Tennessee Valley Authority, Post Office Box 2000, Spring City, TN 37381-2000

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U.S. Nuclear Regulatory Commission
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Watts Bar Nuclear Plant, Unit 2
NRC Docket No. 50-391

Subject: WATTS BAR NUCLEAR PLANT (WBN) UNIT 2 – INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS DESIGN REPORT

References:
1. TVA letter dated January 29, 2008, "Watts Bar Nuclear Plant (WBN) – Unit 2 – Regulatory Framework for the Completion of Construction and Licensing Activities for Unit 2"
2. NRC letter dated October 23, 2007, "Watts Bar Nuclear Plant, Unit 2 – Information Needed for Licensing Review Reconstitution"

The purpose of this letter is to provide a Design Report describing the Individual Plant Examination for External Events (IPEEE) for WBN Unit 2. Enclosure 1 provides the IPEEE Design Report. In Reference 1, TVA committed to complete the evaluation for WBN Unit 2. The IPEEE for WBN Unit 2 is being completed in accordance with the U.S. Nuclear Regulatory Commission (NRC) Generic Letter (GL) 88-20, Supplements 4 and 5. In Reference 1, Enclosure 2, Item 128 provided a response to NRC's letter (Reference 2) of October 23, 2007, and NRC GL 88-20.

The WBN Unit 2 IPEEE program is being conducted with an approach consistent with that used for the WBN Unit 1 program with the exception of the Low-Seismic-Ruggedness Relays that are described in Attachment 2 of the IPEEE Design Report. The outcome of the IPEEE Design Report is acceptable and is similar to that resulting from the WBN Unit 1 IPEEE. The corrective action programs from WBN Unit 1 are being implemented for WBN Unit 2, and thorough follow-up confirmatory actions are included in the WBN Unit 2 IPEEE program.

A011
NRR

Enclosure 2 provides a list of commitments made in this submittal. I declare under penalty of perjury that the foregoing is true and correct. Executed on the 30th day of April, 2010.

If you have any questions, please contact me at (423) 365-2351.

Sincerely,

M. Bajestani

Masoud Bajestani
Watts Bar Unit 2 Vice President

Enclosures:

1. IPEEE Design Report
2. List of Commitments

cc (Enclosures):

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Enclosure 1

IPEEE Design Report

Watts Bar Nuclear Plant Unit 2 (WBN2)

Individual Plant Examination of External Events (IPEEE)

Design Report

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Revision 0
April 27, 2010

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1.0 INTRODUCTION

This report describes the Individual Plant Examination for External Events (IPEEE) for Tennessee Valley Authority (TVA) Watts Bar Nuclear Plant Unit 2 (WBN2), including seismic, other external events, and the fire-induced vulnerability evaluations. The results summarized herein provide a "design report," based largely on the ongoing and planned WBN2 final design and construction completion activities. A final report will be submitted following certain validation activities, described herein, as WBN2 draws closer to operation.

As documented in TVA RIMS No. T04-980217-539 (Ref. 1), the IPEEE for WBN1 was completed in accordance with the U.S. Nuclear Regulatory Commission (NRC) Generic Letter (GL) No. 88-20, Supplement 4 (Ref. 2). In the WBN1 IPEEE investigation, no issues were found that would require mitigation through severe accident guidelines. The WBN2 IPEEE program is being performed with an approach consistent with that used for the WBN1 program, and in general WBN2 is just like WBN1. In particular, the same corrective action programs from WBN1 are being implemented for WBN2. It is thus anticipated that the WBN2 IPEEE will have an acceptable outcome similar to that resulting from the WBN1 IPEEE. Thorough follow-up confirmatory actions are included in the WBN2 IPEEE program for validation of this anticipated outcome.

The WBN1 seismic study and its applicability to WBN2 are summarized in Section 1.2. The IPEEE for other events and its applicability to WBN2 are summarized in Section 1.3, and the Fire-Induced Vulnerability Evaluation (FIVE) is described in Section 1.4. Background on the corrective action programs is provided in Section 1.5.

1.1 PLANT FAMILIARIZATION

Watts Bar Nuclear Plant is located in southeastern Tennessee on the west shore of Chickamauga Lake, approximately 50 miles northeast of Chattanooga and 31 miles northeast of the Sequoyah Nuclear Plant site. WBN is a two unit plant. Each unit employs a pressurized water reactor nuclear steam supply system with four coolant loops furnished by Westinghouse Electric Corporation.

WBN1 and WBN2 are essentially identical. WBN1 and WBN2 shared structures include the Auxiliary and Control Building, Turbine and Service Buildings, Diesel Generator

Buildings, and the Intake Pumping Station. Major independent structures for each WBN unit consist of an ice-condenser containment with free standing steel vessel, a reinforced concrete Shield Building, a main cooling tower, and a refueling water storage tank.

1.2 SEISMIC IPEEE

A Seismic Margin Assessment (SMA) was performed for WBN1 in accordance with the Electric Power Research Institute (EPRI) NP-6041-SL (Ref. 3) seismic margins methodology. No design change recommendations resulted from the WBN1 IPEEE seismic evaluation. A number of minor anomalies were noted during the WBN1 walkdowns, mostly requiring housekeeping or maintenance actions. The IPEEE program did not identify any adverse spatial interactions or any equipment or components with seismic capacity below the reference level of the Review Level Earthquake (RLE), i.e., 0.3g. In fact, the governing high confidence low probability of failure (HCLPF) seismic capacity of WBN1 was found to be 0.36g.

In general, WBN2 is just like Watts Bar Nuclear Plant Unit 1 (WBN1). The ongoing WBN2 construction completion work is implementing the same design criteria and similar implementation procedures as WBN1. All of the same corrective action programs from WBN1 are being implemented for WBN2 (see Section 1.5). Therefore, the WBN2 HCLPF seismic capacity is expected to be at least as high as that determined for WBN1, and the results of the WBN1 seismic IPEEE should be fully applicable to WBN2. That is, the WBN2 HCLPF seismic capacity is expected to be at least 0.36g.

Confirmatory seismic margins capacity walkdowns and evaluations will be performed after the bulk of the construction completion activities is completed. The methodology that will be used for these confirmatory evaluations is described in Chapter 2. Validation activities are summarized in Chapter 5.

1.3 OTHER EXTERNAL EVENTS

The other external events for IPEEE include high winds, floods, transportation, and nearby facility accidents. WBN1 performed the screening described in Supplement 4 to Generic Letter 88-20 (Ref. 2) and NUREG-1407 (Ref. 4). Because WBN1 was designed prior to the 1975 Standard Review Plan (SRP, Ref. 5), the general approach taken was

to review the design bases and compare them to the SRP requirements. A review was performed to determine if any changes around and at WBN had taken place since issuance of the operating license in November 1995. The WBN1 IPEEE evaluation revealed that the plant meets the 1975 SRP criteria for these external events, and only one recommendation for plant improvement resulted; namely, a recommendation to modify an Auxiliary Building concrete canopy to provide additional protection against tornado missiles. This modification is common for WBN2.

A goal of the WBN2 construction completion project is to make WBN2 as much as possible like WBN1. Thus, a similar effort as performed for WBN1 is used for the WBN2 other external events portion of the IPEEE. Additional discussion is provided in Chapter 3.

1.4 FIRE-INDUCED VULNERABILITY EVALUATION

The WBN1 plant vulnerability to internal fire events evaluation was assessed based on the Fire Induced Vulnerability Evaluation (FIVE) methodology developed by EPRI (Ref. 6). For those areas that did not pass the screen at the initial levels of evaluation, more detailed review techniques were utilized (e.g., zone of influence reviews for potential fires, segmentation of fire scenarios utilizing event trees). The results of the WBN1 detailed evaluation process were that all remaining plant areas were screened from further consideration while maintaining a conservative level of assumed system failures within the analysis. This WBN1 evaluation confirmed that there are no fire-induced vulnerabilities associated with continued operation.

For WBN2, the same FIVE process as used for WBN1 was repeated for plant areas supporting WBN2. Additional discussion is provided in Chapter 4.

1.5 CORRECTIVE ACTION PROGRAMS

WBN2 is implementing the same CAPs as WBN1. A brief summary of the WBN1 Civil/Seismic CAPs follows:

- Seismic reanalysis of nine Category I structures was performed for WBN1 restart using the methodology described in the Seismic Analysis CAP (Ref. 7) and Design Criteria WB-DC-20-24 (Ref. 8), and approved by NRC Inspection Reports 50-390-89/21 and 50-391-89/21. The nine structures were reanalyzed using current analysis

methods, upgraded structural models, and site specific response spectra. The seismic models of the Interior Concrete Structures and Auxiliary Control Building were revised to include actual location of shear centers. Also, the torsional constants in the seismic models of the Interior Concrete Structure (ICS) and North Steam Valve Room (NSVR) were revised to consider effects of warping and new analyses were performed. These upgraded building models were used in the development of the evaluation basis (Set B) and the new design/modification (Set B+C) amplified response spectra. The same seismic response spectra are being used for WBN2 evaluations (Set B) and new designs (Set B+C). Block walls were evaluated and accepted as part of the TVA response to the NRC Bulletin 80-11 (Ref. 9) for WBN1. Any WBN2 block walls that may not have been addressed in the WBN1 80-11 program are included in the WBN2 construction completion project.

- The Hanger and Analysis Update Program (HAAUP) addressed seismic as well as other issues relating to piping and pipe supports which were previously identified to the NRC. The scope of the HAAUP included TVA responses to NRC Bulletin 79-02 (Ref. 10) for verification of pipe support base plate flexibility and expansion anchorage factor of safety, and also Bulletin 79-14 (Ref. 11) for verification of input data used in the seismic qualification of piping systems. TVA completed action plans for four distinct categories of piping under the WBN1 HAAUP: 1) ASME Large Bore Piping and Supports; 2) ASME Small Bore Piping and Supports; 3) Category I(L) Piping and Supports; and 4) Instrument Lines and Supports. Additional program elements that were covered under the HAAUP include 1) Pipe Support Component Substitution; 2) Pipe Rupture; 3) Buried Piping; and 4) Equipment Interfaces. A similar rigorous HAAUP is being implemented for WBN2 piping and pipe supports.
- The Integrated Interaction Program (IIP) identified and evaluated potential seismic interaction hazards as well as interactions due to piping thermal expansion. The different types of seismic interactions that were evaluated include the following:
    - Interaction due to structural failure and falling;
    - Spray interaction;
    - Impact due to flexure/displacement;
    - Commodity/component deformation due to building interface differential displacement, termed "shakespace" interaction.

The objective of the IIP walkdown was two-fold: 1) to perform "screening evaluation" using conservative screening criteria; and 2) to identify outliers, i.e., items that did not meet the screening criteria requirements; as well as bounding cases. Subsequent acceptance criteria evaluations of bounding cases and outliers were performed to ensure that the safety-related functional capability of commodities will not be compromised by seismic systems interaction. The WBN1 program included comprehensive plant walkdowns of all WBN1 and common systems and areas. The WBN2 IIP covers all of the applicable plant systems and areas not previously addressed in the WBN1 IIP.

- The Equipment Seismic Qualification (ESQ) Program covered all Category I equipment, including walkdowns of all items and 100-percent inspection of the anchorage. Attributes of the ESQ Program include (1) completeness and retrievabililty of qualification documentation; (2) evaluation of equipment mounting conditions; and (3) resolution of all discrepancies between design documents and as installed conditions. A similar rigorous ESQ program has been implemented for WBN2 and appropriate modifications are in progress.

  Category I(L) equipment was addressed in the IIP as described above (structural failure and falling interactions) on an area-by-area basis. WBN2 is using the same approach as WBN1 for seismic verification of Category I(L) equipment.

- The WBN1 and Common major commodities (cable tray, conduit, and HVAC systems) and their supports were re-evaluated and screened and/or walked down for location, structural adequacy, and anchorage issues. This was accomplished in accordance with their respective CAPs. The comparable WBN2 programs are covering all of the applicable plant systems and areas not previously addressed in the WBN1 programs.

The above programs provided documentation of the WBN1 design basis seismic qualification. This documentation was used throughout the WBN1 IPEEE to screen, assess, and verify seismic margin beyond design basis. Results of the WBN2 CAP will similarly be used in the WBN2 seismic IPEEE program. See Chapter 2 for additional discussion.

In addition to the above-described civil/seismic CAPs, another CAP of interest to IPEEE is for fire protection. WBN2 is implementing the same Fire Protection CAP approach as

WBN1. The program includes documentation of the measures taken to evaluate violation of the Appendix R requirements and issuance of design change notices (DCNs) to correct the deficiencies; review of SQN Appendix R allegations, as well as issues raised by the NRC during SQN inspections, for applicability to WBN and issuance of DCNs to correct the deficiencies; and Fire Protection Compliance Review to ensure WBN conformance with NRC requirements and applicable guidelines. As with WBN1, the results of the Compliance Review will be used as the basis for developing the remaining scope of work (calculations, analyses, DCNs, and document updates) and the consolidation of fire protection documentation into an organized package to support and substantiate the Compliance Review.

1.6 LIST OF ACRONYMS

ACB	Auxiliary Control Building
ACI	American Concrete Institute
AHU	Air Handling Unit
AOI	Abnormal Operating Instruction
ARS	Amplified Response Spectrum
ASME	American Society of Mechanical Engineers
BAMB	Boric Acid Mixing Building
CAP	Corrective Action Program
CCS	Component Cooling System
CDFM	Conservative Deterministic Failure Mechanism
DBT	Design Basis Tornado
DCN	Design Change Notice
DG	Diesel Generator
DGB	Diesel Generator Building
EMPAC	Enterprise Maintenance Planning and Control
EPRI	Electric Power Research Institute
ERCW	Essential Raw Cooling Water
ESQ	Equipment Seismic Qualification
FIVE	Fire-Induced Vulnerability Evaluation
FRC	Facility Risk Consultants, Inc.
FSAR	Final Safety Analysis Report
HAAUP	Hangar and Analysis Update Program

HCLPF	High Confidence Low Probability of Failure
ICS	Interior Concrete Structure
IIP	Integrated Interaction Program
IPE	Individual Plant Examination
IPEEE	Individual Plant Examination for External Events
LOCA	Loss of Coolant Accident
LOOP	Loss of Offsite Power
MEL	Master Equipment List
MOV	Motor Operated Valve
NRC	Nuclear Regulatory Commission
NSVR	North Steam Valve Room
PGA	Peak Ground Acceleration
PMF	Probable Maximum Flood
PMP	Probable Maximum Precipitation
PRA	Probabilistic Risk Assessment
PSA	Plant Safety Assessment
RHR	Residual Heat Removal
RLE	Review Level Earthquake
RWST	Refueling Water Storage Tank
SB	Shield Building
SC	Seismic Capacity Ratio
SCV	Steel Containment Vessel
SD	Seismic Demand Ratio
SMA	Seismic Margin Assessment
SQN	Sequoyah Nuclear Plant
SRP	Standard Review Plan
SRT	Seismic Review Team
SSD	Safe Shutdown
SSE	Safe Shutdown Earthquake
SSEL	Safe Shutdown Equipment List
TVA	Tennessee Valley Authority
UNID	Unique Identification
WBN	Watts Bar Nuclear Plant

2.0 SEISMIC IPEEE

WBN1 performed the seismic IPEEE using the EPRI Seismic Margin Assessment (SMA) approach (Ref. 3). This is a deterministic method which involves determination of the high-confidence-low-probability-of-failure (HCLPF) capacity for a subset of essential components and subsystems necessary to safely shutdown the reactor in the event of a specified earthquake greater than the design basis. The objective of the SMA is to define the margin above the design basis Safe Shutdown Earthquake (SSE) for the plant. HCLPF capacity is expressed in terms of peak ground acceleration (PGA).

The walkdown effort for the WBN1 seismic IPEEE took credit for the extensive walkdowns associated with the numerous corrective action programs performed prior to issuance of the low power operating license. Salient features are described in Sections 2.1 through 2.4. In general, the same approach is used for WBN2, as described in Section 2.5.

2.1 SAFE SHUTDOWN EQUIPMENT LIST

The WBN1 Safe Shutdown Equipment List (SSEL) for the seismic IPEEE was developed using the EPRI SMA methodology (Ref. 3). The WBN1 SSEL identified Unit 1, common, and Unit 2 equipment required to achieve and maintain a Unit 1 safe shutdown condition for at least 72 hours following a seismic event and a seismic event concurrent with a small break Loss of Coolant Accident (LOCA).

WBN2 systems and components function in the same manner as the Unit 1 systems and components. Development of the WBN2 SSEL is summarized in Section 2.5.1.

2.2 SEISMIC DEMAND

The Set B+C new design/modification spectra was used in the WBN1 IPEEE program as the basis for defining seismic demand for equipment on the SSEL. Appropriate scale factors were used to boost those amplified response spectra (ARS) to the demand level of the RLE. The primary scale factors for the amplified portion of the ARS for WBN1 and Common Category I structures are shown in Table 2-1. A 1.25 scale factor for set B+C was applied to both the horizontal and vertical ARS in non-amplified portions of the ARS for all buildings. In addition, scale factors for items supported on base slabs were

determined on a case-by-case basis using the natural frequency of the item and the difference between the RLE spectrum and the Set B+C composite spectrum.

These same scale factors and general approach are used for WBN2.

2.3 SEISMIC CAPABILITIES OF STRUCTURES AND COMPONENTS

In the WBN1 seismic IPEEE, HCLPF calculations were prepared for items which could not be screened by other means. In all cases, the calculated HCLPF values exceeded the RLE. HCLPF seismic capacities for WBN2 structures, systems, and components will also be confirmed to exceed the RLE. Table 2-2 summarizes the WBN1 HCLPF calculations and results. The evaluations for other key items in the WBN1 seismic IPEEE were as follows.

Refueling Water Storage Tank (RWST)

The WBN1 RWST was reevaluated during the Seismic CAP for Set B seismic responses and found to be adequate. The design features of the tank were also extensively investigated by TVA and the NRC and any seismic vulnerabilities were addressed. The WBN1 RWST was screened from further review based on (1) the conservative HCLPF of 0.48g calculated for the Sequoyah RWST, (2) the more rugged design of the WBN RWST, and (3) the well-designed foundation and anchorage of the WBN RWST.

The seismic review team will perform an independent walkdown of the WBN2 RWST to assess if there are any new seismic vulnerabilities that could lead to structural failure during the RLE.

Category I Block Walls

WBN1 contains approximately 85 masonry block walls located in, or in association with, Category I Buildings (Control Building, Diesel Generator Building, Auxiliary Building, and Reactor Building). They consist of three distinct types or may be divided into the following three categories:

1. Reinforced - Hollow Core Mortared Masonry Walls *:

   - 25 – 8" thick block walls in the Control Building
   - 13 – 8" thick block walls in the Diesel Generator Building

- 1 - 8" thick block wall in the Reactor Building
- 19 - 8" thick block walls in the Auxiliary Building

2. Unreinforced - Mortared Solid Block Masonry Walls **:

- 15 - 6"x 8"x 12" block walls in the Auxiliary Building

3. Unreinforced – Unmortared Solid Block Masonry Shielding Walls ***:

- 2 walls in the Reactor Building
- 10 walls in the Auxiliary Building

* All the walls have some degree of fixity at top, bottom, and at the sides.

** Unreinforced mortared solid block walls either have physical restraints or designated safe fall zones.

*** Unreinforced unmortared solid stackable shield walls either have physical restraints or designated safe fall zones.

All of these walls were reviewed as part of the NRC Bulletin 80-11 (Ref. 9) program prior to WBN1 start-up, by assessing a sample of WBN1 and common worst case masonry walls. The SMA of the WBN1 block walls utilized information from this design basis calculation to the extent possible including choice of most highly loaded walls, wall properties, and material properties. Walls in the Control Building and Diesel Generator Building were selected as representative of the worst cases (greatest height, applied attachment loads, type of fixity, and design basis evaluation interaction ratios). All of these walls are 8" thickness, mortared and reinforced.

The WBN1 walls were evaluated using the procedures outlined in Appendix R of EPRI NP-6041-SL (Ref. 3). A minimum conservative deterministic failure method (CDFM) capacity of 0.53g was found for the walls evaluated. Therefore, in the WBN1 seismic IPEEE, failure of the masonry walls was not considered credible for the RLE.

The seismic margin of WBN2 masonry walls will be confirmed for the WBN2 IPEEE program prior to start-up.

Diesel Generator Building (DGB)

The DGB could not be automatically screened out based on the criteria in Table 2-3 of EPRI NP-6041-SL (Ref. 3). The WBN1 SRT performed a walkdown of the DGB to

identify any structural vulnerabilities. No significant structural vulnerabilities that could lead to structural damage due to the RLE were identified. During the WBN1 Seismic CAP, a detailed evaluation of worst-case concrete walls and slabs was performed to confirm the original design. None of the DGB walls and slabs were identified as worst-case features because of their robust design and moderate loads. Therefore, the DGB was screened from further evaluation based on the SRT walkdown coupled with the evaluation performed under the WBN1 seismic CAP.

The DGB is common for WBN1 and WBN2. No further evaluation is required.

Impact between Adjacent Structures

The gap between the WBN1 Shield Building and Auxiliary Control Building (ACB) is 1" wide, and the gap between the ACB and the Waste Packaging Building is 2" wide. The SQN IPEEE demonstrated a large margin of approximately 5:l against closure of the gap during out-of-phase seismic motion between the ACB and the Shield Building. Although the scaled Set B+C responses are more conservative than those used for the SQN IPEEE evaluation, the gaps between WBN structures is more than adequate to prevent closure during an RLE.

The gap between the WBN2 Shield Building and the ACB is also 1" wide, therefore no further evaluation is required for the WBN2 IPEEE program.

Ice Basket Lower Seal (Divider Barrier Seal)

The WBN1 SRT reviewed the determination of seismic margin for the seal during the SQN IPEEE. The SQN review determined that a margin of approximately 16:1 existed against exceedence of the tangential allowable movement of 1-in. The SRT confirmed that the WBN1 seal design and gap is similar to that of Sequoyah and that allowable displacement limits are similar.

It will be confirmed that the same detail is used for the WBN2 ice basket lower seal, and this will establish the basis that this seal is screened from further review.

Buckling of Containment

The WBN1 steel containment was screened from evaluation in accordance with the criteria in EPRI NP-6041-SL (Ref. 3). Further, the containment structure was reviewed for the SQN IPEEE and determined to be acceptable with a margin of failure against

buckling of 27:1. Based on the EPRI NP-6041-SL (Ref. 3) screening criteria and the large margin established during the SQN IPEEE evaluation, no further review was determined to be necessary for WBN1.

The WBN2 containment shell is the same design as WBN1 and is, likewise, considered acceptable.

Auxiliary/Control Building

The SQN IPEEE seismic evaluation determined that for all site building features the controlling HCLPF value was for the Aux. Bldg. High Bay Roof Diaphragm slab located between the two reactor buildings at elevation 791.75'. Since this feature was the controlling building item it was evaluated also for the WBN1 IPEEE. The SQN and WBN Auxiliary Buildings are based on the same design and are essentially the same with the exception of building elevations, seismic input levels and rotation of building axes by 90 degrees (i.e., SQN Aux. Bldg. N-S direction corresponds to WBN Aux. Bldg. E-W direction, and SQN elevation 791.75 corresponds to WBN elevation 814.75). The wall and slab thicknesses and reinforcing are equivalent. The WBN1 seismic IPEEE approach included scaling SQN IPEEE seismic loads to WBN levels (this was done to develop both translational and torsional components of in-plane loads for the diaphragm) and evaluating the diaphragm in detail. The resulting HCLPF for the roof diaphragm was computed to be 0.75g for the RLE.

The Auxiliary/Control Building is common to WBN1 and WBN2. No further evaluation is required for WBN2.

Relay Evaluation

Watts Bar Nuclear Plant is listed in NUREG-1407 Table 3.1 as a 0.3g focused scope plant. This designation requires a relay chatter evaluation as part of the IPEEE. Subsequent to NUREG-1407, Generic Letter GL 88-20 Supplement 5 (Ref. 13) was issued which modified the relay evaluation requirements for focused scope plants to: *"drastically reduce the scope of relay chatter evaluation, retaining only the identification of bad actor relays."* To comply with this requirement, WBN1 concluded the relay evaluation as specified, and no low seismic ruggedness relays were found to be installed in unacceptable configurations at WBN1. This verified design basis expectations.

See Section 2.5.2 for a summary of the WBN2 seismic IPEEE relay review.

2.4 WBN2 EQUIPMENT ANCHORAGE

For newly-installed base-anchored electrical equipment, the WBN2 ESQ program anchorage design basis envelopes the requirements for a 0.30g RLE HCLPF capacity as follows:

- Seismic Demand. IPEEE seismic demand is obtained from set B+C floor response spectra scaled up by a maximum factor of 1.25. The appropriate damping value for HCLPF capacity determination is 5% per EPRI NP-6041-SL (Ref. 3). The TVA WBN design criteria (WB-DC-40-31.2, Ref. 12) specifies 3% damping. Thus the HCLPF / design seismic demand ratio is as follows:

  $$SD = 1.25 \times (3 / 5)^{1/2} = 0.97 < 1.0$$

  This means that the 0.30g RLE HCLPF seismic demand level is less than the design criteria seismic demand level.

- Seismic Capacity. In general, for expansion anchors, the EPRI margins HCLPF capacity of expansion anchors is based on a factor of safety ranging from 2.4 up to 3.6 for multiple bolts depending on the presence of cracks. In general, the upper bound factor of safety for WBN electrical panels is 3.2. The TVA anchor design specification DS-C-1.7.1 (Ref. 14) lower bound factor of safety, for wedge bolts, is 4.0. Thus the HCLPF / design seismic capacity ratio is:

  $$SC = 4 / 3.2 = 1.25$$

  This means that the HCLPF seismic capacity level is higher than the design criteria seismic capacity level.

Using the above 2 ratios, the minimum equivalent RLE for HCLPF capacity of WBN2 new electrical equipment panel anchorage is:

$$HCLPF = 0.30g \times (1.25 / 0.97) = 0.39g$$

This is higher than the lower bound WBN1 HCLPF capacity as reported in Table 2-2. Thus no additional work is required for new electrical panel anchorage for WBN2 seismic IPEEE.

2.5 WBN2 SEISMIC IPEEE APPROACH

The approach being implemented for the WBN2 seismic IPEEE is summarized in the following Sections which address the following:

- Safe Shutdown Equipment List
- Relay Review
- Walkdown and HCLPF Evaluations
- Seismic Review Team and Peer Reviewers

2.5.1 Safe Shutdown Equipment List

The WBN2 SSEL design report is included as Attachment 1 to this report. The WBN2 SSEL was developed primarily based on the WBN1 SSEL. That is, the original WBN1 SSEL was used as a starting point, formatting the equipment IDs to TVA's unique identification (UNID) format. DCNs for each SSEL system issued between 12/15/1997 and 12/31/1998 were reviewed to identify any equipment additions and deletions to the systems (note that the WBN1 SSEL was issued on 12/15/1997). Any equipment additions and deletions were incorporated in the WBN1 SSEL as required.

Changes to the Master Equipment List (MEL) after 12/31/1998 were reviewed to identify equipment additions and deletions (note that the TVA EMPAC MEL was issued on or about 12/31/1998). The WBN1 SSEL was then updated and converted into the design report WBN2 SSEL.

As described in Attachment 1, the final WBN2 SSEL will be issued following later validation and confirmation to include the following:

- Upon availability of the WBN2 final design and design drawings as well as Master Equipment List (MEL), verify the WBN2 SSEL equipment ID, description, flow diagram, category, seismic category, and elevation/room against the completed MEL.
- Obtain TVA Probability Risk Assessment (PRA) Section and Operations reviews of the WBN2 SSEL and resolve comments as required. It will be confirmed that the SSEL and success paths are those normally preferred by operations for shutdown following a seismic event.

2.5.2 WBN2 Relay Review

The WBN1 seismic IPEEE relay evaluation concluded that no low-seismic-ruggedness relays were used in applications which would qualify them as essential relays. No corrective actions were required.

A similar evaluation will be performed for WBN2, using the 0.3g Focused Scope plant relay evaluation process in accordance with Supplement 5 of GL 88-20 (Ref. 13). That is, the evaluation is limited to only a review for low seismic ruggedness relays (bad actor relays). Bad actor relays are those subject to "chatter" during a review level earthquake. "Chatter" is considered to be the inadvertent opening or closing of a relay contact with a sustained output of two milliseconds or more.

The WBN2 relay review design report is included in Attachment 2. The design report concludes that WBN2, like WBN1, requires no corrective actions for the issue of Relay Chatter. As described in Attachment 2, the final WBN2 relay review will be issued following later verification including the following:

- Evaluation of any changes to design documents utilized in the development of the WBN2 relay review design report;
- Confirmation of the final WBN2 SSEL as described in Section 2.5.1;
- A Control and Power Interface will be created to document any differences between Unit 1 and Unit 2, including but not limited to SSEL, control and/or power, and fail safe circuitry. This Interface will be the source document for further investigation of Bad Actor Relays.

If no differences in Unit 1 and Unit 2 are identified, this verification report will conclude that WBN requires no corrective actions for the issue of Relay Chatter.

2.5.3 WBN2 Walkdown and HCLPF Evaluations

Once the bulk of construction work on WBN2 is completed, a seismic margins walkdown will be performed for the items of equipment that are unique to the WBN2 SSEL in accordance with the requirements of the EPRI SMA methodology. In addition, a walk-by will be performed for common items that were previously addressed in the WBN1 program as deemed necessary due to possible significant changes from WBN2 construction completion modifications.

Consistent with the WBN1 program, the WBN2 seismic margins review will factor in the results of other ongoing construction completion efforts, including corrective action programs (CAPs), the equipment seismic qualification program (ESQ), and the integrated interaction program (IIP). WBN2 is implementing the same CAPs, ESQ, and IIP as WBN1 (see Section 1.5), using a similar approach and the same design criteria. The WBN2 seismic capacity calculations will be performed following the walkdowns, and will be based largely on those performed for WBN1 (see Section 2.3).

One of the controlling features for the WBN1 0.36g HCLPF is the control room ceiling. After the WBN1 IPEEE program was completed, as described in Section 3.7.3.18 of the UFSAR (Ref. 15), a detailed evaluation including non-linear finite element analysis of the controlling features of the ceiling was performed. This evaluation provides considerable insight to the seismic performance of the control room ceiling. Utilizing information from the detailed ceiling evaluation, an updated HCLPF capacity of the WBN main control room ceiling structure is found to be 0.52g (Ref. 16).

As described in the Attachment 1 WBN2 SSEL design report, equipment items which were directly or indirectly referred to in the WBN1 SSEL report but not specifically listed in the SSEL were added to the WBN2 SSEL. The seismic margin assessment for these new items is as follows:

- The Diesel Generator Seven Day Fuel Oil Tanks are screened out from further evaluation based on verification of engineered compacted foundation eliminating likelihood of differential settlement.
- Sump Strainers are screened out as inherently rugged.
- Walkdown evaluation of Fifth Vital Battery verified consistency with other WBN1 SSEL batteries as well as design drawings and seismic qualification basis.
- Walkdown evaluation of Control Rod Drive Mechanisms verified seismic bracing at top of frame enabling these to be screened out.
- ERCW flow control valves, Safety Injection System (SIS) pump discharge isolation valves, and ERCW to Auxiliary Feedwater System isolation valves are screened out, noting that the WBN2 IIP will perform the seismic proximity interaction reviews for these items.

- Later verification walkdown screening evaluations will be performed for the Centrifugal Charging Pump (CCP 2A& 2B) & Residual Heat Removal (RHR) Pump Room Coolers and Lower Compartment Cooler Fans.

2.5.4 Seismic Review Team and Peer Reviewers

The WBN2 Seismic Review Team (SRT) consists of Richard D. Cutsinger, John O. Dizon, and Stephen J. Eder. These individuals are fully trained and meet all SRT requirements for the SMA. These individuals have a working knowledge of the WBN1 and WBN2 seismic programs, and recently were responsible for the successful completion of the SMA for TVA Browns Ferry Unit 1. In particular, the WBN2 SRT is currently responsible for the WBN2 IIP. Outlier resolution and bounding evaluation efforts from the IIP will directly consider seismic IPEEE implications and will be factored into the margins review as applicable. The peer review team for the WBN2 seismic IPEEE will consist of former TVA individuals who served as WBN1 seismic IPEEE SRT members, namely Robert O. Enis and Bill C. Perkins.

Table 2-1: RLE Scale Factors for Category I Structures

Structure	Scale Factors*		
	N-S Direction	E-W Direction	Vertical
Auxiliary Control Building	1.0	1.16	1.25
Interior Concrete Structure	1.0	1.0	1.0
Shield Building	1.0	1.0	1.33
Steel Containment Vessel	1.0	1.0	1.25

Notes:

* Scale Factor is for ARS in amplified portion of buildings

Table 2-2: Resolution of WBN1 Seismic IPEEE Outliers

Item	Building	Resolution HCLPF	Issue
Spatial Interactions	Various	Interactions determined to be acceptable	Seismic Spatial Interaction
Masonry Walls	Various	0.53g	Stability
6900V Shutdown Boards	AUXILIARY	0.45g	Structural Integrity
DG Air Intake Filters	D.G.	1.78g	Anchorage
Main Control Rm AHU	CONTROL	0.56g	Anchorage
Auxiliary Bldg. Roof Diaphragm	AUXILIARY	0.75g	Structural Integrity
RHR Pumps	AUXILIARY	0.50g	Anchorage
480V Shutdown Board Transformers	AUXILIARY	0.38g	Structural Integrity
Control Air Pre & Aft. Filters	AUXILIARY	1.08g	Anchorage
CCS Heat Exchangers	AUXILIARY	0.38g	Anchorage
ERCW Pumps	IPS	> 0.40g	Anchorage
IPS Screen Wash Pumps	IPS	0.36g	Anchorage
480V - Reactor MOV, Reactor Vent, Control & Aux. Boards	AUXILIARY	0.40g	Anchorage
Main Cont. Rm. Ceiling Structure	CONTROL	0.36g	Anchorage
Main Cont. Rm. Electrical Panels	CONTROL	0.70g	Structural Integrity

3.0 OTHER EXTERNAL EVENTS

To address the potential vulnerabilities at nuclear power plants from the effects of high winds, floods, and transportation and nearby facility accidents, NUREG-1407 (Ref. 4) recommends a progressive screening approach. The first step in the process is to review the plant-specific design hazard information and licensing bases, including the resolution given for each event noted. The next step is to review the site for any significant changes since the operational license was issued with respect to the following:

1. Military and industrial facilities within 5 miles of the site;
2. Onsite storage or other activities involving hazardous materials;
3. Transportation; or
4. Development that could affect the original design conditions.

Then the analyst should compare the information from the reviews conducted in the previous steps for conformance to the 1975 Standard Review Plan (SRP, Ref. 5) and perform a confirmatory walkdown. If the comparison indicates that the plant conforms to the 1975 SRP and the walkdown reveals no potential vulnerabilities which were not included in the original design basis analysis, the IPEEE screening criteria are met.

WBN is not a 1975 SRP plant, hence reviews of WBN1 were required of the design basis and any changes since the design for comparison to the SRP criteria. The reviews and subsequent walkdowns confirmed that the plant does meet the 1975 SRP criteria and that these events may be screened out.

Selection of external events for the IPEEE and the technical approach recommended for evaluation of such external events are discussed in NUREG-1407. In the WBN1 IPEEE, the information and criteria used in the selection of external events included in NUREG-1407 was reviewed and the applicability of these to WBN examined, in order to confirm that no unique external events are excluded in the IPEEE. Table 3-1 documents the results of the WBN1 evaluations for High Winds, Floods, and Other External Events for TVA Watts Bar Nuclear Plant (WBN).

As described in Table 3-1, the one exception noted and resolved during the WBN1 was for high winds and tornadoes. This is further described in Section 3.1 below.

3.1 HIGH WINDS AND TORNADOS

A walkdown was performed during the WBN1 IPEEE to identify potential high wind and tornado concerns. This evaluation concentrated on outdoor tanks and equipment, entrances to concrete buildings, openings in buildings such as air intakes, diesel exhaust stacks, and louvers, block walls in structures with openings, structures which could collapse and impact buildings containing safety-related equipment, and availability of objects which could become missiles in a tornado.

The following is a summary of the WBN1 walkdown observations with respect to high winds and tornadoes:

- Metal-sided structures on site were verified to not contain Category I equipment. The most significant metal-sided building, closest to a Category I structure, is the Turbine Building. The Turbine Building is a metal-sided building whose panels are assumed to fail at loads less than Design Basis Tornado (DBT). The impact of the resulting missiles on other Category I structures has been evaluated in the design calculations and found to be acceptable. No other metal-sided structures on site were found to be of greater significance than the Turbine Building as a source of tornado missiles.
- During the walkdown, it was confirmed that Category I building entrances and exterior openings in walls and slabs, which were determined to require protection as part of the design basis, are protected against tornado generated missiles which could penetrate and hit safety related equipment. The only exception found was an opening in the concrete canopy on the unit 2 side of the Auxiliary Building, which had the potential to allow tornado missiles to penetrate the Auxiliary Building from the Unit 2 area. Plant modifications were implemented to correct this situation.
- Block walls were qualified for tornado depressurization during the design basis evaluation. During the confirmatory walkdown, no modifications to block wall were observed that would compromise the design basis evaluation.
- The only outdoor safety related tank is the RWST. Although it is not designed to withstand a DBT event, a storage basin is located around the tank to retain

sufficient borated water in the event of a rupture of the tank due to tornado missiles.

- The number of potential objects available to be picked up by a tornado and become missiles was found to be not unusually large, in particular because there was no ongoing major construction activity at the plant site at the time of the WBN1 IPEEE program.

3.2 APPROACH FOR WBN2 OTHER EXTERNAL EVENTS

The findings and results from the WBN1 other external events IPEEE are fully applicable to WBN2. The following confirmatory reviews have already been performed for WBN2:

- Severe weather, lightning, and external fires were addressed in the WBN1 IPEEE program by reference to Loss of Offsite Power (LOOP) evaluations performed under the PSA for the internal events IPE. Similarly, detailed LOOP evaluations are included in the state-of-the-art PSA for the internal events IPE performed for WBN2 (Ref. 20) in accordance with RG 1.200 (Ref. 21).
- It has been re-confirmed that WBN1 has no additional operating experience indicating that anything other than loss of offsite power would result from lightning strikes. In addition, WBN2 meets the requirements of NFPA Code No. 78-1975 (Ref. 18). Lightning protection was evaluated in detail (Ref. 19) and corrective actions were implemented including addition of air terminals on the WBN2 Reactor Building parapet wall (verified by walkdown 04/07/2010). Therefore, as in WBN1, the generic data for screening out lightning for IPEEE is applicable to WBN2.
- The transportation accident statistics and industrial and military facilities within 5 miles of the site were reviewed for any significant changes that may have occurred since the WBN1 FSAR. This study was conducted as part of the preparation of the WBN2 FSAR (Ref. 22). It was concluded that none of the activities being performed in the vicinity of the site are a potential hazard to the plant.
- Probable maximum flood (PMF) levels are currently being re-established by a TVA hydrology for all sites (Ref. 23). The results of this ongoing hydrology study

indicate that flood levels at WBN may increase. Any changes in PMF elevation are going to be handled by TVA as a WBN2 design issue; no further discussion is provided in this report.

- WBN2 is being outfitted with a new Siemens turbine generator system (Ref. 24) and this included a new study on turbine missiles (Ref. 25). The report concludes that the turbine missile probabilities remain below NRC limits and thus no further consideration is required for the WBN2 IPEEE.
- WBN Abnormal Operating Instruction AOI-8 (Ref. 26) requires that in the event of a tornado watch or warning that loose equipment be secured or removed in the General Yard, Switchyard, Transformer yard, Intake Pumping Station, Power Stores dock, and Cooling Tower areas. Nevertheless, additional walkdowns will be performed as described below for tornado missile effects review.

Additional confirmatory review will be performed for WBN2 after the bulk of the construction completion activities is completed. Items that will be specifically addressed include the following:

- A site walkdown will be performed to identify potential objects that could be picked up by a tornado that may not be enveloped by the WBN1 evaluations. This WBN2 walkdown will not be performed until after the WBN2 construction work is complete and associated loose materials and equipment have been taken away from the site. Any significant discoveries will be removed from the site or evaluated in detail for acceptability.
- A new metal-sided Boric Acid Mixing Building (BAMB) is being added on the east side adjacent to the Turbine Building. It will be confirmed that the tornado missile assumptions based on the Turbine Building wall panels are bounding relative to possible missiles originating from the BAMB.

Table 3-1: Screening of External Events for the WBN1 IPEEE Program

Event	Generic Basis	Applicability to WBN1
High Winds and Tornadoes	NUREG- 1407 (Ref. 4) requests that this event be examined in the IPEEE. A progressive screening approach is recommended. If the plant does not meet the NRC criteria (1975 version of the Standard Review Plan), more detailed examination is required.	A review of the UFSAR (Ref. 15) indicates that tornado wind design does not strictly meet the Standard Review Plan. Additional evaluations were conducted as described in Section 4.1.
External Floods	NUREG-1407 requests that flooding be evaluated if the plant design basis does not meet the criteria (Regulatory Guide 1.59, Ref. 17). It also requires the use of the latest probable maximum precipitation (PMP) criteria which may result in higher site flooding levels and greater roof ponding loads than have been used in the plant design basis.	A review of the FSAR indicated that the design meets the NRC regulatory position 2 of the Regulatory Guide 1.59. The new PMP criteria were reviewed and it was determined that WBN is designed to withstand this flood and prevents water from entering safety related structures.
Transportation and Nearby Facility Accidents	NUREG-1407 requests that older plants need systematic examination for plant specific vulnerabilities from these events.	The FSAR previously examined the impact of potential transportation and nearby facility accidents and concluded that their contribution to plant risk is negligible. The transportation accident statistics and nearby facilities were reviewed for any changes to this conclusion as part of the WBN1 IPEEE and none were found.
Lightning	In accordance with NUREG-1407, the primary impact of lightning on nuclear power plants is loss of offsite power which is included as part of the internal events IPE. The NRC staff has judged that the probability of a severe accident caused by lightning (other that one due to loss of offsite power) is relatively low and further consideration of lightning effects should be performed only for plant sites where lightning strikes are likely to cause more than just loss of offsite power or a scram.	Walls Bar meets the requirements of NFPA Code No. 78-1975 (Ref. 18) and has no additional operating experience indicating that anything other than loss of offsite power would result from lightning strikes. Lightning protection was evaluated in calculation WBN-EEB-MSTI-190025 (Ref. 19). Therefore, the generic data used in screening lightning is applicable to Watts Bar.
Severe Temperature Transients	In accordance with NUREG-1407, the effects of these events are usually limited to reducing the capacity of the ultimate heat sink and loss of offsite power. The capacity reduction of the ultimate heat sink would be a slow process that allows plant operators sufficient time to take proper actions such as reducing power output level or achieving safe shutdown. The other potential impact on the plant, loss of offsite power, will be considered within the realm of the station blackout rule. Therefore, the temperature transients need not be addressed in the IPEEE.	Watts Bar site is not exposed to temperature transients more severe than other nuclear power plants in the U.S. Therefore, the generic data used in screening this event is applicable to Watts Bar.

Table 3-1: Screening of External Events for the WBN1 IPEEE Program, Continued

Event	Generic Basis	Applicability to WBN1
Severe Weather Storms	In accordance with NUREG-1407, the potential effects of severe weather storms are loss of offsite power and station blackout; these will be addressed in the internal events IPE. Thus, severe weather storms need not be examined further in the IPEEE.	Watts Bar has no additional information to supplement NUREG-1407. Therefore, the generic data used in screening of this event is applicable to Watts Bar.
External Fires	In accordance with NUREG-1407, the potential effects on the plant could be loss of offsite power, forced isolation of the plant ventilation, and possible control room evacuation. Usually, external fires are unable to spread onsite because of site clearing during construction stage. The effect of loss of offsite power will be addressed in the internal events IPE. The other effects have been evaluated during operating license review against sufficiently conservative criteria; thus they do not need to be reassessed in the IPEEE.	Watts Bar agrees with the generic basis and confirms that the plant site is generally cleared which would preclude the possibility of an external fire spreading onsite. Therefore, external fires will not be considered further in the IPEEE.
Extraterrestrial Activity	In accordance with NUREG-1407, the probability of a meteorite or satellite strike is estimated to be negligibly small (less than 10^{-9}) and the event is dismissed on the basis of low event frequency.	Watts Bar agrees with the generic basis; therefore, this event will not be considered further in the IPEEE.
Volcanic Activity	In accordance with NUREG- 1407, plant sites too far away from active volcanoes to expect any effect need not be considered in the IPEEE.	Watts Bar is far removed from an active volcano; therefore, this event will not be considered further in the IPEEE.
Turbine Missile	Based on the regular inspection of low pressure turbine discs and overspeed protection system followed by the utilities, the probability of turbine failure leading to missiles is considered acceptably small.	The plant arrangement for WBN is such that safety related structures, systems and components are essentially protected from low trajectory turbine missiles. FSAR Section 10.2.3 describes the analysis performed to estimate the probability of damage to WBN from turbine missiles. The probability was determined to be less than 1×10^{-7} per year. Also, WBN is committed to an inspection program of the turbine discs on a regular basis. This provides the basis for not considering the turbine missiles further in the IPEEE.

4.0 FIRE-INDUCED VULNERABILITY EVALUATION

Determination of the WBN1 vulnerability to internal fire events, in response to Supplement 4 to Generic Letter 88-20 (Ref. 2), was accomplished by use of the EPRI FIVE methodology (Ref. 6). Section 4.1 provides an overview of the WBN1 FIVE program. The WBN2 fire vulnerability evaluation is an extension of and uses a methodology consistent with WBN1 as described in Section 4.2. The WBN2 FIVE evaluation is included as Attachment 3 to this report.

4.1 SUMMARY OF THE WBN1 FIVE APPROACH AND RESULTS

The FIVE methodology consists of a progressive screening evaluation in which plant fire areas are screened from consideration based on *qualitative information* (Phase I) or by *quantitative analysis* (Phase II). Half (135 of 269) of the plant areas included within the scope of the WBN1 FIVE program were screened in Phase I. This phase consisted of screening fire areas based on area fire boundary integrity, the absence of safe shutdown components, and the lack of plant trip initiators. Containment fires were also screened based on qualitative factors. The Phase II quantitative analysis then consisted of an *initial quantitative evaluation*, followed by a more *detailed quantitative evaluation* for areas that were not screened, based on a fire-induced core damage frequency of less than 1 E-06.

The WBN1 *initial quantitative evaluation* consisted of generating an area-specific fire ignition frequency, then assuming that all fires totally engulf the affected area. Plant components that could be damaged by these fires were evaluated in the Appendix R analysis and documented in the Fire Protection Report. A "conditional core damage frequency" was then generated for each area by incorporating the failed components into the Plant Safety Assessment (PSA) model. Nearly half (60 of 132) of the remaining areas were screened during this phase.

The *detailed quantitative evaluation* was then performed for the remaining areas (i.e. those that were not screened from consideration in the initial quantitative evaluation). For those Control Building and Auxiliary Building areas that did not screen at an initial level of evaluation, more detailed review techniques were utilized (e.g., zone of influence reviews for potential fires, segmentation of fire scenarios utilizing event trees).

The results of the detailed evaluation processes were that all remaining plant areas were screened from further consideration while maintaining a conservative level of assumed system failures within the analysis. This evaluation has confirmed that there are no fire-induced vulnerabilities associated with the continued operation of the Watts Bar Nuclear Plant.

The last part of the fire evaluation process addressed the response to and resolution of the Sandia Fire Risk Scoping Study (NUREG/CR-5088, Ref. 27) issues and the evaluation of containment isolation and heat removal. These issues were resolved by a combination of referral to the WBN1 Fire Protection Report (Ref. 28) or by discussion in Attachment 4 of the WBN1 IPEEE report (Ref. 1).

4.2 WBN2 FIVE APPROACH

The WBN2 FIVE will repeat the above-described process that was used for the WBN1 FIVE for fire areas that support WBN2 operation. This will also include consideration of the following potential program additions:

- Areas that support WBN2 operation will be examined from a dual unit perspective;
- Identification of combustible load additions/deletions and ignition source additions/deletions that occurred after the WBN1 IPEEE report was published for common unit areas that support both WBN1 and WBN2.

The WBN2 Fire Induced Vulnerability Evaluation (FIVE) is documented in Attachment 3. The FIVE represents an analysis of the "as designed" condition of WBN2. Since Generic Letter (GL) 88-20 specifies that the IPEEE evaluation should be based upon the "as built" configuration of the plant, the FIVE analyses of the "as designed" configuration will be validated when construction is complete to meet the "as built" GL 88-20 criterion. The FIVE validation effort will be comprised of the following activities:

<u>Validation Activities for Phase I</u>

- The Unit 2 population of rooms with Appendix R Safe Shutdown (SSD) Equipment will be reviewed to ensure that no safe shutdown components or plant trip initiators have been added to the scope. If any of these are discovered, they will be evaluated via the FIVE process. A representative population of rooms will

be reviewed to ensure that each room's configuration, barrier ratings, room use, etc. has not changed. Based on the results of this review, rooms will be reanalyzed as necessary and changes incorporated into the analysis.

Validation Activities for Phase II, Step 1

- A representative population of Unit 2 rooms will be reviewed to verify that there have been no significant changes in the room ignition frequencies which would result in a less conservative analysis result. New walkdowns will be performed and incorporated into the analysis as necessary.

Validation Activities for Phase II, Step 2

- The "as built" equipment and location data for the Unit 2 Appendix R SSD equipment and safety injection/recirculation equipment will be reviewed and incorporated into the Plant Probabilistic Risk Assessment (PRA) as necessary to update the analysis. Manual actions credited in the analysis will be confirmed. Also, the latest Plant PRA will be compared to the "as designed" version of the model and updated if needed.

Validation Activities for Phase II, Step 3

- Report WBN-IPE-005 U2 will be updated as necessary. This includes reviewing and updating both the assumptions and event trees as required.

Validation Activities for Phase III

- All applicable reports, including the summary, associated with the Unit 2 FIVE evaluation will be updated as necessary.

Other Validation Activities

- A peer review of the Unit 2 analysis will be performed prior to submittal of the Validated "As Built" Analysis Report. This review will be similar to the review performed for the Unit 1 evaluation.

5.0 SUMMARY OF VALIDATION ACTIVITIES

This Chapter provides, in punch-list format, a summary of the validation activities to be performed in order to enable confirmation of the results presented herein and submission of the final report for the WBN2 IPEEE implementation.

5.1 SSEL VALIDATION

5.1.1 Upon availability of the WBN2 final design and design drawings as well as Master Equipment List (MEL), verify the WBN2 SSEL equipment ID, description, flow diagram, category, seismic category, and elevation/room against the completed MEL.

5.1.2 Obtain TVA Probability Risk Assessment (PRA) Section and Operations reviews of the WBN2 SSEL and resolve comments as required. It will be confirmed that the SSEL and success paths are those normally preferred by operations for shutdown following a seismic event.

5.1.3 An independent peer review of the WBN2 SSEL development process and results will be performed similar to the independent peer review that was conducted for the WBN1 SSEL.

5.2 RELAY REVIEW VALIDATION

5.2.1 Evaluate any changes to any of the design documents utilized in the development of the WBN2 relay review design report.

5.2.2 Confirm that the bad actor relay identification encompasses the scope of equipment in the final WBN2 SSEL.

5.2.3 Prepare a Control and Power Interface to document any differences between WBN1 and WBN2, including but not limited to the SSEL control and/or power and fail safe circuitry. This Interface will be the source document for further investigation of bad actor relays.

5.2.4 An independent peer review of the WBN2 Relay Review will be performed similar to the independent peer review that was conducted for the WBN1 Relay Review.

5.3 SEISMIC MARGIN ASSESSMENT

5.3.1 Confirm completion of corrective action programs of interest to the seismic margin assessment, in particular the HAAUP, IIP, and ESQ programs.

5.3.2 Review the final SSEL and identify any new items or other significant deviations for seismic assessment.

5.3.3 Once the bulk of WBN2 construction work is completed, perform the seismic margins walkdown for the items of equipment that are unique to the WBN2 SSEL.

5.3.4 Perform a walk-by for common items that were previously addressed in the WBN1 program as deemed necessary due to possible significant changes from WBN2 construction completion modifications.

5.3.5 Perform specific verification walkdown screening evaluations for the Centrifugal Charging Pump (CCP 2A& 2B) & Residual Heat Removal (RHR) Pump Room Coolers and Lower Compartment Cooler Fans.

5.3.6 Perform an independent walkdown of the WBN2 RWST to assess if there is any new seismic vulnerability in relation to the WBN1 RWST seismic margin evaluation.

5.3.7 Confirm the seismic margin of WBN2 masonry walls by comparison to WBN1 masonry walls.

5.3.8 Confirm that the same detail as used in WBN1 is used for the WBN2 ice basket lower seal.

5.3.9 An independent peer review of the WBN2 SMA will be performed similar to the independent peer review that was conducted for the WBN1 SMA, in accordance with the peer review requirements as described in the EPRI NP-6041-SL (Ref. 3).

5.4 OTHER EXTERNAL EVENTS ASSESSMENT

5.4.1 Perform a general site walkdown to identify potential objects that could be picked up by a tornado that may not be enveloped by the WBN1 evaluations.

5.4.2 Confirm that the metal-wall panels for the Boric Acid Mixing Building (BAMB) are bounded by the WBN1 IPEEE tornado missile assumptions based on the Turbine Building wall.

5.5 FIVE VALIDATION

5.5.1 The Unit 2 population of rooms with Appendix R Safe Shutdown (SSD) Equipment will be reviewed to ensure that no safe shutdown components or plant trip initiators have been added to the scope. If any of these are discovered, they will be evaluated via the FIVE process. A representative population of rooms will be reviewed to ensure that each room's configuration, barrier ratings, room use, etc. has not changed. Based on the results of this review, rooms will be reanalyzed as necessary and changes incorporated into the analysis (Phase I).

5.5.2 A representative population of Unit 2 rooms will be reviewed to verify that there have been no significant changes in the room ignition frequencies which would result in a less conservative analysis result. New walkdowns will be performed and incorporated into the analysis as necessary (Phase II, Step 1).

5.5.3 The "as built" equipment and location data for the Unit 2 Appendix R SSD equipment and safety injection/recirculation equipment will be reviewed and incorporated into the Plant Probabilistic Risk Assessment (PRA) as necessary to update the analysis. Manual actions credited in the analysis will be confirmed. Also, the latest Plant PRA will be compared to the "as designed" version of the model and updated if needed (Phase II, Step 2).

5.5.4 Report WBN-IPE-005 U2 will be updated as necessary. This includes reviewing and updating both the assumptions and event trees as required. (Phase II, Step 3).

5.5.5 All applicable reports, including the summary, associated with the Unit 2 FIVE evaluation will be updated as necessary (Phase III).

5.5.6 A peer review of the Unit 2 analysis will be performed prior to submittal of the Validated "As Built" Analysis Report. This review will be similar to the review performed for the Unit 1 evaluation.

6.0 REFERENCES

1. Tennessee Valley Authority letter to United States Nuclear Regulatory Commission dated February 17, 1998, transmitting the Watts Bar Unit 1 Final Report, "Watts Bar Nuclear Plant (WBNP) Individual Plant Examination of External Events (IPEEE) Final Report," RIMS No. T04 980217 539.

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27. Sandia National Laboratories, "Fire Risk Scoping Study: Investigation of Nuclear Power Plant Fire Risk, Including Previously Unaddressed Issues," prepared for the U.S. NRC, NUREG/CR-5088, January, 1989.

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Attachment 1:

Watts Bar Nuclear Plant Unit 2 Preliminary IPEEE Seismic Margins Evaluation Design Report, Safe Shutdown Paths and Safe Shutdown Equipment List

Report No: WBNIPEEE-003

Watts Bar Nuclear Plant
Unit 2

Preliminary IPEEE Seismic Margins Evaluation Design Report
Report No: WBNIPEEE-003

SAFE SHUTDOWN PATHS
And
SAFE SHUTDOWN EQUIPMENT LIST

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1.0 INTRODUCTION

The Unit 1 Safe Shutdown Equipment List (SSEL) was developed as part of the Unit 1 Individual Plant Examination of External Events (IPEEE) Seismic Margins Evaluation. Using methodology described in the IPEEE Seismic Margins Evaluation Report, the SSEL identified Unit 1, common and Unit 2 equipment required to achieve and maintain a Unit 1 safe shutdown condition for at least 72 hours following two different seismic event scenarios. One scenario is a seismic event beyond the design basis earthquake. The second is a beyond design basis earthquake concurrent with a small break Loss of Coolant Accident (LOCA). The preliminary Unit 2 SSEL Design Report was developed utilizing the Unit 1 SSEL since the Unit 2 systems and components are designed and function the same as the Unit 1 systems and components. Thus, the methodology used to develop the Unit 1 SSEL applies to Unit 2. The Unit 2 SSEL Design Report is preliminary since much of the Unit 2 design and documentation work remains to be done.

The Unit 1 SSEL was first updated as, applicable, to account for changes to equipment and systems descriptions since the Unit 1 SSEL report was issued. Generally, Unit 2 equipment Unique Identification (UNID) numbers are the same as Unit 1 UNIDs except that the UNID number is preceded by the unit designation; i.e., 2- instead of 1-. Thus, the preliminary Unit 2 SSEL was established by converting the Unit 1 UNIDS and associated information to Unit 2 UNIDS. In similar manner, Unit 2 equipment UNIDs listed in the Unit 1 SSEL was converted to Unit 1 UNIDs. Equipment UNIDs common to both units were retained in the Unit 2 SSEL without change. The preliminary Unit 2 SSEL will be verified and validated (see following Table 1A) when the Unit 2 design, drawings, and Unit 2 Master Equipment List (MEL) are completed and verified. Upon completion of verification the preliminary Unit 2 SSEL Design Report will be issued as the final Unit 2 IPEEE Seismic Margins Evaluation Report.

In addition to the above, the following equipment, which was directly or indirectly referred to in the Unit 1 report but not listed in the Unit 1 SSEL, was added to the preliminary Unit 2 SSEL Design Report: Fifth Vital Battery, Room Coolers for the following four pumps: Centrifugal Charging Pump (CCP 2A& 2B) and Residual Heat Removal pump (RHR 2A-A and 2B-B), ERCW flow control valves, Safety Injection System (SIS) pump discharge isolation valves, Control Rod Drive Mechanisms, ERCW to Auxiliary feed water system isolations valves, Lower Compartment Cooler Fans, Sump Strainers, and Diesel Generator Seven Day Fuel Oil Tanks.

TABLE 1A

SSEL VERIFICATION / VALIDATION ACTIVITIES

1. Complete Unit 2 design and design drawings
2. Complete Unit 2 Master Equipment List (MEL)
3. Verify SSEL equipment ID, description, flow diagram, category, seismic category, and Elevation / room against the competed Unit 2 MEL.
4. Verify SSEL against operations procedures
5. Perform peer review.

1.1 Background

The general objectives of the Individual Plant Examination for External Events (IPEEE) are similar as stated in reference 3 are:

1) To develop an appreciation of severe accident behavior,

2) To understand the most likely severe accident sequences that could occur at the plant under full power operating conditions,

3) To gain a qualitative understanding of the overall likelihood of core damage and fission product releases, and,

4) If necessary, to reduce the overall likelihood of core damage and fission product releases by modifying, where appropriate, hardware and procedures that would help prevent severe accidents.

This report documents the definition of safe shutdown paths and the identification of associated critical equipment that would be used to accomplish the necessary safe shutdown and containment performance functions.

1.2 Methodology

References 2 and 3 document the request by the US Nuclear Regulatory Commission (NRC) that each active commercial nuclear power plant in the United States perform an IPEEE for specified beyond design basis events, one of which is a seismic event. The NRC has also identified three (3) acceptable approaches for the evaluation of the plant specific beyond design basis seismic event. The Tennessee Valley Authority (TVA) has chosen to employ the Electric Power Research Institute (EPRI) Seismic Margins Assessment method, (Ref. 3), at its Watts Bar Nuclear Plant (WBN).

1.3 Work Scope Statement

One element of EPRI's Seismic Margins Assessment methodology is a systems evaluation activity. The principle objective of the systems evaluation is to identify those components required for an operational sequence of plant systems that will bring the plant to a stable condition and maintain

that condition for at least 72 hours. To accomplish this objective, it is necessary to develop an understanding of how the plant, as well as the plant operators, will perform following a seismic margin earthquake (SME).

The specific steps to be followed in the systems evaluation are:

Step 1 Determine the plant specific front line systems included in a preferred and alternate shutdown path that perform the following long-term safety functions:

- ☐ Reactivity control
- ☐ RCS pressure control
- ☐ RCS inventory control
- ☐ Decay heat removal
- ☐ Containment performance

Step 2 Determine the support systems required for the front line systems to operate using the documents listed in Table 2.1.

Step 3 Determine the components that make up the front line and support systems again using the resources noted in Table 2.1.

Step 4 Once the systems and system components are identified, define the active components of those systems that are required to accomplish the long term safety functions identified in Step 1.

Step 5 Perform a walk down of the required components to gather detailed information that may not be available from drawings. This includes anchoring of components and pipe runs, support of heavy loads above components, stiffening of adjacent electrical cabinets, and verification of component model and types.

The execution of the above five steps provides for both the development of an understanding of the plant and plant operators response to an SME, and the identification of the minimum set of components required for an operational sequence of plant systems to bring the plant to a stable condition and maintain that condition for at least 72 hours.

This report documents the results of activities performed to accomplish Steps 1 through 4. The walk downs will be discussed in greater detail in the seismic evaluation of the components comprising the Safe Shutdown Equipment List.

1.4 Safe Stable Shutdown States

For the purposes of this study, two safe, stable shutdown conditions are identified; one with the reactor coolant system (RCS) intact, and one with a loss of primary coolant from the RCS to the containment.

Intact RCS: This case assumes there is no uncontrolled release of primary coolant from the RCS to the containment. The licensed long term safe, stable plant condition for WBN is Hot Standby, with the average primary coolant temperature greater than 350° F and decay heat removal accomplished with auxiliary feedwater and atmospheric dumping of secondary side steam through the mainsteam PORVs.

Breech in RCS: This case assumes a loss of primary coolant from the RCS to the containment, due either to a small leak which cannot be isolated, or due to the use of the pressurizer power operated relief valves (PORVs). The long term safe, stable plant condition for WBN is Cold Shutdown with the Residual Heat Removal (RHR) system recirculating coolant to the core from the containment sump.

The reason for this second safe, stable shutdown condition is based on depletion of the refueling water storage tank (RWST). A small leak in the RCS which cannot be isolated will release high energy fluid to the containment, increasing containment pressure. Similarly, if auxiliary feedwater is unavailable and bleed and feed is used to remove decay heat from the reactor core, the release of high energy primary coolant through the pressurizer PORVs to the containment will also act to increase containment pressure. For WBN, virtually any release of high energy primary coolant to containment is predicted to actuate containment sprays. Operation of containment sprays will quickly deplete the refueling water storage tank (RWST) inventory, requiring that decay heat removal from the RCS be accomplished by recirculating water collected in the containment sump. Hence, if the RCS remains intact over the 72 hour period of interest, the safe, stable long term shutdown condition for the SME is defined to be Hot Standby. If there is any loss of high energy coolant from the RCS to the containment, the safe, stable long term shutdown condition is defined to be Cold Shutdown with the RHR aligned for recirculation of fluid from the containment sump.

2.0 SAFE SHUTDOWN PATHS

This section describes the assumptions and process used to select the preferred and alternate Safe Shutdown Paths, and to define the paths.

2.1 Assumptions

The major systems-related assumptions and ground rules used in the systems evaluation portion of the WBN seismic margin evaluation are:

1) Path success is defined as the ability to achieve and maintain a safe, stable shutdown condition for at least a 72-hour period following the seismic event. For the case with the RCS intact and auxiliary feedwater available, this is Hot Standby. For the case with the RCS intact but auxiliary feedwater unavailable, or with a small LOCA having an equivalent break size of no more than a 1-inch pipe, this is Cold Shutdown with recirculation from the containment sump.
2) Offsite power is assumed to be failed due to the SME and unrecoverable during the 72 hour time period of interest. Credit for equipment operation (e.g., fail closed valve on L.O.P.) is not assumed.
3) Only seismically induced transient events and small seismically induced primary coolant leakage events (referred to as "small LOCAs") are addressed. The small LOCA is taken to be the combined leakage equivalent to a 1" diameter pipe break.
4) Non-seismically caused component or system unavailability is not explicitly addressed. However, both trains of safety related equipment are listed on the SSEL.
5) The potential effects of seismically induced relay chatter will be evaluated under a separate element of the WBN IPEEE study. This evaluation will be limited to low seismic ruggedness relays as defined in Appendix E of EPRI NP-7148-SL, "Procedure for Evaluating Nuclear Power Plant Relay Seismic Functionality". Although the essential relays are not identified in this element of the study, the electrical panels and cabinets which house the electrical relays have been included in the Safe Shutdown Equipment List (SSEL).

Assumption 4 states that non-seismic failures are not explicitly addressed. Potential for human error is minimized by selecting Safe Shutdown Paths that require either no operator actions (such as for a loss of offsite power with AFW available), or a minimum of operator actions. In all cases operator actions required to achieve the Safe Shutdown Path are those normally included in the operator training program and trained on by operators; for example, performing bleed and feed operations in the event of a loss of AFW. This approach allows human error failures to be screened out using the guidelines identified in Section 2.4.3 of Volume 2 of NUREG/CR-4826 (Reference 4).

2.2 Resources Used in the Safe Shutdown Path Development.

Resources listed in table 2.1 were reviewed and used, as determined applicable, in the development of the safe shutdown paths and critical equipment list developed for the WBN Seismic Margins assessment.

2.3 Shutdown Path Descriptions

Consistent with the EPRI methodology, two scenarios were considered in developing the Safe Shutdown Path for the WBN seismic margins assessment;

Scenario 1 A "No-LOCA" scenario, which assumes the RCS remains intact throughout the 72 hour time frame of interest, and,

Scenario 2 A "Small LOCA" scenario, which assumes the breach in the primary system, occurs at the initiation of the SME.

The reason for including small LOCA Safe Shutdown Path in the WBN SME is that it was judged that the effort necessary to demonstrate the availability of a source of makeup water to the RCS would be considerably less than the effort required to demonstrate that the integrity of the reactor coolant pump (RCP) seals and other small instrument and sensing lines would be maintained.

Preferred and alternate Safe Shutdown Paths were developed for both scenarios. They were developed to be consistent with plant operator training and plant procedures. Both Safe Shutdown Paths satisfy the plant safe shutdown criteria that the reactor is subcritical and that a stable cooling

condition be established and maintained for 72 hours, accomplishing the following basic long-term safety functions:

1) Reactivity Control
2) RCS pressure control
3) RCS inventory control
4) Decay heat removal
5) Containment performance

All systems used to accomplish the long terms safety functions are multi-train systems. In addition, equipment components necessary to ensure containment integrity have been identified and included in the SSEL. Check valves which perform a containment isolation function are generically screened and are not included in the SSEL (Ref. EPRI NP 6041-SL, R1, page 3-29).

Success Path Logic Diagrams (SPLDs) are used to show both the preferred and alternate Safe Shutdown Paths developed for the WBN SME. The SPLD for Scenario 1 (Intact RCS) is shown in Figure 2-1, and the SPLD for Scenario 2 (Break Size 1 Inch Equivalent Diameter) is shown in Figures 2-2. Both preferred and alternate paths are shown for both scenarios.

2.3.1 Intact RCS

Considering Figure 2-1, the SPLD with an intact RCS, core sub criticality is required as is removal of decay heat, RCS pressure control, and RCS inventory control. Core sub criticality is attained by insertion of the control rods into the core. The preferred Safe Shutdown Path is for decay heat removal to be accomplished by supplying auxiliary feedwater to the steam generators and removing heat from the steam generators through the secondary side PORVs. Should decay heat removal via auxiliary feedwater and PORVs either fail or be unavailable, the alternate Safe Shutdown Path is for decay heat removal to be accomplished by means of a bleed and feed operation on the primary side. RCS pressure control is maintained by use of the pressurized PORVs and Safety Valves, and RCS injection via the CCPs, SIPs, and RHR Pumps. RCS inventory control is maintained by RCS injection using CCPs, SIPs, and RHR Pumps and maintaining R.C. Pump seal flow.

Note that the preferred Safe Shutdown Path results in the plant being maintained at Hot Standby (average coolant temperature 350° F), and that the alternate Safe Shutdown Path results in the plant going to Cold Shutdown. This is discussed in some detail in Section 1.4.

Insertion of the control rods into the core will occur when the electro-magnetic coils that hold the control rods lose power. This can occur:

1) Automatically upon a signal from the reactor protection system (RPS),
2) Manually by an operator action to trip the plant, or,
3) As a consequence of the loss of offsite power.

Loss of offsite power is assumed to occur in this assessment. Credit for loss of offsite power, however, is not assumed for this evaluation. Consequently, the control rods will fall into the core upon receipt of a signal from the RPS. Emergency boration provides an alternate method of assuring sub criticality. However, since sub criticality is achieved via control rod insertion by a signal from the RPS, only this mode for achieving sub criticality is considered for the WBN SME. On loss of offsite power, the reactor coolant pumps will coast down to a stop and both the normal feedwater and the condenser system will be lost; procedure E-0 will be entered. Decay heat removal is accomplished via the auxiliary feedwater system (AFW) supplying feedwater to the steam generators and using the steam generator PORVs to remove heat per procedure ES-0.1. Since the condensate storage tank, which is the normal supply of water to the auxiliary feedwater system, is not seismically qualified, the AFW system will be automatically aligned to the essential raw cooling water system (ERCW), its backup supply. This arrangement, considered the preferred path, is sufficient to keep the plant in Hot Standby conditions for 72 hours.

Note that primary coolant temperature at Hot Standby, the licensed long term safe shutdown condition for Watts Bar when the RCS is intact, is above that for RHR cut in. Thus, the RHR system is not utilized for the preferred safe shutdown path with the RCS intact and AFW available.

An alternative success path for decay heat removal is the use of a bleed and feed operation on the primary side. This approach is independent of the preferred AFW and PORV path. With this approach, heat is removed from the core through the pressurizer PORVs (bleed) and made up by injecting water from the RWST via the centrifugal charging pumps or the safety injection pumps (feed) as directed by procedure FR-H.1. With the bleed operation, the containment pressure will

rise and actuate the containment spray system which also draws from the RWST. The water inventory in the RWST is limited and once it is depleted, cold leg recirculation from the containment sump is necessary. Cold leg recirculation requires drawing water from the sump via the residual heat removal pumps and supplying it to either the charging or safety injection pumps per procedure ES-1.3. The charging and/or safety injection pumps then inject the water back into the RCS cold legs. Cold leg recirculation requires the following actions to be accomplished:

1) Establishing the flow path from the sump to the RHR pumps,
2) Starting the RHR pumps if they are not yet running,
3) Establishing the flow path from the RHR pumps to the charging and/or safety injection pumps, and,
4) Isolating the RWST.

Procedures direct the operators to switch to hot leg recirculation as early as three hours after the beginning of a LOCA to preclude precipitation of Boron out of solution per procedure ES-1.4. Hot leg recirculation requires switching the RCS injection point from the cold legs to the hot legs. This alternative path is adequate to keep the plant in cold shutdown for 72 hours.

For path 1, RCS pressure control is maintained by RCS letdown and / or RCS injection via the CCPs. As a precaution, the Pressurizer PORVs and Safety Valves are listed to insure RCS pressure relief is available for this path. RCS inventory control for path 1 is maintained by RCS injection by the CCPs and by maintaining RCP Seal flow. For path 2, RCS pressure control is maintained by the Pressurizer PORVs and Safety Valves and by RCS injection via the CCPs, SIPs and RHR Pumps. RCS inventory control for path 2 is maintained by the CCPs, SIPs and RHR Pumps and by maintaining RCP Seal flow.

See discussion in Section 2.3.2 about containment performance.

2.3.2 Small Break (1-Inch Equivalent Break) LOCA

Figure 2-2 shows the SPLD for the small LOCA scenario. Core sub criticality, removal of decay heat, and RCS inventory control are required for the small LOCA. Sub criticality is achieved by insertion of the control rods into the core. Decay heat removal is accomplished by supplying auxiliary feedwater to the steam generators and removing heat from the steam generators through

the secondary side PORVs. Should decay heat removal via auxiliary feedwater and PORVs fail, then heat can be removed via a bleed and feed operation on the primary side as previously described. RCS pressure control is maintained by use of the pressurized PORVs and Safety Valves, and RCS injection via the CCPs, SIPs, and RHR Pumps. RCS inventory control is maintained by RCS injection using CCPs, SIPs, and RHR Pumps and maintaining R.C. Pump seal flow.

As discussed in Section 2.3.1 for the no-LOCA case, sub criticality for the small LOCA case is accomplished by insertion of the control rods into the core occurring when the electro-magnetic coils that hold the control rods lose power as a result of any one of the three conditions previously identified and procedure E-0 is entered. Decay heat removal is again accomplished by supplying feedwater to the steam generators via the AFW system, which has been aligned to draw suction from the ERCW system, and using the steam generator PORVs to remove heat per procedure E-1.

Similar to the removal of decay heat in the no-LOCA case, RCS inventory control is maintained by injecting water from the RWST into the RCS via either the charging pumps or safety injection pumps. With a small LOCA, the containment pressure will rise and actuate the containment spray system which also draws from the RWST. Following depletion of the RWST inventory, cold leg recirculation from the containment sump is necessary per procedure ES-1.3. This requires drawing water from the sump via the residual heat removal pumps and supplying it to either the charging or safety injection pumps. The charging and/or safety injection pumps then inject the water back into the RCS cold legs. The actions required to accomplish cold leg recirculation are identical to those described above.

Again, an alternative success path for decay heat removal is using a bleed and feed operation on the primary side. This approach is independent of the preferred AFW and PORV path for decay heat removal. As discussed in Section 2.3.1, with this approach decay heat is removed from the core through the pressurizer PORVs (bleed) and made up by injecting water from the RWST via the centrifugal charging pumps or the safety injection pumps (feed) per procedure FR-H.1. With the bleed operation, the containment pressure will rise and actuate the containment spray system which also draws from the RWST. Once the limited water inventory in the RWST is depleted, cold leg recirculation from the containment sump is necessary per procedure ES-1.3.

For either the primary or the alternate success paths, as early as three hours following the onset of a LOCA, procedures direct the operators to switch to hot leg recirculation so as to preclude Boron precipitation per procedure ES-1.4. Hot leg recirculation requires switching the RCS injection

point from the cold legs to the hot legs. This flow path is adequate to keep the plant in cold shutdown for 72 hours. Thus, either the preferred or alternate Safe Shutdown Paths are adequate to keep the plant in a safe stable state for 72 hour time period of interest to the SME.

Thus, the SME preferred paths for safe shutdown for WBN include control rod insertion, the AFW system, the steam generator PORVs, the RHR system in both the open and closed loop recirculation alignments, the high pressure safety injection and charging pumps, and the RWST. Also, all support systems that provide cooling and electrical power to equipment used to achieve safe shutdown, as well as the minimum instrumentation and safeguards actuation and control systems are included in the SME success paths.

For path 1 (Fig. 2.2), RCS pressure control is maintained by RCS injection via the CCPs, SIPs and RHR Pumps. As a precaution, the Pressurizer PORVs and Safety Valves are listed to insure RCS pressure relief is available for this path. RCS inventory control for path 1 is maintained by RCS injection by the CCPs, SIPs and RHR Pumps, and by maintaining RCP Seal flow. For path 2, RCS pressure control is maintained by the Pressurizer PORVs and Safety Valves and by RCS injection via the CCPs, SIPS and RHR pumps. RCS inventory control for path 2 is maintained by RCS injection by the CCPs, SIPs and RHR pumps, and by maintaining RCP Seal flow.

Although not specifically shown on Figures 2.1 and 2.2, equipment necessary to ensure containment performance subsequent to a seismic event has been included on the SSEL and will be evaluated in the SME evaluation. This equipment includes containment isolation equipment, Ice Condenser, containment spray equipment, Lower Compartment Cooler Fans, and Containment Air Return Fans.

The containment isolation system provides the means of isolating fluid systems that pass through containment penetrations so as to confine to the containment any radioactivity that may be released in the containment following a design basis event. The containment isolation systems are required to function following any design basis event that initiate a Phase A or Phase B containment isolation signal or releases radioactive materials into containment to isolate non-safety related fluid systems penetrating the containment. Isolation design is achieved by applying common criteria to penetrations in many different fluid systems and by using Engineered Safety Features Actuation signals to actuate the appropriate equipment.

Phase A containment isolation, whose function is to prevent fission product release by isolating all lines not essential to reactor protection, can be generated manually or by a safety injection signal (SIS). A SIS is generated by one or more of the following:

1. Low steamline pressure in any steamline
2. Low pressurizer pressure
3. High containment pressure
4. Manually

Phase B containment isolation is generated by the following:

1. High-high containment pressure
2. Manually

Also, containment vent isolation signal is generated by the following:

1. A manual Phase A or B isolation actuation
2. A safety injection signal (SIS)
3. High radiation signal from the containment purge air exhaust monitors

The containment isolation signal is "fail safe" to the following extent:

1. Most of the containment isolation valves fail closed on loss of power or air and many are powered and controlled by battery backed power supplies.
2. A number of isolation valves are normally closed air-operated valves or solenoid valves with de-energized control solenoid coils.
3. A modified control circuit design is provided for specific motor operated valves whose possible inadvertent misalignment due to spurious operation could result in the loss of a system safety function.

The glycol lines to the chillers inside the Ice Condenser are isolated following a containment isolation signal; these isolation valves are listed on the SSEL. However, the Ice Condenser and Ice Condenser doors, which are listed on the SSEL, are required to function for cases when primary coolant is released to the containment to reduce containment pressure and temperature. The containment Air Return Fans are also on the SSEL since they are required to circulate from upper containment to lower containment, forcing any steam through the Ice Condenser.

The Containment Spray System is initiated upon receipt of Phase B containment isolation signal. This system consists of Containment Spray Pumps, Heat Exchangers and associated valves. The system serves to reduce containment pressure and temperature after a release of high energy fluids to the containment; this equipment is listed on the SSEL

The Combustible Gas Control System (CGCS) is designed to detect and control the concentration of combustible gas mixtures inside primary containment following a large bore LOCA successfully mitigated by the Emergency Core Cooling System. The CGCS includes the Hydrogen Recombiners, the Hydrogen Analyzer, Containment Air Return Fans, which are redundant, safety grade subsystems and the non-safety grade Hydrogen Mitigation System (HMS). The HMS, which consists of two groups of 34 igniters distributed throughout the containment, was originally designed, procured and installed as completely safety-grade system that was redundant, Seismic Category I and Class IE (except for the igniter coil). However, a licensing commitment to install a complete safety-grade system was never made by TVA. As indicated above, the CGCS is required following a large break LOCA. Since the SME assessment involves (1) an intact RCS and (2) a small break (bore) LOCA, the CGCS is not included on the SSEL and is not evaluated as a part of the SME evaluation.

The WBN design does not include Penetration cooling as part of containment performance, and does not include inflatable seals around personnel hatches.

2.4 Dependency Matrices

Dependency matrices for the SME safe shutdown paths were developed to assure that all systems required to perform or support performance of the basic long-term safety functions identified in Section 2.3 would be considered in the development of the Safe Shutdown Equipment List. The WBN SME support system-to-front line system dependency matrix is given in Table 2.2. The WBN SME support system-to-support system dependency matrix is given in Table 2.3. The support systems providing support are listed in the left hand column. The required support system(s) is identified by an "X" in the column associated with the system or function in question.

The steam generator cooling mode and bleed and feed cooling mode which are considered for WBN require Essential Raw Cooling Water (ERCW), Component Cooling System (CCS), essential AC power (6.9-kV and 480V), vital instrument and control power (120V AC and 125V DC), the refueling water storage tank (RWST), the containment sump, Auxiliary Control (essential) air, heating, ventilating, and air conditioning (HVAC), the reactor protection system (Eagle 21), and the engineered safety features actuation system (ESFAS). These systems are included in the dependency matrices.

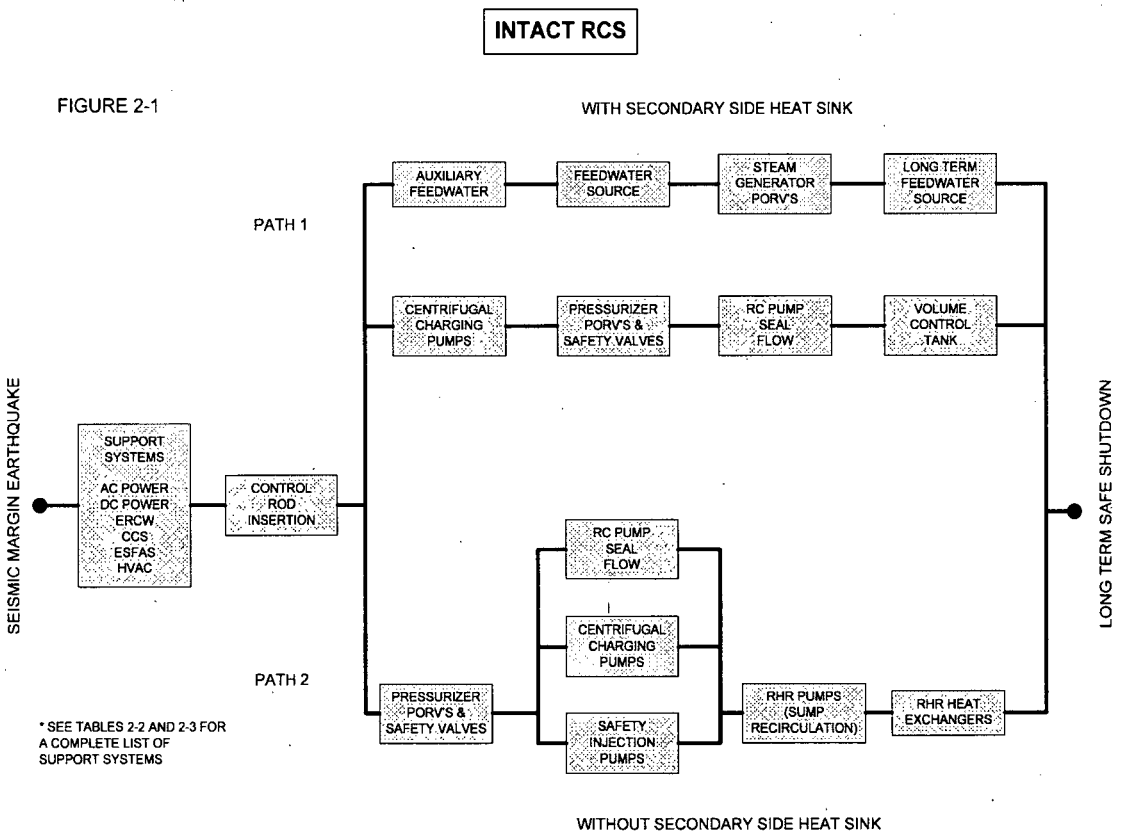
INTACT RCS
WITH SECONDARY SIDE HEAT SINK
AUXILIARY FEEDWATER
FEEDWATER SOURCE
STEAM GENERATOR PORV'S
LONG TERM FEEDWATER SOURCE
PATH 1
CENTRIFUGAL CHARGING PUMPS
PRESSURIZER PORV'S & SAFETY VALVES
RC PUMP SEAL FLOW
VOLUME CONTROL TANK
SEISMIC MARGIN EARTHQUAKE
SUPPORT SYSTEMS
AC POWER
DC POWER
ERCW
CCS
ESFAS
HVAC
CONTROL ROD INSERTION
LONG TERM SAFE SHUTDOWN
RC PUMP SEAL FLOW
CENTRIFUGAL CHARGING PUMPS
PATH 2
PRESSURIZER PORV'S & SAFETY VALVES
SAFETY INJECTION PUMPS
RHR PUMPS (SUMP RECIRCULATION)
RHR HEAT EXCHANGERS
* SEE TABLES 2-2 AND 2-3 FOR A COMPLETE LIST OF SUPPORT SYSTEMS
WITHOUT SECONDARY SIDE HEAT SINK

FIGURE 2-1

SMALL LOCA (≤ 1-INCH BREAK)

FIGURE 2-2

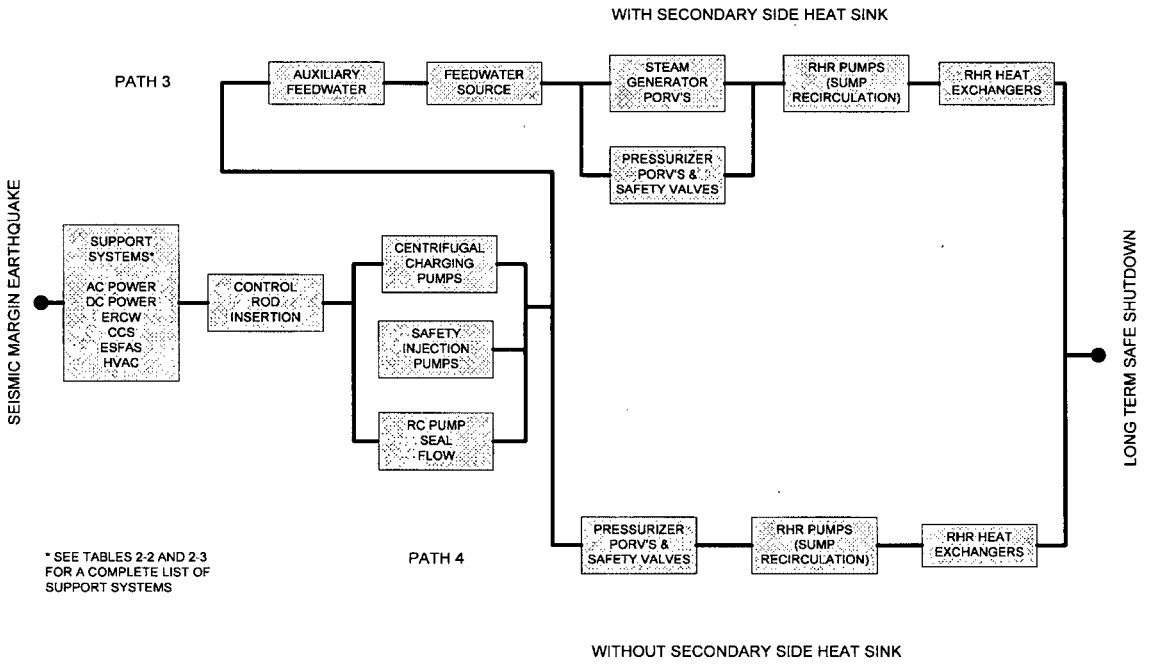

TABLE 2.1 WATTS BAR IPEEE SEISMIC MARGINS INPUT DOCUMENTATION

1 Watts Bare Nuclear Plant IPEEE Seismic Margins Evaluation Safe Shutdown Paths and Safe Shutdown Equipment List, Report No.: WBNIPEEE-001, Revision 2, dated Dec. 15, 1997.

2 WBN Final Safety Analysis Report (FSAR), Watts Bar Flow, Control, and Electrical Drawings.

3 WBN Individual Plant Examination (IPE) Final Report

4 Review with Cognizant TVA Systems Engineers, and Operations.

5 System Descriptions and System Design Criteria

6 Sequoyah Nuclear Plant IPEEE Seismic Margins Evaluation Safe Shutdown Paths Report No. SCG-5M-0008, Revision 1 (B89 950620 010)

7 Watts Bar Nuclear Plant Unit 1 Technical Specifications

8 Emergency Procedures

E-0	Reactor Trip or Safety Injection	Revision 28
E-1	Loss of Reactor Secondary Coolant	Revision 15
ES-0.1	Reactor Trip Response	Revision 22
ES-1.3	Transfer to RHR Containment Sump	Revision 17
ES-1.4	Transfer to Hot Leg Recirculation	Revision 10
FR-H.1	Loss of Secondary Heat Sink	Revision 17

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TABLE 2.2: WATTS BAR SUPPORT TO FRONTLINE DEPENDENCY MATRIX

REQUIRED SUPPORT SYSTEM	FRONTLINE SYSTEM OR FUNCTION														
	SG PORVS	SG MSIV/ BYPASS VALVES	AFW	REACTOR SHUTDOWN	PZR PORVS	RCP SEAL INJ & COOLING	CVCS	SIS	RHR SYSTEM	COLD LEG SUMP RECIRCULATION	RHR SPRAY	HOT LEG RECIRC	CONTAINMENT ISOLATION	AIR RETURN FANS	CONTAINMENT SPRAY
6.9 KV AC			√				√	√	√						√
480V AC			√		√	√	√	√	√	√	√	√	√	√	√
125V DC	√	√	√	√	√		√	√	√					√	√
120V AC	√		√		√	√				√					
ESFAS		√	√	√			√	√	√						√
HVAC			√				√	√	√				√	√	√
CONTROL AIR - ESSENTIAL AIR PORTION	√		√				√	√	√						
ERCW			√			√									√
COMPONENT COOLING SYSTEM						√	√	√	√				√		√
RWST							√	√	√						√
CNTMT SUMP										√	√	√			√

TABLE 2.3: WATTS BAR SUPPORT TO SUPPORT DEPENDENCY MATRIX

REQUIRED SUPPORT SYSTEM	SUPPORT SYSTEM																
	6.9k VAC SD BOARDS	480 VAC SD BOARDS	480 VAC REACTOR MOV BOARD	480 VAC CNTL & AUX BLDDG VENT BOARD	480 VAC DIESEL AUX BOARDS	125 VDC VITAL BATTERY BOARDS	120 VAC VITAL INST PWR BOARDS	DIESEL GENERATORS	FUEL OIL	SSPS / ESFAS	SHUTDOWN BD ROOM VENT	480VAC TRANS ROOM VENT	480VAC BD ROOM VENT	CCS / AFW EQPMT COOLERS	CONTROL AIR SYSTEM	ERCW	CCS
6.9k VAC SD BOARDS		√														√	
480 VAC SD BOARDS			√	√	√	√	√				√		√				√
480 VAC C&A VEND BD												√	√	√	√		
480 VAC DIESEL AUX BD								√									
125 VDC VITAL BAT BD	√	√					√	√			√					√	√
120 VAC VITAL INST PWR										√				√	√		
DIESEL GENERATORS	√								√								
FUEL OIL SYSTEM								√									
SSPS / ESFAS																√	
SHUTDOWN BD VENT	√	√															
480V TRANS RM VENT		√															
480V BD ROOM VENT			√				√										
CCS / AFW EQPMT COOLERS																	√
ESSENTIAL AIR SYSTEM															√		
ERCW								√						√	√		√

3.0 SYSTEMS DESCRIPTION

The Seismic Margin Criteria specify that a success path or paths that will safely shut the plant down to either hot or cold stable shutdown, and maintain the plant in that condition for a minimum of 72 hours must be demonstrated to survive and function properly during and after a Seismic Margin Event (SME). As discussed in Section 1.4, the two safe shutdown states used in the SME for WBN are:

1. For the intact RCS scenario using the preferred success path, the safe shutdown condition is defined to be Hot Standby (Reactor coolant temperature 350° F). Hot Standby is the licensed long term safe, stable shutdown condition for the Watts Bar units.

2. For the intact RCS scenario using the alternate success path or the small LOCA scenario using either the preferred or alternate success paths, the safe shutdown condition is defined to be Cold Shutdown.

Each of the mechanical systems at WBN was reviewed to assess their role in accomplishing the five long term safety functions listed in Section 2.3. A system by system listing is given in Table 3.1, which identifies those systems which perform an essential safety function. Summary descriptions of the identified essential systems are given in this section. For a detailed description of system operation, the reader is referred to the specific system description and design criteria. For schematic diagrams of systems that are presented in the following sections, the reader is referred to the system flow diagrams referenced in the SSEL. The Safe Shutdown Equipment List (SSEL), discussed in Section 4.0, consists of the specific components, associated with the essential systems, which must function properly to achieve the desired safe shutdown condition and to satisfactorily perform containment performance functions.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST

System No.	System Description	Part of SSEL	Comment
001	Main Steam	YES	Provides containment isolation and secondary side pressure control
002	Condensate	NO	Not required for safe shutdown or containment isolation.
003	Main Feedwater	YES	Provides containment isolation.
003B	Auxiliary Feedwater	YES	Provides decay heat removal.
005	Steam, Extraction	NO	Not required for safe shutdown or containment isolation.
006	Feedwater Heater Drains and Vents	NO	Not required for safe shutdown or containment isolation.
007	Turbine, Extraction Traps and Drains	NO	Not required for safe shutdown or containment isolation.
008	Turbine, Miscellaneous Connections	NO	Not required for safe shutdown or containment isolation.
009	Turbine, Miscellaneous Vents	NO	Not required for safe shutdown or containment isolation.
012	Auxiliary Boiler	NO	Not required for safe shutdown or containment isolation.
013	Fire Detection	NO	Not required for safe shutdown or containment isolation.
014	Condensate Demineralized	NO	Not required for safe shutdown or containment isolation.
015	Steam Generator Blowdown	NO	Not required for safe shutdown or containment isolation.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Description
018	Fuel Oil	YES	Support system for emergency power generation.
019	Lighting - Off Oil and Air Piping	NO	Not required for safe shutdown or containment isolation.
020	Central Lubricating Oil	NO	Not required for safe shutdown or containment isolation.
024	Raw Cooling Water	NO	Not required for safe shutdown or containment isolation.
025	Raw Service Water	NO	Not required for safe shutdown or containment isolation.
026	High Pressure Fire Protection	YES	Required for containment isolation.
027	Condenser Circulating Water/ Cooling Tower	NO	Not required for safe shutdown or containment isolation.
028	Water Treatment	NO	Not required for safe shutdown or containment isolation.
029	Potable Water Distribution	NO	Not required for safe shutdown of containment isolation.
030	Ventilation	YES	Required for containment isolation and operation and cooling of essential equipment.
031	Air Conditioning (Cooling-Heating)	YES	Required for cooling of essential equipment.
032	Control Air (Essential Air Portion Only)	YES	Required for operation of essential valves and equipment.
033	Service Air	NO	Not required for safe shutdown or Containment isolation.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
035	Hydrogen, Generator Cooling	NO	Not required for safe shutdown or containment isolation.
036	Feedwater Secondary Treatment	NO	Not required for safe shutdown or containment isolation.
037	Gland Seal Water	NO	Not required for safe shutdown or containment isolation.
038	Insulating Oil	NO	Not required for safe shutdown or containment isolation.
039	CO_2 Storage, Fire Protection and Purging	NO	Not required for safe shutdown or containment isolation.
040	Drainage, Station	NO	Not required for safe shutdown or containment isolation.
041	Layup Water Treatment	NO	Not required for safe shutdown or containment isolation.
042	Chemical Cleaning	NO	Not required for safe shutdown or containment isolation.
043	Sampling and Water Quality System	YES	Required for containment isolation.
044	Building Heating	NO	Not required for safe shutdown or containment isolation.
046	Feedwater Control System (includes 046A through 046B)	NO	Not required for safe shutdown or containment isolation.
047	Turbogenerator Controls	NO	Not required for safe shutdown or containment isolation.

TABLE 3.1WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
049	Air, Breathing	NO	Not required for safe shutdown or containment isolation.
050	Hypochlorite	NO	Not required for safe shutdown or containment isolation.
052	System Test Facility (Seismic Instrumentation)	NO	Not required for safe shutdown or containment isolation.
054	Injection Water	NO	Not required for safe shutdown or containment isolation.
055	Annunciator & Sequential Events Recording	NO	Not required for safe shutdown or containment isolation.
056	Temperature Monitoring	NO	Not required for safe shutdown or containment isolation.
057	Generator Associated Electical	NO	Not required for safe shutdown or containment isolation.
058	Generator Bus Cooling	NO	Not required for safe shutdown or containment isolation.
059	Demineralized Water and Cask Decontamination	NO	Not required for safe shutdown or containment isolation.
061	Ice Condenser	YES	Required for containment isolation and containment pressure control.
062	Chemical Volume & Control	YES	Required for safe shutdown and containment isolation.
063	Safety Injection	YES	Required for safe shutdown.
064	Ice Condenser Containment	NO	Not required for safe shutdown or containment isolation.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
065	Emergency Gas Treatment	NO	Not required for safe shutdown or containment isolation.
067	Essential Raw Cooling Water (ERCW)	YES	Required for safe shutdown.
068	Reactor Coolant System	YES	Required for safe shutdown.
069	Plumbing	NO	Not required for safe shutdown or containment isolation.
070	Component Cooling Water	YES	Required for essential equipment operation during safe shutdown.
072	Containment Spray	YES	Required for containment isolation and integrity.
074	Residual Heat Removal	YES	Required for safe shutdown & containment isolation
076	Volume Reduction and Solidification System	NO	Not required for safe shutdown or containment isolation.
077	Waste Disposal (Includes 077A/Gas, 077B/Solid, 077C/Liquid)	YES	Required for containment isolation.
078	Spent Fuel Pit Cooling	YES	Required for CCS pressure boundary
079	Fuel Handling and Storage	NO	Not required for safe shutdown or containment isolation.
080	Primary Containment Cooling	NO	Not required for safe shutdown or containment isolation.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
081	Primary Makeup Water	YES	Required for containment isolation.
082	Standby Diesel Generators and Diesel Starting	YES	Required for emergency power generation.
083	Hydrogen Recombination	NO	Not required for safe shutdown or containment isolation.
084	Flood Mode Boration	NO	Not required for safe shutdown or containment isolation.
085	Control Rod Drive Mechanism	YES	Required for stopping Nuclear Reaction (Shutdown Rods).
088	Containment Isolation	YES	Required for containment isolation. Components listed under specific systems.
090	Radiation Monitoring	YES	Required for containment isolation & Containment Monitoring.
092	Neutron Monitoring System	YES	Required for reactivity monitoring.
094	Incore Flux Detectors	NO	Not required for safe shutdown or containment isolation.
99	Reactor Protection System	YES	Required for safe shutdown.
200	161/6.9 KV Common Power	NO	Required for safe shutdown or containment isolation.
201	6.9 kV Unit Power	NO	Not required for safe shutdown or containment isolation.
202	6.9kV Reactor Cooling Pump Power	NO	Not required to power essential equipment for safe shutdown.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY

SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
203	480 V Unit Power	NO	Not required for safe shutdown or containment isolation.
204	480 V Switchyard Power	NO	Not required for safe shutdown or containment isolation.
205	480 V Turbine Building Common Power	NO	Not required for safe shutdown or containment isolation.
206	480 V Aux. Building Common Motor Control	NO	Not required for safe shutdown or containment isolation.
207	Turbine Building Common Motor Control	NO	Not required for safe shutdown or containment isolation.
208	Auxiliary Building Common Motor Control	NO	Not required for safe shutdown or containment isolation.
209	Turbine Building Motor Operated Valve Power	NO	Not required for safe shutdown or containment isolation.
210	Turbine Building Vent Power	NO	Not required for safe shutdown or containment isolation.
211	6.9kV Shutdown Power	YES	Required for safe shutdown
212	480 V Shutdown Power	YES	Required for safe shutdown
213	Reactor Motor Operated Valve Power	YES	Required for safe shutdown & containment isolation.
214	Control and Auxiliary Vent Power	YES	Required for safe shutdown & containment isolation.
215	Diesel Auxiliary Power	YES	Required for safe shutdown

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
216	Fuel and Waste Handling Power	NO	Not required for safe shutdown or containment isolation.
217	Chemical and Volume Control Power	NO	Not required for safe shutdown or containment isolation.
218	Lube Oil Power	NO	Not required for safe shutdown or containment isolation.
219	Chlorination Building Power	NO	Not required for safe shutdown or containment isolation.
220	Makeup Water Power	NO	Not required for safe shutdown or containment isolation.
221	480V Service Building Power	NO	Not required for safe shutdown or containment isolation.
222	Service Building Vent Power	NO	Not required for safe shutdown or containment isolation.
223	Office Building Vent Power	NO	Not required for safe shutdown or containment isolation.
224	Gate House Power	NO	Not required for safe shutdown or containment isolation.
225	CCW Pumping Station Power	NO	Not required for safe shutdown or containment isolation.
226	Intake Pumping Station Power	NO	Not required for safe shutdown or containment isolation.
227	Turbine Building Lighting	NO	Not required for safe shutdown or containment isolation.
228	Auxiliary Building Lighting	NO	Not required for safe shutdown

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
229	Service Building Lighting	NO	Not required for safe shutdown or containment isolation.
230	Office Building Lighting	NO	Not required for safe shutdown or containment isolation.
231	480 V Transformer Yard Power	NO	Not required for safe shutdown or containment isolation.
232	Reactor Vent Power	YES	Required for safe shutdown
233	Yard Lighting	NO	Not required for safe shutdown or containment isolation.
234	Heat Tracing Systems	NO	Not required for safe shutdown or containment isolation.
235	120 VAC Vital Power	YES	Required for safe shutdown
236	125 VDC Vital Power	YES	Required for safe shutdown.
237	120 VAC Instrument Power	YES	Required for safe shutdown
238	120 VAC Preferred Power	NO	Not required for safe shutdown / Con. Iso.
239	250 VDC Power	NO	Not required for safe shutdown or containment isolation.
240	48 VDC Power	NO	Not required for safe shutdown or containment isolation.
241	120 VAC Computer Power	NO	Not required for safe shutdown or containment isolation.
242	Rad Mon & Sampling PWR, Process and Area Rad Mon Pwr	NO	Not required for safe shutdown or containment isolation.
243	Recording Instrument Boards	NO	Not req'd For Safe Shutdown

TABLE 3.1WATTS BAR SEISMIC MARGINS STUDYSYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
244	24 KV Power (Includes Main Transformer)	NO	Not required for safe shutdown or containment isolation.
245	500 KV Switchyard Equipment & Cable Tunnel Cable Trays	NO	Not required for safe shutdown or containment isolation.
246	Main Relay Boards	NO	Not required for safe shutdown or containment isolation.
247	24 VDC Communications Power	NO	Not required for safe shutdown or containment isolation.
248	Electrical Control and Recording Instrument	NO	Not required for safe shutdown or containment isolation.
249	Condensate Demineralized Motor Control Center	NO	Not required for safe shutdown or containment isolation.
250	Automatic, Manual & Public Telephones	NO	Not required for safe shutdown or containment isolation.
251	Sound-Powered Telephones	NO	Not required for safe shutdown or containment isolation.
252	Code Call, Paging, Intercom and Evacuation Alarms	NO	Not required for safe shutdown or containment isolation.
253	Microwave and VHF Radio	NO	Not required for safe shutdown or containment isolation.
254	Carrier Equipment	NO	Not required for safe shutdown or containment isolation.
255	Supervisory Control	NO	Not Req'd for Safe Shutdown
256	Sound Powered Communications	NO	Not required for safe shutdown
257	Closed-Circuit TV and Security	NO	Not required for safe shutdown

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
258	Miscellaneous Audio	NO	Not required for safe shutdown or containment isolation.
259	Communications Room	NO	Not required for safe shutdown or containment isolation.
260	Data Logger, Data Acquisition	NO	Not required for safe shutdown or containment isolation.
261	Process Computer	NO	Not required for safe shutdown or containment isolation.
262	Load Shed Logic	NO	Not required for safe shutdown
263	Station Monitor Computer	NO	Not required for safe shutdown
264	Technical Support Center	NO	Not required for safe shutdown or containment isolation.
265	Computer Interface Equipment	NO	Not required for safe shutdown
268	Permanent Hydrogen Mitigation Equipment	NO	Not required for safe shutdown or containment isolation.
270	Handling Systems and Misc Excluding Control & Aux bldgs.	NO	Not required for safe shutdown or containment isolation.

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
271	Cranes	YES	Integrity required for safe shutdown
272	Water Treatment Plant Bldg. Conduit & Cable Trays	NO	Not required for safe shutdown or containment isolation.
275	Train Aux. Inst. Racks Only	YES	Required for Containment Iso.
276	Local Instrument Control Racks	YES	Required for safe shutdown or containment isolation
278	Main and Auxiliary Control Panels	YES	Required for safe shutdown
280	Condenser Tube Cleaning	NO	Not required for safe shutdown or containment isolation.
281	Makeup Water Treatment Motor Operated Valve Power	NO	Not required for safe shutdown or containment isolation.
282	Field Service Facility Electrical Equipment	NO	Not required for safe shutdown or containment isolation.
283	Low Level Rad-waste Facility	NO	Not required for safe shutdown or containment isolation.
284	Volume Reduction Solidification Facility	NO	Not required for safe shutdown or containment isolation.
285	Spare Cables	NO	Not required for safe shutdown or containment isolation.
286	Security Power Backup Building	NO	Not required for safe shutdown or containment isolation.
290	Control Building Conduit and Cable Trays	YES	Required for safe shutdown
300	Miscellaneous Elect Equip	NO	Not required for safe shutdown

TABLE 3.1 WATTS BAR SEISMIC MARGINS STUDY SYSTEMS SUMMARY LIST (continued)

System No.	System Description	Part of SSEL	Comment
301	Chemical Laboratory Equipment	NO	Not required for safe shutdown or containment isolation.
302	Health Physics Laboratory Equipment	NO	Not required for safe shutdown or containment isolation.
303	Prime Computer and Associated Equipment	NO	Not required for safe shutdown or containment isolation.
304	Penetrations and Sleeves (Mechanical)	NO	No change of state or position required for containment isolation.
510	Plant Equipment (non system related)	NO	Not required for safe shutdown or containment isolation.
900	Local Instrument Panels	NO	Not required for safe shutdown or containment isolation.
928	Makeup Water Treatment Plant Equipment	NO	Not required for safe shutdown or containment isolation.
959	Demineralized Water Storage & Distribution	NO	Not required for safe shutdown or containment isolation.

3.1 Main Steam System

The main steam system (MSS) is designed to conduct steam from the steam generator outlets to the high pressure turbine or to the condenser turbine bypass (steam dump) system. This system also supplies steam to the feedwater pump turbines, auxiliary feedwater pump turbines, moisture separator reheater, and turbine seals. The MSS includes self-actuating safety valves (PORVs) to provide emergency pressure relief for steam generators and atmospheric relief valves to provide the means for plant cool down by steam discharge into the atmosphere if the turbine bypass system is not available. The normal functions of the MSS can be summarized as follows:

1) Transport main steam from the steam generators to the final steam users, including the turbine generator and main feedwater pump turbines (MFPT),

2) Provide steam dump to the main condenser for control of nuclear steam supply system (NSSS) temperature and steam generator pressure during all phases of operation (startup, shutdown, and load rejection), and,

3) Drain condensate that accumulates in the main steam piping during initial heat up and normal operation.

For the SME, the MSS is required to provide isolation of the steam lines. This is accomplished with the closure of the main steam isolation valves (MSIVs), which are designated as WBN-2-FCV-001-0004-T; WBN-2-FCV-001-0011-T; WBN-2-FCV-001-0022-T; WBN-2-FCV-001-0029 -T. The MSIVs are 32-inch, failed-closed, air operated valves located in the main steam line downstream of the main steam safety valves and atmospheric relief valves. During normal plant operation, the MSIVs are held open by the pneumatic pressure supplied through the normally energized solenoid valves to the valve actuators. The MSIV isolation signal will block the air supply to the MSIVs and open the air venting paths from the valve actuators. On loss of pneumatic pressure, fast closure is achieved by a spring installed in the MSIV valve operator.

Pressure transmitters: WBN-2-PT-001-0002A-D; WBN-2-PT-001-0002B-E; WBN-2-PT-001-0009A-D; WBN-2-PT-001-0009B-E; WBN-2-PT-001-0020A-D; WBN-2-PT-001-0020B-E; WBN-2-PT-001-0027A-D; WBN-2-PT-001-0027B-E are located between the respective steam generator and its MSIV. MCR indication of the steam generator pressure is required for manual operation of the respective PORVs.

3.2 Main Feedwater System

The main feedwater (MFW) system is designed to supply feedwater to the steam generator secondary side during all normal operating conditions. The MFW system pumps take suction from the main condenser hotwells and deliver water to the steam generators via the feedwater heaters. The main feedwater isolation valves, WBN-2-FCV-003-0033-A; WBN-2-FCV-003-0047-B; WBN-2-FCV-003-0087 -A; WBN-2-FCV -003-0100-B are motor operated and receive power from a diesel backed Reactor MOV Boards. On receipt of a MFW isolation signal, the MFW system isolates so that main feedwater will not be delivered to the steam generators; this prevents reactor overcooling or possible over pressurization of containment due to feedwater line breaks inside containment.

For the SME evaluation in which a coincident loss of offsite power is assumed to occur, the MFW pumps lose power. The motor operated MFW isolation valves continue to receive power from the diesel backed Reactor MOV Boards and close upon receipt of a MFW isolation signal. The main and bypass regulation valves, located upstream of the MFW isolation valves, are not safety related and are installed in non-seismically qualified piping. Thus, only the MFW isolation valves are considered in the SSEL.

3.3 Auxiliary Feedwater System

The safety function of the auxiliary feedwater (AFW) system is to supply a sufficient feedwater flow to the steam generators to remove primary system stored and residual core energy in the event of a loss of main feedwater (MFW). The AFW may also be required to perform its safety function in other events, such as loss of off-site power, cool down after a loss of coolant accident for a small break LOCA, maintaining a water head in the steam generators following a loss of coolant accident, Main feed line or main steam line breaks, and flood above plant grade.

The system is designed to start automatically in the event that any of a number of events should occur which may result in, may be coincident with, or may be caused by a reactor trip. These include a loss of offsite electrical power, safety injection signal, low-low steam generator water level alarm, or a trip of both main feedwater pumps. It will supply sufficient feedwater to prevent the relief of primary coolant through the pressurizer safety valves and the uncovering of the core. It has adequate capacity to maintain the reactor at hot standby and then to cool the reactor coolant system to the temperature at which the residual heat removal system may be placed in operation, but it cannot supply sufficient feedwater for power generation.

The AFW system consists of two motor-driven pumps (410-gpm rated flow each) and a turbine-driven pump (720-gpm rated flow). The turbine-driven pump and its associated valving, instrumentation, and piping was not considered in this seismic margins evaluation as it was determined that the motor-driven AFW pumps were the preferred equipment to be used by plant operators for the 72 hour period of interest for the SMA. The AFW system has no normal power operation function. However, it may be used during plant startup and normal plant cool down when the preferred supply from MFW is unavailable. Motor-driven pump 2A-A (WBN-2-PMP -003-0118-A), which delivers flow to steam generators 1 and 2, and pump 2B-B (WBN-2-PMP -003-0128-B), which services steam generators 3 and 4, are aligned for auto start.

The Unit 2 Condensate Storage Tank (CST) serves as the normal water supply for the AFW pumps with ERCW as an automatic backup source. The CST is not seismically qualified and is assumed to be unavailable following the SME. Thus, the suction pressure of the motor-driven pumps is expected to decrease as they begin operation. The motor-operated ERCW supply valves servicing the motor-driven pumps (WBN-2-FCV-003-0116A-A and WBN-2-FCV-003-0116B-A for pump 2A-A and WBN-2-FCV-003-0126A-B; WBN-2-FCV-003-0126B-B for pump 2B-B) open automatically when the pump is running and the suction pressure drops $\leq$ 2.0 psig as sensed by two out of three pressure switches (WBN-2-PS-003-0139A-A, WBN-2-PS -003-0139B-A and WBN-2-PS-003-0139D-A for pump 2A-A, and WBN-2-PS-003-0144A-B, WBN-2-PS-003-0144B -B and WBN-2-PS-003-0144D-B for pump 2B-B) for 4 seconds.

The essential raw cooling water (ERCW) system serves as an unlimited backup water supply to the AFW pumps. ERCW discharge header A supplies water to motor-driven pump 2A-A, and ERCW discharge header B supplies water to pump 2B-B. There are two motor-operated FCVs in series in each supply line from the main ERCW header to the pump suction (eight total). During normal operation, these valves are closed to isolate the AFW system from the low quality ERCW. Two motor operated valves each in train A and train B ERCW headers supply ERCW to the suction of the Turbine Driven Auxiliary Feedwater Pump. Two of these valves (WBN-2-FCV -003-0136A - A, WBN-2-FCV -003-0179A-B) are listed in the SSEL for system isolation purposes since the turbine driven pump is not considered in the SSEL.

The motor-driven pumps 2A-A and 2B-B start automatically in the event of a two out of three low-low level signal for any steam generator, a safety injection signal, a trip of both MFW pump turbines, or a loss of offsite power. The motor-driven pumps may also be manually started via hand switches in the main control room. Cooling for the motor-driven pump spaces is provided by

the system 30 AB component cooling system (CCS)/AFW space coolers 2A-A and 2B-B (WBN-2-PMCL-030-0190 and WBN-2-PMCL-030-0191 respectively). As the motor-driven pump breakers close to start the pumps, contacts off of the breakers open to allow the large LCVs in the steam generator inlet lines to open. These LCVs (WBN-2-LCV-003-0156 -A and WBN-2-LCV-003-0164 -A from pump 2A-A and WBN-2-LCV-003-0148-B and WBN-2-LCV-003-0171-B from pump 2B-B) are then modulated to a preset open position by their respective level control circuits.

Portions of the Main feedwater System are isolated by containment isolation valves; WBN-2-FCV-003-0236, WBN-2-FCV-003-0239, WBN-2-FCV-003-0242, WBN-2-FCV-003-0245 and these valves are identified on the SSEL. The following check valves function as containment isolation valves, but are generically screened and are not included on the SSEL (Ref. EPRI NP-6041-SL, R1, Table 2-4 & page 3-29): 2-CKV-3-0805, -0806.

3.4 Chemical and Volume Control System

The chemical and volume control system (CVCS) is designed to maintain the required water inventory and water chemistry control of the reactor coolant system (RCS). Specifically, the CVCS functions during normal operation to:

1) Maintain the programmed water level in the pressurizer.
2) Maintain seal water flow to the reactor coolant pumps.
3) Control the reactor coolant water chemistry conditions, activity level, soluble chemical neutron absorber concentrations, and makeup.
4) Degas the RCS.

During emergency operation, the CVCS functions as part of the emergency core cooling system (ECCS) to provide high pressure safety injection from the refueling water storage tank (RWST) into the RCS. The CVCS is also used during certain events such as a faulted steam generator tube rupture (SGTR) or loss of sump recirculation to refill the refueling water storage tank.

The CVCS is a safety-related system designed to perform functions during normal operations and accident conditions. The CVCS operates during all modes of operation:

During reactor startup, RCS pressure and temperature increase as the boron concentration is decreased from shutdown concentration so that criticality can be achieved. During normal

operation, the CVCS adjusts the RCS boron concentration to account for core burn up and the build up and decay of xenon during the core lifetime. At hot shutdown, the RCS boron concentration is maintained such that the reactor is subcritical but can return to full power by withdrawing the control rods. During cold shutdown, the RCS boron concentration is increased to cold shutdown concentration, and the RCS pressure and temperature are decreased. A portion of the CVCS is shared with the ECCS and is required for emergency shutdown following a LOCA.

For the SME evaluation in which a coincident loss of offsite power is assumed to occur, the centrifugal charging pumps are used for normal makeup and for high pressure injection to achieve the alternate safe shutdown path of bleed and feed with an intact RCS. For the scenario with a small LOCA, the centrifugal charging pumps are used in both the preferred and alternate safe shutdown paths. For all SME shutdown paths, equipment necessary to maintain Reactor Coolant Pump seal flow is listed on the SSEL. Portions of the CVCS System are isolated by containment isolation valves; these valves are identified on the SSEL. The following check valves function as containment isolation valves, but are generically screened and are not included on the SSEL: 2-CKV-062-543, -0560,-061,-0562,-0563, and -0639.

3.5 Safety Injection System

The safety injection system (SIS) consists of two independent pump trains. The two pump trains discharge to a common header before splitting into four injection paths to provide flow to each of the four RCS cold legs. Separate injection paths are used for hot leg recirculation. Miniflow recirculation is provided for the SIS pumps. The cold leg accumulators inject their contents of borated water into the RCS during intermediate or large break LOCA events. The SIS is used for safety injection during both the injection and sump recirculation phases.

During normal plant operation, the SIS is in standby alignment for accident mitigation. The SIS pumps are used to fill and top-off the cold leg accumulators (WBN-2-ACUM-063-0001, WBN-2-ACUM-063-0002, WBN-2-ACUM-063-0003, and WBN-2-ACUM-063-0004). The normal standby lineup of the SIS is such that the pumps 2A-A and 2B-B (WBN-2-PMP -063-0010-A, WBN-2-PMP-063-0015-B) are aligned to take suction from the RWST (WBN-2-TANK-063-0046) through the normally open inlet valve (WBN-2-FCV -063-0005-B). The train A path includes a normally open pump suction valve (WBN-2-FCV -063-0047-A), safety injection pump 2A-A, a pump discharge check valve (WBN-2-CKV-063-0524-A), a locked-open pump discharge isolation valve (WBN-2-ISV-063-0525-A), and a normally open cold leg isolation valve (WBN-2-FCV -063-0152-A). The train B path includes a normally open pump suction valve (WBN-2-FCV-063-0048-B), safety injection pump 2B-B, a pump discharge check valve (WBN-2-CKV -063-

0526-B), a locked-open pump discharge isolation valve (WBN-2-ISV-063-0527-B), and a normally open cold leg isolation valve (WBN-2-FCV-063-0153-B). The two discharge paths join and flow through the normally open valve (WBN-2-FCV-063-0022-B), to the four RCS cold leg injection paths. Operation of SIS pumps requires cooling from the component cooling system (CCS) for the pump mechanical seals and cooling water supplied from the ERCW for the pump room coolers and the pump lube oil coolers. The pump room cooling fan is also required for successful operation of each SIS pump. Each SIS pump will start upon receipt of the "SI" signal.

The injection phase of the SIS is initiated by an "SI" signal. The "SI" signal automatically starts the SIS pumps. The SIS pumps will recirculate water through the minimum flow line back to the RWST until RCS pressure falls below the shutoff head. As pressure decreases in the RCS, the SIS pumps will start injecting into the RCS. The SIS pump maximum injection flow rate is 650 gpm at 1808 feet of head.

The recirculation phase is automatically initiated for ECCS when the RWST reaches low level with the containment sump high level and an "SI" signal present. In this phase, cooling water is pumped into the reactor vessel from the containment sump. Water collected in the sump is pumped by the RHR pumps, cooled by the RHR heat exchangers, and discharged to the RCS cold legs, the SIS and chemical and volume control system (CVCS) pump suction. The SIS and CVCS pumps inject the recirculated sump water into the reactor vessel when the RCS pressure remains above the shutoff head of the RHR pumps.

Upon receipt of the required level signal, the containment sump isolation valves (WBN-2-FCV-063-0072 -A and WBN-2-FCV-063-0073-B) automatically open and the RHR normal suction valves (WBN-2-FCV-074-0003-A and WBN-2-FCV-074-0021-B) automatically close to isolate the RWST. The operator is instructed to complete the alignment of the SIS for the recirculation phase manually. This is accomplished by closing the RWST isolation valve (WBN-2-FCV-063-0005-B), closing the SIS minimum flow valves (WBN-2-FCV-063-0003-A, WBN-2-FCV -063-0004 -B and WBN-2-FCV-063-0175 -B), and opening the supply path from the RHR system to the SIS (WBN-2-FCV-063-0011-B) and the flow path (WBN-2-FCV-063-0006-B, WBN-2-FCV-063-0007-A, WBN-2-FCV-063-0008-A).

Three hours after a LOCA starts, the operator is instructed to manually align the RHR and SIS for "hot leg" recirculation. To initiate Hot Leg recirculation using the Safety Injection Pumps, the suction piping alignment remains the same as for cold leg injection, but each Safety Injection Pump discharge is aligned through separate headers that split to two branch lines and eventually to

the hot legs. A throttling valve in each injection line is pre-set to limit Safety Injection Pump run-out and to equalize flow through the lines such that the amount of safety injection that spills to containment is minimized in the RCS loop that has ruptured. The throttle valves are also adjusted to limit RHR pump run-out when one RHR pump is used to supply flow to the RHR Spray headers and to the Safety Injection Pumps suction.

Placing the unit in the "hot leg" recirculation mode will provide long-term cooling for the reactor and prevent boric acid "plate out" in the core by reversing flow in the reactor and limiting the boron concentration. This will prevent boric acid from blanketing the fuel rods, which may degrade the heat transfer from the core.

The cold leg accumulators are pressurized to a minimum 585 psig by nitrogen gas and have a nominal volume of approximately 1355.59 ft^3 of borated water. Each accumulator injects its contents through a normally open, de-energized, motor-operated isolation valve and two check valves into the RCS cold leg through a 10-inch line. The four cold leg accumulators function independently of the rest of the SIS and inject into the RCS solely on the basis of pressure differential between the accumulators and the RCS.

The accumulators are primarily designed to inject during LOCA conditions when RCS pressure rapidly decreases, and a large volume of water is needed to flood and cool the reactor in a relatively short period of time.

Portions of the Safety-Injection System are isolated by containment isolation valves; these valves are identified on the SSEL. The following check valves function as containment isolation valves, but are generically screened and are not included on the SSEL: 2-CKV-063-0551,-0553,-0555,-0557,-0581,-0632,-0633,-0634,-0635,-0640, & -0643.

3.6 Essential Raw Cooling Water

The primary function of the essential raw cooling water (ERCW) system (System 67) during normal operation is to provide cooling water to primary and secondary components such as component cooling system (CCS) heat exchangers, reactor coolant pump motors, control rod drive ventilation coolers, room coolers, and the air compressors. During accident conditions, the ERCW system provides an ultimate heat sink function for dissipating heat from essential plant equipment, room ventilation systems, and the component cooling system. The ERCW system is also the alternate water supply for the auxiliary feedwater system and the CCS surge tank.

The ERCW system consists of an intake pumping station (IPS) structure, traveling screens, pumps, strainers, discharge overflow structure, valves and piping arranged in two trains, each of which has two supply headers to the various supplied equipment. Those components of the ERCW System required to operate and/or maintain system integrity following a SME are included in the SSEL.

3.7 Component Cooling System

The component cooling system (CCS) acts as a barrier between the radioactive fluid flowing in the various coolers and the essential raw cooling water (ERCW) system to avoid release of radioactivity into the environment. The function of the CCS is to serve as an intermediate heat conductor for the removal of heat from potentially radioactive heat loads during normal and accident conditions. This function is accomplished through the use of a closed-loop system in which the CCS removes heat from the various component coolers (CCS loads) and transfers it to the CCS heat exchangers where the heat is transferred to the ERCW system. Those portions of the CCS required following a SME are included in the SSEL. Portions of this system are isolated following a LOCA; the isolation valves are included in the SSEL. Check valves 2-CKV-070-0679,-0687,-0698, & 0790 also function as containment isolation valves, but are generically screened and are not listed on the SSEL. Other components serviced by the CCS such as the Waste Gas Compressor and Spent Fuel Cooling Heat Exchangers are not specifically required for the SMA, but are listed on the SSEL for CCS pressure boundary integrity.

3.8 Residual Heat Removal

The RHR system is a safety-related system designed to perform functions during startup and cool down operations, shutdown operations, and during accident conditions. The RHR consists of two independent pump trains in each unit. With the exception of the common piping described below, each loop is capable of performing the safety-related and normal operating functions of the system. Each loop consists of a pump, pump miniflow loop, a heat exchanger, and flow control and isolation valves. Both loops share a common heat exchanger bypass line, suction piping from the RCS, suction and discharge to the RWST.

The normal functions of the RHR system are used during reactor startup, cool down, shutdown, and refueling. These normal functions of the RHR are:

1) To transfer decay heat from the RCS to the component cooling system when the RCS pressure and temperature are below RHR system design conditions.

2) To maintain adequate RCS flow with the reactor coolant pumps off to ensure adequate chemical mixing, and,

3) To transfer refueling water between the RWST and the refueling cavity at the beginning and end of refueling operations.

The RHR system is designed to perform several safety functions during accident conditions:

1) Provide low pressure injection to the RCS,

2) Switch over the RHR suction from the RWST to the containment sump and provide suction to centrifugal charging pumps and SIS pumps,

3) Provide normal cool down for decay heat removal with suction from the RCS loop 4 hot leg,

4) Provide RHR spray as part of the CSS, and,

5) Provide hot leg recirculation.

On receipt of a safety injection signal, the RHR pumps start; the RWST to RHR pump flow control valve (WBN-2-FCV-074-0001-A), normally aligned open, provides a suction path from the RWST; and normally open RHR heat exchanger outlet valves (WBN-2-FCV-074-0016 and WBN-2-FCV-074-0028) provide a discharge path to the four RCS cold legs. Miniflow valves (WBN-2-FCV-074-0012-A and WBN-2-FCV-074-0024-B) are opened or closed (depending on RHR injection flow into the RCS). When the RWST level is below the low level setpoint, the containment sump level is above the required setpoint and increasing, and the safety injection signal is present, the RHR supply valves automatically swap, and the recirculation mode begins.

Switchover of the RHR pump suction to the containment sump from the RWST is required during an event when the RWST level is below the low level setpoint and the containment sump level is above the required setpoint. The RHR recirculation mode begins with the automatic opening of the containment sump supply valves (WBN-2-FCV-063-0072-A and WBN-2-FCV-063-0073-B)

and closing the RWST supply valves (WBN-2-FCV-074-0003-A and WBN-2-FCV-074-0021-B). If automatic switchover does not occur, the operators are instructed to complete the switchover manually.

RHR supply to CVCS and safety injection valves (WBN-2-FCV-063-0008-A and WBN-2-FCV-063-0011-B) are manually opened to establish a flow path from the containment sump through the RHR pumps and heat exchangers to the suction of the centrifugal charging pumps and safety injection pumps for high pressure recirculation. The two RHR crosstie valves (WBN-2-FCV-074-0033-A and WBN-2-FCV-074-0035-B) are manually closed during the recirculation mode to separate the RHR train A and B flow paths for protection against a passive failure.

The RHR system can be used in the recirculation mode to supply part of its flow to the one of two parallel RHR containment spray headers. One of the RHR spray header isolation valves (WBN-2-FCV-072-0040-A and WBN-2-FCV-072-0041-B) must be opened by the operators to establish the flow path from the RHR pumps to the headers.

3.9 Reactor Protection System

The reactor protection system (RPS) provides (1) automatic protection against unsafe reactor operation and (2) initiating signals to mitigate the possible consequences of faulted conditions. The RPS is composed of two major systems: the reactor trip system (RTS) and the engineered safety features actuation system (ESFAS). The function of the RTS is to ensure that the reactor operates within established safe operating limits. The ESFAS is provided to sense accident situations and to initiate the operation of necessary engineered safety features (ESF).

Reactor Trip System

The RTS automatically trips the reactor whenever the safe operating limits are about to be breached. The general safety limits relating to the necessity of tripping the reactor are;

1) High power,
2) Excessive reactor coolant temperature,
3) Low coolant pressure, and
4) A combination of these parameters.

The RTS functions by interrupting power to the rod control system, causing the control rods to drop into the core. The two reactor trip breakers associated with each unit, RTA and RTB, are arranged in series between the control rod motor generator set switchgear and the control rod drive power cabinets. A breaker can be tripped electrically by either of two methods;

1) Operation of the under voltage trip attachment (UVTA), and/or,
2) The shunt trip attachment (STA).

Engineered Safety Features Actuation System (ESFAS)

ESFAS senses selected plant parameters, determines whether established safety limits are being approached and, if they are, combines the signals into logic matrices that are sensitive to combinations indicative of a primary or secondary system boundary rupture.

The ESFAS is composed of the following systems:

1) Process and Control Instrumentation Protection Set Racks (EAGLE 21)
2) Solid State Protection System (SSPS)
3) ESF Test Cabinets
4) Manual Actuation Circuits

The process protection system and the SSPS are designed to accomplish the following:

1) Generate all necessary process protection signals, combine them into logic matrices, and initiate a reactor trip or actuate necessary ESF equipment.

2) Maintain physical and electrical separation by providing four sets of process and control instrumentation protection system (EAGLE 21) cabinets and two sets of SSPS cabinets (racks), one for each protection train (A and B).

Process Protection System (Eagle 21)

The EAGLE 21 process protection system is a microprocessor-based system housed in 14 racks, in four cabinets which are divided into 4 protection channel sets. In each protection channel the process electronics power the sensors and perform signal conditioning, calculation, and isolation operations on the input signals. The analog input module of the system powers the field sensor(s)

and performs signal conditioning. All calculations for the process channel functions are performed by the loop calculation processor (LCP), and channel trip signals are provided through the partial trip output boards to the protection logic circuits of the SSPS.

Solid State Protection System

The SSPS is a dual-train, redundant protection system housed in two 3-bay cabinets, one single bay control board demultiplexer cabinet, and a computer-monitored demultiplexer assembly. Each 3-bay cabinet contains an input relay bay, a logic bay, and an output relay bay. The inputs are transmitted through AC-operated relays that separate SSPS logic circuits from the protection set inputs. The output relays consist of master and slave relays with the slave relays driven by the master relays.

When a transient occurs, various signals are generated, depending on the event that initiated the transient. These signals provide actuation for the equipment that is expected to operate automatically during the transient. Manual actuation of the ESFAS signals is also available.

3.10 ELECTRIC POWER SYSTEM

The electric power system at the Watts Bar Nuclear Plant consists of the unit main generator, three unit station service transformers (USST) per unit, four common station service transformers (CSST), four diesel generators, the station and vital batteries, and a two-train electrical distribution system. The electric power system can be broken into six subsystems: offsite grid, 6.9-kV AC power and diesel generators, 480V AC power, 250V DC power, 125V DC, and 120V AC power.

During normal plant operation, the unit main generators supply electric power through the USSTs to the non-safety auxiliary power system. Offsite electric power supplies Class IE circuits through the 1.61 - Kv system via the CSSTs. The normal power operation alignment of each subsystem is described below.

Offsite Grid

Two offsite power grids are connected to the Watts Bar Nuclear Plant: a 500-kV grid via a 500-kV switchyard and a 161-kV grid via the 161-kV switchyard. The 500-kV grid is supplied power from the Unit 2 main generator during normal power operation. When a unit trip occurs, the unit is separated from the 500-kV grid, and all offsite power is supplied by the 161-kV grid. The Watts

Bar Hydro Plant switchyard supplies the Watts Bar Nuclear Plant 161-kV transformer yard. Two separate transmission lines provides 161 kV power to the 161 - 6.9 kV CSSTs A, B, C, and D.

6.9-kV AC Power and Diesel Generators

During power operation, the 6.9-kV unit boards receive power from the unit main generators via the USSTs. When a unit trip occurs the unit boards will transfer to the start buses for power. The 6.9 kV start buses are powered by CSSTs A and B via the 161 kV transformer yard.

The 6.9 kV shutdown boards are powered by CSSTs C and D via the 161 kV transformer yard. Upon loss of offsite power (161 kV power from Watts Bar Hydro Plant), the 6.9 kV shutdown boards will be powered from the emergency diesel generators.

Following the postulated SME, offsite power is assumed to be lost and unavailable for the 72 hour period of interest. Therefore, electrical power for the operation of safeguards equipment must be supplied by the onsite emergency power source; the diesel generators. Specifically, the diesel generators are needed to provide electrical power to the 6.9-kV shutdown boards for the operation of pumps, valves, and instrumentation in the fluid mechanical systems used to keep the plant in a safe stable shutdown condition.

The 250V DC system supplies control power to the 6.9-kV Unit Boards. Although these boards are required to re power the 6.9-kV Shutdown Boards from the grid (should the grid be regained) via the unit boards, they are not required for the plant to achieve or maintain a safe stable shutdown condition. Thus, 250V DC system components are not included on the SSEL.

WBN has four diesel generators, with each diesel generator unit supplying a single safeguards bus. Each diesel generator unit includes the following equipment:

1) A diesel generator,
2) Sequencer,
3) Dedicated DC control power,
4) Diesel room ventilation,
5) Essential raw cooling water (ERCW) cooling systems,
6) Output breaker, and,
7) Associated piping and valves.

The Watts Bar diesel generators are each a single generator with a 16-cylinder engine mounted on each end connected to a single shaft. The diesel is started by an air start system unique to each diesel. At WBN, the diesel generators are skid-mounted package units with most essential auxiliary components furnished as part of the skid. This includes such components as the starting air receiver tanks and motors, fuel day tanks and fuel oil priming pumps, and cooling water heat exchangers. The intake air supply silencers, air cleaners and the exhaust silencers are not part of the skid and are located in a separate room on the floor above the diesel generator rooms. Combustion air supply is hard piped from the air cleaner in the intake room through the generator room to the engine.

The standby diesel generator (DG) system serves as the plant emergency standby alternating current power source. Each DG is capable of starting and accelerating to rated speed within 10 seconds to provide power to the needed engineering safety features and shutdown loads. The DG system is required to operate under each of, or, any combination of the following events:

1. Loss of Off-site Power (LOOP)
2. Degraded voltage on the 6.9-kV shutdown boards
3. Safety Injection (SI) signal

The DG starts automatically when a sustained (longer than 1.5 seconds) loss of voltage on the 6.9-kV Shut Down board occurs. After an additional time delay of 3 seconds at zero volts, all 6.9-kV Shutdown Boards loads (except the 6.9-kV to 480 volt transformers) and major 480 Vac loads are tripped. The DG is automatically connected to the 6.0-kV Shut down Board after it reaches rated speed and voltage. The return of voltage to the board initiates logic to connect the required loads in sequence. Such an automatic start signal operates a lock-out relay that removes all manually, electrically, and mechanically-operated stop signals except emergency stop, over-speed trip and generator differential trip. Wiring features a transformer, resistor and relay assembly used as a neutral grounding device to limit ground fault current and provide relay contacts for annunciation in the main and auxiliary control room.

The fuel oil transfer system for the diesels consists of the following equipment:

1) A 62,000-gallon minimum fuel oil supply,
2) Fuel oil transfer pumps 1 and 2, and,
3) Associated piping, valves, and instrumentation.

The diesel generators consume 100 pounds of fuel in 2:28 minutes at a load of 5,000 kW. The fuel transfer pumps are started at different levels by level switches such that if the first pump does not start, the level will drop, and the second will start. Both fuel transfer pumps will stop as the day tank level reaches a "high level" and activates a level switch.

Ventilation and cooling for the Unit 1 shutdown boards is supplied by air handling Unit 1A-A and Unit 1B-B; Unit 2 boards are cooled by air handling Unit 2A-A and Unit 2B-B (WBN-0-AHU -031-0044, WBN-0-AHU -031-0045, WBN-0-AHU -031-0055, WBN-0-AHU -031-0061). During normal operation, one air handling unit is in operation, while the other is in standby.

480V AC Power

The 480V AC power subsystems receive power from their associated 6.9-kV AC power shutdown boards. 6.9-kV board 1A-A (WBN-1-BD-211-A-A) supplies 480V boards 1A1-A and 1A2-A (WBN-1-BD-212-A001-A and WBN-1-BD-212-A002-A). 6.9-kV board 1B-B supplies 480V boards 1B1-B and 1B2-B. Similarly, Unit 2 480V AC power boards 2A1-A, 2A2-A, 2B1-B, and 2B2-B (WBN-2-BD-212-A001-A, WBN-2-BD-212-A002-A, WBN-2-BD-212-B001-B, WBN-2-BD-212-B002-B) receive power from their associated 6.9-kV shutdown boards. Namely, 2A1-A and 2A2-A receive power from 6.9-kV shutdown board 2A-A (WBN-2-BD-211-A-A), and 2B1-B and 2B2-B receive power from 6.9-kV shutdown board 2B-B (WBN-2-BD-211-B-B). The 480V AC auxiliary building common boards are supplied from the 6.9-kV common boards.

480V AC transformer room ventilation is supplied by four fans each for rooms 1A and 2B, and by three fans each for rooms 2A and 1B. Each fan is activated by a temperature switch that is set differently so that each fan is started on a staggered basis as the room temperature rises. The ventilation system in each room includes two motor-operated inlet dampers. Each fan has a mechanical back draft damper to prevent reverse flow while the fan is not in operation.

125V DC/120V AC Power

Each of the four 125V DC Vital Battery channels consists of the following:

1) One 125V DC Vital Battery,
2) One Vital Battery charger, and,
3) One Vital Battery Board with associated breakers and fuses.

During normal operation, the battery chargers supply all required DC. Vital Battery chargers 1A, 1B, 2A, and 2B (WBN-0-CHGR-236-0001-D, WBN-0-CHGR-236-0002-E, WBN-0-CHGR-236-0003-F and WBN-0-CHGR-236-0004-G) are normally powered from 480V shutdown boards 1A1-A, 1B2-B, 2A1-A, and 2B2-B, respectively. The 125V DC battery is maintained on a float charge by virtue of its connection to the bus and acts as an emergency DC supply should the charger fail. There are two spare chargers (WBN-0-CHGR-236-0006-S and WBN-0-CHGR-236-0007-S), one in each transfer rack.

There is a fifth Vital Battery (WBN-0-BAT-236-0005-S) that may be substituted for any of the other four Vital Batteries.

Each of the eight 120V Vital AC Instrument Power Systems consists of the following:

1) One Vital Inverter,
2) One Vital Instrument Power Board with associated breakers, and,
3) An alternate supply for the Vital Instrument Power Board from an Instrument Power Transformer supplied from a 480V Shutdown Board.

During normal operation, the inverter provides power to the 120V AC vital instrument bus. The inverter is normally supplied by the associated 480V shutdown board. Should all AC power be lost, the inverter will be directly supplied from its associated 125V DC battery board.

The 120V AC instrument power buses 1A consists of:

1) Instrument Power Transformer 1A,
2) Instrument Power Distribution Panel 1A with associated breakers,
3) A fused disconnect switch, and,
4) A 480V manual transfer switch.

The transformer is normally powered from 480V shutdown board 1A1-A with a non automatic alternate supply from 480V shutdown board 1B1-B. The transformer reduces the voltage from 480V to 120V for use in instrumentation. The 120V AC instrument power buses 1B, 2A, and 2B are similarly configured.

The 120V AC instrument power system requires ventilation for operation. The 480V board room ventilation system supplies rooms 1B and 2B in which the 120V AC inverters reside. One air handling unit (AHU) supplies each room; and there is no cross connect of ducting.

Accident/Transient Operation

The following describes the expected operation of the electric power subsystems for the loss of offsite power (LOOP) assumed coincident with the SME.

1) The offside grid is assumed to be lost. The equipment affected includes the 500-kV switchyard, the 161-kV transformer yard, the CSSTs (A, B, C and D), the start and shutdown buses, and their associated secondary-side breakers.

2) With a loss of offsite power, the unit boards and the 6.9-kV shutdown boards fail to receive power from the CSSTs; the start buses are de-energized. The diesel generators will start and supply power to their associated 6.9-kV shutdown board. On a loss of offsite power, after the diesel generators are started and loaded to the 6.9-kV shutdown boards, the 480V shutdown boards are then re-energized. The ventilation system is then restarted to serve the shutdown board rooms.

3) The 480V AC power subsystem is further divided into Class 1E power and balance-of-plant (BOP) power. Train A equipment includes 480V shutdown transformer 1A-A and 2A-A 480V shutdown board 1A-A and 2A-A, reactor motor-operated valve board 1A-A and 2A-A,diesel auxiliary board 1A-A and 2A-A, reactor ventilation board 1A-A and 2A-A, control and auxiliary building ventilation board 1A-A and 2A-A, and their associated loads. Alternate power can be supplied to 480V Shutdown Board 1A-A and 2A-A via Shutdown Transformer 1A1-A and 2A1-A, but the transfer is manual. Train B equipment is similarly configured.

   With the loss of offsite power (LOOP), the 480V Shutdown Boards continue to be powered from their associated 6.9-kV shutdown boards. Several Class 1E boards, however, are shed from the 480V shutdown boards on a loss of offsite power. These boards include all four reactor ventilation boards and control and auxiliary building ventilation boards 1A2-A, 1B2-B, 2A2-A, and 2B2-B.

4) The 120V AC Vital Instrument Power boards 1-I, 1-II, 1-III, and 1-IV are normally supplied from the 480V AC shutdown boards 1A1-A, 1B2-B, 2A2-A and 2B2-B,

respectively, via a vital inverter. Following the LOOP, power continues to be supplied from the 480V AC bus (the diesel generators supply the 480V AC shutdown boards via the 6.9-kV AC boards). Also, for the LOOP, the AHUs in the 480V board rooms will restart after power is restored to the shutdown buses by the diesel generators. Ventilation is required by the 120V AC instrument power system; the 480V AC board room ventilation system supplies rooms 1B and 2B; these rooms hold the 120V AC inverters. One AHU supplies each room, and there is no cross connecting of duct work.

3.11 MISCELLANEOUS SYSTEMS

In addition to the systems described in Sections 3.1 through and including 3.10, equipment from several other systems are included in the SSEL. These systems are described briefly in this section.

High Pressure Fire Protection (System 26)

This system provides automatic fire suppression (water spray) to the reactor coolant pumps (RCPs) in the event of an RCP fire. There are two motor operated valves associated with fire suppression for the reactor coolant pumps; WBN-2-FCV-026-0240-A which feeds the spray headers positioned about the reactor coolant pumps, and WBN-2-FCV-026-0243-A which supplies the associated stand pipe. The valves are powered by 480 V Reactor MOV Board BD 2A1-A. This system is automatically isolated during containment isolation. Thus, the valves required to perform the containment isolation safety function are included on the SSEL.

Check valves 1-CKV-026-1296 and -1260 also function as isolation valves, but are generically screened and are not included on the SSEL.

Ventilation (System 30)

This system is required for containment isolation, containment lower compartment environmental circulation and to provide airflow to certain pumps and electrical boards that are required to operate following the SME. The ventilation equipment required to perform both its containment isolation function for the small LOCA scenario, long term cooling post accident and its support system function for both the intact RCS and the small LOCA scenarios are included in the SSEL.

Air Conditioning (System 31)

The air conditioning system provides cooling for essential electrical equipment and pumps that are required to operate following the SME. Those components (air handlers, chillers, etc.) required to function to perform this task are included in the SSEL.

Control Air (System 32)

The Essential Air portion of the Control Air System provides pneumatic power to valves required to perform front line safety functions following a SME. Those components required to function to accomplish this task are included in the SSEL. Check valves 2-CKV-032-0323,-0333- & -0343function as containment isolation valves, but are generically screened and are not listed on the SSEL.

Post Accident Sampling (System 43)

The Post Accident Sampling System is isolated following receipt of a containment isolation signal. The valves that perform this function are included in the SSEL. Check valves 2-CKV-043-0834,-0841,-0883, & -0884 function as containment isolation valves, but are generically screened and are not listed on the SSEL.

Ice Condenser (System 61)

The glycol lines to the chillers inside the ice condenser are isolated following receipt of a containment isolation signal. The valves that perform the containment isolation function are included in the SSEL. Check valves 2-CKV-061-0692,-0680,-0745, & -0533 function as containment isolation valves, but are generically screened and are not listed on the SSEL.

Also, the ice condenser doors and ice condenser itself is required for cases when primary coolant is released to the containment and is therefore also included in the SSEL. For a small break LOCA, only the lower compartment doors are required to function and are included on the SSEL. Flow to the upper compartment bypasses the Intermediate deck doors through the vent curtain. Since the ice condenser baskets are passive components, they are not included on the SSEL.

Reactor Coolant System (System 68)

The reactor coolant system (RCS) components, i.e. reactor vessel, steam generators, pressurizer, and accumulators etc., are included in the SSEL for evaluation of their ability to perform their intended function.

Containment Spray (System 72)

The primary safety function of the containment spray system is to remove thermal energy from the containment in the event of a LOCA or a steam line break inside containment. The heat removable capability of the spray system assists in maintaining containment integrity when steam generated in the core continues to enter containment by keeping the containment pressure below its design pressure after all the ice in the containment ice condenser has melted. Those components of the CS system required to accomplish this function are listed on the SSEL.

Check valves 2-CKV-072-548,-0549,-0562, & -0563 function as containment isolation valves, but are generically screened and are not listed on the SSEL.

Waste Disposal (System 77)

During normal operation, one function of the Waste Disposal system is to collect contaminated liquid waste from inside containment and duct it to holding tanks located in the Auxiliary Building. In the event of containment isolation, the Waste Disposal system is isolated from containment. Thus, those valves required to perform this isolation function are listed on the SSEL. The valves are closed on a Phase A Containment Isolation Signal. Power is supplied by 125 VDC Battery Boards.

Check valves 2-CKV-077-0849 and 2-CKV-077-0862 function as containment isolation valves, but are generically screened and are not included on the SSEL.

Spent Fuel Cooling (System 78)

The spent Fuel Cooling components are listed for CCS pressure boundary integrity only. The spent fuel cooling function is not considered as part of the SMA.

Primary Makeup Water (System 081)

This system provides containment isolation of the reactor coolant pump standpipe seal water. The valve that performs the containment isolation function is included in the SSEL. Check valve 2-CKV-081-0502 functions as a containment isolation valve, but is generically screened and is not included on the SSEL.

Containment Isolation (System 88)

Containment isolation valves are not assigned system 88 identification number; they carry the component identification of the system in which they are located. Consequently, there are no system 88 identification numbers listed in the SSEL.

Radiation Monitoring (System 90)

The Containment Upper and Lower Compartment Area Radiation Monitors monitor radiation levels inside containment post accident; these monitors are listed in the SSEL.

The Containment Upper and Lower Compartment Airborne Radiation Monitors monitor radiation levels inside containment during normal operation. In the event of containment isolation, these monitors are isolated from containment. The valves required to perform this isolation function are listed on the SSEL.

Neutron Monitoring System (System 92)

Specific components (instruments) of the Neutron Monitoring System required to be operable post-accident to monitor reactivity associated with the core are included on the SSEL. Those components not in the main control room are included in the SSEL.

Incore Instrumentation System (System 94)

The Incore Instrumentation System does not perform any safety function; therefore, it is not included in the SSEL. It should be noted that seismic restraints for the movable frame assembly above the seal table have been provided. However, since these restraints are only removed during refueling, they are not required to be evaluated by this program.

Cranes (System 271)

The polar crane located inside containment is a large, heavy structure that, should it become dislodged from its track could fall and damage other critical equipment inside containment required to perform safety functions following a SME. Thus, the polar crane is included on the SSEL for evaluation of position retention capability only. For the same reasons, the crane located over the refueling floor in the Auxiliary Building is included in the SSEL.

System 275 & 276 Racks and Panels

The racks and panels listed were identified during the control-power interface review and are classified as Auxiliary Relay Racks (ARR) and trained BOP instrument racks. The relay racks (ARR) provide the necessary isolation and separation between the process signals and safety circuits. The following criteria apply to these circuits:

1. A safety signal derived from the Solid-State Protection System overrides the process signal.
2. The isolation relays have a coil to contact rating equal to or greater than the maximum credible ac or dc potential that could be applied to the non-1E circuit as its end points or intermediate routing.
3. The isolation relays and racks designated as Train A or Train B be seismically qualified.

Each relay rack is included in the relay evaluation. Both the 1E and non-1E racks were reviewed for the application of seismically susceptible relays in control circuits.

Junction Boxes (Systems 290, 292 and 293)

Junction boxes in which equipment, not readily identifiable to a process system, is mounted are included in the SSEL. The junction boxes have unique component identifiers with conduit system numbers 290, 292 and 293. This system number identifies the building in which the box is located. Since junction boxes are usually considered bulk commodities, they are generally not within the SMA scope. Accordingly, these systems have not been included in the Systems Summary List (Table 3.1). Each component is evaluated with its related SMA system.

4.0 SAFE SHUTDOWN EQUIPMENT LIST

This section describes the approach taken to develop the Safe Shutdown Equipment List (SSEL), provides a key to the reading of the SSEL, and provides the SSEL itself.

4.1 Approach

The approach taken was to minimize the amount of equipment to be included on the SSEL itself, yet maintain high reliability by listing redundant components. To accomplish this, the following guidelines were employed:

Equipment Included on SSEL

1) Reactor Coolant System Boundary Components, such as the reactor vessel, the steam generators, pressurizer and accumulators.
2) Active valves, those that are required to change position to successfully accomplish the Safe Shutdown Path(s). Examples of these would be containment isolation valves. Another example would be RHR and SI valves that may be required to change position as a result of realigning from cold leg recirculation to hot leg recirculation.
3) Active components such as those that are required to operate to successfully accomplish the Safe Shutdown Path(s). These include the ERCW pumps, RHR pumps, motor-driven charging pumps, air compressors and related equipment required for essential air, air handling units required to cool pump rooms, tanks, and heat exchangers.
4) Instrumentation required by the operators to monitor parameters associated with the key long term safety functions.
5) Electrical equipment required to power required pumps, valves, air handlers and instrumentation required to accomplish the Safe Shutdown Path(s).
6) Major system passive components necessary to maintain system pressure boundary, such as tanks, filters, strainers, etc.

Equipment Excluded from SSEL

Similarly, the following guide lines were used to exclude equipment from the SSEL:

1) Check valves. Generically screened out due to seismic ruggedness.

2) Valves in a required system that do not change state (move). These include valves that are locked open, locked closed, open with power removed, close with power removed, open with air removed and close with air removed.
3) Electrical systems not required either to achieve or maintain the plant in its safe, stable shutdown condition for the 72 hour period of interest for the SME. An example of this is the 250 Volt DC battery system.
4) Components downstream of their isolation valves for systems not required to operate in order to achieve or maintain the safe shutdown condition.
5) Similarly, non-essential components beyond the isolation valves when only a portion of the system is required to operate successfully to achieve the safe shutdown state. An example of this is the boric acid system associated with the CVCS.

The guidelines listed above were applied to determine the equipment and components to be included on the SSEL.

4.2 Definitions of Table Entries

Table 4-1 lists the key for use in interpreting the critical equipment lists developed based on the SPLDs shown in Figures 2-1 and 2-2, the dependency matrices given in Tables 2.2 and 2.3 and the detailed list of references given in Table 2.1. This key provides the definitions for and explanations of the ten entries made for the critical equipment list developed under the Systems Evaluation portion of the SME.

4.3 Safe Shutdown Equipment List

The SSEL provided in Appendix A includes equipment unique to Unit 2, Unit 1 equipment required for Unit 2 operation, and equipment designated as common to Unit 1 and Unit 2.

Table 4.1 KEY FOR READING SAFE SHUTDOWN EQUIPMENT LIST

Entry (Column)	Description of Entry
1	Equipment ID = UNID: UNnique Equipment IDentifier _____ - ____ - _____ - _____ - _____ - ____ Plant Unit Function System Address/Sub Train Where Plant = WBN (Watts Bar Nuclear) (Three Characters) Unit = 0 - Common (One Character) 1 Unit 1 2 Unit 2 Function = Function Code Defined in Table 4.1 Column 8 (Four Characters). System = is the three digit System Number as identified in Table 3.1(Three Characters). Address / Sub address = are two fields of (four character) given to number each type of component. Train = A single alpha character given to safety related components.
2	Equipment Description – Description of Equipment
3	Flow diagram – Drawing depicting equipment functional arrangement

(Column) Description of Entry

4 Path – Success Path to which the Component is associate;

1 – Intact RCS, Aux Feed Available

2 – Intact RCS, Aux Feed unavailable (alternate success path uses RCS bleed and feed)

3 – Small LOCA, Aux Feed available and use Safety Injection

4 – Small LOCA, Aux Feed unavailable (alternate success path uses RCS bleed and feed)

5 – Component is used in all (preferred and alternate) success paths.

5 Func – Success Path Function Performed By Equipment

A - Support System

B - Reactivity Control

C - RCS Pressure Control

D - RCS Inventory Control

E - Decay Heat Removal

F Containment Isolation

G - System Isolation

H - Room or Area Cooling (HVAC)

I - Containment Pressure / Temperature Control

J - Combination of Above

6 Op Nor - The operational status of the component during normal operation.

(Column) Description of Entry

7 Op Des - The desired status of the component following the SME event

Entry		Definition
On	-	On
Off	-	Off
O	-	Open
C	-	Closed
V	-	Variable
NR	-	Not Required
T	-	Throttled
--	-	Non-active, i.e. tank

(Column)	Description of Entry	
8	Function Code Definition	
	ACUM	ACCUMULATOR
	AHU	AIR HANDLING UNIT
	ARB	BOARD, RELAY, AUXILIARY
	BAT	BATTERY
	BD	SWITCHBOARD
	BKR	BREAKER, CIRCUIT
	CDPL	PANEL, DISTRIBUTION, CONTROL
	CHGR	CHARGER, BATTERY
	CHR	CHILLER
	CLR	COOLER
	COMP	COMPRESSOR
	COND	CONDENSER
	CRN	CRANE
	DEMN	DEMINERALIZER
	DIEG	ENGINE, DIESEL
	DOOR	DOOR
	DPL	PANEL, DISTRIBUTION
	DRYR	DRYER, AIR
	DXF	TRANSFORMER, DRY-TYPE
	FAN	FAN
	FCO	VALVE OPERATOR, FLOW CONTROL
	FCV	VALVE, CONTROL, FLOW
	FE	ELEMENT, FLOW
	FIS	SWITCH, INDICATING, FLOW
	FLTR	FILTER
	FS	SWITCH, FLOW
	FSV	VALVE, SOLENOID, FLOW
	FT	TRANSMITTER, FLOW
	GEN	GENERATOR
	HIC	CONTROLLER, INDICATING, HAND
	HS	SWITCH, HAND
	HTX	HEAT EXHANGER
	IACL	CLEANER, AIR
	INV	INVERTER
	ISV	VALVE, ISOLATION

(Column) Description of Entry

8 (Cont.) Function Code Definitions

JB	BOX, JUNCTION, TVA
LCV	VALVE, CONTROL, LEVEL
LSV	VALVE, SOLENOID, LEVEL
LT	TRANSMITTER, LEVEL
MCC	CONTROL CENTER, MOTOR
NM	MODIFIER, NEUTRON
OXF	TRANSFORMER, OIL-FILLED
PCV	VALVE, CONTROL, PRESSURE
PDIS	SWITCH, INDICATING, DIFFERENTIAL, PRESSURE
PDT	TRANSMITTER, DIFFERENTIAL, PRESSURE
PMCL	COOLER, PUMP
PMP	PUMP
PNL	PANEL
PRES	PRESSURIZER
PS	SWITCH, PRESSURE
PSV	VALVE, SOLENOID, PRESSURE
PT	TRANSMITTER, PRESSURE
RCVR	RECEIVER
RE	ELEMENT, RADIATION
RFV	VALVE, RELIEF
ROD	ROD, CONTROL
RPV	VESSEL, REACTOR PRESSURE
SEP	SEPARATOR
SFV	VALVE, SAFETY
SGEN	GENERATOR, STEAM
SILN	SILENCER
STN	STRAINER
TANK	TANK
TC	CONTROLLER, TEMPERATURE
TCV	VALVE, CONTROL, TEMPERATURE
TE	ELEMENT, TEMPERATURE
TIS	SWITCH, INDICATING, TEMPERATURE
TS	SWITCH, TEMPERATURE
TSV	VALVE, SOLENOID, TEMPERATURE
TT	TRANSMITTER, TEMPERATURE

TWS SCREEN, TRAVELING WATER

(Column) Description of Entry

8 (Cont.) Function Code Definitions

XSW SWITCH, TRANSFER

9 Pwr - Power (either electrical or air) required to achieve the desired status:

Entry		Description
Y	-	Yes
N or NA	-	No

10 Seism Cat - Seismic Category

11 Flr Elev/Room - Floor elevation and location (room, azimuth, column lines, etc.) of equipment

5.0 Peer Review

To be performed as part of verification / validation.

6.0 SUMMARY

This report documents the following:

1) The objectives of the systems evaluation portion of the seismic margins assessment being performed for Watts Bar Nuclear Plant Unit 2.
2) The basic assumptions associated with the system evaluation.
3) The resources utilized in the development of the shutdown paths
4) The Safe Shutdown Paths themselves as shown in the SPLDs of Figure 2-1 and 2-2, along with a statement of the key feature(s) used by the path to obtain and maintain the safe shutdown condition.
5) The Development of dependency matrices, showing the interrelationship between support systems and front line safety systems and functions (Table 2.2) and between support systems and other support systems (Table 2.3).
6) The development of a Safe Shutdown Equipment List (Appendix A) identifying the critical front line and support equipment required for the safe shutdown paths shown in the SPLDs of Figures 2-1 and 2-2.

The SSEL is used as input to the seismic evaluation of structures and mechanical / electrical components required during or after the seismic event, including the containment isolation function, and input to the selection and evaluation of relays for effects of low ruggedness relay chatter on performance of equipment required to achieve the Safe Shutdown Path functions.

7.0 REFERENCES

1. Report No: WBNIPEEE-001, Rev. 2, Dated December 15, 1997 and entitled: "Watts Bar Nuclear Plant IPEEE Seismic Margins Evaluation Safe Shutdown Paths and Safe Shutdown Equipment List."
2. US NRC Generic Letter 88-20 Supplement 4, "Individual Plant Examination of External Events (IPEEE) for Severe Accident Vulnerabilities," June 1991.
3. NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examinations of External Events (IPEEE) for Severe Accident Vulnerabilities, US Nuclear Regulatory Commission, June 1991.
4. EPRI NP-6041M, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin," Revision 1, Electric Power Research Institute, Palo Alto, CA, August 1991.
5. EG/CR-4826, Volume 2, "Seismic Margin Review of the Maine Yankee Atomic power Station," US Nuclear Regulatory Commission, March 1987.

Appendix A

SAFE SHUTDOWN EQUIPMENT LIST (SSEL)

EquipID	Description	FlowDiag	Path	Func	Op Nor	Op Des	Cat	PW R	Floor Elev	Room Num
WBN-2-FCV -001-0004 -T	SG 2 MAIN STM HDR ISOLATION VALVE	2-47W801-1	5	F,G	O	C	AOV	Yes	0	0
WBN-2-FCV -001-0007 -B	BLOWDOWN ISOLATION VALVE SG-2	2-47W801-2	5	F,G	O	C	SOV	Yes	0	0
WBN-2-FCV -001-0011 -T	SG 2 MAIN STM HDR ISOLATION VALVE	2-47W801-1	5	F,G	O	C	AOV	Yes	AUX/757	0
WBN-2-FCV -001-0014 -A	BLOWDOWN HDR FLOW CONTROL VALVE, SG-2	2-47W801-2	5	F,G	C	C	SOV	Yes	AUX/713	A11
WBN-2-FCV -001-0015 -A	TD AUX FW PMP STM SUPPLY FROM SG NO 2	2-47W803-2	5	E, G,F	O	O/C	MOV	Yes	0	/ALVE VAULT ROOI
WBN-2-FCV -001-0016 -A	AUX FW PMP TURB STM SUPPLY FROM SG NO 4	2-47W803-2	5	E, G,F	C	O/C	MOV	Yes	0	/ALVE VAULT ROOI
WBN-2-FCV -001-0022 -T	SG 3 MAIN STM HDR ISOLATION VALVE	2-47W801-1	5	F,G	O	C	AOV	Yes	AUX/713	
WBN-2-FCV -001-0025 -B	BLOWDOWN HDR ISOLATION VALVE, SG-3	2-47W801-2	5	F,G	O	C/O	SOV	Yes	AUX/713	A11
WBN-2-FCV -001-0029 -T	STEAM GENERATOR 4 MAIN STEAM ISOL VLV	2-47W801-1	5	F,G	O	C	AOV	Yes	RXB/716	
WBN-2-FCV -001-0032 -A	BLOWDOWN HDR FLOW CONTROL VALVE, SG-4	2-47W801-1	5	F,G	O	C	SOV	Yes	AUX/741	A11
WBN-2-FCV -001-0051 -S	TD AUX FEEDWATER PMP TRIP & THROTTLE VALVE	2-47W803-2	2,3	E	C	O/C	MOV	Yes	AUX/737	A25
WBN-2-FCV -001-0052	TD AUX FEEDWATER PMP GOVERNOR VALVE	2-47W803-2	2,3	E	O	O	EHA	Yes	AUX/713	A25
WBN-2-FCV -001-0147 -A	MAIN STEAM ISOL VLV LOOP 2 BYP WARMING VLV	2-47W801-1	5	F,G	C	C	AOV	Yes	AUX/713	A29
WBN-2-FCV -001-0148 -B	MAIN STEAM ISOL VLV LOOP 2 BYP WARMING VLV	2-47W801-1	5	F,G	C	C	AOV	Yes	AUX/713	
WBN-2-FCV -001-0149 -A	MAIN STEAM ISOL VLV LOOP 3 BYP WARMING VLV	2-47W801-1	5	F,G	C	C	AOV	Yes	AUX/713	
WBN-2-FCV -001-0150 -B	MAIN STEAM ISOL VLV LOOP 4 BYP WARMING VLV	2-47W801-1	6	F,G	C	C	AOV	Yes	AUX/713	A14
WBN-2-FCV -001-0181 -A	BLOWDOWN ISOL VLV INSIDE CNTMT, SG-1	2-47W801-2	5	G	O	C	SOV	Yes	AUX/713	0
WBN-2-FCV -001-0182 -B	BLOWDOWN ISOL VLV INSIDE CNTMT, SG-2	2-47W801-2	5	G	O	C	SOV	Yes	AUX/737	A9

WBN-2-FCV -001-0183 -A	BLOWDOWN ISOL VLV INSIDE CNTMT, SG-3	2-47W801-2	5	G	O	C	SOV	Yes	AUX/676	0
WBN-2-FCV -001-0184 -B	BLOWDOWN ISOL VLV INSIDE CNTMT, SG-4	2-47W801-2	5	G	O	C	SOV	Yes	AUX/676	0
WBN-2-FSV -001-0004A -A	SG 1 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	AUX/708	A11
WBN-2-FSV -001-0004B -B	SG 1 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0004D -A	SG 1 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0004E -A	SG 1 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	AUX/708	A11
WBN-2-FSV -001-0004G -B	SG 1 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0004H -B	SG 1 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0011A -A	SG 2 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0011B -B	SG 2 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0011D -A	SG 2 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0011E -A	SG 2 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0011G -B	SG 2 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0011H -B	SG 2 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0022A -A	SG 3 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0022B -B	SG 3 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0022D -A	SG 3 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0022E -A	SG 3 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0022G -B	SG 3 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10
WBN-2-FSV -001-0022H -B	SG 3 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A10

WBN-2-FSV -001-0029A -A	SG 4 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0029B -B	SG 4 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	O	C	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0029D -A	SG 4 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	0
WBN-2-FSV -001-0029E -A	SG 4 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0029G -B	SG 4 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A11
WBN-2-FSV -001-0029H -B	SG 4 MAIN STM HDR ISOLATION VLV	2-47W610-1-1	5	F,G	C	O	SOV	Yes	CTL/708	A11
WBN-2-PCV -001-0005 -T	SG 2 MAIN STM HDR PWR RELIEF CONTROL VLV	2-47W801-2	5	E,F,G	C	O/C	AOV	Yes	729	0
WBN-2-PCV -001-0012 -T	SG 2 MAIN STM HDR PWR RELIEF CONTROL VLV	2-47W801-2	5	E,F,G	C	O/C	AOV	Yes	729	0
WBN-2-PCV -001-0023 -T	SG 3 MAIN STM HDR PWR RELIEF CONTROL VLV	2-47W801-2	5	E,F,G	C	O/C	AOV	Yes	729	0
WBN-2-PCV -001-0030 -T	SG 4 MAIN STM HDR PWR RELIEF CONTROL VLV	2-47W801-2	5	E,F,G	C	O/C	AOV	Yes	729	A11
WBN-2-PSV -001-0006A -A	SG1 MAIN PWR RELIEF CONT VLV	2-47W610-1-1	5	E,F,G	ON	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0006B -A	SG1 MAIN PWR RELIEF CONT VLV	2-47W610-1-1	5	E,F,G	ON	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0006C -B	SG1 MAIN PWR RELIEF CONT VLV	2-47W610-1-1	5	E,F,G	ON	ON/OFF	SOV	YES	729	A5
WBN-2-PSV -001-0013A -B	SG2 MAIN PWR RELIEF CONT VLV	2-47W610-1-1	5	E,F,G	OFF	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0013B -B	SG2 MAIN PWR RELIEF CONT VLV	2-47W610-1-1	5	E,F,G	OFF	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0013C -A	SG2 MAIN PWR RELIEF CONT VLV	2-47W610-1-1	5	E,F,G	OFF	ON/OFF	SOV	YES	729	A16
WBN-2-PSV -001-0024A -A	SG3 MAIN PWR RELIEF CONT VLV	2-47W610-1-2	5	E,F,G	OFF	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0024B -A	SG3 MAIN PWR RELIEF CONT VLV	2-47W610-1-2	5	E,F,G	OFF	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0024C -B	SG3 MAIN PWR RELIEF CONT VLV	2-47W610-1-2	5	E,F,G	OFF	ON/OFF	SOV	YES	729	A512
WBN-2-PSV -001-0031A -B	SG4 MAIN PWR RELIEF CONT VLV	2-47W610-1-2	5	E,F,G	OFF	ON/OFF	SOV	YES	729	0

WBN-2-PSV -001-0031B -B	SG4 MAIN PWR RELIEF CONT VLV	2-47W610-1-2	5	E,F,G	OFF	ON/OFF	SOV	YES	729	0
WBN-2-PSV -001-0031C -A	SG4 MAIN PWR RELIEF CONT VLV	2-47W610-1-2	5	E,F,G	OFF	ON/OFF	SOV	YES	729	A705
WBN-2-PT -001-0002A -D	MAIN STEAM LOOP 1 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	713	0
WBN-2-PT -001-0002B -E	MAIN STEAM LOOP 1 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	713	0
WBN-2-PT -001-0009A -D	MAIN STEAM LOOP 2 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	729	0
WBN-2-PT -001-0009B -E	MAIN STEAM LOOP 2 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	729	0
WBN-2-PT -001-0020A -D	MAIN STEAM LOOP 3 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	729	0
WBN-2-PT -001-0020B -E	MAIN STEAM LOOP 3 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	729	0
WBN-2-PT -001-0027A -D	MAIN STEAM LOOP 4 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	713	0
WBN-2-PT -001-0027B -E	MAIN STEAM LOOP 4 PRESSURE	2-47W801-1	5	A,E	ON	ON	PT	YES	713	0
WBN-2-SFV -001-0512	MAIN STEAM SAFETY VALVES, SG-3	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0513	MAIN STEAM SAFETY VALVES, SG-3	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0514	MAIN STEAM SAFETY VALVES, SG-3	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0515	MAIN STEAM SAFEN VALVES, SG-3	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0516	MAIN STEAM SAFETY VALVES, SG-3	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0517	MAIN STEAM SAFETY VALVES, SG-2	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0518	MAIN STEAM SAFETY VALVES, SG-2	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0519	MAIN STEAM SAFETY VALVES, SG-2	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0520	MAIN STEAM SAFETY VALVES, SG-2	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0521	MAIN STEAM SAFETY VALVES, SG-2	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10

WBN-2-SFV -001-0522	MAIN STEAM SAFETY VALVES, SG-1	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0523	MAIN STEAM SAFETY VALVES, SG-1	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0524	MAIN STEAM SAFETY VALVES, SG-1	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A01
WBN-2-SFV -001-0525	MAIN STEAM SAFETY VALVES, SG-1	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0526	MAIN STEAM SAFETY VALVES, SG-1	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A10
WBN-2-SFV -001-0527	MAIN STEAM SAFETY VALVES, SG-4	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A01
WBN-2-SFV -001-0528	MAIN STEAM SAFETY VALVES, SG-4	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A01
WBN-2-SFV -001-0529	MAIN STEAM SAFETY VALVES, SG-4	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A01
WBN-2-SFV -001-0530	MAIN STEAM SAFETY VALVES, SG-4	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A01
WBN-2-SFV -001-0531	MAIN STEAM SAFETY VALVES, SG-4	2-47W801-1	1,3	E	C	O/C	SFV	NO	729	A01
WBN-2-FCV -003-0033 -A	SG#1 FW ISOLATION VALVE	2-47W803-2	5	F,G	O	C	MOV	YES	AUX/737	A9
WBN-2-FCV -003-0047 -B	STM GEN #2 ISOLATION VALVE	2-47W803-2	5	F,G	O	C	MOV	YES	AUX/713	A29
WBN-2-FCV -003-0087 -A	STM GEN #3 ISOLATION VALVE	2-47W803-2	5	F,G	O	C	MOV	YES	AUX/713	A29
WBN-2-FCV -003-0100 -B	STM GEN #4 ISOLATION VALVE	2-47W803-2	5	F,G	O	C	MOV	YES	AUX/676	A13
WBN-2-FCV -003-0116A -A	AUX FEED ISOLATION VALVE	2-47W803-2	1,3	E	C	O	MOV	YES	AUX/676	A12
WBN-2-FCV -003-0116B -A	AUX FEED ISOLATION VALVE	2-47W803-2	1,3	E	C	O	MOV	YES	0	0
WBN-2-FCV -003-0126A -B	AUX FEED ISOLATION VALVE	2-47W803-2	1,3	E	C	O	MOV	YES	0	0
WBN-2-FCV -003-0126B -B	AUX FEED ISOLATION VALVE	2-47W803-2	1,3	E	C	O	MOV	YES	AUX/676	A12
WBN-2-FCV -003-0136A -A	ERCW HEADER A ISOLATION VALVE	2-47W803-2	5	G	C	C	MOV	NO	/706	0
WBN-2-FCV -003-0136B -A	ERCW HEADER A ISOLATION VALVE	2-47W803-2	5	G	C	C	MOV	NO	/706	0

WBN-2-FCV -003-0179A -B	ERCW HEADER B ISOLATION VALVE	2-47W803-2	5	G	O	C	MOV	NO	/728	0
WBN-2-FCV -003-0179B -B	ERCW HEADER B ISOLATION VALVE	2-47W803-2	5	G	O	C	MOV	NO	/728	0
WBN-2-FCV -003-0236	CONT ISO	2-47W803-2	5	F	O	C	AOV	YES	AUX/676	0
WBN-2-FCV -003-0239	CONT ISO	2-47W803-2	5	F	O	C	AOV	YES	/723	0
WBN-2-FCV -003-0242	CONT ISO	2-47W803-2	5	F	O	C	AOV	YES	AUX/676	A13
WBN-2-FCV -003-0245	CONT ISO	2-47W803-2	5	F	O	C	AOV	YES	AUX/676	0
WBN-2-FCV -003-0355 -A	AUX FEEDWATER PMP 2A-A RECIRC FLOW CONTROL	2-47W803-2	1,3	E,G	C	C	AOV	Yes	/723	A1
WBN-2-FCV -003-0359 -B	AUX FEEDWATER PUMP 2B-BRECIRC FLOW CONTROL	2-47W803-2	1,3	E,G	C	C	AOV	Yes	/723	A1
WBN-2-LCV -003-0148 -B	STM GEN #3 LEVEL CONTROL VALVE	2-47W803-2	5	E,F	C	O/C	AOV	YES	RXB/703	0
WBN-2-LCV -003-0148A -B	CONT ISO	2-47W803-2	5	E,F	O	O/C	AOV	YES		#N/A
WBN-2-LCV -003-0156 -A	STM GEN #2 LEVEL CONTROL VALVE	2-47W803-2	5	E,F	C	O/C	AOV	YES	0	0
WBN-2-LCV -003-0156A -A	CONT ISO	2-47W803-2	5	E,F	C	O/C	AOV	YES	0	0
WBN-2-LCV -003-0164 -A	STM GEN #2 LEVEL CONTROL VALVE	2-47W803-2	5	E,F	C	O/C	AOV	YES	0	0
WBN-2-LCV -003-0164A -A	CONT ISO	2-47W803-2	5	E,F	C	O/C	AOV	YES	0	0
WBN-2-LCV -003-0171 -B	STM GEN #4 LEVEL CONTROL VALVE	2-47W803-2	5	E,F	C	O/C	AOV	YES	0	0
WBN-2-LCV -003-0171A -B	CONT ISO	2-47W803-2	5	E,F	C	O/C	AOV	YES	0	0
WBN-2-LCV -003-0172 -A	STM GEN #3 LEVEL CONTROL VALVE	2-47W803-2	5	F	C	C/O	AOV	NO	AUX/757	0
WBN-2-LCV -003-0173 -B	STM GEN #2 LEVEL CONTROL VALVE	2-47W803-2	5	F	C	O/C	AOV	NO	AUX/713	0
WBN-2-LCV -003-0174 -B	STM GEN #2 LEVEL CONTROL VALVE	2-47W803-2	5	F	C	O/C	AOV	NO	0	0
WBN-2-LCV -003-0175 -A	STM GEN #4 LEVEL CONTROL VALVE	2-47W803-2	5	F	C	O/C	AOV	NO	0	0

WBN-2-LT -003-0038	-E	STM GEN 2 LEVEL XMTR (NR)	2-47W610-3-1	1,3	E	On	On	LT	YES	0	0
WBN-2-LT -003-0039	-F	STM GEN 2 LEVEL XMTR (NR)	2-47W610-3-1	1,3	E	On	On	LT	YES	0	0
WBN-2-LT -003-0042	-G	STM GEN 2 LEVEL XMTR (NR)	2-47W610-3-1	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0043	-F	STM GEN 2 LEVEL XMTR (WR)	2-47W610-3-1	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0051	-E	STM GEN 2 LEVEL XMTR (NR)	2-47W610-3-1C	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0052	-F	STM GEN 2 LEVEL XMTR (NR)	2-47W610-3-1C	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0055	-G	STM GEN 2 LEVEL XMTR (NR)	2-47W610-3-1C	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0056	-G	STM GEN 2 LEVEL XMTR (WR)	2-47W610-3-1C	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0093	-E	STM GEN 3 LEVEL XMTR (NR)	2-47W610-3-2	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0094	-F	STM GEN 3 LEVEL XMTR (NR)	2-47W610-3-2	1,3	E	On	On	LT	Y	AUX/737	A12
WBN-2-LT -003-0097	-G	STM GEN 3 LEVEL XMTR (NR)	2-47W610-3-2	1,3	E	On	On	LT	Y	0	0
WBN-2-LT -003-0098	-G	STM GEN 3 LEVEL XMTR (WR)	2-47W610-3-2	1,3	E	On	On	LT	Y	AUX/676	0
WBN-2-LT -003-0106	-E	STM GEN 4 LEVEL XMTR (NR)	2-47W610-3-2B	1,3	E	On	On	LT	Y	AUX/676	0
WBN-2-LT -003-0107	-F	STM GEN 4 LEVEL XMTR (NR)	2-47W610-3-2B	1,3	E	On	On	LT	Y	AUX/676	0
WBN-2-LT -003-0110	-G	STM GEN 4 LEVEL XMTR (NR)	2-47W610-3-2B	1,3	E	On	On	LT	Y	AUX/676	0
WBN-2-LT -003-0111	-F	STM GEN 4 LEVEL XMTR (WR)	2-47W610-3-2B	1,3	E	On	On	LT	Y	AUX/692	0
WBN-2-LT -003-0148	-B	AFW PMP 2B-B, SG 3 LVL	2-47W610-3-7	1,3	E	On	On	LT	Yes	AUX/692	0
WBN-2-LT -003-0156	-A	AFW PMP 2A-A, SG 2 LVL	2-47W610-3-7	1,3	E	On	On	LT	Yes	AUX/692	0
WBN-2-LT -003-0164	-A	AFW PMP 2A-A, SG 2 LVL	2-47W610-3-7	1,3	E	On	On	LT	Yes	AUX/692	0
WBN-2-LT -003-0171	-B	AFW PMP 2B-B, SG 4 LVL	2-47W610-3-7	1,3	E	On	On	LT	Yes	AUX/692	A325

WBN-2-PCV -003-0122	MDP THROTTLE VLV	2-47W803-2	1,3	E	T	T	AOV	Yes	723	0
WBN-2-PCV -003-0132	MDP THROTTLE VLV	2-47W803-2	1,3	E	T	T	AOV	Yes	723	0
WBN-2-PMP -003-0118 -A	MOTOR DRIVEN AUX FEEDWATER PUMP 2A-A	2-47W803-2	1,3	E	OFF	On	PMP	Yes	723	A1
WBN-2-PMP -003-0128 -B	MOTOR DRIVEN AUX FEEDWATER PUMP 2B-B	2-47W803-2	1,3	E	OFF	On	PMP	Yes	723	A01
WBN-2-PS -003-0139A -A	AFW PMP 2A-A, SUCTION PRESS	1-47W803-2	1,3	C	O	C	PS	Yes	713	0
WBN-2-PS -003-0139B -A	AFW PMP 2A-A, SUCTION PRESS	1-47W803-2	1,3	C	O	C	PS	Yes	713	0
WBN-2-PS -003-0139D -A	AFW PMP 2A-A, SUCTION PRESS	1-47W803-2	1,3	C	O	C	PS	Yes	713	0
WBN-2-PS -003-0144A -B	AFW PMP 2B-B, SUCTION PRESS	1-47W803-2	1,3	C	O	C	PS	Yes	713	0
WBN-2-PS -003-0144B -B	AFW PMP 2B-B, SUCTION PRESS	1-47W803-2	1,3	C	O	C	PS	Yes	713	0
WBN-2-PS -003-0144D -B	AFW PMP 2B-B, SUCTION PRESS	1-47W803-2	1,3	C	O	C	PS	Yes	713	0
WBN-1-PMP -018-0054/1 -A	DAY TNK XFER PMP	1-47W840-1	5	A	OFF	ON	PMP	Yes	DGB/742	1A-A
WBN-1-PMP -018-0054/2 -B	DAY TNK XFER PMP	1-47W840-1A	5	A	OFF	ON	PMP	Yes	/742	1B-B
WBN-1-PMP -018-0055/1 -A	DAY TNK XFER PMP	1-47W840-1	5	A	OFF	ON	PMP	Yes	DGB/742	1A-A
WBN-1-PMP -018-0055/2 -B	DAY TNK XFER PMP	1-47W840-1A	5	A	OFF	ON	PMP	Yes	DGB	1B-B
WBN-1-TANK-018-0038	7 DAY FUEL OIL SUP DSL GEN 1A-A	1-47W840-1	5	A	OFF	ON	TANK	NO	742	1A-A
WBN-1-TANK-018-0041	7 DAY FUEL OIL SUP DSL GEN 1B-B	1-47W840-1	5	A	OFF	ON	TANK	NO	742	1B-B
WBN-1-TANK-018-0061/1	ENGINE 1A1 DAY TANK 550 GAL	1-47W840-1	5	A	OFF	ON	TANK	No	742	1A-A
WBN-1-TANK-018-0061/2	ENGINE 1B1 DAY TANK 550 GAL	1-47W840-1A	5	A	OFF	ON	TANK	No	742	1B-B
WBN-1-TANK-018-0076/1	ENGINE 1A1 DAY TANK 550 GAL	1-47W840-1	5	A	OFF	ON	TANK	No	742	1A-A
WBN-1-TANK-018-0076/2	ENGINE 1B1 DAY TANK 550 GAL	1-47W840-1A	5	A	OFF	ON	TANK	No	742	1B-B

WBN-2-PMP -018-0054/3 -A	DAY TNK XFER PMP	1-47W840-1A	5	A	OFF	ON	PMP	Yes	742	2A-A
WBN-2-PMP -018-0054/4 -B	DAY TNK XFER PMP	1-47W840-1B	5	A	OFF	ON	PMP	Yes	742	2B-B
WBN-2-PMP -018-0055/3 -A	DAY TNK XFER PMP	1-47W840-1A	5	A	OFF	ON	PMP	Yes	742	2A-A
WBN-2-PMP -018-0055/4 -B	DAY TNK XFER PMP	1-47W840-1B	5	A	OFF	ON	PMP	Yes	742	2B-B
WBN-2-TANK-018-0038	7 DAY FUEL OIL SUP DSL GEN 2A-A	1-47W840-1	5	A	OFF	ON	TANK	NO	742	2A-A
WBN-2-TANK-018-0041	7 DAY FUEL OIL SUP DSL GEN 2B-B	1-47W840-1	5	A	OFF	ON	TANK	NO	742	2B-B
WBN-2-TANK-018-0061/3	ENGINE 2A1 DAY TANK 550 GAL	1-47W840-1A	5	A	OFF	ON	TANK	No	742	2A-A
WBN-2-TANK-018-0061/4	ENGINE 2B1 DAY TANK 550 GAL	1-47W840-1B	5	A	OFF	ON	TANK	No	742	2B-B
WBN-2-TANK-018-0076/3	ENGINE 2A2 DAY TANK 550 GAL	1-47W840-1A	5	A	OFF	ON	TANK	No	742	2A-A
WBN-2-TANK-018-0076/4	ENGINE 2B2 DAY TANK 550 GAL	1-47W840-1B	5	A	OFF	ON	TANK	No	742	2B-B
WBN-2-FCV -026-0240 -A	RB STANDPIPE ISOLATION VLV	2-47W850-13	5	F,G	O	C	MOV	Y	RXB/692	A25
WBN-2-FCV -026-0243 -A	REACTOR COOLANT PUMP SPRAY ISOL VALVE	2-47W850-13	5	F,G	O	C	MOV	Y	AUX/713	A29
WBN-0-PMCL-030-0192 -A	CCS TB BSTR & SFP PUMP COOLER A-A	1-47W866-8	5	H	V	ON	CLR	Yes	737	A1
WBN-0-PMCL-030-0193 -B	CCS TB BSTR & SFP PUMP COOLER B-B	1-47W866-8	5	H	V	ON	CLR	Yes	737	A1
WBN-0-TS -030-0192A -A	SFP PUMP/TBBP SPARE CLR A-A TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A1
WBN-0-TS -030-0192B -A	SFT PUMP/TBBP SPARE CLR A-A TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A1
WBN-0-TS -030-0193A -B	SFP PUMP/TBBP SPARE CLR B-B TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A1
WBN-0-TS -030-0193B -B	SFP PUMP/TBBP SPARE CLR B-B TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A1
WBN-1-CLR -030-0194 -A	EL 737 PENETRATION ROOM COOLER 2A-A	1-47W866-8	5	H	V	ON	CLR	Yes	737	A5
WBN-1-CLR -030-0195 -B	EL 737 PENETRATION ROOM COOLER 2B-B	1-47W866-8	5	H	V	ON	CLR	Yes	737	A5

WBN-1-FAN -030-0244F -A	480V TRANSFORMER ROOM 1A EXH FAN 1A1-A	1-47W866-3		5	H	ON	ON	FAN	Yes	772	A6
WBN-1-FAN -030-0244G -A	480V TRANSFORMER ROOM 1A EXH FAN 1A2-A	1-47W866-3		5	H	ON	ON	FAN	Yes	772	A6
WBN-1-FAN -030-0244H -A	480V TRANSFORMER ROOM 1A EXH FAN 1A3-A	1-47W866-3		5	H	ON	ON	FAN	Yes	772	A6
WBN-1-FAN -030-0248E -B	480V TRANSFORMER ROOM 1B EXH FAN 1B1-B	1-47W866-3		5	H	ON	ON	FAN	Yes	772	A5
WBN-1-FAN -030-0248F -B	480V TRANSFORMER ROOM 1B EXH FAN 1B2-B	1-47W866-3		5	H	ON	ON	FAN	Yes	772	A5
WBN-1-FAN -030-0248G -B	480V TRANSFORMER ROOM 1B EXH FAN 1B3-B	1-47W866-3		5	H	ON	ON	FAN	Yes	772	A5
WBN-1-FAN -030-0447 -A	D-G RM 1A-A EXHAUST FAN 1	1-47W866-9		5	H	OFF	ON	FAN	Y	740	DGB
WBN-1-FAN -030-0449 -B	D-G RM 1B-B EXHAUST FAN 1	1-47W866-9		5	H	OFF	ON	FAN	Y	740	DGB
WBN-1-FAN -030-0451 -A	D-G RM 1A-A EXHAUST FAN 2	1-47W866-9		5	H	OFF	ON	FAN	Y	740	DGB
WBN-1-FAN -030-0453 -B			0					FAN		742	5
WBN-1-FAN -030-0459 -A	DIESEL GEN 1A-A ELECT BD ROOM EXHAUST		0	5	H	OFF	ON	FAN	Y	740	DGB
WBN-1-FAN -030-0461 -B	DIESEL GEN 1B-B ELECT BD ROOM EXHAUST		0	5	H	OFF	ON	FAN	Y	740	DGB
WBN-1-FAN -030-0491	DIESEL PANEL 1A-A VENT FAN	1-47W866-9		5	H	OFF	ON	FAN	Yes	742	4
WBN-1-FAN -030-0493	DIESEL PANEL 1B-B VENT FAN	1-47W866-9		5	H	OFF	ON	FAN	Yes	742	5
WBN-1-FCO -030-0244A	TRANSFORMER ROOM 1A DAMPER	1-47W866-3		5	H	O	O	DMP	Y	772	A6
WBN-1-FCO -030-0244B	TRANSFORMER ROOM 1A DAMPER	1-47W866-3		5	H	O	O	DMP	Y	772	A6
WBN-1-FCO -030-0248A	TRANSFORMER ROOM 1B DAMPER	1-47W866-3		5	H	O	O	DMP	Y	772	A5
WBN-1-FCO -030-0248B	TRANSFORMER ROOM 1B DAMPER	1-47W866-3		5	H	O	O	DMP	Y	772	A5
WBN-1-FCO -030-0443 -A	DG RM 1A-A AIR INTAKE DAMPER	1-47W866-9		5	H	O	O	DMP	Yes	742	4
WBN-1-FCO -030-0445 -B	DG RM 1B-B AIR INTAKE DAMPER	1-47W866-9		5	H	O	O	DMP	Yes	742	6

WBN-1-FCO -030-0447 -A	DG RM 1A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	3
WBN-1-FCO -030-0449 -B	DG RM 1B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	3
WBN-1-FCO -030-0451 -A	DG RM 1A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	3
WBN-1-FCO -030-0453 -B	DG RM 1B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	9
WBN-1-FCO -030-0455 -A	DG RM 1A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	3
WBN-1-FCO -030-0457 -B	DG RM 1B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	9
WBN-1-FCO -030-0459 -A	DG 1A-A ELEC BD RM EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	3
WBN-1-FCO -030-0461 -B	DG 1B-B ELEC BD RM EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	760.5	9
WBN-1-FS -030-0447 -A	DG 1A-A RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	RXB/726	D5
WBN-1-FS -030-0449 -B	DG 1B-B RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	RXB/726	D11
WBN-1-FS -030-0451 -A	DG 1A-A RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	CTL/755	D5
WBN-1-FS -030-0453 -B	DG 1A-A RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	RXB/726	D11
WBN-1-PMCL-030-0190	CCS & AUX FEEDWATER PUMP AREA COOLER	1-47W866-8	5	H	V	ON	CLR	Yes	713	A1
WBN-1-PMCL-030-0191	CCS & AUX FEEDWATER PUMP AREA COOLER	1-47W866-8	5	H	V	ON	CLR	Yes	AUX/713	A1
WBN-1-TS -030-0194A -A	PENETRATION RM EL 737 CLR 2A-A TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A5
WBN-1-TS -030-0194B -A	PENETRATION RM EL 737 CLR 2A-A TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A5
WBN-1-TS -030-0195A -B	PENETRATION RM EL 737 CLR 2B-B TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A5
WBN-1-TS -030-0195B -B	PENETRATION RM EL 737 CLR 2B-B TEMP	1-47W610-30-6	5	H	O/C	O/C	TS	No	737	A5
WBN-1-TS -030-0244A -A	TRANSFORMER RM 1A EXH FAN 1A1-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6
WBN-1-TS -030-0244B -A	TRANSFORMER RM 1A EXH FAN 1A2-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6

WBN-1-TS -030-0244D -A	TRANSFORMER RM 1A EXH FAN 1A3-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6
WBN-1-TS -030-0244E	TRANSFORMER RM 1A EXH FAN 1A4-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6
WBN-1-TS -030-0248A -B	TRANSFORMER RM 1B EXH FAN 1B1-B TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A5
WBN-1-TS -030-0248B -B	TRANSFORMER RM 1B EXH FAN 1B1-B TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A5
WBN-1-TS -030-0248D -B	TRANSFORMER RM 1B EXH FAN 1B1-B TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A5
WBN-1-TS -030-0447A -A	DG 1A-A RM EXH FAN 1A HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D3
WBN-1-TS -030-0447B -A	DG 1A-A RM EXH FAN 1B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D3
WBN-1-TS -030-0449A -B	DG 1B-B RM EXH FAN 1B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-1-TS -030-0449B -B	DG 1B-B RM EXH FAN 1B LO TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-1-TS -030-0451A -A	DG 1A-A RM EXH FAN 2A HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D3
WBN-1-TS -030-0451B -A	DG1A-A ROOM EXHAUST LOW TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D3
WBN-1-TS -030-0453A -B	DG 1B-B RM EXH FAN 2B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-1-TS -030-0453B -B	DG 1B-B RM EXH FAN 2B LO TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-2-CLR -030-0186 -A	PENETRATION ROOM COOLER 2A-A	2-47W866-8	5	H	V	ON	CLR	Y	AUX/692	#N/A
WBN-2-CLR -030-0187 -B	PENETRATION ROOM COOLER 2B-B	2-47W866-8	5	H	V	ON	CLR	Y	AUX/713	A06
WBN-2-CLR -030-0194 -A	EL 737 PENETRATION ROOM COOLER 2A-A	1-47W866-8	5	H	V	ON	CLR	Yes	AUX/692	A9
WBN-2-CLR -030-0195 -B	EL 737 PENETRATION ROOM COOLER 2B-B	1-47W866-8	5	H	V	ON	CLR	Yes	AUX/692	A9
WBN-2-CLR -030-0196	PENETRATION ROOM COOLER 2A-A	2-47W866-8	5	H	V	ON	CLR	Y	AUX/692	0
WBN-2-CLR -030-0197 -B	PENETRATION ROOM COOLER 2B-B	2-47W866-8	5	H	V	ON	CLR	Y	AUX/692	0
WBN-2-CLR -030-0200	EMERGENCY GAS TREATMENT RM COOLER A-A	2-47W866-8	5	H	V	ON	CLR	Yes	AUX/692	A16

WBN-2-CLR -030-0201	PIPE CHASE COOLER 2A-A	2-47W866-8	5	H	V	ON	CLR	Y	AUX/692	0
WBN-2-CLR -030-0202 -B	PIPE CHASE COOLER 2B-B	2-47W866-8	5	H	V	ON	CLR	Y	AUX/713	0
WBN-2-CLR -030-0207	EMERGENCY GAS TREATMENT RM COOLER B-B	1-47W866-8	5	H	V	ON	CLR	Yes	AUX/713	A16
WBN-2-FAN -030-0038 -A	CNTMT AIR RETURN FAN A	2-47W866-1	5	H	OFF	ON	FAH	Y	AUX/726	A29
WBN-2-FAN -030-0039 -B	CNTMT AIR RETURN FAN B	2-47W866-1	5	H	OFF	ON	FAH	Y	0	0
WBN-2-FAN -030-0074 -A	LOWER COMPT COOLING UNIT A-A FAN	1-47W866-1	1	H	ON	ON	FAN	Yes	730	
WBN-2-FAN -030-0075 -B	LOWER COMPT COOLING UNIT B-B FAN	1-47W866-1	1	H	ON	ON	FAN	Yes	730	
WBN-2-FAN -030-0077 -A	LOWER COMPT COOLING UNIT C-A FAN	1-47W866-1	1	H	ON	ON	FAN	Yes	730	
WBN-2-FAN -030-0078 -B	LOWER COMPT COOLING UNIT D-B FAN	1-47W866-1	1	H	ON	ON	FAN	Yes	730	
WBN-2-FAN -030-0244F -A	480V TRANSFORMER ROOM 2A EXH FAN 2A1-A	2-47W866-3	5	H	ON	ON	FAN	Yes	772	A6
WBN-2-FAN -030-0244G -A	480V TRANSFORMER ROOM 2A EXH FAN 2A2-A	2-47W866-3	5	H	ON	ON	FAN	Yes	772	A7
WBN-2-FAN -030-0244H -A	480V TRANSFORMER ROOM 2A EXH FAN 2A3-A	2-47W866-3	5	H	ON	ON	FAN	Yes	772	A8
WBN-2-FAN -030-0246F -B	480V TRANSFORMER RM 2B EXH FAN 2B1-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A11
WBN-2-FAN -030-0246G -B	480V TRANSFORMER RM 2B EXH FAN 2B2-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A11
WBN-2-FAN -030-0246H -B	480V TRANSFORMER RM 2B EXH FAN 2B3-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A11
WBN-2-FAN -030-0248E -B	480V TRANSFORMER ROOM 2B EXH FAN 2B1-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A11
WBN-2-FAN -030-0248F -B	480V TRANSFORMER ROOM 2B EXH FAN 2B2-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A11
WBN-2-FAN -030-0248G -B	480V TRANSFORMER ROOM 2B EXH FAN 2B3-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A11
WBN-2-FAN -030-0250E	480V TRANSFORMER RM 2A EXH FAN 2A1-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A12
WBN-2-FAN -030-0250F	480V TRANSFORMER RM 2A EXH FAN 2A2-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A12

WBN-2-FAN -030-0250G	480V TRANSFORMER RM 2A EXH FAN 2A3-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A12
WBN-2-FAN -030-0447 -A	D-G RM 2A-A EXHAUST FAN 2	1-47W866-9	5	H	OFF	ON	FAH	Y	DGB/760	2A
WBN-2-FAN -030-0448	DG RM 2A-A EXH FAN 2	1-47W866-1	5	H	V	ON	FAN	Yes	DGB/760	2A
WBN-2-FAN -030-0449 -B	D-G RM 2B-B EXHAUST FAN 2	1-47W866-9	5	H	OFF	ON	FAH	Y	DGB/760	2B
WBN-2-FAN -030-0450	DG RM 2B-B EXH FAN 2	1-47W866-1	5	H	V	ON	FAN	Yes	DGB/760	2B
WBN-2-FAN -030-0451 -A	D-G RM 2A-A EXHAUST FAN 2	1-47W866-9	5	H	OFF	ON	FAH	Y	DGB/760	2A
WBN-2-FAN -030-0452	DG RM 2A-A EXH FAN 2	1-47W866-1	5	H	V	ON	FAN	Yes	DGB/760	2A
WBN-2-FAN -030-0453 -B	DG 2B-B ROOM EXHAUST FAN 2B	1-47W866-9	5	H	V	ON	FAN	Yes	DGB/760	2B
WBN-2-FAN -030-0454	DG RM 2B-B EXH FAN 2	1-47W866-1	5	H	V	ON	FAN	Yes	DGB/760	2B
WBN-2-FAN -030-0459 -A	DIESEL GEN 2A-A ELECT BD ROOM EXHAUST	1-47W866-9	5	H	OFF	ON	FAN	Y	742	6
WBN-2-FAN -030-0460	DG 2A-A ELEC BD RM EXHAUST	1-47W866-1	5	H	V	ON	FAN	Yes	DGB/760	2A
WBN-2-FAN -030-0461 -B	DIESEL GEN 2B-B ELECT BD ROOM EXHAUST	1-47W866-9	5	H	OFF	ON	FAN	Y	DGB/760	2B
WBN-2-FAN -030-0462	DG 2B-B ELEC BD RM EXHAUST	1-47W866-1	5	H	V	ON	FAN	Yes	DGB/760	2B
WBN-2-FAN -030-0491	DIESEL PANEL 2A-A VENT FAN	1-47W866-9	5	H	OFF	ON	FAN	Yes	DGB/742	2A-A
WBN-2-FAN -030-0492	DIESEL PANEL 2A-A VENT FAN	1-47W866-1	5	H	OFF	ON	FAN	Yes	DGB/742	2A-A
WBN-2-FAN -030-0493	DIESEL PANEL 2B-B VENT FAN	1-47W866-9	5	H	OFF	ON	FAN	Yes	/720	0
WBN-2-FAN -030-0494	DIESEL PANEL 2B-B VENT FAN	1-47W866-2	5	H	OFF	ON	FAN	Yes	742	0
WBN-2-FCO -030-0246A	480V TRANSFORMER RM 2B DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A11
WBN-2-FCO -030-0246B	480V TRANSFORMER RM 2B DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A11
WBN-2-FCO -030-0250A	480V TRANSFORMER RM 2A DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A12

WBN-2-FCO -030-0250B	480V TRANSFORMER RM 2A DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A12
WBN-2-FCO -030-0443 -A	DG RM 2A-A AIR INTAKE DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	5
WBN-2-FCO -030-0444 -A	DG RM 2A-A AIR INTAKE DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	5
WBN-2-FCO -030-0445 -B	DG RM 2B-B AIR INTAKE DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	7
WBN-2-FCO -030-0446 -B	DG RM 2B-B AIR INTAKE DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	7
WBN-2-FCO -030-0447 -A	DG RM 2A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2A
WBN-2-FCO -030-0448 -A	DG RM 2A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2A
WBN-2-FCO -030-0449 -B	DG RM 2B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2B
WBN-2-FCO -030-0450 -B	DG RM 2B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2B
WBN-2-FCO -030-0451 -A	DG RM 2A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2A
WBN-2-FCO -030-0452 -A	DG RM 2A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2A
WBN-2-FCO -030-0453 -B	DG RM 2B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2B
WBN-2-FCO -030-0454 -B	DG RM 2B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2B
WBN-2-FCO -030-0455 -A	DG RM 2A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/762	2A
WBN-2-FCO -030-0456 -A	DG RM 2A-A EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2A
WBN-2-FCO -030-0457 -B	DG RM 2B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/762	2B
WBN-2-FCO -030-0458 -B	DG RM 2B-B EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2B
WBN-2-FCO -030-0459 -A	DG 2A-A ELEC BD RM EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/762	2A
WBN-2-FCO -030-0460 -A	DG 2A-A ELEC BD RM EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2A
WBN-2-FCO -030-0461 -B	DG 2B-B ELEC BD RM EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/762	2B

WBN-2-FCO -030-0462	-B	DG 2B-B ELEC BD RM EXH FAN DAMPER	1-47W866-9	5	H	O	O	DMP	Yes	DGB/760	2B
WBN-2-FCV -030-0007	-A	UPPER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	0	0
WBN-2-FCV -030-0008	-B	UPPER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	0	0
WBN-2-FCV -030-0009	-B	UPPER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	AUX/713	A29
WBN-2-FCV -030-0010	-A	UPPER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	0	0
WBN-2-FCV -030-0014	-A	LOWER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	0	0
WBN-2-FCV -030-0015	-B	LOWER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	AUX/713	A29
WBN-2-FCV -030-0016	-B	LOWER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	AUX/713	A29
WBN-2-FCV -030-0017	-A	LOWER COMPT PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	0	0
WBN-2-FCV -030-0019	-B	INCORE INSTR ROOM PURGE ISOLATION VALVE	2-47W866-1	5	F	C	C	AOV	FC	AUX/713	A29
WBN-2-FCV -030-0020	-A	INCORE INSTR ROOM PURGE ISOLATION VALVE	2-47W866-1	5	I	C	C	AOV	FC	RXB/741	0
WBN-2-FCV -030-0037	-B	LOWER COMPT PURGE CTRL VALVE	2-47W866-1	5	I	C	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0040	-A	LOWER COMPT PURGE CTRL VALVE	2-47W866-1	5	I	C	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0050		UPPER CNTMT EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0052		UPPER CNTMT EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0053		UPPER CNTMT EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0056		LOWER CNTMT EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0057		LOWER CNTMT EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0058		INCORE INSTR ROOM EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0
WBN-2-FCV -030-0059		INCORE INSTR ROOM EXH ISOLATION VALVE	2-47W866-1	5	F	O	C	AOV	N	RXB/741	0

WBN-2-FS -030-0447 -A	DG 2A-A RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	AUX/676	A12
WBN-2-FS -030-0448 -A	DG 2A-A RM EXH LO FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	AUX/676	A13
WBN-2-FS -030-0449 -B	DG 2B-B RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	AUX/786	0
WBN-2-FS -030-0450 -B	DG 2B-B RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	CTL/708	C4
WBN-2-FS -030-0451 -A	DG 2A-A RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	CTL/708	0
WBN-2-FS -030-0452 -A	DG 2A-A RM EXH FAN 2A LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	CTL/708	0
WBN-2-FS -030-0453 -B	DG 2A-A RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	CTL/708	0
WBN-2-FS -030-0454 -B	DG 2B-B RM EXH LOW FLOW	1-47W866-9	5	H	O/C	O/C	FS	No	CTL/706	0
WBN-2-FSV -030-0134 -B	CONT ANNULUS DP ISOLATION VALVE	2-47W866-1	5	F	O	C	SOV	Yes	CTL/708	0
WBN-2-FSV -030-0135 -A	CONT ANNULUS DP ISOLATION VALVE	2-47W866-1	5	F	O	C	SOV	Yes	0	0
WBN-2-PDT -030-0042 -G	CONTAINMENT/ANNULUS DIFFERENTIAL PRESSURE	2-47W866-1	2,3,4	I	ON	ON	DPT	Yes	724	0
WBN-2-PDT -030-0043 -F	CONTAINMENT/ANNULUS DIFFERENTIAL PRESSURE	2-47W866-1	2,3,4	I	ON	ON	DPT	Yes	724	0
WBN-2-PDT -030-0044 -E	CONTAINMENT/ANNULUS DIFFERENTIAL PRESSURE	2-47W866-1	2,3,4	I	ON	ON	DPT	Yes	724	0
WBN-2-PDT -030-0045 -D	CONTAINMENT/ANNULUS DIFFERENTIAL PRESSURE	2-47W866-1	2,3,4	I	ON	ON	DPT	Yes	724	0
WBN-2-PMCL-030-0175 -A	RHR PUMP 2A-A ROOM COOLER	2-47W866-8	2,3,4	H	V	ON	CLR	Yes	676	0
WBN-2-PMCL-030-0176 -B	RHR PUMP 2B-B ROOM COOLER	2-47W866-8	2,3,4	H	V	ON	CLR	Yes	676	0
WBN-2-PMCL-030-0177 -A	CONT SPRAY PUMP 2A-A ROOM COOLER	2-47W866-8	2,3,4	H	V	ON	CLR	Yes	676	0
WBN-2-PMCL-030-0178 -B	CONT SPRAY PUMP 2B-B ROOM COOLER	2-47W866-8	2,3,4	H	V	ON	CLR	Yes	676	0
WBN-2-PMCL-030-0179 -B	SIS PUMP 2B-B ROOM COOLER	2-47W866-8	2,3,4	H	V	ON	CLR	Yes	692	0
WBN-2-PMCL-030-0180 -A	SIS PUMP 2A-A ROOM COOLER	2-47W866-8	2,3,4	H	V	ON	CLR	Yes	692	0

WBN-2-PMCL-030-0182 -B	CENT CHARGING PUMP 2B-B COOLER	2-47W866-8		5	H	V	ON	CLR	Yes	692	0
WBN-2-PMCL-030-0183 -A	CENT CHARGING PUMP 2A-A COOLER	2-47W866-8		5	H	V	ON	CLR	Yes	692	0
WBN-2-PMCL-030-0184 -A	AFW/BA XFER PUMP SPACE COOLER 2A-A	1-47W866-8		5	H	V	ON	CLR	Yes	713	A1
WBN-2-PMCL-030-0185 -B	AFW/BA XFER PUMP SPACE COOLER 2B-B	1-47W866-8		5	H	V	ON	CLR	Yes	713	A1
WBN-2-PMCL-030-0190	CCS & AUX FEEDWATER PUMP AREA COOLER	2-47W866-8		5	H	V	ON	CLR	Yes	723	A2
WBN-2-PMCL-030-0191	CCS & AUX FEEDWATER PUMP AREA COOLER	2-47W866-8		5	H	V	ON	CLR	Yes	723	A2
WBN-2-PT -030-0310 -A	CONTAINMENT PRESS TRANSMITTER		0	5	I	ON	ON	0	Y	0	0
WBN-2-PT -030-0311 -B	CONTAINMENT PRESS TRANSMITTER		0	5	I	ON	ON	0	Y	0	0
WBN-2-TS -030-0175 -A	RHR PUMP 2A-A ROOM CLR TEMP	2-47W610-30-5		2,3,4	H	O/C	O/C	TS	No	676	0
WBN-2-TS -030-0176 -B	RHR PUMP 2A-A ROOM CLR TEMP	2-47W610-30-5		2,3,4	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0177 -A	CS PUMP 2A-A ROOM CLR TEMP	2-47W610-30-5		2,3,4	H	O/C	O/C	TS	No	676	0
WBN-2-TS -030-0178 -B	CS PUMP 2B-B ROOM CLR TEMP	2-47W610-30-5		2,3,4	H	O/C	O/C	TS	No	676	0
WBN-2-TS -030-0179 -B	SIS PUMP 2B-B ROOM CLR TEMP	2-47W610-30-5		2,3,4	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0180 -A	SIS PUMP 2A-A ROOM CLR TEMP	2-47W610-30-5		2,3,4	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0182 -B	CENT CHARG PUMP 2B-B RM CLR TEMP	2-47W610-30-5		5	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0183 -A	CENT CHARG PUMP 2A-A RM CLR TEMP	2-47W610-30-5		5	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0184A -A	AFW & BA TRANSFER PUMP CLR 2A-A	1-47W610-30-5A		5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0184B -A	AFW & BA TRANSFER PUMP CLR 2A-A	1-47W610-30-5A		5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0185A -B	AFW & BA TRANSFER PUMP CLR 2B-B	1-47W610-30-5A		5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0185B -B	AFW & BA TRANSFER PUMP CLR 2B-B	1-47W610-30-5A		5	H	O/C	O/C	TS	No	713	A1

WBN-2-TS -030-0186A -A	PENETRATION RM EL 692 CLR 2A-A TEMP	2-47W610-30-5	5	H	O/C	O/C	TS	No	692	A325
WBN-2-TS -030-0186B -A	PENETRATION RM EL 692 CLR 2A-A TEMP	2-47W610-30-5	5	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0187A -B	PENETRATION RM EL 692 CLR 2B-B TEMP	2-47W610-30-5	5	H	O/C	O/C	TS	No	692	A325
WBN-2-TS -030-0187B -B	PENETRATION RM EL 692 CLR 2B-B TEMP	2-47W610-30-5	5	H	O/C	O/C	TS	No	692	A25
WBN-2-TS -030-0190A -A	CCS & AFW PUMP SPACE CLR 2A-A TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0190B -A	CCS & AFW PUMP SPACE CLR 2A-A TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0191A -B	CCS & AFW PUMP SPACE CLR 2B-B TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0191B -B	CCW & AFW PUMP SPACE CLR 2B-B TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A1
WBN-2-TS -030-0196A -A	PENETRATION RM EL 713 CLR 2A-A TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A19
WBN-2-TS -030-0196B -A	PENETRATION RM EL 713 CLR 2A-A TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A19
WBN-2-TS -030-0197A -B	PENETRATION RM EL 713 CLR 2B-B TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	A19
WBN-2-TS -030-0197B -B	PENETRATION RM EL 713 CLR 2B-B TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	713	0
WBN-2-TS -030-0200A -A	EGTS ROOM COOLER 2A-A TEMP	1-47W610-30-6A	5	H	O/C	O/C	TS	No	757	A16
WBN-2-TS -030-0201A -A	AB EL 692 PIPE CHASE CLR 2A-A TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	692	A324
WBN-2-TS -030-0201B -A	AB EL 692 PIPE CHASE CLR 2A-A TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0202A -B	AB EL 692 PIPE CHASE CLR 2B-B TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	692	A324
WBN-2-TS -030-0202B -B	AB EL 692 PIPE CHASE CLR 2B-B TEMP	2-47W610-30-6	5	H	O/C	O/C	TS	No	692	0
WBN-2-TS -030-0207A -B	EGTS ROOM COOLER 2B-B TEMP	1-47W610-30-6A	5	H	O/C	O/C	TS	No	757	A16
WBN-2-TS -030-0244A -A	TRANSFORMER RM 2A EXH FAN 2A2-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6
WBN-2-TS -030-0244B -A	TRANSFORMER RM 2A EXH FAN 2A2-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6

WBN-2-TS -030-0244D -A	TRANSFORMER RM 2A EXH FAN 2A3-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6
WBN-2-TS -030-0244E	TRANSFORMER RM 2A EXH FAN 2A4-A TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A6
WBN-2-TS -030-0246A -B	TRANSFORMER RM 2B EXH FAN 2B2-B	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A11
WBN-2-TS -030-0246B -B	TRANSFORMER RM 2B EXH FAN 2B2-B	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A11
WBN-2-TS -030-0246D -B	TRANSFORMER RM 2B EXH FAN 2B3-B	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A11
WBN-2-TS -030-0248A -B	TRANSFORMER RM 2B EXH FAN 2B2-B TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A5
WBN-2-TS -030-0248B -B	TRANSFORMER RM 2B EXH FAN 2B2-B TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A5
WBN-2-TS -030-0248D -B	TRANSFORMER RM 2B EXH FAN 2B2-B TEMP	1-47W610-30-8	5	H	O/C	O/C	TS	No	772	A5
WBN-2-TS -030-0250A -A	TRANSFORMER RM 2A EXH FAN 2A2-A TEMP	1-47W610-30-8A	5	H	O/C	O/C	TS	No	772	A12
WBN-2-TS -030-0250B -A	TRANSFORMER RM 2A EXH FAN 2A2-A	1-47W610-30-8A	5	H	O/C	O/C	TS	No	772	A12
WBN-2-TS -030-0250D -A	TRANSFORMER RM 2A EXH FAN 2A3-A	1-47W610-30-8A	5	H	O/C	O/C	TS	No	772	A12
WBN-2-TS -030-0447A -A	DG 2A-A RM EXH FAN 2A HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D3
WBN-2-TS -030-0447B -A	DG 2A-A RM EXH FAN 2B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D3
WBN-2-TS -030-0448A -A	DG 2A-A RM EXH FAN 2A HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D6
WBN-2-TS -030-0448B -A	EG 2A-A RM EXH FAN 2A LOW TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D6
WBN-2-TS -030-0449A -B	DG 2B-B RM EXH FAN 2B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-2-TS -030-0449B -B	DG 2B-B RM EXH FAN 2B LO TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-2-TS -030-0450A -B	DG 2B-B RM EXH FAN 2B LOW TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D14
WBN-2-TS -030-0450B -B	DG 2B-B RM EXH FAN 2B LOW TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D14
WBN-2-TS -030-0452A -A	DG 2A-A RM EXH FAN 2A HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D6

WBN-2-TS -030-0452B -A	DG 2A-A RM EXH FAN 2A LOW TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D6
WBN-2-TS -030-0453A -B	DG 2B-B RM EXH FAN 2B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-2-TS -030-0453B -B	DG 2B-B RM EXH FAN 2B LO TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D9
WBN-2-TS -030-0454A -B	DG 2B-B RM EXH FAN 2B HI TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D24
WBN-2-TS -030-0454B -B	DG 2B-B RM EXH FAN 2B LOW TEMP	1-47W866-9	5	H	O/C	O/C	TS	No	760	D24
WBN-0-AHU -031-0011 -B	MAIN CONTROL ROOM AHU B-B	1-47W865-3	5	H	ON	ON	AHU	Yes	755	C1
WBN-0-AHU -031-0012 -A	MAIN CONTROL ROOM AHU A-A	1-47W865-3	5	H	ON	ON	AHU	Yes	755	C1
WBN-0-AHU -031-0030B -A	EL 692.0 ELEC BOARD ROOM AHU A-A	1-47W865-7	5	H	ON	ON	AHU	Yes	692	C1
WBN-0-AHU -031-0030D -A	EL 692.0 ELEC BOARD ROOM AHU B-A	1-47W865-7	5	H	ON	ON	AHU	Yes	692	C1
WBN-0-AHU -031-0031B -B	EL 692.0 ELEC BD RM AHU C-B	1-47W865-7	5	H	ON	ON	AHU	Yes	692	C1
WBN-0-AHU -031-0031D -B	EL 692.0 ELEC BD RM AHU D-B	1-47W865-7	5	H	ON	ON	AHU	Yes	692	C1
WBN-0-AHU -031-0044	SHUTDOWN BD RM B AHU B-A	1-47W866-3	5	H	ON	ON	AHU	Yes	757	A17
WBN-0-AHU -031-0045	SHUTDOWN BD ROOM A AHU A-A	1-47W866-3	5	H	ON	ON	AHU	Yes	757	A9
WBN-0-AHU -031-0055	SHUTDOWN BD ROOM A AHU C-B	1-47W866-3	5	H	ON	ON	AHU	Yes	757	A9
WBN-0-AHU -031-0061	SHUTDOWN BD RM B AHU D-B	1-47W866-3	5	H	ON	ON	AHU	Yes	757	A17
WBN-0-AHU -031-0497	COMPUTER RM SUPPLEMENTAL AHU 2	1-47W865-12	5	H	ON	ON	AHU	Yes	708	C2
WBN-0-AHU -031-0498	COMPUTER RM SUPPLEMENTAL AHU 2	1-47W865-12	5	H	ON	ON	AHU	Yes	708	C2
WBN-0-CHR -031-0036/2	SHUTDOWN BD ROOMS A&B CHILLER PKG A-A	1-47W865-8	5	H	ON	ON	CHR	Yes	737	A1
WBN-0-CHR -031-0049/2 -B	SHUTDOWN BD ROOMS A&B CHILLER PKG B-B	1-47W865-8	5	H	ON	ON	CHR	Yes	737	A1
WBN-0-CHR -031-0080 -A	MAIN CONTROL ROOM CHILLER PKG A-A	1-47W865-3	5	H	ON	ON	CHR	Yes	737	A1

WBN-0-CHR -031-0096 -B	MAIN CONTROL ROOM CHILLER PKG B-B	1-47W865-3	5	H	ON	ON	CHR	Yes	737	A1
WBN-0-CHR -031-0128	EL 692.0 ELEC BOARD ROOM CHILLER PKG A-A	1-47W865-7	5	H	ON	ON	CHR	Yes	692	C10
WBN-0-CHR -031-0129	EL 692.0 ELEC BOARD ROOM CHILLER PKG B-B	1-47W865-7	5	H	ON	ON	CHR	Yes	692	C10
WBN-0-FAN -031-0027 -B	CONTROL BLDG BTRY RM EXHAUST FAN C-B	1-47W866-4	5	H	ON	ON	FAN	Yes	692	C10
WBN-0-FAN -031-0028 -A	CONTROL BLDG BTRY RM EXHAUST FAN A-A	1-47W866-4	5	H	ON	ON	FAN	Yes	692	C2
WBN-0-FAN -031-0029 -B	CONTROL BLDG BTRY RM EXHAUST FAN B-B	1-47W866-4	5	H	ON	ON	FAN	Yes	692	C2
WBN-0-FCO -031-0001A -A	PRESS AIR ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0002	PRESS AIR ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0002A -B	PRESS AIR ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0013 -A	BTRY RM EXH FAN TORNADO DAMPER	2-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0014 -B	BTRY RM EXH FAN TORNADO DAMPER	2-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0022 -B	MCR AHU B-B ISOLATION DAMPER	2-47W866-4	5	H	O	O	DMP	Yes	755	C2
WBN-0-FCO -031-0023 -A	BTRY RM EXH FAN C-B TORNADO DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	729	T2
WBN-0-FCO -031-0024 -B	BTRY RM EXH FAN C-B TORNADO DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	729	T2
WBN-0-FCO -031-0027 -B	BTRY RM EXH FAN C-B ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	692	C10
WBN-0-FCO -031-0028 -A	BTRY RM EXH FAN A-A ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	692	C2
WBN-0-FCO -031-0029 -B	BTRY RM EXH FAN B-B ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	692	C2
WBN-0-FCO -031-0030	EL 692.0 ELEC BD RM AHU ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	692	C1
WBN-0-FCO -031-0031	EL 692.0 ELEC BD RM AHU ISOLATION DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	692	C1
WBN-0-FCO -031-0032 -A	PRESS AIR TORNADO DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1

WBN-0-FCO -031-0033 -B	PRESS AIR TORNADO DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0034 -A	PRESS AIR TORNADO DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0035 -B	PRESS AIR TORNADO DAMPER	1-47W866-4	5	H	O	O	DMP	Yes	755	C1
WBN-0-FCO -031-0082	MCR AHU A-A MODULATING DAMPER	1-47W866-4	5	H	O	O	DMP	No	755	C1
WBN-0-FCO -031-0091	MCR AHU B-B MODULATING DAMPER	1-47W866-4	5	H	O	O	DMP	No	755	C1
WBN-0-FCO -031-0335	EBR AHU A-A MODULATING DAMPER	1-47W866-4	5	H	O	O	DMP	No	692	C1
WBN-0-FCO -031-0336	EBR AHU B-A MODULATING DAMPER	1-47W866-4	5	H	O	O	DMP	No	692	C1
WBN-0-FCO -031-0337	EBR AHU C-B MODULATING DAMPER	1-47W866-4	5	H	O	O	DMP	No	692	C1
WBN-0-FCO -031-0338	EBR AHU D-B MODULATING DAMPER	1-47W866-4	5	H	O	O	DMP	No	692	C1
WBN-0-FCV -031-0003 -A	MAIN CONTROL ROOM OUTSIDE AIR ISOLATION	2-47W866	5	H	0	0	DMP	Yes	755	C2
WBN-0-FCV -031-0004 -B	MAIN CONTROL ROOM OUTSIDE AIR ISOLATION	2-47W866-4	5	H	0	0	DMP	Yes	755	C2
WBN-0-FS -031-0038 -A	SHUTDOWN BD RM AHU A-A AIR FLOW	1-47W610-31-4	5	H	O/C	O/C	FS	Yes	757	A2
WBN-0-FS -031-0043 -A	SHUTDOWN BD RM AHU B-A AIR FLOW	1-47W610-31-4	5	H	O/C	O/C	FS	Yes	757	A27
WBN-0-FS -031-0051 -B	SHUTDOWN BD RM AHU C-B AIR FLOW	1-47W610-31-4	5	H	O/C	O/C	FS	Yes	757	A2
WBN-0-FS -031-0057 -B	SHUTDOWN BD RM AHU D-B AIR FLOW	1-47W610-31-4	5	H	O/C	O/C	FS	Yes	757	A27
WBN-0-FS -031-0084 -A	MAIN CONTROL RM AHU A-A AIR FLOW	1-47W610-31-2	5	H	O/C	O/C	FS	Yes	755	C1
WBN-0-FS -031-0094 -B	MAIN CONTROL RM AHU B-B AIR FLOW	1-47W610-31-2	5	H	O/C	O/C	FS	Yes	755	C1
WBN-0-FS -031-0117 -A	ELEC BD RM AHU A-A AIR FLOW	1-47W610-31-3	5	H	O/C	O/C	FS	Yes	692	C2
WBN-0-FS -031-0123 -A	ELEC BD RM AHU B-A AIR FLOW	1-47W610-31-3	5	H	O/C	O/C	FS	Yes	692	C2
WBN-0-FS -031-0126 -B	ELEC BD RM AHU C-B AIR FLOW	1-47W610-31-3	5	H	O/C	O/C	FS	Yes	692	C2

WBN-0-FS -031-0154 -B	ELEC BD RM AHU D-B AIR FLOW	1-47W610-31-3	5	H	O/C	O/C	FS	Yes	692	C2
WBN-0-FS -031-0401 -A	BATTERY ROOM EL 692 EXH FAN B- B FLOW	1-47W610-31-1	5	H	O/C	O/C	FS	Yes	692	C3
WBN-0-FS -031-0402 -B	BATTERY ROOM EL 692 EXH FAN A-A FLOW	1-47W610-31-1	5	H	O/C	O/C	FS	Yes	692	C3
WBN-0-PDIS-031-0101 -A	SHUTDOWN BD RM CW PUMP A-A DIFF PRESS	1-47W865-8	5	H	O/C	O/C	DPIS	No	737	A01
WBN-0-PDIS-031-0131 -B	SHUTDOWN BD RM CW PUMP B-B DIFF PRESS	1-47W865-8	5	H	O/C	O/C	DPIS	No	737	A01
WBN-0-PDIS-031-0161 -A	MAIN CONTROL ROOM CW PUMP A-A DIFF PRE	1-47W865-3	5	H	O/C	O/C	DPIS	No	755	C12
WBN-0-PDIS-031-0186 -B	MAIN CONTROL ROOM CW PUMP B-B DIFF PRE	1-47W865-3	5	H	O/C	O/C	DPIS	No	737	A1
WBN-0-PDIS-031-0211 -A	ELEC BD ROOM CW PUMP A-A DIFF PRESS	1-47W865-7	5	H	O/C	O/C	DPIS	No	692	C10
WBN-0-PDIS-031-0241 -B	ELEC BD ROOM CW PUMP B-B DIFF PRESS	1-47W865-7	5	H	O/C	O/C	DPIS	No	692	C11
WBN-0-PMP -031-0036/3 -A	SDBR CHLR PKG A-A CW CIRC PUMP A-A	1-47W865-8	5	H	ON	ON	PMP	Yes	737	A1
WBN-0-PMP -031-0049/1 -B	SDBR CHLR PKG B-B CW CIRC PUMP B-B	1-47W865-8	5	H	ON	ON	PMP	Yes	737	A1
WBN-0-PMP -031-0080/1 -A	CW CIRC PMP A-A (MCR)	1-47W865-3	5	H	ON	ON	PMP	Yes	755	C1
WBN-0-PMP -031-0096/1 -B	CW CIRC PMP B-B (MCR)	1-47W865-3	5	H	ON	ON	PMP	Yes	755	C1
WBN-0-PMP -031-0128/1	ELEC BD RM CHILLER PKG A-A CIR PMP A-A	1-47W865-7	5	H	ON	ON	PMP	Yes	692	C10
WBN-0-PMP -031-0129/1	ELEC BD RM CHILLER PKG B-B CIR PMP B-B	1-47W865-7	5	H	ON	ON	PMP	Yes	692	C10
WBN-0-SEP -031-0036	SDBR CHLR PKG A-A CW AIR SEPARATOR A	1-47W865-8	5	H	O	O	SEP	Yes	737	A1
WBN-0-SEP -031-0049	SDBR CHLR PKG B-B CW AIR SEPARATOR B	1-47W865-8	5	H	O	O	SEP	Yes	737	A1
WBN-0-SEP -031-0080	AIR SEPARATOR-A-(MCR)	1-47W865-3	5	H	O	O	SEP	No	755	C1
WBN-0-SEP -031-0096	AIR SEPARATOR-B-(MCR)	1-47W865-3	5	H	O	O	SEP	No	755	C1
WBN-0-SEP -031-0128	AIR SEPARATOR A-(EBR)	1-47W865-7	5	H	O	O	SEP	No	692	C10

WBN-0-SEP -031-0129	AIR SEPARATOR B-(EBR)	1-47W865-7	5	H	O	O	SEP	No	692	C10
WBN-0-SGEN-031-0156	ELECT BD RM AHU A-A STEAM GENERATOR	1-47W865-7	5	H	ON	ON	STGR	Yes	692	C10
WBN-0-SGEN-031-0158	MAIN CONT RM AHU A-A STEAM GENERATOR	1-47W865-3	5	H	ON	ON	STGR	Yes	755	C1
WBN-0-STN -031-0036	STRAINER (SDBR CHR A-A)	1-47W865-8	5	H	O	O	STN	No	737	A1
WBN-0-STN -031-0049	STRAINER (SDBR CHR B-B)	1-47W865-8	5	H	O	O	STN	No	737	A1
WBN-0-STN -031-0080	STRAINER (MCR CHR A-A)	1-47W865-3	5	H	O	O	STN	No	755	C1
WBN-0-STN -031-0096	STRAINER (MCR CHR B-B)	1-47W865-3	5	H	O	O	STN	No	755	C1
WBN-0-STN -031-0128	STRAINER (EBR CHR A-A)	1-47W865-7	5	H	O	O	STN	No	692	C10
WBN-0-STN -031-0129	STRAINER (EBR CHR B-B)	1-47W865-7	5	H	O	O	STN	No	692	C10
WBN-0-TANK-031-0036	SDBR CHLR PKG A-A CW CHEM TREATMENT TK	1-47W865-8	5	H	O	O	TANK	Yes	737	A1
WBN-0-TANK-031-0049	SDBR CHILR PKG B-B CW CHEM TREATMENT TK	1-47W865-8	5	H	O	O	TANK	Yes	737	A1
WBN-0-TANK-031-0073	SDBR CHLR PKG A-A CW COMPRESSION TK A	1-47W865-8	5	H	O	O	TANK	Yes	737	A1
WBN-0-TANK-031-0149	SDBR CHLR PKG B-B CW COMPRESSION TK B	1-47W865-8	5	H	O	O	TANK	Yes	737	A1
WBN-0-TANK-031-0175	COMPRESSION TANK A-(MCR)	1-47W865-3	5	H	O	O	TANK	No	755	C1
WBN-0-TANK-031-0200	COMPRESSION TANK B-(MCR)	1-47W865-3	5	H	O	O	TANK	No	755	C1
WBN-0-TANK-031-0225	COMPRESSION TANK A-(EBR)	1-47W865-7	5	H	O	O	TANK	No	692	C10
WBN-0-TC -031-0082	MCR AHU A-A MODULATING DAMPER - CONTRO	1-47W610-31-2	5	H	V	V	TC	Yes	755	C1
WBN-0-TC -031-0091	MCR AHU B-B MODULATING DAMPER - CONTRO	1-47W610-31-2	5	H	V	V	TC	Yes	755	C1
WBN-0-TCV -031-0499	SUPPLEMENTAL AHU 2 CW TCV	1-47W865-12	5	H	O	O	TCV	No	708	C2
WBN-0-TCV -031-0500	SUPPLEMENTAL AHU 2 CW TCV	1-47W865-12	5	H	O	O	TCV	No	708	C2

WBN-0-TS -031-0040B -A	SD BD ROOM AHU A-A INLET TEMP	1-47W610-31-4	5	H	O/C	O/C	TS	No	757	A9
WBN-0-TS -031-0048B -A	SD BD ROOM AHU B-A INLET TEMP	1-47W610-31-4	5	H	O/C	O/C	TS	No	757	A817
WBN-0-TS -031-0052B -B	SD BD ROOM AHU C-B INLET TEMP	1-47W610-31-4	5	H	O/C	O/C	TS	No	757	A9
WBN-0-TS -031-0060B -B	SB BD ROOM AHU D-B INLET TEMP	1-47W610-31-4	5	H	O/C	O/C	TS	No	757	A817
WBN-0-TS -031-0088B -A	MAIN CONTROL RM AHU A-A SUPPLY TEMP	1-47W610-31-2	5	H	O/C	O/C	TS	No	755	C401
WBN-0-TS -031-0089B -B	MAIN CONTROL RM AHU B-B SUPPLY TEMP	1-47W610-31-2	5	H	O/C	O/C	TS	No	755	C401
WBN-0-TS -031-0150B -A	ELEC BD RM AHU CB/DB SUPPLY TEMP	1-47W610-31-3	5	H	O/C	O/C	TS	No	692	C101
WBN-0-TT -031-0082	MCR AHU A-A MODULATING DAMPER - THERMO	1-47W610-31-2	5	H	V	V	TT	Yes	755	C12
WBN-0-TT -031-0091	MCR AHU B-B MODULATING DAMPER - THERMO	1-47W610-31-2	5	H	V	V	TT	Yes	755	C12
WBN-1-AHU -031-0461 -A	480V BD ROOM 2A SUPPLY AHU 1A-A	1-47W866-3	5	H	ON	ON	AHU	Yes	772	A7
WBN-1-AHU -031-0475 -B	480V BOARD ROOM 1B SUPPLY AHU 1B-B	1-47W866-3	5	H	ON	ON	AHU	Yes	786	A3
WBN-1-COMP-031-0447 -B	480V BD RM 1B RECIP COMP 1B-B	1-47W865-6	5	H	ON	ON	COM	Yes	786	A3
WBN-1-COMP-031-0465 -A	480V BD RM 1A RECIP COMP 1A-A	1-47W865-6	5	H	ON	ON	COM	Yes	772	A7
WBN-1-COND-031-0289 -B	480V ELECT BD RM 1A AIR COOLED COND	1-47W866-3	5	H	ON	ON	COND	Y	786	A7
WBN-1-COND-031-0290 -A	480V ELECT BD RM 1B AIR COOLED COND	1-47W866-3	5	H	ON	ON	COND	Y	772	A3
WBN-1-FAN -031-0285 -A	BATTERY ROOM II EXHAUST FAN 1B2-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A3
WBN-1-FAN -031-0286 -B	BATTERY ROOM II EXHAUST FAN 2B2-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A3
WBN-1-FAN -031-0287 -A	BATTERY ROOM I EXHAUST FAN 2A2-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A4
WBN-1-FAN -031-0288 -B	BATTERY ROOM I EXHAUST FAN 2A2-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A4
WBN-1-FCO -031-0285 -A	BATTERY ROOM II DAMPER FOR FAN 1B1-A	1-47W866-3	5	H	O	O	DMP	Yes	772	A3

WBN-1-FCO -031-0286 -B	BATTERY ROOM II DAMPER FOR FAN 1B2-B	1-47W866-3	5	H	O	O	DMP	Yes	772	A3
WBN-1-FCO -031-0287 -A	BATTERY ROOM I DAMPER FOR FAN A1-A	1-47W866-3	5	H	O	O	DMP	Yes	772	A4
WBN-1-FCO -031-0288 -B	BATTERY ROOM I DAMPER FOR FAN 1A2-B	1-47W866-3	5	H	O	O	DMP	Yes	772	A4
WBN-1-FCO -031-0289	BOARD ROOM CONDENSER 1B-B DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	786	A3
WBN-1-FCO -031-0290	BOARD ROOM CONDENSER 1A-A DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A7
WBN-1-FCO -031-0291 -A	480V BD RM 2A COND 1A-A DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A7
WBN-1-FLTR-031-0447	480V BD RM 1B FILTER DRIER	1-47W865-6	5	H	O	O	DRIE	No	RXB/726	A3
WBN-1-FLTR-031-0465	480V BD RM 1A FILTER DRIER	1-47W865-6	5	H	O	O	DRIE	No	RXB/726	A7
WBN-1-FSV -031-0441 -A	480V BD RM 1A REFRIGERANT LINE FSV	1-47W865-6	5	H	O	O	FSV	Yes	AUX/692	A7
WBN-1-FSV -031-0447 -B	480V BD RM 1+C796B REFRIGERANT LINE FSV	1-47W865-6	5	H	O	O	FSV	Yes	AUX/692	A3
WBN-1-PS -031-0447A -B	480V BD RM 1B R-22 GAS PRESS	1-47W610-31-8	5	H	O/C	O/C	PS	No	772	IC
WBN-1-PS -031-0465 -A	480V BD RM 1A R-22 GAS PRESS	1-47W610-31-7	5	H	O/C	O/C	PS	No	722	ANN
WBN-1-SEP -031-0447	480V BD RM 1B OIL SEPARATOR	1-47W865-6	5	H	O	O	SEP	No	786	A3
WBN-1-SEP -031-0465	480V BD RM 1A OIL SEPARATOR	1-47W865-6	5	H	O	O	SEP	No	772	A7
WBN-1-TS -031-0441A -A	480V BD RM 1A AHU 1A-A TEMP	1-47W610-31-7	5	H	O/C	O/C	TS	No	772	A2
WBN-1-TS -031-0441C -A	A/C 480V BD RM B TEMP SWITCH	1-47W610-31-7	5	H	O/C	O/C	TS	No	772	A2
WBN-1-TS -031-0447A -B	480V BD RM 1B AHU 1B-B TEMP	1-47W610-31-8	5	H	O/C	O/C	TS	No	772	A2
WBN-2-AHU -031-0461 -A	480V BD RM 2A AHU 2A-A	1-47W866-3	5	H	ON	ON	AHU	Yes	772	A10
WBN-2-AHU -031-0475 -B	480V BD RM 2B AHU 2B-B	1-47W866-3	5	H	ON	ON	AHU	Yes	786	A4
WBN-2-COMP-031-0447 -B	480V BD RM 2B RECIP COMP 2B-B	1-47W865-6A	5	H	ON	ON	COM	Yes	AUX/786	A4

WBN-2-COMP-031-0465 -A	480V BD RM 2A RECIP COMP 2A-A	1-47W865-6A	5	H	O	O	COM	Yes	AUX/772	A4
WBN-2-COND-031-0289 -B	480V BD RM 2B AIR COOLED COND	1-47W866-3	5	H	ON	ON	CON	Yes	AUX/786	A4
WBN-2-COND-031-0290 -A	480V BD RM 2A AIR COOLED COND	1-47W866-3	5	H	ON	ON	CON	Yes	AUX/772	A10
WBN-2-FAN -031-0285 -A	BTRY RM III EXHAUST FAN 2B2-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A4
WBN-2-FAN -031-0286 -B	BTRY RM III EXHAUST FAN 2B2-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A4
WBN-2-FAN -031-0287 -A	BTRY RM IV EXHAUST FAN 2A2-A	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A13
WBN-2-FAN -031-0288 -B	BTRY RM IV EXHAUST FAN 2A2-B	1-47W866-3	5	H	ON	ON	FAN	Yes	772	A13
WBN-2-FCO -031-0285 -A	BTRY RM III DAMPER FOR FAN 2B2-A	1-47W866-3	5	H	O	O	DMP	Yes	772	A4
WBN-2-FCO -031-0286 -B	BTRY RM III DAMPER FOR FAN 2B2-B	1-47W866-3	5	H	O	O	DMP	Yes	772	A4
WBN-2-FCO -031-0287 -A	BTRY RM IV DAMPER FOR FAN 2A2-A	1-47W866-3	5	H	O	O	DMP	Yes	AUX/772	A4
WBN-2-FCO -031-0288 -B	BTRY RM IV DAMPER FOR FAN 2A2-B	1-47W866-3	5	H	O	O	DMP	Yes	AUX/772	A13
WBN-2-FCO -031-0289	480V BD RM COND UNIT 2B-B DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	772	A13
WBN-2-FCO -031-0290	480V BD RM 2A COND 2A-A DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	AUX/772	A10
WBN-2-FCO -031-0291 -A	480V BD RM 2A COND 2A-A DAMPER	1-47W866-3	5	H	O	O	DMP	Yes	AUX/772	A10
WBN-2-FCV -031-0305 -B	ANNULUS ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	0	0
WBN-2-FCV -031-0306 -A	INSTRUMENT ROOM ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	0	0
WBN-2-FCV -031-0308 -A	INSTRUMENT ROOM ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	0	0
WBN-2-FCV -031-0309 -B	ANNULUS ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	AUX/676	0
WBN-2-FCV -031-0326 -A	ANNULUS ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	AUX/676	0
WBN-2-FCV -031-0327 -B	INSTRUMENT ROOM ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	0	0

WBN-2-FCV -031-0329 -B	INSTRUMENT ROOM ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	0	0
WBN-2-FCV -031-0330 -A	ANNULUS ISOLATION VALVE	2-47W865-5	5	H	O	O	0	N	0	0
WBN-2-FLTR-031-0447	480V BD RM 2B FILTER DRIER	1-47W865-6A	5	H	O	O	DRIE	No	786	A4
WBN-2-FLTR-031-0465	480V BD RM 2A FILTER DRIER	1-47W865-6A	5	H	O	O	DRIE	No	772	A10
WBN-2-FSV -031-0441 -A	480V BD RM 2A REFRIGERANT LINE FSV	1-47W865-6A	5	H	O	O	FSV	Yes	772	A10
WBN-2-FSV -031-0447 -B	480V BD RM 2B REFRIGERANT LINE FSV	1-47W865-6A	5	H	O	O	FSV	Yes	786	A4
WBN-2-PS -031-0447A -B	480V BD RM 2B R-22 GAS PRESS	1-47W610-31-8	5	H	O/C	O/C	PS	No	772	NA
WBN-2-PS -031-0465 -A	480V BD RM 2A R-22 GAS PRESS	1-47W610-31-7	5	H	O/C	O/C	PS	No	722	NA
WBN-2-SEP -031-0447	480V BD RM 2B OIL SEPARATOR	1-47W865-6A	5	H	O	O	SEP	No	786	A4
WBN-2-SEP -031-0465	480V BD RM 2A OIL SEPARATOR	1-47W865-6A	5	H	O	O	SEP	No	772	A10
WBN-2-TS -031-0441A -A	480V BD RM 2A AHU 2A-A TEMP	47W610-31-7A	5	H	O/C	O/C	TS	No	772	A15
WBN-2-TS -031-0441C -A	480V BD RM 2A AHU 2A-A TEMP	47W610-31-7A	5	H	O/C	O/C	TS	No	772	A15
WBN-2-TS -031-0447A -B	480V ELEC BD RM 2B AHU 2B-B TEMP	47W610-31-8A	5	H	O/C	O/C	TS	No	772	A15
WBN-0-ACUM-032-0060	AUX CNT AIR COMP ACC TNK	47W848-01	5	A	OF	O	TANK	Yes	757	A/A6U
WBN-0-ACUM-032-0086	AUX CNT AIR COMP ACC TNK	47W848-01	5	A	OF	O	TANK	Yes	757	A/A9U
WBN-0-COMP-032-0060	AUX CONTROL AIR COMPRESSOR A-A	47W848-02	5	A	OFF	ON	COM	Yes	757	A6U
WBN-0-COMP-032-0086	AUX CONTROL AIR COMPRESSOR B-B	47W848-02	5	A	OFF	ON	COM	Yes	757	A10U
WBN-0-DRYR-032-0074	ESSNT CON AIR TRAN A DRYR 2	47W848-01	5	A	OF	O	DRYR	Yes	757	A/A7U
WBN-0-DRYR-032-0075	ESSNT CON AIR TRAN A DRYR 1	47W848-01	5	A	OF	O	DRYR	Yes	757	A/A7U
WBN-0-DRYR-032-0099	ESSNT CON AIR TRAN B DRYR 2	47W848-01	5	A	OF	O	DRYR	Yes	757	A/A7U

WBN-0-DRYR-032-0100	ESSNT CON AIR TRAN B DRYR 1	47W848-01	5	A	OF	O	DRYR	Yes	757	A/A7U
WBN-0-FCV -032-0082 -A	ACAS COMPRESSOR A-A, ACAS ISOLATION	47W848-1	5	A	O	C	AOV	Yes	757	A7
WBN-0-FCV -032-0085 -B	ACAS COMPRESSOR B-B, ACAS ISOLATION	47W848-1	5	A	O	C	AOV	Yes	757	A13
WBN-0-FLTR-032-0060	AUX CNTL AIR COMP INTK FLTR	47W848-01	5	A	OF	O	FLTR	Yes	757	A/A5U
WBN-0-FLTR-032-0076	ESSNT CON AIR TRN A AFT-FLTR	47W848-01	5	A	OF	O	FLTR	Yes	757	A/A7U
WBN-0-FLTR-032-0086	AUX CNTL AIR COMP INTK FLTR	47W848-01	5	A	OF	O	FLTR	Yes	757	A/A9U
WBN-0-FLTR-032-0101	ESSNT CON AIR TRN B AFT-FLTR	47W848-01	5	A	OF	O	FLTR	Yes	757	A/A9U
WBN-0-FSV -032-0082 -A	ACAS COMPRESSOR A-A, ACAS ISOLATION	47W848-1	5	A	O	C	SOV	Yes	757	A7U
WBN-0-HTX -032-0060	AUX CNTL AIR COMP AFTRCOOL	47W848-01	5	A	OF	O	HTX	No	757	A13
WBN-0-HTX -032-0086	AUX CNTL AIR COMP AFTRCOOL	47W848-01	5	A	OF	O	HTX	No	757	A13
WBN-0-PS -032-0062 -A	AUXILIARY CONTROL AIR RECEIVER A LPS	47W848-1	5	A	O/C	O/C	PS	Yes	757	A6U
WBN-0-PS -032-0062A -A	AUXILIARY AIR COMPRESSOR A-A UNLOAD SW	47W848-1	5	A	O/C	O/C	PS	Yes	757	A6U
WBN-0-PS -032-0062B -A	AUXILIARY AIR COMPRESSOR A-A LOAD CTL SW	47W848-1	5	A	O/C	O/C	PS	Yes	757	A6U
WBN-0-PS -032-0082 -A	CAS LOW PRESSURE ACAS ISOLATION	47W848-1	5	A	C	O	PS	Yes	757	A13
WBN-0-PS -032-0085 -B	CAS LOW PRESSURE ACAS ISOLATION	47W848-1	5	A	C	O	PS	Yes	757	A13
WBN-0-PS -032-0088 -B	AUXILIARY CONTROL AIR RECEIVER B LPS	47W848-1	5	A	O/C	O/C	PS	Yes	757	A13
WBN-0-PS -032-0088A -B	AUXILIARY AIR COMPRESSOR B-B UNLOAD SWIT	47W848-1	5	A	O/C	O/C	PS	Yes	757	A9V
WBN-0-PS -032-0088B -B	AUXILIARY AIR COMPRESSOR B-B	47W848-1	5	A	O/C	O/C	PS	Yes	757	A9V
WBN-0-RCVR-032-0062	ESSNT CON AIR TR A AIR RECVR	47W848-01	5	A	NA	NA	RCVR	No	757	A/A8V
WBN-0-RCVR-032-0088	ESSNT CON AIR TR B AIR RECVR	47W848-01	5	A	NA	NA	RCVR	No	757	A/A8V

WBN-2-FCV -032-0081	-A	REACTOR BUILDING UNIT 2 TRAIN B ISOL VLV		0	5	F	O	C	AOV	N	0	0
WBN-2-FCV -032-0103	-B	REACTOR BUILDING UNIT 2 TRAIN B ISOL VLV		0	5	F	O	C	AOV	N	AUX/729	A11
WBN-2-FCV -032-0111	-B	REACTOR BLDG UNIT 2 NONESNTL CNTL AIR		0	5	F	O	C	AOV	N	AUX/729	A11
WBN-2-FCV -043-0002	-B	PRSZR GAS SAMPL ISOL	47W625-02		5	F	C	C/V	SOV	Yes	AUX/729	A11
WBN-2-FCV -043-0003	-A	PRSZR GAS SAMPL ISOL	47W625-01		5	F	C	C/V	AOV	Yes	AUX/729	A11
WBN-2-FCV -043-0022	-B	PRSZR LIQUID SAMPL ISO	47W625-01		5	F	C	C/V	SOV	Yes	AUX/729	A11
WBN-2-FCV -043-0023	-A	HOT LEGS 2/3 SPL ISO	47W625-01		5	F	O	O/C	AOV	Yes	AUX/729	A11
WBN-2-FCV -043-0034	-B	ACCUM TANK SMPL HDR ISOL	47W625-02		5	F	C	C/V	SOV	Yes	AUX/729	A10
WBN-2-FCV -043-0035	-A	ACCUM TANK SMPL HDR ISOL	47W625-02		5	F	C	C/V	SOV	Yes	AUX/729	A10
WBN-2-FCV -043-0054D	-B	STGR 2 DRM SPL ISO	2-47W625-02		5	F	O	C	AOV	Yes	AUX/729	A10
WBN-2-FCV -043-0055	-A	STEAM GEN 2 DRM SPL ISO	47W625-02		5	F	O	C	AOV	No	AUX/729	A10
WBN-2-FCV -043-0056D	-B	STGR 2 DRM SPL ISO	2-47W625-02		5	F	O	C	AOV	Yes	AUX/729	A10
WBN-2-FCV -043-0058	-A	STEAM GEN 2 DRM SPL ISO	47W625-02		5	F	O	C	AOV	No	AUX/729	A10
WBN-2-FCV -043-0059D	-B	STGR 3 DRM SPL ISO	2-47W625-02		5	F	O	C	AOV	Yes	AUX/729	A10
WBN-2-FCV -043-0061	-A	STEAM GEN 3 DRM SPL ISO	47W625-02		5	F	O	C	AOV	No	AUX/729	A10
WBN-2-FCV -043-0063D	-B	STGR 4 DRM SPL ISO	2-47W625-02		5	F	O	C	AOV	Yes	AUX/729	A10
WBN-2-FCV -043-0064	-A	STEAM GEN 4 DRM SPL ISO	47W625-02		5	F	O	C	AOV	No	AUX/729	A10
WBN-2-FCV -043-0075	-B	DNSTR EXCESS LTDN HT EXCH-ISOL VLV	47W625-07		5	F	C	C/V	SOV	Yes	AUX/729	A10
WBN-2-FCV -043-0201	-A	LOCA H2 CNTMT MN IS	47W625-11		5	F	O	O	SOV	Yes	AUX/729	A10
WBN-2-FCV -043-0202	-A	LOCA H2 CNTMT MN OT	47W625-11		5	F	O	O	SOV	Yes	AUX/729	A11

WBN-2-FCV -043-0207	-B	LOCA H2 CNTMT MONITOR ISOLATION VLV	47W625-11	5	F	O	O	SOV	Yes	AUX/729	A11
WBN-2-FCV -043-0208	-B	LOCA H2 CNTMT MN OT	47W625-11	5	F	O	O	SOV	Yes	0	0
WBN-2-FCV -043-0433	-A	LOCA H2 CNTMT MN IS	47W625-11	5	F	O	O	SOV	Yes	AUX/729	A11
WBN-2-FCV -043-0434	-A	LOCA H2 CNTMT MN IS	47W625-11	5	F	O	O	SOV	Yes	AUX/729	A11
WBN-2-FCV -043-0435	-B	LOCA H2 CNTMT MN IS	47W625-11	5	F	O	O	SOV	Yes	AUX/729	A11
WBN-2-FCV -043-0436	-B	LOCA H2 CNTMT MN IS	47W625-11	5	F	O	O	SOV	Yes	RXB/726	AC4
WBN-2-FSV -043-0075	-B	DNSTR EXCSW ITDN HT EXC ISO	47W625-07	5	F	C	C/V	SOV	Yes	CTL/708	0
WBN-2-FSV -043-0077	-A	EXCESS ITDN HX SMPL ISOL	47W625-07	5	F	C	C/V	AOV	Yes	CTL/708	0
WBN-2-FSV -043-0250	-A	PAS HOT LEG 2 SAMPLE ISOL	47W625-15	5	F	C	C/V	SOV	Yes	CTL/708	0
WBN-2-FSV -043-0251	-A	PAS HOT LEG 2 SAMPLE ISOL	47W625-15	5	F	C	C/V	SOV	Yes	CTL/708	0
WBN-2-FSV -043-0287	-A	PAS CONT AIR SUPPLY ISOL	47W625-15	5	F	C	C/V	SOV	Yes	CTL/708	0
WBN-2-FSV -043-0288	-A	PAS CONT AIR SUPPLY ISOL	47W625-15	5	F	C	C/V	SOV	Yes	CTL/708	0
WBN-2-FSV -043-0307	-A	PAS CONT AIR RETURN ISOL	47W625-15	5	F	C	C/V	SOV	Yes	0	0
WBN-2-FSV -043-0309	-B	PAS HOT LEG 3 SAMPLE ISOL	47W625-15	5	F	C	C/V	SOV	Yes	AUX/757	0
WBN-2-FSV -043-0310	-B	PAS HOT LEG 3 SAMPLE ISOL	47W625-15	5	F	C	C/V	SOV	Yes	AUX/757	0
WBN-2-FSV -043-0318	-B	PAS CONT AIR SPL ISO	47W625-15	5	F	C	C/V	SOV	Yes	RXB/703	0
WBN-2-FSV -043-0319	-B	PAS CONT AIR SPL ISO	47W625-15	5	F	C	C/V	SOV	Yes	0	0
WBN-2-FSV -043-0325	-B	PAS CNTMT AIR RETRN ISOL	47W625-15	5	F	C	C/V	SOV	Yes	0	0
WBN-2-FSV -043-0341	-B	PAS WASTE TO CONT SUMP ISOL	47W625-15	5	F	C	C/V	SOV	Yes	0	0
WBN-2-FSV -043-0342	-A	PAS WASTE TO CONT SMP ISOL	47W625-15	5	F	C	C/V	SOV	Yes	0	0

WBN-2-FCV -061-0096 -A	GLYCOL FLOOR SUPPLY ISOLATION VALVE	2-47W824-2	5	F	O	C	AOV	Y	RXB/702	ANN
WBN-2-FCV -061-0097 -B	INLET ISOLATION VALVE REACTOR BLDG	2-47W824-2	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -061-0110 -A	GLYCOL FLOOR RETURN ISOLATION VALVE	2-47W824-2	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -061-0122 -B	OUTLET ISOLATION VALVE REACTOR BLDG	1,2-47W814-2	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -061-0191 -A	GLYCOL AIR HANDLER SUPPLY ISO VALVE	2-47W824-2	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -061-0192 -B	GLYCOL SUPPLY ISOLATION VALVE	2-47W824-2	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -061-0193 -A	GLYCOL AIR HANDLER RETURN ISO VALVE	2-47W824-2	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -061-0194 -B	GLYCOL RETURN ISOLATION VALVE	1,2-47W814-2	5	F	O	C	AOV	Y	0	0
WBN-2-FSV -061-0096 -A	INLET ISOLATION VALVE AUX BLDG	2-47W620-61-	5	F,G	ON	OFF	SOV	Yes	AUX/713	0
WBN-2-FSV -061-0097 -B	GLYCOL SUPPLY HDR ISO VLV	2-47W620-61-	5	F,G	ON	OFF	SOV	Yes	0	0
WBN-2-FSV -061-0110 -A	GLYCOL RETURN HDR ISO VLV	2-47W620-61-	5	F,G	ON	OFF	SOV	Yes	/729	0
WBN-2-FSV -061-0122 -B	GLYCOL RETURN HDR ISO VLV	2-47W620-61-	5	F,G	ON	OFF	SOV	Yes	/729	0
WBN-2-FSV -061-0191A -A	GLYCOL SUPPLY CONT ISO VLV	2-47W620-61-	5	F,G	ON	OFF	SOV	Yes	AUX/737	A5
WBN-2-FSV -061-0192 -B	GLYCOL SUPPLY CONT ISO VLV	2-47W620-61-	5	F,G	ON	OFF	SOV	Yes	/729	0
WBN-2-FSV -061-0193A -A	GLYCOL FLOOR RETURN ISO VLV	2-47W620-61-5	5	F,G	ON	OFF	SOV	Yes	/729	0
WBN-2-FSV -061-0194 -B	GLYCOL FLOOR RETURN ISO VLV	2-47W620-61-5	5	F,G	ON	OFF	SOV	Yes	AUX/729	A16
WBN-1-TANK-062-0001A	HOLDUP TANK A	147W809-3	2,2	D	--	--	TANK	No	676	A/A5R
WBN-2-DEMN-062-0001/1B	CVCS MIXED BED DEMINERALIZER 2B	2-47W809-2	2	D	ON	ON	DEMN	No	AUX/692	0
WBN-2-DOOR-062-(ALL)	ICE COND LOWER INLET DOOR (PAIR) 2 THRU 24	47W824-2	2,3,4	E	C	O	DOOR		RXB	
WBN-2-FCV -062-0009	RCP 1 SEAL LEAKOFF FLOW CONTROL	2-47W620-62-2	5	D	OFF	OFF		Yes	0.	0

WBN-2-FCV -062-0022		RCP 2 SEAL LEAKOFF FLOW CONTROL	2-47W620-62-2	5	D	OFF	OFF		Yes	0	0
WBN-2-FCV -062-0035		RCP 3 SEAL LEAKOFF FLOW CONTROL	1-47W610-62-1	5	D	OFF	OFF		Yes	0	0
WBN-2-FCV -062-0048		RCP 4 SEAL LEAKOFF FLOW CONTROL	1-47W610-62-1	5	D	OFF	OFF		Yes	0	0
WBN-2-FCV -062-0061	-B	SEAL WATER ISOLATION VALVE	2-47W809-1	0	D	O	C	MOV	Y	0	0
WBN-2-FCV -062-0063	-A	RCP SEAL INJECTION ISOLATION VALVE	2-47W809-1	0	D	O	C	MOV	Y	0	#N/A
WBN-2-FCV -062-0069	-A	RC LOOP 3 LETDOWN ISOLATION FLOW	2-47W809-1	0	F	O	C	AOV	FC	0	#N/A
WBN-2-FCV -062-0070	-A	RC LOOP 3 LETDOWN ISOLATION FLOW	2-47W809-1	0	F	O	C	AOV	FC		0
WBN-2-FCV -062-0072	-A	REGEN HT EXCH LETDOWN ORIFICE A ISOL VLV	2-47W809-1	0	F	O	C	AOV	FC	0	0
WBN-2-FCV -062-0073	-A	REGEN HT EXCH LETDOWN ISOL VLV B	2,2-47W809-1	2,2	D/F	O/O	O/C	AOV	N	AUX/757	0
WBN-2-FCV -062-0074	-A	REGEN HT EXCH LETDOWN ISOL VLV C	2,2-47W809-1	2,2	D/F	O/O	O/C	AOV	N	0	0
WBN-2-FCV -062-0076	-A	LETDOWN ORIFICE ISOLATION VALVE	2-47W809-1	5	F,D	C	C/O	AOV	Yes	0	0
WBN-2-FCV -062-0077	-B	LETDOWN LINE ISOL VLV FLOW CONTROL	2,2-47W809-1	2,2	0	O/O	O/C	0	N/Y	0	0
WBN-2-FCV -062-0084	-A	AUX PRESSURIZER SPRAY	2-47W809-1	2	C	C	O	AOV	Yes	0	0
WBN-2-FCV -062-0085	-B	NORMAL CHARGING ISOL VALVE	2-47W809-1	0	D,G	O	O/C	AOV	N	0	0
WBN-2-FCV -062-0089		SEAL REG VALVE	2-47W809-1	5	D,F	T	T	AOV	Yes	0	0
WBN-2-FCV -062-0090	-A	CHARGING HEADER ISOL VALVE	2-47W809-1	0	D	O	O	0	N	0	0
WBN-2-FCV -062-0091	-B	CHARGING FLOW ISOLATION VALVE	2-47W809-1	0	D	O	O	0	N	0	0
WBN-2-FCV -062-0093		PRZR LEVEL CONT	2-47W809-1	5	D	T	T	AOV	Yes	0	0
WBN-2-FCV -062-0138	-B	EMERGENCY BORATION FLOW CONT VLV	2-47W809-1	0	F	C	C	0	N	0	0
WBN-2-FCV -062-1228	-A	BORIC ACID ISOLATION VLV	2-47W809-1	5	G	O	C	AOV	Yes	0	0

WBN-2-FCV -062-1229	-B	BORIC ACID ISOLATION VLV	2-47W809-1	5	G	O	C	AOV	Yes	0	0
WBN-2-FLTR-062-0065		SEAL WATER RETURN FILTER	2-47W809-2	0	D	ON	ON	0	N	AUX/737	0
WBN-2-FLTR-062-0096		SEAL WATER INJECTION FILTER B	2-47W809-2	0	A	ON	ON	0	N	AUX/737	0
WBN-2-FLTR-062-0097		SEAL WATER INJECTION FILTER A	2-47W809-2	5	D	ON	ON	FLTR	No	#N/A	#N/A
WBN-2-FLTR-062-0117		REACTOR COOLANT FILTER	2-47W809-2	0	A	ON	ON	0	N	#N/A	#N/A
WBN-2-FSV -062-0009		RCP 2 SEAL INJECT ISO VLV SOLENOID	2-47W620-62-1	5	D	OFF	OFF	SOV	Yes	/729	0
WBN-2-FSV -062-0022		RCP 2 SEAL INJECT ISO VLV SOLENOID	2-47W620-62-1	5	D	OFF	OFF	SOV	Yes	/729	0
WBN-2-FSV -062-0035		RCP 3 SEAL INJECT ISO VLV SOLENOID	2-47W620-62-1	5	D	OFF	OFF	SOV	Yes	AUX/729	A512
WBN-2-FSV -062-0048		RCP 4 SEAL INJECT ISO VLV SOLENOID	2-47W620-62-1	5	D	OFF	OFF	SOV	Yes	/729	0
WBN-2-FSV -062-0069	-A	RC LOOP 3 LETDOWN ISOLATION VALVE	2-47W620-62-2	5	F,D	ON	ON	SOV	Yes	/729	0
WBN-2-FSV -062-0070	-A	RC LOOP 3 LETDOWN ISOLATION VALVE	2-47W620-62-2	5	F,D	ON	ON	SOV	Yes	AUX/737	A705
WBN-2-FSV -062-0072	-A	REGEN HT EXCH LETDOWN ORIFICE A ISO VL	2-47W620-62-2	5	F	OFF	OFF	SOV	Yes	AUX/713	0
WBN-2-FSV -062-0073	-A	REGEN HT EXCH LETDOWN ORIFICE B ISO VL	2-47W620-62-2	5	F,D	ON	ON	SOV	Yes	AUX/713	0
WBN-2-FSV -062-0074	-A	REGEN HT EXCH LETDOWN ORIFICE C ISO VL	2-47W620-62-2	5	F,D	OFF	OFF	SOV	Yes	0	0
WBN-2-FSV -062-0076	-A	LETDOWN ORIFICE ISOLATION	2-47W620-62-2	5	F,D	OFF	OFF	SOV	Yes	0	0
WBN-2-FSV -062-0077	-B	LETDOWN ORIFICE ISOLATION	2-47W620-62-2	5	F,D	ON	ON	SOV	Yes	0	0
WBN-2-FSV -062-0084	-A	AUX PRZR SPRAY	2-47W620-62-2	2	C	OFF	ON/OFF	SOV	Yes	0	0
WBN-2-FSV -062-0085	-B	NORMAL CHARGING ISOLATION VALVE	2-47W809-2	5	D,G	O	O/C	AOV	Yes	AUX/713	0
WBN-2-FT -062-0001		RCP NO.2 SEAL WATER FLOW	2-47W809-1	5	D	ON	ON	LITS	Y		0
WBN-2-FT -062-0014		RCP NO.2 SEAL WATER FLOW	2-47W809-1	5	D	ON	ON	LITS	Y		0

WBN-2-FT -062-0027	RCP NO.3 SEAL WATER FLOW	2-47W809-1	5	D	ON	ON	LITS	Y		0
WBN-2-FT -062-0040	RCP NO.4 SEAL WATER FLOW	2-47W809-1	5	D	ON	ON	LITS	Y		0
WBN-2-FT -062-0093A	CHARGING HEADER FLOW CONTROL	2-47W809-1	2,2	D	ON	ON	FT	Yes		0
WBN-2-HIC -062-0089A	CHARGING FLOW CONT VLV	47W610-62-2	5	D	ON	ON	HIC	Yes		0
WBN-2-HIC -062-0093A	CHARGING HEADER FLOW CONTROLLER	2-47W610-62-2	5	D	ON	ON	HIC	Yes		0
WBN-2-HTX -062-0066	SEAL WATER HEAT EXCHANGER	2-47W809-1	0	D	ON	ON	FSST	N	AUX/729	A10
WBN-2-HTX -062-0120	REGENERATIVE HEAT EXCHANGER	2-47W809-1	0	D	ON	NR	HSCT	N	AUX/729	A10
WBN-2-HTX -062-0121	EXCESS LETDOWN HEAT EXCHANGER	2-47W809-1	0	D	OFF	NR	0	N	AUX/729	A10
WBN-2-HTX -062-0124	LETDOWN HEAT EXCHANGER	2-47W809-1	0	D	ON	NR	HSCT	N	AUX/729	A10
WBN-2-LCV -062-0118 -A	HOLDUP TANK VALVE	2-47W809-1	2,2	D,G	O	C/O	AOV	Yes	0	0
WBN-2-LCV -062-0132 -A	VCT OUTLET ISOLATION VALVE LEVEL CONTROL	2-47W809-1	0	D,F	O	C	MOV	Y	0	0
WBN-2-LCV -062-0133 -B	VCT OUTLET ISOLATION VALVE LEVEL CONTROL	2-47W809-1	0	D,F	O	C	MOV	Y	0	0
WBN-2-LCV -062-0135 -A	RWST CVCS SUPPLY HDR ISOLATION	2-47W809-1	0	G,D	C	O	MOV	Y	0	0
WBN-2-LCV -062-0136 -B	RWST CVCS SUPPLY HDR ISOLATION	2-47W809-1	0	G,D	C	O	MOV	Y	0	0
WBN-2-LSV -062-0118A -A	DIVERSION FLOW TO HOLDUP TANKS	2-47W610-62-3	2,2	D,G	OFF	ON/OFF	SOV	Yes	0	0
WBN-2-LSV -062-0118B -A	HOLDUP TANK - DIVERSION VALVE	2-47W610-62-3	2,2	D,G	OFF	ON/OFF	SOV	Yes	0	0
WBN-2-LT -062-0129A	VOLUME CONTROL TANK LEVEL	2-47W809-1	2,2	D	ON	ON	LT	Yes	AUX/692	0
WBN-2-LT -062-0129C	VOLUME CONTROL TANK LEVEL	2-47W809-1	2,2	D	ON	ON	LT	Yes	AUX/692	A25
WBN-2-LT -062-0130A	VOLUME CONTROL TANK LEVEL	2-47W809-1	2,2	D	ON	ON	LT	Yes	AUX/713	A1
WBN-2-LT -062-0130C	VOLUME CONTROL TANK LEVEL	2-47W809-1	2,2	D	ON	ON	LT	Yes	AUX/713	A1

WBN-2-PCV -062-0081	LETDOWN HEAT EXCH PRESS CONT		0	2,2	D	ON	ON	0	Y	0	0
WBN-2-PMP -062-0104 -B	CENTRIFUGAL CHARGING PUMP 2B-B	2-47W809-1		0	D	ON	ON	HP	Y	692	A22
WBN-2-PMP -062-0108 -A	CENTRIFUGAL CHARGING PUMP 2A-A	2-47W809-1		0	D	ON	ON	HP	Y	692	A23
WBN-2-RFV -062-0636 -S	CVCS SEAL WTR RETURN HEADER RELIEF	2-47W809-1		5	D	C	O	RFV	No	716	0
WBN-2-TANK-062-0001A	HOLDUP TANK B	147W809-3		2,2	D	--	--	TANK	No	676	A/A5R
WBN-2-TANK-062-0001B	HOLDUP TANK B	147W809-3		2,2	D	--	--	TANK	No	676	A/A8R
WBN-2-TANK-062-0129	VOLUME CONTROL TANK	147W809-1		1,2	D	--	--	TANK	No	713	0
WBN-2-TCV -062-0079 -A	LETDOWN FLOW TEMP DIVERSION CONT VLV		0	0	0	O,C	O,C	0	Y	690	0
WBN-2-TIS -062-0079 -A	LETDOWN FLOW TEMP SWITCH	2-47W610-62-3		1,2	D	C	C	TIS	Yes	737	0
WBN-2-TSV -062-0079 -A	LETDOWN FLOW TEMP DIVERSION CONTROL	2-47W610-62-3		1,2	D	ON/OFF	ON/OFF	SOV	Yes	713	A/A4T
WBN-2-ACUM-063-0001	SIS ACCUMULATOR TANK NO 1	1-47W811-1		3	D	OFF	ON	FSST	N	RXB/702	ANN
WBN-2-ACUM-063-0002	SIS ACCUMULATOR TANK NO 2	1-47W811-1		3	D	OFF	ON	FSST	N	RXB/702	ANN
WBN-2-ACUM-063-0003	SIS ACCUMULATOR TANK NO 3	1-47W811-1		3	D	OFF	ON	FSST	N	RXB/702	ANN
WBN-2-ACUM-063-0004	SIS ACCUMULATOR TANK NO 4	1-47W811-1		3,4	D	OFF	ON	FSST	N	AUX/770	A16
WBN-2-FCV -063-0001 -A	RWST TO RHR PMP FLOW CNTL VLV	2-47W811-1		2,3,4	B,D,E	O	O/C	MOV	Y	0	0
WBN-2-FCV -063-0003 -A	SIS PUMP DISCHARGE TO RWST SHUTOFF VALVE	2-47W811-1		2,3,4	D,E	O	C	MOV	Y	0	0
WBN-2-FCV -063-0004 -B	SIS PUMP A-A DISCH TO RWST SHUTOFF VALVE	2-47W811-1		2,3,4	D,E	O	C	MOV	Y	0	0
WBN-2-FCV -063-0005 -B	RWST TO SIS PUMP FLOW CONTROL VALVE	2-47W811-1		2,3,4	B,D,E	O/C	O	MOV	Y	AUX/723	0
WBN-2-FCV -063-0006 -B	SIS PUMP INLET TO CVCS CHARGING PUMP	2-47W811-1		2,3,4	D,E	C	O	MOV	Y	0	0
WBN-2-FCV -063-0007 -A	SIS PUMP INLET TO CVCS CHARGING PUMP	2-47W811-1		2,3,4	D,E	C	O	MOV	Y	0	0

WBN-2-FCV -063-0008	-A	RHR HTX A TO CVCS CHARGING PUMPS	2-47W811-1	2,3,4	D,E	C	O	MOV	Y	0	0
WBN-2-FCV -063-0011	-B	RHR HTX B TO SIS PUMPS	2-47W811-1	2,3,4	D,E	C	O	MOV	Y	0	0
WBN-2-FCV -063-0021		SIS PUMP OUTLET TO SIS TEST LINE	2-47W811-1	5	G,F	C	C	AOV	Y	0	0
WBN-2-FCV -063-0022	-B	SIS PUMPS COLD LEG INJECTION CONTROL VLV	2-47W811-1	2,3,4	D,E	O	C	MOV	Y	0	0
WBN-2-FCV -063-0023	-B	SIS ACCUM FILL LINE ISOLATION VALVE	2-47W811-1	2,3,4	G,F	C	C	AOV	Y	0	#N/A
WBN-2-FCV -063-0025	-B	SIS CCP INJ TANK SHUTOFF VALVE	2-47W811-1	2,3,4	B,D,E	C	O	MOV	Y	AUX/723	0
WBN-2-FCV -063-0026	-A	SIS BORON INJ TANK SHUTOFF VALVE	2-47W811-1	2,3,4	B,D,E	C	O	MOV	Y	0	0
WBN-2-FCV -063-0047	-A	SIS PUMP A-A INLET VLV	2-47W811-1	2,3,4	B,D,E	O	O/C	MOV	Y	0	0
WBN-2-FCV -063-0048	-B	SIS PUMP B-B INLET VLV	2-47W811-1	2,3,4	B,D,E	O	O/C	MOV	Y	0	0
WBN-2-FCV -063-0064	-A	SIS ACCUM TANK N2 HDR INLET VALVE	2-47W830-6	5	G,F	C	C	AOV	Y	0	0
WBN-2-FCV -063-0067	-B	SIS ACCUMULATOR TNK 4 FLOW ISOL VALVE	2-47W811-1	3,4	D	O	C	MOV	Y	0	0
WBN-2-FCV -063-0071	-A	SIS CHECK VALVE FLOW ISOLATION VALVE	2-47W811-1	2,3,4	G,F	C	C	AOV	Y	0	0
WBN-2-FCV -063-0072	-A	RHR CONTAINMENT SUMP FLOW ISOL VLV	2-47W811-1	2,3,4	E,D	C	O	MOV	Y	0	0
WBN-2-FCV -063-0073	-B	RHR CONTAINMENT SUMP FLOW ISOL VLV	2-47W811-1	2,3,4	E,D	C	O	MOV	Y		0
WBN-2-FCV -063-0080	-A	SIS ACCUMULATOR TNK 3 FLOW ISOL VALVE	2-47W811-1	3,4	D	O	O	MOV	Y	0	0
WBN-2-FCV -063-0084	-B	SIS CHK VLV ISOL HDR FLOW ISOLATION VLV	2-47W811-1	2,3,4	G,F	C	C	AOV	Y	0	0
WBN-2-FCV -063-0093	-A	RHR PUMP A-A DISCHARGE TO CL 2&3	2-47W811-1	2,3,4	B,D,E	O	O/C	MOV	Y	0	#N/A
WBN-2-FCV -063-0094	-B	RHR PUMP B-B DISCHARGE TO CL 2&4	2-47W811-1	2,3,4	B,D,E	O	O/C	MOV	Y	0	0
WBN-2-FCV -063-0098	-B	SIS ACCUMULATOR TNK 2 FLOW ISOL VALVE	2-47W811-1	3,4	D	O	C	MOV	Y	0	0
WBN-2-FCV -063-0111		SIS CHECK VLV LEAK TEST ISOLATION VALVE	2-47W811-1	2,3,4	G,F	C	C	AOV	Y	0	0

WBN-2-FCV -063-0112		SIS CHECK VLV LEAK TEST ISOLATION VALVE	2-47W811-1	2,3,4	G,F	C	C	AOV	Y	0	0
WBN-2-FCV -063-0118	-A	SIS ACCUMULATOR TNK 2 FLOW ISOL VALVE	2-47W811-1	2,3,4	D	O	O	MOV	Y	0	0
WBN-2-FCV -063-0121		SIS FLOW TO CL CHECK VALVE TEST	2-47W811-1	2,3,4	G	C	C	0	Y	0	0
WBN-2-FCV -063-0152	-A	SIS PUMP A-A OUTLET FLOW CONTROL VALVE	2-47W811-1	2,3,4	B,D,E	C/O	C	MOV	Y	0	0
WBN-2-FCV -063-0153	-B	SIS PUMP B-B OUTLET FLOW CONTROL VALVE	2-47W811-1	2,3,4	B,D,E	C/O	C	MOV	Y	0	0
WBN-2-FCV -063-0156	-A	SIS PUMP OUTLET TO RCS LP 2&3 HL	2-47W811-1	2,3,4	B,D,E	C	O	MOV	Y	0	0
WBN-2-FCV -063-0157	-B	SIS PUMP OUTLET TO RCS LP 2&4 HL	2-47W811-1	2,3,4	B,D,E	C	O	MOV	Y	0	0
WBN-2-FCV -063-0158		CONT ISO	2-47W811-1	5	G,F	C	C	AOV	Yes	0	0
WBN-2-FCV -063-0167		SIS PUMP OUTLET TEST LINE	2-47W811-1	5	G,F	C	C	AOV	Y		A1
WBN-2-FCV -063-0172	-B	RHR INJECTION OR RECIRC AFTER LOCA	2-47W811-1	2,3,4	D,E	C	O/C	MOV	Y		A1
WBN-2-FCV -063-0174		SIS TEST LINE CHECK VALVE TEST	2-47W811-1	5	F,G	C	C	AOV	Y	0	0
WBN-2-FCV -063-0175	-B	SIS PUMP B-B DISCH TO RWST SHUTOFF VLV	2-47W811-1	2,3,4	D,E	O	C	MOV	Y	0	0
WBN-2-FCV -063-0177	-A	SUMP RECIRC FROM RHR TO SIP	2-47W811-1	2,3,4	D,E	O	O	MOV	Yes	AUX/676	0
WBN-2-FCV -063-0185		CONT ISO	2-47W811-1	5	G,F	C	C	AOV	Yes	AUX/676	0
WBN-2-FSV -063-0021		SIS PUMP OUTLET TO SIS TEST LINE	2-47W620-63-1	2,3,4	D,E,F	OF	OFF	SOV	Yes	AUX/713	0
WBN-2-FSV -063-0023	-B	SIS ACUM FILL LINE ISO VLV	2-47W620-63-1	2,3,4	D,E,F	OF	OFF	SOV	Yes	RXB/728	0
WBN-2-FSV -063-0064	-A	SIS ACUM TANK N2 HDR INLET VLV	2-47W620-63-2	5	G,F	OF	OFF	SOV	Yes	RXB/728	0
WBN-2-FSV -063-0071	-A	SIS CHECK VLV FLOW ISO VLV	2-47W620-63-1	2,3,4	G,F	OF	OFF	SOV	Yes	0	0
WBN-2-FSV -063-0084	-B	SIS CHECK VLV HDR FLOW ISO VLV	2-47W620-63-1	2,3,4	G,F	OF	OFF	SOV	Yes	0	0
WBN-2-FSV -063-0185	-A	RHR SUPPLY TEST LINE VLV	2-47W620-63-2	5	G,F	OF	OFF	SOV	Yes	RXB/716	0

WBN-2-ISV -063-0525 -A	SIS PUMP DISCH ISLN	2-47W811-1	2,3,4	B,D,E	O	O/C	ISV	No	AUX/729	A01
WBN-2-ISV -063-0527 -B	SI PUMP 2B-B DISCHARGE ISOLATION	2-47W811-1	2,3,4	B,D,E	O	O/C	ISV	No	RXB/703	0
WBN-2-LT -063-0050 -D	SIS RWST LEVEL TRANSMITTER	2-47W811-1	2,3,4	A	O	O	LT	Yes	AUX/713	A19
WBN-2-LT -063-0051 -E	SIS RWST LEVEL TRANSMITTER	2-47W811-1	2,3,4	A	O	O	LT	Yes	AUX/713	A19
WBN-2-LT -063-0052 -F	RWST LEVEL	2-47W811-1	2,3,4	A	O	O	LT	Yes	AUX/713	0
WBN-2-LT -063-0053 -G	RWST LEVEL	2-47W811-1	2,3,4	A	O	O	LT	Yes	AUX/692	A324
WBN-2-LT -063-0180 -D	CNTMT SUMP LEVEL	2-47W610-2	2,3,4	A	O	O	LT	Yes	AUX/692	0
WBN-2-LT -063-0181 -E	CNTMT SUMP LEVEL	2-47W610-2	2,3,4	A	O	O	LT	Yes	AUX/692	A324
WBN-2-LT -063-0182 -F	CONTAINMENT SUMP LEVEL	2-47W610-2	2,3,4	A	O	O	LT	Yes	AUX/692	0
WBN-2-LT -063-0183 -G	CONTAINMENT SUMP LEVEL	2-47W610-2	2,3,4	A	O	O	LT	Yes	CTL/755	0
WBN-2-PMP -063-0010 -A	SIS PUMP 2A-A	2-47W811-1	2,3,4	B,D,E	OFF	ON	PMP	Y	669	A19
WBN-2-PMP -063-0015 -B	SIS PUMP 2B-B	2-47W811-1	2,3,4	B,D,E	OFF	ON	PMP	Y	669	A20
WBN-2-STN -063-0200	CONTAINMENT SUMP STRAINER		2,4	A	NR	O	STR	NO		
WBN-2-TANK-063-0036	BORON INJECTION TANK 2A (CCP INJ TNK)	2-47W811-1	2,3,4	B,D,E	OFF	ON	TANK	N	690	0
WBN-2-TANK-063-0046	REFUELING WATER STORAGE TANK	2-47W811-1	2,3,4	B,D,E	OFF	ON	TANK	N	705	0
WBN-0-FCV -067-0144	CCS HTX OUTLET	1-47W845-2	5	A	O	O	MOV	Yes	737	A01
WBN-0-FCV -067-0151 -A	CCS HX C ERCW HDR 2A OUT FLOW	1-47W845-2	5	A	C	C	MOV	Yes	737	A02
WBN-0-FCV -067-0152 -B	CCS HX C ERCW HDR 2B OUT FLOW	1-47W845-2	5	A	C	O/C	MOV	Yes	737	A02
WBN-0-PMP -067-0028 -A	ESSENTIAL RAW COOLING WATER PUMP A-A	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-PMP -067-0032 -A	ESSENTIAL RAW COOLING WATER PUMP B-A	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS

WBN-0-PMP -067-0036 -A	ESSENTIAL RAW COOLING WATER PUMP C-A	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-PMP -067-0040 -A	ESSENTIAL RAW COOLING WATER PUMP D-A	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-PMP -067-0047 -B	ESSENTIAL RAW COOLING WATER PUMP E-B	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-PMP -067-0051 -B	ESSENTIAL RAW COOLING WATER PUMP F-B	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-PMP -067-0055 -B	ESSENTIAL RAW COOLING WATER PUMP G-B	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-PMP -067-0059 -B	ESSENTIAL RAW COOLING WATER PUMP H-B	1-47W859-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-0-TCV -067-1050 -A	AUTO WATER REGULATING VALVE EBR CHILLER A-A	1-47W845-4	5	A	O	O	TCV	No	692	C20
WBN-0-TCV -067-1051 -A	AUTO WATER REGULATING VALVE MCR CHILLER A-A	1-47W845-2	5	A	O	O	TCV	No	737	A02
WBN-0-TCV -067-1052 -B	AUTO WATER REGULATING VALVE EBR CHILLER B-B	1-47W845-4	5	A	O	O	TCV	No	692	C20
WBN-0-TCV -067-1053 -B	AUTO WATER REGULATING VALVE MCR CHILLER B-B	1-47W845-2	5	A	O	O	TCV	No	737	A09
WBN-1-FCV -067-0009A -A	ERCW STRAINER 1A-A BACKWASH	2-47W845-2	5	A	C	O	MOV	Yes	722	IPS
WBN-1-FCV -067-0009B -A	ERCW STRAINER 1A-A FLUSH CONTROL	2-47W845-2	5	A	C	O	MOV	Yes	722	IPS
WBN-1-FCV -067-0010A -B	ERCW STRAINER 1B-B BACKWASH	2-47W845-2	5	A	C	O	MOV	Yes	722	IPS
WBN-1-FCV -067-0010B -B	ERCW STRAINER 1B-B FLUSH CONTROL	2-47W845-2	5	A	C	O	MOV	Yes	722	IPS
WBN-1-FCV -067-0065 -B	EMERG DSL HTXS B1&B1 SUP VLV FROM HDR A	1,2-47W845-1	5	A	C	O	MOV	Y	722	DGB
WBN-1-FCV -067-0068 -A	EMERG DSL HTXS A1&A1 SUP VLV FROM HDR B	1,2-47W845-1	5	A	C	O	MOV	Y	722	DGB
WBN-1-FCV -067-0162 -A	CCS PMP & AUX FW PMP AREA CLR A-A	1-47W845-4	5	H	O	O	AOV	Yes	713	A1
WBN-1-FCV -067-0164 -B	CCS PMP & AUX FW PMP AREA CLR B-B	1-47W845-4	5	H	O/C	O	AOV	Yes	713	A1
WBN-1-FCV -067-0213 -A	SFP PIT PMP & TB BOOSTER PMP AREA CLR A-	1-47W845-4	5	H	O	O	AOV	Yes	737	A1
WBN-1-FCV -067-0215 -B	SFP PIT PMP & TB BOOSTER PMP AREA CLR B-	1-47W845-4	5	H	O/C	O	AOV	Yes	737	A1

WBN-1-FCV -067-0354 -A	EL 737 PEN RM CLR 1A-A	1-47W845-4	5	H	O	O	AOV	Yes	737	A5
WBN-1-FCV -067-0356 -B	EL 737 PEN RM CLR 1B-B	1-47W845-4	5	H	O/C	O	AOV	Yes	737	A5
WBN-1-FT -067-0061 -A	ERCW HDR 1A SUPPLY	1-47W600-144	5	A	ON	ON	FT	Yes	AUX/692	YARD
WBN-1-FT -067-0062 -B	ERCW HDR 1B SUPPLY	1-47W600-144	5	A	ON	ON	FT	Yes	AUX/692	YARD
WBN-1-HS -067-0431B -A	SCRN WASH PUMP 1A-A HAND SWITCH	1-47W610-67-4	5	A	OFF	ON/OFF	HS	Yes	RXB	IPS
WBN-1-HS -067-0440B -B	SCRN WASH PUMP 1B-B HAND SWITCH	1-47W610-67-4	5	A	OFF	ON/OFF	HS	Yes	AUX/723	IPS
WBN-1-PMP -067-0431	ERCW SCREEN WASH PUMP 1A-A	1-47W845-1	5	A	ON	ON	PMP	Yes	/742	IPS
WBN-1-PMP -067-0440	ERCW SCREEN WASH PUMP 1B-B	1-47W845-1	5	A	ON	ON	PMP	Yes	/742	IPS
WBN-1-PS -067-0434 -A	TRAV SCRN 1A-A IN PRESS	147W610-4	5	A	ON/OFF	ON	PS	Yes	722	IPS
WBN-1-PS -067-0445 -B	TRAV SCRN 1B-B IN PRESS	147W610-4	5	A	ON/OFF	ON	PS	Yes	722	IPS
WBN-1-STN -067-0009 -A	ESSENTIAL RAW COOLING WATER STRAINER 1A-A	1-47W845-1	5	A	ON	ON	STN	No	722	IC
WBN-1-STN -067-0010 -B	ESSENTIAL RAW COOLING WATER STRAINER 1B-B	1-47W845-1	5	A	ON	ON	STN	No	722	0
WBN-1-TWS -067-0434 -A	TRAVELING SCREEN 1A-A	1-47W845-1	5	A	ON/OFF	ON	TWS	Yes	741	IPS
WBN-1-TWS -067-0445 -B	TRAVELING SCREEN 1B-B	1-47W845-1	5	A	ON/OFF	ON	TWS	Yes	741	IPS
WBN-2-FCV -067-0009A -A	ERCW STRAINER 2A-A BACKWASH VLV	1-47W845-1	5	A	C	O	MOV	Yes	722	IPS
WBN-2-FCV -067-0009B -A	ERCW STRAINER 2A-A FLUSH VLV	1-47W845-1	5	A	C	O	MOV	Yes	722	IPS
WBN-2-FCV -067-0010A -B	ERCW STRAINER 2B-B BACKWASH VLV	1-47W845-1	5	A	C	O	MOV	Yes	722	IPS
WBN-2-FCV -067-0010B -B	ERCW STRAINER 2B-B FLUSH VLV	1-47W845-1	5	A	C	O	MOV	Yes	722	IPS
WBN-2-FCV -067-0065 -B	EMERG DSL HTXS B2 & B2 SUP VLV HDR A	1-47W845-1	5	A	C	O	MOV	Yes	742	IPS
WBN-2-FCV -067-0068 -A	EMERG DSL HTXS A2 & A2 SUP VLV HDR B	1-47W845-1	5	A	C	O	MOV	Yes	742	IPS

WBN-2-FCV -067-0083	-A	LOWER CNTMT A COOLERS SUPPLY ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	0	0
WBN-2-FCV -067-0087	-A	LWR CNTMT A CLRS DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/737	0
WBN-2-FCV -067-0088	-B	LOWER CNTMT A COOLERS DISCH ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/737	0
WBN-2-FCV -067-0089	-A	LWR CNTMT D COOLERS SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/723	0
WBN-2-FCV -067-0095	-A	LWR CNTMT C CLRS DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/723	0
WBN-2-FCV -067-0096	-B	LOWER CNTMT C COOLERS DISCH ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/676	0
WBN-2-FCV -067-0097	-A	LWR CNTMT C COOLERS SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/676	0
WBN-2-FCV -067-0099	-B	LOWER CNTMT B COOLERS SUPPLY ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	#N/A	#N/A
WBN-2-FCV -067-0103	-B	LWR CNTMT B CLRS DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/692	0
WBN-2-FCV -067-0104	-A	LOWER CNTMT B COOLERS DISCH ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/692	0
WBN-2-FCV -067-0105	-B	LWR CNTMT C COOLERS SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	0	0
WBN-2-FCV -067-0107	-B	LOWER CNTMT A COOLERS SUPPLY ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	0	0
WBN-2-FCV -067-0111	-B	LWR CNTMT D CLRS DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/737	0
WBN-2-FCV -067-0112	-A	LOWER CNTMT D COOLERS DISCH ISOL VALVE	2,2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/737	0
WBN-2-FCV -067-0113	-B	LWR CNTMT D CLRS SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Yes	AUX/737	0
WBN-2-FCV -067-0123	-B	CNTMT SPRAY HTX B SUPPLY CONTROL VALVE	2,2-47W845-2	2,3,4	I	C	O	MOV	Y	0	0
WBN-2-FCV -067-0124	-B	CONTAINMENT SPRAY HTX B DISCHARGE VALVE	2,2-47W845-2	2,3,4	I	C	O	MOV	Y	AUX/737	0
WBN-2-FCV -067-0125	-A	CNTMT SPRAY HTX A SUPPLY CONTROL VALVE	2,2-47W845-2	2,3,4	I	C	O	MOV	Y	AUX/737	0
WBN-2-FCV -067-0126	-A	CONTAINMENT SPRAY HTX A DISCHARGE VALVE	2,2-47W845-2	2,3,4	I	C	O	MOV	Y	AUX/737	0
WBN-2-FCV -067-0130	-A	UPPER CNTMT VENT CLR A SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/737	0

WBN-2-FCV -067-0131	-B	UPPER CNTMT VENT CLR A DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/737	0
WBN-2-FCV -067-0133	-A	UPPER CNTMT VENT CLR C Supply ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/737	0
WBN-2-FCV -067-0134	-B	UPPER CNTMT VENT CLR C DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/729	VALVE VAULT
WBN-2-FCV -067-0138	-B	UPPER CNTMT VENT CLR B SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/729	0
WBN-2-FCV -067-0139	-A	UPPER CNTMT VENT CLR B DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/723	0
WBN-2-FCV -067-0141	-B	UPPER CNTMT VENT CLR D SUPPLY ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/723	0
WBN-2-FCV -067-0142	-A	UPPER CNTMT VENT CLR D DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	AUX/723	0
WBN-2-FCV -067-0143		CCS HTX OUTLET	2-47W845-2	5	A	O	O	MOV	Yes	AUX/692	0
WBN-2-FCV -067-0162	-A	CCS PMP & AUX FW PMP AREA CLR A-A	1-47W845-4	5	H	O/C	O	AOV	Yes	AUX/723	A02
WBN-2-FCV -067-0164	-B	CCS PMP & AUX FW PMP AREA CLR B-B	1-47W845-4	5	H	O/C	O	AOV	Yes	AUX/757	A02
WBN-2-FCV -067-0168	-A	CCP ROOM COOLER 2A ERCW SUP FLOW CNTL	2-47W845-4	5	A	O/C	O	AOV	Yes		0
WBN-2-FCV -067-0170	-B	CCP ROOM COOLER 2B ERCW SUP FLOW CNTL	2-47W845-4	5	A	O/C	O	AOV	Yes	0	0
WBN-2-FCV -067-0176		SIS PUMP RM CLR-30-280 SUPPLY CNTL VLV	1,2-47W845-4	2,3,4	A,I	C	O	AOV	Y	RXB	FAN
WBN-2-FCV -067-0182		SIS PUMP RM CLR-30-279 SUPPLY CNTL VLV	1,2-47W845-4	2,3,4	A,I	C	O	AOV	Y	0	0
WBN-2-FCV -067-0184		CS PUMP RM CLR-30-277 SUPPLY CNTL VLV	1,2-47W845-4	2,3,4	A,I	C	O	AOV	Y	0	0
WBN-2-FCV -067-0186		CS PUMP RM CLR-30-278 SUPPLY CNTL VLV	1,2-47W845-4	2,3,4	A,I	C	O	AOV	Y	0	0
WBN-2-FCV -067-0188	-A	RHRP ROOM COOLER 2A-A ERCW SUP FLOW CNTL	2-47W845-4	5	A	O/C	O	AOV	Yes	RXB/726	RTH FAN ROOM
WBN-2-FCV -067-0190	-B	RHRP ROOM COOLER 2B-B ERCW SUP FLOW CNTL	2-47W845-4	5	A	O/C	O	AOV	Yes	0	0
WBN-2-FCV -067-0217		EL 713 AFW & BA TRANS PMP CLR A-A	1-47W845-7	5	H	O/C	O	AOV	Yes	713	A1
WBN-2-FCV -067-0219		EL 713 AFW & BA TRANS PMP CLR B-B	1-47W845-7	5	H	O/C	O	AOV	Yes	713	A1

WBN-2-FCV -067-0295 -A	UPPER CNTMT VENT CLR A DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	RXB/726	3TH FAN ROOM
WBN-2-FCV -067-0296 -A	UPPER CNTMT VENT CLR C DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	0	0
WBN-2-FCV -067-0297 -B	UPPER CNTMT VENT CLR B DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	0	0
WBN-2-FCV -067-0298 -B	UPPER CNTMT VENT CLR D DISCH ISOL VLV	2-47W845-3	5	A,F	O	O/C	MOV	Y	0	0
WBN-2-FCV -067-0336	EGTS RM CLR A-A	1-47W845-7	5	H	O/C	O	AOV	Yes	757	AUX/757
WBN-2-FCV -067-0338	EGTS RM CLR B-B	1-47W845-7	5	H	O/C	O	AOV	Yes	757	AUX/757
WBN-2-FCV -067-0342	PIPE CHASE CLR 2A-A	2-47W845-4	5	H	O	O	AOV	Yes	0	0
WBN-2-FCV -067-0344	PIPE CHASE CLR 2B-B	2-47W845-4	5	H	O/C	O	AOV	Yes	0	0
WBN-2-FCV -067-0346	EL 692 PEN RM CLR 2A-A	2-47W845-4	5	H	O	O	AOV	Yes	RXB	FAN
WBN-2-FCV -067-0348	EL 692 PEN RM CLR 2B-B	2-47W845-4	5	H	O/C	O	AOV	Yes	RXB/726	0
WBN-2-FCV -067-0350	EL 723 PEN RM CLR 2A-A	2-47W845-4	5	H	O	O	AOV	Yes	RXB/726	0
WBN-2-FCV -067-0352	EL 723 PEN RM CLR 2B-B	2-47W845-4	5	H	O/C	O	AOV	Yes	0	0
WBN-2-FCV -067-0354	EL 737 PEN RM CLR 2A-A	1-47W845-4	5	H	O/C	O	AOV	Yes	737	A9
WBN-2-FCV -067-0356	EL 737 PEN RM CLR 2B-B	1-47W845-4	5	H	O/C	O	AOV	Yes	737	A9
WBN-2-FT -067-0061 -A	ERCW HDR 2A SUPPLY	1-47W600-144	5	A	ON	ON	FT	Yes	715	YARD
WBN-2-FT -067-0062 -B	ERCW HDR 2B SUPPLY	1-47W600-144	5	A	ON	ON	FT	Yes	715	YARD
WBN-2-FT -067-0122	CNTMT SPRAY HX 2B-B ERCW INLET FLOW	247W845-2	2,3,4	A,I	ON	ON	FT	Yes		0
WBN-2-FT -067-0136	CNTMT SPRAY HX 2A-A ERCW INLET FLOW	247W845-2	2,3,4	A,I	ON	ON	FT	Yes		0
WBN-2-HS -067-0437A -A	SCRN WASH PUMP 2A-A HAND SWITCH	1-47W620-67-4	5	A	OFF	ON/OFF	HS	Yes		0
WBN-2-HS -067-0437B -A	SCRN WASH PUMP 2A-A HAND SWITCH	1-47W620-67-4	5	A	OFF	ON/OFF	HS	Yes	741	0

WBN-2-HS -067-0447A -B	SCRN WASH PUMP 2B-B HAND SWITCH	1-47W620-67-4	5	A	OFF	ON/OFF	HS	Yes	741	0
WBN-2-HS -067-0447B -B	SCRN WASH PUMP 2B-B HAND SWITCH	1-47W620-67-4	5	A	OFF	ON/OFF	HS	Yes	0	0
WBN-2-PMP -067-0437	ERCW SCREEN WASH PUMP 2A-A	1-47W845-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-2-PMP -067-0447	ERCW SCREEN WASH PUMP 2B-B	1-47W845-1	5	A	ON	ON	PMP	Yes	742	IPS
WBN-2-PS -067-0434 -A	TRAV SCRN 2A-A IN PRESS	2-47W620-4	5	A	ON/OFF	ON	PS	Yes	722	IPS
WBN-2-PS -067-0439 -A	TRAVEL SCRN 2A-A INLET PRESS	1-47W620-67-4	5	A	ON/OFF	ON	PS	Yes	722	IPS
WBN-2-PS -067-0445 -B	TRAV SCRN 2B-B IN PRESS	2-47W620-4	5	A	ON/OFF	ON	PS	Yes	722	IPS
WBN-2-PS -067-0451 -B	TRAVEL SCRN 2B-B INLET PRESS	1-47W610-67-4	5	A	ON/OFF	ON	PS	Yes	722	IPS
WBN-2-STN -067-0009 -A	ERCW STRAINER 2A-A	1-47W845-1	5	A	ON	ON	STN	No	722	IPS
WBN-2-STN -067-0010 -B	ERCW STRAINER 2B-B	1-47W845-1	5	A	ON	ON	STN	No	722	IPS
WBN-2-TWS -067-0434 -A	TRAVELING SCREEN 2A-A	1-47W845-1	5	A	ON/OFI	ON	TWS	Yes	742	IPS
WBN-2-TWS -067-0439 -A	TRAVELING SCREEN 2A-A	1-47W845-1	5	A	ON/OFI	ON	TWS	Yes	742	IPS
WBN-2-TWS -067-0445 -B	TRAVELING SCREEN 2B-B	1-47W845-1	5	A	ON/OFI	ON	TWS	Yes	742	IPS
WBN-2-TWS -067-0451 -B	TRAVELING SCREEN 2B-B	1-47W845-1	5	A	ON/OFI	ON	TWS	Yes	742	IPS
WBN-2-FCV -068-0305 -A	RCS FLOW CNTL VLV WDS N2 MAN TO PRT	2-47W830-6	5	F	C	C	AOV	N	0	0
WBN-2-FCV -068-0307 -A	RCS FLOW CNTL VLV WDS GA TO PRT	2-47W813-1	5	F	O	C	AOV	Y	0	0
WBN-2-FCV -068-0308 -B	RCS FLOW CNTL VLV WDS GA TO PRT	2-47W813-1	5	F	C	C	AOV	N	0	0
WBN-2-FCV -068-0332 -B	RCS PRESSURIZER RELIEF FLOW CTRL VALVE	1,2-47W813-1	5	G	O	O	MOV	N	0	0
WBN-2-FCV -068-0333 -A	RCS PRESSURIZER RELIEF FLOW CTRL VALVE	1,2-47W813-1	5	G	O	O	MOV	N	0	0
WBN-2-FSV -068-0305 -A	RCS FLOW CNTL VLV WDS N2 TO PRT	2-47W620-68-6	5	F	ON	OFF	SOV	Yes	0	0

WBN-2-FSV -068-0307 -A	RCS FLOW CNTL VLV WDS GA TO PRT	2-47W620-68-6	5	F	ON	OFF	SOV	Yes	0	0
WBN-2-FSV -068-0308 -B	RCS FLOW CNTL VLV WDS GA TO PRT	2-47W620-68-6	5	F	ON	OFF	SOV	Yes	AUX/713	A1
WBN-2-FSV -068-0394 -A	REACTOR HEAD VENT ISOLATION VALVE	2-47W813-2	5	G,E	C/O	C	SOV	N	0	0
WBN-2-FSV -068-0395 -B	REACTOR HEAD VENT ISOLATION VALVE	2-47W813-2	5	G,E	C/O	C	SOV	N	0	0
WBN-2-FSV -068-0396 -B	REACTOR HEAD VENT ISOLATION VALVE	2-47W813-2	5	G,E	C/O	C	SOV	N	0	0
WBN-2-FSV -068-0397 -A	REACTOR HEAD VENT ISOLATION VALVE	2-47W813-2	5	G,E	C/O	C	SOV	N	0	0
WBN-2-LT -068-0320 -F	RCS PRESSURIZER LEVEL TRANSMITTER	2-47W813-1	5	D	ON	ON	LT	Y	0	0
WBN-2-LT -068-0335 -E	RCS PRESSURIZER LEVEL TRANSMITTER	2-47W813-1	5	D	ON	ON	LT	Y	0	0
WBN-2-LT -068-0339 -D	RCS PRESSURIZER LEVEL TRANSMITTER	2-47W813-1	5	D	ON	ON	LT	Y	0	0
WBN-2-LT -068-0367 -D	RVLIS DYNAMIC HEAD RANGE (RCPS ON)	2-47W600-287	2,	A	ON	ON	LT	Y	0	0
WBN-2-LT -068-0368 -D	RVLIS LOWER RANGE (RCPS OFF)	2-47W600-287	2,	A	ON	ON	LT	Y	0	0
WBN-2-LT -068-0369 -D	RVLIS UPPER RANGE (RCPS OFF)	2-47W600-287	2,	A	ON	ON	LT	Y	0	0
WBN-2-LT -068-0370 -E	RVLIS DYNAMIC HEAD RANGE (RCPS ON)	2-47W600-287	2,	A	ON	ON	LT	Y	0	0
WBN-2-LT -068-0371 -E	RVLIS LOWER RANGE (RCPS OFF)	2-47W600-287	2,	A	ON	ON	LT	Y	0	0
WBN-2-LT -068-0372 -E	RVLIS UPPER RANGE (RCPS OFF)	2-47W600-287	2,	A	ON	ON	LT	Y	0	0
WBN-2-OXF -068-0341A -A	PZR BACKUP HTR GRP 2A-A TRANSFORMER	2-25E500-2	5	A	ON	ON	XFMR	Yes	782	A2
WBN-2-OXF -068-0341D -B	PZR BACKUP HTR GRP 2B-B TRANSFORMER	2-25E500-2	5	A	ON	ON	XFMR	Yes	782	A2
WBN-2-PCV -068-0334 -B	PRESSURIZER POWER OPERATED RELIEF VALVE	2-47W813-1	5	C,E	C	O/C	SOV	Yes	783'20	0
WBN-2-PCV -068-0340A -A	PRESSURIZER POWER OPERATED RELIEF VALVE	2-47W813-1	5	C,E	C	O/C	SOV	Yes	783'20	0
WBN-2-PMP -068-0008	REACTOR COOLANT PUMP 2	1,2-47W813-1	5	J	ON	OFF	VP	N	695	0

WBN-2-PMP -068-0031	REACTOR COOLANT PUMP 2	1,2-47W813-1	5	J	ON	OFF	VP	N	685	0
WBN-2-PMP -068-0050	REACTOR COOLANT PUMP 3	1,2-47W813-1	5	J	ON	OFF	VP	N	685	0
WBN-2-PMP -068-0073	REACTOR COOLANT PUMP 4	1,2-47W813-1	5	J	ON	OFF	VP	N	685	0
WBN-2-PRES-068-PR	UNIT 2 PRESSURIZER	1-47W813-1	5	C,D	ON	ON	PRES	No	703	0
WBN-2-PT -068-0070 -G	RCS WIDE RANGE PRESSURE LOOP 4 HOT LEG	2-47W813-1	5	C	ON	ON	PT	Y	0	0
WBN-2-PT -068-0322 -G	RCS PRESSURIZER PRESSURE TRANSMITTER	2-47W813-1	5	C	ON	ON	PT	Yes	716	0
WBN-2-PT -068-0323 -F	RCS PRESSURIZER PRESSURE TRANSMITTER	2-47W813-1	5	C	ON	ON	PT	Y	0	0
WBN-2-PT -068-0334 -E	RCS PRESSURIZER PRESSURE TRANSMITTER	2-47W813-1	5	C	ON	ON	PT	Y	0	0
WBN-2-PT -068-0340 -D	RCS PRESSURIZER PRESSURE TRANSMITTER	2-47W813-1	5	C	ON	ON	PT	Y	0	0
WBN-2-RFV -068-0563	PRESS. SAFETY VALVE	2-47W813-1	5	C,E	C	C	RFV	No	780	IC
WBN-2-RFV -068-0564	PRESS SAFETY VALVE	2-47W813-1	5	C,E	C	C	RFV	No	780	IC
WBN-2-RFV -068-0565	PRESS SAFETY VALVE	2-47W813-1	5	C,E	C	C	RFV	No	780	IC
WBN-2-RPV -068-U2	REACTOR VESSEL	1-47W813-1	5	J	--	--	RPV	N	0	0
WBN-2-SGEN-068-SG1	STEAM GENERATOR 1	2-47W813-1	5	J	--	--	SGEN	N	0	0
WBN-2-SGEN-068-SG2	STEAM GENERATOR 2	2-47W813-1	5	J	--	--	SGEN	N	0	0
WBN-2-SGEN-068-SG3	STEAM GENERATOR 3	2-47W813-1	5	J	--	--	SGEN	N	0	0
WBN-2-SGEN-068-SG4	STEAM GENERATOR 4	2-47W813-1	5	J	--	--	SGEN	N	0	0
WBN-2-TANK-068-PRT	PRESSURIZER RELIEF TANK	2-47W813-1	5	C,E	--	--	TNK	No	703	0
WBN-2-TE -068-0001 -D	RCS LOOP 1 HOT LEG TEMP	2-47W813-1	5	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0018 -D	RCS LOOP 1 COLD LEG TEM P	2-45N1616-8	0	C,E	ON	ON	TE	Y	0	0

WBN-2-TE -068-0024 -D	RCS LOOP 2 HOT LEG TEMP	2-47W813-1	5	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0041 -D	RCS LOOP 2 COLD LEG TEM P	2-45N1616-8	0	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0043 -E	RCS LOOP 3 HOT LEG TEMP	2-47W813-1	5	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0060 -E	RCS LOOP 3 COLD LEG TEM P	2-45N1616-8	0	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0065 -E	RCS LOOP 4 HOT LEG TEMP	2-47W813-1	5	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0083 -E	RCS LOOP 4 COLD LEG TEM P	2-47B601-068	0	C,E	ON	ON	TE	Y	0	0
WBN-2-TE -068-0373 -D	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702	0
WBN-2-TE -068-0376 -D	REACTOR LEVEL TEMP COMP GUIDE TUBE	2-47W610-68-7	5	A	ON	ON	TE	Yes	716	0
WBN-2-TE -068-0377 -D	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702	0
WBN-2-TE -068-0378 -D	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702'9"	0
WBN-2-TE -068-0379 -D	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702	0
WBN-2-TE -068-0380 -E	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702	0
WBN-2-TE -068-0383 -E	REACTOR LEVEL TEMP COMP GUIDE TUBE	2-47W610-68-7	5	A	ON	ON	TE	Yes	674'6"	0
WBN-2-TE -068-0384 -E	REACTOR LEVEL CAPILLARY TUBE TEM COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702	0
WBN-2-TE -068-0385 -E	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702'9"	0
WBN-2-TE -068-0386 -E	REACTOR LEVEL CAP TUBE TEMP COMP (HEAD)	2-47W610-7	5	A	ON	ON	TE	Yes	702	0
WBN-2-TE -068-0393 -E	REACTOR LEVEL CAPILLARY TUBE TEMP COMP	2-47W610-68-7	5	A	ON	ON	TE	Yes	702	0
WBN-0-HTX -070-0186	COMPONENT COOLING HX C	1-47W859-1	5	A	ON	ON	HTX	No	737	A1
WBN-0-PMP -070-0051 -S	CCS PUMP C-S	1-47W859-1	5	A	ON	ON	PMP	Yes	690	A3S
WBN-0-PT -070-0221	CCS HTX C INLET PRESSURE	1-47W859-1	5	A	ON	ON	PT	Yes	723	A1

WBN-0-TE -070-0162 -B	CCS HEAT EXCHANGER C OUTLET TEMP	1-47W610-70-1	2,3,4	A	ON	ON	TE	Yes	737	A1
WBN-2-FCV -070-0066	CCS SURGE TANK VENT VALVE	1,2-47W859-3	5	A	O	O	AOV	N	0	0
WBN-2-FCV -070-0085 -B	EXCESS LETDOWN HTX OUTLET VALVE	1,2-47W859-3	5	F	C	C	AOV	N	YRD/729	0
WBN-2-FCV -070-0087 -B	RC PUMP THERM BARRIER RET CNTNMT ISOL	1,2-47W859-3	5	A,F	O	O/C	MOV	Y	0	0
WBN-2-FCV -070-0089 -B	RC PUMP OIL CLR RET CNTNMT ISOL VALVE	1,2-47W859-3	5	A,F	O	O/C	MOV	Y	0	0
WBN-2-FCV -070-0090 -A	RC PUMP THERM BARRIER RET CNTNMT ISOL	1,2-47W859-3	5	A,F	O	O/C	MOV	Y	AUX/713	A28
WBN-2-FCV -070-0092 -A	RC PUMP OIL CLR RET CNTNMT ISOL VALVE	1,2-47W859-3	5	A,F	O	O/C	MOV	Y	AUX/713	A19
WBN-2-FCV -070-0100 -A	RC PUMP OIL CLR HDR CONT ISOL VALVE	2-47W859-2	5	A,F	O	O/C	MOV	Yes	RXB/716	UMULATOR #4
WBN-2-FCV -070-0133 -A	RC PUMP THERM BARRIER CONT ISOL VALVE	1,2-47W859-2	5	A	O	O	MOV	N	AUX/741	0
WBN-2-FCV -070-0134 -B	RC PUMP THERM BARRIER CONT ISOL VALVE	1,2-47W859-2	5	A,F	O	O/C	MOV	Y	AUX/737	A9
WBN-2-FCV -070-0140 -B	RC PUMP OIL CLR HDR CONT ISOL VALVE	1,2-47W859-2	5	A,F	O	O/C	MOV	Y	AUX/713	A29
WBN-2-FCV -070-0143 -A	EXCESS LETDOWN HTX CONT INLET ISOL VLV	2-47W859-2	5	F	C	C	MOV	Y	AUX/713	A2
WBN-2-FCV -070-0153 -B	RHR HTX B OUTLET VALVE	1,2-47W859-4	2,3,4	A,E	O	O	MOV	Y	AUX/713	A1
WBN-2-FCV -070-0156 -A	RHR HTX A OUTLET VALVE	1,2-47W859-4	2,3,4	A,E	C	O	MOV	Y	AUX/713	A1
WBN-2-FCV -070-0183 -A	SAMPLE HTX HDR OUTLET VALVE	1,2-47W859-4	5	A	O	O	MOV	N	AUX/713	A14
WBN-2-FCV -070-0215 -A	SAMP HTX INLET	2-47W859-2	5	A	O	O/C	MOV	Yes	AUX/713	0
WBN-2-FIS -070-0081 -B	THERMAL BARRIER CCS HDR FLOW	2-47W620-70-3	5	A	ON	ON	FIS	Yes	RXB/703	0
WBN-2-FT -070-0159A -A	2A ESF EQUIPMENT CCS SUPPLY HEADER FLOW	2-47W859-2	5	A	ON	ON	FT	Yes		0
WBN-2-FT -070-0165A -B	2B ESF EQUIPMENT CCS SUPPLY HDR FLOW	2-47W859-2	5	A	ON	ON	FT	Yes		0
WBN-2-FT -070-0215A -A	SAMPLE HTX HDR INLET FLOW	2-47W610-70-2	5	A	ON	ON	FT	Yes		0

WBN-2-FT -070-0215B -A	SAMPLE HTX HDR OUTLET FLOW	2-47W610-70-2	5	A	ON	ON	FT	Yes		0
WBN-2-HTX -070-0185	COMPONENT COOLING HX A	2-47W859-1	5	A	ON	ON	HTX	No	AUX/729	A10
WBN-2-LCV -070-0063	CCS SURGE TANK DEMIN WATER INLET VALVE	1,2-47W859-1	5	A	C	O/C	AOV	N	0	0
WBN-2-LT -070-0063A -A	UNIT 2 CCS SURGE TANK 2A SIDE LEVEL	2-47W859-1	5	A	ON	ON	LT	Yes	737	A2
WBN-2-LT -070-0099A -B	UNIT 2 CCS SURGE TANK 2B SIDE LEVEL	2-47W859-1	5	A	ON	ON	LT	Yes	737	A2
WBN-2-PMP -070-0038 -B	CCS PUMP 2B-B	1,2-47W859-1	5	A	ON	ON	PMP	Y	690	CORRIDOR
WBN-2-PMP -070-0046 -A	CCS PUMP 2A-A	1,2-47W859-1	5	A	ON	ON	PMP	Y	690	CORRIDOR
WBN-2-PMP -070-0130 -B	CCS THERMAL BARRIER BOOSTER PUMP 2B-B	1,2-47W859-2	5	A	ON	ON	PMP	Y	724	0
WBN-2-PMP -070-0131 -A	CCS THERMAL BARRIER BOOSTER PUMP 2A-A	1,2-47W859-2	5	A	ON	ON	PMP	Y	724	0
WBN-2-PT -070-0024A -A	CCS HTX A INLET PRESSURE	2-47W859-1	5	A	ON	ON	PI	Yes	713	A1
WBN-2-TANK-070-0001	COMPONENT COOLING WATER SURGE TANK	2-47W859-1	5	A	ON	ON	TANK	No	757	0
WBN-2-TE -070-0161 -A	CCS HEAT EXCHANGER A OUTLET TEMP	2-47W610-70-1	2,3,4	A	ON	ON	TE	Yes	737	A12
WBN-2-FCV -072-0002 -B	CONTAINMENT SPRAY HDR B ISOLATION VALVE	1,2-47W812-1	2,3,4	I	C	O/C	MOV	Y	AUX/737	A9
WBN-2-FCV -072-0021 -B	RWST TO SPRAY HDR B FLOW CONTROL VALVE	1,2-47W813-1	2,3,4	I	O	C	MOV	Y	AUX/676	0
WBN-2-FCV -072-0022 -A	RWST TO SPRAY HDR A FLOW CONTROL VALVE	1,2-47W813-1	2,3,4	I	O	O/C	MOV	Y	AUX/676	0
WBN-2-FCV -072-0039 -A	CNTMT SPRAY HDR A ISOLATION VLV	1,2-47W813-1	2,3,4	I	C	O/C	MOV	Y	AUX/737	A9
WBN-2-FCV -072-0040 -A	RHR SPRAY HEADER A ISOLATION VALVE	1,2-47W813-1	2,3,4	I	C	O/C	MOV	Y	AUX/713	A29
WBN-2-FCV -072-0041 -B	RHR SPRAY HEADER B ISOLATION VALVE	1,2-47W813-1	2,3,4	I	C	O/C	MOV	Y	AUX/713	A29
WBN-2-FCV -072-0044 -A	CNTMT SUMP SPRAY HDR A FLOW CONTROL VLV	2-47W812-1	5	I,F	C	O/C	MOV	Yes	AUX/676	A13
WBN-2-FCV -072-0045 -B	CNTMT SUMP SPRAY HDR B FLOW CONTROL VLV	2-47W812-1	5	I,F	C	O/C	MOV	Yes	AUX/676	A12

WBN-2-FT -072-0013 -G	CONTAINMENT SPRAY HEADER B MINI FLOW CTL	2-47W812-1	2,3,4	I	ON	ON	FT	Yes		0
WBN-2-FT -072-0034 -F	CONTAINMENT SPRAY HEADER A MINI FLOW CTL	2-47W812-1	2,3,4	I	ON	ON	FT	Yes		0
WBN-2-HTX -072-0001A -A	CONTAINMENT SPRAY HEAT EXCHANGER 2A	2-47W812-1	2,3,4	I	--	--	HTX	No	AUX/729	A10
WBN-2-HTX -072-0001B -B	CONTAINMENT SPRAY HEAT EXCHANGER 2B	2-47W812-1	2,3,4	I	--	--	HTX	No	AUX/729	A10
WBN-2-PMP -072-0010 -B	CONTAINMENT SPRAY PUMP 2B-B	1,2-47W812-1	2,3,4	I	OFF	ON	HP	Y	653	#N/A
WBN-2-PMP -072-0027 -A	CONTAINMENT SPRAY PUMP 2A-A	1,2-47W812-1	2,3,4	I	OFF	ON	HP	Y	653	#N/A
WBN-2-FCV -074-0001 -A	RHR SYSTEM ISOLATION VALVE	2-47W810-1	2,3,4	G,E	C	C	MOV	N	#N/A	#N/A
WBN-2-FCV -074-0002 -B	RHR SYSTEM ISOLATION VALVE	2-47W810-1	2,3,4	G,E,F	C	C	MOV	N	#N/A	#N/A
WBN-2-FCV -074-0003 -A	RHR PUMP 2A-A INLET FLOW CONTROL VALVE	2-47W810-1	2,3,4	B,D,E	O	O	MOV	N	AUX/782	A12
WBN-2-FCV -074-0008 -A	RHR SYSTEM ISOLATION VALVE	2-47W810-1	2,3,4	G,E,F	C	C/O	MOV	Yes	AUX/782	0
WBN-2-FCV -074-0009 -B	RHR SYSTEM ISOLATION VALVE	2-47W810-1	2,3,4	G,E,F	C	C/O	MOV	Yes	AUX/782	0
WBN-2-FCV -074-0012 -A	RHR PUMP 2A-A MINIMUM FLOW VALVE	2-47W810-1	2,3,4	B,D,E	O	O/C	MOV	Y	AUX/782	0
WBN-2-FCV -074-0016	RHR HT EX A OUTLET FLOW CONTROL VALVE	1,2-47W810-1	2,3,4	B,D,E	O	O/C	AOV	Y	0	0
WBN-2-FCV -074-0021 -B	RHR PUMP 2B-B INLET FLOW CONTROL VALVE	2-47W810-1	2,3,4	B,D,E	O	O	MOV	N	0	A13
WBN-2-FCV -074-0024 -B	RHR PUMP 2B-B MINIMUM FLOW VALVE	2-47W810-1	2,3,4	B,D,E	O	O/C	MOV	Y	/729	0
WBN-2-FCV -074-0028	RHR HT EX B OUT FLOW CONTROL VALVE	1,2-47W810-1	2,3,4	B,D,E	O	O/C	AOV	Y	AUX/729	A11
WBN-2-FCV -074-0032	RHR HT EX A/B BYPASS FCV	2-47W810-1	2,3,4	D,E	C	O/C	AOV	Yes	AUX/723	0
WBN-2-FCV -074-0033 -A	RHR HT EX A BYPASS	2-47W810-1	2,3,4	D,E	O	O	MOV	N	0	0
WBN-2-FCV -074-0035 -B	RHR HT EX B BYPASS	2-47W810-1	2,3,4	D,E	O	O	MOV	N	AUX/737	0
WBN-2-FE -074-0012	RHR FLOW INDICATOR, TRAIN A	2-47W820-2	2,3,4	D,E	ON	ON	FE	Y	AUX/692	A20

WBN-2-FE -074-0024	RHR FLOW INDICATOR, TRAIN B	2-47W820-2	2,3,4	D,E	ON	ON	FE	Y	RXB/703	0
WBN-2-FIS -074-0012 -A	RHR PMP 2A-A MIN FLOW VALV SW	47W620-74-2	2,3,4	B,D,E	ON	ON	FIS	Yes	RXB/703	0
WBN-2-FIS -074-0024 -B	RHR PMP 2B-B MIN FLOW VALV SW	47W620-74-2	2,3,4	B,D,E	ON	ON	FIS	Yes	RXB/703	0
WBN-2-HTX -074-0010 -A	RHR PUMP 2A-A SEAL HEAT EXCHANGER	2-47W859-4	2,3,4	B,D,E	--	--	HTX	N	AUX/729	A10
WBN-2-HTX -074-0020 -B	RHR PUMP 2B-B SEAL HEAT EXCHANGER	2-47W810-1	2,3,4	B,D,E	--	--	HTX	N	AUX/729	A10
WBN-2-HTX -074-0030 -A	RHR HEAT EXCHANGER 2A	2-47W859-4	2,3,4	B,D,E	--	--	HTX	N	AUX/729	A10
WBN-2-HTX -074-0031 -B	RHR HEAT EXCHANGER 2B	2-47W810-1	2,3,4	B,D,E	--	--	HTX	N	AUX/729	A10
WBN-2-PMP -074-0010 -A	RHR PUMP 2A-A	2-47W810-1	2,3,4	B,D,E	OFF	ON	PMP	Y	653	A12
WBN-2-PMP -074-0020 -B	RHR PUMP 2B-B	2-47W810-1	2,3,4	B,D,E	OFF	ON	PMP	Y	653	A13
WBN-0-HTX -077-0096	WASTE GAS COMPRESSOR A HEAT EXCHANGER	1-47W830-4	5	A	--	--	HTX	No	723	A26
WBN-0-HTX -077-0111	WASTE GAS COMPRESSOR B HEAT EXCHANGER	1-47W830-4	5	A	--	--	HTX	No	723	A26
WBN-2-FCV -077-0009 -B	R C DRAIN TANK FLOW CNTL VALVE	2-47W830-1	5	F	O	C	AOV	Yes	0	0
WBN-2-FCV -077-0016 -B	R C DRN TNK GAS ANALY FLW CON	2-47W830-1	5	F	O	C	AOV	Yes	0	0
WBN-2-FCV -077-0017 -A	R C DRN TNK GAS ANALY FLW CON	2-47W830-1	5	F	O	C	AOV	Yes	0	A29
WBN-2-FCV -077-0018 -B	R C DRN TNK TO VENT HDR ISOL	2-47W830-1	5	F	O	C	AOV	Yes	0	0
WBN-2-FCV -077-0019 -A	R C DRN TNK TO VENT HDR ISOL	2-47W830-1	5	F	O	C	AOV	Yes	/728	0
WBN-2-FCV -077-0020 -A	REACT COOLANT DRAIN TANK N2 SUPPLY FLOW	1,2-47W830-2	5	A	C	C	0	N	AUX/676	A29
WBN-2-FCV -077-0127 -B	REACT BLDG SUMP DISCH FLOW CONTROL VA	1-47W852-1	5	F	O	C	AOV	Yes	AUX/676	0
WBN-2-FCV -077-0128 -A	REACT BLDG SUMP DISCH FLOW CONTROL VA	1-47W852-1	5	F	O	C	AOV	Yes	AUX/676	A29
WBN-2-FSV -077-0009 -B	R C DRAIN TANK FLOW CNTL VALVE	2-47W620-77-4	5	F	ON	OFF	SOV	Yes	0	0

WBN-2-FSV -077-0016 -B	RCDT TO GAS ANALYZER FLOW SOL VALVE	2-47W620-77-4	5	F	ON	OFF	SOV	Yes	RXB/780	IC
WBN-2-FSV -077-0017 -A	R C DRAIN TK GAS ANALYZ FLOW	2-47W620-77-4	5	F	ON	OFF	SOV	Yes	/780	IC
WBN-2-FSV -077-0019 -A	R C DRAIN TK TO VENT HDR	2-47W620-77-4	5	F	ON	OFF	SOV	Yes	RXB/780	IC
WBN-2-FSV -077-0020 -A	R C DRAIN TANK FLOW CNTL VALVE	2-47W620-77-4	5	F	ON	OFF	SOV	Yes		0
WBN-0-HTX -078-0031	SPENT FUEL PIT HEAT EXCHANGER A	1-47W855-1	5	A	--	--	HTX	No	737	AW6
WBN-0-HTX -078-0032	SPENT FUEL PIT HEAT EXCHANGER B	1-47W855-1	5	A	--	--	HTX	No	737	AW6
WBN-0-PMP -078-0009 -B	SPENT FUEL PMP	1-47W855-1	5	A	ON	ON	PMP	Yes	737	A02
WBN-0-PMP -078-0012 -A	SPENT FUEL PMP	1-47W855-1	5	A	ON	ON	PMP	Yes	737	A01
WBN-1-FCV -081-0012 -A	PW RCS PRESS RELF TNK & RCP STANDPIPES	1,2-47W819-1	5	F	O/C	C	AOV	Y	AUX/723	A4W
WBN-2-FSV -081-0012 -A	PW RCS PRESS RELF TNK & RCP STANDPIPES	2-47W819-1	5	F	OFF/ON	OFF	SOV	Yes		0
WBN-1-ARB -082-A /2 -A	DG 1A-A PROTECT RELAY PNL 2	NA	5	A	ON	ON	PNL	Yes	742	DGB
WBN-1-CDPL-082-A /F -A	DIESEL GENERATOR 1A-A CNTL DISTRIBUTION PNL	NA	5	A	ON	ON	PNL	Yes	760	DGB
WBN-1-CDPL-082-B /F -B	DIESEL GENERATOR 1B-B CNTL DISTRIBUTION PNL	NA	5	A	ON	ON	PNL	Yes	760	DGB
WBN-1-DIEG-082-A1 -A	DIESEL ENGINE 1A1	1-47W839-1	5	A	OFF	ON	DIEG	Yes	742	1A-A
WBN-1-DIEG-082-A2 -A	DIESEL GENERATOR ENGINE 1A2	1-47W839-1	5	A	OFF	ON	DIEG	Yes	742	1A-A
WBN-1-DIEG-082-B1 -B	DIESEL GENERATOR ENGINE 1B1	1-47W839-1A	5	A	OFF	ON	DIEG	Yes	742	1B-B
WBN-1-DIEG-082-B2 -B	DIESEL GENERATOR ENGINE 1B2	1-47W839-1A	5	A	OFF	ON	DIEG	Yes	742	1B-B
WBN-1-DPL -082-A -A	DG 1A-A 125V DC DISTRIBUTION PANEL	NA	5	A	ON	ON	PNL	Yes	742	DGB
WBN-1-DPL -082-B -B	DG 1B-B 125V DC DISTRIBUTION PANEL	NA	5	A	ON	ON	PNL	Yes	742	DGB
WBN-1-GEN -082-0001A -A	DIESEL GENERATOR 1A-A	1-47W839-1B	5	A	OFF	ON	GEN	Yes	AUX/692	DGB

WBN-1-GEN -082-0001B -B	DIESEL GENERATOR 1B-B	1-47W839-1C	5	A	OFF	ON	GEN	Yes	AUX/692	DGB
WBN-1-IACL-082-0101	DG EN 1A1 INTAKE AIR CLEANER	1-47W839-1	5	A	--	--	FLTR	NA	760.5	DG5
WBN-1-IACL-082-0102	DG EN 1A2 INTAKE AIR CLEANER	1-47W839-1	5	A	--	--	FLTR	NA	760.5	DG5
WBN-1-IACL-082-0103	DG EN 1B1 INTAKE AIR CLEANER	1-47W839-1A	5	A	--	--	FLTR	NA	760.5	DG11
WBN-1-IACL-082-0104	DG EN 1B2 INTAKE AIR CLEANER	1-47W839-1A	5	A	--	--	FLTR	NA	760.5	DG11
WBN-1-PNL -082-A -A	DIESEL GENERATOR CONTROL BOARD	NA	5	A	ON	ON	PNL	Yes	AUX/729	DGB
WBN-1-PNL -082-B -B	DIESEL GENERATOR CONTROL BOARD	NA	5	A	ON	ON	PNL	Yes	AUX/729	DGB
WBN-1-SILN-082-0101 -A	DG ENG 1A1 INTAKE SILENCER	1-47W839-1	5	A	--	--	SILN	NA	760.5	DG5
WBN-1-SILN-082-0102 -A	DG ENG 1A2 INTAKE SILENCER	1-47W839-1	5	A	--	--	SILN	NA	760.5	DG5
WBN-1-SILN-082-0103 -B	DG ENG 1B1 INTAKE SILENCER	1-47W839-1A	5	A	--	--	SILN	NA	760.5	DG11
WBN-1-SILN-082-0104 -B	DG ENG 1B2 INTAKE SILENCER	1-47W839-1A	5	A	--	--	SILN	NA	760.5	DG11
WBN-1-SILN-082-0105 -A	DG ENG 1A1 EXHST SILENCER	1-47W839-1	5	A	--	--	SILN	NA	760.5	DG5
WBN-1-SILN-082-0106 -A	DG ENG 1A2 EXHST SILENCER	1-47W839-1	5	A	--	--	SILN	NA	760.5	DG5
WBN-1-SILN-082-0107 -B	DG ENG 1B EXHST SILENCER	1-47W839-1A	5	A	--	--	SILN	NA	760.5	DG11
WBN-1-SILN-082-0108 -B	DG ENG 1B EXHST SILENCER	1-47W839-1A	5	A	--	--	SILN	NA	760.5	DG11
WBN-2-ARB -082-A /2 -A	DG 2A-A PROTECT RELAY PNL 2	NA	5	A	ON	ON	PNL	Yes	742	DGB
WBN-2-ARB -082-B /2 -B	DG 2B-B PROTECT RELAY PNL 2	NA	5	A	ON	ON	PNL	Yes	#N/A	0
WBN-2-CDPL-082-A /F -A	DIESEL GENERATOR 2A-A CNTL DISTRIBUTION PNL	NA	5	A	ON	ON	PNL	Yes	760	DGB
WBN-2-CDPL-082-B /F -B	DIESEL GENERATOR 2B-B CNTL DISTRIBUTION PNL	NA	5	A	ON	ON	PNL	Yes	760	DGB
WBN-2-DIEG-082-A1 -A	DIESEL GENERATOR ENGINE 2A1	1-47W839-1B	5	A	OFF	ON	DIEG	Yes	AUX/713	2A-A

WBN-2-DIEG-082-A2 -A	DIESEL GENERATOR ENGINE 2A2	1-47W839-1B	5	A	OFF	ON	DIEG	Yes	AUX/713	2A-A
WBN-2-DIEG-082-B1 -B	DIESEL GENERATOR ENGINE 2B1	1-47W839-1C	5	A	OFF	ON	DIEG	Yes	0	2B-B
WBN-2-DIEG-082-B2 -B	DIESEL GENERATOR ENGINE 2B2	1-47W839-1C	5	A	OFF	ON	DIEG	Yes	AUX/676	2B-B
WBN-2-DPL-082-A -A	DG 2A-A 125V DC DISTRIBUTION PANEL	NA	5	A	ON	ON	PNL	Yes	DGB/742	DGB
WBN-2-DPL-082-B -B	DG 2B-B 125V DC DISTRIBUTION PANEL	NA	5	A	ON	ON	PNL	Yes	DGB/742	DGB
WBN-2-GEN-082-0002A -A	DIESEL GENERATOR 2A-A	1-47W839-1B	5	A	OFF	ON	GEN	Yes	742	0
WBN-2-GEN-082-0002B -B	DIESEL GENERATOR 2B-B	1-47W839-1C	5	A	OFF	ON	GEN	Yes	742	0
WBN-2-IACL-082-0201 -A	DG EN 2A2 INTAKE AIR CLEANER	1-47W839-1B	5	A	--	--	FLTR	NA	760.5	DG8
WBN-2-IACL-082-0202 -A	DG EN 2A2 INTAKE AIR CLEANER	1-47W839-1B	5	A	--	--	FLTR	NA	760.5	DG8
WBN-2-IACL-082-0203 -B	DG EN 2B1 INTAKE AIR CLEANER	1-47W839-1C	5	A	--	--	FLTR	NA	760.5	DG14
WBN-2-IACL-082-0204 -B	DG EN 2B2 INTAKE AIR CLEANER	1-47W839-1C	5	A	--	--	FLTR	NA	760.5	DG14
WBN-2-PNL-082-A -A	DG 2A-A CONT. BRD	NA	5	A	ON	ON	PNL	Yes	742	DGB
WBN-2-PNL-082-B -B	DG 2B-B CONT BRD.	NA	5	A	ON	ON	PNL	Yes	742	DGB
WBN-2-SILN-082-0201 -A	DG ENG 2A1 INTK SILENCER	1-47W839-1B	5	A	--	--	SILN	NA	760.5	DG8
WBN-2-SILN-082-0202 -A	DG ENG 2A2 INTK SILENCER	1-47W839-1B	5	A	--	--	SILN	NA	760.5	DG8
WBN-2-SILN-082-0203 -B	DG ENG 2B1 INTK SILENCER	1-47W839-1C	5	A	--	--	SILN	NA	760.5	DG14
WBN-2-SILN-082-0204 -B	DG ENG 2B2 INTK SILENCER	1-47W839-1C	5	A	--	--	SILN	NA	760.5	DG14
WBN-2-SILN-082-0205 -A	DG ENG 2A1 EXHST SILENCER	1-47W839-1B	5	A	--	--	SILN	NA	760.5	DG8
WBN-2-SILN-082-0206 -A	DG ENG 2A2 EXHST SILENCER	1-47W839-1B	5	A	--	--	SILN	NA	760.5	DG8
WBN-2-SILN-082-0207 -B	DG ENG 2B1 EXHST SILENCER	1-47W839-1C	5	A	--	--	SILN	NA	760.5	DG14

WBN-2-SILN-082-0208 -B	DG ENG 2B2 EXHST SILENCER	1-47W839-1C	5	A	--	--	SILN	NA	760.5	DG14
WBN-2-ROD -085-B10	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-B12	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-B4	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-B6	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-B8	SHTDN BK C FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-C11	SHTDN BK C FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-C5	SHTDN BK D FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-C7	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-C9	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-D14	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-D2	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-E13	SHTDN BK D FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-E3	SHTDN BK C FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-G13	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-G3	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-J13	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-J3	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-L13	SHTDN BK C FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-L3	SHTDN BK D FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		

WBN-2-ROD -085-M14	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-M2	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-N11	SHTDN BK D FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-N5	SHTDN BK C FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-N7	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-N9	SHTDN BK B FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-P12	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-ROD -085-P4	SHTDN BK A FULL LG ROD DRIVE MECH	N / A	5	B	On	OFF	ROD	No		
WBN-2-FCV -090-0107 -A	CNTNMT BLDG LWR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/676	0
WBN-2-FCV -090-0108 -B	CNTNMT BLDG LWR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	0	0
WBN-2-FCV -090-0109 -B	CNTNMT BLDG LWR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/692	0
WBN-2-FCV -090-0110 -B	CNTNMT BLDG LWR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/692	0
WBN-2-FCV -090-0111 -A	CNTNMT BLDG LWR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/723	0
WBN-2-FCV -090-0113 -A	CNTNMT BLDG UPR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/713	A1
WBN-2-FCV -090-0114 -B	CNTNMT BLDG UPR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/713	A01
WBN-2-FCV -090-0115 -B	CNTNMT BLDG UPR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/692	A22
WBN-2-FCV -090-0116 -B	CNTNMT BLDG UPR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/692	A23
WBN-2-FCV -090-0117 -A	CNTNMT BLDG UPR COMPT MON ISOL VALVE	1,2-47W610-90-3	5	F	O	C	AOV	N	AUX/692	A19
WBN-2-RE -090-0271 -A	UPPER INS CONTMT POST A CD AREA MONITOR	2-45W610-4	5	A	ON	ON	MON	Y	0	0
WBN-2-RE -090-0272 -B	UPPER INS CONTMT POST A CD AREA MONITOR	2-45W610-4	5	A	ON	ON	MON	Y	0	0

WBN-2-RE -090-0273 -A	LOWER INS CONTNT POST A CD AREA MONITOR	2-45W610-4	5	A	ON	ON	MON	Y	0	0
WBN-2-RE -090-0274 -B	LOWER INS CONTNT POST A CD AREA MONITOR	2-45W610-4	5	A	ON	ON	MON	Y	0	0
WBN-2-NM -092-0131 -D	CH 2 NEUT MON SOURCE/INTER RNG AMP	2-47W620-92-1	5	A	ON	ON	AMP	Yes	729	A24
WBN-2-NM -092-0132 -E	CH 2 NEUT MON SOURCE/INTER RNG AMP	2-47W620-92-1	5	A	ON	ON	AMP	Yes	737	A7
WBN-2-NM -092-0138 -D	CHI NEUT MON APP R ISOLATOR	2-47W620-92-1	5	A	ON	ON	ISO	Yes	729	A24
WBN-2-PNL -099-L116	REACTOR TRIP SW GEAR PNL (W-92250L3)	45W600-99-1	5	B	ON	ON	PNL	Yes	782	0
WBN-2-PNL -099-R1 -D	REACTOR PROT SET I PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R10 -F	REACTOR PROT SET III PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R11 -F	REACTOR PROT SET III PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R12 -G	REACTOR PROT SET IV PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R13 -G	REACTOR PROT SET IV PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R2 -D	REACTOR PROT SET I PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R28 -G	REACTOR PROT SET IV PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R3 -D	REACTOR PROT SET I PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C202
WBN-2-PNL -099-R4 -D	REACTOR PROT SET I PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R46 -A	SOLID STATE PROT SYSTEM TRAIN A INPUT PANEL	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R47 -A	SOLID STATE PROT SYSTEM TRAIN A LOGIC PANEL	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R48 -A	SS PROT SYSTEM INPUT OUTPUT PANEL TRAIN A	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R49 -B	SOLID STATE PROT SYSTEM TRAIN B INPUT PANEL	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R5 -E	REACTOR PROT SET II PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4

WBN-2-PNL -099-R50 -B	SOLID STATE PROT SYSTEM TRAIN B LOGIC PANEL	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R51 -B	SS PROT SYSTEM INPUT OUTPUT PANEL TRAIN B	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R52 -A	SOLID STATE PROT SYSTEM TRAIN A TEST PANEL	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R53 -B	SOLID STATE PROT SYSTEM TRAIN B TEST PANEL	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R54 -A	NSSS AUXILIARY RELAY PANEL A	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R55 -B	NSSS AUXILIARY RELAY PANEL B	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R58	NSSS AUXILIARY RELAY PANEL COMMON	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R6 -E	REACTOR PROT SET II PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -099-R7 -E	REACTOR PROT SET II PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C204
WBN-2-PNL -099-R8 -E	REACTOR PROT SET II PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	C4
WBN-2-PNL -099-R9 -F	REACTOR PROT SET III PROCESS INSTRUMENTATION	2-47W610-99-1	5	A	ON	ON	PNL	Yes	708	0
WBN-1-BD -211-A -A	6.9KV SHUTDOWN BOARD 1A-A	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A1
WBN-1-BD -211-B -B	6.9KV SHUTDOWN BOARD 1B-B	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A24
WBN-1-PNL -211-A -A	6900V STDN LOG REL PNL 2A-A	NA	5	A	ON	ON	PNL	Yes	AUX/713	A1
WBN-1-PNL -211-B -B	6900V STDN LOG REL PNL 2B-B	NA	5	A	ON	ON	PNL	Yes	RXB/692	A24
WBN-2-BD -211-A -A	6.9KV SHUTDOWN BOARD 2A-A	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A1
WBN-2-BD -211-B -B	6.9KV SHUTDOWN BOARD 2B-B	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A24
WBN-2-PNL -211-A -A	6.9 KV LOGIC RELAY PANEL 2A-A	NA	5	A	ON	ON	PNL	Yes	757	A2
WBN-2-PNL -211-B -B	6.9KV LOGIC RELAY PANEL 2B-B	NA	5	A	ON	ON	PNL	Yes	757	A24
WBN-1-BD -212-A002 -A	480V SHUTDOWN BD 1A2A	1-15E500-2	6	A	ON	ON	BRD	Yes	757	A2

WBN-1-BD -212-B002 -B	480V SHUTDOWN BD 2B2-B	1-15E500-2	6	A	ON	ON	BRD	Yes	757	A5
WBN-1-OXF -212-A -A	480V SHUTDOWN BD EMERG XFMR 1A-A	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A6
WBN-1-OXF -212-A001 -A	480V SHUTDOWN BD EMERG XFMR 1A1-A	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A6
WBN-1-OXF -212-A002 -A	480V SHUTDOWN BD EMERG XFMR 1A2-A	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A6
WBN-1-OXF -212-B -B	480V SHUTDOWN BD EMERG XFMR 1B-B	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A5
WBN-1-OXF -212-B001 -B	480V SHUTDOWN BD EMERG XFMR 1B1-B	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A5
WBN-1-OXF -212-B002 -B	480V SHUTDOWN BD EMERG XFMR 1B2-B	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A5
WBN-2-BD -212-A001 -A	480V SHUTDOWN BD 2A2-A	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A21
WBN-2-BD -212-A002 -A	480V SHUTDOWN BD 2A2-A	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A21
WBN-2-BD -212-B001 -B	480V SHUTDOWN BD 2B2-B	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A24
WBN-2-BD -212-B002 -B	480V SHUTDOWN BD 2B2-B	1-15E500-2	5	A	ON	ON	BRD	Yes	757	A24
WBN-2-OXF -212-A -A	480V SHUTDOWN BD EMERG XFMR 2A-A	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A12
WBN-2-OXF -212-A001 -A	480V SHUTDOWN BD XFMR 2A1-A	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A12
WBN-2-OXF -212-A002 -A	480V SHUTDOWN BD XFMR 2A2-A	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A12
WBN-2-OXF -212-B -B	480V SHUTDOWN BD EMERG XFMR 2B-B	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A11
WBN-2-OXF -212-B001 -B	480V SHUTDOWN BD XFMR 2B1-B	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A11
WBN-2-OXF -212-B002 -B	480V SHUTDOWN BD XFMR 2B2-B	1-15E500-2	5	A	ON	ON	XFMR	Yes	772	A11
WBN-1-MCC -213-A001 -A	480V REACTOR MOV BOARD 1A1-A	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A1
WBN-1-MCC -213-A002 -A	480V REACTOR MOV BOARD 1A2-A	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A1
WBN-1-MCC -213-B001 -B	480V REACTOR MOV BOARD 1B1-B	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A2

WBN-1-MCC -213-B002 -B	480V REACTOR MOV BOARD 1B2-B	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A2
WBN-2-MCC -213-A001 -A	480V REACTOR MOV BOARD 2A1-A	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A16
WBN-2-MCC -213-A002 -A	480V REACTOR MOV BOARD 2A2-A	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A16
WBN-2-MCC -213-B001 -B	480V REACTOR MOV BOARD 2B1-B	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A15
WBN-2-MCC -213-B002 -B	480V REACTOR MOV BOARD 2B2-B	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A15
WBN-1-MCC -214-A001 -A	480V C&A BUILDING VENT BOARD 1A1-A	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A2
WBN-1-MCC -214-A002 -A	480V C&A BUILDING VENT BOARD 1A2-A	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A2
WBN-1-MCC -214-B001 -B	480V C&A BUILDING VENT BOARD 1B1-B	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A5
WBN-1-MCC -214-B002 -B	480V C&A BUILDING VENT BOARD 1B2-B	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A5
WBN-2-MCC -214-A001 -A	480V C&A BUILDING VENT BOARD 2A1-A	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A21
WBN-2-MCC -214-A002 -A	480V C&A BUILDING VENT BOARD 2A2-A	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A21
WBN-2-MCC -214-B001 -B	480V C&A BUILDING VENT BOARD 2B1-B	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A24
WBN-2-MCC -214-B002 -B	480V C&A BUILDING VENT BOARD 2B2-B	1-15E500-2	5	A	ON	ON	MCC	Yes	757	A24
WBN-1-BAT -215-A -A	DG 1A-A 125V BATTERY	45W727	5	A	ON	ON	BAT	No	742	DGR1
WBN-1-BAT -215-B -B	DG 1B-B 125V BATTERY	45W727	5	A	ON	ON	BAT	No	742	DGR1
WBN-1-CHGR-215-A -A	DG 1A-A BATTERY CHARGER	45W727	5	A	ON	ON	CHG	Yes	742	DGR1
WBN-1-CHGR-215-B -B	DG 1B-B BATTERY CHARGER	45W727	5	A	ON	ON	CHG	Yes	742	DGR1
WBN-1-MCC -215-A001 -A	480V DIESEL AUXILIARY BOARD 1A1-A	1-15E500-2	5	A	ON	ON	MCC	Yes	761	DGB
WBN-1-MCC -215-A002 -A	480V DIESEL AUXILIARY BOARD 1A2-A	1-15E500-2	5	A	ON	ON	MCC	Yes	761	DGB
WBN-1-MCC -215-B001 -B	480V DIESEL AUXILIARY BOARD 1B1-B	1-15E500-2	5	A	ON	ON	MCC	Yes	761	DGB

WBN-1-MCC -215-B002 -B	480V DIESEL AUXILIARY BOARD 1B2-B	1-15E500-2	5	A	ON	ON	MCC	Yes	761	DGB
WBN-2-BAT -215-A -A	DG 2A-A 125V BATTERY	45W727	5	A	ON	ON	BAT	No	742	DGR2
WBN-2-BAT -215-B -B	DG 2B-B 125V BATTERY	45W727	5	A	ON	ON	BAT	No	742	DGR2
WBN-2-CHGR-215-A -A	DG 2A-A BATTERY CHARGER	45W727	5	A	ON	ON	CHG	Yes	742	DGR2
WBN-2-CHGR-215-B -B	DG 2B-B BATTERY CHARGER	45W727	5	A	ON	ON	CHG	Yes	742	DGR2
WBN-2-MCC -215-A001 -A	480V DIESEL AUXILIARY BOARD 2A1-A	1-15E500-2	5	A	ON	ON	MCC	Yes	762	DGB
WBN-2-MCC -215-A002 -A	480V DIESEL AUXILIARY BOARD 2A2-A	1-15E500-2	5	A	ON	ON	MCC	Yes	762	DGB
WBN-2-MCC -215-B001 -B	480V DIESEL AUXILIARY BOARD 2B1-B	1-15E500-2	5	A	ON	ON	MCC	Yes	762	DGB
WBN-2-MCC -215-B002 -B	480V DIESEL AUXILIARY BOARD 2B2-B	1-15E500-2	5	A	ON	ON	MCC	Yes	762	DGB
WBN-1-MCC -232-A -A	REACTOR VENT BOARD 1A-A	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A1
WBN-1-MCC -232-B -B	REACTOR VENT BOARD 1B-B	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A2
WBN-2-MCC -232-A -A	REACTOR VENT BOARD 2A-A	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A16
WBN-2-MCC -232-B -B	REACTOR VENT BOARD 2B-B	1-15E500-2	5	A	ON	ON	MCC	Yes	772	A15
WBN-1-BD -235-0001 -D	120 AC VITAL INST POWER BOARD 1-I	1-45N706-1	5	A	ON	ON	BRD	Yes	757	A4
WBN-1-BD -235-0002 -E	120V AC VITAL INST POWER BOARD 1-II	1-45N706-2	5	A	ON	ON	BRD	Yes	757	A3
WBN-1-BD -235-0003 -F	120V AC VITAL INST POWER BOARD 1-III	1-45N706-3	5	A	ON	ON	BRD	Yes	757	A23
WBN-1-BD -235-0004 -G	120V AC VITAL INST POWER BOARD 1-IV	1-45N706-4	5	A	ON	ON	BRD	Yes	757	A23
WBN-1-INV -235-0001 -D	120V AC VITAL INVERTER 1-I	1-45N703-1	5	A	ON	ON	INV	Yes	772	A2
WBN-1-INV -235-0002 -E	120V AC VITAL INVERTER 1-II	1-45N703-2	5	A	ON	ON	INV	Yes	772	A2
WBN-1-INV -235-0003 -F	120V AC VITAL INVERTER 1-III	1-45N703-3	5	A	ON	ON	INV	Yes	772	A15

WBN-1-INV -235-0004 -G	120V AC VITAL INVERTER 1-IV	1-45N703-4	5	A	ON	ON	INV	Yes	772	A15
WBN-2-BD -235-0001 -D	120V AC VITAL INST POWER BOARD 2-I	1-45N706-1	5	A	ON	ON	BRD	Yes	757	A4
WBN-2-BD -235-0002 -E	120V AC VITAL INST POWER BOARD 2-II	1-45N706-2	5	A	ON	ON	BRD	Yes	757	A3
WBN-2-BD -235-0003 -F	220V AC VITAL INST POWER BOARD 2-III	1-45N706-3	5	A	ON	ON	BRD	Yes	757	A23
WBN-2-BD -235-0004 -G	220V AC VITAL INST POWER BOARD 2-IV	1-45N706-4	5	A	ON	ON	BRD	Yes	757	A23
WBN-2-INV -235-0001 -D	120 AC VITAL INVERTER 2-I	2-45N703-2	5	A	ON	ON	INV	Yes	772	A2
WBN-2-INV -235-0002 -E	120V AC VITAL INVERTER 2-II	2-45N703-2	5	A	ON	ON	INV	Yes	772	A2
WBN-2-INV -235-0003 -F	120V AC VITAL INVERTER 2-III	2-45N703-3	5	A	ON	ON	INV	Yes	772	A15
WBN-2-INV -235-0004 -G	120V AC VITAL INVERTER 2-IV	2-45N703-4	5	A	ON	ON	INV	Yes	772	A15
WBN-0-BAT -236-0001 -D	125V VITAL BATTERY I	45N703-1	5	A	ON	ON	BAT	Yes	772	A4
WBN-0-BAT -236-0002 -E	125V VITAL BATTERY II	45N703-2	5	A	ON	ON	BAT	Yes	772	A3
WBN-0-BAT -236-0003 -F	125V VITAL BATTERY III	45N703-3	5	A	ON	ON	BAT	Yes	772	A14
WBN-0-BAT -236-0004 -G	125V VITAL BATTERY IV	45N703-4	5	A	ON	ON	BAT	Yes	772	A13
WBN-0-BAT -236-0005 -S	125V VITAL BATT V	45N703-5	5	A	ON	ON	BAT	Yes	772	A8
WBN-0-BD -236-0001 -D	125V VITAL BATTERY BD I	45N703-1	5	A	ON	ON	BRD	Yes	757	A4
WBN-0-BD -236-0002 -E	125V VITAL BATTERY BD II	47N703-2	5	A	ON	ON	BRD	Yes	757	A3
WBN-0-BD -236-0003 -F	125V VITAL BATTERY BD III	47N703-3	5	A	ON	ON	BRD	Yes	757	A14
WBN-0-BD -236-0004 -G	125V VITAL BATTERY BD IV	47N703-4	5	A	ON	ON	BRD	Yes	757	A13
WBN-0-BD -236-0005 -S	125V VITAL BTRY BD V	45W703-9	5	A	ON	ON	BRD	Yes	772	A8
WBN-0-CHGR-236-0001 -D	125V VITAL BTRY CHARGER I	45N703-1	5	A	ON	ON	BRD	Yes	772	A2

WBN-0-CHGR-236-0002 -E	125V VITAL BTRY CHARGER II	45N703-2	5	A	ON	ON	CHG	Yes	772	A2
WBN-0-CHGR-236-0003 -F	125V VITAL BTRY CHARGER III	45N703-3	5	A	ON	ON	CHG	Yes	772	A15
WBN-0-CHGR-236-0004 -G	125V VITAL BTRY CHARGER IV	45N703-4	5	A	ON	ON	CHG	Yes	772	A15
WBN-0-CHGR-236-0006 -S	125 VITAL BTRY CHARGER 6-S	45N703-1	5	A	ON	ON	CHG	Yes	772	A2
WBN-0-CHGR-236-0007 -S	125V VITAL BTRY CHARGER 7-S	45N703-3	5	A	ON	ON	CHG	Yes	772	A25
WBN-0-DPL -236-0001 -D	125V VITAL BTRY BD I DISTRIBUTION PANEL	45N703-1	5	A	ON	ON	PNL	Yes	757	A4
WBN-0-DPL -236-0002 -E	125V VITAL BTRY BD II DISTRIBUTION PANEL	45N703-2	5	A	ON	ON	PNL	Yes	757	A3
WBN-0-DPL -236-0003 -F	125V VITAL BTRY BD III DISTRIBUTION PANEL	45N703-3	5	A	ON	ON	PNL	Yes	757	A14
WBN-0-DPL -236-0004 -G	125V VITAL BTRY BD IV DISTRIBUTION PANEL	45N703-4	5	A	ON	ON	PNL	Yes	757	A13
WBN-0-DPL -236-0005/A -S	125V VITAL BTRY BD V DISTRIBUTION PANEL A	45W703-9	5	A	ON	ON	PNL	Yes	757	A2
WBN-0-DPL -236-0005/B -S	125V VITAL BTRY BD V DISTRIBUTION PANEL B	45W703-9	5	A	ON	ON	PNL	Yes	757	A2
WBN-1-BD -237-A	120V INSTRUMENT POWER DISTRIBUTION PANEL 1A	45W708-1	5	A	ON	ON	BRD	Yes	757	A4
WBN-1-BD -237-B	120V INSTRUMENT POWER DISTRIBUTION PANEL 1B	45W708-1	5	A	ON	ON	BRD	Yes	757	A3
WBN-1-DXF -237-A	INSTRUMENT POWER TRANSFORMER 1A	45W700-1	5	A	ON	ON	XFMR	Yes	757	A4
WBN-1-DXF -237-B	INSTRUMENT POWER TRANSFORMER 1B	45W700-1	5	A	ON	ON	XFMR	Yes	757	A3
WBN-2-BD -237-A	120V INSTRUMENT POWER DISTRIBUTION PANEL 2A	45W708-1	5	A	ON	ON	BRD	Yes	757	A23
WBN-2-BD -237-B	120V INSTRUMENT POWER DISTRIBUTION PANEL 2B	45W708-1	5	A	ON	ON	BRD	Yes	757	A23
WBN-2-DXF -237-A	INSTRUMENT POWER TRANSFORMER 2A	45W700-1	5	A	ON	ON	XFMR	Yes	757	A23
WBN-2-DXF -237-B	INSTRUMENT POWER TRANSFORMER 2B	45W700-1	5	A	ON	ON	XFMR	Yes	757	A22
WBN-0-CRN -271-A1	AUX BLDG 225 TON CRANE	44N230-237	5	A	OFF	OFF	CRN	No	789	A13

WBN-2-CRN -271-R1	UNIT 2 POLAR CRANE (275 TON)	44N230-237	5	A	OFF	OFF	CRN	No	RXB	
WBN-2-PNL -275-R071	TURBO-GENERATOR AUXILIARY RELAY PANEL	NA	5	A	ON	ON	XFMR	Yes	708	0
WBN-2-PNL -275-R127 -A	TRAIN A BOP INSTR RACK	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R131 -B	TRAIN B BOP INSTR RACK	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R140 -B	TRAIN B BOP INSTR RACK	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R143 -A	TRAIN A BOP INSTR RACK	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R148	REACTOR VESSEL LEVEL IND. SYS	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R72	FEEDWATER AUXILIARY RELAY PANEL	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R73 -A	SEPARATIONS AUX RELAY PANEL A	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R74 -A	SEPARATIONS AUX RELAY PANEL A	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R75	SEPARATIONS AUX RELAY PNL A COMM	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R77 -B	SEPARATIONS AUX RELAY PANEL B	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -275-R78 -B	SEP AUX RELAY PANEL B	NA	5	A	ON	ON	PNL	Yes	708	0
WBN-2-PNL -276-L010 -T	AUX CNTL RM PNL	NA	5	A	ON	ON	PNL	Yes	757	0
WBN-2-PNL -276-L011A	AUX CNTL RM PNL	NA	5	A	ON	ON	PNL	Yes	757	0
WBN-2-PNL -276-L011B	AUX CNTL RM PNL	NA	5	A	ON	ON	PNL	Yes	757	0
WBN-0-PNL -278-M##	ALL MAIN CONTROL ROOM PANELS	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-0-PNL -278-M012	RADIATION MONT & RECORD	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-0-PNL -278-M026A -A	DSL GEN 1A-A MAIN CONT RM	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-0-PNL -278-M026B -B	DSL GEN 1B-B MAIN CONT RM	NA	5	A	ON	ON	PNL	Yes	755	C12

WBN-0-PNL -278-M026C -A	DSL GEN 2A-A MAIN CONT RM	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-0-PNL -278-M026D -B	DSL GEN 2B-B MAIN CONT RM	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-0-PNL -278-M027A	ERCW MAIN CNTL RN PNL	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-0-PNL -278-M27B	COMP COOL WATER MCR PNL	NA	5	A	ON	ON	PNL	Yes	755	C12
WBN-1-PNL -278-M1	GENERATOR & AUX POWER	N/A	5	A	ON	ON	PNL	Yes	755	C12
WBN-1-PNL -278-M9	VENT, ICE CONTAINMENT, & RCTR BLDG	N/A	5	A	ON	ON	PNL	Yes	755	C12
WBN-2-BD -278-M007A	120VAC INST PWR RACK	1-45W1646-3	5	A	ON	ON	PNL	Yes	0	0
WBN-2-BD -278-M007B	120VAC INST PWR RACK	1-45W1646-4	5	A	ON	ON	PNL	Yes	AUX/692	0
WBN-2-XSW -278-M7	PFD PWR, INST PWR A&B TRANSFER SWITCHES	1-45W1646-1	5	A	ON	ON	PNL	Yes	755	MCR
WBN-2-JB -290-4964 -B	TVA JUNCTION BOX	N/A	5	F,G	ON	ON/OFF	N/A	Yes	RXB/703	0
WBN-2-JB -290-4965 -A	TVA JUNCTION BOX	N/A	5	F,G	ON	ON/OFF	N/A	Yes	RXB/703	0

Attachment 2:

Watts Bar Nuclear Plant, IPEEE Seismic Margins Evaluation, Unit 2 Relay Design Report

Report No. WBNIPEEE-004

TENNESSEE VALLEY AUTHORITY

Title: Watts Bar Nuclear Plant, IPEEE Seismic Margins Evaluation, Unit 2 Relay Design Report		Report No. WBNIPEEE-004
Prepared By: Michael G. Eason	Date: 04/26/2010	Page 1 of 25

This report was prepared by the WBN Seismic Margin Relay Evaluation Team consisting of the following Members:

1) **Michael Eason, Electrical Engineering**
2) **Louvain Edmondson, Instrumentation and Controls Engineering**
3) **Jimmie Perkins, Instrumentation and Controls Engineering**

And Approved by:

1) **Mohan Bali – Discipline Lead EGS of Electrical Engineering**
2) **Fred Dimitrew – Discipline Lead EGS of Instrumentation and Control Engineering**

This is a Design Report.
Checking and Verification are to be done as described herein.
At that time, Checking and Verification signatures will be provided.

Prepared By: Michael G. Eason **Date:** 4/26/2010

Prepared By: [signature] **Date:** 4/26/2010

Prepared By: [signature] **Date:** 4/26/2010

Approved By: for Anil Kumar (for MOHAN BALI) **Date:** 4/27/10

Approved By: TAK 4/26/10 **Date:** 4/26/10

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1.0 INTRODUCTION AND PURPOSE

1.1 Introduction

This report describes the relay evaluation portion of the Watts Bar Nuclear Plant, Unit 2 (WBNU2) Individual Plant Examination for External Events (IPEEE). Per NUREG-1407, Table 3.1, WBN is a "0.3g Focused Scope" plant. As described in GENERIC LETTER 88-20, SUPPLEMENT 5, the required relay evaluation for a 0.3g Focused Scope plant is limited to a review for low seismic ruggedness relays (Bad Actor Relays). Bad Actor Relays are those that can be prone to "chatter" during a review level earthquake. "Chatter" is considered to be the inadvertent opening or closing of a relay, contact, or switch with a sustained output of two milliseconds or more.

This WBNU2 Focused Scope approach has been refined from the approach used for the relay review performed for the WBNU1 IPEEE. That is, the WBNU1 relay evaluation included portions of the required relay review for a Full Scope plant, including a review for fail safe circuitry for all devices on the SSEL followed by the review for Bad Actor Relays. The WBNU1 relay review, completed in 1997, found that no low seismic ruggedness relays were used in applications which would qualify them as essential relays, and that no corrective actions were required for this element of the IPEEE.

Although recognized as a refinement to the WBNU1 approach, the WBNU2 Focused Scope approach is considered to be fully adequate for the WBNU2 IPEEE. WBNU1 results were confirmatory, and the WBNU2 Focused Scope approach is fully consistent with the regulatory guidance. Consistent with NUREG-1407, the WBNU2 design review for low ruggedness relays will be performed as the first step, followed by the fail safe review for identified low-ruggedness relays.

1.2 Purpose

The purpose of this relay chatter evaluation is to determine if any Bad Actor Relays exist in WBNU2 safe shutdown systems for which malfunction is unacceptable. This evaluation will also determine if any Bad Actor Relays exist in upgraded or added systems since the WBNU1 IPEEE evaluation. Proper design output requirements are in place to prevent the installation of "Bad Actor Relays" in seismically sensitive configurations which could degrade the design basis response of critical plant safety features. Proper due diligence is required to confirm these requirements are in place and their intent is met.

This design report is a snapshot in time. It will be verified once designed systems, devices and components are installed and tested.

2.0 REFERENCES

2.1 WBNIPEEE-001, "Watts Bar Nuclear Plant IPEEE Seismic Margins Evaluation Safe Shutdown Paths and Safe Shutdown Equipment List" – Unit 1 Evaluation

2.2 WBNIPEEE-002, "Watts Bar Nuclear Plant IPEEE Seismic Margins Evaluation Relay Evaluation" – Unit 1 Relay Evaluation

2.3 WBNIPEEE-003, "Watts Bar Nuclear Plant IPEEE Seismic Margins Evaluation Safe Shutdown Paths and Safe Shutdown Equipment List" – Unit 2 Evaluation

2.4 EPRI NP-7147-SL, 'Seismic Ruggedness of Relays", August 1991.

2.5 NUREG-1407, "Procedural and Submittal Guidance for the Individual Plant Examinations of External Events(IPEEE) for Server Accident Vulnerabilities", Final Report, US Nuclear Regulatory Commission, June 1991.

2.6 EPRI NP-7148-SL, "Procedure for Evaluating Nuclear Power Plant Relay Seismic Functionality", December 1990.

2.7 EPRI NP-6041M, Revision 1, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin", August 1991.

2.8 EPRI NP-5223-SL, Revision 1, "Generic Seismic Ruggedness of Power Plant Equipment" August 1991.

2.9 SS-E18.7.42, TVA Nuclear Power Standard Specifications for Process Instrument Switches. Multiple listings of Approved Specifications for Procurement of Devices.

2.10 Generic letter 88-20 Supplement 4 & 5, Individual Plant Examination of External Events" (IPEEE).

2.11 WB-DC-30-27, "AC and DC Control Power Systems" (UNIT 1 / UNIT 2), Rev. 0029, October 2009.

2.12 NEDP-8, "Technical Evaluation For Procurement of Materials And Services", Rev. 0014, July 2009.

2.13 WBN-VTD-W120-2568, "Westinghouse Full Length Rod Control System", Watts Bar Nuclear Plant.

3.0 DESIGN INPUT DATA

3.1 Safe Shutdown Equipment List (SSEL)

The SSEL, provided in Reference 2.3, identifies the systems and equipment needed to achieve WBNU2 safe shutdown.

3.2 List of Low-Seismic-Ruggedness Relays (Appendix A)

A list of Bad Actor Relays, as identified in Appendix E of Reference 2.7, is included in this report as Appendix A. The relay evaluation procedure for seismic demand determination and Generic Equipment Ruggedness Spectra (GERS) cannot be applied to these relays due to their low seismic ruggedness. Such relays are considered acceptable if it can be demonstrated that the effects of the chatter can be reset by operator action or that the relay contact does not play a role in achieving safe shutdown.

3.3 Control and Power Interface Review (Appendix B)

The equipment on the WBNU2 SSEL requiring power or control was reviewed to determine whether the control and power requirements were unlike that of WBNU1. The objective was to identify the relays, contacts and power sources used by the safe shutdown equipment that may be different than that of Unit 1. Flow, control, wiring and logic diagrams as well as single-line and schematic drawings were the source documents for this review. The fail safe logic established by the U1 IPEEE would apply to WBNU2 unless any differences in devices, components or wiring were identified. All differences will be reflected within Appendix B of the verification report.

3.4 Bad Actor Relay List (Appendix C)

The Relay List identifies potential Bad Actor Relays requiring further screening or analysis. This list was developed based on the SSEL, the Control and Power Interface Review, the Electric Power Research Institute (EPRI) NP-7147-SL Appendix E list of low ruggedness relays and the following TVA and vendor design input data:

- Vendor Assembly and Bill of Material Drawings
- Vendor Manuals
- Manufacturer supplied Documentation
- TVA Connection and Bill of Material Drawings
- TVA Contract Files
- TVA Design Change Notice (DCN) Document/Engineering Document Construction Release (EDCR) Packages

- TVA Design Criteria and Operation/Construction Database

4.0 ASSUMPTIONS AND METHODOLOGY

4.1.1 Per reference 2.5 "NUREG-1407", paragraph 3.2.4.2, "Relay Evaluation" and table 3.1, 'Review Level Earthquake - Plant Sites East of the Rocky Mountains", the scope of the Watts Bar Nuclear Plant relay chatter evaluation is to locate and evaluate low-seismic-ruggedness relays.

4.1.2 Per reference 2.4, "EPRI NP-7147-SL" pages 3-3 and 3-4, the following are used in establishing the set of relays evaluated for relay chatter:

- With the exception of the type General Electric IJD (NON-1E) and the English Electric type YCG relays, the Bad Actor Relays are not structurally damaged as a result of an earthquake and will be functional after the period of strong shaking.
- It is necessary to verify that relay malfunction during strong shaking does not result in an unacceptable seal-in, lockout, or system disabling action. In such cases, operator actions to reset or restore such circuits to their original condition are acceptable provided there is sufficient time, access, indication and procedures for such actions to be taken.
- Specific relays and their associated circuits are considered non-essential for shutdown after an earthquake if:

  1. The function provided by the system and associated relays is not needed during the period of strong shaking and relay malfunction will not make essential functions unavailable when needed after strong shaking, or operator action can be taken to restore the function.
  2. Relay malfunction does not prevent the desired function (e.g., reactor trip) from occurring.
  3. Relay malfunction does not cause a spurious, unacceptable event.
  4. Relay malfunction affects only alarm circuits.

- No corrective actions are required for non-essential relays.
- Relay chatter is considered to be the inadvertent opening or closing of a relay contact with a sustained output of two milliseconds or more.
- Mechanically (versus electromechanical) actuated contacts, such as control switch contacts (e.g., hand switches, transfer switches, etc.) and limit switch contacts(e.g., those on motor operated valves) are judged to be not seismically vulnerable. These manual and mechanically driven switches require the application of reasonable force in order to change state.

- Solid state relays (with no mechanically moving parts) are considered inherently rugged and no seismic capacity evaluation is required.

4.1.3 Per Appendix A, transformer pressure surge sensing devices are considered low ruggedness relays (sudden pressure switches).

4.1.4 A relay may latch or seal-in due to the seismic event. The relay evaluation procedure, EPRI NP-7148-SL, allows for restoring or resetting systems providing there is sufficient time for the operator or an assistant to perform the necessary diagnostic evaluations and take the necessary resetting or restoring actions. This may be dependent on the system involved. However, one-half to one hour should be adequate time to reset most systems.

4.1.5 EPRI NP-5223-SL (Reference 2.8) identifies the following position for relay chatter in switchgear enclosures:

> The functionality of switchgear is governed by the control, protective, and associated auxiliary relays. In many tests the standard 2-ms chatter failure criterion was utilized. Due to this conservative failure criterion, many relays were found to be unacceptable when mounted on switchgear enclosures. However, in other tests the switchgear was considered as a complete subsystem where chatter can be tolerated without loss of switchgear function. The primary function of the switchgear is to either connect or disconnect a main power circuit to protect the remainder of the circuit against overcurrent, overvoltage, undervoltage, phase reversal, etc., or to switch circuits upon demand. As long as the switchgear can perform its primary function, the occurrence of minor chatter in a control, protective, or associated auxiliary relay is not a relevant concern. Thus, in contrast to control circuits where short duration (> 2ms) relay chatter is considered a failure to "operate", switchgear fails only by a non-commanded change of state. In order to cause switchgear loss of function, relay chatter must have significant duration (usually greater than the period of one AC cycle or > 16ms). IEEE guidelines for seismic testing of switchgear have recognized this chatter tolerance in switchgear.

4.1.6 The diesel generator is not required until after the seismic event which is consistent with the scenario described in Reference 2.7. Therefore, the controls (i.e., relays) necessary to start the diesel generator are not required during the strong motion of the seismic event.

4.1.7 The 480V Diesel Auxiliary Boards are not used until after the diesel generator is supplying power to the plant. Section 4.1.6 states that the diesel generator is not required until

after the seismic event. Only those relays that latch seal-in or otherwise become unavailable will be evaluated.

4.1.8 The SSEL, Relay Evaluation and IPEEE Report will be verified at a point in the future. This point will be after all operating procedures are available, start-up testing is finalized and construction is substantially complete.

4.2 Methodology

The following describes the approach which will be used in verifying the low ruggedness relays which could interfere with the safe shutdown of WBN:

- Determine similarities between WBNU1 SSEL and WBNU2 SSEL and screen like-for-like equipment.
- Select the equipment requiring power from the Safe Shutdown Equipment List.
- Perform a "Control-Power Interface Review" (Appendix B) to identify the circuits and relays/contacts which affect the operation of the safe shutdown systems.
- Identify the equipment in which potential "Bad Actor" relays reside. Using the design input data in Section 3.4, develop a list of potential "Bad Actor" relays types. It should be noted that the "Operating Mode" of the W Type SG and the GE Type HGA relays must be determined before classifying them as Bad Actor Relays.
- Evaluate the application of the relays on the list and develop a list of relays requiring further study; relays are defined by Appendix E of Reference 2.6.
- Screen the Bad Actor Relays whose chatter/malfunction will not prevent system/component functioning or cause an unacceptable condition.
- Screen the Bad Actor Relays where "operator action" to reset or restore system/function is acceptable.
- Designate relays which cannot be screened as "Essential Relays".
- Identify required corrective action.

5.0 ANALYSIS

5.1 General

The scope of the relay evaluation as stated in NUREG-1407 is to "locate and evaluate low ruggedness relays" involved in the operation of Seismic Margin equipment. The following activities are required to accomplish this:

1. Locate the set of relays, mercury switches, and transformer pressure surge sensing devices (sudden pressure switches) which affect the operation of the safe shutdown systems. (see Appendix A)
2. Develop a list of low ruggedness relays, mercury switches, and transformer pressure surge sensing devices (sudden pressure switches) that are on the Bad Actor Relay list (see Appendix B).This is accomplished using the mechanics described in Section 4.2.
3. Screen out non-essential Bad Actor Relays and switches.
4. Identify essential Bad Actor Relays.
5. Prove that the intentionally designed, fail safe circuitry allows for safe shutdown. This item is not required but performed.
6. Identify the corrective action required where essential Bad Actor Relays are used.

This section describes the rationale used in arriving at the Potential Bad Actor Relay list. This section is derived from both the similarities between Unit 1 and Unit 2 and the differences between Unit 1 and Unit 2. By developing a list of all potential Bad Actors at WBN, the total effective fragility can be realized.

5.2 Mercury Switches

The use of mercury wetted contacts in pressure, temperature, level, and flow switches is prohibited and controlled by NEDP-8, Reference 2.12. Also the design requirements section of the Standard Specifications for each type of switch prohibits the use of mercury through the utilization of Form 10581-13 "I&C Requisition Data Sheet", specifically Line 15.

5.3 Sudden Pressure Switches

The only sudden pressure switches which could affect the safe shutdown systems are associated with the two preferred power 161 to 6.9kV common station service transformers (CSST C&D). CSST C&D and the associated switches are not safety related and as such are not included on the SSEL. The switch's function is to initiate an automatic open-circuit fast transfer between the normal and alternate feeds to the 6.9kV shutdown boards. Pressure switch contact chatter associated with CSST "C" could cause spurious "fault pressure relaying" resulting in fast transfer from normal to alternate feed. This is the result of contacts

C86C1X and C86C2X which signal closure for 6.9kV shutdown boards 1A-A and 2A-A (see Figure 5.1). Once auto fast transfer is initiated, further automatic fast transfer is prevented by the auto transfer lockout logic. Spurious fault pressure relaying associated with CSST "D" will cause a fast transfer for feeds 1B-B and 2B-B. This inadvertent transfer is acceptable, and will not prevent the starting of the diesel generator initiated by the postulated loss of off-site power (LOOP). Therefore sudden pressure switch contact chatter is acceptable.

5.4 6.9kV Shutdown Boards

The GE Model 12HGA14AF52 relays are interposing relays (AX) which provide contacts to the closing circuit of the four diesel generator breakers. The normal operating mode for the relays is de-energized and the normally open contact is used in the control circuit. Therefore, the relays do not qualify as Bad Actor Relays (see Figure 5.2).

The GE Model 12HGA11J52 relays are auxiliary relays (51x, DCS1"x" & DCS1"x"E) which provide contacts to annunciation circuits and are screened by assumption 4.1.2.

5.5 480V Shutdown Boards

Three Westinghouse Type SG relays are in each Unit board and are under voltage relays (27S"xxx"X, DCS"x" & DCS"x"E) which provide contacts to annunciation circuits and are screened by assumption 4.1.2.

Two Westinghouse Type SG relays are in each Unit board. The equipment controlled by these relays is not on the SSEL and therefore are considered screened.

5.6 120V AC Vital Instrument Power Boards

One Westinghouse Type SG relay is in each Unit board and serves as an under voltage relay (27/2-"x") which provides a contact to an annunciation circuit and is screened by assumption 4.1.2.

5.7 Diesel Generator Protection Relay Panel

There are twelve GE Model 12HGA17M52 relays in each relay panel. The relays are designated as follows: 74, ES1AY1, RRX1A, ESX1A, ESX11A, ESX21A, SRX1A, SLX1A, R01, RC1, RO2 and SPARE. Relay RRX1A's normal operating mode is de-energized and

provides a normally closed contact to the "Safety Shutdown Reset" circuit and therefore qualifies as a Bad Actor Relay. The other relays are screened based on their operating mode.

The function of relay RRX1A is to provide remote reset from main control room panel 0-M-26 (see Figure 5.3). Since there would be no reason for the circuit to be set, contact chatter would have no adverse effect and therefore the relay is screened.

5.8 LOCA Containment Hydrogen Monitor Sampling Isolation Valves

There is one GE Model 12HGA11J52 relay in the circuit of the four isolation valve pairs. The relays are designated as 42X1 & 42X2. During normal operation each relay is de-energized and two normally open contacts are used in the Auto-Open circuit of each valve pair (see Figure 5.4). GE type HGA relays used in this operating configuration do not qualify as Bad Actor Relays.

5.9 WBNU1 and WBNU2 System Differences

In order to accept like for like equipment, it is also necessary to accept like for unlike equipment. This section identifies these differences at a design level and will be an integral portion of the verification activities at WBN which will be included in the final IPEEE report. The below systems have been identified by the design Relay Evaluation team to have dissimilar or new qualities than that of the WBNU1 relay evaluation.

5.9.1 System 043 – Sampling and Water Quality

The only safety related function that System 43 provides is containment isolation of the containment penetrations to which the sample lines are attached. Sampling System has fail-closed inboard and outboard containment isolation valves for each penetration to which a sample line is attached. Sampling and Water Quality System has no outgoing signals other than valve position indication and illumination. There is no component or electrical difference between Unit 1 and Unit 2 at WBN but the system, identified by Reference 2.2 (WBNU1 IPEE Relay Evaluation) as having a "Potential Bad Actor Relay," was not fully described in the Unit 1 Evaluation. This system is now described for clarity and confirmation only.

5.9.2 System 085 - Control Rod Drive Mechanisms

This system consists of two types of rods: 1) shutdown rods and 2) control rods. Shutdown rods are required to provide sufficient negative reactivity thus ensuring the reactor remains subcritical. These rods are fully withdrawn during normal operation. Control rods are used to control the reactor core reactivity. Shutdown and control rods are raised or lowered by a prescribed set of electromechanical actions performed by the control rod drive (CRD) mechanisms.

A review of the Vendor Technical Manual (WBN-VTD-W120-2568), Reference 2.13, for the Full Length Rod Control System was completed in order to verify whether any installed relays could negatively affect components identified by the SSEL. The review determined that Bad Actor Relays, as identified in Appendix E of Reference 2.7 "Low Ruggedness Relays", are not used in the Unit 1 Control Rod Drive System and will not be used in the Unit 2 system.

After this design review, it was determined that the shutdown rods identified in the SSEL supply enough negative reactivity to maintain the reactor in a safe shutdown condition.

5.9.3 System 090 - Radiation Monitoring System

There are ten flow control valves and four radiation monitors on the SSEL for this system. The four radiation monitors are for indication only and have no control function, therefore having no impact to the safe shutdown of WBNU2.

The Unit 2 controls for these valves will be like the Unit 1 valve controls, therefore no bad actor relays will be used.

5.9.4 System 092 - Neutron Monitoring System

The WBNU2 Power Range and Auxiliary Equipment drawers are refurbished by Westinghouse and the relays used will be similar to Unit 1 but improved due to certain upgrades. The function of this part of System 92 is identical to Unit 1 except a time delay circuit is added to Unit 2 Flux Deviation drawer, whereas Unit 1 has a time delay in the annunciator system for the QPTR alarms. Like the Unit 1 system, no bad actor relays will be used in the Unit 2 Neutron Monitoring System.

5.9.5 System 099 - Reactor Protection System

The purpose of the Reactor Protection System (RPS) is to provide automatic protection against unsafe and improper reactor operation during steady-state and transient power operations and to provide initiating signals to mitigate the consequences of faulted conditions. The Reactor Protection System is composed of two subsystems, the reactor trip subsystem and the engineered safety features actuation subsystem.

The reactor trip subsystem automatically keeps the reactor operating within a safe region by shutting down the reactor whenever the limits of the region are approached. The safe operating region is defined by several considerations such as mechanical/hydraulic limitations on equipment, and heat transfer phenomena. Therefore, the reactor trip subsystem keeps surveillance on process variables which are directly related to equipment mechanical limitations, such as pressure, pressurizer water level and also on variables which directly affect the heat transfer capability of the reactor (e.g., flow and reactor coolant temperatures). Still other parameters utilized in the reactor trip system are calculated from various process variables. In any event, whenever a direct or calculated variable exceeds a set point, the reactor will be shut down in order to protect against either damage to fuel cladding or loss of system integrity which could lead to release of radioactive fission products into the containment.

The engineered safety features actuation subsystem uses selected plant parameters, determines whether or not predetermined safety limits are being exceeded and, if they are, combines the signals into logic matrices sensitive to combinations indicative of primary or secondary system boundary ruptures. Once the required logic combination is completed, the system sends actuation signals to the appropriate Engineered Safety Features.

The reactor trip system, and engineered safety features actuation system shall be capable of providing the necessary protective actions during and after a Safe Shutdown Earthquake (SSE). Therefore, the reactor protection system shall be capable of tripping the reactor during and after a Safe Shutdown Earthquake. The engineered safety features actuation system and the safety features systems shall be designed to initiate their protective functions during and after an SSE.

Integral to the RPS is the Eagle 21 Process Protection System located in panel 2-R-28 and panels 2-R-1 through 2-R-13 and the Solid State Protection System (SSPS) located in panel 2-R-58 and panels 2-R-46 through 2-R-55. Westinghouse has been contracted for WBN Unit 2 to install the Eagle 21 equipment and refurbish the SSPS hardware in the aforementioned panels.

Currently, designed system components do not house or rely on Bad Actor Relays. Verification activities will include confirming the SSEL components of this system are not subject to unacceptable relay chatter.

5.9.6 System 236 – 125 VDC Vital Power

An addition to the WBNU2 SSEL included the Fifth Vital Battery and the components to distribute and transfer power from them to either Train A or Train B via a transfer switch located on the panel; making it completely independent and able to serve either Train as a backup for maintenance or accident purposes. The batteries, distribution panels A&B and the 125 V Vital Battery Board V were confirmed to have no low seismic ruggedness relays and fail safe circuitry is adequate for the system. The charger for Battery V is not included in the SSEL since during the use of the batteries, charging them is performed through the use of the SPARE charger for the system it is serving. Both SPARE chargers were evaluated and qualified by the WBNU1 IPEEE. There are no Inverters specifically for the Vital Battery V loop. Existing inverters, also evaluated and qualified by the WBNU1 IPEEE, are utilized from the battery that is unavailable.

6.0 RESULTS

Through initial design review, there are no low-seismic-ruggedness relays used in applications which would qualify them as an essential relay; therefore no corrective action is anticipated.

7.0 VERIFICATION

Verification activities include a full review, in respect to changes, of the design documents created for this design report. The design documents created for this review will first be verified and validated against the Unit 2 SSEL when the Unit 2 Master Equipment List (MEL), OPS Procedures and PSA Review can be completed and verified (Reference 2.3, Section 1.0).

During this verification review, a Control and Power Interface will be created to document any differences between Unit 1 and Unit 2, including but not limited to SSEL, control and/or power and fail safe circuitry. This Interface will be the source document for further investigation of Bad Actor Relays and will be available as Appendix B of the verification report. If no differences in Unit 1 and Unit 2 are identified, this verification report will conclude that WBN requires no corrective actions for the issue of Relay Chatter.

FIGURE 5.1

TVA Drawing # 45W760-211-1 Rev 12 & 45W760-211-3 Rev 8

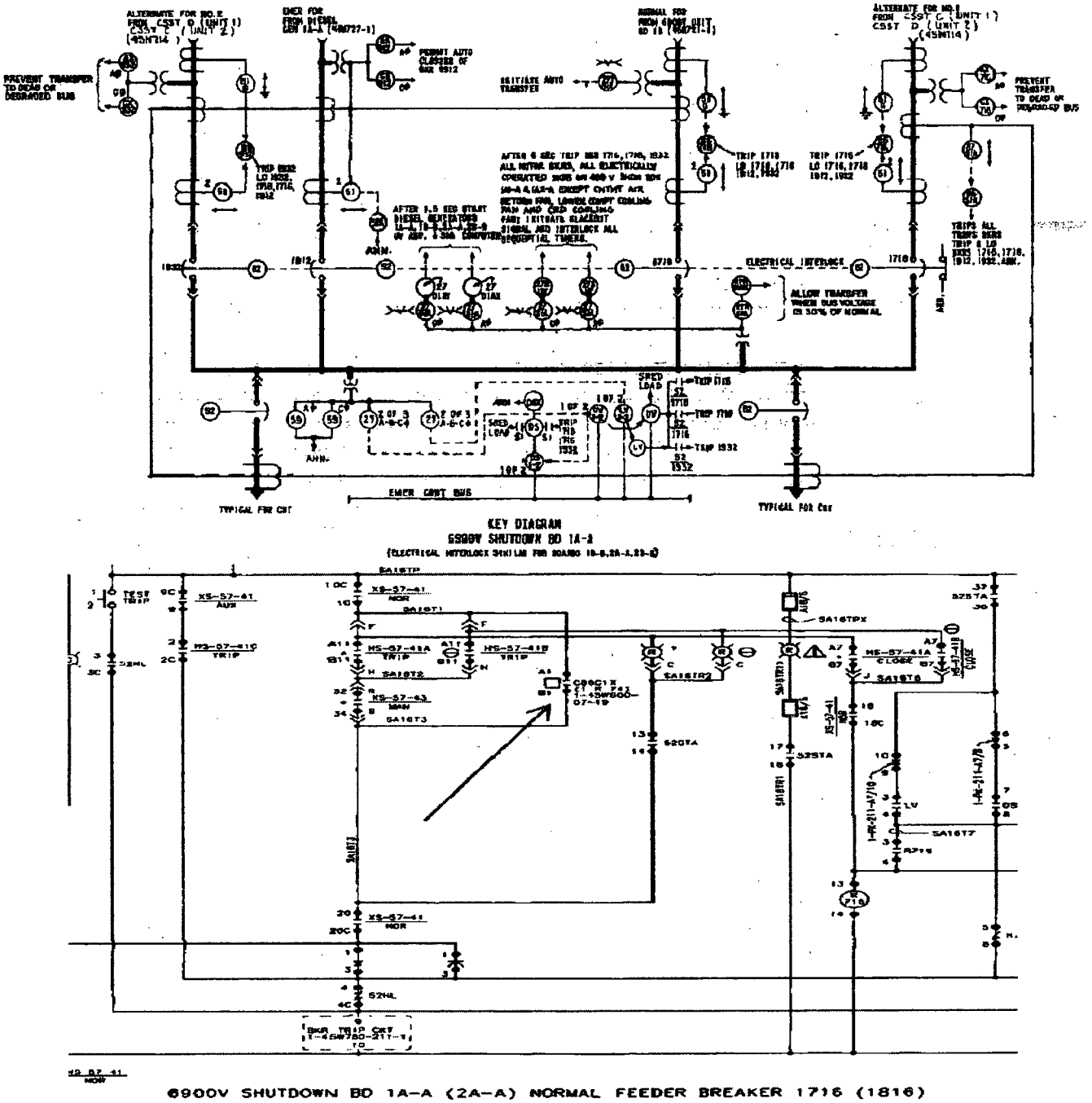
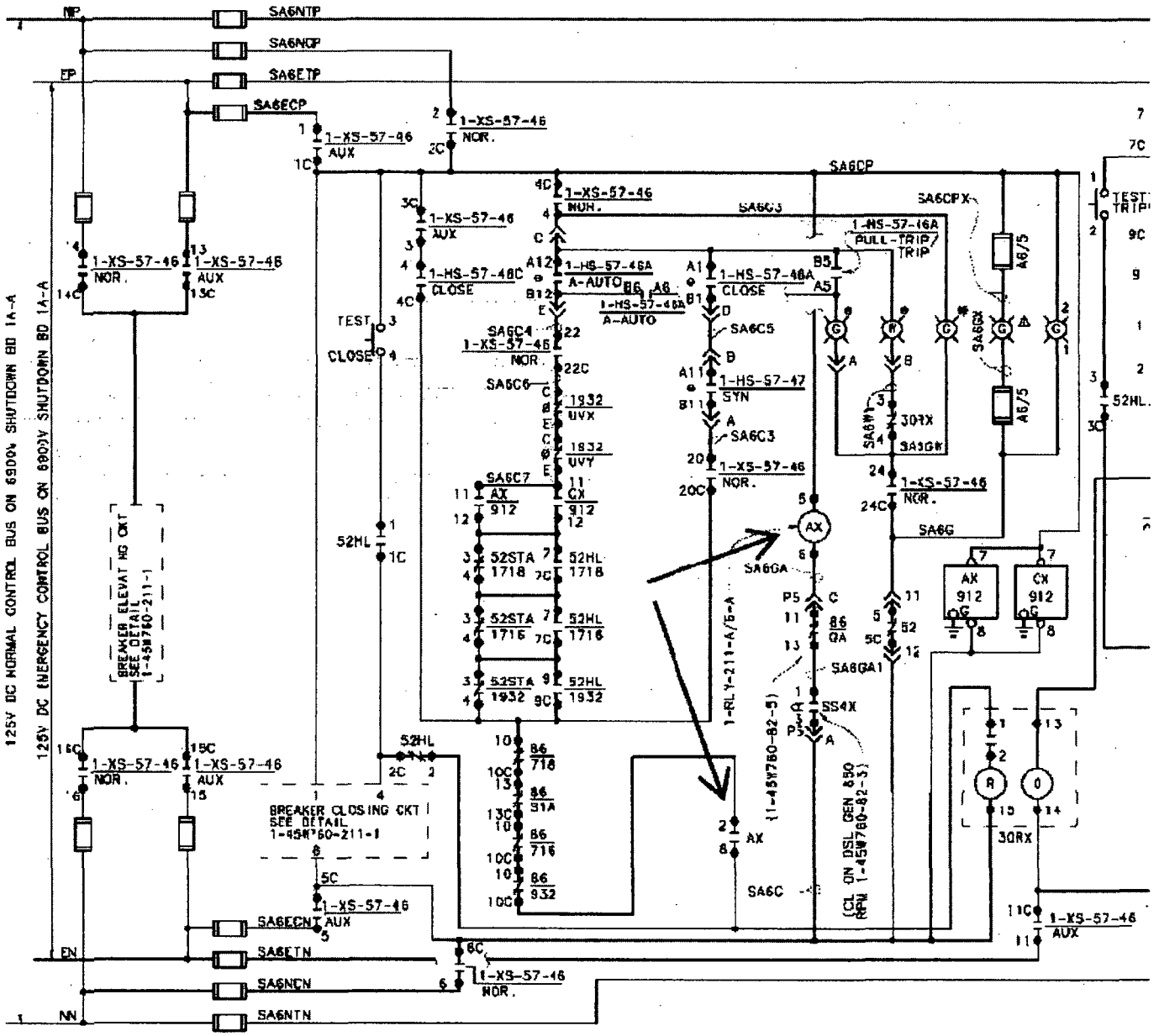
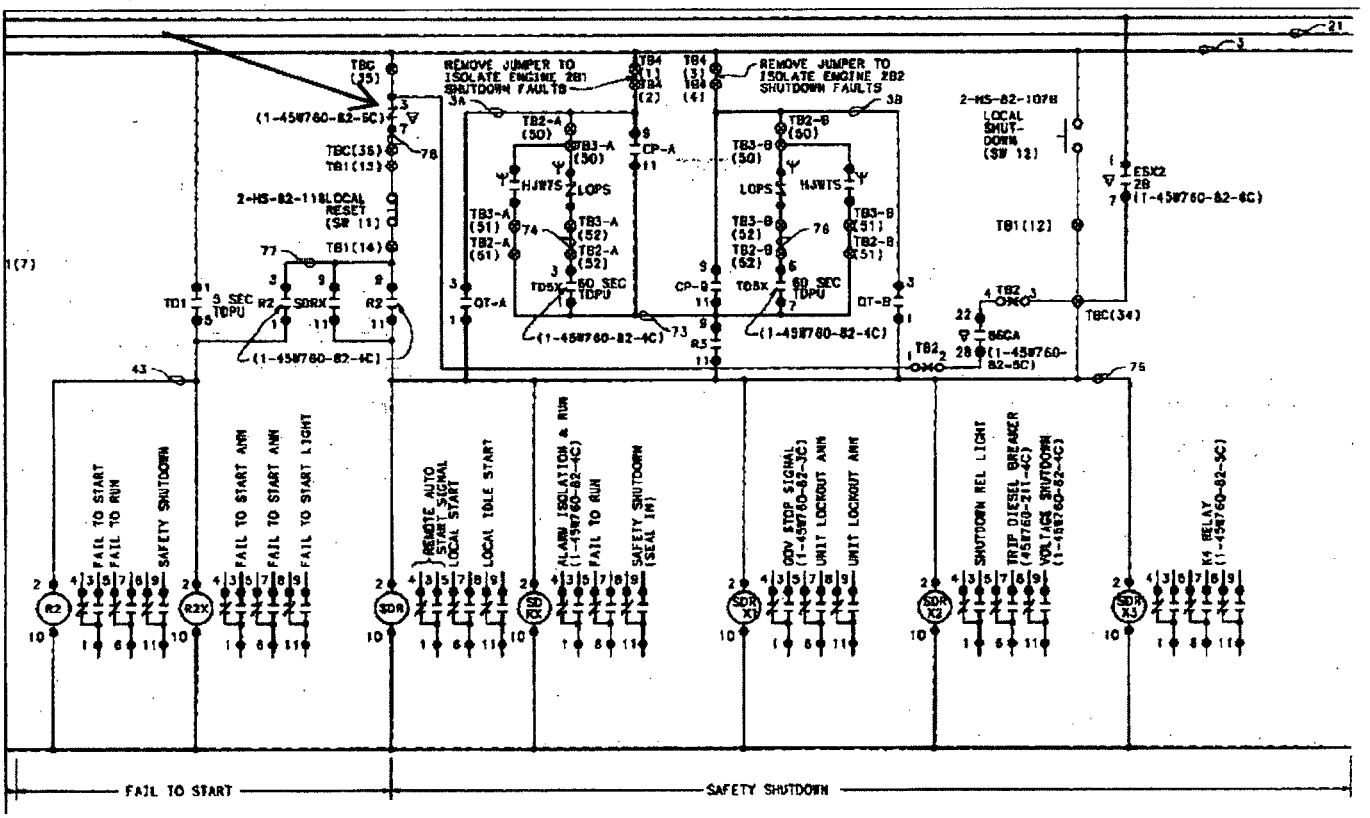


FIGURE 5.2
TVA Drawing # 45W760-211-4 Rev 15



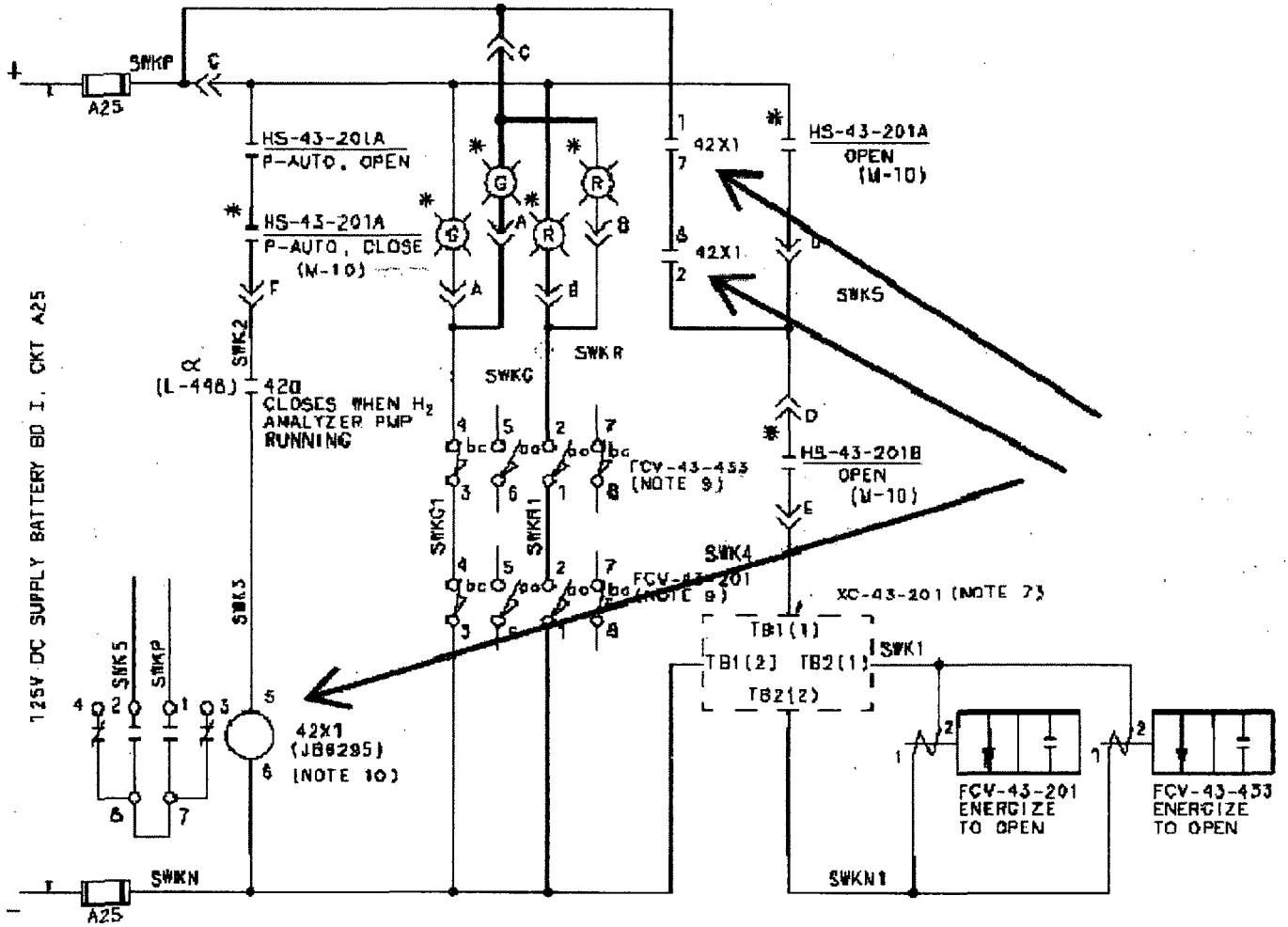
6.9kV SHUTDOWN BOARDS

FIGURE 5.3
TVA Drawing # 45W760-82-2C Rev 8



DIESEL GENERATOR PROTECTION RELAY PANEL (UNIT 2)

FIGURE 5.4
TVA Drawing # 45W600-43-2 Rev 25



FCV-43-201 (INBOARD) AND FCV-43-433 (OUTBOARD) TRAIN A

LOCA II. CONTAINMENT ISOLATION VALVE

TVA NO.	TRAIN	WIRE PREFIX	FUSE SUPPLY UNIT 1	FUSE SUPPLY UNIT 2	LOCAL PANEL	RELAY	RELAY LOCATION	CONSTANT CURRENT UNIT
FCV-43-201 FCV-43-433	A	SWK	I -A25	[illegible]	L-448	42X1	JB-6295	XC-43-201
FCV-43-202 FCV-43-434	A	SWL	I -A27	[illegible]	L-448	42X2	JB-6295	XC-43-202
FCV-43-207 FCV-43-435	B	SWM	II -B34	[illegible]	L-449	42X1	JB-6294	XC-43-207
FCV-43-208 FCV-43-436	B	SWN	II -B35	[illegible]	L-449	42X2	JB-6294	XC-43-208

LOCA CONTAINMENT HYDROGEN MONITOR ISOLATION VALVES

APPENDIX A - LOW RUGGEDNESS RELAYS

The relay evaluation procedure seismic demand determination and GERS cannot be applied to these relays because of their low seismic ruggedness or demonstrated sensitivity to high frequency vibration. Case specific techniques or current qualification techniques must be utilized to demonstrate the adequacy of these relays.

RELAY TYPE	OPERATING MODE	REFERENCES
GE CFD	ALL	1 (91-14/313, 82-26/348, 86-13/293), 2, 3, 4, 5, (IN 85-82), 6
GE CFVB	ALL	2, 3, 6
GE CEH	ALL	2, 6
GE CPD	ALL	2, 6
GE IJD* (NON 1E)	ALL	2
GE PVD11 AND PVD21	ALL	1 (84-20/352), 3, 4, (GE)
GE RAV11	ALL	4 (GE)
GE HGA	(DE, NC)	1 (84-18/331, 86-15/269, 87-11/250), 4,5 (IN 88-14)
GE HFA65	ALL	4 (BNL)
W HLF	ALL	2, 6
W HU (NON 1E)	ALL	3, 6
W ITH	ALL	1 (81-44/346 AND 81-37/346)
W ARMLA	ALL	5 (IN 82-55)
W PMQ	ALL	1 (85-16/247)
W SG	(DE, NC)	4 (ANCO)
W SV	ALL	4 (BNL)
W SC	ALL	4 (BNL)
W SSC	ALL	4 (BNL)
W CON-5 (NON 1E)**	ALL	1 (88-06/387)
ASEA ARMX-L	ALL	1 (88-06/387)
ENGLISH ELECTRIC YCG*	ALL	2
MERCURY SWITCHES	ALL	1 (86-25/249), 2
SUDDEN PRESSURE SWITCHES π	ALL	2

REFERENCES:

1)GERS
2)EARTHQUAKE EXPERIENCE DATA
3)SAFEGUARDS DATA
4)IEEE 501 TEST DATA
5)NOTICES, BULLETINS, ETC
6)INDUCTION CUP OR INDUCTION CYLINDER DESIGN

- DE = DE-ENERGIZED
- E = ENERGIZED
- NC = NORMALLY CLOSED CONTACT
- NO = NORMALLY OPEN
- ALL = ALL MODES

* DAMAGE HAS OCCURRED TO THIS RELAY IN AN EARTHQUAKE AND IT MUST BE ASSUMED THAT IT WILL BE INOPERABLE FOLLOWING AN SSE LEVEL EARTHQUAKE

π TRANSFORMER PRESSURE SURGE SENSING DEVICES

** WITH SSC-T OR IITH UNIT

APPENDIX B – Control and Power Interface Document

PROVIDED AFTER COMPLETED VERIFICATION ACTIVITIES

APPENDIX C – LIST OF POTENTIAL BAD ACTOR RELAYS

Component ID	Component Description	Bad Actor Relay Type	# of Relays	See Section	REFERENCE DOCUMENTS
1-ARB-082-A-A	DG 1A-A PROTECTION RELAY PANEL	GE TYPE 12HGA17M52 / W TYPE SC	12 / 1	5.7	TVA DWG 45W727, 45W760-82-1, -2, -3, -4, -5, -6, D47495-3
1-ARB-082-B-B	DG 1B-B PROTECTION RELAY PANEL	GE TYPE 12HGA17M52 / W TYPE SC	12 / 1	5.7	TVA DWG 45W727, 45W760-82-1, -2, -3, -4, -5, -6, D47495-3
2-ARB-082-A-A	DG 2A-A PROTECTION RELAY PANEL	GE TYPE 12HGA17M52 / W TYPE SC	12 / 1	5.7	TVA DWG 45W727, 45W760-82-1, -2, -3, -4, -5, -6, D47495-3
2-ARB-082-B-B	DG 2B-B PROTECTION RELAY PANEL	GE TYPE 12HGA17M52 / W TYPE SC	12 / 1	5.7	TVA DWG 45W727, 45W760-82-1, -2, -3, -4, -5, -6, D47495-3
1-BD-211-A-A	6.9 KV SHUTDOWN BOARD 1A-A	GE TYPE 12HGA14AF52	4	5.4	TVA DWG 45W724-1, 45W760-211-4, 45BM247-1, GE 84376,CONNECTION DWGS
1-BD-211-B-B	6.9 KV SHUTDOWN BOARD 1B-B	GE TYPE 12HGA14AF52	4	5.4	TVA DWG 45W724-1, 45W760-211-4, 45BM247-2, GE 84376,CONNECTION DWGS
2-BD-211-A-A	6.9 KV SHUTDOWN BOARD 2A-A	GE TYPE 12HGA11J52	32	5.4	TVA DWG 45W724-1, 45W760-211-4, 45BM247-1, GE 84376,CONNECTION DWGS
2-BD-211-B-B	6.9 KV SHUTDOWN BOARD 2B-B	GE TYPE 12HGA11J52	32	5.4	TVA DWG 45W724-1, 45W760-211-4, 45BM247-2, GE 84376,CONNECTION DWGS
1-BD-212-A1-A	480V SHUTDOWN BOARD 1A1-A	W TYPE SG	5	5.5	TVA DWG 45W749-1, W 75767A - DWGS 6947D01, 6947D02, 6947D10, 618F932
1-BD-212-A2-A	480V SHUTDOWN BOARD 1A2-A	W TYPE SG	5	5.5	TVA DWG 45W749-2, W 75767A - DWGS 6947D01, 6947D02, 6947D18, 6947D19
1-BD-212-B1-B	480V SHUTDOWN BOARD 1B1-B	W TYPE SG	5	5.5	TVA DWG 45W749-3, W 75767A - DWGS 6947D01, 6947D02, 6947D27
1-BD-212-B2-B	480V SHUTDOWN BOARD 1B2-B	W TYPE SG	5	5.5	TVA DWG 45W749-4, W 75767A - DWGS 6947D01, 6947D36, 6947D37

Component ID	Component Description	Bad Actor Relay Type	# of Relays	See Section	REFERENCE DOCUMENTS
2-BD-212-A1-A	480V SHUTDOWN BOARD 2A1-A	W TYPE SG	3	5.5	TVA DWG 45W749-1A, W 75767A - DWGS 6947D01, 6947D58, 618F938
2-BD-212-A2-A	480V SHUTDOWN BOARD 2A2-A	W TYPE SG	3	5.5	TVA DWG 45W749-2A, W 75767A - DWGS 6947D01, 6947D66, 6947D67
2-BD-212-B1-B	480V SHUTDOWN BOARD 2B1-B	W TYPE SG	3	5.5	TVA DWG 45W749-3A, W 75767A - DWGS 6947D01, 6947D75, 618F941
2-BD-212-B2-B	480V SHUTDOWN BOARD 2B2-B	W TYPE SG	3	5.5	TVA DWG 45W749-4A, W 75767A - DWGS 6947D01, 6947D84, 6947D85
1-BD-235-0001-D	120VAC VITAL INSTRUMENT POWER BOARD 1-I	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
2-BD-235-0001-D	120VAC VITAL INSTRUMENT POWER BOARD 2-I	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
1-BD-235-0002-E	120VAC VITAL INSTRUMENT POWER BOARD 1-II	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
2-BD-235-0002-E	120VAC VITAL INSTRUMENT POWER BOARD 2-II	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
1-BD-235-0003-F	120VAC VITAL INSTRUMENT POWER BOARD 1-III	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
2-BD-235-0003-F	120VAC VITAL INSTRUMENT POWER BOARD 2-III	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
1-BD-235-0004-G	120VAC VITAL INSTRUMENT POWER BOARD 1-IV	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5
2-BD-235-0004-G	120VAC VITAL INSTRUMENT POWER BOARD 2-IV	W TYPE SG	2	5.6	TVA DWG 45W706-1, VTM W120-2064, W 85216 DWG CP-33419-MKE-BM-1, -2, -3, -4, -5

Component ID	Component Description	Bad Actor Relay Type	# of Relays	See Section	REFERENCE DOCUMENTS
1-JB-293-6294	JUNCTION BOX - LOCA CONTAINMENT H2 SAMPLING ISOLATION VALVES	GE TYPE 12HGA11J52	2	5.8	45W600-43-2, 47W611-88-1, 45W163-80
2-JB-293-6294	JUNCTION BOX - LOCA CONTAINMENT H2 SAMPLING ISOLATION VALVES	GE TYPE 12HGA11J52	2	5.8	45W600-43-2, 47W611-88-1, 45W163-80
1-JB-293-6295	JUNCTION BOX - LOCA CONTAINMENT H2 SAMPLING ISOLATION VALVES	GE TYPE 12HGA11J52	2	5.8	45W600-43-2, 47W611-88-1, 45W163-80
2-JB-293-6295	JUNCTION BOX - LOCA CONTAINMENT H2 SAMPLING ISOLATION VALVES	GE TYPE 12HGA11J52	2	5.8	45W600-43-2, 47W611-88-1, 45W163-80

Attachment 3:

Watts Bar Nuclear Plant Unit 2
Individual Plant Examination for External Events
Summary of Fire Evaluation Process

Report No. WBN-IPEEE-005

WATTS BAR NUCLEAR PLANT
UNIT 2

WBN-IPEEE-005

INDIVIDUAL PLANT EXAMINATION FOR EXTERNAL EVENTS

SUMMARY OF FIRE EVALUATION PROCESS

Prepared By J.J. Pierce / J.J. PIERCE / 4/26/2010
Signature Print Date

Reviewed By Quentin Seals / QUENTIN SEALS 4/26/10
Signature Print Date

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Signature Print Date

George Servicz / George Servicz 4/26/10

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EXECUTIVE SUMMARY

In 1997 Watts Bar Nuclear Plant submitted a response to Supplement 4 to Generic Letter 88-20 that determined the plant vulnerability to internal fire events for Unit 1 operation. That evaluation was based on the Fire Induced Vulnerability Evaluation (FIVE) methodology developed by the Electric Power Research Institute. This report summarizes the evaluation performed for the "as designed" configuration of Watts Bar Unit 2 and addresses the Unit 2 compartments (rooms) that were not addressed for the Unit 1 report and also includes any compartments that contain Unit 2 required components. The Unit 2 evaluation is also based on the same FIVE methodology as the Unit 1 report. Since this evaluation is based on the "as designed" plant configuration, there will be a validation effort performed at the completion of Unit 2 that will be based on the "as built" plant configuration.

The FIVE methodology consists of a progressive screening evaluation in which plant fire areas are screened from consideration based on *qualitative information* (Phase I) or by *quantitative analysis* (Phase II). Approximately 10% (17 of 140) of the compartments were screened in Phase I (see Section 2). This phase consists of screening fire areas based on area fire boundary integrity and the absence of safe shutdown components and plant trip initiators. The Unit 2 Reactor Building was screened based on qualitative factors.

The quantitative analysis (Phase II) then consists of an *initial quantitative evaluation* (see Section 4), followed by a more *detailed quantitative evaluation* (see Section 5) for areas that were not screened, based on a fire-induced core damage frequency of less than 1E-06.

The *initial quantitative evaluation* consists of generating a room-specific fire ignition frequency, then assuming that the postulated fire damaged all components in the fire affected room. Plant components that could be damaged by a postulated fire included safety injection/RHR (SI/RHR) components and components identified in the dual unit Appendix R analysis (WBN-EEB-EDQ00099920090012). A "conditional core damage frequency" was then generated for each area by incorporating the failed components into the Probabilistic Risk Assessment (PRA) model. Over 60% (71 of 116) of the rooms were screened during this phase.

The *detailed quantitative evaluation* was then performed for the remaining rooms. For those Control Building, Turbine Building and Auxiliary Building areas that did not screen at an initial level of evaluation, more detailed review techniques were used (e.g., zone of influence reviews for potential fires, segmentation of fire scenarios using event trees).

The results of the detailed evaluation process were that all remaining plant areas were screened from further consideration while maintaining a conservative level of assumed system failures within the analysis. This "as designed" evaluation did not identify any fire-induced vulnerabilities associated with the addition and operation of Unit 2 at Watts Bar.

1.0 INTRODUCTION

This report describes the process used to evaluate the fire hazards for Unit 2 at Watts Bar Nuclear Plant and the results of that process. The evaluation was performed in response to the Individual Plant Examination for External Events (IPEEE) requested by Supplement 4 of Generic Letter 88-20 (NUREG-1407, Reference 19). The methodology used to perform this examination is based on the Fire Induced Vulnerability Evaluation (FIVE) methodology that was developed by the Electric Power Research Institute (EPRI), as described in Reference 2.

The scope of the evaluation included the rooms that contain systems and equipment required to safely shutdown the unit in the event of a fire as identified in the Unit 2 Appendix R analysis. The evaluation was based on the "as designed" configuration of Unit 2. A validation of this analysis will be conducted when plant construction is complete to confirm this evaluation.

1.1 Overview of the FIVE Methodology

The EPRI FIVE methodology was used as a basis for evaluation of fire hazards and for screening fires from further consideration, based on screening criteria of less than 1E-06 core damage frequency due to fire related initiating events.

The FIVE documentation describes the fire evaluation process in three phases. The steps involved in each of these phases are described below.

Phase I **Qualitative screening and fire compartment interaction analysis**
During this phase, plant areas can be removed from further consideration based on the absence of safe shutdown equipment and no identified need for plant trip. In addition, fire boundaries are reviewed to ensure that a fire could not develop and then spread to other areas that may contain safe shutdown equipment or components.

Phase II **Quantitative evaluation of plant areas**
This phase accounts for the largest portion of effort for the fire hazard evaluation process and consists of the following steps.

Phase II (Step 1) identified room specific and generic plant fire hazards and their associated fire ignition frequencies for those rooms that were not screened out during the Phase I analysis. A total fire ignition frequency for each plant area is calculated as the sum of the individual ignition source frequencies in that area. EPRI identifies this frequency as F_1 and if it has a value of less than 1E-06, then the room can be screened from further evaluation. It has been noted that, if a room has any ignition sources, the F_1 will always be greater than 1E-06. This was the case with Unit 2.

Phase II (Step 2) evaluated the plant model impact for a fire in each of the rooms from Step 1 of this phase. Using the information from the Unit 2 Appendix R analysis, which assumed that any required component in the room was damaged by the fire, the PRA model was run. The results of this run generated a "conditional core damage frequency" for each room. This conditional core damage frequency is referred to as P_2 in the FIVE methodology.

The product of the Ignition Sources (F_1) and the conditional core damage frequency (P_2) results in a fire related core damage frequency (F_2).

$$F_2 = F_1 \times P_2$$

If F_2 is less than 1E-06, the room can be screened from further evaluation.

Phase II (Step 3) If F_2 for a room is greater than 1E-06, then additional evaluations were conducted. These additional evaluations included determining the zone of influence from fire ignition sources and dividing the fires into severity probabilities using an "event tree" approach.

PHASE III Results and Issues

The final phase of the fire evaluation process consists of the documentation of results and identification of any new or remaining issues, including those addressed by the Sandia Fire Risk Scoping Study (NUREG/CR-5088) and the evaluation of containment performance.

1.2 Implementation of the EPRI FIVE Methodology

The implementation of the EPRI FIVE methodology and the organization of this report is shown graphically in Figure 1-1. This implementation can be described as follows.

Phase I The qualitative screening process is described in Section 2 of this report. A Fire Compartment Interaction Analysis (FCIA) was performed to determine if a given room contained any components required for fire safe shutdown (FSSD) or could require a plant trip. In addition, the room was evaluated for the potential for fire spread from an exposed room to an adjacent room. There were 17 rooms out of 140 rooms, listed in Table 6.1, screened from further evaluation through this process. This evaluation is documented in the Fire Compartment Interaction Analysis Report (Reference 8).

Phase II The quantitative evaluation of the fire hazard frequency for each of the remaining rooms was then performed. This was based on the guidance given in the EPRI FIVE documentation, which was implemented in a three step process.

Phase II (Step 1) used the guidance in the EPRI FIVE documentation to generate fire ignition frequencies (F_1 values) for each room. These calculations are based on the plant-specific data listed in Sections 2 and 3. This process consisted of first allocating a plant area fire ignition frequency based on the assignment of each plant location to a generic type of area such as "Auxiliary Building, Switchgear Room", etc. Then the ignition sources were identified in each room and assigned a fire ignition frequency using the information provided by the FIVE documentation. The sum of the individual fire ignition frequencies becomes the room's total fire ignition frequency (F_1). This evaluation is documented in the Ignition Source Data Report (Reference 10), and is summarized in Section 3 of this report. Only the Unit 2 Reactor Building and Annulus were screened, based on qualitative factors, from further evaluation at this level of evaluation.

Phase II (Step 2) assumed that all components in the room were impacted (i.e. failed) by a postulated fire. The credited safe shutdown components located outside the room with the fire were then used as input to the PRA model and their unavailability factor was determined and this factor is referred to as P_2. The product of the room fire frequency, F_1 and the conditional core damage frequency P_2 yields a value that is the probability of a fire in the room causing core damage. This fire damage frequency number is referred to as F_2 and, if it is less than 1E-06, then that room can be screened from further evaluation. This process is documented in the Determination of Fire Scenario Safe Shutdown Path Unavailability Report (Reference 5), which is summarized in Section 4 of this report. There were 71 rooms screened from further consideration at this level of analysis.

Phase II (Step 3) is a more detailed look at those rooms remaining for further evaluation after Step 2 with a F_2 value greater than 1E-06. This evaluation consisted of a review of significant ignition sources in each room and the plant components (e.g., equipment and cables) that could be within the zone of influence of the ignition sources. The EPRI FIVE methodology was used to determine the zone of influence for each fire source. Supporting documentation for this phase of the evaluation regarding walkdowns and zone of influence calculations is provided by Fire Damage Zone of Influence Report (Reference 12).

The remaining rooms were also evaluated using a probabilistic model of fire behavior (i.e., an "event tree" methodology). This was accomplished by segmenting the fire ignition frequency into individual cases for evaluation, based on fire severity and area fire suppression. This phase of the fire evaluation is summarized in Section 5 of this report.

The Main Control Room was evaluated by using the guidance provided in Appendix M of the Fire Risk Analysis Implementation Guide (Reference 3). This evaluation consisted of a review of the control functions that could be affected by potential fires in various locations within the Main Control Room

and is documented in the IPEEE (Fire) Quantitative Screening (Phase II - Detailed Analysis) Report (Reference 13).

Phase III This phase documents the summary of the results of the fire hazards evaluation and also discusses the resolution of outstanding fire-related issues, including response to the issues arising from the Sandia Laboratories Fire Risk Scoping Study (NUREG/CR-5088, Reference 6).

Phase III (Step 1) consists of documenting the results of the fire hazard evaluation performed in Phase I and Phase II. These results are presented in the individual sections of this report and are summarized in Section 6.

Phase III (Step 2) provides the resolution of any outstanding fire-related issues, including containment isolation and heat removal, response to the issues arising from the Sandia Laboratories Fire Risk Scoping Study (NUREG/CR-5088) and resolution of the requirements of NUREG-1407 (Reference 19). The resolution of these issues is discussed in Section 7 of this report.

The organization of the various reports generated through the fire evaluation process is shown in Figure 1-2.

FIGURE 1-1
FIRE INDUCED VULNERABILITY EVALUATION (FIVE)
SUMMARY REPORT ORGANIZATION

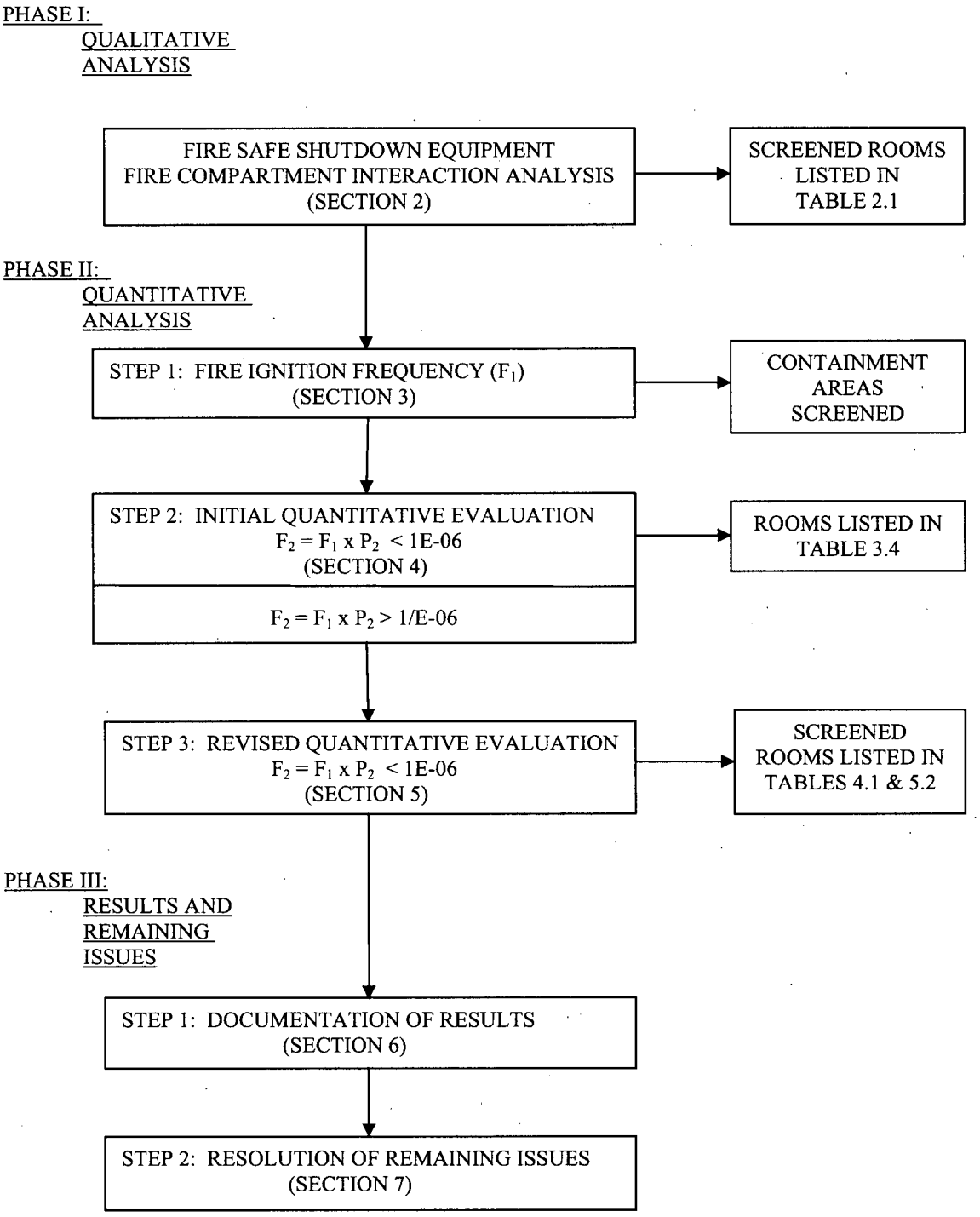
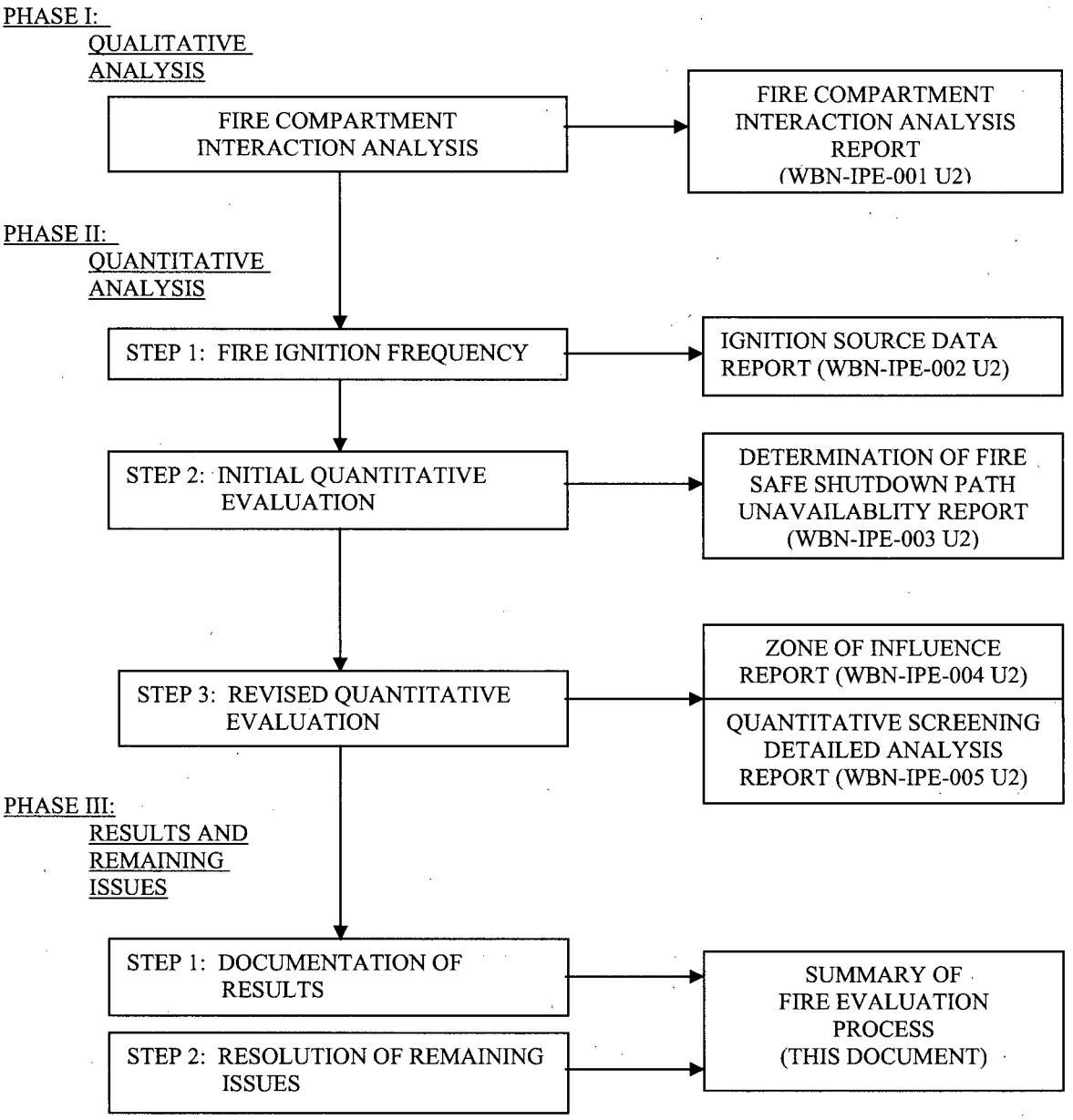


FIGURE 1-2

FIRE INDUCED VULNERABILITY EVALUATION (FIVE)
ORGANIZATION OF REPORTS



2.0 QUALITATIVE SCREENING AND FIRE COMPARTMENT INTERACTION ANALYSIS (FIVE PHASE I)

The initial level of evaluation described in the FIVE documentation evaluates the various areas of the plant based on qualitative factors such as the presence of equipment required to perform a safe shutdown or equipment that could initiate a plant trip. This process is described in the Fire Compartment Interaction Analysis Report (Reference 8), which is summarized in Section 2.2.

Section 2.1 provides a general description of the Watts Bar Nuclear Plant.

2.1 General Description of the Watts Bar Nuclear Plant

Watts Bar Nuclear Plant is a two unit Westinghouse Pressurized Water Reactor plant. Only Unit 1 is complete and operating, and Unit 2 is currently under construction. This report addresses the Unit 2 rooms that were not included in the Unit 1 IPEEE report and re-evaluates those Unit 1 and common rooms that also contain Unit 2 components (equipment and cables). The major buildings included in this evaluation are

Auxiliary Building
Control Building
Emergency Diesel Generator Building (4 separate diesels – 2 per unit)
Intake Pumping Station
Unit 2 Reactor Building
Turbine Building

All of the buildings contain components that support the operation of both of the reactors, except the Reactor Buildings (i.e., Unit 1 Reactor Building contains components required only for Unit 1 reactor and Unit 2 Reactor Building contains components required only for Unit 2 reactor).

The Auxiliary Building contains most of the support equipment required for safe shutdown (e.g., Charging Pumps, Safety Injection Pumps, RHR Pumps, Component Cooling Water Pumps, Auxiliary Feedwater Pumps, 6.9KV and 480-V shutdown boards and motor control centers, Auxiliary Control Room, etc.) and is separated from adjacent buildings by 3-hour rated fire resistive barriers (12-inch to 36-inch thick reinforced concrete). Most of these components are located in individual rooms with at least 12-inch thick concrete walls, floors, ceilings with a minimum fire resistive rating of 2-hours. For example, the Train A and B Charging Pumps are located in separate rooms that have 2-hour fire resistive ratings. Train A 6.9KV Shutdown Board Room is separated from Train B 6.9KV Shutdown Board Room by 2-hour fire resistive barriers. The individual rooms and their fire resistive ratings are documented on the Fire Compartmentation drawings (47W240 series). In addition to the fire resistive barriers, the individual rooms (except for high radiation tank rooms, heat exchanger rooms, etc.) are also provided with smoke and/or heat detectors and most are provided with automatic suppression. The pump rooms without automatic suppression have very low combustible loads (i.e., less that 5,000 Btu/ft^2, which equates to a fire severity of less than 4 minutes).

The Control Building contains the Main Control Room, the Spreading Room and rooms that contain balance of plant components such as the 250-V batteries and battery boards, Auxiliary Instrument Rooms, Plant Computer Room and Relay Room. The Control Building is separated from other buildings with 3-hour fire resistive barriers (typically 36-inch thick reinforced concrete). The rooms within the Control Building are generally separated from each other with 2-hour fire resistive barriers (typically 8-inch to 12-inch thick reinforced concrete). The rooms are provided with smoke detectors (and thermal detectors for the Auxiliary Instrument Rooms and Plant Computer Room) and most are protected by an automatic suppression system. Smoke detectors are also provided inside selected Main Control Room cabinets.

The Emergency Diesel Generator Building contains the four (two train A and two train B) emergency diesel generators and their associated electric boards. Each diesel generator unit is separated from the other by 3-hour rated fire resistive barriers (typically 12-inch thick reinforced concrete). The diesel generator rooms and their associated electric board rooms are provided with a fire detection system and automatic CO_2 suppression system.

The Intake Pumping Station (IPS) contains the Essential Raw Cooling Water Pumps and the electric driven fire pumps and the associated strainers for these pumps. The Raw Cooling Water pumps are located on an outside deck that is part of the Intake Pumping Station. The electric board room is provided with a fire detection system and automatic suppression system. The strainer rooms are provided with a detection system. The ERCW pumps and electric driven fire pumps are located on the upper floor of the Intake Pumping Station which is open to the atmosphere. The Train A portions of the IPS are typically separated from the Train B portions by (12-inch to 36-inch thick reinforced concrete) barriers that have a fire resistive rating of 3-hours.

2.2 Fire Compartment Interaction Analysis (FCIA)

The qualitative evaluation consists primarily of reviewing the various plant fire compartments for two criteria:

1. The compartment does not contain Appendix R safe shutdown components or plant trip initiators.
2. There is no potential for the fire to spread to adjacent compartments (i.e. no concentration of combustibles near the boundary, lack of continuous combustible pathway between compartments, and no unprotected openings).

The FIVE methodology allows a compartment to be screened if the above conditions are true. The rooms that were screened from further consideration based on these considerations are listed in Table 2.1.

TABLE 2.1

AREAS SCREENED DURING FIVE PHASE I (INFORMATION TAKEN FROM REPORT WBN-IPE-001 U2)			
FIRE AREA	**ROOM NO.**	**ROOM DESCRIPTION**	**COMMENTS**
1	692.0-A5	Gas Decay Tank Room	
	692.0-A27	Concentrate Filter Room	
	692.0-A29	Boric Acid Evaporator Package B Room	
8	713.0-A4	Radio-Chemistry Lab	
71	713.0-A21	Unit 2 Reactor Building Access	
8	713.0-A23	CVCS Valve Gallery	
14	737.0-A8	Unit 2 Letdown Heat Exchanger	
72	737.0-A10	Air Lock	
14	737.0-A11	Air Lock	
73	737.0-A14	Air Lock	
74	737.0-A16	Unit 2 Gross Failed Fuel Detector Room	
10	786.0-A1	Fan Room	
47	786.0-A2	Roof Access Air Lock	
	786.0-A3	Mechanical Equipment Room	
	786.0-A4	Mechanical Equipment Room	
60	728.IPS-RSW Deck	Intake Pumping Station – Outdoor Deck containing RSW Pumps	
53	742.0-D8	Fuel Oil Transfer Valve Room	

The quantitative evaluation of the rooms that were not screened from further evaluation in Phase I was then performed in Phase II using a three step process.

Step 1 consisted of the development of fire ignition frequencies for each of the remaining rooms. This process is described in WBN-IPE-002 U2 and summarized in Section 3, below.

Step 2 consisted of an initial quantitative evaluation of each room, assuming that all non-Appendix R and unprotected Appendix R (i.e. only one train protected from fire damage) equipment for each room was failed by postulated fire in that room. This process is described in WBN-IPE-003 U2 and summarized in Section 4, below.

Step 3 consisted of a revised quantitative evaluation of each of the remaining rooms, evaluating each room on an individual basis for the relaxation of overly conservative assumptions from Step 2. This process is described in WBN-IPE-005 U2 and summarized in Section 5, below.

Note:

Of the individual entries listed in Table 6.1, the following 5 areas were not considered to be separate rooms for purposes of room count for calculation of fire ignition frequency:

	Areas Screened in Phase I	
Stair D-1	DG Building Stairs	Included with 760.5-D1
814.75-ACS	Roof Access	Included with 786.0-A1
	Areas Included in Quantitative Analysis (Phase II)	
692.0-A4	Chemical Drain Tank Room	Included with 692.0-A1
713.0-A22	Valve Gallery	Included with 713.0-A1
763.5-A2	U2 Additional Equip Bldg	Included with 729.0-A15
742.0-D3	Toilet	Included with 742.0-D9
755.0-C20	DPSO Shop	Included with 755.0-C13

3.0 EVALUATION OF FIRE IGNITION FREQUENCIES (FIVE PHASE II, STEP 1)

The calculation of fire ignition frequencies for the rooms that remained for quantitative screening is described in the Ignition Source Data Report (WBN-IPE-002 U2). This evaluation resulted in fire ignition frequencies above 1E-06 for all rooms evaluated, with the exception of the Unit 2 Reactor Building, which was screened based on specific guidance given in the FIVE documentation. Therefore, only the Unit 2 Reactor Building (includes Annulus) was screened from further evaluation in this step. For reference, the rooms that remain for quantitative evaluation in Steps 2 and 3 of Phase II are listed in Table 3.4, below, along with the associated fire ignition frequencies.

3.1 Fire Areas and Fire Zones

The first part of the fire ignition frequency evaluation methodology described in the FIVE documentation requires that the various plant areas be assigned to a generic type. Those generic types described in FIVE are listed below in Table 3.1 along with the number of each type at Watts Bar.

TABLE 3.1

TABULATION OF GENERIC PLANT AREA TYPES	
PLANT LOCATION TYPE	**NUMBER OF LOCATIONS**
AUXILIARY BUILDING	1
DIESEL GENERATOR ROOM	6
SWITCHGEAR ROOM	17
BATTERY ROOM	9
CONTROL ROOM	1
CABLE SPREADING ROOM	1
INTAKE STRUCTURE	1
TURBINE BUILDING	1
RADWASTE AREA	1
TRANSFORMER YARD	1

The Watts Bar Appendix R analysis considered 94 separate fire areas. The Unit 1 report considered all of these fire areas except the rooms containing Unit 2 components not required for Unit 1 operation. Each of these fire areas is separated from adjacent fire areas by rated fire barriers. The Auxiliary Building is comprised of 75 fire areas (numbers 1 through 47, 1-1, 1-2, 2-1, 2-2, 3-1, 3-2, 9-1, 15-1, 15-2, 65 through 77 and 71-1). The Control Building is one fire area (number 48) and is subdivided into 37 fire compartments. The Diesel Generator Building is comprised of 8 fire areas (numbered 49 through 56). The Additional Diesel Generator Building is fire area 57. The Intake Pumping Station is comprised of three fire areas (numbered 58 through 60). The Unit 1 Reactor Building is fire area 61 and the Unit 2 Reactor Building is fire area 77. The Condensate Demineralizer Waste Evaporator Building is fire area 62; the Turbine Building is fire area 63; and the Yard is fire area 64. The Unit 2 IPEEE FIVE analysis addresses the rooms that were not considered during the Unit 1 analysis. The Unit 2 analysis also re-evaluates the Unit 1 report rooms that contain components required for fire safe shutdown of Unit 2.

For the remainder of this report the terms fire area, fire zone and fire compartment will be used interchangeably to refer to the evaluation of an individual plant area/room/compartment. Table 6.1 lists each fire area and provides a description of the room or rooms that comprise the fire area.

Each of these plant rooms were then assigned to a generic type of area corresponding to Table 3.1. The determination of fire ignition frequency for each of these rooms was based on the type of plant location and is documented in the Ignition Source Data Report (WBN-IPE-002 U2). The results of this evaluation are summarized in Table 3.4 of this report. A sample calculation worksheet is shown in Figure 3.1 and it details the calculation of fire ignition frequency for room 713.0-A1, which is used as an example in Section 5 of this report.

3.2 Plant Wide Components

The next step in determining the overall fire ignition frequency for a room is to assign each ignition source in the room a generic ignition frequency which is provided in the FIVE data reference tables (see Table 3.2 for a reproduction of that data from Reference 2). The FIVE methodology also provides a means of determining a weighting factor for each ignition source based upon the total number of like components in the plant or similar area and the number of ignition sources in the room.

The number of ignition sources was derived primarily from the Combustible Loading Summary (drawing 47W893-035), the Appendix R analysis, walkdowns and the Unit 1 IPEEE report. Table 3.3 provides a summary of the number of the various types of ignition sources in the plant.

TABLE 3.2

FIRE IGNITION SOURCES AND FREQUENCIES BY APPLICABLE PLANT LOCATIONS

PLANT LOCATION	FIRE IGNITION SOURCE	IGNITION SOURCE WEIGHTING FACTOR	FIRE FREQUENCY [1,2]
Auxiliary Building	Electrical Cabinets	B	1.9E-02
	Pumps	B	1.9E-02
Diesel Generator Room	Diesel Generators	A	2.6E-02
	Electrical Cabinets	A	2.4E-03
Switchgear Room	Electrical Cabinets	A	1.5E-02
Battery Room	Batteries	A	3.2E-03
Control Room	Electrical Cabinets	A	9.5E-03
Cable Spreading Room	Electrical Cabinets	A	3.2E-03
Intake Structure	Electrical Cabinets	A	2.4E-03
	Fire Pumps	A	4.0E-03
	Others	A	3.2E-03
Turbine Building	T/G Exciter	B	4.0E-03
	T/G Oil	B	1.3E-02
	T/G Hydrogen	B	5.5E-03
	Electrical Cabinets	B	1.3E-02
	Other Pumps	B	6.3E-03
	Main Feedwater Pumps	A	4.0E-03
	Boiler	B	1.6E-03
Radwaste Area	Miscellaneous Components	A	8.7E-03
Transformer Yard	Yard Transformers (propagating to Turbine Building)	A	4.0E-03
	Yard Transformer (LOSP)	A	1.6E-03
	Yard Transformer (Others)	F	1.5E-02
Plant-Wide Components	Fire Protection Panels	F	2.4E-03
	RPS MG Sets	F	5.5E-05
	Non-qualified cable run	E	6.3E-03
	Junction Box/splice in non-qualified cable	E	1.6E-03
	Junction Box in qualified cable	E	1.6E-03
	Transformers	F	7.9E-03
	Battery Chargers	F	4.0E-03
	Hydrogen Tanks	G	3.2E-03
	Misc. Hydrogen Fires	C	3.2E-03
	Gas Turbines	G	3.1E-02 [5]
	Air Compressors	F	4.7E-03
	Ventilation Subsystems	F	9.5E-03
	Elevator Motors	F	6.3E-03
	Dryers	F	8.7E-03
	Transients	D	1.3E-03 [3,4]
	Cable fires caused by welding	C	5.1E-03 [4]
	Transient fires caused by welding and cutting	C	3.1E-02 [4]

1. Frequencies are per reactor year unless otherwise noted. Reactor year is the sum each reactor multiplied by the calendar years between operating license issuance date and December 31, 1988.
2. Fire frequencies are per fraction of ignition sources per year.
3. Fire frequency represents one event. The thirteen transient events which occurred during power operation are considered by the weighting factor.
4. Fire frequency represents years at power operation.

5. Fire frequency represents an estimated 130 gas-turbine-operating years.

TABLE 3.3

TABULATION OF PLANT-WIDE FIRE IGNITION SOURCES	
TYPE OF COMPONENT	**NUMBER**
Air Compressors	16
Battery Chargers	34
Fire Protection Panels	45
Junction Boxes [1]	2634
Hydrogen Storage Tanks	2
Motor Generator Sets	15
Non-qualified Cable Runs (Btu total)	5.99E+10
Transformers	114
Ventilation Sub-systems	334

1 Total number of junction boxes in the safety related areas of the plant.

Figure 3-1

Sample Fire Ignition Calculation Worksheet						
Fire Area		8				
Fire Compartment		713.0-A1				
Description		Corridor				
	Generic Fire Frequency (f)	Location Weighting Factor (W_L)	Number Devices in Room (a)	Number Devices in Bldg/Plant (b)	Ignition Source Factor (W_I)	Room Fire Frequency (F_I)
Compartment Ignition Source						
Elec. Cabinets	1.90E-02	2	85	867	9.80E-02	3.73E-03
Pumps	1.90E-02	2	19	137	1.39E-01	5.27E-03
Plant Wide Ignition Source						
Battery Chargers	4.00E-03	2	1	34	2.94E-02	2.34E-04
Cable Trays	6.30E-03	2	3.47E+09	5.99E+10	5.79E-02	7.30E-04
FP Panels	2.40E-03	2	2	45	4.44E-02	2.13E-04
HVAC	9.50E-03	2	10	334	2.99E-02	5.69E-04
Junction Boxes	1.60E-03	2	128	2634	4.86E-02	1.56E-04
Transformers	7.90E-03	2	4	114	3.51E-02	5.54E-04
Transients	1.30E-03	2	10	264	3.79E-02	9.85E-05
Welding Cable	5.10E-03	2	1	264	3.79E-03	3.86E-05
Welding/Cutting	3.10E-02	2	1	264	3.79E-03	2.35E-04
				Total		**1.16E-02**

Notes:

1. f - from EPRI Table 1.2 (Table 3.2 in this report)
2. W_L - Number of units (reactors)/Number of buildings (Auxiliary Building)
3. W_I - a/b
4. $F_I = f \times W_L \times W_I$

3.3 Results of Fire Ignition Frequency Evaluation

The Reactor Building contains the reactor vessel, steam generators, pressurizer and reactor coolant pumps. This Reactor Building structure is separated from other buildings by 3-hour rated fire resistive barriers. The Reactor Building was screened from the FIVE fire frequency determination because:

1. A hot gas layer is unlikely to form in most areas of the Reactor Building which can damage cables.

2. Reactor Coolant Pump fires are unlikely to occur due to compliance with 10CFR50 Appendix R, Section III.O, oil collection system.

3. Previous fire PRA's did not show that Reactor Building fires are risk significant.

Therefore, a separate evaluation of fire ignition frequency was not generated for the Reactor Building. Based on the above guidelines, a severe fire inside the Reactor Building is judged to be highly unlikely.

The fire ignition frequencies for the remaining unscreened areas are shown in Table 3.4. This table includes 116 individual fire ignition frequencies used to evaluate the 121 individual areas (rooms 692.0-A4, 713.0-A22, 755.0-C20, 742.0-D3 and 763.5-A2 are combined with rooms 692.0-A1, 713.0-A1, 755.0-C13, 742.0-D9 and 729.0-A15, respectively, for purposes of fire ignition frequency development) that remained for further evaluation following the completion of Phase I.

TABLE 3.4

FIRE IGNITION FREQUENCIES FOR UNSCREENED AREAS (INFORMATION TAKEN FROM REPORT WBN-IPE-002 U2)			
FIRE AREA	**ROOM NO.**	**ROOM DESCRIPTION**	**FIRE IGNITION FREQUENCY**
1	676.0-A1	Corridor	2.61E-03
	676.0-A14	Containment Spray Pump 2A-A Room	6.75E-04
	676.0-A15	Containment Spray Pump 2B-B	7.17E-04
	692.0-A1 & A4	Corridor & Chemical Drain Tank Room	9.62E-03
	692.0-A30	Boric Acid Evaporator Package Room A	1.41E-03
1-1	692.0-A20	Safety Injection Pump 2B-B Room	1.04E-03
1-2	692.0-A19	Safety Injection Pump 2A-A Room	9.53E-04
2-2	676.0-A13	RHR Pump 2B-B Room	7.61E-04
3-2	676.0-A12	RHR Pump 2A-A Room	7.61E-04
8	713.0-A1 & A22	Corridor &Valve Gallery	1.16E-02
	713.0-A14	Sample Room 2	5.6E-04
	713.0-A15	Heat Exchanger 2A Room	7.46E-05
	713.0-A16	Heat Exchanger 2B Room	7.58E-05
	713.0-A17	Seal Water Heat Exchanger 2A	7.46E-05
10	729.0-A6	Nitrogen Storage Area	1.14E-04
	729.0-A9	Unit 2 Post Accident Sampling Room	3.09E-03
	757.0-A13	Refueling Room	1.46E-02
	772.0-A9	HEPA Filter Plenum Room	3.35E-04
14	737.0-A1	Corridor	1.14E-02
15-1	737.0-A3	Heat and Vent Equipment Room 1	3.88E-04
15-2	737.0-A12	Heat and Vent Equipment Room 2	5.14E-04
17	757.0-A2	6.9KV and 480-V Shutdown Board Room A	5.31E-04
	757.0-A9	Personnel and Equipment Access	8.59E-04
18	757.0-A3	125-V Vital Battery Board II Room	7.09E-04
19	757.0-A4	125-V Vital Battery Board I Room	7.95E-04
20	757.0-A1	Auxiliary Control Room	3.71E-04
21	757.0-A25	Auxiliary Control Instrument Room 1A	1.89E-04
22	757.0-A26	Auxiliary Control Instrument Room 1B	1.90E-04
23	757.0-A27	Auxiliary Control Instrument Room 2A	1.98E-04
24	757.0-A28	Auxiliary Control Instrument Room 2B	1.91E-04
25	782.0-A1	Control Rod Drive Equipment Room 1	2.95E-03
	782.0-A2	Pressurizer Heater Transformer Room 1	9.91E-04
27	757.0-A5	480-V Shutdown Board Room 1B	4.73E-04
28	757.0-A21	480-V Shutdown Board Room 2A	5.52E-04
29	757.0-A22	125-V Vital Battery Board Room IV	6.32E-04
30	757.0-A23	125-V Vital Battery Board Room III	6.32E-04
31	757.0-A17	Personnel and Equipment Access	5.14E-04
	757.0-A24	6.9KV & 480-V Shutdown Board Room B	1.10E-03
32	772.0-A1	480-V Board Room 1A	6.10E-04
33	772.0-A2	480-V Board Room 1B	1.91E-03
34	772.0-A3	125-V Vital Battery II	4.27E-04
35	772.0-A4	125-V Vital Battery I	4.27E-04
36	772.0-A5	480-V Transformer Room 1B	1.06E-03

FIRE IGNITION FREQUENCIES FOR UNSCREENED AREAS (INFORMATION TAKEN FROM REPORT WBN-IPE-002 U2)			
FIRE AREA	**ROOM NO.**	**ROOM DESCRIPTION**	**FIRE IGNITION FREQUENCY**
37	772.0-A6	480-V Transformer Room 1A	1.15E-03
38	772.0-A7	Mechanical Equipment Room	1.00E-03
39	772.0-A8	5th Vital Battery & Battery Board Room	8.61E-04
40	772.0-A10	Mechanical Equipment Room	9.79E-04
41	772.0-A11	480-V Transformer Room 2B	1.14E-03
42	772.0-A12	480-V Transformer Room 2A	1.04E-03
43	772.0-A13	125-V Vital Battery Room IV	4.27E-04
44	772.0-A14	125-V Vital Battery Room III	4.27E-04
45	772.0-A15	480-V Board Room 2B	2.36E-03
46	772.0-A16	480-V Board Room 2A	1.64E-03
47	786.0-AR	Auxiliary Building Roof	4.75E-04
48	692.0-C5	250-V Battery Board Room 2	2.45E-03
	692.0-C6	250-V Battery Room 2	4.43E-04
	692.0-C7	24-V & 48-V Battery Room	4.15-04
	692.0-C8	24-V & 48-V Battery Bd and Charger Room	3.07E-03
	692.0-C9	Communications Room	2.49E-03
	692.0-C10	Mechanical Equipment Room	1.42E-03
	692.0-C11	Corridor	6.96E-04
	692.0-C12	Secondary Alarm Station	1.37E-03
	708.0-C2	Corridor	5.84E-04
	708.0-C3	Plant Computer Room	4.21E-03
	708.0-C4	Auxiliary Instrument Room 2	1.13E-02
	729.0-C1	Cable Spreading Room	1.86E-03
	755.0-C12	Main Control Room	1.94E-02
	755.0-C13 & C20	Relay Room & DPSO Shop	4.67E-03
49	742.0-D4	Diesel Generator 1A-A Room	5.93E-02
	760.5-D3	Air Exhaust Room 1A	8.86E-04
	760.5-D4	480-V Board Room 1A	1.36E-03
	760.5-D5	Air Intake Room 1A	7.92E-05
50	742.0-D5	Diesel Generator 2A-A Room	5.93E-02
	760.5-D6	Air Exhaust Room 2A	7.06E-04
	760.5-D7	480-V Board Room 2A	1.36E-03
	760.5-D8	Air Intake Room 2A	2.93E-04
51	742.0-D6	Diesel Generator 1B-B Room	5.93E-02
	760.5-D9	Air Exhaust Room 1B	7.06E-04
	760.5-D10	480-V Board Room 1B	1.36E-03
	760.5-D11	Air Intake Room 1B	7.92E-05
52	742.0-D7	Diesel Generator 2B-B Room	5.90E-02
	760.5-D12	Air Exhaust Room 2B	7.06E-04
	760.5-D13	480-V Board Room 2B	1.29E-03
	760.5-D14	Air Intake Room 2B	7.92E-05
53	742.0-D3 & D9	Toilet & Corridor	1.24E-03
55	742.0	Train A Cable Chase	1.04E-05
56	742.0	Train B Cable Chase	1.04E-05

FIRE IGNITION FREQUENCIES FOR UNSCREENED AREAS (INFORMATION TAKEN FROM REPORT WBN-IPE-002 U2)			
FIRE AREA	**ROOM NO.**	**ROOM DESCRIPTION**	**FIRE IGNITION FREQUENCY**
58	722.IPS-STR A	Train A ERCW Strainer Room	1.11E-03
	741.IPS-ERCW Pump Room A	Train A ERCW Pump Room	1.49E-03
	741.IPS SWP A	Train A Screen Wash Pump & Fire Pump Room	3.83E-03
59	722.IPS-STR B	Train B ERCW Strainer Room	1.04E-03
	741.IPS-ERCW Pump Room B	Train B ERCW Pump Room	1.49E-03
	741.IPS SWP B	Train B Screen Wash Pump & Fire Pump Room	3.61E-03
60	711.IPS-Elec BD Room	480-V Board Room	1.86E-03
63	Turbine Building	Turbine Building	7.19E-02
65	676.0-A17	Pipe Gallery (Unit 2)	3.35E-04
	692.0-A24	Unit 2 Pipe Chase & Valve Gallery	3.33E-04
	713.0-A29	Unit 2 Pipe Chase & Valve Gallery	9.17E-04
66	692.0-A21	Charging Pump Room 2C	7.56E-04
67	692.0-A22	Centrifugal Charging Pump Room 2B-B	9.90E-04
68	692.0-A23	Centrifugal Charging Pump Room 2A-A	9.90E-04
69	692.0-A26	Turbine Driven AFW Pump Room 2A-S	1.53E-03
70	692.0-A25	Unit 2 Pipe Gallery	4.54E-03
71	713.0-A19	Unit 2 Pipe Gallery	1.86E-03
71-1	713.0-A20	Unit 2 Volume Control Tank Room	1.72E-03
72	729.0-A11	Unit 2 South Main Steam Valve Room	3.67E-04
73	729.0-A10	Unit 2 North Main Steam Valve Room	5.02E-04
	729.0-A13	Unit 2 Steam Valve Instrument Room	7.58E-05
	729.0-A15 & 763.5-A2	Unit 2 Additional Equipment Building (all elevations)	2.01E-03
	729.5-A17	Unit 2 Shield Building Vent Radiation Monitor Rm	3.13E-04
74	737.0-A9	Unit 2 Ventilation & Purge Air Room	8.19E-04
75	757.0-A14	Unit 2 Reactor Building Access Room	1.25E-04
	757.0-A16	Emergency Gas Treatment Filter Room	3.93E-03
	782.0-A3	Unit 2 Control Rod Drive Equipment Room	2.71E-03
	782.0-A4	Unit 2 Pressurizer Heater Transformer Room	8.94E-04
76	757.0-A15	Unit 2 Reactor Building Equipment Hatch	7.75E-05

4. INITIAL PRA MODEL EVALUATION OF FIRES (FIVE Phase II, Step 2)

Following the development of room fire ignition frequencies, as described in report WBN-IPE-002 U2 (Reference 10) and Section 3 of this report, the updated Watts Bar Nuclear Plant Probabilistic Risk Assessment (PRA) model (Reference 21) was modified in order to develop the conditional core damage frequency values required to generate a fire-related core damage frequency for each remaining room. This was performed in a two step process using the following general equation:

$$\mathbf{F_2} = F_1 \times P_2$$

Where

F_2 is the fire-related core damage frequency for the room under evaluation.

F_1 is the room fire ignition frequency for the room under evaluation, (see WBN-IPE-002 U2).

P_2 is the core damage frequency for the room under evaluation, assuming a fire ignition frequency of 1.0. This gives what is known as the "conditional" core damage frequency (CCDF). That is, given a fire with frequency of F_1, this P_2 value can be used directly in the equation above to calculate the core damage frequency associated with such a fire.

If the fire-related core damage frequency is less than 1E-06, the room can be screened from further evaluation. As noted above, this process was performed in two main steps. The first of these is documented in report WBN-IPE-003 U2, entitled "Determination of Fire Scenario Safe Shutdown Path Unavailability - Watts Bar Nuclear Plant Unit 2" (Reference 5). This report is summarized in this section.

The detailed portion of the quantitative evaluation is summarized in Section 5.

During this step of the quantitative evaluation, any equipment not on the Appendix R Safe Shutdown Equipment List (SSEL), except for safety injection and RHR components (SI/RHR) that support bleed and feed cooling, was arbitrarily assumed to fail. The SI/RHR related equipment was credited because the equipment and cabling locations were identified, which allowed fire impacts to this equipment to be correctly modeled. The resulting "conditional" core damage frequency, based on the failure of the aforementioned equipment, was then multiplied by the fire ignition frequency for the area of interest shown in Table 3.4. If the resulting fire-related core damage frequency was below 1E-06, the area could be screened from further consideration. For the Control Building areas, a conditional core damage frequency of 1.0 was arbitrarily assumed. This assured that all remaining Control Building areas would be retained for detailed analysis.

Areas outside the Control Building were evaluated using a modified version of the updated WBN plant model.

The data used as input for the model included (Reference 5).

1. Unit 0 (common) and Unit 2 SSEL equipment and associated fire zones
2. Unit 0 and Unit 2 cable routings with associated fire zones, fire wrap commitments and end devices
3. Correlation between fire zones, room numbers and analysis volumes
4. SSEL equipment not to be assumed fully functional for fire analysis (i.e., without motive power)
5. Table of cables which provide power to the 6.9KV shutdown boards 2-BD-211-A-A and 2-BD-211-B-B and their associated fire zones. The cables are labeled as to whether their failure in a fire would cause loss of offsite power to the associated shutdown board, cause only failure of power from the backup emergency diesel generators, or would cause failure of both power sources to the boards.
6. Safety injection and recirculation related equipment with associated cable locations.

Items 1 and 2 above were used in this evaluation to identify the SSEL equipment and to associate them to fire zones along with their supporting cables and the fire zones the cables traverse. The data in item 3 above correlates the analysis volumes to fire zones. These analysis volumes were developed during the Unit 1 Appendix R analysis (and continued in the Unit 2 analysis) to ensure that one redundant train of equipment required for safe shutdown would be in accordance with the separation criteria of Appendix R, Section III.G.2 and therefore remain free of fire damage. For the purposes of the screening evaluation, fire propagation from the fire zones in one analysis to another does not have to be assumed. The data in item 4 above was provided to identify those SSEL components that while included in the list, not all functions of the equipment can be credited. For example, the control cables are included to allow tripping of the equipment, but cables for motive power are not traced and therefore credit for operation of the equipment cannot be taken. Nevertheless, failures involving transfer of valves to the undesired position are considered as a result of the fire (i.e., motive power is conservatively available for such cases). Item 5 above tabulates the routings for those cables which provide both offsite and onsite power to the 6.9KV shutdown boards. Item 6 identifies additional equipment not on the SSEL which were credited in this study. This added equipment is used to perform bleed and feed cooling in the event that AFW fails. Some of the equipment added were considered on the SSEL list but were considered not "fully functional".

This initial quantitative evaluation, including the incorporation of fire-related impacts into the Watts Bar PRA model structure, is documented in WBN-IPE-003 U2. This resulted in the screening of over half (71 of 116) of the rooms that remained for further quantitative evaluation. For reference, the areas that were screened from further consideration are listed in Table 4.1, below. The evaluation of rooms that remained for further analysis is described in Section 5.

TABLE 4.1

AREAS SCREENED IN PHASE II, STEP 2 (INFORMATION FROM WBN-IPE-003 U2)					
FIRE AREA	**ROOM NO.**	**ROOM DESCRIPTION**	**F_1**	**P_2**	**F_2**
1	676.0-A1	Corridor	2.61E-03	8.88E-05	2.32E-07
3-2	676.0-A12	RHR Pump 2B-B Room	7.61E-04	7.62E-05	5.80E-08
2-2	676.0-A13	RHR Pump 2A-A Room	7.61E-04	7.62E-05	5.80E-08
1	676.0-A14	Containment Spray Pump Room 2A-A	6.75E-04	1.88E-05	1.27E-08
1	676.0-A15	Containment Spray Pump Room 2B-B	7.17E-04	1.48E-05	1.06E-08
65	676.0-A17	Unit 2 Pipe Gallery	3.35E-04	1.59E-03	5.30E-07
1	692.0-A1 & A4	Corridor & Chemical Drain Tank Room	9.62E-03	8.88E-05	8.54E-07
1-2	692.0-A19	Safety Injection Pump Room 2A-A	9.53E-04	7.62E-05	7.27E-08
1-1	692.0-A20	Safety Injection Pump Room 2B-B	1.04E-03	1.66E-05	1.72E-08
66	692.0-A21	Charging Pump Room 2C	7.56E-04	1.48E-05	1.12E-08
67	692.0-A22	Charging Pump Room 2B-B	9.90E-04	1.57E-05	1.56E-08
68	692.0-A23	Charging Pump Room 2A-A	9.90E-04	1.65E-05	1.63E-08
65	692.0-A24	Unit 2 Pipe Chase & Valve Gallery	3.33E-04	1.59E-03	5.29E-07
69	692.0-A26	Turbine Driven AFW Pump 2A-S	1.53E-03	2.29E-05	3.51E-08
1	692.0-A30	Boric Acid Evaporator Package Room A	1.41E-03	8.21E-05	1.16E-07
8	713.0-A14	Sample Room 2B	5.60E-04	7.62E-05	4.27E-08
8	713.0-A15	Heat Exchanger 2A	7.46E-05	1.67E-05	1.25E-09
8	713.0-A16	Heat Exchanger 2B	7.58E-05	7.62E-05	5.78E-09
71-1	713.0-A20	Unit 2 Volume Control Tank Room	1.72E-03	6.40E-05	1.10E-07
10	729.0-A6	Nitrogen Storage Area	1.14E-04	4.97E-3	5.65E-07
10	729.0-A9	Fuel Transfer Valve Room	3.09E-03	1.48E-05	4.58E-08
73	729.0-A10	Unit 2 North Main Steam Valve Room	5.02E-04	1.48E-05	7.44E-09
72	729.0-A11	Unit 2 South Main Steam Valve Room	3.67E-04	3.23E-05	1.19E-08
73	729.0-A13	Unit 2 Steam Valve Instrument Room A	7.58E-05	1.48E-05	1.12E-09
73	729.0-A15–763.5-A2	Unit 2 Additional Equipment Building (all elevations)	2.01E-03	1.48E-05	2.98E-08
73	729.5-A17	Unit 2 Shield Building Vent Rad Monitor Rm	3.13E-04	1.48E-05	4.64E-09
15-1	737.0-A3	Heat and Vent Equipment Room 1	3.88E-04	1.63E-04	6.34E-08
74	737.0-A9	Unit 2 Ventilation and Purge Air Room	8.19E-04	2.54E-04	2.08E-07
15-2	737.0-A12	Heat and Vent Equipment Room 2	5.14E-04	4.65E-04	2.39E-07
18	757.0-A3	125V Vital Battery Board Room II	7.09E-04	9.62E-05	6.82E-08
75	757.0-A14	Unit 2 Reactor Building Access Room	1.25E-04	8.41E-05	1.05E-08
76	757.0-A15	Unit 2 Reactor Building Equipment Hatch	7.75E-05	8.41E-05	6.51E-09
21	757.0-A25	Train A Instrument Room 1A	1.89E-04	8.83E-05	1.67E-08
22	757.0-A26	Train B Instrument Room 1B	1.90E-04	1.60E-05	3.05E-09
33	772.0-A2	480V Board Room 1B	1.91E-03	4.80E-05	9.16E-08
34	772.0-A3	125V Vital Battery Room II	4.27E-04	1.50E-05	6.41E-09
35	772.0-A4	125V Vital Battery Room I	4.27E-04	2.27E-05	9.71E-09
36	772.0-A5	480V Transformer Room 1B	1.06E-03	2.40E-05	2.55E-08
37	772.0-A6	480V Transformer Room 1A	1.15E-03	1.48E-05	1.71E-08
38	772.0-A7	Mechanical Equipment Room 1	1.00E-03	1.48E-05	1.49E-08

AREAS SCREENED IN PHASE II, STEP 2 (INFORMATION FROM WBN-IPE-003 U2)					
FIRE AREA	ROOM NO.	ROOM DESCRIPTION	F_1	P_2	F_2
39	772.0-A8	5th Vital Battery & Board Room	8.61E-04	7.21E-05	6.21E-08
40	772.0-A10	Mechanical Equipment Room 2	9.97E-04	1.53E-04	1.50E-07
43	772.0-A13	125V Vital Battery Room IV	4.27E-04	7.21E-05	3.08E-08
44	772.0-A14	125V Vital Battery Room III	4.27E-04	5.64E-05	2.41E-08
25	782.0-A1	Unit 1 Control Rod Drive Equipment Room	2.95E-03	1.48E-05	4.37E-08
25	782.0-A2	Unit 1 Pressurizer Heater Transformer Rm	9.91E-04	1.48E-05	1.47E-08
53	742.0-D3 & D9	Toilet & Corridor	1.24E-03	1.48E-05	1.84E-08
49	742.0-D4	Diesel Generator Unit 1A-A	5.93E-02	1.48E-05	8.78E-07
50	742.0-D5	Diesel Generator Unit 2A-A	5.93E-02	1.48E-05	8.78E-07
51	742.0-D6	Diesel Generator Unit 1B-B	5.93E-02	1.48E-05	8.78E-07
52	742.0-D7	Diesel Generator Unit 2B-B	5.90E-02	1.48E-05	8.74E-07
55	742.0-CHASE A	Train A Cable Tray Chase	1.04E-05	1.48E-05	1.54E-10
56	742.0-CHASE B	Train B Cable Tray Chase	1.04E-05	1.48E-05	1.54E-10
49	760.5-D3	DG 1A-A Air Exhaust Room	8.86E-04	1.48E-05	1.31E-08
	760.5-D4	DG 1A-A 480-V Board Room	1.36E-03	1.48E-05	2.01E-08
	760.5-D5	DG 1A-A Air Intake Room	7.92E-05	1.48E-05	1.17E-09
50	760.5-D6	DG 2A-A Air Exhaust Room	7.06E-04	1.48E-05	1.05E-08
	760.5-D7	DG 2A-A 480-V Board Room	1.36E-03	1.48E-05	2.01E-08
	760.5-D8	DG 2A-A Air Intake Room	2.93E-04	1.48E-05	4.33E-09
51	760.5-D9	DG 1B-B Air Exhaust Room	7.06E-04	1.48E-05	1.05E-08
	760.5-D10	DG 1B-B 480-V Board Room	1.36E-03	1.48E-05	2.01E-08
	760.5-D11	DG 1B-B Air Intake Room	7.92E-05	1.48E-05	1.17E-09
52	760.5-D12	DG 2B-B Air Exhaust Room	7.06E-04	1.48E-05	1.05E-08
	760.5-D13	DG 2B-B 480-V Board Room	1.29E-03	1.48E-05	1.91E-08
	760.5-D14	DG 2B-B Air Intake Room	7.92E-05	1.48E-05	1.17E-09
58	722.IPS-STR RM A	Train A ERCW Strainer Room	1.11E-03	1.28E-04	1.42E-07
59	722.IPS-STR RM B	Train B ERCW Strainer Room	1.04E-03	1.28E-04	1.33E-07
58	741.IPS-ERCW PMP RM A	Train A ERCW Pump Room	1.49E-03	1.28E-04	1.91E-07
59	741.IPS-ERCW PMP RM B	Train B ERCW Pump Room	1.49E-03	1.66E-04	2.48E-07
58	741.IPS-SWP RM	Train A Screen Wash Pumps & HPFP Pump Room	3.83E-03	1.28E-04	4.90E-07
59	741.IPS-HPFP RM B	Train B Screen Wash Pumps & HPFP Pump Room	3.61E-03	1.66E-04	6.00E-07

5. REVISED PRA MODEL EVALUATION OF FIRES (FIVE Phase II, Step 3)

For the areas that remained for further evaluation following the initial quantitative evaluation, a revised evaluation was then performed.

For those areas that remained for further evaluation, the use of EPRI fire events database (Reference 1) allowed the development of fire severity factors to be incorporated into an "event tree" methodology of segmenting the fire ignition frequency into various cases (i.e. successful automatic suppression, etc.). The EPRI database has been reviewed and was incorporated into J.R. Houghton's work on fire severity for the Reliability and Risk Assessment Branch of the U.S. NRC (Reference 4). An evaluation of the severity factors developed by EPRI for specific types of ignition sources, which are described in Appendix D of the Fire PRA Implementation Guide (Reference 3), was also performed to confirm the validity of these values. This level of evaluation also involved the review of ignition sources located in various areas. This review is described in report WBN-IPE-004 U2. The 45 rooms that required further evaluation during this step represent all remaining areas to be evaluated. The results for these areas are summarized in Table 5.2.

The areas remaining for further evaluation in Step 3 of Phase 2 were evaluated using a modified version of the WBN plant model. This model was developed for the initial quantitative evaluation described in Section 4. The development and modification of this plant risk model are discussed in References 5 and 13. All area fires were therefore modeled as being no less severe than a plant trip due to total loss of main feedwater. The fire-related impacts for each area also included failure of all equipment located in, or routed through, the affected area.

The 45 remaining plant rooms were evaluated based on the presence of significant fire ignition sources in the area and information from the fire events database to determine the likelihood of a fire spreading to become a significant event.

In order to simplify the development of individual cases for this evaluation, an "event tree" structure was used, with severity values and non-suppression probabilities, to lay out the various cases. For example, this type of evaluation was used to evaluate Auxiliary Building Corridor Area 713.0-A1 (713.0-A1 & A22). Four cases were evaluated for this room:

Case 1 A minor fire starts in the affected area and self-extinguishes, or is extinguished with portable extinguishers. This results in a plant trip with a total loss of main feedwater and no other fire impacts.

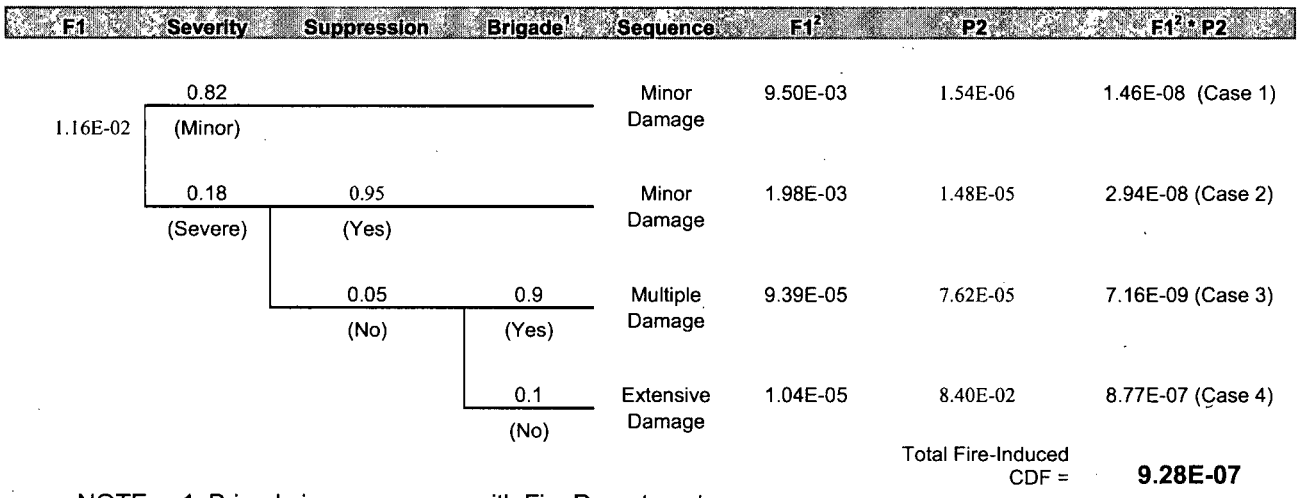
Case 2 A potentially significant fire starts and is suppressed by actuation of the installed sprinkler system. All non-Appendix R equipment, with the exception of SI/RHR components to support bleed and feed cooling, are assumed to fail prior to fire suppression. This results in a plant trip with a total loss of main feedwater.

Case 3 A potentially significant fire starts in the affected area and is eventually suppressed with hose streams. This fire is then conservatively assumed to damage all non-Appendix R equipment, including SI/RHR equipment that supports bleed and feed cooling. Plant trip is again assumed to occur due to a fire-induced total loss of main feedwater.

Case 4 A potentially significant fire starts in the affected area and is not suppressed. This fire is then assumed to fail (1) all plant equipment that is not specifically credited in the Appendix R evaluation, except SI/RHR equipment and (2) equipment located in or routed through the affected area. As shown in Table 7 of WBN-IPE-003 U2 for the analysis volume (AV26) found to be bounding for this room, this includes both motor driven AFW pumps, component cooling water pump 2A-A, both RHR pumps, and centrifugal charging pump 2B-B.

The development of the frequency for each of these cases can be shown graphically as:

Figure 5-1
Example Case Development Using Event Tree Structure



NOTE: 1. Brigade is synonymous with Fire Department.
2. Fire ignition frequency based on fire severity and mitigating factors.

The total fire-related core damage frequency for all of these cases is less than 1E-06; therefore, this area can be screened from further evaluation. The discussion for each of these areas includes justification for the evaluation remaining conservative.
For all areas evaluated with this technique, only 7 were within a factor of two of the screening criteria of 1E-06 (i.e. a fire-related core damage frequency above 5E-07).

Only four areas were within 30% of the screening criteria:

TABLE 5.1

AREAS WITHIN 30% of SCREENING CRITERIA		
Room Name	**Room Number**	**Fire Related Core Damage Frequency**
Main Control Room	757-C12	9.65E-7
Corridor	713-A1 & 713-A22	9.28E-7
125-V Vital Battery Board Room IV	757-A22	8.35E-7
Refueling Room	757-A13	7.46E-7

The areas listed in Table 5.2 were screened from further evaluation based on this level of review.

Note:

Room 737.0-A1 is evaluated as three areas 737.0-A1A, 737.0-A1B and 737.0-A1C in Table 5.2, but is shown with only one entry in Table 6.1 (the highest CDF which was in 737.0-A1B). The potential for fire spread across the two 21 foot buffer areas (737.0-A1AN and 737.0-A1BN) between 737.0-A1A and A1B and the 27 foot buffer (737.0-A1CN) to 737.0-A1C to involve all of room 737.0-A1 was previously evaluated by NRC (Reference 19). The potential for cross zone fire spread for this area is discussed under NUREG-1407 Issue Number 4 in Section 7.3.

TABLE 5.2

AREAS SCREENED IN THE REVISED EVALUATION (INFORMATION FROM WBN-IPE-005 U2)			
FIRE AREA	**ROOM NO.**	**ROOM DESCRIPTION**	**F_2**
8	713.0-A1 & A22	Corridor &Valve Gallery	9.28E-07
	713.0-A17	Seal Water Heat Exchanger 2A	4.57E-09
10	757.0-A13	Refueling Room	7.46E-07
	772.0-A9	HEPA Filter Plenum Room	3.64E-08
14	737.0-A1	Corridor	5.05E-07
17	757.0-A2	6.9KV and 480-V Shutdown Board Room A	4.27E-08
	757.0-A9	Personnel and Equipment Access	7.94E-08
19	757.0-A4	125-V Vital Battery Board I Room	7.88E-08
20	757.0-A1	Auxiliary Control Room	1.95E-08
23	757.0-A27	Auxiliary Control Instrument Room 2A	1.91E-08
24	757.0-A28	Auxiliary Control Instrument Room 2B	2.86E-08
27	757.0-A5	480-V Shutdown Board Room 1B	2.35E-08
28	757.0-A21	480-V Shutdown Board Room 2A	4.03E-08
29	757.0-A22	125-V Vital Battery Board Room IV	8.35E-07
30	757.0-A23	125-V Vital Battery Board Room III	5.96E-08
31	757.0-A17	Personnel and Equipment Access	7.54E-08
	757.0-A24	6.9KV & 480-V Shutdown Board Room B	2.27E-07
32	772.0-A1	480-V Board Room 1A	2.84E-08
41	772.0-A11	480-V Transformer Room 2B	1.15E-07
42	772.0-A12	480-V Transformer Room 2A	1.25E-07
45	772.0-A15	480-V Board Room 2B	8.09E-08
46	772.0-A16	480-V Board Room 2A	2.88E-08
47	786.0-AR	Auxiliary Building Roof	3.10E-07
48	692.0-C5	250-V Battery Board Room 2	1.87E-07
	692.0-C6	250-V Battery Room 2	3.38E-08
	692.0-C7	24-V & 48-V Battery Room	3.16E-08
	692.0-C8	24-V & 48-V Battery Bd and Charger Room	2.34E-07
	692.0-C9	Communications Room	1.90E-07
	692.0-C10	Mechanical Equipment Room	1.00E-07
	692.0-C11	Corridor	5.30E-08
	692.0-C12	Secondary Alarm Station	1.05E-07
	708.0-C2	Corridor	4.45E-08
	708.0-C3	Plant Computer Room	2.56E-07
	708.0-C4	Auxiliary Instrument Room 2	6.83E-07
	729.0-C1	Cable Spreading Room	1.42E-07
	755.0-C12	Main Control Room	9.65E-07
	755.0-C13& C20	Relay Room & DPSO Shop	2.20E-07
60	711.IPS-Elec BD Room	480-V Board Room	3.28E-08
63	Turbine Building	Turbine Building	5.92E-07
65	713.0-A29	Unit 2 Pipe Chase & Valve Gallery	4.09E-08

AREAS SCREENED IN THE REVISED EVALUATION (INFORMATION FROM WBN-IPE-005 U2)			
FIRE AREA	ROOM NO.	ROOM DESCRIPTION	F_2
70	692.0-A25	Unit 2 Pipe Gallery	7.69E-08
71	713.0-A19	Unit 2 Pipe Gallery	3.23E-08
75	757.0-A16	Emergency Gas Treatment Filter Room	7.57E-08
	782.0-A3	Unit 2 Control Rod Drive Equipment Room	5.42E-08
	782.0-A4	Unit 2 Pressurizer Heater Transformer Room	1.87E-08

6. RESULTS (FIVE Phase III, Step 1)

Phase III of the FIVE process consists of documentation of results from the screening process and resolution of any new or remaining issues, primarily those identified in the Sandia Fire Risk Scoping Study (NUREG/CR-5088, Reference 6). The results of this evaluation are discussed in this section. New and remaining issues are then discussed in Section 7.

This evaluation, which was performed in accordance with the requirements of Supplement 4 to Generic Letter 88-20 (NUREG-1407, Reference 19) and the guidance provided by the EPRI FIVE documentation (Reference 2), has confirmed that there are no fire-induced vulnerabilities of concern associated with the continued operation of the Watts Bar Nuclear Plant.

The results of the screening process performed in this evaluation can be summarized as follows:

Of the 140 plant areas listed in Table 6.1, 17 were screened from further consideration in Phase I, the fire compartment interaction analysis. These screened areas are indicated with an "X" under the "Phase I" column in Table 6.1 and are listed individually in Table 2.1.

Of the (140-17 =) 123 areas listed in Table 6.1 that remained for quantitative evaluation, only those associated with the Unit 2 Reactor Building were screened from further consideration due to fire ignition frequency below 1E-06. This is indicated with "II.1" in the "Screened at Phase II.2" column in Table 6.1.

Of the (121-5) = 116 areas (five rooms were combined with five other rooms) listed in Table 6.1 that remained for quantitative evaluation, 71 were screened from further consideration based on the initial quantitative evaluation. These areas are indicated with an "X" in the "Phase II.2" column in Table 6.1 and are individually listed in Table 4.1.

Of the (116 - 71 =) 45 areas that remained for detailed quantitative evaluation, all were screened from further consideration in Phase II, Step 3. These areas are

indicated with an "X" in the "Phase II.3" column in Table 6.1 and are individually listed in Table 5.2.

TABLE 6.1

SUMMARY OF AREA SCREENING PROCESS					
FIRE AREA	ROOM NO.	ROOM DESCRIPTION	SCREENED AT PHASE		
			I	II.2	II.3
1	676.0-A1	Corridor		X	
	676.0-A14	Containment Spray Pump Room 2A-A		X	
	676.0-A15	Containment Spray Pump Room 2B-B		X	
	692.0-A1 & A4	Corridor & Chemical Drain Tank Room		X	
	692.0-A5	Gas Decay Tank Room	X		
	692.0-A27	Concentrate Filter Room	X		
	692.0-A29	Boric Acid Evaporator Package B Room	X		
	692.0-A30	Boric Acid Evaporator Package A Room		X	
1-1	692.0-A20	Safety Injection Pump Room 2B-B		X	
1-2	692.0-A19	Safety Injection Pump Room 2A-A		X	
2-2	676.0-A13	RHR Pump Room 2B-B		X	
3-2	676.0-A12	RHR Pump Room 2A-A		X	
8	713.0-A1 & A22	Corridor & Valve Gallery			X
	713.0-A4	Radio Chemistry Lab	X		
	713.0-A14	Sample Room 2B		X	
	713.0-A15	Heat Exchanger Room 2A		X	
	713.0-A16	Heat Exchanger Room 2B		X	
	713.0-A17	Seal Water Heat Exchanger Room 2A			X
	713.0-A23	CVCS Valve Gallery	X		
10	729.0-A6	Nitrogen Storage Area		X	
	729.0-A9	Unit 2 Fuel Transfer Valve Room		X	
	757.0-A13	Refueling Floor			X
	772.0-A9	HEPA Filter Plenum Room			X
	786.0-A1	Fan Room	X		
14	737.0-A1	Corridor			X
	737.0-A8	Unit 2 Letdown Heat Exchanger Room	X		
	737.0-A11	Air Lock	X		
15-1	737.0-A3	HVAC Equipment Room 1		X	
15-2	737.0-A12	HVAC Equipment Room 2		X	
17	757.0-A2	6.9KV & 480V Shutdown Board Room A			X
	757.0-A9	Personnel & Equipment Access Room			X
18	757.0-A3	125V Vital Battery Board Room II		X	
19	757.0-A4	125V Vital Battery Board Room I			X
20	757.0-A1	Auxiliary Control Room			X
21	757.0-A25	Unit 1 Train A Instrument Room		X	
22	757.0-A26	Unit 1 Train B Instrument Room		X	
23	757.0-A27	Unit 2 Train A Instrument Room			X
24	757.0-A28	Unit 2 Train B Instrument Room			X
25	782.0-A1	Unit 1 Control Rod Drive Equipment Room		X	
25	782.0-A2	Unit 1 Pressurizer Heater Transformer Room		X	
27	757.0-A5	480V Shutdown Board Room 1B			X

SUMMARY OF AREA SCREENING PROCESS					
FIRE AREA	ROOM NO.	ROOM DESCRIPTION	SCREENED AT PHASE		
			I	II.2	II.3
28	757.0-A21	480V Shutdown Board Room 2A			X
29	757.0-A22	125V Vital Battery Board Room IV			X
30	757.0-A23	125V Vital Battery Board Room III			X
31	757.0-A17	Personnel & Equipment Access Room			X
	757.0-A24	6.9KV & 480V Shutdown Board Room B			X
32	772.0-A1	480V Board Room 1A			X
33	772.0-A2	480V Board Room 1B		X	
34	772.0-A3	125V Vital Battery Room II		X	
35	772.0-A4	125V Vital Battery Room I		X	
36	772.0-A5	480V Transformer Room 1B		X	
37	772.0-A6	480V Transformer Room 1A		X	
38	772.0-A7	Mechanical Equipment Room 1		X	
39	772.0-A8	Fifth 125V Vital Battery & Board Room		X	
40	772.0-A10	Mechanical Equipment Room 2		X	
41	772.0-A11	480V Transformer Room 2B			X
42	772.0-A12	480V Transformer Room 2A			X
43	772.0-A13	125V Vital Battery Room IV		X	
44	772.0-A14	125V Vital Battery Room III		X	
45	772.0-A15	480V Board Room 2B			X
46	772.0-A16	480V Board Room 2A			X
47	786.0-AR	Auxiliary Building Roof			X
	786.0-A2	Roof Access Air Lock	X		
	786.0-A3	Mechanical Equipment Room	X		
	786.0-A4	Mechanical Equipment Room	X		
48	692.0-C5	250V Battery Board Room 2			X
	692.0-C6	250V Battery Room 2			X
	692.0-C7	24V & 48V Battery Room			X
	692.0-C8	24V & 48V Battery Board & Charger Room			X
	692.0-C9	Communications Room			X
	692.0-C10	Unit 2 Mechanical Equipment Room			X
	692.0-C11	Corridor			X
	692.0-C12	Secondary Alarm Station			X
	708.0-C2	Corridor			X
	708.0-C3	Computer Room			X
	708.0-C4	Unit 2 Auxiliary Instrument Room			X
	729.0-C1	Cable Spreading Room			X
	755.0-C12	Main Control Room			X
	755.0-C13 & C20	Relay Room & DPSO Shop			X
49	742.0-D4	Diesel Generator Unit 1A-A Room		X	
	760.5-D3	Diesel Generator 1A-A Air Exhaust Room		X	
	760.5-D4	Diesel Generator 1A-A Board Room		X	
	760.5-D5	Diesel Generator 1A-A Air Intake Room		X	
50	742.0-D5	Diesel Generator Unit 2A-A Room		X	
	760.5-D6	Diesel Generator 2A-A Air Exhaust Room		X	
	760.5-D7	Diesel Generator 2A-A Board Room		X	

SUMMARY OF AREA SCREENING PROCESS					
FIRE AREA	ROOM NO.	ROOM DESCRIPTION	SCREENED AT PHASE I	II.2	II.3
50	760.5-D8	Diesel Generator 2A-A Air Intake Room		X	
51	742.0-D6	Diesel Generator Unit 1B-B Room		X	
	760.5-D9	Diesel Generator 1B-B Air Exhaust Room		X	
	760.5-D10	Diesel Generator 1B-B Board Room		X	
	760.5-D11	Diesel Generator 1B-B Air Intake Room		X	
52	742.0-D7	Diesel Generator Unit 2B-B Room		X	
	760.5-D12	Diesel Generator 2B-B Air Exhaust Room		X	
	760.5-D13	Diesel Generator 2B-B Board Room		X	
	760.5-D14	Diesel Generator 2B-B Air Intake Room		X	
53	742.0-D3 & D9	DG Building Toilet & Corridor		X	
	742.0-D8	Fuel Oil Transfer Valve Room	X		
55	742.0-Chase A	Train A Cable Chase		X	
56	742.0-Chase B	Train B Cable Chase		X	
58	722.IPS-STR A	Train A ERCW Strainer Room		X	
	741.IPS-ERCW PUMP RM A	Train A ERCW Pump Room		X	
	741.IPS- SWP A	Train A Screen Wash & Fire Pump Room		X	
59	722.IPS-STR B	Train B ERCW Strainer Room		X	
	741.IPS-ERCW PUMP RM B	Train B ERCW Pump Room		X	
	741.IPS- SWP B	Train B Screen Wash & Fire Pump Room		X	
60	711.IPS-ELEC BD ROOM	Intake Pumping Station Electrical Board Room			X
	728.IPS-RSW DECK	Intake Pumping Station – RSW Pump Deck	X		
63	TURBINE BLDG	Turbine Building			X
65	676.0-A17	Unit 2 Pipe Gallery		X	
	692.0-A24	Unit 2 Pipe Chase & Valve Gallery		X	
	713.0-A29	Unit 2 Pipe Chase & Valve Gallery			X
66	692.0-A21	Charging Pump 2C Room		X	
67	692.0-A22	Centrifugal Charging Pump 2B-B Room		X	
68	692.0-A23	Centrifugal Charging Pump 2A-A Room		X	
69	692.0-A26	Turbine Driven AFW Pump 2A-S Room		X	
70	692.0-A25	Unit 2 Pipe Gallery			X
71	713.0-A19	Unit 2 Pipe Gallery			X
	713.0-A21	Unit 2 Reactor Building Access Room	X		
71-1	713.0-A20	Unit 2 Volume Control Tank Room		X	
72	729.0-A11	Unit 2 South Main Steam Valve Room		X	
	737.0-A10	Air Lock	X		
73	729.0-A10	Unit 2 North Main Steam Valve Room		X	
	729.0-A13	Unit 2 Steam Valve Instrument Room		X	
	729.0-A15 & 763.5-A2	Unit 2 Additional Equipment Building (all elevations)		X	
	729.5-A17	Unit 2 Shield Building Vent Rad Monitor Rm.		X	
	737.0-A14	Air Lock	X		

SUMMARY OF AREA SCREENING PROCESS					
FIRE AREA	ROOM NO.	ROOM DESCRIPTION	SCREENED AT PHASE		
			I	II.2	II.3
74	737.0-A9	Unit 2 Ventilation & Purge Air Room		X	
	737.0-A16	Unit 2 Gross Fail Fuel Detector Room	X		
75	757.0-A14	Unit 2 Reactor Building Access Room		X	
	757.0-A16	Emergency Gas Treatment Filter Room			X
	782.0-A3	Unit 2 Control Rod Drive Equipment Room			X
	782.0-A4	Unit 2 Pressurizer Heater Transformer Room			X
76	757.0-A15	Unit 2 Reactor Building Equipment Hatch		X	
77	U2 ANN	Unit 2 Annulus	II.1		
	U2 Primary	Unit 2 Primary Containment	II.1		

7. NEW AND REMAINING ISSUES (FIVE PHASE III, Step 2)

The last part of the fire evaluation process addresses the response to and resolution of the Sandia Fire Risk Scoping Study (NUREG/CR-5088, Reference 6) issues and the evaluation of containment isolation and heat removal. Also, the individual requirements for performance and documentation of a fire IPEEE, as specified in NUREG-1407 (Reference 19), are addressed. These issues are discussed in the following report sections:

Section 7.1	Containment heat removal and isolation
Section 7.2	Sandia Fire Risk Scoping Study (NUREG/CR-5088) issues
Section 7.3	Individual requirements of NUREG-1407.

References to the Fire Protection Report and plant documentation (e.g., procedures) in this section will be reviewed and updated during the validation of the Unit 2 "as designed" FIVE analysis.

7.1 Evaluation of Containment Heat Removal and Isolation

Section 4.1.5 (Perform Containment Analysis) of NUREG-1407 states that the licensee should:

> *"Perform containment analysis if containment failure modes differ significantly from those found in the IPE internal events evaluation."*

The EPRI FIVE report (Reference 2) provides a justification for limiting containment performance evaluations related to heat removal and isolation. It states "...fires leading to the potential loss of safe shutdown functions above the threshold value of 1E-06/year and having plant damage states and minimum operable equipment not included in the IPE, should be flagged for containment analysis evaluation." In the Unit 2 fire analysis, all of the areas screened-out and had fire-induced core damage frequencies less that 1E-06/year; therefore, further containment evaluation was unnecessary.

The containment discussion below pertaining to the Fire Protection Report and the Appendix R analysis is for information. As stated previously, the EPRI FIVE report provides justification for not evaluating containment isolation and heat removal if the fire-related core damage frequency for all areas is below 1E-06/year.

A separate discussion of the requirements for containment isolation in response to fires is provided in Section 4.12 of Part III of the Fire Protection Report. Review of these considerations, relative to containment failure confirm that no containment failure modes are introduced by the fire evaluation that differ significantly from those seen in the IPE.

In addition to containment isolation, the Fire Protection Report (FPR) addresses several issues related to reactor coolant system integrity following plant fires. The first of these issues, reactor coolant pump (RCP) seal integrity, is addressed in Part III, Section 4.1 of the FPR.

The Appendix R analysis also considered the pressurizer PORV and PORV block valves as Fire Safe Shutdown (FSSD) components, such that they were explicitly tracked through the fire evaluation process. Due to the requirement for a "hot short" condition to open the PORV,

coincident with a failure of the associated block valve to close on demand from the operator, the routing of these components as redundant fire safe shutdown components provides adequate assurance against a fire-induced LOCA through this path. For the single plant area where this mode of failure was noted (Main Control Room Panel 2-M-5, as described in Section 6.5 of report WBN-IPE-005 U2), no other major plant components were identified as being affected by a fire. For a significant, unsuppressed fire in this area, Control Room evacuation would be required, allowing isolation of these components from outside the Control Room using the Alternate Shutdown Capability described in Section IV of the Fire Protection Report and Abnormal Operating Instruction, AOI-30.2.

Finally, the Fire Protection Report addresses containment heat removal by including the associated heat removal path (using Emergency Raw Cooling Water - ERCW - as an ultimate heat sink) with the long term decay heat removal path using the RHR system. This heat removal path would also be used for long term containment heat removal following plant shutdown with bleed and feed cooling. This mode of cooling is only credited for the evaluation of specific cases in reports WBN-IPE-003 U2 and WBN-IPE-005 U2. Otherwise, the Fire Protection Report requires short term heat removal through the steam generators using Auxiliary Feedwater (AFW).

7.2 Resolution of Sandia Fire Risk Scoping Study Issues

The EPRI FIVE documentation discusses the following six issues to be addressed.

1. Seismic/fire interactions.

2. Fire barrier qualification.

3. Manual fire fighting effectiveness.

4. Total environment equipment survival.

5. Control systems interaction.

6. Improved analytical codes.

These issues, which were originally taken from the Fire Risk Scoping Study (NUREG/CR-5088) performed by Sandia Laboratories (the Sandia Fire Risk Scoping Study Issues) are discussed below. The specific responses for each of these concerns for the Watts Bar analysis are listed in italics directly below the description of the Sandia issue.

7.2.1 Seismic/Fire Interactions

The issue of seismic/fire interactions centers on the following 3 areas of interest:

- Seismically induced fires. In particular, this concern centers on fires caused by flammable gas or liquid storage containers or systems that could rupture during a seismic event.

- Seismic actuation of fire suppression systems. In particular, this concern centers on the failure of electrical or other components due to water sprays.

- Seismic degradation of fire suppression systems. In particular, this concern reviews the plant design for fragility of fire suppression systems to a seismic event.

Each of these areas of interest is described in detail below.

7.2.1.1 Seismically Induced Fires

As part of the seismic assessment walkdown, verify hydrogen or other flammable gas or liquid storage vessels in areas with seismic safe shutdown or safety related equipment are not subject to leakage under seismic conditions. Examples would be improperly anchored hydrogen or oxygen bottles, hydrogen tanks used for primary coolant chemistry control, etc.

Response *Hydrogen or flammable gas/liquid storage vessels are not kept on a permanent basis in the Auxiliary Building, Diesel Generator Buildings, Control Building or the Intake Pump Station. Hydrogen storage tanks are located outside in the yard area. Hydrogen supply lines are seismically designed and provided with excess flow shutoffs.*

Site Standard Practice SSP-13.02 and Fire Protection Instruction FPI-0100 provide the requirements for control of this type of combustible, including the requirement that compressed gas cylinders be tied to permanent structural features, using methods described in the standard practice.

In addition, the seismic walkdown required for the seismic portion of the Unit 1 IPEEE identified potential seismic class II components affecting seismic class I components in safety related areas (Reference 16). These were shown to be acceptable by the IPEEE Outlier Interaction Evaluation (Reference 17). For IPEEE Unit 2, the seismic walkdowns will be performed as a validation activity.

7.2.1.2 Seismic Actuation of Fire Suppression Systems

As part of the seismic assessment, verify that the design of the water suppression system considers the effects, if appropriate, of inadvertent suppression system actuation and discharge on that equipment credited as part of the seismic safe shutdown path in a margins assessment that was not previously reviewed relative to the internal flooding analysis or concerns such as those discussed in NRC I&E Notice 83-41.

Response *This issue was also addressed by Information Notice 94-12, Effects of Fire Suppression System Actuation on Safety Related Systems. The Watts Bar response to these issues was as follows:*

1. *Mercury Relays. No mercury relays are present in the fire protection control systems.*

2. *Seismic Dust/Smoke Detectors. Smoke and/or heat detectors are used at the Watts Bar Nuclear Plant to actuate fire suppression systems in various areas of the plant. The CO_2 systems are actuated by heat detectors or by a combination of smoke and heat detectors. Therefore, dust particles created during a seismic event alone will not activate the CO_2 systems.*

   Watts Bar Nuclear Plant has no open head spray systems located inside safety related buildings. As part of the Appendix R analysis, fire suppression damage evaluations have been made, as documented in calculation EPM-RAC-032392, Evaluation of Suppression System Discharge (Reference 15). It has been concluded that spurious discharge of water from fire suppression systems will have no adverse impact on the safe shutdown capability of the plant.

3. *Water Deluge Systems. As noted above, Watts Bar Nuclear Plant has no open head spray systems located inside safety related buildings.*

4. *Fire Suppressant Availability during a Seismic Event. Halon systems are not used to protect areas that contain safety related equipment. The CO_2 systems are seismically qualified, with the exception of the refrigeration system, which is not required except for prolonged periods. The water suppression system uses four electric motor driven pumps and one diesel driven fire pump. The electric pumps and associated 6.9kV shutdown boards are located in seismic class 1 structures.*

5. *Switchgear Fires. There are cases where electrical cables and raceways are located close to the top of electrical cabinets and could become directly involved in a fire. These cases are identified in report WBN-IPE-004 U2 and evaluated in the detailed analysis described in report WBN-IPE-005 U2, which is summarized in Section 5 of this report.*

6. *Electro-Mechanical Components in Cable Spreading Rooms. No high voltage electric cabinets are present in these areas at the Watts Bar Nuclear Plant. HVAC equipment and control panels in these areas are installed such that tipping or sliding is prevented.*

7.2.1.3 Seismic Degradation of Fire Suppression Systems

As part of the seismic assessment walkdown, verify that plant fire suppression systems have been structurally installed in accordance with good industrial practice and reviewed for seismic considerations, such that suppression system piping and components will not fail and damage safe shutdown path components, nor is it likely that leaking or cascading of the suppressant will result.

Response *The fire protection system piping is designed to maintain pressure boundary integrity where spray damage to safety related components would affect the safe shutdown capability of the plant. The fire protection system piping is designed at a minimum for position retention (seismic II/I design criteria). Additionally, the seismic walkdown required for the seismic portion of the Unit 1 IPEEE identified potential seismic class II components affecting seismic class I components in safety related areas (Reference 16). These were shown to be acceptable by the IPEEE Outlier Interaction Evaluation (Reference 17). For the Unit 2 IPEEE, detailed seismic verification walkdowns of the fire protection piping will be performed as part of the Integrated Interaction Program (IIP) and this will be used as the basis for screening out this concern during seismic IPEEE validation activities.*

7.2.2 Fire Barrier Qualifications

The concern for fire barrier qualification centers on the following 4 areas of interest:

- Fire barrier surveillance program.
- Inspection and maintenance of fire doors.
- Installation, inspection, surveillance and maintenance of penetration seal assemblies.
- Inspection, testing and maintenance of fire dampers.

Each of these areas of interest is described in detail below.

7.2.2.1 Fire Barriers

Fire barriers and components such as fire dampers, fire penetration seals and fire doors for fire barriers are included in the plant surveillance program.

Response *Fire barriers are included in the Watts Bar Nuclear Plant surveillance program. Fire Operating Instruction 0-FOR-304-1, Fire Barrier/Mechanical, Conduit, Cable Tray, and Fire Damper (External) Penetration Visual Inspection - Auxiliary, Control and Diesel Generator Building, is performed to verify the functional status of required fire rated barriers, including mechanical pipe fire rated penetration seals and external electrical conduit fire rated seals by performing a visual inspection. 0-FOR-304-2, Electrical Raceway Fire Barrier Systems Visual Inspection - Auxiliary Building addresses these requirements for electrical raceways in the Auxiliary Building. The Reactor Buildings are addressed by 1-FOR-304-1, Visual Inspection of Fire-Rated Assemblies Located in the Reactor Building (2-FOR-304-1 is being written for Unit 2 Reactor Building).*

7.2.2.2 Fire Doors

A fire door inspection and maintenance program should be implemented at the plant.

Response *The inspection of fire doors is addressed by Fire Operating Instruction 0-FOR-410-1, 31 Day Fire Door Inspection. Operational testing of fire doors is addressed by 0-FOR-410-2, 12 Month Fire Door Operational Test.*

7.2.2.3 Penetration Seal Assemblies

a. A penetration seal inspection and surveillance program should be implemented at the plant.

Response *The surveillance and inspection of penetration seals is addressed in Fire Operating Instruction 0-FOR-304-1, Fire Barrier /Mechanical, Conduit, Cable Tray, and Fire Damper (External) Penetration Visual Inspection - Auxiliary, Control and Diesel Generator Building.*

b. Fire barrier penetration seals have been installed and maintained to address concerns such as those identified in NRC Information Notice 88-04.

Response *Fire barrier penetration seals at the Watts Bar Nuclear Plant have been installed and are maintained in compliance with the relevant Appendix R requirements, as described in Part II, Section 12.10.6*

(Penetration Seals) of the Watts Bar Nuclear Plant Fire Protection Report.

7.2.2.4 Fire Dampers

a. An inspection and maintenance program for fire dampers should be implemented at the plant.

Response *The inspection and testing of fire dampers is addressed by Fire Operating Instructions 0-FOR-304-1, Fire Barrier/Mechanical, Conduit, Cable Tray, and Fire Damper (External) Penetration Visual Inspection - Auxiliary, Control and Diesel Generator Building and 0-FOR-304-3, Fire Damper (Internal) Visual Inspection - Auxiliary, Control and Diesel Generator Buildings.*

b. Damper installations address concerns such as those identified in NRC Information Notice 89-52, "Potential Fire Damper Operational Problems," dated June 8, 1989 and NRC Information Notice 83-69, "Improperly Installed Fire Dampers at Nuclear Power Plants," dated October 21, 1983.

Response *Fire dampers at the Watts Bar Nuclear Plant are installed to meet the applicable Appendix R compartmentation requirements. These dampers are described in Part II, Section 12.10.5 (Fire Dampers) of the Watts Bar Nuclear Plant Fire Protection Report. Inspection and testing for this equipment is discussed under item (a) above.*

7.2.3 Manual Fire Fighting Effectiveness

The concern for manual fire fighting effectiveness centers on the following 6 areas of interest:

- Fire reporting, including the use and availability of portable fire extinguishers and plant procedures for reporting fires, including plant communication.
- Fire brigade makeup and equipment.
- Fire brigade training in the classroom.
- Fire brigade practice in hands-on structural fire training and in the use of equipment.
- Fire brigade drills.
- Fire brigade training records.

Each of these areas of interest is described in detail below.

7.2.3.1 Reporting Fires

a. Appropriate plant personnel are knowledgeable in the use of portable fire extinguishers.

Response *Plant personnel and fire department (WBN has a dedicated fire department instead of a fire brigade) members receive regular training in the use of portable fire extinguishers.*

b. Portable extinguishers are located throughout the plant.

Response *Part II, Section 12.4.1 (Portable Extinguishers) of the Fire Protection Report specifies that "Portable extinguishers of a size and type compatible with specific hazards are located throughout the plant."*

c. A plant procedure is in use for reporting fires in the plant.

Response *Fire Protection Instruction FPI-0110 (Emergency Response) directs the person reporting the fire to call extension 3911, which will connect the caller to the Main Control Room.*

d. A plant communication system that includes contact to the control room is operable at the plant.

Response *The Control Room can be contacted by telephone, from one of the internal plant communication stations or by plant operations/fire brigade radio.*

7.2.3.2 Fire Brigade Makeup and Equipment

7.2.3.2.1 A fire brigade that is made up of at least 5 trained people on each shift should be maintained at the plant.

Response *This requirement (1 brigade leader and at least 4 other members) is specified in Section 9.1 (Fire Brigade Staffing) of Part II of the Fire Protection Report.*

7.2.3.2.2 The fire brigade leader and at least two other brigade members on each brigade shift should be knowledgeable in plant systems and operations.

Response *All fire department personnel pass the two week Nuclear Systems Training Course, in addition to completing a Plant Systems Familiarization Qualification Card. This requirement is also specified for personnel transferring from other nuclear sites in Fire Protection Instruction FPI-0120 (Emergency Response Training).*

7.2.3.2.3 Each brigade member should receive an annual review of physical condition to evaluate his ability to perform fire fighting activities.

Response *This requirement is specified in Section 9.3 (Training and Qualifications) of Part II of the Watts Bar Nuclear Plant Fire Protection Report.*

7.2.3.2.4 A minimum amount of equipment should be provided for the onsite fire brigade:

a. Personal protective equipment should be provided such as SCBA, turnout coats, boots, gloves, and hard hats.

b. Emergency communications equipment should be provided for fire brigade use.

c. Portable lights should be provided for fire brigade use.

d. Portable ventilation equipment should be provided for fire brigade use.

e. Portable extinguishers should be provided for fire brigade use.

Response *These requirements are included in Section 9.4 (Firefighting Equipment), Part II of the Fire Protection Report.*

7.2.3.3 Fire Brigade Training

Brigade members should receive an initial classroom instruction program consisting of the following:

a. A review of the plant fire fighting plan and identification of each individual's responsibilities.

b. Identification of typical fire hazards and associated types of fires that may occur in the plant.

c. Identification of the location of firefighting equipment and familiarization with the layout of the plant, including access and egress routes.

d. Training on the proper use of available firefighting equipment and the correct method of fighting each type of fire. The types of fires covered should include fires in energized electrical equipment, fires in cables and cable trays and fires involving flammable and combustible liquids and gases.

e. Training on the proper use of communication, lighting, ventilation and emergency breathing equipment.

f. Training on techniques for fighting fires inside buildings and confined spaces.

g. A review of fire fighting strategies and procedures.

Response *Fire Department training requirements, including those that address the items listed above are specified in Section 9.3 (Training and*

Qualification) of Part II of the Watts Bar Nuclear Plant Fire Protection Report.

7.2.3.4 Fire Brigade Practice

Fire brigade members should receive hands-on structural fire fighting training at least once a year to provide experience in actual fire extinguishment and the use of emergency breathing apparatus.

Response *Fire Department drill requirements, including annual requirements, such as actual fire extinguishment and the use of emergency breathing apparatus, are specified in Section 9.3 (Training and Qualifications) of Part II of the Watts Bar Nuclear Plant Fire Protection Report.*

7.2.3.5 Fire Brigade Drills

a. Fire brigade drills are performed in the plant so that each fire brigade shift can practice as a team.

Response *Fire department drill requirements for fire department team members are specified in Fire Protection Instruction FPI-0120 (Emergency Response Training).*

b. Drills should be performed at regular intervals for each shift fire brigade.

Response *Section 9.3 (Training and Qualifications) of Part II of the Fire Protection Report specifies a minimum of one drill per shift every 92 days.*

c. At least one unannounced fire drill for each shift fire brigade should be performed per year.

Response *This requirement is specified in Section 9.3 (Training and Qualifications) of Part II of the Watts Bar Nuclear Plant Fire Protection Report).*

d. At least one drill per year should be performed on a "backshift" for each shift fire brigade.

Response *This requirement is specified in Section 9.3 (Training and Qualifications) of Part II of the Watts Bar Nuclear Plant Fire Protection Report).*

e. Drills should be preplanned to establish training objectives and critiqued to determine how well the training objectives have been met.

Response *These requirements, including scheduling of additional training for identified deficiencies, are specified in Section 9.3 (Training and*

Qualifications) of Part II of the Watts Bar Nuclear Plant Fire Protection Report. The forms used for fire drill critique are provided in Fire Protection Instruction FPI-0120 (Emergency Response Training).

f. At least triennially, an unannounced drill should be performed for and critiqued by qualified individuals, independent of the licensee's staff.

Response *This requirement is specified in Section 9.3 (Training and Qualifications) of Part II of the Watts Bar Nuclear Plant Fire Protection Report.*

g. Pre-fire plans should be developed for safety related areas of the plant (as a minimum).

Response *This requirement for pre-fire plans is specified in Section 9.5 (Fire Emergency Procedures and Prefire Plans) of Part II of the Watts Bar Nuclear Plant Fire Protection Report.*

h. The pre-fire plans should be updated and used as part of the brigade training.

Response *The preparation and revision of prefire plans is addressed in Fire Protection Instruction FPI-0130 (Control of Prefire Plans). Prefire plan use and adequacy for drills is addressed by the drill critique form in FPI-0120 (Emergency Response Training).*

i. Fire brigade equipment is maintained in good condition and ready for use by the fire brigade.

Response *Section 9.4 (Firefighting Equipment) of Part II of the Fire Protection Report addresses the staging of equipment to facilitate availability and address surveillance test concerns relative to life safety and ALARA. Also, equipment operability is verified prior to storage after each drill.*

7.2.3.6 Fire Brigade Training Records

Records are provided for each fire brigade member, demonstrating the minimum level of training and refresher training has been provided.

Response *Fire department training records are maintained in order to address and document compliance with the requirements of Section 9.3 (Training and Qualification) of Part II of the Watts Bar Nuclear Plant Fire Protection Report. These requirements address initial, as well as refresher, training.*

7.2.4 Total Environment Equipment Survival

The general issue of total environmental equipment survival centers on the following 3 areas of interest:

- Adverse effects of combustion products on plant equipment.
- Spurious or inadvertent fire suppression system actuation.
- Impact on effectiveness of operator actions.

Each of these areas of interest is discussed in detail below.

7.2.4.1 Potential Adverse Effects on Plant Equipment by Combustion Products

a. The FIVE methodology does not currently provide for an evaluation of non-thermal environmental effects of smoke on equipment. See Section 4.2.2 of EPRI TR-100370, Fire-Induced Vulnerability Evaluation (FIVE).

Response *During the screening evaluation, all equipment in the affected area was assumed to be damaged by the fire. More specific plant model impacts were modeled during the detailed analysis. This treatment is judged to conservatively bound the impact of non-thermal environmental effects on plant equipment. Also, these non-thermal effects, such as corrosion or degradation due to soot or other smoke products occur over a much longer period than that required to establish cold shutdown conditions.*

These impacts on plant equipment, such as control circuitry and switchgear, would be addressed during the ensuing plant outage period, as part of corrective maintenance following the fire.

b. Plant staff should be aware of and sensitive to the potential impact of smoke and products of combustion on human performance in safe shutdown operations in application of FIVE.

Response *Plant operations personnel receive regular training in the effective use of SCBA equipment. Also, operator actions were considered to fail for fires in a given area within the plant model by failing the associated plant equipment.*

7.2.4.2 Spurious or Inadvertent Fire Suppression Activation

Verify that the design of fire suppression systems considers the effects, if appropriate, of inadvertent suppression system actuation and discharge on equipment credited for safe shutdown for concerns such as those discussed in NRC I&E Information Notice 83-41.

Response *This issue was also addressed by Information Notice 94-12, Effects of Fire Suppression System Actuation on Safety Related Systems. The Watts Bar Nuclear Plant response to these issues is discussed under Section 7.2.1.2, above.*

7.2.4.3 Operator Action Effectiveness

a. There are safe shutdown procedures that identify the steps for planned shutdown when necessary, in the event of a fire.

Response *Safe shutdown instructions have been developed to address the fires that could develop in each area of the plant. For severe fires, operator actions are directed by the appropriate section of Abnormal Operating Instruction AOI-30.2, Fire Safe Shutdown. These procedures provide detailed instructions to direct the control room operator's response to the potential loss of equipment and support cables located in each area of the plant.*

b. Operators should receive training on the safe shutdown procedures.

Response *Discussions with plant operators have confirmed that they regularly receive training in the use of the fire safe shutdown instructions.*

c. If, in performance of these procedures, operators are expected to pass through or perform manual actions in areas that may contain fire or smoke suitable SCBA equipment and other protective equipment are available for operators to perform their function.

Response *SCBA equipment is located in key locations throughout the plant, in addition to the equipment that is located in the fire brigade lockers. Plant operators receive regularly scheduled training in the effective use of this equipment.*

7.2.5 Control Systems Interactions

This issue centers on the concern that safe shutdown circuits are physically independent of, or can be isolated from, the control room for a fire in the control room fire area.

Response *The remote shutdown system at Watts Bar consists of the Auxiliary Control Room and shutdown boards that are located in the Auxiliary Building. The remote shutdown system circuits are physically independent of, or can be electrically isolated from, the Main Control Room. Therefore, safe shutdown can be accomplished from outside the Control Building in the event of a severe fire in the Control Building that would cause Main Control Room abandonment. This capability is described in Part IV of the Fire Protection Report. The implementation of this capability is directed by Appendix C.69 of Abnormal Operating Instruction 30.2, Fire Safe Shutdown.*

7.2.6 Improved Analytical Codes

The issue of analytical codes centers on the fire modeling techniques that have been incorporated into the FIVE methodology. These modeling techniques, which are derived from the basic correlations used in the COMPBRN IIIe fire modeling program, have been reviewed for use in the modeling of fire progression.

Response *The correlations shown in the FIVE documentation were used to generate the zones of influence shown in Report WBN-IPE-004 U2.*

These correlations are based on fire modeling techniques from those reviewed in the Sandia study.

7.3 Requirements of NUREG-1407

The analysis described in this report was performed in order to meet the informational requirements of NUREG-1407. In particular, NUREG-1407 specifies the submittal of documentation for the following areas of interest (Appendix C, Section C.3):

1. A description of the methodology and key assumptions used in performing the fire IPEEE and a discussion of the status of Appendix R modifications.

Response *The fire IPEEE methodology consists of a progressive screening analysis, based on the EPRI FIVE methodology, as described in EPRI report TR-100370.*

Watts Bar Nuclear Plant is currently designed for compliance with applicable Appendix R related requirements.

2. A summary of walkdown findings and a concise description of the walkdown team and the procedures used. This should include a description of the efforts to ensure that cable routing used in the analysis represents as-built information and the treatment of any existing dependence between remote shutdown and control room circuitry.

Response *Plant walkdowns were performed to confirm the locations of potential fire ignition sources and to identify any safety related electrical raceways and components which could be affected by a postulated fire generated by these ignition sources.*

The walkdown findings are described in report WBN-IPE-004 U2. This report documents the zone of influence (ZOI) calculations for plant ignition sources and identifies the equipment and cable routing within the ZOI. Cable routing information was confirmed during this process by physical area walkdown and review of plant documentation.

The walkdown teams were from the Operations staff and they received guidance and support from Fire Protection Engineering and System Engineering. First and second party data collection was used to ensure that the walkdown data adequately reflects the

fire ignition sources. This two party process, in conjunction with the team staffing and support, provided confidence in the walkdown results.

The remote shutdown capability was only credited for severe fires in the Control Building, which were conservatively assumed to require Control Room evacuation (see report WBN-IPE-005 U2). This system was specifically designed to provide an independent control capability for identified plant systems and functions, including any required control circuitry. The remote shutdown capability system is described in Part IV (Alternate Shutdown Capability) of the Watts Bar Nuclear Plant Fire Protection Report.

3. A discussion of the criteria used to identify critical fire areas and a list of critical areas, including (a) single areas in which equipment failures represent a serious erosion of safety margin, and (b) same as (a), but for double or multiple areas that share common barriers, penetration seals, HVAC ducting, etc.

Response *Based on the EPRI FIVE guidance, critical fire areas are considered to be those areas that contain either any Fire Safe Shutdown (FSSD) components or a Plant Trip Initiator (PTI) or could have a fire spread from an adjacent area. The qualitative screening analysis is documented in report WBN-IPE-001 U2, which is summarized in Section 2. The specific areas that were not screened from consideration during this evaluation (i.e. "critical fire areas") are listed in Table 3.4. Fire ignition frequencies were generated for these areas and are documented in report WBN-IPE-002 U2.*

Each of the remaining areas was then evaluated on a quantitative basis, assuming that any postulated fire would totally engulf the area and result in a plant trip. If the resulting fire ignition frequency or resulting fire-related core damage frequency was less than 1E-06, further quantitative analysis was judged to be unnecessary and the area was screened from further consideration. This process is described in reports WBN-IPE-002 U2 and WBN-IPE-003 U2, which are summarized in Sections 3 and 4, respectively, of this report.

Detailed area analysis was then performed for the remaining Auxiliary Building, Control Building, Intake Pumping Station and Turbine Building. This analysis is described in report WBN-IPE-005 U2. The results of this evaluation are summarized in Section 5.

Fire hazards that could extend to include multiple fire areas were screened from further consideration, based on the fire barrier screening guidelines given in the EPRI FIVE documentation. The potential for a multiple area fire developing in area 737.0-A1A, -A1AN, -A1B, -A1BN, -A1C and –A1CN, and propagating to involve the adjacent areas is discussed under item (4) below.

4. A discussion of the criteria used to determine fire size and duration and the treatment of cross-zone fire spread and associated major assumptions.

Response *Fire size was conservatively assumed to be engulfing for postulated fires analyzed in the screening analysis described in report WBN-IPE-003 U2, which is summarized in Section 4. Fires were assumed to consume the fire ignition source for components located in the zone of influence in report WBN-IPE-004 U2.*

The Fire Events Database (NSAC/178L) was used as a basis for fire size for Turbine Building, Control Building and Auxiliary Building fires analyzed in Sections 1, 6 and 7 of report WBN-IPE-005 U2. These areas are summarized in Table 5.2. Fire duration was as required to consume the source.

Cross-zone spread of fires was evaluated using the EPRI FIVE criteria, as described in report WBN-IPE-001 U2, which is summarized in Section 2. The potential for a postulated fire involving all of room 737.0-A1 has been separately reviewed by NRC staff (Reference 20). In essence, this review concluded that the protection of trained cables for both divisions across the two 21 foot buffer areas (737.0-A1AN and 737.0-A1BN) provided between areas 737.0-A1A and -A1B and the 27 foot buffer area (737.0-A1CN) separating 737.0-A1C from the above are adequate to prevent the spread of a fire developing in any of these areas in such a way as to impact any combination of the -A1A, -A1B, and –A1C sections of the room. Discussion of the evaluation of these areas, including the impact of automatic sprinkler suppression, which is installed throughout the room, is provided in report WBN-IPE-005 U2.

5. A discussion of the fire initiating event database, including the plant specific database used. Provide documentation in each case where the plant specific data is less conservative than the data used in the approved fire vulnerability methodologies. Describe methods for handling data, including major assumptions, the role of expert judgment, and the identification and evaluation of sources of data uncertainty.

Response *The EPRI Fire Events Database (documented in NSAC/178L) was used to generate fire ignition frequencies, as described in the EPRI FIVE documentation. Review of plant experience shows plant specific data to be no less conservative than the data given in the FIVE documentation.*

Due to the use of a progressive screening analysis, data uncertainty was not explicitly modeled. For each of the areas that remained for more detailed analysis in report WBN-IPE-005 U2, a qualitative discussion of conservative assumptions is given in the associated report section. It should be noted that, with the exception of the use of the Alternate Shutdown Capability for selected severe fires in the Control Building,

recovery of equipment from fire-induced damage is conservatively not credited in this analysis.

6. A discussion of the treatment of fire growth and spread, the spread of hot gases and smoke, and the analysis of detection and suppression and their associated assumptions, including the treatment of suppression induced damage to equipment.

Response *Fire growth between areas is addressed by using the EPRI FIVE criteria. Detection and suppression are not evaluated as mitigating any fires in the initial quantitative screening evaluation documented in report WBN-IPE-003 U2. Detection and suppression were credited for selected cases, on a case-by-case basis, as described in the analysis of the Turbine Building, Control Building and Auxiliary Building areas of report WBN-IPE-005 U2.*

Suppression-induced damage is addressed under the associated Sandia issue in Section 7.2.1.2

7. A discussion of fire damage modeling, including the definition of fire-induced failures related to fire barriers and control systems and fire induced damage to cabinets. A discussion of how human intervention is treated and how fire induced and non-fire induced failures are combined. Identify recovery actions and types of fire mitigating actions for which credit is taken in these sequences.

Response *Fire barrier effectiveness was evaluated using the EPRI FIVE criteria, as described in report WBN-IPE-001 U2 and documented in EPRI report TR-100370 (Reference 2). These criteria are summarized in Section 2 of this report. For this analysis, control systems were assumed to fail in such a way as to fail the function of the affected system. It should be noted that this analysis conservatively assumes that "hot short" failures occur whenever necessary to fail the system function.*

Electrical cabinet damage was conservatively assumed to occur for postulated fires in the area, with the exception of those Turbine Building, Control Building and Auxiliary Building areas evaluated in the revised report WBN-IPE-005 U2. In these areas, which are listed in Table 5.2, component damage was typically assumed to occur, based on the severity of the individual case under consideration.

Manual actions (including required time to accomplish the action and staffing limitations) were used in the Appendix R analysis and are documented in plant operating procedures (e.g. Abnormal Operating Procedure (AOI) 30.2). Plant Operations staff train regularly on this procedure. These "human interventions" were credited in the FIVE analyses as justification that ability to safely shutdown was guaranteed. Fire Brigade response for fire suppression activities were integrated into the revised report (WBN-IPE-005 U2) for selected areas of the Turbine,

Control and Auxiliary Buildings. Non-fire induced failures are combined with fire-related impacts through use of the Level 1 PRA plant model.

8. Discuss the treatment of fire detection and suppression, including fire fighting procedures, fire brigade training and adequacy of existing fire brigade equipment and treatment of access routes versus existing barriers.

Response *Fire suppression was only considered in the detailed analysis described in report WBN-IPE-005 U2 and only on a case-by-case basis for certain Turbine Building, Control Building and Auxiliary Building areas. Fire brigade training, equipment availability and procedures are described under the associated Sandia issue in Section 7.2.*

9. All functional and systemic event trees associated with fire-initiated sequences.

Response *The plant model and associated event trees are as described in the Level 1 PRA report. Fire-initiated scenarios were incorporated by failing individual basic events within the Level 1 plant model. The individual event trees that were used to segment fire ignition frequency into individual cases, where this technique was used, are shown in report WBN-IPE-005 U2.*

10. A description of dominant functional and systemic sequences leading to core damage, along with their frequencies and percentage contribution to overall core damage frequency due to fire. Sequence selection criteria are as provided in Generic Letter 88-20 and NUREG-1335. The description of the sequences should include a discussion of specific assumptions and human recovery actions.

Response *The results of the fire risk analysis are summarized and discussed in Section 6. Due to the use of a progressive screening approach, as described in the EPRI FIVE documentation, individual scenarios are not listed for areas that were screened from further consideration, based on fire-related core damage frequency of less than 1E-06.*

11. The estimated core damage frequency, the timing of the associated core damage, a list of analytical assumptions, including their bases, and the sources of uncertainty.

Response *The results of this analysis are summarized in Section 6. The analytical assumptions used to evaluate each plant area are provided with the discussion in the associated text. Due to the use of a screening analysis, plant damage states would only be evaluated for unscreened areas. Also, a separate analysis of data uncertainty was not performed due to use of a screening analysis.*

12. Any fire induced containment failures identified as being different from those identified in the internal events analysis.

Response *Containment failure due to fire-induced damage was addressed in Section 7.1. This review concluded that no significant containment failures were introduced by the analysis of internal fires.*

13. Documentation with regard to the decay heat removal function and Fire Risk Scoping Study issues addressed by the submittal, the basis and assumptions used to address these issues, and a discussion of the findings and conclusions. Evaluation results and potential improvements should be specifically highlighted. Specifically, NUREG-1407 (Section 4) specifies that the submittal should address the following Fire Risk Scoping Study issues:

- Seismic/fire interactions.
- Effect of fire suppressant systems on safety equipment.
- Control system interactions.

Response *The issues raised in the Fire Risk Scoping Study (NUREG/CR-5088) are addressed in Section 7.2.*

14. When an existing PRA is used to address the fire IPEEE, the licensee should describe sensitivity studies related to the use of the initial hazard, supplemental plant walkdown results and subsequent evaluations. The licensee should examine the above list to fill in those items missed in the existing fire PRA.

Response *Only the plant model was used from the Level 1 PRA. In particular, this model was used specifically to capture the non-fire induced failures that could occur and to model plant response, following the incorporation of fire-induced failures.*

8. Validation of the Unit 2 "As Designed" Fire Induced Vulnerability Evaluation

The Fire Induced Vulnerability Evaluation (FIVE) documented in this summary represents an analysis of the "as designed" condition of Watts Bar Nuclear Unit 2. Since Generic Letter (GL) 88-20 specifies that the IPEEE evaluation should be based upon the "as built" configuration of the plant, the FIVE analyses of the "as designed" configuration will be validated when construction is complete to meet the "as built" GL 88-20 criterion.

The FIVE validation effort will be comprised of the following activities:

Validation Activities for Phase I

The Unit 2 population of rooms with Appendix R Safe Shutdown (SSD) Equipment will be reviewed to ensure that no safe shutdown components or plant trip initiators have been added to the scope. If any of these are discovered, they will be evaluated via the FIVE process. A representative population of rooms will be reviewed to ensure that each room's configuration, barrier ratings, room use, etc. has not changed. Based on the results of this review, rooms will be reanalyzed as necessary and changes incorporated into the analysis.

Validation Activities for Phase II, Step 1

A representative population of Unit 2 rooms will be reviewed to verify that there have been no significant changes in the room ignition frequencies which would result in a less conservative analysis result. New walkdowns will be performed and incorporated into the analysis as necessary.

Validation Activities for Phase II, Step 2

The "as built" equipment and location data for the Unit 2 Appendix R SSD equipment and safety injection/recirculation equipment will be reviewed and incorporated into the Plant Probabilistic Risk Assessment (PRA) as necessary to update the analysis. Manual actions credited in the analysis will be confirmed. Also, the latest Plant PRA will be compared to the "as designed" version of the model and updated if needed.

Validation Activities for Phase II, Step 3

Report WBN-IPE0-005 U2 will be updated as necessary. This includes reviewing and updating both the assumptions and event trees as required.

Validation Activities for Phase III

All applicable reports, including the summary, associated with the Unit 2 FIVE evaluation will be updated as necessary.

Other Validation Activities

A peer review of the Unit 2 analysis will be performed prior to submittal of the Validated "As Built" Analysis Report. This review will be similar to the review performed for the Unit 1 evaluation.

9. REFERENCES

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3. Electric Power Research Institute, "Fire PRA Implementation Guide," TR-105928, Final Report, December, 1995.

4. Houghton, J.R., "Special Study - Fire Events - Feedback of U.S. Operating Experience," AEOD/S97-03, prepared for the U.S. Nuclear Regulatory Commission, June, 1997.

5. ABSG Consulting, "Determination of Fire Scenario Safe Shutdown Path Unavailability Watts Bar Nuclear Plant Unit 2," Report WBN-IPE-003 U2.

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9. Tennessee Valley Authority, "Ignition Source Data," Unit 1 Report WBN-IPE-002.

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11. Tennessee Valley Authority, "Watts Bar Nuclear Plant Fire Protection Report," Revision 37, May 23, 2008

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13. ABS Consulting, "IPEEE (Fire) - Quantitative Screening - Phase 2 (Detailed Analysis)," Report WBN-IPE-005 U2.

14. Tennessee Valley Authority, "Fire Safe Shutdown," Watts Bar Nuclear Plant Abnormal Operating Instruction AOI-30.2, Revision 31, January 6, 2010.

15. Tennessee Valley Authority, "Evaluation of Suppression System Discharge," Calculation EPM-RAC-032392, Revision 1.

16. Tennessee Valley Authority, "Seismic Capability Walkdown for IPEEE," Calculation WCG-1-1840, Revision 1, July, 1997.

17. Tennessee Valley Authority, "IPEEE Outlier Interaction Evaluation," Calculation WCG-1-1842, Revision 1, February 2, 1998.

18. EPM, "Unit 1 and 2 Appendix R Safe Shutdown Analysis", Calculation EDQ00099920090012, Revision 0.

19. U.S. NRC, "Individual Plant Examination for External Events (IPEEE)," Supplement 4 to Generic Letter 88-20, NUREG-1407, Final Report, June, 1991.

20. U.S. NRC, "Safety Evaluation Report Related to the Operation of Watts Bar Nuclear Plant, Units 1 and 2," NUREG-0847, Supplement 18, October 1995

21. Tennessee Valley Authority, "Watts Bar Unit 2 PRA Model", Revision 0, January 22, 2010

Enclosure 2

List of Commitments

1. Prior to fuel load, a final report will be submitted following certain validation activities as described in the IPEEE Design Report (Enclosure 1).