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DTE Energy

10 CFR 50.54

December 9, 2014
NRC-14-0074

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington D C 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

2) 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

3) NEI Letter to NRC, "Proposed Path Forward for NTTF Recommendation 2.1: Seismic Reevaluations," dated April 09, 2013 (ADAMS Accession No. ML13101A379)

4) NRC Letter, "EPRI 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)

Subject: Fermi 2 Expedited Seismic Evaluation Process Report (CEUS Sites), Response to NRC Request for Information Pursuant to 10 CFR 50.54(f) Regarding Recommendation 2.1 of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued Reference 2 to all power reactor licensees and holders of construction permits in active or deferred status. Enclosure 1 of Reference 2 requested each addressee located in the Central and Eastern United States (CEUS) to submit a Seismic Hazard Evaluation and Screening Report within 1.5 years from March 12, 2012.

In Reference 3, the Nuclear Energy Institute (NEI) requested NRC agreement to delay submittal of the final CEUS Seismic Hazard Evaluation and Screening Reports so that an update to the Electric Power Research Institute (EPRI) ground motion attenuation model could be completed and used to develop that information. NEI proposed that descriptions of subsurface materials and properties and base case velocity profiles be submitted to the NRC by September 12, 2013, with the remaining seismic hazard and screening information submitted by March 31, 2014. The NRC agreed with that proposed path forward in Reference 4.

Reference 2 requested that licensees provide interim evaluations and actions taken or planned to address the higher seismic hazard relative to the design basis, as appropriate, prior to completion of the risk evaluation. In accordance with the NRC endorsed guidance in Reference 4, the enclosed Expedited Seismic Evaluation Process (ESEP) Report for Fermi 2 provides the information described in Section 7 of Reference 4 in accordance with the schedule identified in Reference 3.

No new commitments are being made in this submittal.

Should you have any questions or require additional information, please contact Mr. Kevin Burke, Manager, Industry Interface at (734) 586-5148.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on December 9, 2014

Vito A. Kaminskas

Vito A. Kaminskas
Site Vice President

Enclosure: Fermi 2 Expedited Seismic Evaluation Process (ESEP) Report

cc: NRC Project Manager
NRC Hazard Management Branch Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission,
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Enclosure to
NRC-14-0074

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

Fermi 2 Expedited Seismic Evaluation Process (ESEP) Report

EXPEDITED SEISMIC EVALUATION PROCESS (ESEP) REPORT

FERMI 2 NUCLEAR POWER PLANT
SEISMIC PROBABILISTIC RISK ASSESSMENT PROJECT

FRENCHTOWN CHARTER TOWNSHIP, MICHIGAN

R14 12-4899
REV. 0
DECEMBER 2, 2014

SUBMITTED TO:

URS

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EXPEDITED SEISMIC EVALUATION PROCESS (ESEP)

FERMI 2 NUCLEAR POWER PLANT
SEISMIC PROBABILISTIC RISK ASSESSMENT PROJECT
FRENCHTOWN CHARTER TOWNSHIP, MICHIGAN

PROJECT NO. R14 12-4899
REVISION 0
DECEMBER 2, 2014

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APPROVALS

Project No.: 12-4899

Report Name: Expedited Seismic Evaluation Process (ESEP) Report
Fermi 2 Nuclear Power Plant
Seismic Probabilistic Risk Assessment Project
Frenchtown Charter Township, Michigan

Date: December 2, 2014

Revision No.: 0

Approval by the responsible manager signifies that the document is complete, all required reviews are complete, and the document is released for use.

Originator:

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CHANGE MANAGEMENT RECORD

Project No.: 12-4899

Report Name: Expedited Seismic Evaluation Process (ESEP) Report
Fermi 2 Nuclear Power Plant
Seismic Probabilistic Risk Assessment Project
Frenchtown Charter Township, Michigan

Revision No.: 0

REVISION NO.	DATE	DESCRIPTIONS OF CHANGES/AFFECTED PAGES	PERSON AUTHORIZING CHANGE	APPROVAL[1]
A	October 31, 2014	For Review	N/A	N/A
B	November 10, 2014	Incorporation of technical comments from DTE	NRV	NRV
0	December 2, 2014	Final submittal after Red Folder Review comments	NRV	NRV

Notes:

[1] Person authorizing change shall sign here for the latest revision.

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LIST OF ACRONYMS

ACRONYM	TITLE
AB	AUXILIARY BUILDING
AFW	AUXILIARY FEEDWATER
BDBEE	BEYOND DESIGN BASIS EXTERNAL EVENT
BE	BEST ESTIMATE
CDFM	CONSERVATIVE DETERMINISTIC FAILURE MARGIN
CEUS	CENTRAL AND EASTERN UNITED STATES
CST	CONDENSATE STORAGE TANK
EL	ELEVATION
ELAP	EXTENDED LOSS OF ALL AC POWER
EPRI	ELECTRIC POWER RESEARCH INSTITUTE
ESEL	EXPEDITED SEISMIC EQUIPMENT LIST
ESEP	EXPEDITED SEISMIC EVALUATION PROCESS
EW	EAST-WEST DIRECTION
FERMI 2	FERMI 2 NUCLEAR POWER PLANT, UNIT 2
FIRS	FOUNDATION INPUT RESPONSE SPECTRA
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
gpm	GALLONS PER MINUTE
HCLPF	HIGH CONFIDENCE LOW PROBABILITY OF FAILURE
HPCI	HIGH PRESSURE COOLANT INJECTION
HVAC	HEATING, VENTILATION, AND AIR-CONDITIONING
Hz	HERTZ
IPEEE	INDIVIDUAL PLANT EXAMINATION OF EXTERNAL EVENTS
ISRS	IN-STRUCTURE RESPONSE SPECTRA
kW	KILOWATTS

LIST OF ACRONYMS
(CONTINUED)

ACRONYM	TITLE
M&E	MECHANICAL AND ELECTRICAL
MAFE	MEAN ANNUAL FREQUENCY OF EXCEEDANCE
MCC	MOTOR CONTROL CENTER
NC	NORMALLY CLOSED
NEI	NUCLEAR ENERGY INSTITUTE
NO	NORMALLY OPEN
NPP	NUCLEAR POWER PLANT
NRC	UNITED STATES NUCLEAR REGULATORY COMMISSION
NS	NORTH-SOUTH DIRECTION
NTTF	NEAR-TERM TASK FORCE
OIP	OVERALL INTEGRATED PLAN
P&ID	PROCESS AND INSTRUMENTATION DIAGRAMS
PGA	PEAK GROUND ACCELERATION
psi	POUNDS PER SQUARE INCH
RB	REACTOR BUILDING
RCIC	REACTOR CORE ISOLATION COOLING
RHR	RESIDUAL HEAT REMOVAL
RIZZO	RIZZO ASSOCIATES
RLE	REVIEW LEVEL EARTHQUAKE
RLGM	REVIEW LEVEL GROUND MOTION
RPV	REACTOR PRESSURE VESSEL
SASSI	SYSTEM FOR ANALYSIS FOR SOIL STRUCTURE INTERACTION
SEL	SEISMIC EQUIPMENT LIST
SEWS	SEISMIC EVALUATION WORK SHEETS
SFP	SPENT FUEL POOL
SMA	SEISMIC MARGIN ASSESSMENT
SPRA	SEISMIC PROBABILISTIC RISK ASSESSMENT
SQUG	SEISMIC QUALIFICATION UTILITY GROUP
SRSS	SQUARE-ROOT-OF-THE-SUM-OF-THE-SQUARES
SRT	SEISMIC REVIEW TEAM

LIST OF ACRONYMS
(CONTINUED)

ACRONYM	TITLE
SRV	SAFETY RELIEF VALVE
SSCs	STRUCTURES, SYSTEMS, AND COMPONENTS
SSE	SAFE SHUTDOWN EARTHQUAKE
SSI	SOIL STRUCTURE INTERACTION
U.S.	UNITED STATES OF AMERICA
UHRS	UNIFORM HAZARD RESPONSE SPECTRA
V_S	SHEAR WAVE VELOCITY

EXPEDITED SEISMIC EVALUATION PROCESS (ESEP)

FERMI 2 NUCLEAR POWER PLANT
SEISMIC PROBABILISTIC RISK ASSESSMENT PROJECT

FRENCHTOWN CHARTER TOWNSHIP, MICHIGAN

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 of America (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. Risk 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 the Fermi 2 NPP (Fermi 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, Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima NTTF Recommendation 2.1: Seismic [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 Fermi 2 FLEX response strategies for Reactor Core Cooling and Heat Removal, Spent Fuel Pool Cooling, and Containment Cooling functions are summarized below. This summary is derived from the Fermi 2 Overall Integrated Plan (OIP) in Response to the March 12, 2012, Commission Order EA-12-049 [3] and the simplified figures of these function provided in ***Attachment A***.

Reactor core cooling and heat removal is achieved via core submergence. The Reactor core Isolation Cooling (RCIC) system will be used to maintain core cooling by injecting into the Reactor Pressure Vessel (RPV) during FLEX Phase 1, with RCIC pump suction from either the Condensate Storage Tank (CST), if available, or the Suppression Pool (Torus) (credited source). During RCIC operation, the Suppression Pool shall act as a heat sink for steam generated by Reactor decay heat. The High Pressure Coolant Injection (HPCI) will also be utilized, if sufficient steam pressure is available, to control Reactor pressure, and minimize Safety Relief Valves (SRV) cycling. Under FLEX Phase 1, prior to HPCI pressure control being placed in service, SRV pressure control is available. All containment parameters are anticipated to remain within design values during the Phase 1 coping period.

The required Phase 1 action for the Spent Fuel Pool (SFP) includes monitoring of the pool level, based on initial SFP level, bounding heat load of a full core off-load, and predicted time-to boil.

Phase 1 support equipment is principally via the DC distribution system and Control Room instrumentation. Fermi's Phase 1 coping equipment is the Division 1 and Division 2 DC distribution system. The DC distribution system supplies the power to the equipment necessary to achieve the FLEX strategy outlined in the above and includes: HPCI, RCIC, SRVs, power inverters, and some Control Room instrumentation. AC power sources are assumed unavailable.

The FLEX Phase 2 strategy includes a feed and bleed strategy for the removal of heat from the containment and preserve RCIC availability by maintaining Torus Temperature below 240 F. Additionally, the FLEX water supply to the Torus feed portion of the strategy can also be utilized to inject into the Reactor, should RCIC become unavailable.

The FLEX feed strategy utilizes two portable diesel driven pumps connected in series to transport water from the FLEX designated water sources (preferred suction is the Circulating Water Pond) into the Reactor Building (RB) and into the RHR system for RPV injection. Sufficient capacity exists with the FLEX pumps to provide the required flow rates for containment cooling, core cooling, and SFP makeup.

The first of two FLEX pumps is a lift pump rated at 3,000 gallons per minute (gpm), and 150 pounds per square inch (psi). This pump is capable of taking water from the FLEX water source and boosting pressure for transit to a second pump. The second pump is a booster pump rated at 3,000 gpm, 150 psi. This booster pump will provide the necessary FLEX supply pressure into the RHR system for Torus heat removal or RPV injection. Diverse FLEX connection points are provided by separate Division 1 and Division 2 RHR system connections within the safety related RB.

The Phase 2 bleed strategy includes HPCI or RCIC pumping the Torus inventory and rejecting this inventory to a controlled location (preferably the Circulating Water Pond).

Should the Phase 2 Torus feed and bleed strategy fail to control the containment pressure and temperature, the Torus Hardened Vent system will be initiated, as directed in the Emergency Operating Procedures.

Phase 2 actions for SFP cooling are based on makeup from the FLEX water supply. Makeup for the SFP will be provided by the FLEX pumps connected to the RHR system for the core cooling strategy. SFP monitoring, described in Phase 1, will continue to be used to monitor SFP water level and establish need for SFP inventory addition via FLEX equipment. Control of FLEX makeup flow to the SFP is provided by a manual-operated valve located near the SFP level monitor available on the 2nd floor of the RB.

FLEX Phase 2 electrical support equipment is via a single FLEX portable diesel powered AC generator to supply the DC battery chargers and 480 VAC critical loads. Prompt restoration of DC battery chargers from FLEX Phase 2 power supplies will provide sufficient capacity, in conjunction with partial load shedding, to power all DC loads required for FLEX. The FLEX generator (550 kilowatts [kW]) has been sized to power all necessary AC & DC single success pathway Phase 2 FLEX loads.

The plant 480 V system and the tie-in locations for the FLEX generators are shown on Figure 4 of ***Attachment A***.

3.0 EQUIPMENT SECTION PROCESS AND EXPEDITED SEISMIC EQUIPMENT LIST

The selection of equipment for the Expedited Seismic Equipment List (ESEL) followed the guidelines of EPRI 3002000704 [2]. The ESEL for Fermi 2 is presented in ***Attachment B***.

3.1 EQUIPMENT SELECTION PROCESS AND ESEL

The selection of equipment to be included on the 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 Fermi 2 OIP in Response to the March 12, 2012, Commission Order EA-12-049 submitted in February, 2014 [3]. The OIP provides the Fermi 2 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, SFP cooling and Containment cooling consistent with the Fermi 2 OIP [3]. FLEX mitigation recovery actions are excluded from the ESEP scope per EPRI 3002000704 [2]. FLEX modifications and the scope for consideration herein is limited to those required to support core cooling, SFP cooling, and containment cooling functions. Any modifications identified for ESEL equipment are identified in ***Section 8.2*** of this Report. 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, SFP cooling, and containment cooling safety functions identified in Table 3-2 of EPRI 3002000704. The instrumentation monitoring requirements for core cooling/SFP cooling/containment cooling safety functions are limited to those outlined in the EPRI 3002000704 guidance, and are a subset of those outlined in the Fermi 2 OIP [3].
2. The scope of components is limited to installed plant equipment and FLEX connections necessary to describe the Fermi 2 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.

4. The “Primary” FLEX success path is Feed and bleed of the Torus/RPV injection path using RHR connections/SFP makeup using RHR cross tie

5. There are no Fermi 2 Phase 3 coping strategies to be included in the ESEP scope, whereas Phase 3 recovery strategies are excluded.

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

   - Structures (e.g., Containment, RB, Control Building, Auxiliary Building AB), etc.)
   - Piping, cabling, conduit, heating, ventilation, and air-conditioning (HVAC), and their supports.
   - Manual valves, check 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., RPV and internals, Reactor coolant pumps 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 Fermi 2 OIP [3] to determine the major equipment involved in the FLEX strategies. Further reviews of plant drawings (e.g., Process and Instrumentation Diagrams (P&IDs) 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 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., RCIC/Auxiliary Feedwater [AFW] trips)." To address this concern, the following guidance is applied in the Fermi 2 ESEL for functional failure modes associated with power-operated valves:

- Power-operated valves that remain energized during the Extended Loss of all AC 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 not included on the ESEL. 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 Phase 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. 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 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 Fermi 2 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.

Item 6 in Section 3 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.

3.2 JUSTIFICATION FOR USE OF EQUIPMENT THAT IS NOT THE PRIMARY MEANS FOR FLEX IMPLEMENTATION

The complete ESEL for Fermi 2 is presented in ***Attachment B***.

The ESEL is based only on the primary means for FLEX implementation.

4.0 GROUND MOTION RESPONSE SPECTRUM (GMRS)

4.1 PLOT OF GMRS SUBMITTED BY THE LICENSEE

The Fermi 2 site bedrock occurs at Elevation (EL) 552 feet (ft) and consists of thinly bedded dolomite of the Bass Island Group. The primary structures of Fermi 2 are founded on bedrock. The deepest foundation elevation of these structures is EL 536 ft and is associated with the RB. The design basis analysis applies the safe shutdown earthquake (SSE) ground motion at the respective building foundations. Therefore, the SSE control point elevation is taken to be the base of the RB foundation, EL 536 ft. The bedrock immediately underlying the RB foundation (EL. 536 ft) is characterized by shear wave velocities (V_S) of about 6,500 feet per second (ft/s).

Figure 4-1 presents the ground motion response spectra (GMRS) at the control point EL 536 ft and compares this to the GMRS reported in the Fermi 2 March 2014 submittal [4]. The difference in the spectral amplitudes is attributed to the material damping used for the subsurface rock material. While the GMRS reported in the March 2014 submittal is based on the low-strain damping of approximately 3.2 percent, the GMRS used in the SPRA uses about 1.0 percent for the Bass Island Dolomite and 2.0 percent for the underlying Salina Group shales of lower V_S. The damping in the dolomites is based on site-specific information including Fermi 3 data, while the damping values for shale are based on the un-weathered shale dynamic properties from Stokoe et al., [5]. The development of the GMRS is more fully described in Reference 4.

Table 4-1 presents the spectral accelerations at selected frequencies defining the GMRS being used in the on-going SPRA.

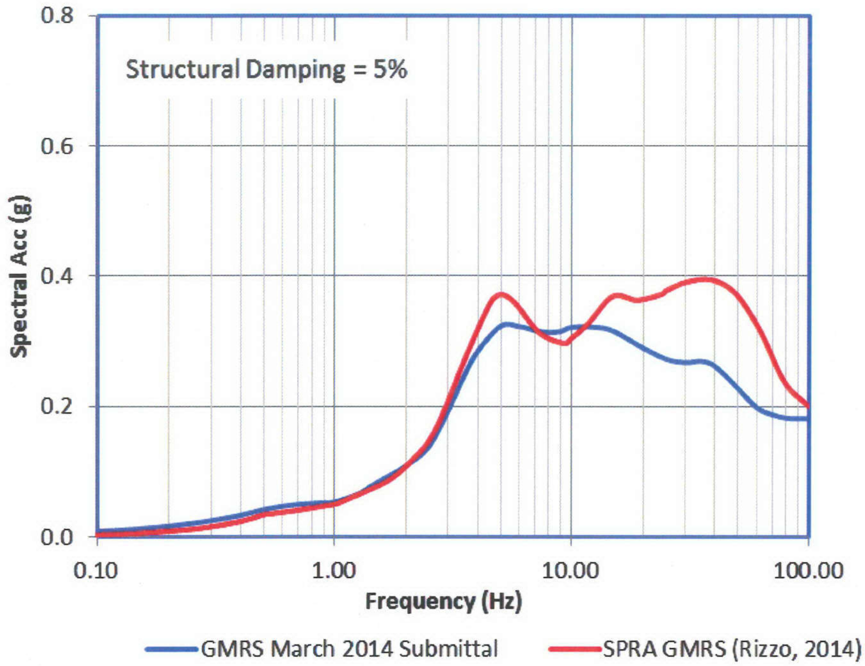

FIGURE 4-1
COMPARISON BETWEEN FERMI 2 SPRA GMRS AND GMRS REPORTED IN THE MARCH 2014 NTTF 2.1 SUBMITTAL

TABLE 4-1
UHRS AND SPRA GMRS AT THE FERMI 2 CONTROL POINT EL 536 FT

FREQUENCY	HORIZONTAL SPECTRAL ACCELERATION (g) AT THE RB FOUNDATION		
(HZ)	$1x10^{-4}$ MAFE UHRS	$1x10^{-5}$ MAFE UHRS	GMRS
0.10	0.0025	0.0059	0.0030
0.13	0.0036	0.0085	0.0043
0.16	0.0051	0.0122	0.0061
0.20	0.0073	0.0173	0.0087
0.26	0.0105	0.0245	0.0124
0.33	0.0153	0.0350	0.0178
0.42	0.0225	0.0502	0.0256
0.50	0.0302	0.0662	0.0340
0.53	0.0311	0.0683	0.0350
0.67	0.0349	0.0778	0.0398
0.85	0.0396	0.0898	0.0458
1.00	0.0429	0.0984	0.0500
1.08	0.0461	0.1082	0.0547
1.37	0.0562	0.1418	0.0707
1.74	0.0672	0.1826	0.0897

TABLE 4-1
UHRS AND SPRA GMRS AT THE FERMI 2 CONTROL POINT EL 536 FT (CONTINUED)

FREQUENCY	HORIZONTAL SPECTRAL ACCELERATION (g) AT THE RB FOUNDATION		
(HZ)	$1x10^{-4}$ MAFE UHRS	$1x10^{-5}$ MAFE UHRS	GMRS
2.21	0.0876	0.2566	0.1242
2.50	0.1013	0.3080	0.1479
2.81	0.1231	0.3822	0.1828
3.56	0.1812	0.5808	0.2761
4.52	0.2328	0.7582	0.3592
5.00	0.2391	0.7852	0.3714
5.74	0.2296	0.7598	0.3588
7.28	0.1964	0.6651	0.3127
9.24	0.1819	0.6346	0.2965
10.00	0.1851	0.6535	0.3047
11.72	0.1957	0.7029	0.3266
14.87	0.2190	0.7952	0.3686
18.87	0.2129	0.7845	0.3626
23.95	0.2152	0.8083	0.3722
25.00	0.2178	0.8205	0.3776
30.39	0.2262	0.8475	0.3904
38.57	0.2302	0.8527	0.3938
48.94	0.2198	0.8040	0.3722
62.10	0.1883	0.6796	0.3155
78.80	0.1456	0.5091	0.2378
100.00	0.1233	0.4273	0.2000

Note:

MAFE = mean annual frequency of exceedance.

4.2 COMPARISON TO SSE

Figure 4-2 compares the GMRS [4] with the site SSE at the control point elevation. The SSE horizontal spectrum is characterized by a peak ground acceleration (PGA) of 0.15 acceleration of gravity (g) and a shape that conforms to the 1940 El Centro, California spectra with minor modifications to accommodate the 1949 Olympia, Washington, and the 1935 Helena, Montana, earthquakes. ***Figure 4-2*** illustrates that within the frequency range of 1 to 10 Hertz (Hz), the maximum ratio of spectral accelerations (GMRS/SSE) is approximately 1.6 at about 5 Hz.

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

FREQUENCY [Hz]	SPECTRAL ACCELERATION [g]
0.10	0.008
0.20	0.028
0.50	0.077
1.00	0.130
2.50	0.220
5.00	0.236
8.00	0.195
9.00	0.180
25.00	0.155
33.00	0.150
100.0	0.150

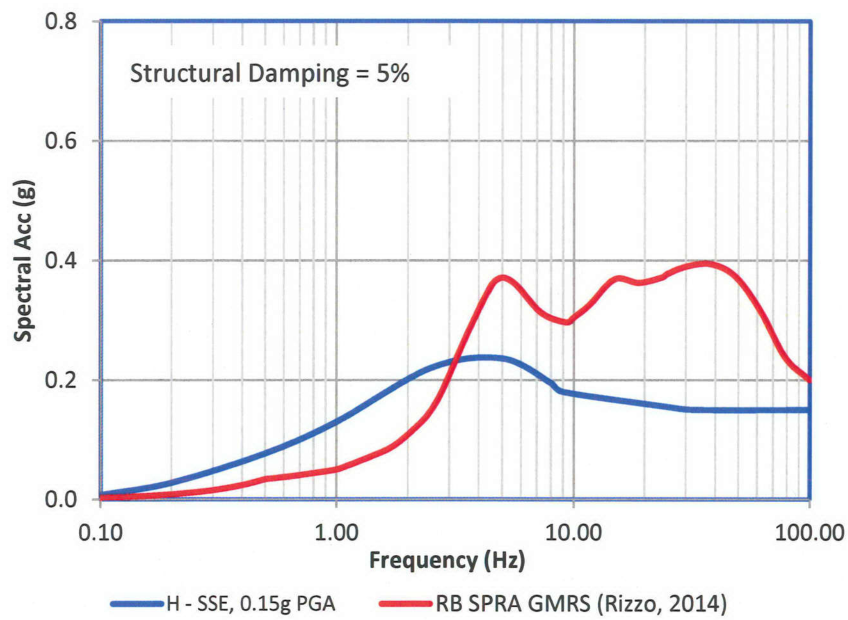

FIGURE 4-2
COMPARISON OF SPRA GMRS AND SSE AT CONTROL POINT ELEVATION

5.0 REVIEW LEVEL GROUND MOTION (RLGM)

5.1 DESCRIPTION OF RLGM SELECTED

The ESEP is being completed as part of the Augmented Approach because the GMRS exceeds the SSE in the 1 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-of-low-probability-of-failure (HCLPF) values for the ESEL components.

Because Fermi 2 is currently performing a SPRA, the fragilities developed in support are being used to the extent applicable also to accomplish the ESEP. These fragilities are being developed for the SPRA GMRS shown on ***Figure 4-1***. Accordingly, the SPRA GMRS shown on ***Figure 4-1*** and tabulated in ***Table 4-1*** is taken to define the RLGM for the ESEP.

5.2 METHOD TO ESTIMATE IN-STRUCTURE RESPONSE SPECTRA

A review of existing lumped mass and stiffness models of the Fermi 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 finite element models of the structures.

The analytical finite element 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 best estimate (BE) V_S of the supporting rock medium is approximately 6,500 ft/s. The study presented in EPRI 1025287 [6], Appendix C, concludes that structures supported on rock with $V_S > 5{,}000$ ft/s could be analyzed assuming fixed-base conditions. However, because some of the subsurface rock at depth has lower V_S, the seismic analysis incorporates soil structure interaction (SSI). The SSI analysis assumes that the structures are surface founded at their respective foundation levels.

The seismic response including the in-structure response spectra (ISRS) for the rock supported structures are developed using the System for Analysis for Soil Structure Interaction (SASSI) computer code. Time histories matching the horizontal and vertical foundation input response spectra (FIRS) at the respective building foundation levels are used to represent the free field ground motion at the building foundation level.

Subsequent equipment HCLPF calculations and fragility evaluations are based on the conservative deterministic failure margin (CDFM) approach. In accordance with EPRI 1019200 [10] "Seismic Fragility Applications Guide Update," the seismic analyses are performed using 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.

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 [8]. 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.

Details of the development of the models, inputs, analysis, and resulting ISRS are presented in RIZZO Associates (RIZZO) Report R6 124899 [9]. This Report reflects the SPRA GMRS shown on ***Figure 4-1***.

6.0 SEISMIC MARGIN EVALUATION APPROACH

It is necessary to demonstrate that ESEL items have sufficient seismic capacity to meet or exceed the demand characterized by the RLGM. The seismic capacity is characterized as the PGA for which there is a HCLPF. The PGA is associated with a specific spectral shape, in this case the five percent-damped RLGM spectral shape. The HCLPF capacity must be equal to or greater than the RLGM PGA. The criteria for seismic capacity determination are given in Section 5 of EPRI 3002000704 [2].

There are two basic approaches for developing HCLPF capacities:

1. Deterministic approach using the CDFM methodology of EPRI NP-6041, A Methodology for Assessment of Nuclear Power Plant Seismic Margin, Rev. 1 [10].

2. Probabilistic approach using the fragility analysis methodology of EPRI TR-103959, Methodology for Developing Seismic Fragilities [11].

6.1 SUMMARY OF METHODOLOGIES USED

Fermi 2 performed a SMA in 1996. The SMA is documented in [12] and consisted of screening walkdowns and HCLPF anchorage calculations. The screening walkdowns used the screening tables from Chapter 2 of EPRI NP-6041 [10]. Anchorage capacity calculations used the CDFM criteria from EPRI NP-6041 [10]. Seismic demand was the Individual Plant Examination of External Events (IPEEE) Review Level Earthquake (RLE) for SMA (median NUREG/CR-0098 [11] ground response spectrum anchored to 0.3g PGA). This spectrum exceeds two times the SSE spectrum. Therefore, the IPEEE HCLPFs may be used to screen some items in the ESEL.

Fermi 2 is conducting a Seismic PRA in accordance with Regulatory Guide 1.200, Rev. 2. [24] The on-going SPRA fragility calculations in support of the SPRA are being performed using the CDFM approach following the guidelines described in EPRI 6041 [10], EPRI 1002988 [14] (Seismic Fragility Application Guide), and EPRI 1019200 [7] (Seismic Fragility Applications Guide Update). The supporting walkdowns were conducted in accordance with EPRI NP-6041 [10]. These walkdowns assessed observable degraded conditions and potential seismic interaction issues, and dispositioned the caveats associated with the use of GERS. The walkdowns were conducted by teams of engineers from RIZZO. Each team contained one engineer who completed the EPRI SQUG Walkdown Screening and Seismic Evaluation Training Course. These walkdowns were documented on Screening Evaluation Work Sheets adapted from EPRI NP-6041 [10]. Anchorage capacity calculations used the CDFM criteria from EPRI NP-6041 [10].

The SPRA fragility calculations are being developed based on the seismic demand associated with the SPRA GMRS presented on ***Figure 4-1***. However, the current set of completed HCLPF values developed as part of the SPRA are based on the GMRS developed earlier RIZZO Report R4 124899, Revision 1 [15] using the EPRI 2004/06 ground motion models (referred to here as the RLE). The RLE GMRS is compared on ***Figure 4-3*** to the RLGM for the ESEP. This methodology is similar to what is required to satisfy the ESEP criteria and shall be credited as explained below.

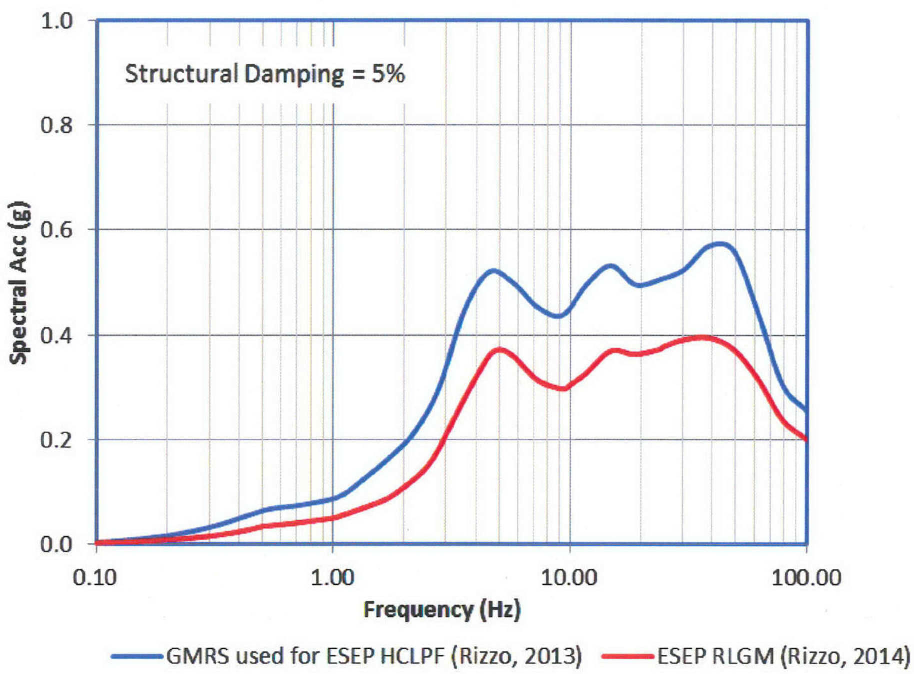

FIGURE 6-1
COMPARISON OF RLGM AND GMRS USED TO DEVELOP ESEL HCLPF

Considering the above, the overall strategy for accomplishing the ESEP consists of the following.

1. Consolidate ESEL by "boxing" breakers and switches and other devices and instrumentation items into "parent" component in which they are housed, such as a motor control center (MCC) or switchgear. This consolidation is performed so that devices and instruments could be evaluated for HCLPF capacities.

2. Use SPRA HCLPF values associated with the 2013 GMRS for screening items on the ESEL which are also on the SPRA SEL. This is considered acceptable because the 2013 GMRS envelops the RLGM over the entire frequency range of interest, as shown on ***Figure 6-1***.

3. Conduct walk by of the remaining ESEL items not part of the SPRA Seismic Equipment List (SEL). The SPRA walkdown performed in 2013 is credited here.

4. Group the remaining ESEL by equipment classes, e.g., and then sample for representative items based on type of equipment, manufacturer, location, and anchorage etc.

5. Perform SMA for functionality and develop HCLPF values of representative items using the CDFM approach. The seismic demand is taken from ISRS associated with the 2013 GMRS. The seismic capacities are based on Table 2.4 of EPRI 6041 [10] capacities, equipment qualification test data, and published generic ruggedness spectra.

6. Perform SMA anchorage calculations based on design documents.

The consolidated ESEL items not addressed as part of the SPRA are evaluated here. As can be seen in Attachment C, the ESEP is satisfied by showing that all HCLPF values of the ESEL components exceeds the PGA value of the RLGM

6.2 HCLPF SCREENING PROCESS

The HCLPF values developed in support of the SPRA are based on the RLE GMRS which envelops the RLGM over the entire range of frequencies (***Figure 6-1***). Therefore, any components whose SPRA HCLPF exceeds the RLE GMRS can be screened out from HCLPF calculations for the ESEP. The screening tables in EPRI NP-6041 [10] are based on ground peak spectral accelerations of 0.8g and 1.2g. These both exceed the RLGM peak spectral acceleration. The anchorage capacity calculations which were based on new floor response spectra were generated for the RLE GMRS. Equipment for which the screening caveats were met and for which the anchorage capacity exceeded the RLE GMRS seismic demand can be screened out from ESEP seismic capacity determination because the HCLPF capacity exceeds the RLGM.

The remaining items on the ESEL are assigned HCLPF values based on CDFM calculations as described in ***Section 6.4***.

The Fermi 2 ESEL contains 291 items. Of these, 77 are valves, both power-operated and relief. In accordance with Table 2-4 of EPRI NP-6041 [10], active valves may be assigned a functional capacity of 1.2g peak spectral acceleration without any review other than looking for valves with large extended operators on small diameter piping, and anchorage is not a failure mode. Power-operated valves were addressed in the SMA utilized in the IPEEE, as well as the SPRA SMA. The SMA evaluations determined that the valves meet EPRI NP-6041 [10] Figures F-25 and F-26 (thus, meeting the 1.2g peak spectral acceleration screening criteria) or to exceed the RLE floor response spectra on the basis of vendor seismic qualification reports.

The SPRA addressed a total of about 260 valves not counting manual and check valves which were screened out. Many motor, air, fluid, and spring-operated relief valves are considered to meet the EPRI NP-6041 [10] 1.2g peak spectral acceleration screening criteria without explicit review. On the basis of the above, the ESEL valves may be assigned the screening level capacity from Table 2.4 in EPRI 6041 [10], or a scaled fragility value from the SPRA analysis.

Although for most components on the ESEL, the RLGM is defined by the GMRS on ***Figure 4-1***, non-valve components on the ESEL which were evaluated in the IPEEE are screened on the basis that the IPEEE RLE spectrum exceeds the 2xSSE spectrum. The seismic demand for the IPEEE SMA was based on the IPEEE RLE for SMA (median NUREG/CR-0098 [10] ground response spectrum anchored to 0.3g PGA). ***Figure 6-2*** compares the IPEEE RLE and the 2xSSE. If the IPEEE SMA showed that the component met the EPRI NP-6041 screening caveats and the CDFM capacity exceeded the RLE demand, the component can be screened out from the ESEP capacity determination.

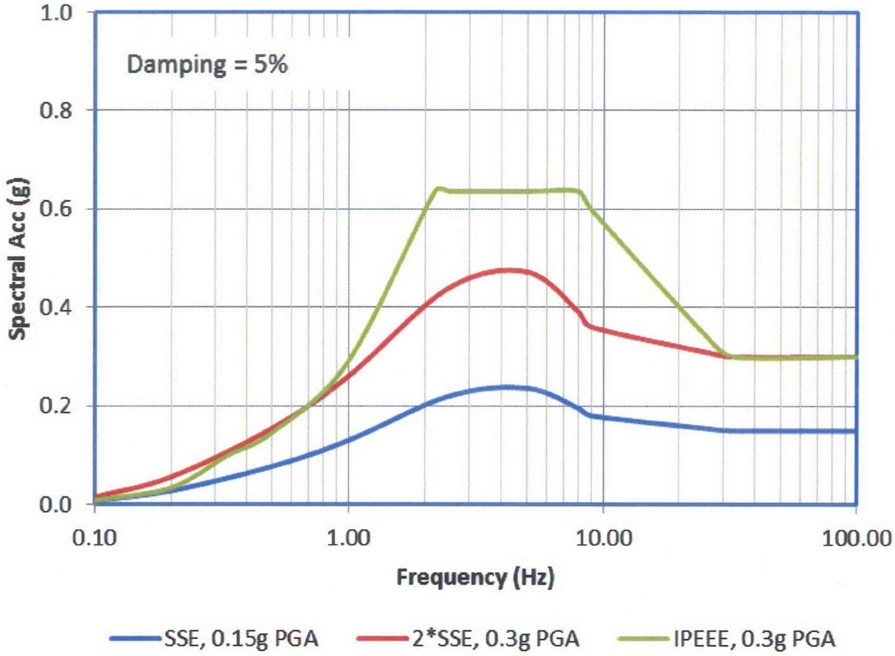

FIGURE 6-2
COMPARISON OF IPEEE RLE SPECTRUM AND 2XSSE SPECTRUM

6.3 SEISMIC WALKDOWN APPROACH

6.3.1 Walkdown Approach

Walkdowns were performed in accordance with the criteria provided in Section 5 of EPRI 3002000704 [2], which refers to EPRI NP-6041 [10] for the SMA process. Pages 2-26 through 2-30 of EPRI NP-6041 [10] describe the seismic walkdown criteria, including the following key criteria.

"The SRT [Seismic Review Team] should "walk by" 100% of all components which are reasonably accessible and in non-radioactive or low radioactive environments. Seismic capability assessment of components which are inaccessible, in high-radioactive environments, or possibly within contaminated containment, will have to rely more on alternate means such as photographic inspection, more reliance on seismic reanalysis, and possibly, smaller inspection teams and more hurried inspections. A 100% "walk by" does not mean complete inspection of each component, nor does it mean requiring an electrician or other technician to de-energize and open cabinets or panels for detailed inspection of all components. This walkdown is not intended to be a QA or QC review or a review of the adequacy of the component at the SSE level.

If the SRT has a reasonable basis for assuming that the group of components are similar and are similarly anchored, then it is only necessary to inspect one component out of this group. The "similarity-basis" should be developed before the walkdown during the seismic capability preparatory work (Step 3) by reference to drawings, calculations, or specifications. The one component or each type which is selected should be thoroughly inspected which probably does mean de-energizing and opening cabinets or panels for this very limited sample. Generally, a spare representative component can be found so as to enable the inspection to be performed while the plant is in operation. At least for the one component of each type which is selected, anchorage should be thoroughly inspected.

The walkdown procedure should be performed in an ad hoc manner. For each class of components the SRT should look closely at the first items and compare the field configurations with the construction drawings and/or specifications. If a one-to-one correspondence is found, then subsequent items do not have to be inspected in as great a detail. Ultimately the walkdown becomes a "walk by" of the component class as the SRT becomes confident that the construction pattern is typical. This procedure for inspection should be repeated for each component class; although, during the actual walkdown the SRT may be inspecting several classes of components in parallel. Is serious exceptions to the drawings or questionable construction practices are found then the system or component class must be inspected in closer detail until the systematic deficiency is defined.

The 100% "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. Appendix D gives guidance for sampling selection."

[1] EPRI 3002000704 [2] Page 5-4 limits the ESEP seismic interaction 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 seismic interaction evaluations are "deferred to the full seismic risk evaluations performed in accordance with EPRI 1025287 [5]."

Of the items on the ESEL, instrumentation items, devices, and sensors were "boxed" into parent components. The remaining items were separated into components addressed in the SPRA, and non-SPRA components for which HCLPF evaluations are needed.

6.3.2 Application of Previous Walkdown Information

Some of the components on the ESEL were included in the NTTF 2.3 seismic walkdowns [16], and the walkdowns supporting the SPRA. Some of the SPRA components were walked down in March, 2013, and the additional components were walked down in September 2013. These walkdowns were recent enough that they did not need to be repeated for the ESEP.

Several ESEL items were also previously walked down during the Fermi 2 Seismic IPEEE program. Where these walkdowns are utilized, the results were reviewed and the following steps were taken to confirm that the 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.

Where these previous walkdowns were not adequate, an additional walkdown was performed to cover additional ESEL items. This was performed in February, 2014.

A summary of all walkdowns performed, with notes and photographs are presented in RIZZO ESEP Walkdown Package for Fermi 2 NPP [17].

6.3.3 Significant Walkdown Findings

RIZZO Report ESEP Walkdown Package [17] presents details of the walkdowns performed in support of the SPRA and subsequent ESEP walkdowns. This includes the SEWS and the walkdown findings that were collected from both the SPRA and ESEP walkdowns. Consistent with the guidance from NP-6041 [10], no significant outliers or anchorage concerns were identified during the Fermi 2 seismic walkdowns. The walkdown observations are primarily interaction issues. The Walkdown Package [17] identifies all of these seismic interactions and provides recommendation for their resolution. The following findings were noted during the walkdowns.

- Some block walls in buildings other than the RB/AB and the Residual Heat Removal (RHR) which were not part of the I. E. Bulletin 80-11 Block Wall Program were identified. One block wall was noted adjacent to R3200S016. This block wall was evaluated in the SPRA analysis and is confirmed to have satisfied ESEP [19].
- Some seismic interaction issues were identified. These are associated with rod hung piping, primarily in the Turbine Building (TB). No piping interaction was seen to interact with ESEL equipment. Swaying displacement of chain hung lighting fixtures was noted throughout the plant, but is judged to be non-credible due to their light weight and a redundant wire installed on each to prevent falling. One significant interaction was noted due to unsecured filing cabinets adjacent to sensitive panels in the Main Control Room. CARD 14-23505 was initiated to have the cabinets removed from the vicinity of the Control Room Panels. Some of the walkdown observations are related to degraded conditions and failure to meet EPRI screening caveats for GERS. These were noted on the SEWS for subsequent assessment, and have been resolved in assigning HCLPF.

6.4 HCLPF CALCULATION PROCESS

ESEL items not included in the Fermi 2 SPRA evaluations were evaluated using the CDFM approach described in EPRI NP-6041 [10] and EPRI 1019200 [7]. Those evaluations included the following steps:

- Performing seismic capability walk by for equipment not included in previous seismic walkdowns (SQUG, IPEEE, or NTTF 2.3) to evaluate the equipment installed plant conditions.
- Performing HCLPF evaluation using capacities in screening tables in EPRI NP-6041 [10] as described in ***Section 6.2***.
- Performing HCLPF calculations considering various failure modes that include both structural failure modes (e.g., anchorage, load path, etc.) and functional failure modes.

All HCLPF calculations were performed using the CDFM methodology and are documented in RIZZO ESEP HCLPF Calculation Package for Fermi 2 [19].

6.5 FUNCTIONAL EVALUATIONS OF RELAYS

Of the total of 63 relays in the ESEL in 13 panels, 39 relays have been addressed as part of the IPEEE [12] and can be screened based on ***Figure 6.2***. The remaining 24 are evaluated here.

The functional evaluation of relays is performed based on the CDFM methodology described in EPRI NP-6041-SL and Appendix A of EPRI 1019200 [7]. Two operating states, non-operate and operate, and two configurations, Normally Open (NO) and Normally Closed (NC) are considered in accordance with the procedure in EPRI 1025287 [6], Appendix B.

The panel amplification factor, AF_C, in accordance with EPRI NP-7147 [20], is considered to scale the ISRS to the estimated mounting point spectrum.

Regardless of the location of relay in the panel, a conservative maximum amplification factor is used. The seismic margin is developed as follows:

$$F_S = \frac{TRS_C}{RRS_C} \cdot \frac{F_{MS}}{F_K} \cdot \frac{1}{AF_C} \qquad \textit{(Equation 6-1)}$$

where,

TRS_C = Clipped equipment test response spectrum capacity,

RRS_C = Clipped required response spectrum demand,

F_{MS} = Multi-axis to single-axis correction factor,

F_K = Knock down factor of Generic Equipment Ruggedness Spectra (GERS)-Relays,

AF_C = Panel amplification factor,

The resulting HCLPF values are referenced to the PGA at the RB foundation level associated with the RLE. In all cases, the capacity exceeds the demand. The ESEP relay functional evaluations are documented in [19].

6.6 TABULATED ESEL HCLPF VALUES (INCLUDING KEY FAILURE MODES)

Attachment C tabulates the HCLPF values for all components on the ESEL. All HCLPF values exceed the RLGM. The Table in ***Attachment C*** 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.

The following notes apply to the information in the tables.

- For items screened out based on SPRA fragility calculations, the screening level can be provided as >RLGM and the failure mode is as identified in the SPRA calculations.
- For items where anchorage controls the HCLPF value, the HCLPF value is listed in the Table and the failure mode is noted as "anchorage."

7.0 INACCESSIBLE COMPONENTS

7.1 Identification of ESEL Items Inaccessible for Walkdowns

Based on the extensive the walkdowns performed for the SPRA and the ESEP, and previous walkdowns, SRT developed confidence to address approximately 27 items such as valves and instrumentation on the basis of similar equipment and installation, supplemented by previous walkdowns and photographs [17]. No items on the ESEL are identified as inaccessible.

7.2 Planned Walkdown / Evaluation Schedule / Close Out

No walkdowns are planned, and no closeout issues are required as a result of the evaluations performed as described in this report.

8.0 ESEP CONCLUSIONS AND RESULTS

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

8.1 SUPPORTING INFORMATION

Fermi 2 has performed the ESEP as an interim action in response to the NRC's 50.54(f) letter [1]. 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 Fermi 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 [21] 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 [22] concluded that the "fleet wide 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 Fermi 2 was included in the fleet risk evaluation submitted in the March 12, 2014 NEI letter [21], therefore, the conclusions in the NRC's May 9 letter [22] also apply to Fermi 2.

In addition, the March 12, 2014 NEI letter [21] 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 time histories 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 time history 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.

8.2 Identification of Planned Modifications

Insights from the ESEP identified no items where the HCLPF is below the RLGM in terms of PGA. Accordingly, no plant modifications are necessary in accordance with EPRI 3002000704 [2] to enhance the seismic capacity of the plant.

8.3 Modification Implementation Schedule

No plant modifications as the result of the evaluations performed as described in this report are required.

8.4 Summary of Regulatory Commitments

No regulatory commitments are being made as a result of the ESEP.

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. (ML12053A340)

2. Seismic Evaluation Guidance: Augmented Approach for the Resolution of Fukushima Near-Term Task Force Recommendation 2.1 – Seismic. EPRI, Palo Alto, California: May 2013, 3002000704, 2013. (ML13101A379)

3. Fermi 2 Overall Integrated Plan (OIP) in Response to the March 12, 2012, Commission Order EA-12-049, February 27, 2014, Enclosure 2 to NRC-14-0002, 2014 (ML14059A350).

4. Probabilistic Seismic Hazard Analysis and Ground Motion Response Spectra, Fermi 2 Nuclear Power Plant, Seismic Probabilistic Risk Assessment Project, RIZZO R4 12-4899, Revision 2, Paul C. Rizzo Associates, Inc., Pittsburgh, Pennsylvania, 2014. DSN #NJPR-14-0087.

5. Stokoe, K. H., W. K. Choi, and F-Y Menq, 2003, "Summary Report: Dynamic Laboratory Tests: Unweathered and Weathered Shale Proposed Site of Building 9720-82 Y-12 National Security Complex, Oak Ridge, Tennessee," Department of Civil Engineering, The University of Texas at Austin, Austin, Texas, 2003.

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16. Fermi 2 NPP Seismic Walkdown Report 10 CFR 50.54(f) Section 2.3 Seismic Response, Detroit Edison Report TMPE-12-0294, Frenchtown Charter Township, Michigan, 2012. (ML12341A363)

17. ESEP Walkdown Package for Fermi 2 NPP, RIZZO Associates, Pittsburgh, Pennsylvania, October 15, 2014. DSN #NJPR-14-0090

18. Seismic Walkdown of Fermi 2 Nuclear Power Station for Seismic Probabilistic Risk Assessment Studies, Report R3 12-4899, Paul C. Rizzo Associates, Inc., Pittsburgh, Pennsylvania, 2013. DSN #NJPR-14-0092

19. ESEP HCLPF Calculation Package for Fermi 2 NPP, RIZZO Associates, Pittsburgh, Pennsylvania, October 15, 2014. DSN #NJPR-14-0091

20. Seismic Ruggedness of Relays, EPRI, Palo Alto, California: August 1991, NP-7147-SL, 1991.

21. Nuclear Energy Institute (NEI), 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 (ML14083A596)

22. 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. (ML14111A147)

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26. TE-K11-13-050 Rev D DSN # TE-K11-13-050 Rev D

ATTACHMENT A

SIMPLIFIED FIGURES

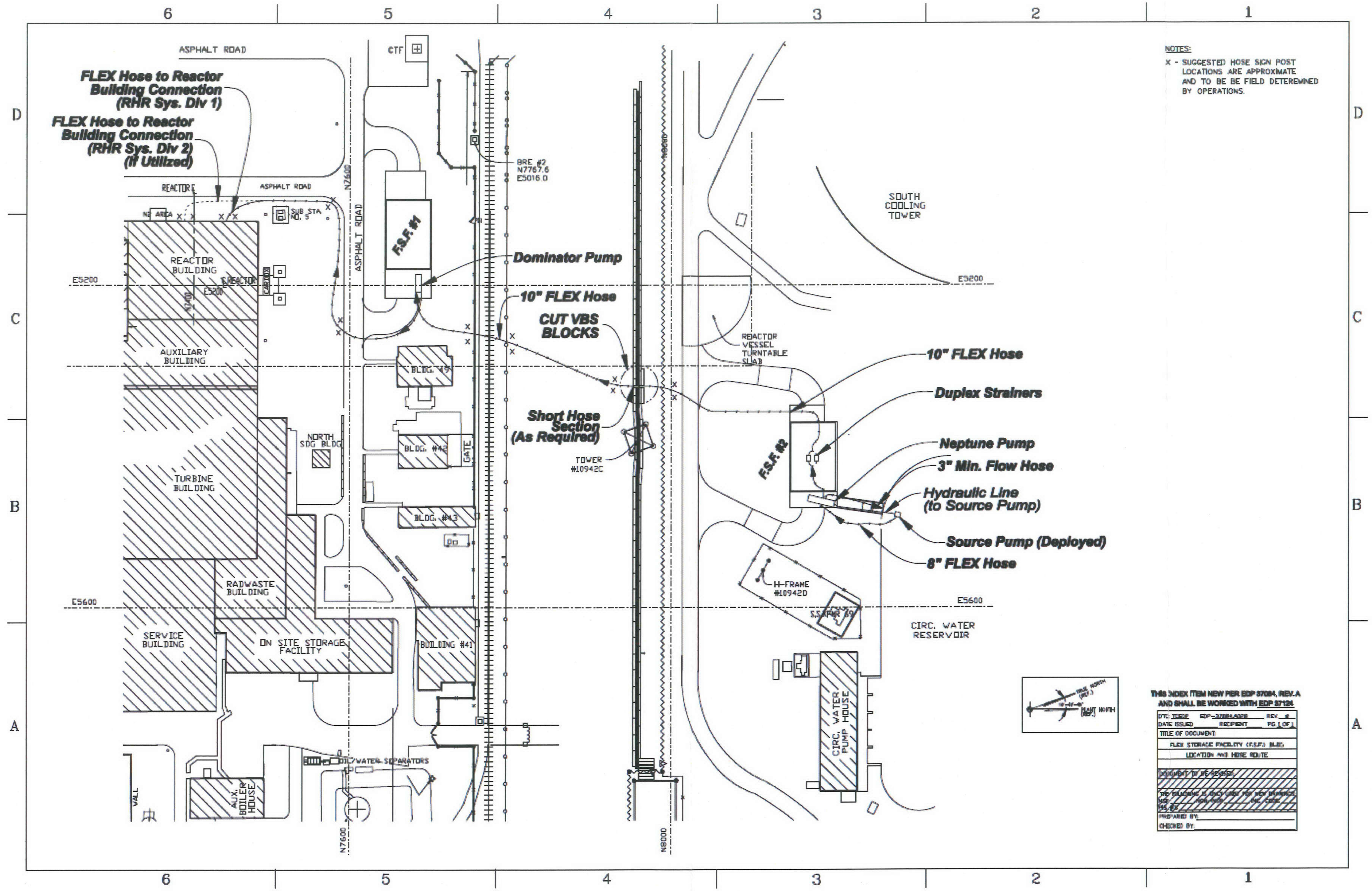

FIGURE 1
OVERVIEW OF PHASE 2 EQUIPMENT STORAGE AND WATER SUPPLY ROUTE

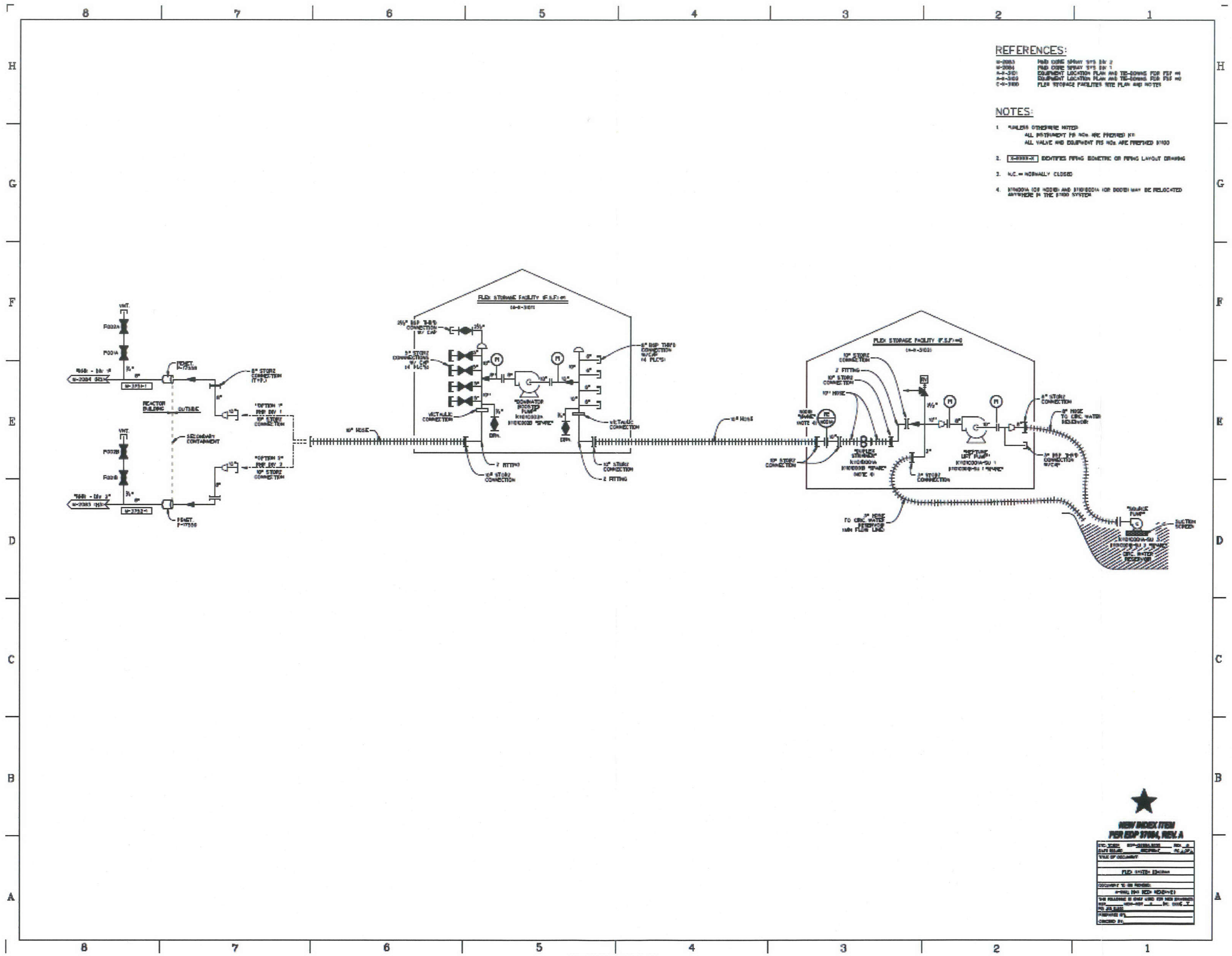

FIGURE 2
SIDE VIEW OF PHASE 2 EQUIPMENT STORAGE AND WATER SUPPLY ROUTE

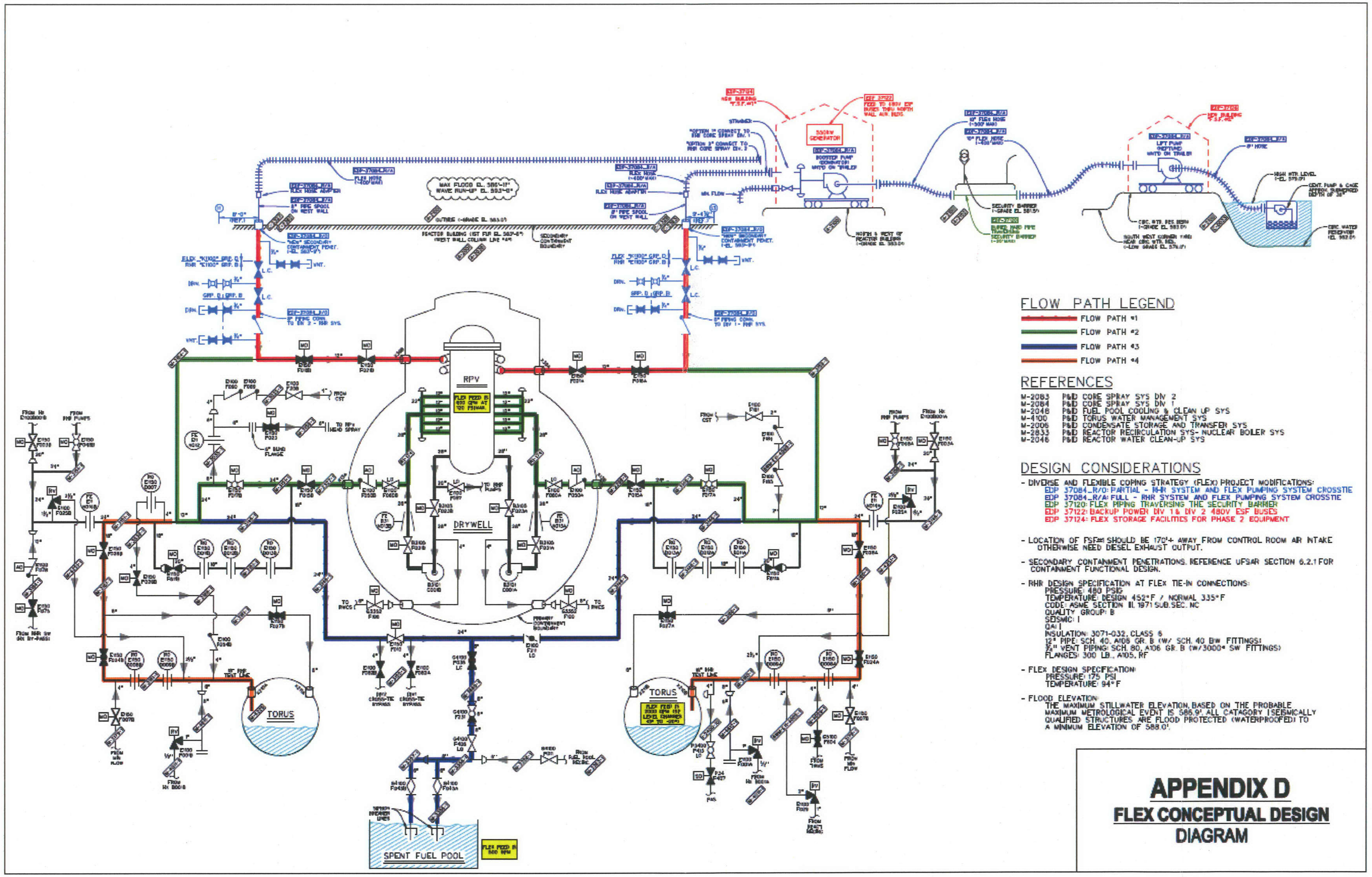

FIGURE 3
FLEX MECHANICAL CONCEPTUAL DRAWING

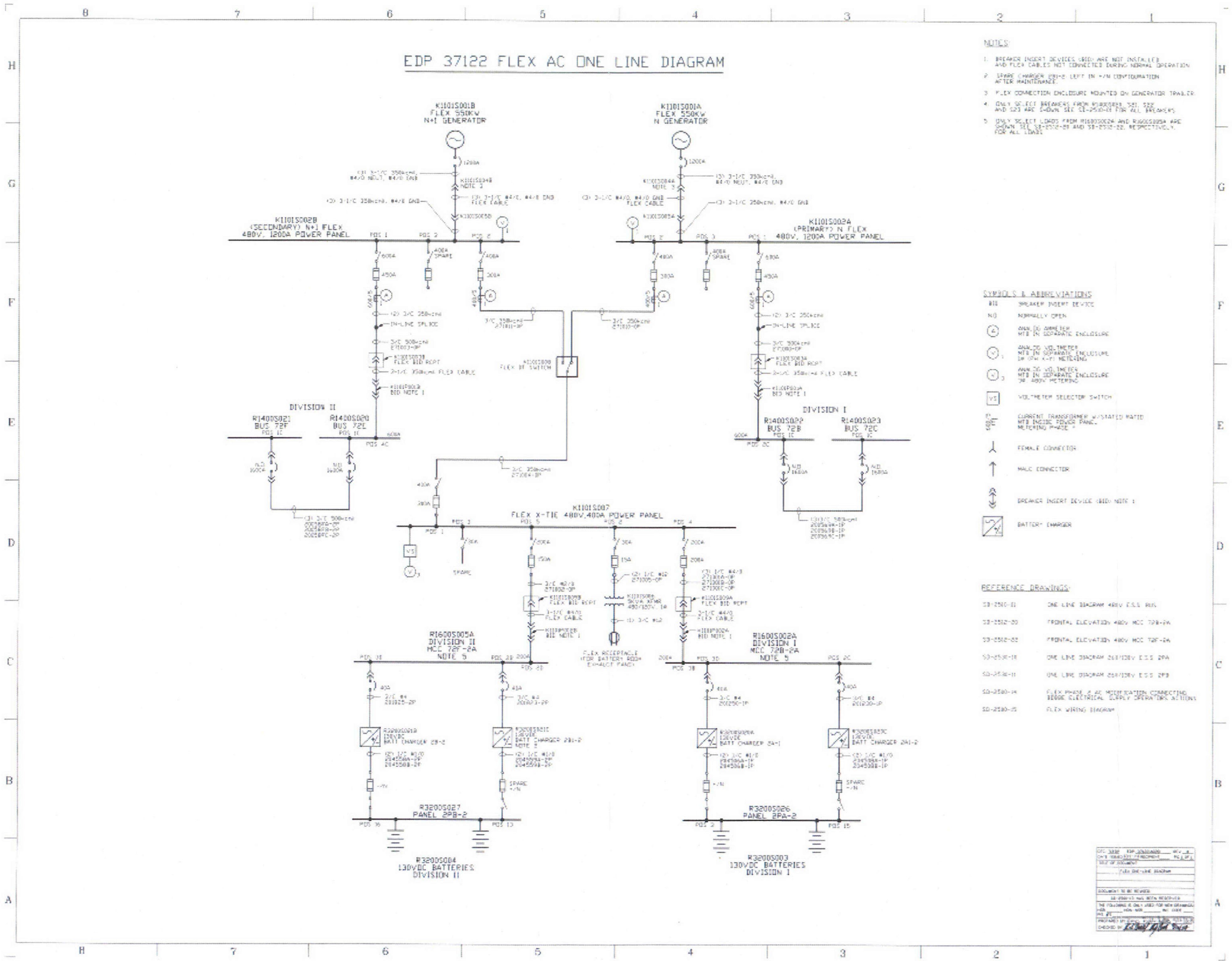

FIGURE 4
FLEX PHASE 2 ELECTRICAL ONE-LINE DIAGRAM