.29. The inlet and outlet louvers are tornado missile protected as is the diesel generator building. The system is separated

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from high energy piping systems and internally generated missiles, thereby satisfying the requirements of General Design Criterion 4 relating to missiles, pipe whip and discharging fluids. There is no sharing of systems; thus, the requirements of General Design Criterion 5 are not applicable. The inlet louvers are approximately 30 feet above grade, thereby meeting the guidance of Item 2, Subsection A, of NUREG/CR-0660, "Enhancement of Onsite Emergency Diesel Generator Reliability," and therefore, the pertinent requirements of General Design Criterion 17, "Electric Power Systems," relating to the protection of essential electrical components from failure due to the accumulation of dust and particulate material are satisfied.

Standby Service Water (SSW) Pumphouse/Ventilation System
The SSW pumphouse ventilation system provides ventilation for rooms containing the safety-related SSW pumps (the SSW cooling tower pumphouse) and for rooms containing SSW switchgear. The standby service water pumps for each unit are located in separate rooms in each unit's SSW cooling tower pumphouse. A separate ventilation system is provided for each

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pump room and consists of two 100% capacity supply fans, inlet plenum, dampers, fire dampers, and associated controls. Each train is powered from the same emergency buses as the pump it serves and is automatically started when its corresponding pump is started. In the event of failure of an operating train, the redundant train is automatically initiated, thus preventing system inoperability resulting from a single failure.

Associated with each pump is a transformer and switchgear located in a separate room. A separate ventilation system is provided for each switchgear room and consists of two 100% capacity supply fans, dampers, fire dampers and associated controls. Each train is powered from the same emergency bus as the pump it serves and is automatically started whenever its corresponding pump is started. In the event of failure of an operating train the redundant train is automatically started, thus preventing system inoperability in the event of a single failure.

The systems are housed in the standby service water pumphouse which is seismic Category I, flood and

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tornado protected ~~protected~~, and the systems themselves designed to seismic Category I, Quality Group C requirements, thereby satisfying the guidelines of Regulatory Guide 1.29, "Seismic Design Classification," thus complying with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena." The pumphouse is designed against the effects of tornado missiles and is separated from high energy piping systems and internally generated missiles, thereby satisfying a portion of the requirements of General Design Criterion 4, "Environmental and Missile Design Bases." There is no sharing of systems; thus, the requirements of Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable. (However, the applicant must provide sufficient information to enable us to determine how the desired temperature ranges are maintained in both the switchgear and pump rooms during the winter, the humidity range to be maintained in the switchgear rooms and how this humidity range is maintained in order to comply, completely, with the requirements of General Design Criterion 4, "Environmental and Missile Design Bases.")

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We find the diesel generator ventilation system and standby service water pumphouse ventilation systems in compliance with the requirements of General Design Criterion 2; since there is no sharing between units, General Design Criterion 5 is not applicable. In addition, the diesel generator ventilation system complies with the pertinent portions of General Design Criterion 17. However, the applicant must provide further information to show that these systems comply with the requirements of General Design Criterion 4. Therefore, we cannot conclude that the applicant's submittal regarding these systems is acceptable. The diesel generator ventilation system and standby service water pumphouse ventilation system do not comply with the criteria of SRP Section 9.4.5.

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9.4.7 Miscellaneous Building Heating Ventilating and Air Conditioning Systems

The miscellaneous building heating, ventilating, and air conditioning systems were reviewed in accordance with Section 9.4.3 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section were performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria ~~except as noted below~~ formed the basis for our evaluation of the miscellaneous building heating, ventilating and air conditioning systems with respect to the applicable regulations of 10 CFR 50.

The miscellaneous systems considered in this section are:

1. Fire Pumphouse (Heating and Ventilation System)
2. Normal Switchgear Building (Heating Ventilation and Air Conditioning System)
3. Auxiliary Boiler Building (Heating Ventilation and Air Conditioning System)

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4. Water Treatment (Heating and Ventilation System)
5. Makeup Water Intake Structure and Switchgear House (Heating and Ventilation System)
6. Electrical and Piping Tunnels (Ventilation System)

These systems are designed to provide a suitable environment for personnel and equipment operation. They also provide filtered, tempered air for all air conditioned areas and electrical equipment areas and also provide exhaust hoods to remove noxious fumes from the battery room and water treatment area.

None of the systems has any safety-related function, nor does failure of any system compromise any safety-related system or components. Failure of any system will not prevent safe shutdown of the reactor. Therefore, no system is designed to seismic Category I standards or to Quality Group A, B, or C standards with the exception of ventilation systems for the electrical and piping tunnels which are provided with seismic Category 1 supports. This was done in order to maintain the structural integrity of these systems in the event of a seismic occurrence. Therefore, the systems are not required to comply with the seismic

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requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena," as outlined in Regulatory Guide 1.29, "Seismic Design Classification."

General Design Criterion 5, "Sharing of Structures, Systems and Components" is not applicable because none of these systems has any safety-related function.

These systems are not designed to control release of radioactive material, therefore, General Design Criterion 60, "Control of Release of Radioactive Materials to the Environment" is not applicable.

Therefore, we find the applicant's submittal with respect to miscellaneous buildings heating ventilation, and air conditioning systems to be acceptable. These systems are in compliance with the acceptance criteria of SRP Section 9.4.3.

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10.3 Main Steam Supply System (Up to and Including the Main Steam Block Valves)

The main steam supply system (from the containment up to and including the outermost isolation valve) was reviewed in accordance with Section 10.3 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria ~~except as noted below~~ formed the basis for our evaluation of the main steam supply system (from the containment up to the outermost isolation valve) with respect to the applicable regulations of 10 CFR 50.

The steam generated in the reactor vessel is routed to the high-pressure turbine by means of four main steam lines. Each main steam line contains two main steam isolation valves (MSIVs) and a shutoff (block) valve. The two MSIVs close automatically on a main steam line break, thus assuring main steam line isolation in the event of a steamline break outside containment and a concurrent single failure of an MSIV. One MSIV is located immediately inside of the drywell and the other immediately outside containment. The shutoff

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valve is located downstream of the outboard MSIV immediately before the steam lines leave the auxiliary building. The main steam isolation valves are designed to provide positive isolation against steam flow associated with a main steamline break. They are pneumatic and/or spring-operated (to close) fast closing (3 to 10 seconds) valves. Operating air is supplied to the valves from the instrument air system, and a seismic Category I air accumulator provides backup operating air for each valve in the event of loss of the normal instrument air supply. The MSIVs are designed to withstand the dynamic forces under the postulated steamline line break flow conditions. The main steam shutoff valves are leaktight motor-operated gate valves and are powered from separate emergency buses. They are manually actuated from the control room.

The main steam supply lines including the MSIVs and shutoff valves are designed to meet seismic Category I criteria from the reactor to the shutoff valve and are designed to Quality Group A criteria from the reactor through the outboard MSIV and beyond (up to and including the first weld outside the jet impingement wall in the auxiliary building) and Quality Group B criteria from the weld up to and including the shutoff valve in the

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auxiliary building steam tunnel. The lines pass through the drywell, containment and auxiliary buildings which are seismic Category I, flood and tornado protected structures. The guidelines of Regulatory Guide 1.29, "Seismic Design Classification," are satisfied for these portions of the main steam supply system, thus complying with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena."

The MSIVs which are required to function in order to assure main steam isolation are protected against the effects of high-energy pipe breaks and are qualified to function in the expected steam environment resulting from a main steamline break. Refer to Sections 3.6.1 and 3 .11 of this SER for further discussion on environmental qualification of essential equipment.

This equipment is located in tornado-missile-protected structures and is separated from the effects of internally generated missiles. Thus, the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," and the guidelines of Regulatory Guide 1.117, "Tornado Design Classification," are

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satisfied. For compliance with the guidelines of Regulatory Guide 1.115, "Protection Against Low Trajectory Turbine Missiles," refer to Section 3.5.1.3 of this SER .

Based on the above, we conclude that the main steam supply system from the reactor to the main steam block valves meets the requirements of General Design Criteria 2 and 4 with respect to protection against seismic events, floods, tornadoes, missiles and environmental effects, and the guidelines of Regulatory Guides 1.117, relating to protection against tornado missiles and high and moderate-energy pipe breaks. Therefore, we find this portion of the steam supply system to be acceptable. This portion of the steam supply system is in compliance with the criteria of SRP Section 10.3.

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10.4.5 Circulating Water System

The circulating water system was reviewed in accordance with Section 10.4.5 of NUREG-0800 (SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section. Conformance with the acceptance criteria formed the basis for our evaluation of the circulating water system with respect to the applicable regulations of 10 CFR 50.

The nonsafety-related (nonseismic Category I, Quality Group D) circulating water system (CWS) is designed to remove the heat rejected from the main condenser to the atmosphere via four multicell forced draft cooling towers per unit. The CWS is not required to maintain the reactor in a safe shutdown condition or to mitigate the consequences of accidents.

The system pumps circulate water from the CWS pump structure through the condenser shells to the cooling towers. The circulating water then flows into the flume and back to the circulating water pump structure.

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Four vertical circulating water pumps are located outdoors; these pumps provide a design flow of 511,560 gpm. Four multicell cooling towers are provided for each unit, designed to cool 565,000 gpm; the difference between this flow rate and the circulating water pump flow rate of 511,560 gpm is to accommodate the service water system coolant flow rate.

The applicant provided the results of an analysis of the effects of possible flooding as a result of a postulated failure of a circulating water system expansion joint or butterfly valve. Flooding in the affected unit turbine building will result from either of the above postulated failures. The analysis assumed that the entire volume of the system including the cooling tower basin would be emptied into the building. The resulting water level, 97 ft. - 6 inches, would be below any nonwatertight doors or unsealed penetrations from the adjacent auxiliary building and below the level of any safety-related equipment, thereby verifying that a total failure in the circulating water system will not result in flooding which would compromise plant safety.

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Since no safety-related equipment is affected by a postulated failure in the CWS, the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," with respect to protection of safety-related systems from failure of nonsafety-related systems are satisfied. In addition, General Design Criterion 5, "Sharing of Structures, Systems and Components" is not applicable. The applicant notes that failure of any component of the CWS will not affect safety-related components, thus satisfying Position C.2 of Regulatory Guide 1.29, "Seismic Design Classification"; in this way the criteria of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena" are complied with.

Indication of leakage or potential failure in CWS components is provided to operators in the control room. The first indication would be an alarm in the control room given by the condenser retention pit redundant sump high-level alarms. Loss of condenser vacuum would also provide an early alarm if the break occurred upstream of the condenser water boxes. Operator action is necessary to trip the pumps and close the condenser

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butterfly valves in order to minimize flooding of the turbine building basement. CWS performance is monitored by pressure and temperature indicators in the control room. Other parameters are monitored by the plant computer.

Based on our review, we conclude that the circulating water system meets the requirements of General Design Criteria 2 and 4 with respect to protection of safety-related systems from failures in nonsafety-related systems. We therefore conclude that the circulating water system is acceptable. The system complies with the acceptance criteria of SRP Section 10.4.5.

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10.4.7 Condensate and Feedwater System

The condensate and feedwater system was reviewed in accordance with Section 10.4.7 of NUREG-0800(SRP). An audit review of each of the areas listed in the "Areas of Review" portion of the SRP section was performed, according to the guidelines provided in the "Review Procedures" portion of the SRP section. Conformance with the acceptance criteria ~~except as noted below~~ formed the basis for our evaluation of the condensate and feedwater system with respect to the applicable regulations of 10 CFR 50.

The condensate and feedwater system includes all components and equipment from the condenser outlet to the connection to the reactor vessel and to the heater drain system. The system serves no safety function and is therefore classified as nonsafety-related (Quality Group D, nonseismic Category I). However, the portion of the system between the reactor vessel and the auxiliary building wall (in the steam tunnel) is safety-related and design to seismic Category I, Quality Group A criteria from the reactor to the outboard containment isolation valve, and is designed to seismic Category I, Quality Group B criteria from the outboard containment isolation valve through the feedwater shutoff valves to the auxiliary building wall in order to assure feedwater system isolation under accident conditions.

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Each of the two main feedwater lines contains a spring load piston actuated check valve outside of containment, held open by air pressure during normal operation that serves as the outboard containment isolation valve. Inside containment an inboard isolation check valve; there are also two motor operated shutoff valves with each shutoff valve powered from a separate emergency bus on each feedwater line, outside of containment. Thus, feedwater isolation is assured in the event of a single failure in any isolation valve. The safety-related portion of the system is located in the seismic Category I, flood and tornado-protected auxiliary building and reactor building. Thus, the guidelines of Position C.1 of Regulatory Guide 1.29, "Seismic Design Classification" are met, thus complying with the requirements of General Design Criterion 2, "Design Bases for Protection Against Natural Phenomena." The essential equipment is separated from the effects of internally generated missiles and is qualified to function in a steamline break environment. Thus, the requirements of General Design Criterion 4, "Environmental and Missile Design Bases," are satisfied. Refer to Section 3.6.1 and 3.11 for further discussion of environmental qualification of essential equipment and protection against postulated piping failures. The feedwater system is not shared between units; therefore, the requirements of General Design Criterion 5, "Sharing of Structures, Systems and Components," are not applicable.

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The feedwater system is not required to transfer heat under accident conditions and, therefore, General Design Criterion 44, "Cooling Water," 45, "Inspection of Cooling Water System," and 46, "Testing of Cooling Water System," are not applicable.

Based on the above, we conclude that the condensate and feedwater system meets the requirements of General Design Criteria 2 and 4 with respect to its protection against natural phenomena, missiles and environmental effects, and is, therefore, acceptable. The condensate and feedwater system complies with the acceptance criteria of SRP Section 10.4.7.

ENCLOSURE 2

OPEN ITEMS CONTAINED IN THE DRAFT SAFETY EVALUATION REPORT

3.4.1 9.4.1	The applicant should show that all safety-related equipment in the control building is protected against flooding resulting from a moderate energy line break.
3.5.1.1 3.5.1.2	The applicant should consider the effect of missiles resulting from rotating equipment (including fans) on safety-related equipment inside and outside of containment.
3.5.1.1 3.5.1.2	The applicant should consider the potential for falling missiles and the effects of these missiles on safety-related equipment inside and outside of containment.
3.5.1.1 3.5.1.2	The applicant should justify the conclusion that valve bonnets, thermowells, nuts, bolts, studs and valve stems would not affect safety-related components and systems.
3.6.1	The applicant has not completely analyzed the rupture of high energy piping systems for the effects of pipe whip, jet impingement and the resulting environmental conditions on safety-related systems and components.
3.6.1	The applicant has not yet provided the results of a compartment flooding analysis due to cracks in moderate energy piping systems.
3.6.1	Detailed information regarding the applicant's analysis involving effects of a main steam line break in the steam tunnel should be provided for our review.
4.6	The applicant must commit to test the scram accumulators periodically to assure scram capability for at least 20 minutes in the event of loss of both CRD pumps.
4.6	The applicant must show that the scram function is maintained in the event of slowly decaying air pressure to the scram discharge inlet and outlet valves.
5.2.5	The applicant must specify the limiting conditions for operation related to availability of leakage detection methods.
5.2.5	The applicant should justify that the use of the containment floor drain sump will provide an accuracy of leak rate measurement of 1 gpm or better and the capability to detect a leakage rate of 1 gpm in less than one hour.
5.2.5	The applicant should provide further information to show how leakage into other systems connected to the reactor coolant system is detected and should show that the leakage detection system will be capable of detecting a leak rate of 1 gpm or less through the isolation valve(s) forming the boundary with the reactor coolant system.

5.2.5 The applicant should verify that all systems which are part of the RCPB leakage detection system are accounted for and that the FSAR is revised, accordingly.

6.7 The applicant must specify the MSIV leak rate to provide assurance that the MS-PLCS system can operate at the specified leakage rate.

6.7 The applicant must specify the differential pressure the MS-PLCS system will have to maintain between the reactor vessel and main steam line.

9.1.1 The applicant must provide further information to show the times and conditions under which the solid covers over the new fuel will be removed. The applicant must show that a K_{eff} in excess of 0.98 will not be attained in the new fuel pool.

9.1.2 The applicant must provide a criticality analysis to confirm the criticality limits to be attained in the spent fuel storage facility.

9.1.3 The applicant should provide the number of fuel assemblies and frequency assumed for a "normal" refueling.

9.1.3 The applicant should show that spent fuel in the containment pool can be cooled in the event of a design basis accident combined with loss of offsite power and the most adverse single failure.

9.1.3 The applicant should describe, fully, the interconnection between the RHR system and fuel pool cooling system.

9.1.3 The applicant should show that failure of a syphon breaker will not cause a reduction in the spent fuel pool water level below 10 ft. above the top of the active fuel.

9.1.3 The applicant should explain why syphon breakers are not required for the dryer storage pool.

9.1.4 The applicant should show that the fuel building bridge crane cannot damage the spent fuel, spent fuel pool or spent fuel cooling system.

9.1.4 The applicant should explain provisions for cooling the maximum number of spent fuel assemblies in the transfer tube and how cooling is maintained if subassemblies become lodged in the tube. The possibility of coolant drainage from the transfer tube should also be discussed.

9.1.4 The applicant must provide an analysis to show that the maximum kinetic energy resulting from the fall of any object handled by the light load handling system over spent spent in containment or in the fuel building will not exceed that obtained from the fall of a fuel assembly and its handling unit.

9.1.5 The applicant should verify that the polar crane will not be moved over stored fuel when refueling is not in progress.

9.1.5 The applicant should show that the polar crane meets Position C.5 of Regulatory Guide 1.13 with regard to the effect of a potential load drop on spent fuel in the containment pool.

9.1.5 The applicant has not provided a spent fuel cask drop analysis to verify that a cask drop does not result in unacceptable damage to the spent fuel storage facility or to safety-related equipment.

9.1.5 The applicant should show the effects of polar crane drops in which loads could drop into the reactor vessel.

9.1.5 The applicant must implement the requirements of NUREG-0612 before a license to operate can be issued.

9.2.2 The applicant must show that the safety-related portion of the RPCCW will not fail as a result of damage due to internally generated missiles.

9.2.2 The applicant must show that the safety-related portion of the RPCCW is protected against the effects of flooding pipe whip and jet impingement resulting from high energy pipe breaks.

9.2.3 The applicant should show whether the makeup water treatment system is maintained at a higher pressure than contiguous systems under all conditions, including a design basis accident or loss of off-site power. If not, the applicant must explain how, as the result of a seismic event, adjacent or contiguous safety-related systems (including the control building chilled water system) and control room personnel are protected against the intrusion of radioactive water which has passed into the makeup water system, in order to comply fully with Position C.2 of Regulatory Guide 1.29, "Seismic Design Classification."

9.2.5
9.2.7 The staff is reviewing the applicant's calculations to show that the ultimate heat sink and standby service water system can provide the necessary heat transfer capability under emergency conditions in order to comply with the requirements of General Design Criterion 44.

9.2.6 The applicant must show that a crack in the supply line to the RCIC and HPCS pumps does not prevent satisfactory operation of these pumps or constitute a danger to other safety-related systems.

9.2.6
9.3.3 The applicant has not addressed the consequences of catastrophic failure of a condensate storage tank, related to possible flooding of any safety-related equipment.

9.2.8 The applicant has not demonstrated that all safety-related systems are protected against flooding in the event of a leak or rupture of the Turbine Plant Component Cooling Water (TPCCW) System.

9.2.9 The applicant has not demonstrated that all safety-related systems are protected against flooding in the event of a leak or rupture of the Ventilation Chilled Water System.

9.2.11 The applicant should demonstrate that all safety-related systems are protected against flooding resulting from a break in or a rupture of the Cooling Tower Makeup Water (CTMW) System.

9.3.1 The applicant must provide information to show the safety class of the interface between the PVLCS and safety/relief valves.

9.3.1 The applicant should show how the safety-related compressed air supply meets the criteria of ANSI MC 11.1-1976 with regard to dewpoint, oil or hydrocarbon content and corrosive or hazardous contaminant content.

9.3.1 The applicant should commit to periodic testing (at least yearly) of the compressed air to the safety/relief valves to assure compliance with the standards of ANSI MC 11.1-1976,

9.3.3 The applicant should provide drawings and narrative to complete the description of the equipment and floor drainage systems.

9.4.1 The applicant must show that the worst single failure of the radiation detection system in tge control building ventilation system will not allow entrance of radioactive material into the control room.

9.4.1 The applicant should justify not using the charcoal filtration train in the main control room air conditioning system in the event of a chlorine release. as recommended in the guidelines of Regulatory Guide 1.95.

9.3.3 The applicant should provide drawings and narrative to complete the description of the equipment and floor drainage systems.

9.4.1 The applicant must show that the worst single failure of the radiation detection system in the control building ventilation system will not allow entrance of radioactive material into the control room.

9.4.1
9.4.2 The applicant should provide details to show how the charcoal filtration unit in the main control room air conditioning exhaust and fuel building ventilation system complies with the guidelines of Positions C.2.a through C.2.f and C.2.k of Regulatory Guide 1.52.

9.4.1
9.4.2 The applicant should show how a record of pressure drop and flow rate through the critical elements of the charcoal filtration units in the main control room air conditioning exhaust and the fuel building ventilation system is maintained in accordance with the guidance of Position C.2.g of Regulatory Guide 1.52.

9.4.1
9.4.2 The applicant should verify that the use of the testing methods of the Associated Air Balance Council for leak tests in the ducts of the charcoal filtration units in the main control room air conditioning exhaust and fuel building ventilation system is equivalent to compliance with Position C.2.1 of Regulatory Guide 1.52.

9.4.1 The applicant should correct the FSAR and P&ID to indicate the location of the standby switchgear rooms air conditioning system. The applicant should explain whether there is any significance of two separate air intake lines to battery room 1C while Rooms 1A and 1B have only one.

9.4.1 The applicant should show the crossties (on the P&ID) in the control building chilled water system used to provide emergency cooling by means of the standby service water system in the event of failure of the chillers and/or chilled water recirculating pumps. The condenser cooling water pumps should also be added to the P&ID.

9.4.3 The applicant should explain whether the radwaste ventilation system is shutdown immediately upon a high radiation signal or if an administrator must make a decision to shut it down.

9.4.3 The applicant should explain what effect the failure, in the open position, of the single damper in the radwaste ventilating system exhaust duct would have in the event of a high radiation signal.

9.4.3
9.4.4 The applicant must show, in detail, how the charcoal filtrations units in the radwaste building ventilation system and turbine building ventilation system comply with the guidelines of Positions C.1.a through C.1.d, C.2.a, C.2.b, C.2.c and C.2.e of Regulatory Guide 1.140.

9.4.3
9.4.4 The applicant must verify that use of the methods of the Associated Air Balance Council in the performance of leak tests in the ducts of the charcoal filtration units in the radwaste building ventilation system and turbine building ventilation system is equivalent to compliance with Position C.2.f of Regulatory Guide 1.140.

9.4.3 The applicant should show that no single failure of the isolation dampers between the auxiliary building ventilation system exhaust and standby gas treatment system (SGTS) during either normal operation or accident conditions will damage or defeat the SGTS so that it could not fundtion as required.

9.4.3 The applicant should clarify the FSAR to show what equipment is contained in the three safety-related pump rooms served by unit coolers in the auxiliary building ventilation system.

9.4.3 The applicant should verify the quality group and seismic standards to which the unit coolers (including fans) in the auxiliary building ventilation system are designed. The applicant should add this information to Item XXXI of Table 3.2-1 and should verify the rest of Item XXXI.

9.4.3 The applicant should show the area served by each cooler in the auxiliary building ventilation system on the applicable P&ID.

9.4.3 The applicant should provide justification for any areas in the auxiliary building not cooled in the event of a DBA or high radiation signal.

9.4.3 The applicant should show how the auxiliary building temperature will be maintained at 40°F during the winter and how this minimum temperature would permit normal operation and maintenance.

9.4.3 The applicant should show how the portion of the auxiliary building ductwork conveying exhaust air to the standby gas treatment system in the event of high exhaust radiation signal complies with the guidelines of applicable portions of Position C.2 of Regulatory Guide 1.52.

9.4.4 The applicant should include the self-contained air conditioning system for the turbine building sample room on the appropriate P&ID.

9.4.4 The applicant must show that the turbine building ventilation system complies with the provisions of Positions C.2 and C.3 of Regulatory Guide 1.29.

9.4.5 The applicant should show how the desired temperature range is maintained in the diesel generator rooms during all operating and accident conditions and how damage from freezing is prevented in the winter when the diesel generators are not operating.

9.4.5 The applicant must show how the desired temperature ranges are maintained in the standby service water switchgear and pump rooms during the winter. In addition, the applicant must show how the desired humidity range is maintained in the switchgear rooms.

ENCLOSURE 3

EXAMPLES OF P&ID ILLEGIBILITY

1. Figure 9.1-23a, Area D-11 - Do those arrows refer to drawing 9.2-7a, c. or e.

2. Figure 9.2.1.c - Part of Note 1 is obliterated and cannot be distinguished. Many numbers, letters are so blurred as to be illegible.

3. Figure 9.2-2a, Areas G-5 - Arrow to reactor building equipment drains - What figure does this refer to?

4. Figure 1.7-2b - What is the difference between the two plugs in the lower left hand corner (one is vinyl, one nylon)?

5. Figure 9.2-8a, Areas B-11, D-11, F-11, G-11. What figures do the arrows show? Two appear to be 9.3-6a or 6c, two 9.3-6d.