VIRGINIA ELECTRIC AND POWER COMPANY
RICHMOND, VIRGINIA 23261

March 7, 2019

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Serial No. 18-086A
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Docket Nos.: 50-338/339
License Nos.: NPF-4/7

VIRGINIA ELECTRIC AND POWER COMPANY
NORTH ANNA POWER STATION UNITS 1 AND 2
RESPONSE TO MARCH 12, 2012 INFORMATION REQUEST
SEISMIC PROBABILISTIC RISK ASSESSMENT SUPPLEMENT FOR RECOMMENDATION 2.1

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 [ADAMS Accession Nos. ML12056A046 and ML12053A340].
2. NRC Letter, "Final Determination of Licensee Seismic Probabilistic Risk Assessments Under the Request for Information Pursuant to Title 10 of the *Code of Federal Regulations* 50.54(f) Regarding Recommendation 2.1 "Seismic" of the Near-Term Task Force Review of Insights from the Fukushima Dai-ichi Accident," dated October 27, 2015 [ADAMS Accession No. ML15194A015].
3. Virginia Electric and Power Company Letter to NRC, "North Anna Power Station Units 1 and 2 Response to March 12, 2012 Information Request – Seismic Probabilistic Risk Assessment for Recommendation 2.1," dated March 28, 2018 [ADAMS Accession No. ML18093A445].

On March 12, 2012, the Nuclear Regulatory Commission (NRC) issued a request for information pursuant to 10 CFR 50.54(f) associated with the recommendations of the Fukushima Near-Term Task Force (NTTF) (Reference 1). Enclosure 1 of Reference 1 requested each licensee to reevaluate the seismic hazards at their sites using present-day NRC requirements and guidance, and to identify actions taken or planned to address plant-specific vulnerabilities associated with the updated seismic hazards.

Reference 2 contains the NRC letter "Final Determination of Licensee Seismic Probabilistic Risk Assessments." In that letter (Table 1 a - Recommendation 2.1 Seismic – Information Requests), the NRC instructed that a Seismic Probabilistic Risk Assessment (SPRA) be submitted for North Anna Power Station (NAPS) Units 1 and 2 by March 31, 2018.

Reference 3 provided the NAPS Units 1 and 2 SPRA Summary Report, which provided the information requested in Enclosure 1, Item (8)B of Reference 1.

This letter supplements the SPRA Summary Report submittal.

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NRR

Based on a review of the risk insights gained from performance of the SPRA, cost-justified plant improvements to reduce the seismic risk associated with electro-mechanical relay contact chatter events have been identified and will be implemented. The plant improvements will consist of operating procedure(s) changes and enhanced operator training to improve the plant response to potential spurious power supply breaker lockouts and spurious pump start due to relay contact chatter. These plant improvements will be implemented by March, 2020 (2 years from the SPRA Summary Report submittal date).

The attachment to this letter provides the results of a sensitivity study that evaluates the effect of increased failure rates for FLEX equipment and FLEX-related operator actions credited in the SPRA.

If you have any questions regarding this information, please contact Diane E. Aitken at (804) 273-2694.

Sincerely,

Mark D. Sartain
Vice President – Nuclear Engineering and Fleet Support

VICKI L. HULL
NOTARY PUBLIC
REG. # 140542
COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES 5/31/2022

COMMONWEALTH OF VIRGINIA)
)
COUNTY OF HENRICO)

The foregoing document was acknowledged before me, in and for the County and Commonwealth aforesaid, today by Mark D. Sartain, who is Vice President – Nuclear Engineering and Fleet Support of Virginia Electric and Power Company. He has affirmed before me that he is duly authorized to execute and file the foregoing document in behalf of that company, and that the statements in the document are true to the best of his knowledge and belief.

Acknowledged before me this 7TH day of March, 2019.

My Commission Expires: May 31, 2022

Vicki L. Hull
Notary Public

Commitments made in this letter: Implement operating procedure changes and enhanced operator training to respond to seismic event-induced relay contact chatter by March, 2020.

Attachment: Sensitivity Study - Effect of Increased Failure Rates for FLEX Equipment and FLEX-Related Operator Actions Credited in the Seismic Probabilistic Risk Assessment

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ATTACHMENT

Sensitivity Study - Effect of Increased Failure Rates for FLEX Equipment and FLEX-Related Operator Actions Credited in the Seismic Probabilistic Risk Assessment

VIRGINIA ELECTRIC AND POWER COMPANY
(DOMINION ENERGY VIRGINIA)
NORTH ANNA POWER STATION UNITS 1 AND 2

A sensitivity study has been performed using FLEX equipment (FLEX Diesel Generator and Reactor Coolant System Injection Pump) failure rates increased by a factor of 10 (probabilities multiplied by 10) and a high FLEX-actions Human Error Probability (HEP) value (probabilities multiplied by 5).

Tables 5.4-2 (partial), 5.4-3, and 5.4-5 from the Seismic Probabilistic Risk Assessment (SPRA) submittal are provided below with the Fussel-Vesely (FV) importances from the sensitivity study inserted into the tables (shown in bold italic font) along with the base SPRA FV importances.

In general, the FV importance of the fragility groups in Table 5.4-2 indicate that the Station Blackout (SBO) sequences increased slightly due to the higher failure probabilities of the FLEX equipment and FLEX-actions HEPs. The FV importance of fragility groups that are not part of SBO sequences decreased slightly, which is expected.

Likewise, the FV importances of the non-seismic failures in Table 5.4-3 indicate a similar change; the FLEX basic events had a higher FV importance due to their higher failure probabilities and the FV importance of basic events associated with non-SBO sequences decreased.

Table 5.4-5 shows the FV importances of HEPs. As indicated in the table, the FV importance of the FLEX HEPs increased, while the importance of HEPs not associated with SBO sequences decreased.

(Partial) Table 5.4-2: SCDF Importance Measures Ranked by FV			
Fragility Groups	**Fragility Group Description**	**U1 CDF FV**	**U2 CDF FV**
SEIS-LOOP	SEISMIC-INDUCED LOSS OF OFFSITE POWER	6.91E-01 ***7.31E-01***	6.90E-01 ***7.30E-01***
SEIS-SSLOCA	SEISMIC-INDUCED SMALL-SMALL LOCA	9.51E-02 ***5.99E-02***	1.02E-01 ***6.44E-02***
SEIS-EE-BKR-HJ8-RLY	4KV to 480V BUS BREAKERS - RELAY CHATTER	6.76E-02 ***1.33E-01***	6.90E-02 ***1.37E-01***
SEIS-SW-P-1AB-RLY	SERVICE WATER PUMPS - RELAY CHATTER	3.84E-02 ***2.55E-02***	3.96E-02 ***2.65E-02***
SEIS-CH-P-1ABC-RLY	CHARGING PUMPS - RELAY CHATTER	3.63E-02 ***2.38E-02***	3.75E-02 ***2.47E-02***
SEIS-SLOCA	SEISMIC-INDUCED SMALL LOCA	3.33E-02 ***2.01E-02***	3.37E-02 ***2.06E-02***
SEIS-VB-INV-1234	120 VAC VITAL BUS INVERTERS	3.26E-02 ***1.77E-02***	3.23E-02 ***1.77E-02***
SEIS-SI-P-1AB-RLY	LOW HEAD SI PUMP - RELAY CHATTER	2.83E-02 ***1.81E-02***	2.83E-02 ***1.84E-02***
SEIS-FW-P-3AB-RLY	MOTOR-DRIVEN AFW PUMPS - RELAY CHATTER	2.65E-02 ***1.66E-02***	2.65E-02 ***1.69E-02***
SEIS-EE-BKR-HJ2-RLY	EDG OUTPUT BREAKERS - RELAY	1.90E-02 ***3.65E-02***	1.94E-02 ***3.77E-02***
SEIS-EP-CB-12ABCD	125 VDC DISTRIBUTION PANELS	1.46E-02 ***9.36E-03***	1.48E-02 ***9.55E-03***
SEIS-EP-CB-4ABCD	120 VAC VITAL BUS DISTRIBUTION PANELS	1.40E-02 ***8.93E-03***	1.41E-02 ***9.12E-03***
SEIS-EDG-HJ-RLY	EMERGENCY DIESEL GENERATORS - RELAY CHATTER	1.09E-02 ***8.74E-03***	1.09E-02 ***8.85E-03***
SEIS-BY-B-1-24	STATION BATTERIES 1-II AND 1-IV	8.53E-03 ***3.91E-03***	8.38E-03 ***3.85E-03***
SEIS-EI-CB-MCR-PNL	SEISMIC FAILURE OF MCR BOARDS AND PANELS	7.55E-03 ***4.76E-03***	7.61E-03 ***4.86E-03***

Table 5.4-3: SCDF Importance Measures Ranked by FV for Non-Seismic Failures			
Unit 1 Model Basic Events	**Prob**	**SCDF FV**	**Description**
1FP-DDP--TM-2	3.16E-02	1.33E-02 ***7.38E-03***	DIESEL-DRIVEN FIRE PUMP 1-FP-P-2 OUT OF SERVICE FOR TEST OR MAINTENANCE
0BDBEDG--FR-1A-FLEX	2.04E-01	7.05E-03 ***4.38E-02***	FLEX DIESEL GENERATOR FAILS TO RUN
0BDBDDP--FS-3A-FLEX	5.46E-02	1.84E-03 ***9.82E-03***	FLEX RCS INJECTION PUMP (00-BDB-P-3A) FAILS TO START
0BDBEDG--FS-1A-FLEX	4.53E-02	1.53E-03 ***8.06E-03***	FLEX DIESEL GENERATOR FAILS TO START
1FW-TRB--TM-2	2.81E-03	1.43E-03 ***8.88E-04***	U1 TURBINE-DRIVEN AFW PUMP OUT OF SERVICE FOR TEST OR MAINTENANCE
1FW-TRB--FS-2	1.92E-03	9.63E-04 ***6.00E-04***	U1 TURBINE-DRIVEN AFW PUMP FAILS TO START
0BDBEDG--FL-1A-FLEX	2.90E-02	9.59E-04 ***5.02E-03***	FLEX DIESEL GENERATOR FAILS TO LOAD
1FW-TRB--FR-2	1.71E-03	8.55E-04 ***5.33E-04***	U1 TURBINE-DRIVEN AFW PUMP FAILS TO RUN
1FP-DDP--FR-2	2.13E-03	8.33E-04 ***4.64E-04***	DIESEL-DRIVEN FIRE PUMP 1-FP-P-2 FAILS TO RUN
0BDBDDP--FR-3A-FLEX	2.28E-02	7.37E-04 ***3.91E-03***	FLEX RCS INJECTION PUMP (00-BDB-P-3A) FAILS TO RUN
Unit 2 Model Basic Events and FV Importance			
1FP-DDP--TM-2	3.16E-02	1.32E-02 ***7.41E-03***	DIESEL-DRIVEN FIRE PUMP 1-FP-P-2 OUT OF SERVICE FOR TEST OR MAINTENANCE
0BDBEDG--FR-1A-FLEX	2.04E-01	6.88E-03 ***4.32E-02***	FLEX DIESEL GENERATOR FAILS TO RUN
0BDBDDP--FS-3A-FLEX	5.46E-02	1.79E-03 ***9.66E-03***	FLEX RCS INJECTION PUMP (00-BDB-P-3A) FAILS TO START
0BDBEDG--FS-1A-FLEX	4.53E-02	1.49E-03 ***7.91E-03***	FLEX DIESEL GENERATOR FAILS TO START
2FW-TRB--TM-2	2.81E-03	1.43E-03 ***8.96E-04***	U2 TURBINE-DRIVEN AFW PUMP OUT OF SERVICE FOR TEST OR MAINTENANCE
2FW-TRB--FS-2	1.92E-03	9.61E-04 ***6.04E-04***	U2 TURBINE-DRIVEN AFW PUMP FAILS TO START
0BDBEDG--FL-1A-FLEX	2.90E-02	9.41E-04 ***4.92E-04***	FLEX DIESEL GENERATOR FAILS TO LOAD
2FW-TRB--FR-2	1.71E-03	8.53E-04 ***5.37E-04***	U2 TURBINE-DRIVEN AFW PUMP FAILS TO RUN
1FP-DDP--FR-2	2.13E-03	8.24E-04 ***4.63E-04***	DIESEL-DRIVEN FIRE PUMP 1-FP-P-2 FAILS TO RUN
0BDBDDP--FR-3A-FLEX	2.28E-02	7.24E-04 ***3.83E-03***	FLEX RCS INJECTION PUMP (00-BDB-P-3A) FAILS TO RUN

5.4-5: SCDF Importance Measures Ranked by FV for Operator Actions		
HEP Basic Event	**SCDF FV**	**Description**
HEP-C-0SW-CHP-ALT	6.61E-02 ***4.05E-02***	Restore Cooling to the Charging Pumps from Fire Protection or Primary Grade Water systems
HEP-C-ALIGN-TDAFW	2.66E-02 ***1.63E-02***	Align turbine-driven AFW Pump to the B and C SGs
HEP-C-FLEX-RIP	1.55E-02 ***5.24E-02***	Install and Start FLEX RCS Injection Pump
HEP-C-FLEX-LOADSHED	7.87E-03 ***2.51E-02***	Load shed the vital 125vdc batteries during SBO
HEP-C-1SI-OPN1836	6.71E-03 ***4.23E-03***	Open 1-SI-MOV-1836 to Align Alternate Flow Path for HHSI
HEP-C-1FW-AFWSPLY	5.50E-03 ***3.85E-03***	Align SW OR Fire Protection Water to AFW Pumps When ECST Depletes
HEP-C-FLEX-VAC	5.36E-03 ***1.91E-02***	Install FLEX Generator to Power Vital Buses
REC-SEIS-FLD-CCHX	5.11E-03 ***2.81E-03***	Isolate SW Flood in Auxiliary Building Caused by Seismic Failure of the CCW Heat Exchangers
HEP SCDF FV Importance in Unit 2 Model		
HEP-C-0SW-CHP-ALT	6.90E-02 ***4.26E-02***	Restore Cooling to the Charging Pumps from Fire Protection or Primary Grade Water systems
HEP-C-ALIGN-TDAFW	2.59E-02 ***1.61E-02***	Align TDAFW Pump to the B and C SGs
HEP-C-FLEX-RIP	1.51E-02 ***5.25E-02***	Install and Start FLEX RCS Injection Pump
HEP-C-FLEX-LOADSHED	7.67E-03 ***2.48E-02***	Load shed the vital 125vdc batteries during SBO
HEP-C-2SI-OPN2836	6.82E-03 ***4.34E-03***	Open 2-SI-MOV-2836 to Align Alternate Flow Path for HHSI
HEP-C-2FW-AFWSPLY	5.57E-03 ***3.93E-03***	Align SW or Fire Protection Water to AFW Pumps When ECST Depletes
HEP-C-FLEX-VAC	5.19E-03 ***1.88E-02***	Install FLEX Generator to Power Vital Buses
REC-SEIS-FLD-CCHX	5.19E-03 ***2.89E-03***	Isolate SW Flood in Auxiliary Building Caused by Seismic Failure of the Component Cooling Heat Exchangers

Tables 5.5-2 (partial), 5.5-3, and 5.5-5 from the submittal are provided below with the FV importances from the sensitivity study inserted into the tables (shown in bold italic font) along with the base SPRA FV importances.

In general, the FV importances of the fragility groups in Table 5.5-2 indicate the SBO sequences increased slightly due to the higher failure probabilities of the FLEX equipment and FLEX-actions HEPs. The FV importance of fragility groups that are not part of SBO sequences decreased slightly, which is expected.

Likewise, the FV importances of the non-seismic failures shown in Table 5.5-3 indicate a similar change; the FLEX basic events had a higher FV importance due to their higher failure probabilities and the FV importance of basic events associated with non-SBO sequences decreased. Basic events that model failures in the SBO sequences had higher FVs due to the increase in the FLEX failure rates.

Table 5.5-5 shows the FV importances of the HEPs. As shown in the table, the FV importance of the FLEX HEPs increased, while the importance of HEPs not associated with SBO sequences decreased.

(Partial) Table 5.5-2: SLERF Importance Measures Ranked by FV			
Fragility Groups	**Fragility Group Description**	**U1 SLERF FV**	**U2 SLERF FV**
SEIS-LOOP	SEISMIC-INDUCED LOSS OF OFFSITE POWER	5.01E-01 ***5.21E-01***	5.05E-01 ***5.28E-01***
SEIS-SLOCA	SEISMIC-INDUCED SMALL LOCA	9.07E-02 ***8.59E-02***	9.19E-02 ***8.62E-02***
SEIS-RS-P-1AB-RLY	INSIDE RS PUMP - RELAY CHATTER	5.46E-02 ***5.13E-02***	5.25E-02 ***4.86E-02***
SEIS-BLDG-RC	REACTOR CONTAINMENT BUILDING	4.40E-02 ***4.12E-02***	4.31E-02 ***3.98E-02***
SEIS-RS-P-2AB-RLYSS	Outside RS Pumps Spuriously Start due to Relay Chatter	2.94E-02 ***2.76E-02***	2.81E-02 ***2.61E-02***
SEIS-FW-P-3AB-RLY	MOTOR-DRIVEN AFW PUMPS - RELAY CHATTER	2.43E-02 ***2.35E-02***	1.80E-02 ***1.70E-02***
SEIS-RS-P-2AB	OUTSIDE RECIRC SPRAY PUMPS	2.29E-02 ***2.16E-02***	2.18E-02 ***2.03E-02***
SEIS-FW-P-2	TURBINE-DRIVEN AUXILIARY FEEDWATER PUMP	2.26E-02 ***2.16E-02***	2.36E-02 ***2.22E-02***
SEIS-EE-BKR-HJ8-RLY	4KV TO 480V BUS BREAKERS - RELAY CHATTER	2.18E-02 ***3.15E-02***	2.20E-02 ***3.25E-02***
SEIS-RS-E-1ABCD	RECIRC SPRAY HEAT EXCHANGERS	1.58E-02 ***1.48E-02***	1.50E-02 ***1.38E-02***
SEIS-EI-CB-MCR-PNL	SEISMIC FAILURE OF MCR BOARDS AND PANELS	1.42E-02 ***1.33E-02***	1.62E-02 ***1.48E-02***
SEIS-BLDG-AB-LOWER	AUX BLDG LOWER FLOORS FAIL	1.42E-02 ***1.32E-02***	1.39E-02 ***1.28E-02***
SEIS-MS-TV-111AB SEIS-MS-TV-211AB	MAIN STEAM TRIP VALVE TO TURBINE DRIVEN AFW PUMP	1.39E-02 ***1.34E-02***	3.18E-03 ***2.97E-03***
SEIS-SSLOCA	SEISMIC-INDUCED SMALL-SMALL LOCA	1.37E-02 ***1.31E-02***	1.46E-02 ***1.38E-02***
SEIS-LLOCA	LARGE LOCA	1.34E-02 ***1.26E-02***	1.27E-02 ***1.18E-02***
SEIS-EG-B-3	EDG 1J Battery	1.32E-02 ***1.38E-02***	4.07E-03 ***3.84E-03***
SEIS-EG-P-1J	EDG 1J Fuel Oil Transfer Pumps	1.29E-02 ***1.35E-02***	3.99E-03 ***3.77E-03***
SEIS-MOV-QSPH-RSHX	MOVs in QUENCH SPRAY PUMP HOUSE - SW Cooling to RS HXs	1.19E-02 ***1.11E-02***	1.13E-02 ***1.04E-02***
SEIS-VB-INV-1234	120 VAC VITAL BUS INVERTERS	1.19E-02 ***9.91E-03***	1.35E-02 ***1.14E-02***

(Partial) Table 5.5-2: SLERF Importance Measures Ranked by FV			
Fragility Groups	**Fragility Group Description**	**U1 SLERF FV**	**U2 SLERF FV**
SEIS-EP-CB-4ABCD	120 VAC VITAL BUS DISTRIBUTION PANELS	1.14E-02 ***1.04E-02***	1.28E-02 ***1.17E-02***
SEIS-MLOCA	MEDIUM LOCA	1.13E-02 ***1.08E-02***	1.22E-02 ***1.14E-02***
SEIS-EE-BKR-HJ2-RLY	EDG OUTPUT BREAKERS - RELAY	1.05E-02 ***1.67E-02***	1.02E-02 ***1.64E-02***
SEIS-QS-TK-1	REFUELING WATER STORAGE TANK (RWST)	9.77E-03 ***9.30E-03***	1.10E-02 ***1.07E-02***
SEIS-RC-CNTRL-RODS	REACTOR CONTROL RODS	9.68E-03 ***9.33E-03***	1.09E-02 ***1.04E-02***
SEIS-EI-CB-202	EMERGENCY DIESEL GENERATOR CONTROL PANELS IN ESGR - Fails EDGs	8.83E-03 ***9.32E-03***	1.13E-02 ***1.23E-02***
SEIS-EP-SS-1H1-1J1	480V LOAD CONTROL CENTERS 1H1 AND 1J1	8.16E-03 ***7.75E-03***	1.20E-02 ***1.24E-02***
SEIS-EI-CB-201	EMERGENCY DIESEL GENERATOR CONTROL PANELS IN EDG ROOM - Fails EDGs	7.98E-03 ***8.26E-03***	9.96E-03 ***1.14E-02***
SEIS-CH-P-1ABC-RLY	CHARGING PUMPS - RELAY CHATTER	7.47E-03 ***7.19E-03***	7.30E-03 ***6.87E-03***
SEIS-CV-TV-150ABCD	Containment Vacuum Isolation Trip Valves	7.11E-03 ***6.64E-03***	6.96E-03 ***6.41E-03***
SEIS-EDG-HJ-RLY	EMERGENCY DIESEL GENERATORS - RELAY CHATTER	7.08E-03 ***8.01E-03***	7.13E-03 ***7.53E-03***
SEIS-EP-SS-1H-1J	480V LOAD CONTROL CENTERS 1H AND 1J	6.87E-03 ***9.43E-03***	1.75E-02 ***2.07E-02***
SEIS-BY-B-1-24	STATION BATTERIES 1-II AND 1-IV	6.70E-03 ***5.97E-03***	8.21E-03 ***7.82E-03***
SEIS-SW-P-1AB-RLY	SERVICE WATER PUMPS - RELAY CHATTER	6.21E-03 ***6.34E-03***	5.97E-03 ***6.02E-03***
SEIS-EP-SW-1H-1J	4160V EMERGENCY BUSES	6.19E-03 ***7.73E-03***	5.85E-03 ***7.37E-03***
SEIS-EG-B-4	EDG 2J Battery	6.09E-03 ***5.79E-03***	1.71E-02 ***2.00E-02***
SEIS-EG-P-2J	EDG 2J Fuel Oil Transfer Pumps	5.78E-03 ***5.50E-03***	1.64E-02 ***1.87E-02***
SEIS-EG-B-1	EDG 1H Battery	5.69E-03 ***5.87E-03***	2.24E-03 ***2.10E-03***
SEIS-FW-P-3AB	MOTOR-DRIVEN AUXILIARY FEEDWATER PUMPS	5.67E-03 ***5.43E-03***	4.06E-03 ***3.84E-03***
SEIS-BLDG-AB-UPPER	AUX BLDG UPPER FLOORS FAIL	5.40E-03 ***5.17E-03***	5.04E-03 ***4.80E-03***

(Partial) Table 5.5-2: SLERF Importance Measures Ranked by FV			
Fragility Groups	**Fragility Group Description**	**U1 SLERF FV**	**U2 SLERF FV**
SEIS-RS-P-2AB-RLYLO	Outside RS Pumps Fail to Start due to Lockout Relay	5.09E-03 ***4.98E-03***	4.64E-03 ***4.39E-03***
SEIS-EI-CB-PROCESS	PLANT PROCESS CABINETS	4.78E-03 ***4.84E-03***	5.19E-03 ***5.14E-03***
SEIS-BDB-DB-123	BEYOND DESIGN BASIS (FLEX) DISTRIBUTION PANELS	4.10E-03 ***3.71E-03***	5.71E-03 ***5.41E-03***
SEIS-EG-B-2	EDG 2H Battery	3.73E-03 ***3.48E-03***	1.21E-02 ***1.49E-02***
SEIS-EG-P-2H	EDG 2H Fuel Oil Transfer Pumps	3.03E-03 ***2.82E-03***	1.05E-02 ***1.16E-02***

Table 5.5-3: SLERF Importance Measures Ranked by FV for Non-Seismic Failures			
Model Basic Events	**Prob**	**SLERF FV**	**Description**
Unit 1 Model Basic Events and FV Importance			
1FP-DDP--TM-2	3.16E-02	5.14E-03 ***4.83E-03***	DIESEL-DRIVEN FIRE PUMP 1-FP-P-2 OUT OF SERVICE FOR TEST OR MAINTENANCE
0SW-HDR--TM-B	1.52E-02	2.95E-03 ***2.81E-03***	B SW HEADER IN OUT OF SERVICE FOR TEST OR MAINTENANCE
0BDBEDG--FR-1A-FLEX	2.04E-01	2.73E-03 ***9.89E-03***	FLEX DIESEL GENERATOR FAILS TO RUN
0SW-HDR--TM-A	1.52E-02	1.99E-03 ***1.86E-03***	A SW HEADER IN OUT OF SERVICE FOR TEST OR MAINTENANCE
1SW-PAT--TM-1B	8.55E-03	1.43E-03 ***1.33E-03***	U1 1B SW PUMP OUT OF SERVICE FOR TEST OR MAINTENANCE
1EE-EDG--FR-1H	2.79E-02	1.29E-03 ***1.40E-03***	U1 H DIESEL GENERATOR FAILS TO RUN
1EE-EDG--FR-1J	2.79E-02	1.14E-03 ***1.25E-03***	U1 J DIESEL GENERATOR FAILS TO RUN
1SW-PAT--TM-1A	8.55E-03	1.01E-03 ***9.40E-04***	U1 1A SW PUMP OUT OF SERVICE FOR TEST OR MAINTENANCE
1EE-EDG--TM-1H	2.25E-02	9.13E-04 ***1.00E-03***	U1 H DIESEL GENERATOR OUT OF SERVICE FOR TEST OR MAINTENANCE
1EE-EDG--TM-1J	2.25E-02	8.65E-04 ***9.44E-04***	U1 J DIESEL GENERATOR OUT OF SERVICE FOR TEST OR MAINTENANCE
Unit 2 Model Basic Events and FV Importance			
1FP-DDP--TM-2	3.16E-02	5.25E-03 ***4.95E-03***	DIESEL-DRIVEN FIRE PUMP 1-FP-P-2 OUT OF SERVICE FOR TEST OR MAINTENANCE
0BDBEDG--FR-1A-FLEX	2.04E-01	2.67E-03 ***1.14E-02***	FLEX DIESEL GENERATOR FAILS TO RUN
0SW-HDR--TM-A	1.52E-02	2.62E-03 ***2.42E-03***	A SW HEADER IN OUT OF SERVICE FOR TEST OR MAINTENANCE
2EE-EDG--FR-2H	2.79E-02	2.31E-03 ***2.70E-03***	U2 H DIESEL GENERATOR FAILS TO RUN
2EE-EDG--TM-2H	2.25E-02	1.79E-03 ***2.04E-03***	U2 H DIESEL GENERATOR OUT OF SERVICE FOR TEST OR MAINTENANCE
0SW-HDR--TM-B	1.52E-02	1.55E-03 ***1.48E-03***	B SW HEADER IN OUT OF SERVICE FOR TEST OR MAINTENANCE

Table 5.5-3: SLERF Importance Measures Ranked by FV for Non-Seismic Failures			
Model Basic Events	**Prob**	**SLERF FV**	**Description**
2EE-EDG--FR-2J	2.79E-02	1.27E-03 ***1.37E-03***	U2 J DIESEL GENERATOR FAILS TO RUN
2SW-PAT--TM-1B	8.55E-03	1.12E-03 ***1.03E-03***	U2 1B SW PUMP OUT OF SERVICE FOR TEST OR MAINTENANCE
2EE-EDG--TM-2J	2.25E-02	9.71E-04 ***1.05E-03***	U2 J DIESEL GENERATOR OUT OF SERVICE FOR TEST OR MAINTENANCE
2QS-PSB--FS-1A	5.59E-03	8.63E-04 ***7.95E-04***	U2 1A QS PUMP FAILS TO START

5.5-5: SLERF Importance Measures Ranked by FV for Operator Actions		
HEP Basic Event	**SLERF FV**	**Description**
HEP SLERF FV Importance in Unit 1 Model		
HEP-C-RCSDEP	2.71E-02 ***2.33E-02***	Depressurize the RCS Per SAMGs
HEP-C-ALIGN-TDAFW	2.26E-02 ***2.05E-02***	Align turbine-driven AFW Pump to B and C SGs
HEP-C-1BAFE	1.17E-02 ***1.01E-02***	Initiate Bleed and Feed After AFW Fails
HEP-C-FLEX-RIP	8.28E-03 ***3.84E-02***	Install and Start FLEX RCS Injection Pump
HEP-C-1HV-SFGD-VENT	6.77E-03 ***5.80E-03***	Restore Safeguards Area Ventilation
REC-SEIS-FLD-CCHX	5.92E-03 ***5.11E-03***	Isolate SW Flood in Auxiliary Building Caused by Failure of the Component Cooling Heat Exchangers
HEP-C-FLEX-LOADSHED	5.23E-03 ***1.85E-02***	Load shed the vital 125vdc batteries during SBO
HEP SLERF FV Importance in Unit 2 Model		
HEP-C-RCSDEP	2.56E-02 ***2.15E-02***	Depressurize the RCS Per SAMGs
HEP-C-ALIGN-TDAFW	2.34E-02 ***2.12E-02***	Align turbine-driven AFW Pump to B and C SGs
HEP-C-2BAFE	9.27E-03 ***7.84E-03***	Initiate Bleed and Feed After AFW Fails
HEP-C-FLEX-RIP	8.31E-03 ***3.87E-02***	Install and Start FLEX RCS Injection Pump
HEP-C-2HV-SFGD-VENT	6.73E-03 ***5.66E-03***	Restore Safeguards Area Ventilation
REC-SEIS-FLD-CCHX	5.72E-03 ***4.83E-03***	Isolate SW Flood in Auxiliary Building Caused by Failure of the Component Cooling Heat Exchangers
HEP-C-FLEX-LOADSHED	5.52E-03 ***1.98E-02***	Load shed the vital 125vdc batteries during SBO

Sensitivity Study Conclusion

This sensitivity shows the effect on seismic core damage frequency (SCDF) and seismic large early release frequency (SLERF) and the impact on importances if the FLEX equipment failure rates and FLEX HEPs are increased. The results of the sensitivity showed the SCDF increases by approximately 15% and the SLERF increases by approximately 3%.

However, the SPRA does not credit deployment of the spares that are in the FLEX storage building and, therefore, the impact on seismic risk due to variabilities in the failure rates and HEPs is expected to be less than indicated by the results of this sensitivity study. For example, there are multiple spare FLEX diesel generators available that could be used if one diesel generator failed to start, load or run. If these spares were credited in the FLEX functions in the SPRA, the SCDF and SLERF are expected to decrease or remain the same as the base SCDF and SLERF even with the higher FLEX equipment failure probabilities.