FENOC
FirstEnergy Nuclear Operating Company

76 South Main Street
Akron, Ohio 44308

Peter P. Sena III
President and Chief Operating Officer

December 19, 2014
L-14-401

10 CFR 50.54(f)

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
11555 Rockville Pike
Rockville, MD 20852

SUBJECT:
Beaver Valley Power Station, Unit Nos. 1 and 2
Docket No. 50-334, License No. DPR-66
Docket No. 50-412, License No. NPF-73
Davis-Besse Nuclear Power Station
Docket No. 50-346, License No. NPF-3
Perry Nuclear Power Plant
Docket No. 50-440, License No. NPF-58
FirstEnergy Nuclear Operating Company (FENOC) Expedited Seismic Evaluation Process (ESEP) Reports, Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force (NTTF) Review of Insights from the Fukushima Dai-ichi Accident

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Reference 1 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 1 requested each addressee to reevaluate the site seismic hazard using updated seismic information and present-day regulatory guidance and methodologies and, if necessary, to perform a risk evaluation.

In Reference 2, the Nuclear Energy Institute (NEI) requested NRC agreement to a path forward to complete the seismic reevaluations. This path forward, an augmented approach to responding to Reference 1, included use of a deterministic ESEP as presented in the Electric Power Research Institute (EPRI) draft report, *Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*. NEI also proposed that the ESEP reports for Central and Eastern U.S. plants would be submitted to the NRC by December 31, 2014. In Reference 3, the NRC agreed with the path forward and the augmented approach presented in the EPRI report, which was subsequently issued as EPRI Report 3002000704 (Reference 4).

FENOC used the guidance in Reference 4 to develop the ESEP reports for Beaver Valley Power Station (BVPS) Unit No. 1, BVPS Unit No. 2, Davis-Besse Nuclear Power Station (DBNPS), and Perry Nuclear Power Plant (PNPP). This guidance allows the use of ground motion response spectra (GMRS) as the review level ground motion (RLGM) seismic demand in lieu of using scaled safe shutdown earthquake (SSE) response spectrum to demonstrate that the resulting high confidence of low probability of failure (HCLPF) values for the expedited seismic equipment list (ESEL) components are acceptable. The rationale that has been used by FENOC for the selection of the RLGM for the ESEPs is illustrated in red on the attached flow chart (Figure 1-2 from Reference 4).

The enclosed ESEP reports for BVPS Unit No. 1, BVPS Unit No. 2, DBNPS, and PNPP (Enclosures A, B, C, and D, respectively) provide the information described in Reference 4 in accordance with the schedule identified in Reference 2.

There are no new regulatory commitments contained in this letter. If there are any questions or if additional information is required, please contact Mr. Thomas A. Lentz, Manager – Fleet Licensing, at 330-315-6810.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 19, 2014.

Respectfully,

Peter P. Sena III

Attachment
Flow Chart Illustrating FENOC Rationale

Enclosures:

A Expedited Seismic Evaluation Process (ESEP) Report Beaver Valley Power Station – Unit 1

B Expedited Seismic Evaluation Process (ESEP) Report Beaver Valley Power Station – Unit 2

C Expedited Seismic Evaluation Process (ESEP) Report Davis-Besse Nuclear Power Station

D Expedited Seismic Evaluation Process (ESEP) Report Perry Nuclear Power Plant

References:

1. NRC Letter, *Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3, of the Near-Term Task force Review of Insights from the Fukushima Dai-ichi Accident*, dated March 12, 2012, Agencywide Documents Access and Management System (ADAMS) Accession No. ML12053A340
2. NEI Letter, *Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations*, dated April 9, 2013, ADAMS Accession No. ML13101A379
3. NRC Letter, *Electric Power Research Institute Final Draft Report XXXXXX, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," as an Acceptable Alternative to the March 12, 2012, Information Request for Seismic Reevaluations*, dated May 7, 2013, ADAMS Accession No. ML13106A331
4. EPRI Report 3002000704, *Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic*, dated April 2013, ADAMS Accession No. ML13107B387

cc: Director, Office of Nuclear Reactor Regulation (NRR)
NRC Region I Administrator
NRC Region III Administrator
NRC Resident Inspector (BVPS)
NRC Resident Inspector (DBNPS)
NRC Resident Inspector (PNPP)
NRR Project Manager (BVPS)
NRR Project Manager (DBNPS)
NRR Project Manager (PNPP)
Director BRP/DEP (without Enclosures)
Site BRP/DEP Representative (without Enclosures)
Utility Radiological Safety Board (without Enclosures)

Attachment
L-14-401

Flow Chart Illustrating FENOC Rationale
Page 1 of 1

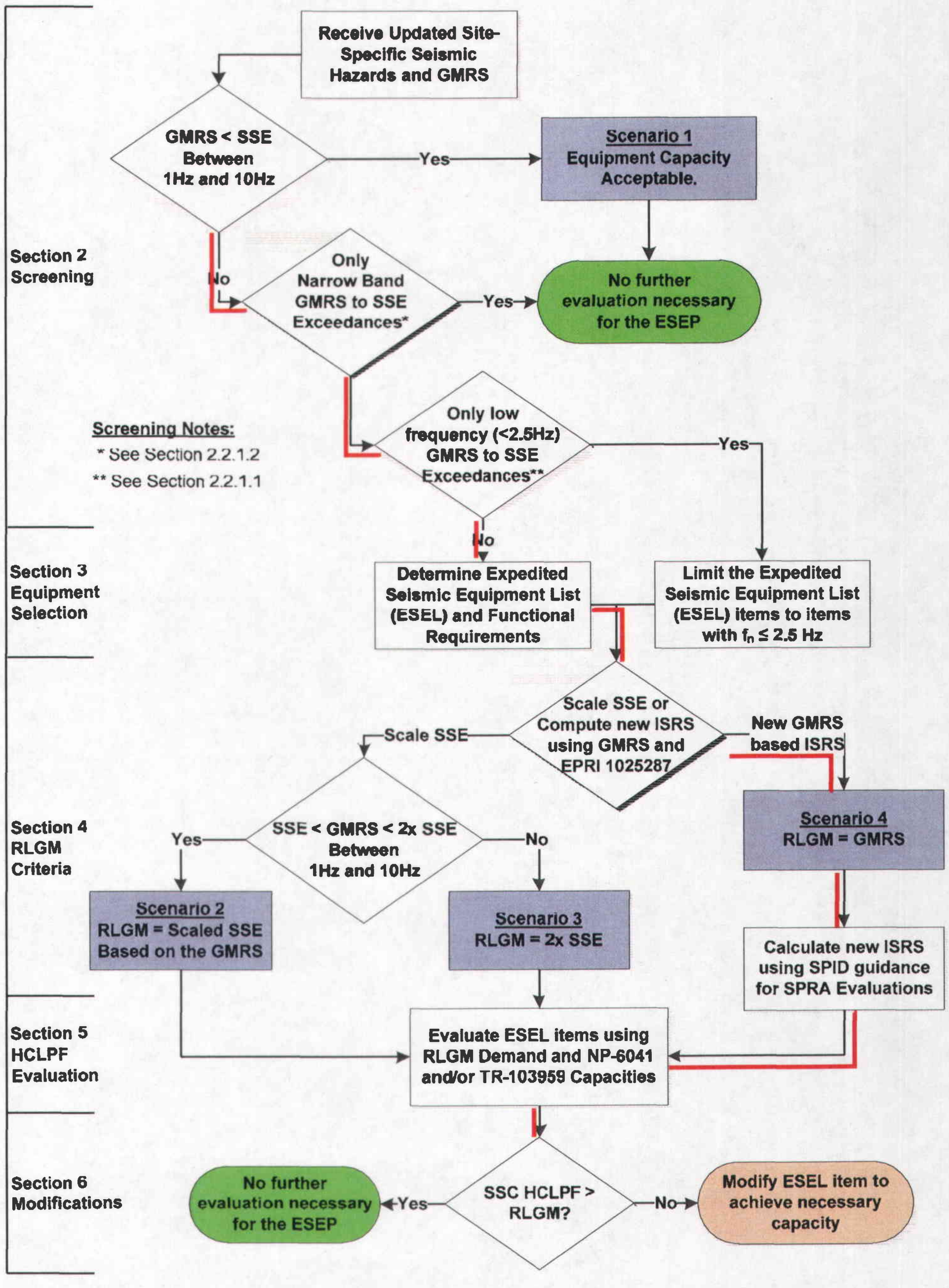

Figure 1-2
Detailed Flow Chart of the ESEP for the Augmented Approach

Enclosure A
L-14-401

Expedited Seismic Evaluation Process (ESEP) Report
Beaver Valley Power Station – Unit 1
(70 pages follow)

ABS Consulting

RIZZO ASSOCIATES

2734294-R-019
Revision 0

Expedited Seismic Evaluation Process (ESEP) Report Beaver Valley Power Station – Unit 1

November 3, 2014

Prepared for:

FirstEnergy Nuclear Operating Company

ABSG Consulting Inc. • 300 Commerce Drive, Suite 200 • Irvine, California 92602

EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT
BEAVER VALLEY POWER STATION – UNIT 1

ABSG CONSULTING INC. REPORT NO. 2734294-R-019
REVISION 0
RIZZO REPORT NO. R11 12-4735
NOVEMBER 3, 2014

ABSG CONSULTING INC.
RIZZO ASSOCIATES

ABS Consulting
RIZZO

APPROVALS

Report Name:	Expedited Seismic Evaluation Process (ESEP) Report Beaver Valley Power Station - Unit 1	
Date:	November 3, 2014	
Revision No.:	Revision 0	
Prepared by:	Eddie M. Guerra (RIZZO Associates)	11/03/2014 Date
	Ronald T. Green (FENOC)	11/7/2014 Date
Reviewed by:	Farzin Beigi (ABSG Consulting Inc.)	11/7/2014 Date
	Ryan Keck (FENOC)	11/7/2014 Date
	Mohammed Alvi (FENOC)	11-7-2014 Date
Approved by:	Eugene E. Ebeck (FENOC)	11-10-14 Date

Table of Revisions

Revision No.	Date	Description of Revision
0	November 3, 2014	Original issue.

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LIST OF ACRONYMS

ABS	ABSG CONSULTING INC.
AC	AIR-CONDITIONING
ACI	AMERICAN CONCRETE INSTITUTE
AFW	AUXILIARY FEED WATER SYSTEM
AISC	AMERICAN INSTITUTE FOR STEEL CONSTRUCTION
ANS	AMERICAN NUCLEAR SOCIETY
AOV	AIR-OPERATED VALVE
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASDV	ATMOSPHERIC STEAM DUMP VALVES
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AUX	AUXILIARY BUILDING
BDBEE	BEYOND DESIGN BASIS EXTERNAL EVENT
BE	BEST ESTIMATE
BVPS	BEAVER VALLEY POWER STATION
BVPS-1	BEAVER VALLEY POWER STATION - UNIT 1
CCR	REACTOR PLANT COMPONENT AND NEURON TANK
CDFM	CONSERVATIVE DETERMINISTIC FAILURE MARGIN
CEUS	CENTRAL AND EASTERN UNITED STATES
CNTB	CONTROL BUILDING
DC	DIRECT CURRENT
DGB	DIESEL GENERATOR BUILDING
EDG	EMERGENCY DIESEL GENERATORS
EL	ELEVATION
ELAP	EXTENDED LOSS OF ALL ALTERNATING CURRENT POWER
EPRI	ELECTRIC POWER RESEARCH INSTITUTE
ERFS	EMERGENCY RESPONSE FACILITY SUBSTATION
ESEL	EXPEDITED SEISMIC EQUIPMENT LIST
ESEP	EXPEDITED SEISMIC EVALUATION PROCESS

LIST OF ACRONYMS (CONTINUED)

EW	EAST-WEST DIRECTION
FDB	FUEL DECONTAMINATION BUILDING
FE	FINITE ELEMENT
FENOC	FIRSTENERGY NUCLEAR OPERATING COMPANY
FIRS	FOUNDATION INPUT RESPONSE SPECTRA
ft	FEET
ft/s	FEET PER SECOND
FULB	FUEL HANDLING BUILDING
FWS	STEAM GENERATOR FEEDWATER SYSTEM
g	ACCELERATION OF GRAVITY
GERS	GENERIC EQUIPMENT RUGGEDNESS DATA
GIP	GENERIC IMPLEMENTATION PROCEDURE
GMRS	GROUND MOTION RESPONSE SPECTRA
HCLPF	HIGH CONFIDENCE OF LOW PROBABILITY OF FAILURE
HVAC	HEATING, VENTILATION, AND AIR-CONDITIONING
Hz	HERTZ
INTS	INTAKE STRUCTURE
IPEEE	INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS
ISRS	IN-STRUCTURE RESPONSE SPECTRA
MAFE	MEAN ANNUAL FREQUENCY OF EXCEEDANCE
MCC	MOTOR CONTROL CENTER
MOV	MOTOR-OPERATED VALVE
MSVCV	MAIN STEAM VALVE AND CABLE VAULT BUILDING
NEI	NUCLEAR ENERGY INSTITUTE
NPP	NUCLEAR POWER PLANT
NRC	UNITED STATES NUCLEAR REGULATORY COMMISSION
NS	NORTH-SOUTH DIRECTION

LIST OF ACRONYMS (CONTINUED)

NSSS	NUCLEAR STEAM SUPPLY SYSTEM
NTTF	NEAR-TERM TASK FORCE
OIP	OVERALL INTEGRATED PLAN
P&ID	PROCESS AND INSTRUMENTATION DIAGRAM
pcf	POUNDS PER CUBIC FOOT
PGA	PEAK GROUND ACCELERATION
PPDWST	PRIMARY PLANT DEMINERALIZED WATER STORAGE TANK
psig	POUNDS PER SQUARE INCH GAUGE
RB	REACTOR BUILDING
RCBX	REACTOR CONTAINMENT STRUCTURE
RCIC	REACTOR CORE ISOLATION COOLING
RCS	REACTOR COOLANT SYSTEM
RIZZO	RIZZO ASSOCIATES
RLGM	REVIEW LEVEL GROUND MOTION
RWS	RIVER WATER SYSTEM
SASSI	SYSTEM FOR ANALYSIS FOR SOIL STRUCTURE INTERACTION
SBO	STATION BLACK-OUT
SCE	SEISMIC CAPABILITY ENGINEER
SEWS	SEISMIC EVALUATION WORK SHEETS
SFGB	SAFEGUARDS BUILDING
SG	STEAM GENERATOR
SI	SEISMIC INTERACTION
SMA	SEISMIC MARGIN ASSESSMENT
SOV	SOLENOID-OPERATED VALVE
SPRA	SEISMIC PROBABILISTIC RISK ASSESSMENT
SQUG	SEISMIC QUALITY UTILTY GROUP
SRSS	SQUARE-ROOT-OF-THE-SUM-OF-THE-SQUARES

LIST OF ACRONYMS (CONTINUED)

SRT	SEISMIC REVIEW TEAM
SRV	SERVICE BUILDING
SSCs	STRUCTURES, SYSTEMS, AND COMPONENTS
SSE	SAFE SHUTDOWN EARTHQUAKE
SSI	SOIL STRUCTURE INTERACTION
TDAFWP	TURBINE DRIVEN AUXILIARY FEED WATER PUMP
TH	TIME HISTORY
TRS	TEST RESPONSE SPECTRUM
TURB	TURBINE BUILDING
UHRS	UNIFORM HAZARD RESPONSE SPECTRA
USNRC	U.S. NUCLEAR REGULATORY COMMISSION
VAC	VOLTAGE ALTERNATING CURRENT
V_S	SHEAR WAVE VELOCITY

EXPEDITED SEISMIC EVALUATION PROCESS REPORT BEAVER VALLEY POWER STATION – UNIT 1

1.0 PURPOSE AND OBJECTIVE

Following the accident at the Fukushima Dai-ichi Nuclear Power Plant (NPP) resulting from the March 11, 2011, Great Tohoku Earthquake, and subsequent tsunami, the Nuclear Regulatory Commission (NRC) established a Near-Term Task Force (NTTF) to conduct a systematic review of NRC processes and regulations and to determine if the agency should make additional improvements to its regulatory system. The NTTF developed a set of recommendations intended to clarify and strengthen the regulatory framework for protection against natural phenomena. Subsequently, the NRC issued a 50.54(f) letter on March 12, 2012 [1], requesting information to assure that these recommendations are addressed by all United States (U.S.) NPPs. The 50.54(f) letter requests that licensees and holders of construction permits under 10 CFR Part 50 reevaluate the seismic hazards at their sites against present-day NRC requirements and guidance. Depending on the comparison between the reevaluated seismic hazard and the current design basis, further risk assessment may be required. Assessment approaches acceptable to the staff include a Seismic Probabilistic Risk Assessment (SPRA), or a Seismic Margin Assessment (SMA). Based upon the assessment results, the NRC staff will determine whether additional regulatory actions are necessary.

This Report describes the Expedited Seismic Evaluation Process (ESEP) undertaken for Beaver Valley Power Station – Unit 1 (BVPS-1). The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter [1] to demonstrate seismic margin through a review of a subset of the plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events.

The ESEP is implemented using the methodologies in the NRC endorsed guidance in Electric Power Research Institute (EPRI) 3002000704 [2].

The objective of this Report is to provide summary information describing the ESEP evaluations and results. The level of detail provided in the Report is intended to enable NRC to understand the inputs used, the evaluations performed, and the decisions made as a result of the interim evaluations.

2.0 BRIEF SUMMARY OF THE FLEX SEISMIC IMPLEMENTATION STRATEGIES

The Beaver Valley Power Station (BVPS) FLEX strategies for Reactor Core Cooling and Heat Removal, Reactor Inventory Control/Long-term Subcriticality, and Containment Function are summarized below. This summary is derived from the BVPS Overall Integrated Plan (OIP) in response to the March 12, 2012 Commission Order EA-12-049 [17].

During Phase 1, Reactor Core Cooling and Heat Removal is accomplished via steam release from the steam generators with make-up supplied via the Auxiliary Feed Water System (AFW). The primary plant demineralized water storage tank (PPDWST), Turbine Driven Auxiliary Feed Water Pump (TDAFWP), and all needed flow paths for feeding steam generators and the flow paths for steam release from the steam generators and steam supply to the TDAFWP are protected from all hazards. AFW Flow Control Valves and Atmospheric Steam Dump Valves (ASDV) are controlled locally and do not need electricity or air for local control.

During Phase 2, cooling water make-up to the PPDWST is via a FLEX portable pump, with suction from the Ohio River. Make-up water is supplied directly to the PPDWST via a new FLEX connection point.

The same Reactor Core Cooling and Heat Removal strategy applies for Phase 3, except that water purification equipment from the National SAFER Response Center is used to purify the make-up water to the PPDWST.

Reactor Inventory Control is maintained through the use of low leakage reactor coolant pump (RCP) seals. Other than installation of the seals, there are no required plant modifications. With low leakage seals, make-up to the reactor coolant system (RCS) is not required during Phase 1.

During Phase 2, Reactor Inventory Control/Long-term Subcriticality is maintained by pumping borated water from the Boric Acid Storage Tanks (BAST) to the RCS using a FLEX high pressure portable pump and new FLEX connection points at the BASTs and downstream of the Charging Pumps.

The same Reactor Inventory Control/Long-term Subcriticality strategy applies for Phase 3, except National SAFER Response Center equipment is used to mix borated water to replace the contents of the BASTs.

Key parameters are available in the control room and communications will be available between the control room and operators that are controlling the valves locally. Electrical components required to maintain the key parameter indication during Phase 1 include the installed safety related batteries, inverters, vital Alternating Current (AC) and Direct Current (DC) buses, instrument racks and control room indicators that are needed for monitoring key reactor parameters in the control room. A load shed strategy is employed to increase the battery life.

During Phase 2, a FLEX portable generator supplies power to the battery chargers through a new FLEX connection point to maintain key parameter indication. The generator back feeds power through the safety related 480 Voltage Alternating Current (VAC) electrical distribution system to the battery chargers.

There are no FLEX actions needed to maintain containment integrity. Low leakage RCP seals minimize the energy input into containment from the RCS. Containment pressure remains less than 5 pounds per square inch gauge (psig) after 7 days post event. Containment temperature and pressure are addressed in recovery actions.

3.0 EQUIPMENT SELECTION PROCESS AND ESEL

3.1 EQUIPMENT SELECTION PROCESS AND ESEL

The selection of equipment to be included on the Expedited Seismic Equipment List (ESEL) was based on installed plant equipment credited in the FLEX strategies during Phases 1, 2, and 3 mitigation of a Beyond Design Basis External Event (BDBEE), as outlined in the BVPS OIP in Response to the March 12, 2012, Commission Order EA-12-049 [3]. The OIP provides the BVPS FLEX mitigation strategy and serves as the basis for equipment selected for the ESEP.

The scope of "installed plant equipment" includes equipment relied upon for the FLEX strategies to sustain the critical functions of core cooling and containment integrity consistent with the BVPS OIP [3]. FLEX recovery actions are excluded from the ESEP scope per EPRI 3002000704 [2]. The overall list of planned FLEX modifications and the scope for consideration herein is limited to those required to support core cooling, reactor coolant inventory and subcriticality, and containment integrity functions. Portable and pre-staged FLEX equipment (not permanently installed) are excluded from the ESEL per EPRI 3002000704 [2].

The ESEL component selection followed the EPRI guidance outlined in Section 3.2 of EPRI 3002000704.

1. The scope of components is limited to that required to accomplish the core cooling and containment safety functions identified in Table 3-2 of EPRI 3002000704. The instrumentation monitoring requirements for core cooling/containment safety functions are limited to those outlined in the EPRI 3002000704 guidance, and are a subset of those outlined in the BVPS OIP [3].

2. The scope of components is limited to installed plant equipment, and FLEX connections necessary to implement the BVPS OIP [3] as described in ***Section 2.0***.

3. The scope of components assumes the credited FLEX connection modifications are implemented, and are limited to those required to support a single FLEX success path; i.e., either "Primary" or "Back-up/Alternate".

4. The "Primary" FLEX success path is to be specified. Selection of the "Back-up/Alternate" FLEX success path must be justified.

5. Phase 3 coping strategies are included in the ESEP scope, whereas recovery strategies are excluded.

6. Structures, systems, and components (SSC) excluded per the EPRI 3002000704 [2] guidance are:

   - Structures (e.g., Containment, Reactor Building [RB], Control Building [CNTB], Auxiliary Building [AUX], etc.).
   - Piping, cabling, conduit, heating, ventilation, and air-conditioning (HVAC), and their supports.
   - Manual valves and rupture disks.
   - Power-operated valves not required to change state as part of the FLEX mitigation strategies.
   - Nuclear steam supply system components (e.g., reactor pressure vessel and internals, RCPs, and seals, etc.)

7. For cases in which neither train was specified as a primary or back-up strategy, then only one train component (generally 'A' train) is included in the ESEL.

3.1.1 ESEL Development

The ESEL was developed by reviewing the BVPS OIP [3] to determine the major equipment involved in the FLEX strategies. Further reviews of plant drawings (e.g., Process and Instrumentation Diagrams [P&ID] and Electrical One-Line Diagrams) were performed to identify the boundaries of the flowpaths to be used in the FLEX strategies and to identify specific components in the flowpaths needed to support implementation of the FLEX strategies. Boundaries were established at an electrical or mechanical isolation device (e.g., isolation amplifier, valve, etc.) in branch circuits / branch lines off the defined strategy electrical or fluid flowpath. P&IDs were the primary reference documents used to identify mechanical components and instrumentation. The flow paths used for FLEX strategies were selected and specific components were identified using detailed equipment and instrument drawings, piping isometrics, electrical schematics and one-line drawings, system descriptions, design basis, and documents, etc., as necessary.

3.1.2 Power-Operated Valves

Page 3-3 of EPRI 3002000704 [2] notes that power-operated valves not required to change state are excluded from the ESEL. Page 3-2 also notes that "functional failure modes of electrical and mechanical portions of the installed Phase 1 equipment should be considered (e.g., reactor core isolation cooling ([RCIC]/AFW trips)." To address this concern, the following guidance is applied in the BVPS ESEL for functional failure modes associated with power-operated valves:

- Power-operated valves that remain energized during the Extended Loss of all Alternating Current Power (ELAP) events (such as DC powered valves), were included on the ESEL.
- Power-operated valves not required to change state as part of the FLEX mitigation strategies were included on the ESEL, but indicated as screening out of evaluation. The seismic event also causes the ELAP event; therefore, the valves are incapable of spurious operation as they would be de-energized.
- Power-operated valves not required to change state as part of the FLEX mitigation strategies during Phase 1, and are re-energized and operated during subsequent Phases 2 and 3 strategies, were not evaluated for spurious valve operation as the seismic event that caused the ELAP has passed before the valves are re-powered.

3.1.3 Pull Boxes

Pull boxes were deemed unnecessary to add to the ESELs, as these components provide completely passive locations for pulling or installing cables. No breaks or connections in the cabling are included in pull boxes. Pull boxes were considered part of conduit and cabling, which are excluded in accordance with EPRI 3002000704 [2].

3.1.4 Termination Cabinets

Termination cabinets, including cabinets necessary for FLEX Phase 2 and Phase 3 connections, provide consolidated locations for permanently connecting multiple cables. The termination cabinets and the internal connections provide a completely passive function; however, the cabinets are included in the ESEL to ensure industry knowledge on panel/anchorage failure vulnerabilities is addressed.

3.1.5 Critical Instrumentation Indicators

Critical indicators and recorders are typically physically located on panels/cabinets and are included as separate components; however, seismic evaluation of the instrument indication may be included in the panel/cabinet seismic evaluation (rule-of-the-box).

3.1.6 Phase 2 and Phase 3 Piping Connections

Item 2 in ***Section 3.1*** above notes that the scope of equipment in the ESEL includes "…FLEX connections necessary to implement the BVPS OIP [3] as described in Section 2." Item 3 in ***Section 3.1*** also notes that "The scope of components assumes the credited FLEX connection modifications are implemented, and are limited to those required to support a single FLEX success path (i.e., either "Primary" or "Back-up/Alternate")."

Item 6 in ***Section 3.0*** above goes on to explain that "piping, cabling, conduit, HVAC, and their supports" are excluded from the ESEL scope in accordance with EPRI 3002000704 [2].

Therefore, piping and pipe supports associated with FLEX Phase 2 and Phase 3 connections are excluded from the scope of the ESEP evaluation. However, any active valves in FLEX Phase 2 and Phase 3 connection flow path are included in the ESEL.

4.0 GROUND MOTION RESPONSE SPECTRUM

4.1 PLOT OF GMRS SUBMITTED BY THE LICENSEE

The BVPS-1 major structures are founded in the Pleistocene Terrace deposits or on compacted granular structural backfill at foundation elevations varying between 637 feet (ft) for the Intake Structure (INTS) to 735 ft for the Diesel Generator Building (DGB). The design basis analysis applies the safe shutdown earthquake (SSE) ground motion at the respective building foundations. Therefore, the SSE, and the ground motion response spectra (GMRS), control point elevation is taken to be at the base of the Reactor Containment Structure (RCBX), elevation (EL) 681. The bedrock immediately underlying the RCBX foundation (EL 561) is characterized by shear wave velocities (V_S) of about 5,000 feet per second (ft/s).

Figure 4-1 presents the GMRS at the control point EL 681 and compares this to the GMRS reported in the BVPS-1 March 2014 submittal [3]. The difference is attributed to:

1. The material damping used for the rock material over the upper 500 ft. While the GMRS, reported in the March 2014, submittal is based on the low strain damping of 3.2 percent over a 500-foot depth of bedrock, the GMRS used in the BV-1 SPRA limits this damping value to the upper 100 ft where the rock is considered as weathered or fractured. Within the depth range of 100 ft to 500 ft, a damping of 1 percent is used based on the unweathered shale dynamic properties from Stokoe et al., [14]. Below a depth of 500 ft, linear material behavior is adopted with the damping value of 0.5 percent is specified consistent with the kappa estimate for the Site.

2. The subsurface profile used in the site amplification analysis. While the GMRS, reported in the March 2014, submittal is based on a profile which extends from the bottom of the RCBX foundation to at depth hard rock, the GMRS used in the SPRA develops from the analysis of the full soil column to plant grade, subsequently truncated to the RB foundation level, in accordance with ISG-17 [18].

Table 4-1 presents the spectral accelerations at selected frequencies defining the GMRS used in the ESEP. The development of this GMRS is more fully described in [3]. This GMRS is also being utilized as basis to obtain fragilities in support of the on-going SPRA. Because the GMRS defines the ground motion at the RCBX foundation, it is also called the RCBX foundation input response spectrum (FIRS).

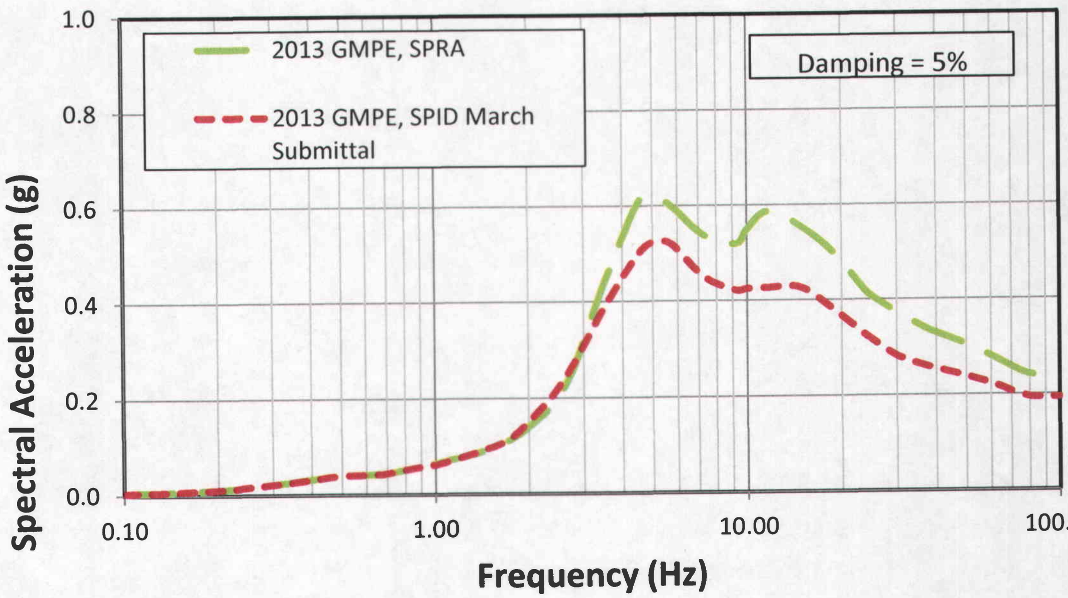

FIGURE 4-1
COMPARISON BETWEEN GMRS AT CONTROL POINT REPORTED IN SPID MARCH 2014 SUBMITTAL AND GMRS USED IN BVPS-1 SPRA PROJECT

TABLE 4-1
UHRS AND GMRS USED IN BVPS-1 SPRA, EL 681

FREQUENCY (Hz)	HORIZONTAL SPECTRAL ACCELERATION (g) AT THE FOUNDATION ELEVATION		
	$1x10^{-4}$ MAFE UHRS	$1x10^{-5}$ MAFE UHRS	GMRS
0.10	0.0027	0.0069	0.0034
0.13	0.0039	0.0098	0.0049
0.16	0.0057	0.0143	0.0071
0.20	0.0087	0.0213	0.0107
0.26	0.0136	0.0325	0.0164
0.33	0.0206	0.0481	0.0244
0.42	0.0289	0.0653	0.0333
0.50	0.0359	0.0792	0.0406
0.53	0.0357	0.0793	0.0406
0.67	0.0370	0.0833	0.0425
0.85	0.0464	0.1073	0.0544
1.00	0.0539	0.1252	0.0635
1.08	0.0577	0.1368	0.0691
1.37	0.0675	0.1729	0.0859
1.74	0.0825	0.2309	0.1128
2.21	0.1104	0.3432	0.1641
2.50	0.1296	0.4307	0.2033

TABLE 4-1
UHRS AND GMRS USED IN BVPS-1 SPRA, EL 681
(CONTINUED)

FREQUENCY (Hz)	HORIZONTAL SPECTRAL ACCELERATION (g) AT THE FOUNDATION ELEVATION		
	1x10^{-4} MAFE UHRS	1x10^{-5} MAFE UHRS	GMRS
2.81	0.1642	0.5745	0.2683
3.56	0.2793	0.9716	0.4543
4.52	0.4214	1.2647	0.6091
5.00	0.4476	1.2715	0.6191
5.74	0.4380	1.2228	0.5975
7.28	0.3789	1.1069	0.5360
9.24	0.3272	1.1010	0.5182
10.00	0.3340	1.1760	0.5486
11.72	0.3720	1.2420	0.5855
14.87	0.3887	1.1434	0.5529
18.87	0.3559	1.0245	0.4975
23.95	0.2994	0.8556	0.4161
25.00	0.2891	0.8365	0.4058
30.39	0.2709	0.7571	0.3699
38.57	0.2506	0.6773	0.3331
48.94	0.2357	0.6196	0.3064
62.10	0.2136	0.5531	0.2743
78.80	0.1871	0.4879	0.2417
100.00	0.1765	0.4841	0.2374

Note:

MAFE = mean annual frequency of exceedance.

4.2 COMPARISON TO SSE

Figure 4-2 compares the GMRS with the Site SSE at the control point elevation. The SSE horizontal spectrum is characterized by a peak ground acceleration (PGA) of 0.125 acceleration of gravity (g) and a shape derived from the five percent-damped average response spectra of several acceleration records. This shape is similar to that suggested by Newmark, et al., [12]. The comparison presented on ***Figure 4-2*** illustrates that the maximum ratio of spectral accelerations (GMRS/SSE) is about 2.8 at about 10 Hertz (Hz).

TABLE 4-2
SSE HORIZONTAL GROUND MOTION RESPONSE SPECTRUM FOR BVPS-1

FREQUENCY [Hz]	SPECTRAL ACCELERATION [g]
0.20	0.012
0.50	0.076
2.00	0.325
5.00	0.325
20.00	0.125
100.00	0.125

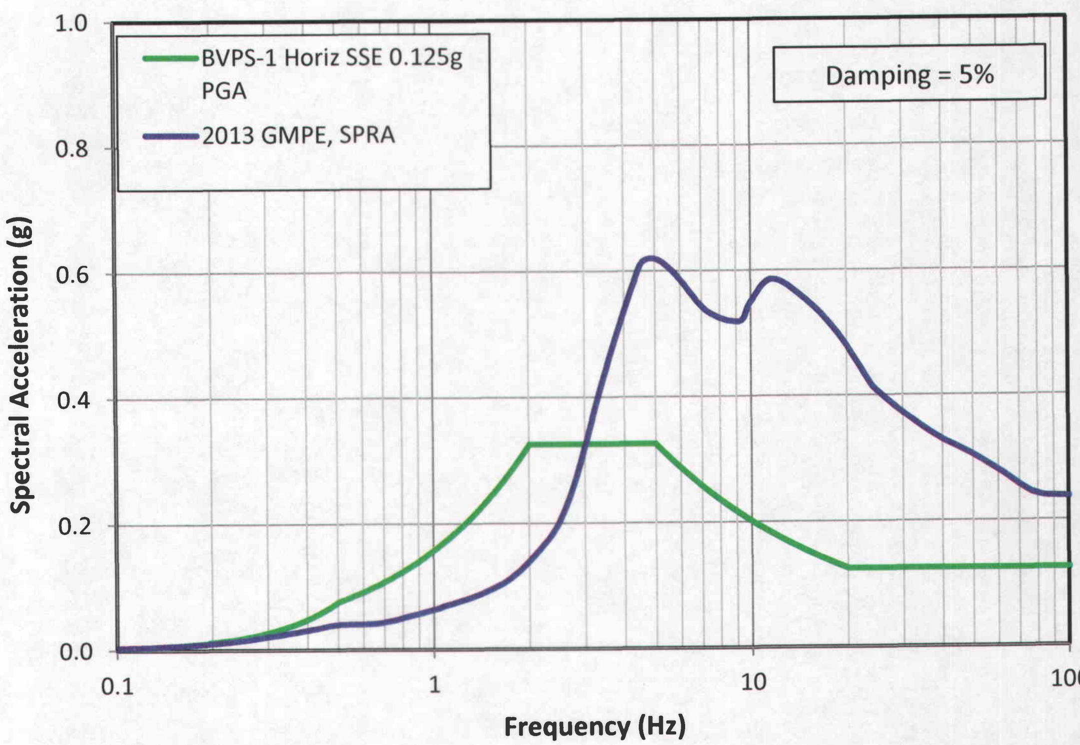

FIGURE 4-2
COMPARISON OF GMRS AND SSE AT CONTROL POINT ELEVATION

5.0 REVIEW LEVEL GROUND MOTION

5.1 DESCRIPTION OF RLGM SELECTED

The ESEP is being completed as part of the Augmented Approach because the GMRS exceed the SSE in the 1 Hz to 10 Hz range. The ESEP guidance (EPRI-3002000704) allows the use of the GMRS as the review level ground motion (RLGM) in lieu of using scaled SSE response spectrum to demonstrate acceptance of the high confidence low probability of failure (HCLPF) values for the ESEL components.

Because BVPS-1 is currently performing a SPRA, the fragilities developed in support are being used to the extent applicable also to accomplish the ESEP. The SPRA GMRS shown on ***Figure 4-1*** represents the ground motion input used to obtain new seismic demand on the components on the ESEL, and to obtain HCLPF and fragilities for the ESEL components. ***Table 4-1*** presents the spectral accelerations at specific frequencies defining the RLGM.

5.2 METHOD TO ESTIMATE ISRS

The process for obtaining in-structure response spectra (ISRS) from the building seismic analysis incorporates the effects of soil structure interaction (SSI) on the seismic response of the building structures. SSI analysis employing the System for Analysis for Soil Structure Interaction (SASSI) code was performed for the buildings of the BVPS-1 because their foundation mat bears on native soils or on Class A Fill. The analytical model for the SSI analysis combines a horizontally layered representation of the subsurface soil column with a finite element (FE) representation of the structure.

Table 5-1 describes the elevations and V_S of the soil layers that were used to conduct the site response analysis by RIZZO Associates (RIZZO) [3]. This analysis developed strain compatible dynamic properties of the subsurface layers at the Beaver Valley Site, following the normalized curves listed in ***Table 5-2***. These properties are used in the SSI analyses performed with the SASSI code.

TABLE 5-1
SUMMARY OF GEOTECHNICAL PROFILE DATA UNDERLYING THE BV SITE (REFERENCE [3])

ELEVATION (ft)	STRATA	DENSITY (pcf)	MEDIAN V_S (ft/s)	COV V_S	MEDIAN TH (ft)
735	Structural Backfill	136	730	0.25	15.00
720	Structural Backfill	136	1,015	0.25	39.10
680.9	(1d) Pleistocene Upper and Lower Terrace	125	1,100	0.25	15.90
665	(1e) Pleistocene Upper and Lower Terrace	136	1,200	0.25	40.00
625	(2) M. Pennsylvanian Allegheny Shale	160	5,000	0.20	75.00
550	(3) L. Pennsylvanian Pottsville SS, Conglomerate	160	6,026	0.11	200.00
350	(4) U. Mississippian Mauch Chunk Shale	155	6,744	0.11	50.00
300	(5) L. Mississippian Pocono Sandstone, Conglomerate	155	6,744	0.11	420.00
-120	(6a) U. Devonian Interbedded Shale, Sands, Siltstone	155	7,112	0.11	2874.00
-2994	(6b) U. Devonian Interbedded Shale, Sands, Siltstone	155	6,416	0.11	706.00
-3700	Half Space	168	9,200	-	-

TABLE 5-2
NORMALIZED STRAIN COMPATIBLE SHEAR MODULI AND DAMPING FOR SOIL UNITS AT THE BV SITE

STRAIN (%)	STRUCTURAL BACKFILL		PLEISTOCENE UPPER AND LOWER TERRACE		PLEISTOCENE UPPER AND LOWER TERRACE	
	G/G_{max}	DAMPING (%)	G/G_{max}	DAMPING (%)	G/G_{max}	DAMPING (%)
0.0001	1.0000	1.49	1.0000	1.26	1.0000	1.02
0.000316	0.9968	1.57	0.9977	1.27	0.9982	1.05
0.00100	0.9707	1.84	0.9845	1.50	0.9925	1.26
0.0020	0.9415	2.30	0.9632	1.80	0.9812	1.48
0.00300	0.9123	2.77	0.9419	2.09	0.9699	1.71
0.0050	0.8663	3.41	0.9070	2.55	0.9412	2.03
0.0070	0.8216	4.05	0.8731	2.99	0.9119	2.35
0.0100	0.7545	5.02	0.8221	3.66	0.8680	2.83
0.0200	0.6419	7.00	0.7224	5.22	0.7805	4.08
0.0300	0.5292	8.98	0.6227	6.79	0.6929	5.33
0.0500	0.4486	10.89	0.5466	8.45	0.6170	6.78
0.0700	0.3772	12.57	0.4783	9.97	0.5475	8.14
0.1	0.2702	15.08	0.3760	12.25	0.4431	10.17
0.2	0.1961	18.11	0.2774	15.30	0.3399	12.95
0.3	0.1228	21.05	0.1789	18.34	0.2353	15.73
1	0.0392	26.60	0.0587	24.68	0.0895	22.67

Note:

G/G_{max} = shear modulus (G) normalized by the low strain shear modulus (G_{max}).

A review of existing lumped-mass and stiffness models of the BVPS-1 structures concluded that these models were not sufficiently adequate to use as basis to scale the building seismic response. Therefore, the building seismic response used in the ESEP (and in the SPRA) is obtained using new FE models of the structures.

The analytical FE models developed here are based on geometric information, such as configuration of floors and walls, dimensions, wall and slab thicknesses, locations, and size of openings, etc., taken from appropriate structure layout drawings and details. The parametric information, such as the material properties, live loads, equipment loads, and boundary conditions are also obtained from drawings, existing reports, and prevalent codes and standards.

The response spectra at the respective foundation levels represent the foundation input ground motion. The seismic Category I structures that have been analyzed are supported at the different foundation depths. Although, the GMRS reported in [3] applies only to the RCBX, the horizontal FIRS were developed for other structures supported at the following elevations:

- EL 713 for the analyses of the AUX, the Service Building (SRV), and the Main Steam Valve and Cable Vault Building (MSVCV)
- EL 723.5 for the analyses of the Fuel Decontamination Building (FDB), the INTS, and the Safeguards Building (SFGB)
- EL 735 for the analysis of the DGB

The seismic response, including the ISRS for the BVPS-1 structures are developed utilizing the time history (TH) modal synthesis in which the input time histories represent the horizontal and vertical FIRS at the respective building foundation levels consistent with the GMRS described in ***Section 4.0***.

ISRS at selected locations are obtained separately, due to three directions of input motion (X, Y, and Z). The resulting response spectra are then combined using the square-root-of-the-sum-of-the-squares (SRSS) method. For example, the three ISRS at a specific location in North-South (NS) direction resulting from ground motion input; respectively, in the NS, East-West (EW), and vertical directions are combined using SRSS.

Subsequently, equipment HCLPF calculations and fragility evaluations are performed based on the conservative deterministic failure margin (CDFM) approach. In accordance with EPRI 1019200 "Seismic Fragility Applications Guide Update," [19] the seismic analyses are performed using Best Estimate (BE) structure stiffness, mass and damping characteristics, and the BE subsurface V_S profile compatible with the expected seismic shear strains. The resulting ISRS approximately represent the 84^{th} percentile response suitable for use in the CDFM calculations.

Details of the development of the models, inputs, analysis, and results are presented in ABSG Consulting Inc. (ABS Consulting)/RIZZO Report 2734294-R-005, Revision 1, 2014.

6.0 SEISMIC MARGIN EVALUATION APPROACH

6.1 Summary of Methodologies Used

The seismic margins for components on the ESEL [6] are developed following the EPRI guidelines described in EPRI 6041 [4], EPRI TR-103959 [5] (Methodology for Developing Seismic Fragilities) and EPRI 1002988 (Seismic Fragility Application Guide). Additionally, EPRI 1019200 [19] is used to develop margins using the CDFM approach.

The ESEL is first grouped to identify similar components relative to equipment classes (e.g., Generic Implementation Procedure [GIP]), and then sampled for representative items based on the type of equipment, manufacturer, location, and anchorage, etc. Representative samples in each equipment group are then evaluated to obtain the seismic margins using the EPRI guidelines.

The overall strategy for developing seismic margins for the various SSCs is as follows:

1. Perform screening verification walkdown to document that caveats associated to generic fragilities are met and perform anchorage calculations.
2. Develop the HCLPF capacities based on available experience data, published generic ruggedness spectra, design criteria documents, and design analysis.
3. Rank the components based on preliminary results.
4. Perform improved analysis of selected equipment.

A number of components on the ESEL are breakers and switches that are housed in a "parent" component, such as a motor control center (MCC) or switchgear. For the purposes of this evaluation, calculations are not explicitly performed for these housed components. Instead, their HCLPF is assigned based on the parent component.

Seismic walkdowns as described in EPRI NP 6041 [4] are performed for all "parent" components on the ESEL [6]. Some ESEL components were walked down in February 2013, in support of SPRA, and these walkdowns were credited, where applicable. The remaining components were walked down in October 2013, during a plant refueling outage.

HCLPF calculations are performed for all "parent" components [6], as described in ***Section 6.3***, which describes the CDFM approach, and the calculation of structural and functional capacities.

6.2 HCLPF Screening Process

No components were screened out based on ruggedness. Rather, the screening level HCLPFs provided in Table 2-4 of EPRI 6041 [4] were utilized to develop mounting level capacities. HCLPF values are then calculated for each component on the ESEL, as described in ***Section 6.3***.

6.3 Seismic Walkdown Approach

6.3.1 Seismic Walkdown Approach

The seismic walkdowns of BVPS-1 were performed in accordance with the criteria provided in Section 5 of EPRI 3002000704 [2], which refers to EPRI NP-6041 [7] for the SMA process. The procedures used for different equipment categories are summarized below.

The Seismic Review Team (SRT) reviewed equipment on the equipment walkdown list that were reasonably accessible and in non-radioactive or moderately radioactive environments. For components in high radioactive environments, a smaller team, and more hurried reviews were employed. For components that were not accessible, the equipment inspection relied on alternate means, such as photographs and plant qualification documents.

In the event the walkdown team had a reasonable basis for assuming that a group of components were similar and similarly anchored, a single representative component out of this group was selected for examination. The similarity of a group of items was established based on equipment construction, dimensions, locations, seismic qualification requirement, anchorage type, and configurations. The "similarity basis" was planned to be confirmed during walk-bys, which would also record anomalies in installation or presence of seismic interaction, if any. The representative item was targeted for a thorough review and documentation. All "representative" and "walk by" items were fully documented in Seismic Evaluation Work Sheets (SEWS).

The SRT performed the walkdowns in an ad hoc manner. For each representative component, the SRT performed a thorough inspection and recorded information related to anchorage, load path configuration, and any potential seismic vulnerability associated to the component seismic capacity. These details recorded in SEWS were subsequently used to verify as-built conditions and determine seismic fragilities.

The 100 percent "walk by" is to look for outliers, lack of similarity, anchorage which is different from that shown on drawings or prescribed in criteria for that component, potential SI [Seismic Interaction[1]] problems, situations that are at odds with the team members' past experience, and any other areas of serious seismic concern. If any such concerns surface, then the limited sample size of one component of each type for thorough inspection will have to be increased. The increase in sample size, which should be inspected, will depend upon the number of outliers and different anchorages, etc., which are observed. It is up to the SRT to ultimately select the sample size since they are the ones who are responsible for the seismic adequacy of all elements which they screen from the margin review.

Walk bys also serve to provide the SRT with the sufficient degree of confidence in relation to plant maintenance and construction practices. This is especially used to reinforce the engineering judgment applied for the fragility assessment of inaccessible components. However, in case questionable construction practices are observed in the SSCs, then the system or component class must be inspected in closer detail until the systematic deficiency is defined.

For each item on the equipment walkdown list, a specific SEWS was prepared covering the different caveats. Each SEWS consists of:

- General description of the equipment: Equipment ID, Name, Equipment Category, and Building/Floor/Room
- Equipment Evaluation Caveats

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1 EPRI 3002000704 [2] Page 5-4 limits the ESEP SI reviews to "nearby block walls" and "piping attached to tanks," which are reviewed "to address the possibility of failures due to differential displacements." Other potential SI evaluations are "deferred to the full seismic risk evaluations performed in accordance with EPRI 1025287 [15]."

- Equipment Anchorage
- Seismic Interaction Issues

A database of SEWS was developed in an electronic format using iPad Computers to facilitate entry of the information collected during the walkdowns. The database includes the record of equipment qualifications, walkdown observations, and photographs.

6.3.2 Application of Previous Walkdown Information

Previous seismic walkdowns were used to support the ESEP seismic evaluations. Some of the components on the ESEL were included in the NTTF 2.3 seismic walkdowns [15] and SPRA seismic walkdowns [16]. Those walkdowns were recent enough that they did not need to be repeated for the ESEP.

Several ESEL items were previously walked down during the BVPS-1 Seismic individual plant examination of external events (IPEEE) program. Those walkdown results were reviewed and the following steps were taken to confirm that the previous walkdown conclusions remained valid.

- A walk by was performed to confirm that the equipment material condition and configuration is consistent with the walkdown conclusions and that no new significant interactions related to block walls or piping attached to tanks exist.
- If the ESEL item was screened out based on the previous walkdown, that screening evaluation was reviewed and reconfirmed for the ESEP.

6.3.3 Significant Walkdown Findings

Consistent with the guidance from NP-6041 [7], no significant outliers or anchorage concerns were identified during the BVPS-1 Seismic walkdowns. The following findings were noted during the walkdowns.

- Block walls were identified in the vicinity of the 125V DC batteries located in the SRV at EL 713. These block walls were assessed for their structural adequacy [6] to withstand the seismic loads associated to the plant's RLGM demand level.

6.4 HCLPF CALCULATION PROCESS

ESEL items in the BVPS-1 were evaluated using the criteria in EPRI NP-6041 [4]. Those evaluations included the following steps:

- Performing seismic capability walkdowns for equipment to verify the installed plant conditions
- Performing screening evaluations using the screening tables in EPRI NP-6041 as described in ***Section 6.2***
- Performing HCLPF calculations considering various failure modes that include both structural failure modes (e.g., anchorage, and load path, etc.) and functional failure modes

All HCLPF calculations were performed using the CDFM methodology and are documented in a BVPS-1 Reference [6].

6.4.1 CDFM Approach

HCLPF values for functionality and anchorage are calculated for each representative component selected from the ESEL. The functional HCLPF for equipment is based on experience data, Generic Equipment Ruggedness Data (GERS), test response data, and design criteria. The functional evaluation is supplemented with the verification of the equipment anchorage following Seismic Qualification Utility Group (SQUG)/GIP procedures. The seismic demand on the equipment is based on the floor response spectra near the equipment support location, and the component damping values as recommended in EPRI 6041 [4].

The CDFM approach described in EPRI 1019200 [19] is utilized to obtain the component HCLPF values. The HCLPF capacities are stated in terms of a selected ground motion PGA. The CDFM approach is consistent with EPRI NP-6041-SL [4], updated to accommodate the parameters presented in ***Table 6-1***.

The screening level HCLPF values provided in EPRI 6041 [4] Table 2-4 are presented in terms of the 5 Hz spectral acceleration at the foundation level. In accordance with EPRI 1019200 [19], these values are used to develop mounting level capacity assuming a median structure amplification factor of 1.5. The ISRS described in ***Section 4.2*** are compared with this mounting level capacity to develop HCLPF associated with the GMRS shape. Anchorage checks are performed based on the spectral accelerations at the estimated equipment frequencies.

TABLE 6-1
SUMMARY OF CONSERVATIVE DETERMINISTIC FAILURE MARGIN APPROACH (EPRI 1019200, TABLE A.1)

TECHNICAL ISSUE	RECOMMENDED METHOD
Load Combination	Normal + SME.
Ground Response Spectrum	Anchor CDFM Capacity to defined response spectrum shape without consideration of spectral shape variability.
Seismic Demand	Perform seismic demand analysis in accordance with latest version of American Society of Civil Engineers (ASCE) 4.
Damping	Conservative estimate of median damping.
Structural Model	BE (Median) + Uncertainty Variation in Frequency.
Soil Structure Interaction	BE (Median) + Parameter Variation.
In-Structure (Floor) Spectra Generation	Use frequency shifting rather than peak broadening to account for uncertainty plus use conservative estimate of median damping.
Material Strength	Code specified minimum strength or 95% exceedance actual strength if test data are available.
Static Strength Equations	Code ultimate strength (ACI), maximum strength (AISC), Service Level D (ASME), or functional limits. If test data are available to demonstrate excessive conservatism of code equation then use 84% exceedance of test data for strength equation.
Inelastic Energy Absorption	For non-brittle failure modes and linear analysis, use appropriate inelastic energy absorption factor from ASCE/SEI 43-05 to account for ductility benefits, or perform nonlinear analysis and go to 95% exceedance ductility levels.

6.4.2 Component Structural Capacity

In general, the CDFM approach:

1. Develops the elastic seismic response for the structures and components for the ground motion.
2. Develops strength margin factor using component capacities as described in ***Table 6-1***.
3. Develops inelastic energy absorption factor based on ASCE 43-05 or at about the 95 percent exceedance probability of ductility levels.
4. Calculates the CDFM capacity as:

$$HCLPF_{CDFM} = F_S \cdot F_\mu \cdot PGA \qquad \textbf{(Equation 6-1)}$$

where,

F_S = Strength margin factor,

F_μ = Inelastic energy absorption factor

The strength margin factor is defined as:

$$F_S = \frac{S - D_{ns}}{D_S} \qquad \textbf{(Equation 6-2)}$$

where,

S = Strength of the structural element

D_{ns} = Non-seismic demand (normal operating loads)

D_S = Seismic demand

6.4.3 Functional Evaluations

The HCLPF capacities for functionality are based on the comparison of the demand (ISRS) with EPRI 6041 [4] screening level HCLPFs, existing analysis, GERS, or test response spectra.

The screening level HCLPF values provided in EPRI 6041 [4] Table 2-4 are presented in terms of the 5 Hz spectral acceleration at the foundation level. In accordance with EPRI 1019200 [19], these values are used to develop mounting level capacity assuming a median structure amplification factor of 1.5. The ISRS described in ***Section 5.2*** are compared with this mounting level capacity to develop HCLPF associated with the GMRS shape. Anchorage checks are performed based on the spectral accelerations at the estimated equipment frequencies.

Available plant specific seismic qualifications tests are biaxial and all of the published GERS are constructed on the basis of the results of previous biaxial tests of similar types of equipment. These tests apply table input motion in one-horizontal direction and in the vertical direction. For most equipment, for which GERS are available, the vertical test response spectrum (TRS) are at least equal to the horizontal TRS. The published GERS define the horizontal component of the table motion, which is, therefore, taken to represent the capacity stated either in terms of the vertical or horizontal input.

The seismic demand on equipment, on the other hand, is typically defined by ISRS in three orthogonal directions, two horizontal and one vertical. The procedure used to develop the functional capacity compares the resultant horizontal and the vertical ISRS separately with the GERS or TRS. The minimum seismic margin is taken to obtain the functional HCLPF capacity.

6.5 Functional Evaluations of Relays

The only relays applicable to FLEX mitigating strategies are the relays that automatically start the TDAFWP. All other plant control is local at the component.

The relays deenergize Solenoid-Operated Valves (SOVs) that port instrument air away from two Air-Operated Valves (AOVs) that control the supply of steam to the TDAFWP in parallel steam supply pipes. The AOVs fail open on loss of instrument air. As instrument air is not seismic, the failure of air results in automatic opening of the AOVs regardless of relay function. Therefore, the relays are not included in this evaluation.

These relays are slave relays in the solid state protection system and have no lock out function. Additionally, manual control from the control room is available to the operators, which deenergizes the SOVs directly, without the need for any relays. Finally, if DC is lost, such that there is no control power available to the control room, the SOVs fail open, porting air from the AOVs and admitting steam to the TDAFWP.

6.6 TABULATED ESEL HCLPF VALUES (INCLUDING KEY FAILURE MODES)

Attachment B tabulates the HCLPF values for all components on the ESEL. All HCLPF values exceed the RLGM. The Table in ***Attachment B*** also identifies the method used to develop the HCLPF values and the controlling failure mode. Most of the controlling failure modes are either anchorage failure or loss of functionality and do not involve structural integrity. For a limited number of components, the controlling failure mode is the failure of a nearby masonry block wall. These cases are also identified in the Table.

7.0 INACCESSIBLE ITEMS

7.1 IDENTIFICATION OF ESEL ITEMS INACCESSIBLE FOR WALKDOWNS

A total of seven items in the ESEL were inaccessible during walkdowns mainly due to their location in confined spaces and high radiation areas. ***Table 7-1*** provides the description of the seven inaccessible components, the reason for their inaccessibility and the criteria implemented to confirm the installed condition and, therefore, evaluate their seismic fragility. The criteria implemented to confirm the installed condition follows EPRI NP 6041 [7], where a number of ways of confirming the installed condition of equipment, including follow up walkdowns, photographic or other confirmatory evidence is provided.

TABLE 7-1
SUMMARY OF INACCESSIBLE ITEMS IN BVPS-1 ESEL

COMPONENT ID	DESCRIPTION	REASON FOR INACCESSIBLE	RESOLUTION
BV-NE-1NI-31	BF3 Proportional Counter Source Range Detector	High radiation area (RCBX EL 692)	Fragility is calculated based on design documentation and installation drawings [6].
BV-TRB-1RC-412B1	Loop 1A Hot Leg Narrow Range Rtd	High radiation area (RCBX EL 718)	Fragility is calculated based on design documentation and installation drawings [6].
BV-TRB-1RC-412C_D	Loop 1A Cold Leg Narrow Range Dual Element Rtd	High radiation area (RCBX EL 718)	Fragility is calculated based on design documentation and installation drawings [6].
BV-T_C-1II-1	Incore Thermocouple	High radiation area (RCBX EL 767)	Fragility is calculated based on design documentation and installation drawings [6].
BV-LT-1FW-477	1A Steam Generator Wide Range Level Transmitter	High radiation area (RCBX EL 718)	Fragility is calculated based on design documentation and installation drawings [6].
BV-LT-1RC-459	Pressurizer RC-Tk-1 Level Transmitter	High radiation area (RCBX EL 718)	Fragility is calculated based on design documentation and installation drawings [6].
BV-1CH-E-3	Regenerative Heat Exchanger	High radiation area (RCBX EL 718)	Reviewed plant drawings to obtain information for structural/anchorage evaluation [6].

8.0 ESEP CONCLUSIONS AND RESULTS

The conclusions and results of the ESEP evaluation are presented in this Section, including the identification of any required plant modifications and schedules for any follow up actions.

8.1 SUPPORTING INFORMATION

BVPS-1 has performed the ESEP as an interim action in response to the NRC's 50.54(f) letter [1]. The ESEP demonstrates that BVPS-1 has additional seismic margin plant equipment that can be relied upon to protect the reactor core following a beyond design basis seismic event. It was performed using the methodologies in the NRC endorsed guidance in EPRI 3002000704 [2].

The ESEP provides an important demonstration of seismic margin and expedites plant safety enhancements through evaluations and potential near-term modifications of plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events.

The ESEP is part of the overall BVPS-1 response to the NRC's 50.54(f) letter [1]. On March 12, 2014, Nuclear Energy Institute (NEI) submitted to the NRC results of a study [7] of seismic core damage risk estimates based on updated seismic hazard information as it applies to operating nuclear reactors in the Central and Eastern United States (CEUS). The study concluded that "site-specific seismic hazards show that there has not been an overall increase in seismic risk for the fleet of U.S. plants," based on the reevaluated seismic hazards. As such, the "current seismic design of operating reactors continues to provide a safety margin to withstand potential earthquakes exceeding the seismic design basis."

The NRC's May 9, 2014, NTTF 2.1 Screening and Prioritization letter [9] concluded that the "fleetwide seismic risk estimates are consistent with the approach and results used in the Gl-199 safety/risk assessment." The letter also stated that "as a result, the staff has confirmed that the conclusions reached in Gl-199 safety/risk assessment remain valid and that the plants can continue to operate while additional evaluations are conducted."

An assessment of the change in seismic risk for BVPS-1 was included in the fleet risk evaluation submitted in the March 12, 2014, NEI letter [7], therefore, the conclusions in the NRC's May 9 letter [9] also apply to BVPS-1.

In addition, the March 12, 2014, NEI letter [7] provided an attached "Perspectives on the Seismic Capacity of Operating Plants," which (1) assessed a number of qualitative reasons why the design of SSCs inherently contain margin beyond their design level, (2) discussed industrial seismic experience databases of performance of industry facility components similar to nuclear SSCs, and (3) discussed earthquake experience at operating plants.

The fleet of currently operating NPPs was designed using conservative practices, such that the plants have significant margin to withstand large ground motions safely. This has been borne out for those plants that have actually experienced significant earthquakes. The seismic design process has inherent (and intentional) conservatisms which result in significant seismic margins within SSCs. These conservatisms are reflected in several key aspects of the seismic design process, including:

- Safety factors applied in design calculations
- Damping values used in dynamic analysis of SSCs
- Bounding synthetic THs for ISRS calculations
- Broadening criteria for ISRS
- Response spectra enveloping criteria typically used in SSCs analysis and testing applications
- Response spectra based frequency domain analysis rather than explicit TH based time domain analysis
- Bounding requirements in codes and standards
- Use of minimum strength requirements of structural components (concrete and steel)
- Bounding testing requirements
- Ductile behavior of the primary materials (that is, not crediting the additional capacity of materials, such as steel and reinforced concrete beyond the essentially elastic range, etc.)

These design practices combine to result in margins, such that the SSCs will continue to fulfill their functions at ground motions well above the SSE.

The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter [1] to demonstrate seismic margin through a review of a subset of the plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events. Because the SPRA for BVPS-1 is already under way, the GMRS used in the SPRA is also used as the RLGM for the ESEP evaluation. To more fully characterize the risk impacts of the seismic ground motion represented by the GMRS on a plant specific basis, a more detailed seismic risk assessment (SPRA or risk-based SMA) is being performed in accordance with EPRI 1025287 [10]. As identified in the BVPS-1 Seismic Hazard and GMRS submittal [3], BVPS-1 screens in for a risk evaluation. The complete risk evaluation will more completely characterize the probabilistic seismic ground motion input into the plant, the plant response to that probabilistic seismic ground motion input, and the resulting plant risk characterization. BVPS-1 will complete that evaluation in accordance with the schedule identified in NEI's letter dated April 9, 2013, [8] and endorsed by the NRC in their May 7, 2013, letter [11].

8.2 IDENTIFICATION OF PLANNED MODIFICATIONS

As discussed in ***Section 6.6*** and presented in ***Attachment B***, all components on the ESEL have a HCLPF greater than the RLGM (0.24g). Therefore, no modifications related to the ESEP are planned.

8.3 MODIFICATION IMPLEMENTATION SCHEDULE

As no modifications are planned, this Section is not applicable.

8.4 SUMMARY OF REGULATORY COMMITMENTS

None

9.0 REFERENCES

1. NRC (E Leeds and M Johnson) Letter to All Power Reactor Licensees et al., "Request for Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(f) Regarding Recommendations 2.1, 2.3, and 9.3 of the Near-Term Task Force Review of Insights from the Fukushima Dai-Ichi Accident," March 12, 2012.

2. EPRI, Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1 – Seismic, Palo Alto, California: May 2013, 3002000704.

3. ABS Consulting and Rizzo Associates, "Probabilistic Seismic Hazard Analysis and Foundation Input Response Spectra Beaver Valley Power Station Seismic Probabilistic Risk Assessment Project," 2734294-R-003 (RIZZO R3 12-4735), Revision 1, October 31, 2014.

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ATTACHMENT A:

EXPEDITED SEISMIC EQUIPMENT LIST

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
FLEX Phase 1								
Core Cooling, Demineralized Water to S/G VIA 1FW-P-2								
1	BV-1WT-TK-10	PRIMARY PLANT DEMIN WTR STORAGE TANK	STBY	IN SVC	Y		PDWS	735
2	BV-1WT-221	PRI PLANT DEMIN WTR ISOL TO STEAM DRIVEN FEED PUMP	OPEN	OPEN	N	MANUAL VALVE	PDWS	735
3	BV-1WT-225	PRI PLANT DEMIN WTR ISOL TO STM DRIVEN	OPEN	OPEN	N	MANUAL VALVE	SFGB	735
4	BV-1FW-P-2	NO.2 TURBINE DRIVEN AUXILIARY FEEDWATER PUMP	STBY	IN SVC	Y		SFGB	735
5	BV-1FW-33	(1FW-P-2) DISCH CHECK	N/A	N/A	N	CHECK VALVE	SFGB	735
6	BV-1FW-36	(1FW-P-2) "A" HEADER DISCH ISOLATION	OPEN	OPEN	N	MANUAL VALVE	SFGB	735
7	BV-MOV-1FW-151F	1A SG AFW THROTTLE VLV (A HDR)	OPEN	OPEN	N	VALVE DOES NOT INITIALLY CHANGE POSITION, MANUALLY THROTTLED (LOCAL) LATER	SFGB	735
8	BV-FE-1FW-101A	AUX FEED WATER EXCESS FLOW CONTROL CAVITATING VENTURI	N/A	N/A	N	PIPING ELEMENT	SFGB	735
9	BV-HCV-1FW-158A	1A SG AFW CNMT ISOL VLV OPERATOR	OPEN	OPEN	N	VALVE LOCKED OPEN	SFGB	751

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
10	BV-HCV-1FW-158A-OPER	1A SG AFW CNMT ISOL VLV OPERATOR (MANUAL OPERATION ONLY)	N/A	N/A	N	MANUAL VALVE	SFGB	751
Core Cooling, Steam from S/G to Atmosphere (Operator Local Operation)								
11	BV-1RC-E-1A	STEAM GENERATOR 1A	IN SVC	IN SVC	N	NSSS COMPONENT	RCBX	718
12	BV-1MS-23	1A S/G ATMOS DUMP ISOLATION VLV	OPEN	OPEN	N	MANUAL VALVE	SFGB	768
13	BV-PCV-1MS-101A	1A S/G ATM DUMP VLV	STBY	IN SVC	Y		SFGB	768
14	BV-PCV-1MS-101A-OPER	1A S/G ATM DUMP VLV AIR OPERATOR	STBY	IN SVC	Y		SFGB	768
15	BV-PCV-1MS-101A-POS	VALVE POSITIONER FOR PCV-MS-101A	STBY	IN SVC	Y		SFGB	768
16	BV-RO-1MS-101A	ATMOSPHERE STEAM DUMP STEAM GEN 1A SOUND ATTENUATING	N/A	N/A	N	PIPING ELEMENT	SFGB	768
17	BV-1MS-TK-1	N2 TANK ASSIST TO ASDV 1A/1B	STBY	IN SVC	Y		SFGB	768
18	BV-PRV-1MS-1	[1MS-TK-1] PRESSURE REGULATOR	STBY	IN SVC	Y		SFGB	768
19	BV-1MS-516	(PCV-1MS-101A) OPERATOR ISOLATION VALVE	FROM IA	FROM N2	Y		SFGB	768
20	BV-SV-1MS-101A	1A S/G SAFETY VALVE	STBY	IN SVC	Y		SFGB	768
21	BV-SV-1MS-102A	1A S/G SAFETY VALVE	STBY	STBY	N	ONLY NEED ONE TRAIN	SFGB	768
22	BV-SV-1MS-103A	1A S/G SAFETY VALVE	STBY	STBY	N	ONLY NEED ONE TRAIN	SFGB	768
23	BV-SV-1MS-104A	1A S/G SAFETY VALVE	STBY	STBY	N	ONLY NEED ONE TRAIN	SFGB	768
24	BV-SV-1MS-105A	1A S/G SAFETY VALVE	STBY	STBY	N	ONLY NEED ONE TRAIN	SFGB	768

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
Core Cooling, Steam from S/G To 1FW-T-2								
25	BV-1MS-15	1A S/G STEAM SUPPLY TO (1FW-P-2) ISOLATION	OPEN	OPEN	N	MANUAL VALVE	SFGB	768
26	BV-1MS-20	1A S/G STEAM SUPPLY TO (1FW-P-2) CHK VLV	N/A	N/A	N	CHECK VALVE	SFGB	751
27	BV-MOV-1MS-105	AFW TURB STEAM ISOL VLV	OPEN	OPEN	N	MOV DOES NOT CHANGE POSITION	SFGB	751
28	BV-TV-1MS-105A	AFW TURB STEAM SUP A TRN TRIP VLV	CLOSED	OPEN	Y		SFGB	747
29	BV-SOV-1MS-105A	(TV-1MS-105A) CONTROL SOLENOID	PORT TO VLV	PORT TO ATM	Y		SFGB	751
30	BV-1MS-465	TRIP & THROTTLE VALVE	STBY	IN SVC	Y		SFGB	735
31	BV-1MS-464	GOVERNOR VLV	STBY	IN SVC	Y		SFGB	735
32	BV-1FW-T-2	FW-P-2 AUX FEED PUMP STEAM TERRY TURBINE	STBY	IN SVC	Y		SFGB	735
33	BV-1QS-TK-1	REFUELING WATER STORAGE TANK	STBY	IN SVC	Y		AUX	735
Key Indicators & Transmitters								
34	BV-LT-1FW-477	1A STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	Y		RCBX	718
35	BV-LI-1FW-477A	STEAM GENERATOR A WIDE RANGE WATER LEVEL	IN SVC	IN SVC	Y		SRV	713
36	BV-LT-1FW-487	1B STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
37	BV-LI-1FW-487A	STEAM GENERATOR B WIDE RANGE WATER LEVEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
38	BV-LT-1FW-497	1C STEAM GENERATOR WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
39	BV-LI-1FW-497A	STEAM GENERATOR C WIDE RANGE WATER LEVEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
40	BV-PT-1MS-474	STEAM GENERATOR 1A STEAM DISCHARGE PRESSURE TRANSMITTER	IN SVC	IN SVC	Y		SFGB	735
41	BV-PI-1MS-474	STEAM GENERATOR 1A HEADER SIGNAL FROM PT-MS474 PRESSURE INDI CATOR	IN SVC	IN SVC	Y		CNTB	735
42	BV-PT-1MS-484	STEAM GENERATOR 1B STEAM DISCHARGE PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	735
43	BV-PI-1MS-484	STEAM GENERATOR 1B HEADER SIGNAL FROM PT-MS484 PRESSURE INDI CATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
44	BV-PT-1MS-494	STEAM GENERATOR 1C STEAM DISCHARGE PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	735
45	BV-PI-1MS-494	STEAM GENERATOR 1C HEADER SIGNAL FROM PT-MS494 PRESSURE INDI CATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
46	BV-TI-1RC-412A	RCS LOOP 1 DELTA T INDICATION - PROT CH 1	IN SVC	IN SVC	Y		CNTB	735
47	BV-TRB-1RC-412B1	LOOP 1A HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	Y		RCBX	718
48	BV-TRB-1RC-412B2	LOOP 1A HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
49	BV-TRB-1RC-412B3	LOOP 1A HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
50	BV-TI-1RC-422A	RCS LOOP 2 DELTA T INDICATION - PROT CH 2	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
51	BV-TRB-1RC-422B1	LOOP 1B HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
52	BV-TRB-1RC-422B2	LOOP 1B HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
53	BV-TRB-1RC-422B3	LOOP 1B HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
54	BV-TI-1RC-432A	RCS LOOP 3 DELTA T INDICATION - PROT CH 3	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
55	BV-TRB-1RC-432B1	LOOP 1C HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
56	BV-TRB-1RC-432B2	LOOP 1C HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
57	BV-TRB-1RC-432B3	LOOP 1C HOT LEG NARROW RANGE RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
58	BV-TRB-1RC-412C_D	LOOP 1A COLD LEG NARROW RANGE DUAL ELEMENT RTD	IN SVC	IN SVC	Y		RCBX	718
59	BV-TRB-1RC-422C_D	LOOP 1B COLD LEG NARROW RANGE DUAL ELEMENT RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
60	BV-TRB-1RC-432C_D	LOOP 1C COLD LEG NARROW RANGE DUAL ELEMENT RTD	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
61	BV-PT-1RC-403	REACTOR COOLANT WIDE RANGE PRESSURE TRANSMITTER	IN SVC	IN SVC	Y		RCBX	692
62	BV-PI-1RC-403	REACTOR PRESSURE WIDE RANGE PRESSURE INDICATOR	IN SVC	IN SVC	Y		SRV	735
63	BV-PT-1RC-402	REACTOR COOLANT WIDE RANGE PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
64	BV-PI-1RC-402A	REACTOR COOLANT PRESSURE WIDE RANGE PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
65	BV-PI-1RC-402B	REACTOR COOLANT PRESSURE NARROW RANGE PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
66	BV-LT-1RC-459	PRESSURIZER RC-TK-1 LEVEL TRANSMITTER	IN SVC	IN SVC	Y		RCBX	718
67	BV-LT-1RC-460	PRESSURIZER RC-TK-1 LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
68	BV-LT-1RC-461	PRESSURIZER RC-TK-1 LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
69	BV-LI-1RC-459A	PRESSURIZER LEVEL INDICATOR	IN SVC	IN SVC	Y		SRV	735
70	BV-LI-1RC-459B	PRESSURIZER LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	AUX	722
71	BV-LI-1RC-459C	PRESSURIZER LEVEL INDICATOR ON SHUTDOWN PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
72	BV-LI-1RC-460A	RC-TK-1 PRESSURIZER LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
73	BV-LI-1RC-460BP	PRESSURIZER LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	735
74	BV-LT-1WT-104A	PRIMARY PLANT DEMIN WTR STOR TANK WT-TK-10 LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	PDWS	735
75	BV-LT-1WT-104A1	PRIMARY PLANT DEMIN WTR STOR TANK WT-TK-10 LEVEL TRANSMITTER	IN SVC	IN SVC	Y		PDWS	735
76	BV-LT-1WT-104A2	PRIMARY PLANT DEMIN WTR STOR TANK WT-TK-10 LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	PDWS	735
77	BV-LI-1WT-104A1	PRIMARY PLANT DEMINERALIZED WATER STORAGE TANK LEVEL INDICATOR	IN SVC	IN SVC	Y		SRV	735
78	BV-LI-1WT-104A2	PRIMARY PLANT DEMINERALIZED WATER STORAGE TANK LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
79	BV-LI-1WT-104A3	DEMINERALIZED WATER STORAGE TANK WT-TK-10 LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	PDWS	735
80	BV-NE-1NI-31	BF3 PROPORTIONAL COUNTER SOURCE RANGE DETECTOR	STBY	IN SVC	Y		RCBX	692
81	BV-NI-1NI-31A	SOURCE RANGE INDICATOR	STBY	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
82	BV-NI-1NI-31B	SOURCE RANGE INDICATOR	STBY	IN SVC	Y		SRV	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
83	BV-NI-1NI-31BA	EMERGENCY SHUTDOWN PANEL SOURCE RANGE LEVEL METER	IN SVC	STBY	N	ONLY NEED ONE TRAIN	SRV	713
84	BV-NI-1NI-31D	BV-NI-1NI-31D	STBY	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
85	BV-NI-1NI-31DA	EMERGENCY SHUTDOWN PANEL SOURCE RANGE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	SRV	713
86	BV-NE-1NI-32	BF3 PROPORTIONAL COUNTER SOURCE RANGE DETECTOR	STBY	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	692
87	BV-NI-1NI-32A	SOURCE RANGE INDICATOR	STBY	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
88	BV-NI-1NI-32B	SOURCE RANGE INDICATOR	STBY	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
89	BV-NI-1NI-32BA	EMERGENCY SHUTDOWN PANEL SOURCE RANGE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	SRV	713
90	BV-NI-1NI-32D	SOURCE RANGE INDICATOR	STBY	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
91	BV-NI-1NI-32DA	EMERGENCY SHUTDOWN PANEL SOURCE RANGE RATE METER	STBY	STBY	N	ONLY NEED ONE TRAIN	SRV	713
92	BV-T_C-1II-1	INCORE THERMOCOUPLE	IN SVC	IN SVC	Y		RCBX	767
93	BV-RK-1PRI-PROC-12	PRIMARY PROCESS RACK 12	IN SVC	IN SVC	Y		SRV	713
94	BV-RK-1PRI-PROC-19	PRIMARY PROCESS RACK 19	IN SVC	IN SVC	Y		SRV	713
95	BV-RK-1PRI-PROC-3	PRIMARY PROCESS RACK 3	IN SVC	IN SVC	Y		SRV	713
96	BV-RK-1SEC-PROC-A	SECONDARY PROCESS RACK	IN SVC	IN SVC	Y		SRV	713

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
97	BV-RK-1PRI-PROC-13	PRIMARY PROCESS RACK 13	IN SVC	IN SVC	Y		SRV	713
98	BV-RK-1PRI-PROC-30	PRIMARY PROCESS RACK 30	IN SVC	IN SVC	Y		SRV	713
99	BV-RK-1SEC-PROC-H	SECONDARY PROCESS RACK	IN SVC	IN SVC	Y		SRV	713
100	BV-INV-VITBUS1-2	VITAL BUS #2 INVERTER/STATIC SWITCH	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
101	BV-INV-VITBUS1-4	VITAL BUS #4 INVERTER/STATIC SWITCH	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
102	BV-BAT-1-2	125VDC INSTRUMENT CONTROL POWER BATTERY NO. 2	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
103	BV-BAT-1-4	125VDC INSTRUMENT CONTROL POWER BATTERY NO. 4	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
104	BV-PNL-VITBUS1-2	AC VITAL BUS PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
105	BV-PNL-VITBUS1-4	AC VITAL BUS PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
106	BV-INV-VITBUS1-1	VITAL BUS #1 INVERTER	IN SVC	IN SVC	Y		SRV	713
107	BV-INV-VITBUS1-3	VITAL BUS #3 INVERTER/STATIC SWITCH	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
108	BV-BAT-1-1	125VDC INSTRUMENT CONTROL POWER BATTERY NO. 1	IN SVC	IN SVC	Y		SRV	713
109	BV-BAT-1-3	125VDC INSTRUMENT CONTROL POWER BATTERY NO. 3	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
110	BV-PNL-VITBUS1-1	AC VITAL BUS PANEL	IN SVC	IN SVC	Y		SRV	735
111	BV-PNL-VITBUS1-3	AC VITAL BUS PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
112	BV-PNL-DC1-1	125VDC DISTRIBUTION PANEL	IN SVC	IN SVC	Y		SRV	735
113	BV-PNL-DC1-2	DISTRIBUTION PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
114	BV-PNL-DC1-3	DISTRIBUTION PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	735
115	BV-PNL-DC1-4	BREAKER 8-4 125DC DISTRIBUTION PANEL POW	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
116	BV-RL-1CV-101A	CONTAINMENT AIR TOTAL PRESSURE (PT-CV101A) RELAY	IN SVC	IN SVC	Y			
117	BV-RL-1CV-101B	CONTAINMENT AIR TOTAL PRESSURE (PT-CV101B) RELAY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
118	BV-PT-1CV-101A	CONTAINMENT TOTAL PRESSURE SIGNAL TRANSMITTER	IN SVC	IN SVC	Y		SFGB	722
119	BV-PT-1CV-101B	CONTAINMENT AIR TOTAL PRESSURE SIGNAL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	722
120	BV-PQ-1CV-101A	CONTAINMENT AIR TOTAL PRESSURE INSTRUMENT POWER SUPPLY	IN SVC	IN SVC	Y		SRV	713
121	BV-PQ-1CV-101B	CONTAINMENT AIR TOTAL PRESSURE INST. POWER SUPPLY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
122	BV-PT-1LM-100A	CONTAINMENT AIR TOTAL PRESSURE TRANSMITTER	IN SVC	IN SVC	Y		SFGB	722
123	BV-PI-1LM-100A	PRESSURE INDICATOR FOR CONTAINMENT AIR TOTAL PRESSURE	IN SVC	IN SVC	Y			

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
124	BV-PT-1LM-100B	CONTAINMENT AIR TOTAL PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	722
125	BV-PI-1LM-100B	RESSURE INDICATOR FOR CONTAINMNT AIR TOTAL PRESSURE	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
126	BV-PT-1LM-100C	CONTAINMENT AIR TOTAL PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	722
127	BV-PI-1LM-100C	PRESSURE INDICATOR FOR CONTAINMENT AIR TOTAL PRESSURE	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
128	BV-PT-1LM-100D	CONTAINMENT AIR TOTAL PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	722
129	BV-PI-1LM-100D	PRESSURE INDICATOR FOR CONTAINMENT AIR TOTAL PRESSURE	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
FLEX PHASE 2								
RCS Boration, Boric Acid Storage Tanks to Portable Pump								
130	BV-1CH-TK-1A	BORIC ACID TANK 1A	IN SVC	IN SVC	Y		AUX	752
131	BV-1CH-TK-1B	BORIC ACID TANK 1B	STBY	IN SVC	Y		AUX	752
132	BV-1CH-71	BORIC ACID TK 1A OUT ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	752
133	BV-1CH-72	BORIC ACID TK 1B OUT ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	752
RCS Boration, Portable Pump to RCS								
134	BV-1CH-299	(1CH-P-1A) DISCH HDR LOW POINT DRAIN	CLOSED	OPEN	N	MANUAL VALVE	AUX	722
135	BV-1CH-25	CHG PP 1A DISCH HDR ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	722
136	BV-1CH-28	(FCV-1CH-122) IN ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	722

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
137	BV-FCV-1CH-122	CHG FLOW TO REGEN HX INLET CONTROL	OPEN	OPEN	N	REMAINS OPEN FOR MINIMUM FLOW ON LOSS OF AIR?	AUX	722
138	BV-1CH-30	(FCV-1CH-122) OUT ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	722
139	BV-MOV-1CH-289	CHG PP DISCH HDR TO REGEN HX IN CNMT ISOL	OPEN	OPEN	N	MOV DOES NOT CHANGE POSITION	SFGB	722
140	BV-1CH-31	REGEN HX IN CHECK	N/A	N/A	N	CHECK VALVE	RCBX	718
141	BV-1CH-E-3	REGENERATIVE HEAT EXCHANGER	IN SVC	IN SVC	Y		RCBX	718
142	BV-MOV-1CH-310	REGEN HX CHG HDR OUT ISOL	OPEN	OPEN	N	MOV DOES NOT CHANGE POSITION	RCBX	692
143	BV-1CH-32	REGEN HX OUTLET CHECK	N/A	N/A	N	CHECK VALVE	RCBX	718
144	BV-MCC-1-E8	480V MOTOR CONTROL CENTER FED FROM 480V SUBSTA 1-9 BUS 1P	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	DGB	735
145	BV-MCC-1-E8-AA	480V MCC-1-E8, SPARE	STBY	STBY	N	ONLY NEED ONE TRAIN	DGB	735
146	BV-PNL-1EE-CONN-1	PLACE HOLDER FOR CONNECTION PANEL TO BE INSTALLED	STBY	STBY	N	ONLY NEED ONE TRAIN	DGB	735
147	BV-480VUS-1-9-P	480V SUBSTATION 1-9 EMERG BUS 1P	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
148	BV-MCC-1-E10	480V MOTOR CONTROL CENTER FED FROM 480V SUBSTA 1-9 BUS 1P	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
149	BV-BAT-CHG1-2	STATION BAT-CHG1-2	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
150	BV-BAT-CHG1-4	STATION BATTERY CHARGER NO. 4	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
151	BV-MCC-1-E7	480V MOTOR CONTROL CENTER FED FROM 480V SUBSTA 1-8 BUS 1N	IN SVC	IN SVC	Y		DGB	735
152	BV-PNL-1EE-CONN-2	PLACE HOLDER FOR CONNECTION PANEL TO BE INSTALLED	STBY	IN SVC	Y		DGB	735
153	BV-480VUS-1-8-N	480V SUBSTATION 1-8 EMERG BUS 1N	IN SVC	IN SVC	Y		SRV	713
154	BV-MCC-1-E9	480V MOTOR CONTROL CENTER FED FROM 480V SUBSTA 1-8 BUS 1N	IN SVC	IN SVC	Y		SRV	713
155	BV-BAT-CHG1-1	STATION BAT-CHG1-1	IN SVC	IN SVC	Y		SRV	713
156	BV-BAT-CHG1-3	STATION BAT-CHG1-3	IN SVC	IN SVC	N	ONLY NEED ONE CHANNEL	SRV	713
FLEX Phase 3								
157	BV-MOV-1RW-106A	CCR HX RW SERIES ISOL VLV			N	RESTORATION	AUX	722
158	BV-PT-1RW-113A	PRI CMP CL WTR HT EX INLET PRESSURE TRANSMITTER			N	RESTORATION	AUX	735
159	BV-PI-1RW-113A	PRI.CMP.CL.WATER HTEX. IN PRESSURE INDICATOR			N	RESTORATION	AUX	
160	BV-REJ-1RW-18A	CC-E-1A INLET EXP JOINT			N	RESTORATION	AUX	735
161	BV-PI-1RW-102A1	PRIMARY COMP CLNG WATER 1A HT EXCH INLET PRESSURE INDICATOR			N	RESTORATION	AUX	735
162	BV-1CC-E-1A	PRIMARY PLANT COMP COOLING WTR HTEXCH			N	RESTORATION	AUX	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
163	BV-PI-1RW-102A2	PRIMARY COMP CLNG WATER 1A HT EXCH OUTLET PRESSURE INDICATOR			N	RESTORATION	AUX	735
164	BV-REJ-1RW-19A	CC-E-1A OUTLET EXP JOINT			N	RESTORATION	AUX	735
165	BV-REJ-1RW-26R1	CC-E-1A, B & C COMMON OUTLET EXPANSION			N	RESTORATION	SFGB	722
166	BV-MEJ-1RW-5	EXPANSION JOINT ON PIPELINE 30"-WR-17-151-Q3			N	RESTORATION	SRV	722
167	BV-MEJ-1RW-6	EXPANSION JOINT ON PIPELINE 30"-WR-17-151-Q3			N	RESTORATION	SRV	722
168	BV-REJ-1RW-26R2	CC & RS HX'S COMB OUT EXP JOINT			N	RESTORATION	TRBB	713
169	BV-1CC-E-1A	PRIMARY PLANT COMP COOLING WTR HTEXCH			N	RESTORATION	AUX	735
170	BV-TW-1CC-101A	THERMOWELL COMPONENT COOLING WATER COOLER OUTLET			N	RESTORATION	AUX	735
171	BV-TI-1CC-100	PRIMARY PLANT COMPONENT COOLING WATER HEADER TEMP INDICATOR			N	RESTORATION	SRV	735
172	BV-TS-1CC-100	PRIM PLT COMP CLG H2O HT EXCH (CC-E-1A,B,C) DISCH TEMP SWITCH			N	RESTORATION	AUX	735
173	BV-FE-1CC-117	FLOW ELEMENT FOR COMP COOL 24" SUPPLY HEADER			N	RESTORATION	AUX	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
174	BV-FT-1CC-117	COMP COOLING 24 IN SUPPLY HEADER FLOW TRANSMITTER			N	RESTORATION	AUX	722
175	BV-FI-1CC-117	COMP COOLING WATER 24IN SUPPLY HEADER FLOW INDICATOR			N	RESTORATION	SRV	735
176	BV-MEJ-1CC-12S	METAL EXPANSION JOINT			N	RESTORATION		
177	BV-MEJ-1CC-12	METAL EXPANSION JOINT			N	RESTORATION		
178	BV-MOV-1CC-112A2	(RH-E-1A) CCR IN CNMT ISOL			N	RESTORATION	RCBX	718
179	BV-PI-1CC-121A	COOL WTR INLET TO RESIDUAL HEAT EXCHANGER PRESSURE INDICATOR			N	RESTORATION	RCBX	707
180	BV-TI-1CC-145A	RESIDUAL HEAT SYSTEM HEAT EXCH 1A INLET TEMPERATURE INDICATOR			N	RESTORATION	RCBX	707
181	BV-1RH-E-1A	RESIDUAL HEAT REMOVAL HEAT EXCHANGER 1A			N	RESTORATION	RCBX	707
182	BV-TI-1CC-146A	RESIDUAL HEAT SYSTEM HEAT EXCH 1A OUTLET TEMPERATURE INDICATOR			N	RESTORATION	RCBX	707
183	BV-MOV-1CC-112A3	(RH-E-1A) CCR OUT CNMT ISOL			N	RESTORATION	RCBX	718
184	BV-MEJ-1CC-3	RESIDUAL HEAT REMOVAL RETURN HEADER EXPANSION JOINT			N	RESTORATION		

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
185	BV-MEJ-1CC-2	REACTOR COOLANT PUMP RETURN HEADER EXPANSION JOINT			N	RESTORATION		
186	BV-FE-1CC-119	FLOW ELEMENT FOR COMP COOL 14" SUPPLY HEADER			N	RESTORATION	AUX	735
187	BV-FT-1CC-119	COMP COOLING 14 IN SUPPLY HEADER FLOW TRANSMITTER			N	RESTORATION	AUX	735
188	BV-FI-1CC-119	COMP COOLING WATER 14IN SUPPLY HEADER FLOW INDICATOR			N	RESTORATION	SRV	735
189	BV-TV-1CC-128	FUEL POOL HX CCR IN ISOL			N	RESTORATION	FDB	735
190	BV-SOV-1CC-128	(TV-1CC-128) SOLENOID			N	RESTORATION	FDB	735
191	BV-TI-1CC-172A	FUEL POOL HEAT EXCHANGER 1A INLET TEMPERATURE INDICATOR			N	RESTORATION	FDB	735
192	BV-1FC-E-1A	FUEL POOL HEAT EXCHANGER 1A			N	RESTORATION	FDB	735
193	BV-TI-1CC-104A	FUEL POOL HEAT EXCHANGER 1A OUTLET TEMPERATURE INDICATOR			N	RESTORATION	FDB	735
194	BV-PI-1CC-181	CC-P-1A INLET (TEST) PRESSURE INDICATOR			N	RESTORATION	AUX	735
195	BV-REJ-1CC-16A	CC-P-1A SUCT EXP JOINT			N	RESTORATION	AUX	735
196	BV-1CC-P-1A	REACTOR PLANT COMPONENT COOLING WATER PUMP 1A			N	RESTORATION	AUX	735

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
197	BV-PI-1CC-100A	PRIMARY COMPONENT COOLING WATER P P.DISCHARGE 1A PRESSURE INDICATOR			N	RESTORATION	AUX	735
198	BV-MEJ-1CC-1A	PRIMARY PLANT CC WATER PUMP CC-P-1A OUTLET EXPANSION JOINT			N	RESTORATION	AUX	735
199	BV-MOV-1RH-700	RESIDUAL HEAT REMOVAL INLET ISOL VLV			N	RESTORATION	RCBX	692
200	BV-MOV-1RH-701	RESIDUAL HEAT REMOVAL INLET ISOL VLV			N	RESTORATION	RCBX	692
201	BV-1RH-P-1A	1A RESIDUAL HEAT REMOVAL PUMP			N	RESTORATION	RCBX	707
202	BV-PI-1RH-602	RESIDUAL HEAT REMOVAL PUMP DISCHARGE HEADER PRESS INDIC			N	RESTORATION	RCBX	718
203	BV-PS-1RH-603	RHR PUMP DISCHARGE HEADER PRESSURE SWITCH			N	RESTORATION	RCBX	
204	BV-MOV-1RH-605	RESIDUAL HEAT REMOVAL HX BYPASS FCV			N	RESTORATION	RCBX	707
205	BV-1RH-E-1A	RESIDUAL HEAT REMOVAL HEAT EXCHANGER 1A			N	RESTORATION	RCBX	707
206	BV-MOV-1RH-758	RESIDUAL HEAT REMOVAL HX FCV			N	RESTORATION	RCBX	707
207	BV-FE-1RH-605	FLOW ELEMENT FOR RESIDUAL HT REMOVAL EXCH DISCHARGE			N	RESTORATION		

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
208	BV-FT-1RH-605	RESIDUAL HEAT REMOVAL EXCHANGER DISCHARGE FLOW TRANSMITTER			N	RESTORATION	RCBX	692
209	BV-FI-1RH-605	RESIDUAL HEAT SYSTEM RETURN LINE FLOW INDICATOR			N	RESTORATION	SRV	735
210	BV-MOV-1RH-720A	RESIDUAL HEAT REMOVAL RETURN ISOL VLV			N	RESTORATION	RCBX	692
211	BV-1FC-P-1A	FUEL POOL CIRCULATION PUMP			N	RESTORATION	FDB	735
212	BV-PS-1FC-102A	FUEL POOL COOLING PMP FC-P-1A LOW DISCH PRESS ALARM			N	RESTORATION	FDB	735
213	BV-PI-1FC-102A	FUEL POOL COOLING PUMP FC-P-1A DISCH PRESSURE INDICATOR			N	RESTORATION	FDB	735
214	BV-2FNC-TI101A	FUEL POOL HT EXCH 2FNC-E21A INLET TEMP IND			N	RESTORATION	FDB	735
215	BV-1FC-E-1A	FUEL POOL HEAT EXCHANGER 1A			N	RESTORATION	FDB	735
216	BV-TI-1FC-102A	FUEL POOL HEAT EXCHANGER OUTLET TEMPERATURE INDICATOR			N	RESTORATION	FDB	735
217	BV-1VS-F-1A	CONTAINMENT AIR RECIRC DIRECT DRIVE FAN BANK "A"			N	RESTORATION	RCBX	692
218	BV-1VS-E-1A1	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
219	BV-1VS-E-1A2	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
220	BV-1VS-E-1A3	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
221	BV-1VS-E-1A4	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
222	BV-1VS-E-1A5	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
223	BV-1VS-E-1A6	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
224	BV-1VS-E-1A7	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
225	BV-1VS-E-1A8	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
226	BV-1VS-E-1A9	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
227	BV-1VS-E-1A10	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
228	BV-1VS-E-1A11	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
229	BV-1VS-E-1A12	CONTAINMENT AIR RECIRC COOLING COILS LOOP #1			N	RESTORATION	RCBX	692
230	BV-1VS-F-1B	CONTAINMENT AIR RECIRC DIRECT DRIVE FAN BANK "B"			N	RESTORATION	RCBX	692

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
231	BV-1VS-E-1B1	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
232	BV-1VS-E-1B2	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
233	BV-1VS-E-1B3	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
234	BV-1VS-E-1B4	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
235	BV-1VS-E-1B5	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
236	BV-1VS-E-1B6	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
237	BV-1VS-E-1B7	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
238	BV-1VS-E-1B8	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
239	BV-1VS-E-1B9	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
240	BV-1VS-E-1B10	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
241	BV-1VS-E-1B11	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692
242	BV-1VS-E-1B12	CONTAINMENT AIR RECIRC COOLING COILS LOOP #2			N	RESTORATION	RCBX	692

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
243	BV-1VS-F-1C	CONTAINMENT AIR RECIRC DIRECT DRIVE FAN BANK "C"			N	RESTORATION	RCBX	692
244	BV-1VS-E-1C1	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
245	BV-1VS-E-1C2	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
246	BV-1VS-E-1C3	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
247	BV-1VS-E-1C4	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
248	BV-1VS-E-1C5	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
249	BV-1VS-E-1C6	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
250	BV-1VS-E-1C7	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
251	BV-1VS-E-1C8	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
252	BV-1VS-E-1C9	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
253	BV-1VS-E-1C10	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
254	BV-1VS-E-1C11	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
255	BV-1VS-E-1C12	CONTAINMENT AIR RECIRC COOLING COILS LOOP #3			N	RESTORATION	RCBX	692
256	BAT-CHG1-1-A	BATTERY CHARGER BAT-CHG-1A					SRV	713
257	VB-A	VB-A					SRV	735
258	VB-B	VB-B					SRV	735
259	VB-C	VB-C					SRV	735
260	RK-REAC-PROT-A	SOLID STATE PROTECTION SYSTEM CABINET					SRV	713
261	PNL-SHUTDN	EMERGENCY SHUTDOWN PANEL, A & B TRAINS (INCLUDE APPENDIX R ISOLATION PANEL)					SRV	713
262	BB-B	BB-B					SRV	735
263	1E7-FLXD01	DH365PK					DGB	755

ATTACHMENT B:

TABULATED HCLPF VALUES

EQUIPMENT ID	HCLPF	β_C	β_R	β_U	A_m	FAILURE MODE	FRAGILITY METHOD
MS-TK-1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
PRV-1MS-1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
MS-516	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
MS-465	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
MCC-1-E7	1.65	0.40	0.24	0.32	4.18	Anchorage	New Analysis
MCC-1-E9	0.57	0.40	0.24	0.32	1.44	Functional	Gers
480VUS-1-8-N	0.41	0.40	0.24	0.32	1.04	Functional	Gers
FW-P-2	0.99	0.40	0.24	0.32	2.51	Anchorage	New Analysis
MS-464	0.99	0.40	0.24	0.32	2.51	Anchorage	Assigned By Rule of the Box. Parent Component: FW-P-2
FW-T-2	0.99	0.40	0.24	0.32	2.51	Anchorage	Assigned By Rule of the Box. Parent Component: FW-P-2
PCV-1MS-101A	0.30	0.40	0.24	0.32	0.77	Functional	Earthquake Experience Data
PCV-1MS-101A-OPER	0.30	0.40	0.24	0.32	0.77	Functional	Assigned By Rule of the Box. Parent Component: PCV-1MS-101A
PCV-1MS-101A-POS	0.30	0.40	0.24	0.32	0.77	Functional	Assigned By Rule of the Box. Parent Component: PCV-1MS-101A
TV-1MS-105A	0.30	0.40	0.24	0.32	0.77	Functional	Earthquake Experience Data
SOV-1MS-105A	0.30	0.40	0.24	0.32	0.77	Functional	Assigned By Rule of the Box. Parent Component: TV-1MS-105A
SV-1MS-101A	0.39	0.40	0.24	0.32	1.00	Functional	Based On Component-Specific Design Criteria
PNL-VITBUS1-1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based On Seismic Ruggedness
BAT-1-1	0.60	0.40	0.24	0.32	1.52	Anchorage	New Analysis
INV-VITBUS1-1	0.77	0.40	0.24	0.32	1.95	Functional	Gers
BAT-CHG1-1	0.60	0.40	0.24	0.32	1.54	Functional	Gers
BAT-CHG1-1-A	0.60	0.40	0.24	0.32	1.54	Functional	Assigned By Rule of the Box. Parent Component: BAT-CHG1-1
LT-1FW-477	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
PT-1RC-403	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness

EQUIPMENT ID	HCLPF	β_C	β_R	β_U	A_m	FAILURE MODE	FRAGILITY METHOD
PT-1CV-101A	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
PT-1LM-100A	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
LT-1RC-459	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
LT-1WT-104A	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
PT-1MS-474	0.60	0.40	0.24	0.32	1.51	Anchorage	New Analysis
T-C-1II-1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
TRB-1RC-412B1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
TRB-1RC-412C_D	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
NE-1NI-31	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
RK-1PRI-PROC-3	0.53	0.40	0.24	0.32	1.34	Anchorage	New Analysis
RK-1PRI-PROC-12	0.53	0.40	0.24	0.32	1.34	Anchorage	New Analysis
RK-1PRI-PROC-13	0.53	0.40	0.24	0.32	1.34	Anchorage	New Analysis
RK-1PRI-PROC-19	0.53	0.40	0.24	0.32	1.34	Anchorage	New Analysis
RK-1SEC-PROC-A	0.55	0.40	0.24	0.32	1.39	Anchorage	New Analysis
RK-1SEC-PROC-H	0.55	0.40	0.24	0.32	1.39	Anchorage	New Analysis
PQ-1CV-101A	0.55	0.40	0.24	0.32	1.39	Anchorage	Assigned By Rule of the Box. Parent Component: RK-1SEC-PROC-A
RK-1PRI-PROC-30	0.70	0.40	0.24	0.32	1.77	Functional	Earthquake Experience Data
PNL-DC1-1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
PI-1MS-474	0.68	0.40	0.24	0.32	1.72	Anchorage	Assigned By Rule of the Box. Parent Component: VB-C
TI-1RC-412A	0.68	0.40	0.24	0.32	1.72	Anchorage	Assigned By Rule of the Box. Parent Component: VB-B
PI-1RC-403	0.68	0.40	0.24	0.32	1.72	Anchorage	Assigned By Rule of the Box. Parent Component: VB-A
LI-1RC-459A	0.68	0.40	0.24	0.32	1.72	Anchorage	Assigned By Rule of the Box. Parent Component: VB-B

EQUIPMENT ID	HCLPF	β_C	β_R	β_U	A_m	FAILURE MODE	FRAGILITY METHOD
LI-1WT-104A1	0.68	0.40	0.24	0.32	1.72	Anchorage	Assigned By Rule of the Box. Parent Component: VB-C
PI-1LM-100A	0.68	0.40	0.24	0.32	1.72	Anchorage	Assigned By Rule of the Box. Parent Component: VB-A
VB-A	0.68	0.40	0.24	0.32	1.72	Anchorage	New Analysis
VB-B	0.68	0.40	0.24	0.32	1.72	Anchorage	New Analysis
VB-C	0.68	0.40	0.24	0.32	1.72	Anchorage	New Analysis
RL-1CV-101A	0.52	0.40	0.24	0.32	1.32	Anchorage	Assigned By Rule of the Box. Parent Component: RK-REAC-PROT-A
RK-REAC-PROT-A	0.52	0.40	0.24	0.32	1.32	Anchorage	New Analysis
LI-1FW-477A	0.70	0.40	0.24	0.32	1.77	Functional	Assigned By Rule of the Box. Parent Component: PNL-SHUTDN
PNL-SHUTDN	0.70	0.40	0.24	0.32	1.77	Functional	Earthquake Experience Data
NI-1NI-31B	0.47	0.40	0.24	0.32	1.18	Anchorage	Assigned By Rule of the Box. Parent Component: BB-B
BB-B	0.47	0.40	0.24	0.32	1.18	Anchorage	New Analysis
PNL-1EE-CONN-2	1.31	0.40	0.24	0.32	3.32	Functional	Earthquake Experience Data
1E7-FLXD01	1.31	0.40	0.24	0.32	3.32	Functional	Earthquake Experience Data
CH-TK-1A	0.39	0.40	0.24	0.32	1.00	Anchorage	New Analysis
CH-TK-1B	0.39	0.40	0.24	0.32	1.00	Anchorage	New Analysis
CH-E-3	0.68	0.35	0.24	0.26	1.54	Anchorage	New Analysis
WT-TK-10	0.27	0.35	0.24	0.26	0.61	Structural	New Analysis
QS-TK-1	0.30	0.35	0.24	0.26	0.68	Structural	New Analysis

Enclosure B
L-14-401

Expedited Seismic Evaluation Process (ESEP) Report
Beaver Valley Power Station – Unit 2
(69 pages follow)

ABS Consulting

RIZZO ASSOCIATES

2734294-R-020
Revision 0

Expedited Seismic Evaluation Process (ESEP) Report Beaver Valley Power Station – Unit 2

November 3, 2014

Prepared for:

FirstEnergy Nuclear Operating Company

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EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT
BEAVER VALLEY POWER STATION – UNIT 2

ABSG CONSULTING INC. REPORT NO. 2734294-R-020
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NOVEMBER 3, 2014

ABSG CONSULTING INC.
RIZZO ASSOCIATES

ABS Consulting
RIZZO ASSOCIATES

APPROVALS

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LIST OF ACRONYMS

ABS	ABSG CONSULTING INC.
AC	ALTERNATING CURRENT
ACI	AMERICAN CONCRETE INSTITUTE
AFW	AUXILIARY FEED WATER SYSTEM
AISC	AMERICAN INSTITUTE FOR STEEL CONSTRUCTION
ANS	AMERICAN NUCLEAR SOCIETY
ASCE	AMERICAN SOCIETY OF CIVIL ENGINEERS
ASDV	ATMOSPERHIC STEAM DUMP VALVES
ASME	AMERICAN SOCIETY OF MECHANICAL ENGINEERS
AUX	AUXILIARY BUILDING
BAST	BORIC ACID STORAGE TANKS
BFBEE	BEYOND DESIGN BASIS EXTERNAL EVENT
BE	BEST ESTIMATE
BVPS	BEAVER VALLEY POWER STATION
BVPS-2	BEAVER VALLEY POWER STATION - UNIT 2
CCP	PRIMARY COMPONENT COOLING WATER SYSTEM
CDFM	CONSERVATIVE DETERMINISTIC FAILURE MARGIN
CEUS	CENTRAL AND EASTERN UNITED STATES
CNTB	CONTROL BUILDING
DC	DIRECT CURRENT
DGB	DIESEL GENERATOR BUILDING
EL	ELEVATION
ELAP	EXTENDED LOSS OF ALL ALTERNATING CURRENT POWER
EPRI	ELECTRIC POWER RESEARCH INSTITUTE
ESEL	EXPEDITED SEISMIC EQUIPMENT LIST
ESEP	EXPEDITED SEISMIC EVALUATION PROCESS
EW	EAST-WEST DIRECTION
FDB	FUEL DECONTAMINATION BUILDING

LIST OF ACRONYMS (CONTINUED)

FE	FINITE ELEMENT
FENOC	FIRSTENERGY NUCLEAR OPERATING COMPANY
FIRS	FOUNDATION INPUT RESPONSE SPECTRA
FNC	FUEL POOL COOLING AND PURIFICATION SYSTEM
FPW	FIRE PROTECTION SYSTEM
ft	FEET
ft/s	FEET PER SECOND
g	ACCELERATION OF GRAVITY
GERS	GENERIC EQUIPMENT RUGGEDNESS DATA
GIP	GENERIC IMPLEMENTATION PROCEDURE
GMRS	GROUND MOTION RESPONSE SPECTRA
HCLPF	HIGH CONFIDENCE OF LOW PROBABILITY OF FAILURE
HVAC	HEATING, VENTILATION, AND AIR-CONDITIONING
HZ	HERTZ
ISRS	IN-STRUCTURE RESPONSE SPECTRA
KV	KILOVOLT
MAFE	MEAN ANNUAL FREQUENCY OF EXCEEDANCE
MCC	MOTOR CONTROL CENTER
MSVCV	MAIN STEAM VALVE AND CABLE VAULT BUILDING
NEI	NUCLEAR ENERGY INSTITUTE
NPP	NUCLEAR POWER PLANT
NRC	UNITED STATES NUCLEAR REGULATORY COMMISSION
NS	NORTH-SOUTH DIRECTION
NSSS	NUCLEAR STEAM SUPPLY SYSTEM
NTTF	NEAR-TERM TASK FORCE
NUREG	U.S.N.R.C. REGULATION
OIP	OVERALL INTEGRATED PLAN

LIST OF ACRONYMS (CONTINUED)

P&ID	PROCESS AND INSTRUMENTATION DIAGRAM
pcf	POUNDS PER CUBIC FOOT
PGA	PEAK GROUND ACCELERATION
PPDWST	PRIMARY PLANT DEMINERALIZED WATER STORAGE TANK
QSS	QUENCH SPRAY SYSTEM
RB	REACTOR BUILDING
RCBX	REACTOR CONTAINMENT STRUCTURE
RCIC	REACTOR CORE ISOLATION COOLING
RCS	REACTOR COOLANT SYSTEM
RIZZO	RIZZO ASSOCIATES
RLGM	REVIEW LEVEL GROUND MOTION
RSGB	ERF SUBSTATION DIESEL BUILDING
SEWS	SEISMIC EVALUATION WORK SHEETS
SFGB	SAFEGUARDS BUILDING
SI	SEISMIC INTERACTION
SIS	SAFETY INJECTION SYSTEM
SOV	SOLENOID-OPERATED VALVE
SMA	SEISMIC MARGIN ASSESSMENT
SPRA	SEISMIC PROBABILISTIC RISK ASSESSMENT
SQUG	SEISMIC QUALITY UTILTY GROUP
SASSI	SYSTEM FOR ANALYSIS FOR SOIL STRUCTURE INTERACTION
SRSS	SQUARE-ROOT-OF-THE-SUM-OF-THE-SQUARES
SRT	SEISMIC REVIEW TEAM
SRV	SERVICE BUILDING
SSCs	STRUCTURES, SYSTEMS, AND COMPONENTS
SSE	SAFE SHUTDOWN EARTHQUAKE
SSI	SOIL STRUCTURE INTERACTION

LIST OF ACRONYMS (CONTINUED)

SWS	SERVICE WATER SYSTEM
TDAFWP	TURBINE DRIVEN AUXILIARY FEED WATER PUMP
TH	TIME HISTORY
TRS	TEST RESPONSE SPECTRUM
TURB	TURBINE BUILDING
UHRS	UNIFORM HAZARD RESPONSE SPECTRA
USNRC	UNITED STATES NUCLEAR REGULATORY COMMISSION
VAC	VOLTAGE ALTERNATING CURRENT
VLVP	VALVE PIT
V_S	SHEAR WAVE VELOCITY

EXPEDITED SEISMIC EVALUATION PROCESS REPORT BEAVER VALLEY POWER STATION – UNIT 2

1.0 PURPOSE AND OBJECTIVE

Following the accident at the Fukushima Dai-ichi Nuclear Power Plant (NPP) resulting from the March 11, 2011, Great Tohoku Earthquake, and subsequent tsunami, the Nuclear Regulatory Commission (NRC) established a Near-Term Task Force (NTTF) to conduct a systematic review of NRC processes and regulations and to determine if the agency should make additional improvements to its regulatory system. The NTTF developed a set of recommendations intended to clarify and strengthen the regulatory framework for protection against natural phenomena. Subsequently, the NRC issued a 50.54(f) letter on March 12, 2012 [1], requesting information to assure that these recommendations are addressed by all United States (U.S.) NPPs. The 50.54(f) letter requests that licensees and holders of construction permits under 10 CFR Part 50 reevaluate the seismic hazards at their sites against present-day NRC requirements and guidance. Depending on the comparison between the reevaluated seismic hazard and the current design basis, further risk assessment may be required. Assessment approaches acceptable to the staff include a Seismic Probabilistic Risk Assessment (SPRA), or a Seismic Margin Assessment (SMA). Based upon the assessment results, the NRC staff will determine whether additional regulatory actions are necessary.

This Report describes the Expedited Seismic Evaluation Process (ESEP) undertaken for Beaver Valley Power Station – Unit 2 (BVPS-2). The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter [1] to demonstrate seismic margin through a review of a subset of the plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events.

The ESEP is implemented using the methodologies in the NRC endorsed guidance in Electric Power Research Institute (EPRI) 3002000704 [2].

The objective of this Report is to provide summary information describing the ESEP evaluations and results. The level of detail provided in the Report is intended to enable NRC to understand the inputs used, the evaluations performed, and the decisions made as a result of the interim evaluations.

2.0 BRIEF SUMMARY OF THE FLEX SEISMIC IMPLEMENTATION STRATEGIES

The Beaver Valley Power Station (BVPS) FLEX strategies for Reactor Core Cooling and Heat Removal, Reactor Inventory Control/Long-term Subcriticality, and Containment Function are summarized below. This summary is derived from the BVPS Overall Integrated Plan (OIP) in response to the March 12, 2012 Commission Order EA-12-049 [17].

During Phase 1, Reactor Core Cooling and Heat Removal is accomplished via steam release from the steam generators with make-up supplied via the Auxiliary Feed Water System (AFW). The primary plant demineralized water storage tank (PPDWST), Turbine Driven Auxiliary Feed Water pump(TDAFWP) and all needed flow paths for feeding steam generators and the flow paths for steam release from the steam generators and steam supply to the TDAFW pump are protected from all hazards. AFW Flow Control Valves and Atmospheric Steam Dump Valves (ASDV) are controlled locally and do not need electricity or air for local control.

During Phase 2, cooling water make-up to the PPDWST is via a FLEX portable pump, with suction from the Ohio River. Make-up water is supplied directly to the PPDWST via a new FLEX connection point.

The same Reactor Core Cooling and Heat Removal strategy applies for Phase 3, except that water purification equipment from the National SAFER Response Center is used to purify the make-up water to the PPDWST.

Reactor Inventory Control is maintained through the use of low leakage reactor coolant pump (RCP) seals. Other than installation of the seals, there are no required plant modifications. With low leakage seals, make-up to the reactor coolant system (RCS) is not required during Phase 1.

During Phase 2, Reactor Inventory Control/Long-term Subcriticality is maintained by pumping borated water from the Boric Acid Storage Tanks (BAST) to the RCS using a FLEX high pressure portable pump and new FLEX connection points at the BASTs and downstream of the Charging Pumps.

The same Reactor Inventory Control/Long-term Subcriticality strategy applies for Phase 3, except National SAFER Response Center equipment is used to mix borated water to replace the contents of the BASTs.

Key parameters are available in the control room and communications will be available between the control room and operators that are controlling the valves locally. Electrical components required to maintain the key parameter indication during Phase 1 include the installed safety related batteries, inverters, vital Alternating Current (AC) & Direct Current (DC) buses, instrument racks and control room indicators that are needed for monitoring key reactor parameters in the control room. A load shed strategy is employed to increase the battery life.

During Phase 2, a FLEX portable generator supplies power to the battery chargers through a new FLEX connection point to maintain key parameter indication. The generator back feeds power through the safety related 480 Voltage Alternating Current (VAC) electrical distribution system to the battery chargers.

There are no FLEX actions needed to maintain containment integrity. Low leakage RCP Seals minimize the energy input into containment from the RCS. Containment pressure remains less than 5 pounds per square inch gauge (psig) after 7 days post event. Containment temperature and pressure are addressed in recovery actions.

3.0 EQUIPMENT SELECTION PROCESS AND ESEL

3.1 EQUIPMENT SELECTION PROCESS AND ESEL

The selection of equipment to be included on the Expedited Seismic Equipment List (ESEL) was based on installed plant equipment credited in the FLEX strategies during Phases 1, 2, and 3 mitigation of a Beyond Design Basis External Event (BDBEE), as outlined in the BVPS OIP in Response to the March 12, 2012, Commission Order EA-12-049 [17]. The OIP provides the BVPS FLEX mitigation strategy and serves as the basis for equipment selected for the ESEP.

The scope of "installed plant equipment" includes equipment relied upon for the FLEX strategies to sustain the critical functions of core cooling and containment integrity consistent with the BVPS OIP [17]. FLEX recovery actions are excluded from the ESEP scope per EPRI 3002000704 [2]. The overall list of planned FLEX modifications and the scope for consideration herein is limited to those required to support core cooling, reactor coolant inventory and subcriticality, and containment integrity functions. Portable and pre-staged FLEX equipment (not permanently installed) are excluded from the ESEL per EPRI 3002000704 [2].

The ESEL component selection followed the EPRI guidance outlined in Section 3.2 of EPRI 3002000704.

1. The scope of components is limited to that required to accomplish the core cooling and containment safety functions identified in Table 3-2 of EPRI 3002000704. The instrumentation monitoring requirements for core cooling/containment safety functions are limited to those outlined in the EPRI 3002000704 guidance, and are a subset of those outlined in the BVPS OIP [17].
2. The scope of components is limited to installed plant equipment and FLEX connections necessary to implement the BVPS OIP [17] as described in ***Section 2.0***.
3. The scope of components assumes the credited FLEX connection modifications are implemented, and are limited to those required to support a single FLEX success path; i.e., either "Primary" or "Back-up/Alternate".
4. The "Primary" FLEX success path is to be specified. Selection of the "Back-up/Alternate" FLEX success path must be justified.

5. Phase 3 coping strategies are included in the ESEP scope, whereas recovery strategies are excluded.

6. Structures, systems, and components (SSC) excluded per the EPRI 3002000704 [2] guidance are:

   - Structures (e.g., Containment, Reactor Building [RB], Control Building [CNTB], Auxiliary Building [AUX], etc.).
   - Piping, cabling, conduit, heating, ventilation, and air-conditioning (HVAC), and their supports.
   - Manual valves and rupture disks.
   - Power-operated valves not required to change state as part of the FLEX mitigation strategies.
   - Nuclear steam supply system components (e.g., reactor pressure vessel and internals, RCPs, and seals, etc.).

7. For cases in which neither train was specified as a primary or back-up strategy, then only one train component (generally 'A' train) is included in the ESEL.

3.1.1 ESEL Development

The ESEL was developed by reviewing the BVPS OIP [17] to determine the major equipment involved in the FLEX strategies. Further reviews of plant drawings (e.g., Process and Instrumentation Diagrams [P&ID] and Electrical One-Line Diagrams) were performed to identify the boundaries of the flowpaths to be used in the FLEX strategies and to identify specific components in the flowpaths needed to support implementation of the FLEX strategies. Boundaries were established at an electrical or mechanical isolation device (e.g., isolation amplifier, valve, etc.) in branch circuits / branch lines off the defined strategy electrical or fluid flowpath. P&IDs were the primary reference documents used to identify mechanical components and instrumentation. The flow paths used for FLEX strategies were selected and specific components were identified using detailed equipment and instrument drawings, piping isometrics, electrical schematics and one-line drawings, system descriptions, design basis, and documents, etc., as necessary.

3.1.2 Power-Operated Valves

Page 3-3 of EPRI 3002000704 [2] notes that power-operated valves not required to change state are excluded from the ESEL. Page 3-2 also notes that "functional failure modes of electrical and mechanical portions of the installed Phase 1 equipment should be considered (e.g., reactor core isolation cooling [RCIC]/AFW trips)." To address this concern, the following guidance is applied in the BVPS ESEL for functional failure modes associated with power-operated valves:

- Power-operated valves that remain energized during the Extended Loss of all Alternating Current Power (ELAP) events (such as DC powered valves), were included on the ESEL.
- Power-operated valves not required to change state as part of the FLEX mitigation strategies were included on the ESEL, but indicated as screening out of evaluation. The seismic event also causes the ELAP event; therefore, the valves are incapable of spurious operation as they would be de-energized.
- Power-operated valves not required to change state as part of the FLEX mitigation strategies during Phase 1, and are re-energized and operated during subsequent Phases 2 and 3 strategies, were not evaluated for spurious valve operation as the seismic event that caused the ELAP has passed before the valves are re-powered.

3.1.3 Pull Boxes

Pull boxes were deemed unnecessary to add to the ESELs, as these components provide completely passive locations for pulling or installing cables. No breaks or connections in the cabling are included in pull boxes. Pull boxes were considered part of conduit and cabling, which are excluded in accordance with EPRI 3002000704 [2].

3.1.4 Termination Cabinets

Termination cabinets, including cabinets necessary for FLEX Phase 2 and Phase 3 connections, provide consolidated locations for permanently connecting multiple cables. The termination cabinets and the internal connections provide a completely passive function; however, the cabinets are included in the ESEL to ensure industry knowledge on panel/anchorage failure vulnerabilities is addressed.

3.1.5 Critical Instrumentation Indicators

Critical indicators and recorders are typically physically located on panels/cabinets and are included as separate components; however, seismic evaluation of the instrument indication may be included in the panel/cabinet seismic evaluation (rule-of-the-box).

3.1.6 Phase 2 and Phase 3 Piping Connections

Item 2 in ***Section 3.1*** above notes that the scope of equipment in the ESEL includes "… FLEX connections necessary to implement the BVPS OIP [17] as described in Section 2." Item 3 in ***Section 3.1*** also notes that "The scope of components assumes the credited FLEX connection modifications are implemented, and are limited to those required to support a single FLEX success path (i.e., either "Primary" or "Back-up/Alternate")."

Item 6 in ***Section 3.0*** above goes on to explain that "piping, cabling, conduit, HVAC, and their supports" are excluded from the ESEL scope in accordance with EPRI 3002000704 [2].

Therefore, piping and pipe supports associated with FLEX Phase 2 and Phase 3 connections are excluded from the scope of the ESEP evaluation. However, any active valves in FLEX Phase 2 and Phase 3 connection flow path are included in the ESEL.

4.0 GROUND MOTION RESPONSE SPECTRUM

4.1 PLOT OF GMRS SUBMITTED BY THE LICENSEE

The BVPS-2 major structures are founded in the Pleistocene Terrace deposits or on compacted granular structural backfill at foundation elevations varying between 681 feet (ft) for the RB to 725 ft for the Service Building (SRV). The design basis analysis applies the safe shutdown earthquake (SSE) ground motion at the respective building foundations. Therefore, the SSE, and the ground motion response spectra (GMRS), control point elevation is taken to be at the base of the RCBX, elevation (EL) 681. The bedrock immediately underlying the RCBX foundation (EL 561) is characterized by shear wave velocities (V_S) of about 5,000 feet per second (ft/s).

Figure 4-1 presents the GMRS at the control point EL 681 and compares this to the GMRS reported in the BVPS-2 March 2014 submittal [3]. The difference is attributed to:

1. The material damping used for the rock material over the upper 500 ft. While the GMRS, reported in the March 2014, submittal is based on the low strain damping of 3.2 percent over a 500-foot depth of bedrock, the GMRS used in the BV-2 SPRA limits this damping value to the upper 100 ft where the rock is considered as weathered or fractured. Within the depth range of 100 ft to 500 ft, a damping of 1 percent is used based on the unweathered shale dynamic properties from Stokoe et al., [14]. Below a depth of 500 ft, linear material behavior is adopted with the damping value of 0.5 percent is specified consistent with the kappa estimate for the Site.

2. The subsurface profile used in the site amplification analysis. While the GMRS, reported in the March 2014, submittal is based on a profile which extends from the bottom of the RCBX foundation to at depth hard rock, the GMRS used in the SPRA develops from the analysis of the full soil column to plant grade, subsequently truncated to the RB foundation level, in accordance with ISG-17 [18].

Table 4-1 presents the spectral accelerations at selected frequencies defining the GMRS used in the ESEP. The development of this GMRS is more fully described in [3]. This GMRS is also being utilized as basis to obtain fragilities in support of the on-going SPRA. Because the GMRS defines the ground motion at the RCBX foundation, it is also called the RCBX foundation input response spectrum (FIRS).

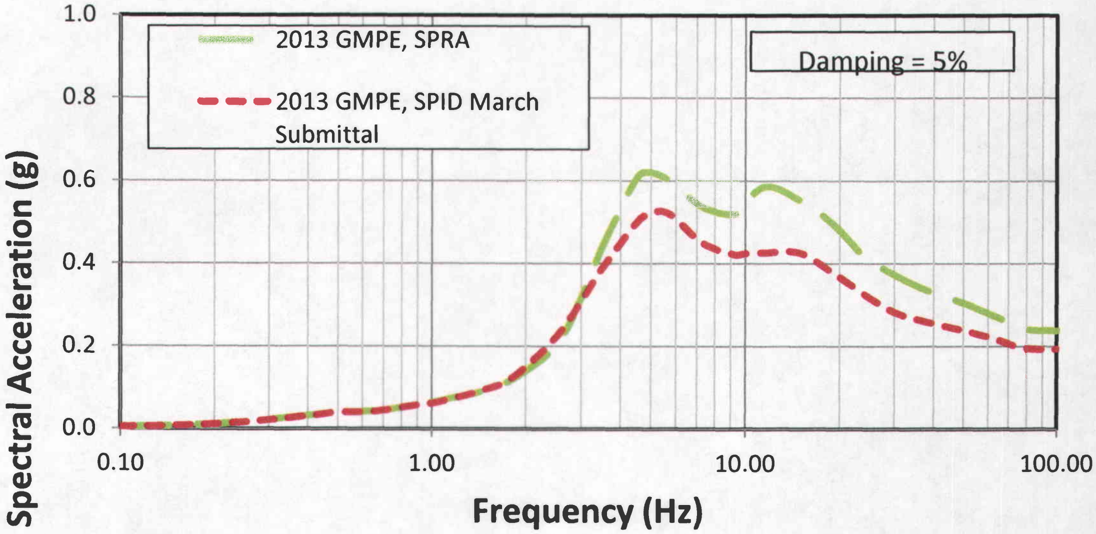

FIGURE 4-1
COMPARISON BETWEEN GMRS AT CONTROL POINT REPORTED IN SPID MARCH 2014 SUBMITTAL AND GMRS USED IN BVPS-2 SPRA PROJECT

TABLE 4-1
UHRS AND GMRS USED IN BVPS-2 SPRA, EL 681

FREQUENCY (Hz)	HORIZONTAL SPECTRAL ACCELERATION (g) AT THE FOUNDATION ELEVATION		
	$1x10^{-4}$ MAFE UHRS	$1x10^{-5}$ MAFE UHRS	GMRS
0.10	0.0027	0.0069	0.0034
0.13	0.0039	0.0098	0.0049
0.16	0.0057	0.0143	0.0071
0.20	0.0087	0.0213	0.0107
0.26	0.0136	0.0325	0.0164
0.33	0.0206	0.0481	0.0244
0.42	0.0289	0.0653	0.0333
0.50	0.0359	0.0792	0.0406
0.53	0.0357	0.0793	0.0406
0.67	0.0370	0.0833	0.0425
0.85	0.0464	0.1073	0.0544
1.00	0.0539	0.1252	0.0635
1.08	0.0577	0.1368	0.0691
1.37	0.0675	0.1729	0.0859
1.74	0.0825	0.2309	0.1128
2.21	0.1104	0.3432	0.1641
2.50	0.1296	0.4307	0.2033
2.81	0.1642	0.5745	0.2683
3.56	0.2793	0.9716	0.4543

TABLE 4-1
UHRS AND GMRS USED IN BVPS-2 SPRA, EL 681
(CONTINUED)

FREQUENCY (Hz)	HORIZONTAL SPECTRAL ACCELERATION (g) AT THE FOUNDATION ELEVATION		
	1x10^{-4} MAFE UHRS	1x10^{-5} MAFE UHRS	GMRS
4.52	0.4214	1.2647	0.6091
5.00	0.4476	1.2715	0.6191
5.74	0.4380	1.2228	0.5975
7.28	0.3789	1.1069	0.5360
9.24	0.3272	1.1010	0.5182
10.00	0.3340	1.1760	0.5486
11.72	0.3720	1.2420	0.5855
14.87	0.3887	1.1434	0.5529
18.87	0.3559	1.0245	0.4975
23.95	0.2994	0.8556	0.4161
25.00	0.2891	0.8365	0.4058
30.39	0.2709	0.7571	0.3699
38.57	0.2506	0.6773	0.3331
48.94	0.2357	0.6196	0.3064
62.10	0.2136	0.5531	0.2743
78.80	0.1871	0.4879	0.2417
100.00	0.1765	0.4841	0.2374

Note:

MAFE = mean annual frequency of exceedance.

4.2 COMPARISON TO SSE

Figure 4-2 compares the GMRS with the Site SSE at the control point elevation. The SSE horizontal spectrum is characterized by a peak ground acceleration (PGA) of 0.125 acceleration of gravity (g) and a shape derived from the five percent-damped average response spectra of several acceleration records. This shape is similar to that suggested by Newmark, et al., [12]. The comparison presented on ***Figure 4-2*** illustrates that the maximum ratio of spectral accelerations (GMRS/SSE) is about 2.8 at about 10 Hertz (Hz).

TABLE 4-2
SSE HORIZONTAL GROUND MOTION RESPONSE SPECTRUM FOR BVPS-2

FREQUENCY [Hz]	SPECTRAL ACCELERATION [g]
0.20	0.012
0.50	0.076
2.00	0.325
6.00	0.325
20.00	0.125
100.00	0.125

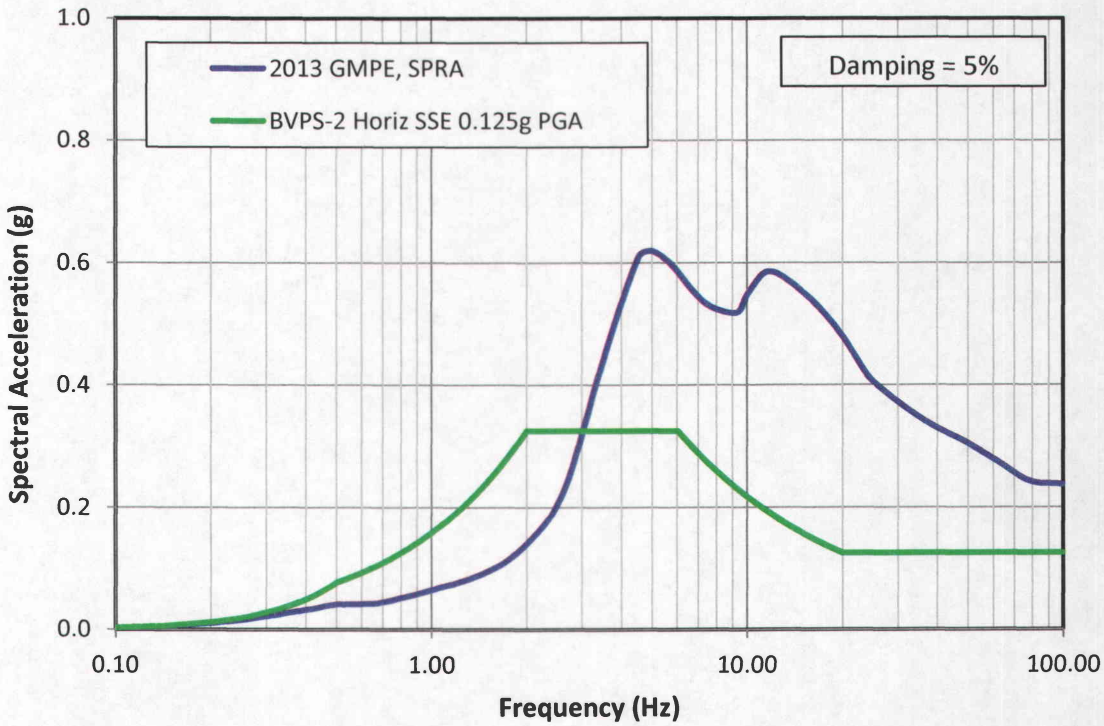

FIGURE 4-2
COMPARISON OF GMRS AND SSE AT CONTROL POINT ELEVATION

5.0 REVIEW LEVEL GROUND MOTION

5.1 DESCRIPTION OF RLGM SELECTED

The ESEP is being completed as part of the Augmented Approach because the GMRS exceed the SSE in the 1 Hz to 10 Hz range. The ESEP guidance (EPRI-3002000704) allows the use of the GMRS as the review level ground motion (RLGM) in lieu of using scaled SSE response spectrum to demonstrate acceptance of the high confidence low probability of failure (HCLPF) values for the ESEL components.

Because BVPS-2 is currently performing a SPRA, the fragilities developed in support are being used to the extent applicable also to accomplish the ESEP. The SPRA GMRS shown on ***Figure 4-1*** represents the ground motion input used to obtain new seismic demand on the components on the ESEL, and to obtain HCLPF and fragilities for the ESEL components. ***Table 4-1*** presents the spectral accelerations at specific frequencies defining the RLGM.

5.2 METHOD TO ESTIMATE ISRS

The process for obtaining in-structure response spectra (ISRS) from the building seismic analysis incorporates the effects of soil structure interaction (SSI) on the seismic response of the building structures. SSI analysis employing the System for Analysis for Soil Structure Interaction (SASSI) code was performed for the buildings of the BVPS-2 because their foundation mat bears on native soils or on Class A Fill. The analytical model for the SSI analysis combines a horizontally layered representation of the subsurface soil column with a finite element (FE) representation of the structure.

Table 5-1 describes the elevations and V_S of the soil layers that were used to conduct the site response analysis by RIZZO Associates (RIZZO) [3]. This analysis developed strain compatible dynamic properties of the subsurface layers at the Beaver Valley Site, following the normalized curves listed in ***Table 5-2***. These properties are used in the SSI analyses performed with the SASSI code.

TABLE 5-1
SUMMARY OF GEOTECHNICAL PROFILE DATA UNDERLYING THE BV SITE (REFERENCE [3])

ELEVATION (ft)	STRATA	DENSITY (pcf)	MEDIAN V_S (ft/s)	COV V_S	MEDIAN TH (ft)
735	Structural Backfill	136	730	0.25	15.00
720	Structural Backfill	136	1,015	0.25	39.10
680.9	(1d) Pleistocene Upper and Lower Terrace	125	1,100	0.25	15.90
665	(1e) Pleistocene Upper and Lower Terrace	136	1,200	0.25	40.00
625	(2) M. Pennsylvanian Allegheny Shale	160	5,000	0.20	75.00
550	(3) L. Pennsylvanian Pottsville SS, Conglomerate	160	6,026	0.11	200.00
350	(4) U. Mississippian Mauch Chunk Shale	155	6,744	0.11	50.00
300	(5) L. Mississippian Pocono Sandst., Conglomerate	155	6,744	0.11	420.00
-120	(6a) U. Devonian Interbedded Shale, Sands, Siltstone	155	7,112	0.11	2874.00
-2994	(6b) U. Devonian Interbedded Shale, Sands, Siltstone	155	6,416	0.11	706.00
-3700	Half Space	168	9,200	-	-

TABLE 5-2
NORMALIZED STRAIN COMPATIBLE SHEAR MODULI AND DAMPING FOR SOIL UNITS AT THE BV SITE

STRAIN (%)	STRUCTURAL BACKFILL		PLEISTOCENE UPPER AND LOWER TERRACE		PLEISTOCENE UPPER AND LOWER TERRACE	
	G/G_{max}	DAMPING (%)	G/G_{max}	DAMPING (%)	G/G_{max}	DAMPING (%)
0.0001	1.0000	1.49	1.0000	1.26	1.0000	1.02
0.000316	0.9968	1.57	0.9977	1.27	0.9982	1.05
0.00100	0.9707	1.84	0.9845	1.50	0.9925	1.26
0.0020	0.9415	2.30	0.9632	1.80	0.9812	1.48
0.00300	0.9123	2.77	0.9419	2.09	0.9699	1.71
0.0050	0.8663	3.41	0.9070	2.55	0.9412	2.03
0.0070	0.8216	4.05	0.8731	2.99	0.9119	2.35
0.0100	0.7545	5.02	0.8221	3.66	0.8680	2.83
0.0200	0.6419	7.00	0.7224	5.22	0.7805	4.08
0.0300	0.5292	8.98	0.6227	6.79	0.6929	5.33
0.0500	0.4486	10.89	0.5466	8.45	0.6170	6.78
0.0700	0.3772	12.57	0.4783	9.97	0.5475	8.14
0.1	0.2702	15.08	0.3760	12.25	0.4431	10.17
0.2	0.1961	18.11	0.2774	15.30	0.3399	12.95
0.3	0.1228	21.05	0.1789	18.34	0.2353	15.73
1	0.0392	26.60	0.0587	24.68	0.0895	22.67

Note:

G/G_{max} = shear modulus (G) normalized by the low strain shear modulus (G_{max}).

A review of existing lumped-mass and stiffness models of the BVPS-2 structures concluded that these models were not sufficiently adequate to use as basis to scale the building seismic response. Therefore, the building seismic response used in the ESEP (and in the SPRA) is obtained using new FE models of the structures.

The analytical FE models developed here are based on geometric information, such as configuration of floors and walls, dimensions, wall and slab thicknesses, locations, and size of openings, etc., taken from appropriate structure layout drawings and details. The parametric information, such as the material properties, live loads, equipment loads, and boundary conditions are also obtained from drawings, existing reports, and prevalent codes and standards.

The response spectra at the respective foundation levels represent the foundation input ground motion. The seismic Category I structures that have been analyzed are supported at the different foundation depths. Although, the GMRS reported in [3] applies only to the RCBX, the horizontal FIRS were developed for other structures supported at the following elevations:

- EL 681 for the analysis of the RB
- EL 703 for the analyses of the AUX and the CNTB
- EL 713 for the analyses of the DGB, Main Steam Valve and Cable Vault Building (MSVCV), and Safeguards Building (SFGB)
- EL 723.5 for the analyses of the Fuel Decontamination Building (FDB) and SRV

The seismic response, including the ISRS for the BVPS-2 structures are developed utilizing the time history (TH) modal synthesis in which the input time histories (TH) represent the horizontal and vertical FIRS at the respective building foundation levels consistent with the GMRS described in ***Section 4.0***.

ISRS at selected locations are obtained separately, due to three directions of input motion (X, Y, and Z). The resulting response spectra are then combined using the square-root-of-the-sum-of-the-squares (SRSS) method. For example, the three ISRS at a specific location in North-South (NS) direction resulting from ground motion input; respectively, in the NS, East-West (EW), and vertical directions are combined using SRSS.

Subsequently, equipment HCLPF calculations and fragility evaluations are performed based on the conservative deterministic failure margin (CDFM) approach. In accordance with EPRI 1019200 "Seismic Fragility Applications Guide Update" [19], the seismic analyses are performed using Best Estimate (BE) structure stiffness, mass and damping characteristics, and the BE subsurface V_S profile compatible with the expected seismic shear strains. The resulting ISRS approximately represent the 84th percentile response suitable for use in the CDFM calculations.

Details of the development of the models, inputs, analysis, and results are presented in ABSG Consulting Inc. (ABS Consulting) Report 2734294-R-012, Revision 1, 2014.

6.0 SEISMIC MARGIN EVALUATION APPROACH

6.1 SUMMARY OF METHODOLOGIES USED

The seismic margins for components on the ESEL [6] are developed following the EPRI guidelines described in EPRI 6041 [4], EPRI TR-103959 [5] (Methodology for Developing Seismic Fragilities) and EPRI 1002988 (Seismic Fragility Application Guide). Additionally, EPRI 1019200 [19] is used to develop margins using the CDFM approach.

The ESEL is first grouped to identify similar components relative to equipment classes (e.g., Generic Implementation Procedure [GIP]), and then sampled for representative items based on the type of equipment, manufacturer, location, and anchorage, etc. Representative samples in each equipment group are then evaluated to obtain the seismic margins using the EPRI guidelines.

The overall strategy for developing seismic margins for the various SSCs is as follows:

1. Perform screening verification walkdown to document that caveats associated to generic fragilities are met and perform anchorage calculations.
2. Develop the HCLPF capacities based on available experience data, published generic ruggedness spectra, design criteria documents, and design analysis.
3. Rank the components based on preliminary results.
4. Perform improved analysis of selected equipment.

A number of components on the ESEL are breakers and switches that are housed in a "parent" component, such as a motor control center (MCC) or switchgear. For the purposes of this evaluation, calculations are not explicitly performed for these housed components. Instead, their HCLPF is assigned based on the parent component.

Seismic walkdowns as described in EPRI NP 6041 [4] are performed for all "parent" components on the ESEL [6]. Some ESEL components were walked down in February 2013, in support of SPRA, and these walkdowns were credited, where applicable. The remaining components were walked down in May 2014, during a plant refueling outage.

HCLPF calculations are performed for all "parent" components [6], as described in ***Section 6.3***, which describes the CDFM approach, and the calculation of structural and functional capacities.

6.2 HCLPF SCREENING PROCESS

No components were screened out based on ruggedness. Rather, the screening level HCLPFs provided in Table 2-4 of EPRI 6041 [4] were utilized to develop mounting level capacities. HCLPF values are then calculated for each component on the ESEL, as described in ***Section 6.3***.

6.3 SEISMIC WALKDOWN APPROACH

6.3.1 Seismic Walkdown Approach

The seismic walkdowns of BVPS-2 were performed in accordance with the criteria provided in Section 5 of EPRI 3002000704 [2], which refers to EPRI NP-6041 [7] for the SMA process. The procedures used for different equipment categories are summarized below.

The Seismic Review Team (SRT) reviewed equipment on the equipment walkdown list that were reasonably accessible and in non-radioactive or moderately radioactive environments. For components in high radioactive environments, a smaller team, and more hurried reviews were employed. For components that were not accessible, the equipment inspection relied on alternate means, such as photographs and plant qualification documents.

In the event the walkdown team had a reasonable basis for assuming that a group of components were similar and similarly anchored, a single representative component out of this group was selected for examination. The similarity of a group of items was established based on equipment construction, dimensions, locations, seismic qualification requirement, anchorage type, and configurations. The "similarity basis" was planned to be confirmed during walk bys, which would also record anomalies in installation or presence of seismic interaction, if any. The representative item was targeted for a thorough review and documentation. All "representative" and "walk by" items were fully documented in Seismic Evaluation Work Sheets (SEWS).

The SRT performed the walkdowns in an ad hoc manner. For each representative component, the SRT performed a thorough inspection and recorded information related to anchorage, load path configuration, and any potential seismic vulnerability associated to the component seismic capacity. These details recorded in SEWS were subsequently used to verify as-built conditions and determine seismic fragilities.

The 100 percent "walk by" is to look for outliers, lack of similarity, anchorage which is different from that shown on drawings or prescribed in criteria for that component, potential SI [Seismic Interaction[1]] problems, situations that are at odds with the team members' past experience, and any other areas of serious seismic concern. If any such concerns surface, then the limited sample size of one component of each type for thorough inspection will have to be increased. The increase in sample size, which should be inspected, will depend upon the number of outliers and different anchorages, etc., which are observed. It is up to the SRT to ultimately select the sample size since they are the ones who are responsible for the seismic adequacy of all elements which they screen from the margin review.

Walk bys also serve to provide the SRT with the sufficient degree of confidence in relation to plant maintenance and construction practices. This is especially used to reinforce the engineering judgment applied for the fragility assessment of inaccessible components. However, in case questionable construction practices are observed in the SSCs, then the system or component class must be inspected in closer detail until the systematic deficiency is defined.

For each item on the equipment walkdown list, a specific SEWS was prepared covering the different caveats. Each SEWS consists of:

- General description of the equipment: Equipment ID, Name, Equipment Category, and Building/Floor/Room
- Equipment Evaluation Caveats

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[1] EPRI 3002000704 [2] Page 5-4 limits the ESEP SI reviews to "nearby block walls" and "piping attached to tanks," which are reviewed "to address the possibility of failures due to differential displacements." Other potential SI evaluations are "deferred to the full seismic risk evaluations performed in accordance with EPRI 1025287 [15]."

- Equipment Anchorage
- Seismic Interaction Issues

A database of SEWS was developed in an electronic format using iPad Computers to facilitate entry of the information collected during the walkdowns. The database includes the record of equipment qualifications, walkdown observations, and photographs.

6.3.2 Application of Previous Walkdown Information

Previous seismic walkdowns were used to support the ESEP seismic evaluations. Some of the components on the ESEL were included in the NTTF 2.3 seismic walkdowns [15] and SPRA seismic walkdowns [16]. Those walkdowns were recent enough that they did not need to be repeated for the ESEP.

6.3.3 Significant Walkdown Findings

Consistent with the guidance from NP-6041 [7], no significant outliers or anchorage concerns were identified during the BVPS-2 seismic walkdowns. The SRT did not identify any potential seismic vulnerabilities associated to any of the screened-in ESEL components in BVPS-2.

6.4 HCLPF CALCULATION PROCESS

ESEL items in the BVPS-2 were evaluated using the criteria in EPRI NP-6041 [4]. Those evaluations included the following steps:

- Performing seismic capability walkdowns for equipment to verify the installed plant conditions
- Performing screening evaluations using the screening tables in EPRI NP-6041 as described in ***Section 6.2***
- Performing HCLPF calculations considering various failure modes that include both structural failure modes (e.g., anchorage, and load path, etc.) and functional failure modes

All HCLPF calculations were performed using the CDFM methodology and are documented in a BVPS-2 Reference [6].

6.4.1 CDFM Approach

HCLPF values for functionality and anchorage are calculated for each representative component selected from the ESEL. The functional HCLPF for equipment is based on experience data, Generic Equipment Ruggedness Data (GERS), test response data, and design criteria. The functional evaluation is supplemented with the verification of the equipment anchorage following Seismic Qualification Utility Group (SQUG)/GIP procedures. The seismic demand on the equipment is based on the floor response spectra near the equipment support location, and the component damping values as recommended in EPRI 6041 [4].

The CDFM approach described in EPRI 1019200 [19] is utilized to obtain the component HCLPF values. The HCLPF capacities are stated in terms of a selected ground motion PGA. The CDFM approach is consistent with EPRI NP-6041-SL [4], updated to accommodate the parameters presented in ***Table 6-1***.

The screening level HCLPF values provided in EPRI 6041 [4] Table 2-4 are presented in terms of the 5 Hz spectral acceleration at the foundation level. In accordance with EPRI 1019200 [19] these values are used to develop mounting level capacity assuming a median structure amplification factor of 1.5. The ISRS described in ***Section 4.2*** are compared with this mounting level capacity to develop HCLPF associated with the GMRS shape. Anchorage checks are performed based on the spectral accelerations at the estimated equipment frequencies.

TABLE 6-1
SUMMARY OF CONSERVATIVE DETERMINISTIC FAILURE MARGIN APPROACH (EPRI 1019200, TABLE A.1)

TECHNICAL ISSUE	RECOMMENDED METHOD
Load Combination	Normal + SME.
Ground Response Spectrum	Anchor CDFM Capacity to defined response spectrum shape without consideration of spectral shape variability.
Seismic Demand	Perform seismic demand analysis in accordance with latest version of American Society of Civil Engineers (ASCE) 4.
Damping	Conservative estimate of median damping.
Structural Model	BE (Median) + Uncertainty Variation in Frequency.
Soil Structure Interaction	BE (Median) + Parameter Variation.
In-Structure (Floor) Spectra Generation	Use frequency shifting rather than peak broadening to account for uncertainty plus use conservative estimate of median damping.
Material Strength	Code specified minimum strength or 95% exceedance actual strength if test data are available.
Static Strength Equations	Code ultimate strength (ACI), maximum strength (AISC), Service Level D (ASME), or functional limits. If test data are available to demonstrate excessive conservatism of code equation then use 84% exceedance of test data for strength equation.
Inelastic Energy Absorption	For non-brittle failure modes and linear analysis, use appropriate inelastic energy absorption factor from ASCE/SEI 43-05 to account for ductility benefits, or perform nonlinear analysis and go to 95% exceedance ductility levels.

6.4.2 Component Structural Capacity

In general, the CDFM approach:

1. Develops the elastic seismic response for the structures and components for the ground motion.
2. Develops strength margin factor using component capacities as described in ***Table 6-1***.

3. Develops inelastic energy absorption factor based on ASCE 43-05 or at about the 95 percent exceedance probability of ductility levels.

4. Calculates the CDFM capacity as:

$$HCLPF_{CDFM} = F_S \cdot F_\mu \cdot PGA \qquad \text{(Equation 6-1)}$$

where,

F_S = Strength margin factor,

F_μ = Inelastic energy absorption factor

The strength margin factor is defined as:

$$F_S = \frac{S - D_{ns}}{D_s} \qquad \text{(Equation 6-2)}$$

where,

S = Strength of the structural element

D_{ns} = Non-seismic demand (normal operating loads)

D_S = Seismic demand

6.4.3 Functional Evaluations

The HCLPF capacities for functionality are based on the comparison of the demand (ISRS) with EPRI 6041 [4] screening level HCLPFs, existing analysis, GERS, or test response spectra.

The screening level HCLPF values provided in EPRI 6041 [4] Table 2-4 are presented in terms of the 5 Hz spectral acceleration at the foundation level. In accordance with EPRI 1019200 [19], these values are used to develop mounting level capacity assuming a median structure amplification factor of 1.5. The ISRS described in ***Section 5.2*** are compared with this mounting level capacity to develop HCLPF associated with the GMRS shape. Anchorage checks are performed based on the spectral accelerations at the estimated equipment frequencies.

Available plant specific seismic qualifications tests are biaxial and all of the published GERS are constructed on the basis of the results of previous biaxial tests of similar types of equipment.

These tests apply table input motion in one-horizontal direction and in the vertical direction. For most equipment, for which GERS are available, the vertical test response spectrum (TRS) are at least equal to the horizontal TRS. The published GERS define the horizontal component of the table motion, which is, therefore, taken to represent the capacity stated either in terms of the vertical or horizontal input.

The seismic demand on equipment, on the other hand, is typically defined by ISRS in three orthogonal directions, two horizontal and one vertical. The procedure used to develop the functional capacity compares the resultant horizontal and the vertical ISRS separately with the GERS or TRS. The minimum seismic margin is taken to obtain the functional HCLPF capacity.

6.5 Functional Evaluations of Relays

The only relays applicable to FLEX mitigating strategies are the relays that automatically start the TDAFWP. All other plant control is local at the component.

The relays deenergize Solenoid-Operated Valves (SOVs) that directly control the supply of steam to the TDAFWP. Since the Vital DC power system is safety related and seismic, the SOVs remain energized and closed until the relays signal the SOVs to open and admit steam to the TDAFWP. Therefore, these relays were included for analysis. Both the relays that actuate on undervoltage of the 4KV busses that supply power to the normal main feed pumps and the relays that actuate on low steam generator water level were included for the AS/G only, as only one success path is required for this evaluation.

These relays are slave relays in the solid state protection system and have no lock out function. Additionally, manual control from the control room is available to the operators, which deenergizes the SOVs directly, without the need for any relays. Finally, if DC is lost, such that there is no control power available to the control room, the SOVs fail open, directly admitting steam to the TDAFWP.

6.6 Tabulated ESEL HCLPF Values (Including Key Failure Modes)

Attachment B tabulates the HCLPF values for all components on the ESEL. All HCLPF values exceed the RLGM. The Table in ***Attachment B*** also identifies the method used to develop the

HCLPF values and the controlling failure mode. Most of the controlling failure modes are either anchorage failure or loss of functionality and do not involve structural integrity.

7.0 INACCESSIBLE ITEMS

7.1 IDENTIFICATION OF ESEL ITEMS INACCESSIBLE FOR WALKDOWNS

A total of seven items in the ESEL were inaccessible during walkdowns, mainly due to their location in confined spaces and high radiation areas. ***Table 7-1*** provides the description of the seven inaccessible components, the reason for their inaccessibility and the criteria implemented to confirm the installed condition and, therefore, evaluate their seismic fragility. The criteria implemented to confirm the installed condition follows EPRI NP 6041 [7], where a number of ways of confirming the installed condition of equipment, including follow up walkdowns, photographic or other confirmatory evidence is provided.

TABLE 7-1
SUMMARY OF INACCESSIBLE ITEMS IN BVPS-2 ESEL

COMPONENT ID	DESCRIPTION	REASON FOR INACCESSIBLE	RESOLUTION
BV-2NMS-NE31	Neutron Element - Source Range Neutron Monitor	High radiation area (RCBX EL 692)	Fragility is calculated based on design documentation and installation drawings [6].
BV-2RCS-TE01E	Incore Thermocouple	High radiation area (RCBX EL 692)	Fragility is calculated based on design documentation and installation drawings [6].
BV-2RCS-TE413	React Clnt Hot Leg LP 21	High radiation area (RCBX EL 732)	Fragility is calculated based on design documentation and installation drawings [6].
BV-2RCS-TE410	React Clnt Cold Leg LP 21 Temp Element	High radiation area (RCBX EL 732)	Fragility is calculated based on design documentation and installation drawings [6].
BV-2FWS-LT474	Steam Generator 21a Level Transmitter	High radiation area (RCBX EL 738)	Fragility is calculated based on design documentation and installation drawings [6].
BV-2FWS-LT477	(2rcs*Sg21a) Wide Range Level Transmitter	High radiation area (RCBX EL 767)	Fragility is calculated based on design documentation and installation drawings [6].
BV-2CHS-E23	Regenerative Heat Exchanger	High radiation area (RCBX EL 718)	Reviewed plant drawings to obtain information for structural/anchorage evaluation [6].

8.0 ESEP CONCLUSIONS AND RESULTS

The conclusions and results of the ESEP evaluation are presented in this Section, including the identification of any required plant modifications and schedules for any follow up actions.

8.1 SUPPORTING INFORMATION

BVPS-2 has performed the ESEP as an interim action in response to the NRC's 50.54(f) letter [1]. The ESEP demonstrates that BVPS-2 has additional seismic margin plant equipment that can be relied upon to protect the reactor core following a beyond design basis seismic event. It was performed using the methodologies in the NRC endorsed guidance in EPRI 3002000704 [2].

The ESEP provides an important demonstration of seismic margin and expedites plant safety enhancements through evaluations and potential near-term modifications of plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events.

The ESEP is part of the overall BVPS-2 response to the NRC's 50.54(f) letter [1]. On March 12, 2014, Nuclear Energy Institute (NEI) submitted to the NRC results of a study [7] of seismic core damage risk estimates based on updated seismic hazard information as it applies to operating nuclear reactors in the Central and Eastern United States (CEUS). The study concluded that "site-specific seismic hazards show that there has not been an overall increase in seismic risk for the fleet of U.S. plants," based on the reevaluated seismic hazards. As such, the "current seismic design of operating reactors continues to provide a safety margin to withstand potential earthquakes exceeding the seismic design basis."

The NRC's May 9, 2014, NTTF 2.1 Screening and Prioritization letter [9] concluded that the "fleetwide seismic risk estimates are consistent with the approach and results used in the Gl-199 safety/risk assessment." The letter also stated that "as a result, the staff has confirmed that the conclusions reached in Gl-199 safety/risk assessment remain valid and that the plants can continue to operate while additional evaluations are conducted."

An assessment of the change in seismic risk for BVPS-2 was included in the fleet risk evaluation submitted in the March 12, 2014, NEI letter [7], therefore, the conclusions in the NRC's May 9 letter [9] also apply to BVPS-2.

In addition, the March 12, 2014, NEI letter [7] provided an attached "Perspectives on the Seismic Capacity of Operating Plants," which (1) assessed a number of qualitative reasons why the design of SSCs inherently contain margin beyond their design level, (2) discussed industrial seismic experience databases of performance of industry facility components similar to nuclear SSCs, and (3) discussed earthquake experience at operating plants.

The fleet of currently operating NPPS was designed using conservative practices, such that the plants have significant margin to withstand large ground motions safely. This has been borne out for those plants that have actually experienced significant earthquakes. The seismic design process has inherent (and intentional) conservatisms which result in significant seismic margins within SSCs. These conservatisms are reflected in several key aspects of the seismic design process, including:

- Safety factors applied in design calculations
- Damping values used in dynamic analysis of SSCs
- Bounding synthetic THs for ISRS calculations
- Broadening criteria for ISRS
- Response spectra enveloping criteria typically used in SSCs analysis and testing applications
- Response spectra based frequency domain analysis rather than explicit TH based time domain analysis
- Bounding requirements in codes and standards
- Use of minimum strength requirements of structural components (concrete and steel)
- Bounding testing requirements
- Ductile behavior of the primary materials (that is, not crediting the additional capacity of materials, such as steel and reinforced concrete beyond the essentially elastic range, etc.)

These design practices combine to result in margins, such that the SSCs will continue to fulfill their functions at ground motions well above the SSE.

The intent of the ESEP is to perform an interim action in response to the NRC's 50.54(f) letter [1] to demonstrate seismic margin through a review of a subset of the plant equipment that can be relied upon to protect the reactor core following beyond design basis seismic events. Because the SPRA for BVPS-2 is already under way, the GMRS used in the SPRA is also used as the RLGM for the ESEP evaluation. To more fully characterize the risk impacts of the seismic ground motion represented by the GMRS on a plant specific basis, a more detailed seismic risk assessment (SPRA or risk-based SMA) is being performed in accordance with EPRI 1025287 [10]. As identified in the BVPS-2 Seismic Hazard and GMRS submittal [3], BVPS-2 screens in for a risk evaluation. The complete risk evaluation will more completely characterize the probabilistic seismic ground motion input into the plant, the plant response to that probabilistic seismic ground motion input, and the resulting plant risk characterization. BVPS-2 will complete that evaluation in accordance with the schedule identified in NEI's letter dated April 9, 2013, [8] and endorsed by the NRC in their May 7, 2013 letter [11].

8.2 Identification of Planned Modifications

As discussed in ***Section 6.6*** and presented in ***Attachment B***, all components on the ESEL have a HCLPF greater than the RLGM (0.24g). Therefore, no modifications related to the ESEP are planned.

8.3 Modification Implementation Schedule

As no modifications are planned, this Section is not applicable.

8.4 Summary of Regulatory Commitments

None

9.0 REFERENCES

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2. EPRI, Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1 – Seismic, Palo Alto, California: May 2013, 3002000704.

3. ABS Consulting and Rizzo Associates, "Probabilistic Seismic Hazard Analysis and Foundation Input Response Spectra Beaver Valley Power Station Seismic Probabilistic Risk Assessment Project," 2734294-R-003 (RIZZO R3 12-4735), Revision 1, October 31, 2014.

4. EPRI, "A Methodology for Assessment of Nuclear Power Plant Seismic Margin," EPRI NP-6041-SL, Revision 1, Palo Alto, California, August 1991.

5. EPRI, "Methodology for Developing Seismic Fragilities," EPRI TR-103959, June 1994.

6. ABS Consulting and Rizzo Associates, "BVPS-2 Seismic Fragility of ESEP Components," Calculation 2734294-C-502/12-4735-C-502, Revision 1, 2014.

7. Nuclear Energy Institute, A. Pietrangelo, Letter to D. Skeen of the USNRC, "Seismic Core Damage Risk Estimates Using the Updated Seismic Hazards for the Operating Nuclear Plants in the Central and Eastern United States," March 12, 2014.

8. Nuclear Energy Institute, A. Pietrangelo, Letter to D. Skeen of the USNRC, "Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations," April 9, 2013.

9. Nuclear Regulatory Commission, NRC (E Leeds) Letter to All Power Reactor Licensees et al., "Screening and Prioritization Results Regarding Information Pursuant to Title 10 of the Code of Federal Regulations 50.54(F) Regarding Seismic Hazard Re-Evaluations for Recommendation 2.1 of the Near-Term Task Force Review of Insights From the Fukushima Dai-Ichi Accident," May 9, 2014.

10. EPRI, "Seismic Evaluation Guidance: Screening, Prioritization, and Implementation Details (SPID) for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1: Seismic," Palo Alto, CA: February 2013, 1025287, 2013.

11. Nuclear Regulatory Commission, NRC (E Leeds) Letter to NEI (J Pollock), "Electric Power Research Institute Final Draft Report Xxxxxx, "Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force

Recommendation 2.1: Seismic," as an Acceptable Alternative to the March 12, 2012, Information Request for Seismic Reevaluations," May 7, 2013.

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13. Nuclear Regulatory Commission, Regulatory Guide 1.92, "Combining Modal Responses and Spatial Components in Seismic Response Analysis," July 2006.

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15. ABS Consulting and Paul C. Rizzo Associates, Inc., "Beaver Valley Power Station Unit 2 Near Term Task Force 2.3 Seismic Walkdown Report," 2734294-R-008 (RIZZO R5 12-4736), Revision 1, September 4, 2013.

16. ABS Consulting and Rizzo Associates, "Seismic Walkdown of Beaver Valley Unit 2 Nuclear Power Station Seismic PRA Project," 2734294-R-011 (RIZZO R6 12-4736), Revision 1, 2014.

17. BVPS Overall Integrated Plan (OIP) in Response to the March 12, 2012, Commission Order EA-12-049, FirstEnergy Corp., Letter No. L-14-25, "FirstEnergy Nuclear Operating Company's Third Six-Month Status Report in Response to March 12, 2012 Commission Order Modifying Licenses with Regard to Requirements for Mitigation Strategies for Beyond-Design-Basis External Events (Order Number EA-12-049) (TAC Nos. MF0841, MF0842, MF0961, and MF0962)," dated August 28, 2014.

18. U.S. Nuclear Regulatory Commission, "Interim Staff Guidance on Ensuring Hazard-Consistent Seismic Input for Site Response and Soil Structure Interaction Analyses" DC/COL-ISG-017, Washington, D.C., March 2010.

19. Electric Power Research Institute, "Seismic Fragility Applications Guide Update," EPRI Report 1019200, Palo Alto, CA, December 2009.

ATTACHMENT A:

EXPEDITED SEISMIC EQUIPMENT LIST

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
FLEX Phase 1								
Core Cooling, Demineralized Water to S/G VIA 2FWE-P22								
1	BV-2FWE-TK210	PRIMARY PLANT DEMIN WATER STORAGE TANK	STBY	IN SVC	Y		PDWS	735
2	BV-2FWE-109	PRIMARY DWST TO (2FWE*P22) ISOLATION	OPEN	OPEN	N	MANUAL VALVE	PDWS	735
3	BV-2FWE-93	(2FWE*P22) SUPPLY FROM PRIMARY DWST	OPEN	OPEN	N	MANUAL VALVE	SFGB	718
4	BV-2FWE-P22	AUX FEED PUMP TURBINE DRIVEN	STBY	IN SVC	Y		SFGB	718
5	BV-2FWE-FCV122	(2FWE*P22) DISCHARGE CHECK AND RECIRCULATING VALVE	OPEN	OPEN	Y		SFGB	718
6	BV-2FWE-36	(2FWE*P22) `A` HEADER DISCH ISOLATION	OPEN	OPEN	N	MANUAL VALVE	SFGB	718
7	BV-2FWE-HCV100E	21A SG AFW THROTTLE VLV	OPEN	OPEN	N	VALVE DOES NOT INITIALLY CHANGE POSITION	SFGB	741
8	BV-2FWE-42A	AUX FEED CHECK `A` HEADER TO SG `A`	N/A	N/A	N	CHECK VALVE	SFGB	741
9	BV-2FWE-FE100A	STEAM GENERATOR A AUX FEED LINE FLOW ELEMENT	N/A	N/A	N	PIPING ELEMENT		
10	BV-2FWE-FE101A	300 GPM FLOW ELEMENT	N/A	N/A	N	PIPING ELEMENT	SFGB	737
11	BV-2FWE-99	AUX FEED TO SG `A' CHECK	N/A	N/A	N	CHECK VALVE	RCBX	767
Core Cooling, Steam from S/G to Atmosphere (Operator Local Operation)								
12	BV-2RCS-SG21A	STEAM GENERATOR LOOP A	IN SVC	IN SVC	N	NSSS COMPONENT	RCBX	718
13	BV-2SVS-23	(2SVS*PCV101A) ISOL	OPEN	OPEN	N	MANUAL VALVE	MSVCV	797
14	BV-2SVS-PCV101A	21A STEAM GENERATOR ATMOS STM DUMP VALVE	STBY	IN SVC	Y		MSVCV	797
15	BV-2SVS-PCV101A-MOTOR	21A STEAM GENERATOR ATMOS STM DUMP VAL	STBY	IN SVC	Y		MSVCV	797

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
16	BV-2SVS-PCV101A-OPER	21A STEAM GENERATOR ATMOS STM DUMP VALVE OPERATOR	STBY	IN SVC	Y		MSVCV	797
17	BV-2SVS-PCV101A-POS	INACTIVE PER ECP 07-0176-01 - VALVE POSITIONER (LVDT) FOR 21A S/G ATMOS STM DUMP VLV	N/A	N/A	Y		MSVCV	797
18	BV-2MSS-SV101A	(2RCS*SG21A) MN STM SAFETY	STBY	IN SVC	Y		MSVCV	797
19	BV-2MSS-SV102A	(2RCS*SG21A) MN STM SAFETY	STBY	STBY	N	ONLY NEED ONE TRAIN	MSVCV	797
20	BV-2MSS-SV103A	(2RCS*SG21A) MN STM SAFETY	STBY	STBY	N	ONLY NEED ONE TRAIN	MSVCV	797
21	BV-2MSS-SV104A	(2RCS*SG21A) MN STM SAFETY	STBY	STBY	N	ONLY NEED ONE TRAIN	MSVCV	797
22	BV-2MSS-SV105A	(2RCS*SG21A) MN STM SAFETY	STBY	STBY	N	ONLY NEED ONE TRAIN	MSVCV	797
Core Cooling, Steam from S/G to 2FWE-T22								
23	BV-2MSS-15	(2FWE*T22) STM SUPPLY ISOL	OPEN	OPEN	N	MANUAL VALVE	MSVCV	773
24	BV-2MSS-SOV105A	TURBINE DRIVEN AUX FEEDWATER PMP STEAMLINE A ISOL VALVE	CLOSED	OPEN	Y		MSVCV	773
25	BV-2MSS-SOV105D	TURBINE DRIVEN AUX FEEDWATER PMP STEAMLINE A ISOL VALVE	CLOSED	OPEN	Y		MSVCV	773
26	BV-2MSS-20	(2FWE*T22) STM SUPPLY CHECK	N/A	N/A	N	CHECK VALVE	MSVCV	773
27	BV-2MSS-196	(2FWE*T22) STM SUPPLY CHECK	N/A	N/A	N	CHECK VALVE	MSVCV	773
28	BV-2FWE-TTV22	TRIP AND THROTTLE VALVE FOR (*P22)	STBY	IN SVC	Y		SFGB	718
29	BV-2FWE-TGV22	GOVERNOR VALVE FOR (2FWE*T22)	STBY	IN SVC	Y		SFGB	718
30	BV-2FWE-T22	AUX FEED PUMP STEAM TERRY TURBINE	STBY	IN SVC	Y		SFGB	718
31	BV-2QSS-TK21	REFUELING WATER STORAGE TANK	STBY	IN SVC	Y		RWST	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screene d In?	Reason Not Screened In	Building	Elevation/ Room
Key Indicators & Transmitters								
32	BV-2FWS-LT477	(2RCS*SG21A) WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	Y		RCBX	767
33	BV-2FWS-LI477	STEAM GENERATOR 21A WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	Y		CNTB	
34	BV-2FWS-LI477A	STEAM GENERATOR 21A WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
35	BV-2FWS-LI477B	STEAM GENERATOR 21A WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
36	BV-2FWS-LT477F	(2RCS*SG21A) WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
37	BV-2FWS-LI477F	STEAM GENERATOR 21A WIDE RANGE LEVEL INDICATOR ON ALT SHUTD N PNL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
38	BV-2FWS-LT487	(2RCS*SG21B) WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
39	BV-2FWS-LI487	STEAM GENERATOR 21B WR LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
40	BV-2FWS-LI487A	STEAM GENERATOR 21B WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
41	BV-2FWS-LI487B	STEAM GENERATOR 21B WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
42	BV-2FWS-LT487F	(2RCS*SG21B) WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
43	BV-2FWS-LI487F	STEAM GENERATOR 21B WIDE RANGE INDICATOR ON ALT SHUTDN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
44	BV-2FWS-LT497	2RCS*SG21C) WIDE RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
45	BV-2FWS-LI497	STEAM GENERATOR 21C WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screene d In?	Reason Not Screened In	Building	Elevation/ Room
46	BV-2FWS-LI497A	STEAM GENERATOR 21C WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
47	BV-2FWS-LI497B	STEAM GENERATOR 21C WIDE RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
48	BV-2FWS-LI474	STEAM GENERATOR LI SG21A	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
49	BV-2FWS-LT474	STEAM GENERATOR 21A LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
50	BV-2FWS-LI475	STEAM GENERATOR 21A NARROW RANGE LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
51	BV-2FWS-LT475	STEAM GENERATOR 21A NARROW RANGE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
52	BV-2FWS-LI476	STEAM GENERATOR 21A LI	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
53	BV-2FWS-LT476	STEAM GENERATOR 21A LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	767
54	BV-2FWS-LI484	STEAM GENERATOR 21B LI	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
55	BV-2FWS-LT484	(2RCS*SG21B) NARROW RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
56	BV-2FWS-LI485	STEAM GENERATOR 21B NARROW RANGE LEVEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
57	BV-2FWS-LT485	(2RCS*SG21B) NARROW RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
58	BV-2FWS-LI486	STEAM GENERATOR 21B LI	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
59	BV-2FWS-LT486	STEAM GENERATOR LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	767
60	BV-2FWS-LI494	STEAM GENERATOR 21C LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
61	BV-2FWS-LT494	(2RCS*SG21C) NARROW RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
62	BV-2FWS-LI495	STEAM GENERATOR 21C NARROW RANGE LEVEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
63	BV-2FWS-LT495	(2RCS*SG21C) NARROW RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
64	BV-2FWS-LI496	STEAM GENERATOR 21C LI	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
65	BV-2FWS-LT496	(2RCS*SG21C) NARROW RANGE LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	767
66	BV-2MSS-PT474	STEAM GEN 21A DISCH STEAM PRESSURE TRANSMITTER	IN SVC	IN SVC	Y		MSVCV	778
67	BV-2MSS-PI474	STM GEN 21A DISCHARGE STEAM PRESSURE INDICATOR	IN SVC	IN SVC	Y		CNTB	735
68	BV-2MSS-PI474A	STEAM GEN 21A DISCH STEAM PRESSURE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
69	BV-2MSS-PT475	STEAM GENERATOR DISCH PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
70	BV-2MSS-PI475	STEAM GEN DISCH PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
71	BV-2MSS-PT475F	STEAM GENERATOR 2RCS-SG21A STEAM PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
72	BV-2MSS-PI475F	STEAM GEN 21A DISCHARGE PRESSURE INDICATOR ON ALT SHUTDOWN P ANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
73	BV-2MSS-PT476	STEAM GENERATOR DISCH PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
74	BV-2MSS-PI476	STEAM GEN DISCH PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
75	BV-2MSS-PT484	STEAM GENERATOR 21B DISCH STEAM PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
76	BV-2MSS-PI484	STEAM GEN 21B DISCHARGE STEAM PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
77	BV-2MSS-PT485	STEAM GENERATOR DISCH PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
78	BV-2MSS-PI485	STEAM GEN DISCH PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
79	BV-2MSS-PI485A	STEAM GEN DISCHARGE PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
80	BV-2MSS-PT485F	STEAM GENERATOR 2RCS-SG21B STEAM PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
81	BV-2MSS-PI485F	STEAM GENERATOR 21B DISCHARGE PRES INDICATOR ON ALT SHUTDN PNL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
82	BV-2MSS-PT486	STEAM GENERATOR DISCH PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
83	BV-2MSS-PI486	STEAM GEN DISCHARGE PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
84	BV-2MSS-PT494	STEAM GEN 21C DISCH STEAM PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
85	BV-2MSS-PI494	STEAM GEN 21C DISCH STEAM PRESSURE IND	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
86	BV-2MSS-PT495	STEAM GENERATOR DISCH PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
87	BV-2MSS-PI495	STEAM GEN DISCH PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
88	BV-2MSS-PT496	STEAM GENERATOR DISCH PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	778
89	BV-2MSS-PI496	STEAM GEN DISCH PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
90	BV-2MSS-PI496A	STEAM GEN DISCH PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screene d In?	Reason Not Screened In	Building	Elevation/ Room
91	BV-2RCS-TI413	REACTOR COOLANT HOT LEG LOOP 21 TEMPERATURE INDICATOR	IN SVC	IN SVC	Y		CNTB	735
92	BV-2RCS-TT413	REACTOR COOLANT HOT LEG LOOP 21 TEMP TRANSMITTER	IN SVC	IN SVC	Y			
93	BV-2RCS-TI413A	REACTOR COOLANT HOT LEG LOOP 21 TEMPERATURE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
94	BV-2RCS-TE413F	REACT CLNT LOOP 1 HOT LEG TEMP	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
95	BV-2RCS-TI413F	REACT CLNT LOOP 1 HOT LEG TEMP INDICATOR ON ALT SHUTDOWN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
96	BV-2RCS-TE413	REACT CLNT HOT LEG LP 21	IN SVC	IN SVC	Y		RCBX	732
97	BV-2RCS-TI423	REACTOR COOLANT HOT LEG LOOP 22 TEMPERATURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
98	BV-2RCS-TE423	REACT CLNT HOT LEG LP 22 TEMPERATURE ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	732
99	BV-2RCS-TT423	REACTOR COOLANT HOT LEG LOOP 22 TEMP TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
100	BV-2RCS-TI423A	REACTOR COOLANT HOT LEG LOOP 22 TEMPERATURE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
101	BV-2RCS-TE423A	REACT CLNT LOOP 2 HOT LEG TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	732
102	BV-2RCS-TI423F	REACT CLNT LOOP 2 HOT LEG TEMP INDICATOR ON ALT SHUTDOWN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
103	BV-2RCS-TE423F	REACT CLNT LOOP 2 HOT LEG TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
104	BV-2RCS-TT423F	REACT CLNT LOOP 2 HOT LEG TEMP TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
105	BV-2RCS-TE433	REACT CLNT HOT LEG LP 23 TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	732

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
106	BV-2RCS-TI433A	REACTOR COOLANT LOOP 23 HOT LEG TEMPERATURE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
107	BV-2RCS-TT433	REACTOR COOLANT HOT LEG LOOP 23 TEMP TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
108	BV-2RCS-TE410	REACT CLNT COLD LEG LP 21 TEMP ELEMENT	IN SVC	IN SVC	Y		RCBX	732
109	BV-2RCS-TI410	REACTOR COOLANT COLD LEG LOOP 21 TEMPERATURE INDICATOR	IN SVC	IN SVC	Y		CNTB	735
110	BV-2RCS-TT410	REACTOR COOLANT COLD LEG LOOP 21 TEMPERATURE TRANSMITTER	IN SVC	IN SVC	Y		CNTB	707
111	BV-2RCS-TE410F	REAC COOL LOOP 1 COLD LEG TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
112	BV-2RCS-TI410F	REAC COOL LOOP 1 COLD LEG TEMP INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
113	BV-2RCS-TT410F	REACTOR COOLANT LOOP 1 COLD LEG TEMP TRANSMITT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
114	BV-2RCS-TE420	REACT CLNT COLD LEG LP 22 TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	732
115	BV-2RCS-TI420	REACTOR COOLANT COLD LEG LOOP 22 TEMPERATURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
116	BV-2RCS-TT420	REACTOR COOLANT COLD LEG LOOP 22 TEMP TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	707
117	BV-2RCS-TE420F	REAC COOL LOOP 2 COLD LEG TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	738
118	BV-2RCS-TI420F	REAC COOL LOOP 2 COLD LEG TEMP INDICATOR ON ALT SHUTDOWN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
119	BV-2RCS-TT420F	REACTOR COOLANT LOOP 2 COLD LEG TEMP TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
120	BV-2RCS-TE430	REACTOR CLNT LP 23 COLD LEG TEMP ELEMENT	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	732

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
121	BV-2RCS-TI430A	REACTOR COOLANT LOOP 23 COLD LEG TEMPERATURE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
122	BV-2RCS-TT430	REACTOR COOLANT LOOP 23 COLD LEG TEMPERATURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	707
123	BV-2RCS-PI402	REACTOR COOLANT PRESSURE INDICATOR			N	ONLY NEED ONE TRAIN	CNTB	735
124	BV-2RCS-PT402	REACTOR COOLANT PRESSURE LP 23 PRESSURE TRANSMITTER			N	ONLY NEED ONE TRAIN	RCBX	718
125	BV-2RCS-PI403	REACTOR COOLANT PRESSURE INDICATOR			Y	ONLY NEED ONE TRAIN	CNTB	735
126	BV-2RCS-PT403	REACTOR COOLANT PRESSURE LP 22 PRESSURE TRANSMITTER			Y	ONLY NEED ONE TRAIN	RCBX	718
127	BV-2RCS-PI403F	REACTOR COOLANT PRESSURE INDICATOR ON ALT SHUTDOWN PNL			N	ONLY NEED ONE TRAIN	CBLT	755
128	BV-2RCS-PT403F	REACT CLNT PRESSURE TRANSMITTER			N	ONLY NEED ONE TRAIN	RCBX	718
129	BV-2RCS-PI404	REACTOR COOLANT PRESSURE LP 23 PRESSURE INDICATOR			N	ONLY NEED ONE TRAIN	RCBX	
130	BV-2RCS-LT459	PRZR LEVEL PROT LEVEL TRANSMITTER	IN SVC	IN SVC	Y		RCBX	718
131	BV-2RCS-LI459A	PRESSURIZER LI PROTECTION	IN SVC	IN SVC	Y		CNTB	735
132	BV-2RCS-LI459B	PRESSURIZER LI PROTECTION	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	AUX	710
133	BV-2RCS-LI459C	PRESSURIZER LI PROTECTION	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
134	BV-2RCS-LT459AF	PRZR PROTECTION LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
135	BV-2RCS-LI459AF	PRESSURIZER LEVEL INDICATOR ON ALT SHUTDOWN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
136	BV-2RCS-LT460	PRESSURIZER LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	718
137	BV-2RCS-LI460	PRESSURIZER LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
138	BV-2RCS-LI460A	PRESSURIZER LEVEL INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
139	BV-2FWE-LT104A	PRI PLANT DEMIN WTR STORAGE TK 210 LVL CONTROL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	YARD	730
140	BV-2FWE-LT104A1	PRIM PLANT DEMIN WATER STORAGE TANK 2FWE-TK210 LEVEL TRANSMITTER	IN SVC	IN SVC	Y		SFGB	
141	BV-2FWE-LI104A1	PRIMARY PLANT DEMINERALIZED WTR STORAGE TANK LEVEL INDICATOR	IN SVC	IN SVC	Y		CNTB	
142	BV-2FWE-LT104A2	PRIM PLANT DEMIN WATER STORAGE TANK 2FWE-TK210 LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	
143	BV-2FWE-LI104A2	PRIMARY PLANT DEMINERALIZED WTR STORAGE TANK LEVEL INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	
144	BV-2FWE-LT104A3	PRIMARY PLANT DEMIN WATER STORAGE TANK LEVEL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	
145	BV-2FWE-LI104A3	LEVEL INDICATOR FOR PRIMARY PLANT DEMIN WATER ST	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	YARD	730
146	BV-2NMS-NE31	NEUTRON ELEMENT - SOURCE RANGE NEUTRON MONITOR	IN SVC	IN SVC	Y		RCBX	692
147	BV-2NMS-NI31A	NEUTRON INDICATOR - SOURCE RANGE NEUTRON MONITORING	IN SVC	IN SVC	Y		CNTB	735
148	BV-2NMS-NI31B	SOURCE RANGE 1 COUNT RATE NEUTRON INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
149	BV-2NMS-NI31BA	SOURCE RANGE 1 COUNT RATE NEUTRON INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
150	BV-2NMS-NI31BF	SOURCE RANGE COUNT RATE INDICATOR ON ALT SHUTDOWN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
151	BV-2NMS-NI31D	SOURCE RANGE 1 START-UP RATE CONTROL BOARD INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
152	BV-2NMS-NI31DA	EMERGENCY SHUTDOWN PANEL SOURCE RANGE F1 START-UP RATE INDICATOR	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
153	BV-2NMS-NI31DF	SOURCE RANGE START-UP RATE INDICATOR ON ALT SHUTDOWN PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	CBLT	755
154	BV-2NMS-NE32	NEUTRON DETECTOR - SOURCE RANGE NEUTRON MONITOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	RCBX	692
155	BV-2NMS-NI32A	NEUTRON INDICATOR - SOURCE RANGE NEUTRON MONITORING	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		
156	BV-2NMS-NI32B	NEUTRON INDICATOR - SOURCE RANGE 2 NEUTRON MONITORING	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
157	BV-2NMS-NI32BA	NEUTRON INDICATOR - SOURCE RANGE 2 NEUTRON MONITORING	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
158	BV-2NMS-NI32D	CONTROL BOARD SOURCE RANGE 2 START-UP RATE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
159	BV-2NMS-NI32DA	EMERGENCY SHUTDOWN PANEL SOURCE RANGE 2 START-UP RATE	STBY	STBY	N	ONLY NEED ONE TRAIN	CNTB	707
160	BV-2RCS-TE01E	INCORE THERMOCOUPLE	IN SVC	IN SVC	Y		RCBX	692
161	BV-RK-2PRI-PROC-1	PRIMARY PROCESS CONTROL PANEL 1	IN SVC	IN SVC	Y		CNTB	707
162	BV-RK-2PRI-PROC-2	PRIMARY PROCESS CONTROL PANEL 2	IN SVC	IN SVC	Y		CNTB	707

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
163	BV-RK-2SEC-PROC-A	EMERGENCY CONTROL SYSTEM SECONDARY PROCESS PANEL A	IN SVC	IN SVC	Y		CNTB	707
164	BV-RK-2NUC-INS	NUCLEAR INSTRUMENTATION RACK	IN SVC	IN SVC	Y		CNTB	735
165	BV-PNL-2RPU-A	REMOTE PROCESSING UNIT "A" PANEL	IN SVC	IN SVC	Y		CNTB	707
166	BV-UPS-VITBS2-2	VITAL BUS UNINTERRUPTIBLE POWER SUPPLY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
167	BV-UPS-VITBS2-4	VITAL BUS NO.4 UPS	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
168	BV-BAT-2-2	CONTROL STORAGE BATTERY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
169	BV-BAT-2-4	CONTROL STORAGE BATTERY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
170	BV-UPS-VITBS2-1	VITAL BUS UNINTERRUPTIBLE POWER SUPPLY	IN SVC	IN SVC	Y		SRV	730
171	BV-UPS-VITBS2-3	VITAL BUS NO. 3 UPS	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
172	BV-BAT-2-1	CONTROL STORAGE BATTERY	IN SVC	IN SVC	Y		SRV	730
173	BV-BAT-2-3	CONTROL STORAGE BATTERY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
174	BV-PNL-VITBS2-1A	120 VAC VITAL BUS 1 DISTRIBUTION PANEL	IN SVC	IN SVC	Y		CNTB	707
175	BV-PNL-DC2-01	125 VDC EMERGENCY DISTRIBUTION PANEL	IN SVC	IN SVC	Y		CNTB	707
176	BV-PNL-DC2-02	125 VDC EMERGENCY DISTRIBUTION PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	707
177	BV-PNL-DC2-03	125 VDC EMERGENCY DISTRIBUTION PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	707
178	BV-PNL-DC2-04	125 VDC NORMAL DISTRIBUTION PANEL	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	755
179	BV-RL-1CV-101B	CONTAINMENT AIR TOTAL PRESSURE (PT-CV101B) RELAY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN		

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
180	BV-PT-1CV-101B	CONTAINMENT AIR TOTAL PRESSURE SIGNAL TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SFGB	722
181	BV-PQ-1CV-101B	CONTAINMENT AIR TOTAL PRESSURE INST. POWER SUPPLY	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	713
182	BV-2LMS-PT106A	REACTOR CONTAINMENT PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	735
183	BV-2LMS-PT106B	REACTOR CONTAINMNT PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	735
184	BV-2LMS-PT950	REACTOR CONTAINMENT PRESSURE TRANSMITTER	IN SVC	IN SVC	Y		MSVCV	735
185	BV-2LMS-PI950	REACTOR CONTAINMENT PRESSURE INDICATOR	IN SVC	IN SVC	Y		CNTB	735
186	BV-2LMS-PT951	REACTOR CONTAINMENT PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	735
187	BV-2LMS-PI951	REACTOR CONTAINMENT PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
188	BV-2LMS-PT952	REACTOR CONTAINMENT PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	735
189	BV-2LMS-PI952	REACTOR CONTAINMENT PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
190	BV-2LMS-PT953	REACTOR CONTAINMENT PRESSURE TRANSMITTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	MSVCV	735
191	BV-2LMS-PI953	REACTOR CONTAINMENT PRESSURE INDICATOR	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	735
FLEX Phase 2								
RCS Boration, Boric Acid Storage Tanks to Portable Pump								
192	BV-2CHS-TK21A	BORIC ACID TANK A	IN SVC	IN SVC	Y		AUX	752
193	BV-2CHS-TK21B	BORIC ACID TANK B	STBY	IN SVC	Y		AUX	752
194	BV-2CHS-71	BORIC ACID TANK 21A OUT ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	755
195	BV-2CHS-72	BORIC ACID TANK 21B OUT ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	755

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
RCS Boration, Portable Pump to RCS								
196	BV-2CHS-723	CHG PP 21A DISCH HDR VENT	CLOSED	OPEN	N	MANUAL VALVE	AUX	735
197	BV-2CHS-25	CHG PP 21A DISCH ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	735
198	BV-2CHS-28	(2CHS*FCV122) INLET ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	710
199	BV-2CHS-FCV122	CHARGING PUMPS DISCHARGE FLOW CONTROL VALVE	OPEN	OPEN	N	REMAINS OPEN FOR MINIMUM FLOW ON LOSS OF AIR?	AUX	710
200	BV-2CHS-30	(2CHS*FCV122) OUT ISOL	OPEN	OPEN	N	MANUAL VALVE	AUX	710
201	BV-2CHS-MOV289	NORMAL CHARGING HDR ISOLATION VALVE	OPEN	OPEN	N	MOV DOES NOT CHANGE POSITION	MSVCV	718
202	BV-2CHS-31	CHARGING HEADER ISOL CHECK	N/A	N/A	N	CHECK VALVE	RCBX	718
203	BV-2CHS-E23	REGENERATIVE HEAT EXCHANGER	IN SVC	IN SVC	Y		RCBX	718
204	BV-2CHS-MOV310	REGEN HX NORMAL CHARGING DISCHARGE VALVE	OPEN	OPEN	N	MOV DOES NOT CHANGE POSITION	RCBX	692
205	BV-2CHS-871	NORM CHARGING UPSTREAM CHECK VALVE TO RCS	N/A	N/A	N	CHECK VALVE	RCBX	692
206	BV-2CHS-872	EXCESS LTDM TO PRIMARY DRNS VENT	N/A	N/A	N	CHECK VALVE	RCBX	692
207	BV-MCC-2-E08	480V MOTOR CONTROL CENTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	DGB	732
208	TBD	PLACE HOLDER FOR FUSE AND DISCONNECT SWITCH PANEL	STBY	STBY	N	ONLY NEED ONE TRAIN	DGB	732
209	BV-PNL-2EE-CONN-1	PLACE HOLDER FOR CONNECTION PANEL TO BE INSTALLED	STBY	STBY	N	ONLY NEED ONE TRAIN	DGB	732
210	BV-480VUS-2-9	480V SUBSTATION 2-9 BUS 2P	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
211	BV-MCC-2-E10	480 VAC MOTOR CONTROL CENTER	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	CNTB	707
212	BV-BAT-CHG2-2	125 VOLT DC BATTERY CHARGER 2-2	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
213	BV-BAT-CHG2-4	BATTERY CHARGER NO. 4	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
214	BV-MCC-2-E07	480V MOTOR CONTROL CENTER	IN SVC	IN SVC	Y		DGB	732
215	BV-480VUS-2-8	480V SUBSTATION 2-8 EMERG BUS 2N	IN SVC	IN SVC	Y		SRV	730
216	BV-MCC-2-E09	480 VAC MOTOR CONTROL CENTER	IN SVC	IN SVC	Y		CNTB	707
217	BV-BAT-CHG2-1	125 VOLT DC BATTERY CHARGER 2-1	IN SVC	IN SVC	Y		SRV	730
218	BV-BAT-CHG2-3	BATTERY CHARGER NO. 3	IN SVC	IN SVC	N	ONLY NEED ONE TRAIN	SRV	730
FLEX Phase 3								
219	BV-2SWS-PI102A1	2CCP-E21A INLET PRESSURE INDICATOR			N	RESTORATION	AUX	710
220	BV-2CCP-E21A	PRIMARY CCW HEAT EXCHANGER			N	RESTORATION	AUX	710
221	BV-TW-1RW-102A	PRIM COMP COOL WTR HT EX 1A DISCHARGE THERMAL WELL			N	RESTORATION	AUX	735
222	BV-2SWS-PI102A2	2CCP-E21A OUTLET HEADER PRESSURE INDICATOR			N	RESTORATION	AUX	
223	BV-2CCP-E21A	PRIMARY CCW HEAT EXCHANGER			N	RESTORATION	AUX	710
224	BV-2CCP-TI100A2	CCP-E21A DISCHARGE HDR TEMPERATURE INDICATOR			N	RESTORATION	AUX	710
225	BV-2CCP-TE100A	PRI COMPONENT CLG WATER HEAT EXCH 21A TEMP ELEMENT			N	RESTORATION	AUX	710
226	BV-2CCP-TI100A	PRIMARY COMPONENT COOLING WATER HEAT EXCH A TEMPERATURE INDICATOR			N	RESTORATION	CNTB	

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
227	BV-2CCP-TE130A	2CCP*E21A OUTLET TEMP ELEMENT			N	RESTORATION	AUX	722
228	BV-2CCP-MOV128A	FUEL POOL HX 2FNC*E21A SUPPLY ISOL			N	RESTORATION	AUX	718
229	BV-2CCP-TI172A	FNC-E21A INLET HDR TEMPERATURE INDICATOR			N	RESTORATION	FDB	729
230	BV-2FNC-E21A	FUEL POOL HEAT EXCHANGER			N	RESTORATION	FDB	
231	BV-2CCP-TI104A	FUEL POOL HEAT EXCH 21A OUTLET TEMPERATURE INDICATOR			N	RESTORATION	FDB	729
232	BV-2CCP-FE100A	FUEL POOL HT EXCH 2FNC-E21A OUTLET FLOW ELEMENT			N	RESTORATION	FDB	729
233	BV-2CCP-FI100A	FUEL POOL HEAT EXCHANGER FNC-E21A OUTLET FLOW INDICATOR			N	RESTORATION	FDB	729
234	BV-2CCP-FE117A	COMPONENT COOLING WATER SUPPLY HEADER FLOW ELEMENT			N	RESTORATION	MSVCV	
235	BV-2CCP-FT117A1	PRIMARY COMPONENT COOLING WATER SUPPLY HEADER FLOW TRANSMITTER			N	RESTORATION	MSVCV	718
236	BV-2CCP-FI117A1	PRI COMP CLG HDR A HIGH RANGE FLOW INDICATOR			N	RESTORATION	CNTB	735
237	BV-2CCP-FT117A2	COOLING WATER SUPPLY HDR A FLOW TRANSMITTER			N	RESTORATION	MSVCV	718
238	BV-2CCP-FI117A2	PRI COMP CLG HDR A LOW RANGE FLOW INDICATOR			N	RESTORATION	CNTB	735
239	BV-2CCP-MOV150-1	PRIM COMP CLG HDR ISOL - OUTSIDE CONTNMNT			N	RESTORATION	MSVCV	722
240	BV-2CCP-MOV150-2	PRIM COMP CLG HDR ISOL - INSIDE CONTNMNT			N	RESTORATION	RCBX	718
241	BV-2CCP-MOV112A	(2RHS*E21A,22A) SUPPLY ISOL			N	RESTORATION	RCBX	718
242	BV-2CCP-PI121A	2RHS-E21A INLET HEADER PRESSURE INDICATOR			N	RESTORATION	RCBX	

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
243	BV-2CCP-TI145A	RHS-E21A INLET HDR TEMPERATURE INDICATOR			N	RESTORATION	RCBX	
244	BV-2RHS-E21A	RES HEAT REMOVAL HEAT EXCHANGER			N	RESTORATION	RCBX	
245	BV-2CCP-PI122A	2RHS-E21A OUTLET HEADER PRESSURE INDICATOR			N	RESTORATION	RCBX	
246	BV-2CCP-TE110A	RESIDUAL HEAT REMOVAL HX E21A OUTLET TEMP ELEMENT			N	RESTORATION	RCBX	713
247	BV-2CCP-TI110A	RESIDUAL HEAT REMOVAL HX E21A OUTLET TEMPERATURE INDICATOR			N	RESTORATION	CNTB	735
248	BV-2CCP-TI146A	RHS-E21A OUTLET HDR TEMPERATURE INDICATOR			N	RESTORATION	RCBX	
249	BV-2CCP-MOV156-2	PRIM COMP CLG HDR ISOL - INSIDE CONTNM			N	RESTORATION	RCBX	718
250	BV-2CCP-MOV156-1	PRIM COMP CLG HDR ISOL - OUTSIDE CONTNMNT			N	RESTORATION	MSVCV	722
251	BV-2CCP-PT150A	PRIMARY COMPONENT COOLING WATER PRESSURE TRANSMITTER			N	RESTORATION	AUX	735
252	BV-2CCP-PI150A	CCP WTR PMP 2CCP-P21A SUCTION PRESSURE INDICATOR			N	RESTORATION	AUX	735
253	BV-2CCP-EJM214A	PRIMARY CCW PUMP P21A SUCTION HDR EXPANSION JOINT			N	RESTORATION	AUX	735
254	BV-2RHS-P21A	RESIDUAL HEAT REMOVAL PUMP 21A			N	RESTORATION	RCBX	692
255	BV-2CCP-PT145A	PRIMARY COMPONENT COOLING WTR PMP 2CCP-P21A DISCH PRESSURE TRANSMIT			N	RESTORATION	AUX	735
256	BV-2CCP-PI145A	PRIMARY COMPONENT COOLING WATER PUMP DISCHARGE PI			N	RESTORATION	CNTB	

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
257	BV-2CCP-PT150A	PRIMARY COMPONENT COOLING WATER PRESSURE TRANSMITTER			N	RESTORATION	AUX	735
258	BV-2CCP-PI150A	CCP WTR PMP 2CCP-P21A SUCTION PRESSURE INDICATOR			N	RESTORATION	AUX	735
259	BV-2CCP-PI100A	2CCP-P21A DISCHARGE PRESSURE INDICATOR			N	RESTORATION	AUX	735
260	BV-2CCP-DCV101A	(2CCP*E21A) DIFF PRESS CONTROL			N	RESTORATION	AUX	710
261	BV-2CCP-TI100A1	CCP-E21A INLET HDR TEMPERATURE INDICATOR			N	RESTORATION	AUX	710
262	BV-2CCP-PT150A	PRIMARY COMPONENT COOLING WATER PRESSURE TRANSMITTER			N	RESTORATION	AUX	735
263	BV-2CCP-PI150A	CCP WTR PMP 2CCP-P21A SUCTION PRESSURE INDICATOR			N	RESTORATION	AUX	735
264	BV-2CCP-EJM214A	PRIMARY CCW PUMP P21A SUCTION HDR EXPANSION JOINT			N	RESTORATION	AUX	735
265	BV-2CCP-E21A	PRIMARY CCW HEAT EXCHANGER			N	RESTORATION	AUX	710
266	BV-2CCP-PT145A	PRIMARY COMPONENT COOLING WTR PMP 2CCP-P21A DISCH PRESSURE TRANSMIT			N	RESTORATION	AUX	735
267	BV-2CCP-PI145A	PRIMARY COMPONENT COOLING WATER PUMP DISCHARGE PI			N	RESTORATION	CNTB	
268	BV-2CCP-PT150A	PRIMARY COMPONENT COOLING WATER PRESSURE TRANSMITTER			N	RESTORATION	AUX	735
269	BV-2CCP-PI150A	CCP WTR PMP 2CCP-P21A SUCTION PRESSURE INDICATOR			N	RESTORATION	AUX	735
270	BV-2CCP-PI100A	2CCP-P21A DISCHARGE PRESSURE INDICATOR			N	RESTORATION	AUX	735

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screened In?	Reason Not Screened In	Building	Elevation/ Room
271	BV-2CCP-DCV101A	(2CCP*E21A) DIFF PRESS CONTROL			N	RESTORATION	AUX	710
272	BV-2CCP-TI100A1	CCP-E21A INLET HDR TEMPERATURE INDICATOR			N	RESTORATION	AUX	710
273	BV-2RHS-MOV702A	RHS TRAIN A SUPPLY ISOLATION			N	RESTORATION	RCBX	718
274	BV-2RHS-MOV701A	RHS TRAIN A SUPPLY ISOLATION			N	RESTORATION	RCBX	718
275	BV-2RHS-PI603A	RHS PUMP SUCTION P21A PRESSURE INDICATOR			N	RESTORATION	RCBX	
276	BV-2RHS-PT603A	RESID HEAT REMOVAL PUMP RHS-P21A SUCTION PRESSURE TRANSMITTER			N	RESTORATION	RCBX	707
277	BV-2RHS-P21A	RESIDUAL HEAT REMOVAL PUMP 21A			N	RESTORATION	RCBX	692
278	BV-2RHS-PI602A	RESIDUAL HEAT PUMP DISCHARGE PRESSURE INDICATOR			N	RESTORATION	CNTB	
279	BV-2RHS-PT602A	2RHS-P21A PUMP DISCHARGE PRESSURE TRANSMITTER			N	RESTORATION	RCBX	718
280	BV-2RHS-TE604A	TEMP ELEMENT RES HT REMVL SYSTEM INLET TEMP			N	RESTORATION	RCBX	718
281	BV-2RHS-TR604A	RES HT REMOVAL SYS INLET TEMP INPUT FROM 2RHS-TT606			N	RESTORATION	CNTB	
282	BV-2RHS-TT604A	RESIDUAL HEAT REMOVAL SYSTEM INLET TEMP TRANSMITTER			N	RESTORATION	CNTB	
283	BV-2RHS-E21A	RES HEAT REMOVAL HEAT EXCHANGER			N	RESTORATION	RCBX	
284	BV-2RHS-HCV758A	RHS TRAIN A HX OUTLET FLOW CONTROL			N	RESTORATION	RCBX	707
285	BV-2RHS-TE606A	TEMP ELEMENT RES HT REMVL SYSTEM OUTLET TEMP			N	RESTORATION	RCBX	718

ESEL ITEM #	FUNCTIONAL LOCATION	DESCRIPTION	NORMAL POSITION	DESIRED POSITION	SCREENED IN?	REASON NOT SCREENED IN	BUILDING	ELEVATION/ ROOM
286	BV-2RHS-TI606A	RESIDUAL HEAT REMOVAL SYSTEM OUTLET TEMPERATURE INDICATOR			N	RESTORATION	CNTB	
287	BV-2RHS-FE605A	RHR HTEXCH BYPASS FLOW ELEMENT			N	RESTORATION	RCBX	692
288	BV-2RHS-FT605A	RHR HEAT EXCHANGER (2RHS-E21A) OUTLET FLOW TRANSMITTER			N	RESTORATION	RCBX	718
289	BV-2RHS-FI605A	RESID HEAT REMOVAL BYPASS FLOW INDICATOR			N	RESTORATION	CNTB	
290	BV-2RHS-FI606A	RHR TRAIN A (HEAT EXCHANGER OUTLET) FLOW INDICATOR			N	RESTORATION	CNTB	735
291	BV-2RHS-FT606A	RESID HEAT REMOVAL LOOP A DISCH FLOW TRANSMITTER			N	RESTORATION	RCBX	692
292	BV-2RHS-MOV720A	RHS TRAIN RETURN TO B LOOP ISOLATION			N	RESTORATION	RCBX	718
293	BV-2FNC-PI100A	FUEL POOL COOLING PUMP 2FNC-P21A SUCTION PRESSURE INDICATOR			N	RESTORATION	FDB	729
294	BV-2FNC-EJM230A	2FNC-P21A SUCTION HEADER EXP JOINT			N	RESTORATION	FDB	729
295	BV-2FNC-P21A	FUEL POOL COOLING PUMP			N	RESTORATION	FDB	729
296	BV-2FNC-PS102A	2FNC-P21A DISCH HDR PRESSURE SWITCH			N	RESTORATION	FDB	729
297	BV-2FNC-PI102A	2FNC-P21A DISCHARGE HEADER PRESSURE INDICATOR			N	RESTORATION	FDB	729
298	BV-2FNC-TI101A	FUEL POOL HT EXCH 2FNC-E21A INLET TEMP IND			N	RESTORATION	FDB	729
299	BV-2FNC-E21A	FUEL POOL HEAT EXCHANGER			N	RESTORATION	FDB	
300	BV-2FNC-TI102A	FUEL POOL HX 21A DISCH TEMPERATURE INDICATOR			N	RESTORATION	FDB	
301	BV-2FNC-FE100	FUEL POOL COOLING PUMPS 2FNC-P21A&B DISCHARG FLOW ELEMENT			N	RESTORATION	FDB	

ESEL Item #	Functional Location	Description	Normal Position	Desired Position	Screene d In?	Reason Not Screened In	Building	Elevation/ Room
302	BV-2HVR-FN201A	CONTAINMENT AIR RECIRC FAN			N	RESTORATION	RCBX	692
303	BV-2HVR-CLC201A	COOLING COIL RC AIR RECIRCULATION			N	RESTORATION	RCBX	
304	BV-2HVR-FN201B	CONTAINMENT AIR RECIRC FAN			N	RESTORATION	RCBX	692
305	BV-2HVR-CLC201B	COOLING COIL RC AIR RECIRCULATING			N	RESTORATION	RCBX	
306	BV-2HVR-FN201C	CONTAINMENT AIR RECIRC FAN			N	RESTORATION	RCBX	692
307	BV-2HVR-CLC201C	COOLING COIL RC AIR RECIRCULATING			N	RESTORATION	RCBX	
308	2VERTBD-A	MAIN CONTROL BOARD VERTICAL SECTION A					CNTB	735
309	2VERTBD-C	MAIN CONTROL BOARD VERTICAL SECTION C					CNTB	735
310	2BNCHBD-B	MAIN CONTROL BOARD BENCH SECTION B					CNTB	735
311	PNL-2SHUTDN	EMERGENCY SHUTDOWN PANEL					CNTB	707
312	RELAY MODEL AR440AR	HOUSED BY RK-2RC-PRT-A					CNTB	707
313	RK-2RC-PRT-A	SOLID STATE PROTECTION SYSTEM TRAIN 'A					CNTB	707

ATTACHMENT B:

TABULATED HCLPF VALUES

EQUIPMENT ID	HCLPF	β_C	β_R	β_U	A_m	FAILURE MODE	FRAGILITY METHOD
2NMS-NE31	0.28	0.40	0.24	0.32	0.71	Function After	Based on Component-Specific Design Criteria
MCC-2-E09	0.51	0.40	0.24	0.32	1.31	Function After	Gers
MCC-2-E07	0.78	0.40	0.24	0.32	1.98	Anchorage	New Analysis
480VUS-2-8	1.14	0.40	0.24	0.32	2.69	Functional	Gers
2FWE-P22	0.65	0.40	0.24	0.32	1.64	Anchorage	New Analysis
2FWE-T22	0.65	0.40	0.24	0.32	1.64	Anchorage	Assigned By Rule of the Box. Parent Component: 2FWE-T22
2FWE-TTV22	0.65	0.40	0.24	0.32	1.64	Anchorage	Assigned By Rule of the Box. Parent Component: 2FWE-T22
2FWE-TGV22	0.65	0.40	0.24	0.32	1.64	Anchorage	Assigned By Rule of the Box. Parent Component: 2FWE-T22
2SVS-PCV101A	4.08	0.45	0.24	0.38	11.63	Functional	Scaling From Pipe Stress Calculation
2SVS-PCV101A-MOTOR	4.08	0.45	0.24	0.38	11.63	Functional	Assigned By Rule of the Box. Parent Component: 2SVS-PCV101A
2SVS-PCV101A-OPER	4.08	0.45	0.24	0.38	11.63	Functional	Assigned By Rule of the Box. Parent Component: 2SVS-PCV101A
2SVS-PCV101A-POS	4.08	0.45	0.24	0.38	11.63	Functional	Assigned By Rule of the Box. Parent Component: 2SVS-PCV101A
2MSS-SV101A	0.39	0.45	0.24	0.38	1.12	Functional	Earthquake Experience Data
2FWE-FCV122	0.61	0.40	0.24	0.38	1.55	Functional	Earthquake Experience Data
2MSS-SOV105A	0.31	0.45	0.24	0.38	0.89	Functional	Earthquake Experience Data
2MSS-SOV105D	0.31	0.45	0.24	0.38	0.89	Functional	Earthquake Experience Data
PNL-DC2-01	0.80	0.40	0.24	0.32	2.03	Function After	Earthquake Experience Data
PNL-VITBS2-1A	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
BAT-2-1	1.12	0.40	0.24	0.32	2.85	Anchorage	New Analysis
BAT-CHG2-1	0.80	0.40	0.24	0.32	2.03	Functional	Gers
UPS-VITBS2-1	1.10	0.40	0.24	0.32	2.78	Functional	Gers
2FWS-LT477	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2RCS-LT459	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2LMS-PT950	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2MSS-PT474	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2FWE-LT104A1	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2RCS-PT403	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2RCS-TE413	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
2RCS-TE410	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness

EQUIPMENT ID	HCLPF	β_C	β_R	β_U	A_m	FAILURE MODE	FRAGILITY METHOD
2RCS-TE01E	0.50	0.40	0.24	0.32	1.27	Functional	Assigned Based on Seismic Ruggedness
RK-2PRI-PROC-1	0.65	0.40	0.24	0.32	1.66	Anchorage	New Analysis
RK-2PRI-PROC-2	0.65	0.40	0.24	0.32	1.66	Anchorage	New Analysis
RK-2SEC-PROC-A	0.65	0.40	0.24	0.32	1.66	Anchorage	New Analysis
RK-2RC-PRT-A	0.65	0.40	0.24	0.32	1.66	Anchorage	New Analysis
2RCS-TT413	0.65	0.40	0.24	0.32	1.66	Anchorage	Assigned By Rule of the Box. Parent Component: RK-2PRI-PROC-1
2RCS-TT410	0.65	0.40	0.24	0.32	1.66	Anchorage	Assigned By Rule of the Box. Parent Component: RK-2PRI-PROC-2
RK-2NUC-INS	0.64	0.40	0.24	0.32	1.64	Function After	Earthquake Experience Data
2VERTBD-A	0.64	0.40	0.24	0.32	1.64	Function After	Earthquake Experience Data
2VERTBD-C	0.64	0.40	0.24	0.32	1.64	Function After	Earthquake Experience Data
2BNCHBD-B	0.64	0.40	0.24	0.32	1.64	Function After	Earthquake Experience Data
2RCS-TI413	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-A
2RCS-TI410	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-A
2FWS-LI477	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-C
2RCS-LI459A	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2BNCHBD-B
2LMS-PI950	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-A
2MSS-PI474	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-C
2FWE-LI104A1	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-C
2NMS-NI31A	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: RK-2NUC-INS
2RCS-PI403	0.64	0.40	0.24	0.32	1.64	Function After	Assigned By Rule of the Box. Parent Component: 2VERTBD-A
PNL-2RPU-A	0.74	0.40	0.24	0.32	1.87	Anchorage	New Analysis
PNL-2SHUTDN	0.39	0.40	0.24	0.32	0.98	Anchorage	New Analysis
2FWE-TK210	0.87	0.35	0.24	0.26	1.96	Structural / Anchorage	New Analysis
2QSS-TK21	0.45	0.35	0.24	0.26	1.02	Structural / Anchorage	New Analysis
2CHS-TK21A	0.62	0.40	0.24	0.32	1.56	Structural / Anchorage	New Analysis
2CHS-TK21B	0.62	0.40	0.24	0.32	1.56	Structural / Anchorage	New Analysis

EQUIPMENT ID	HCLPF	β_C	β_R	β_U	A_m	FAILURE MODE	FRAGILITY METHOD
2CHS-E23	0.33	0.35	0.24	0.26	0.74	Structural / Anchorage	New Analysis
RELAY MODEL AR440AR	0.53	0.40	0.24	0.32	1.36	Function During	Capacity Based on Test Response Spectra (TRS)