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DTE Energy

10 CFR 50.54(f)

October 24, 2012
NRC-12-0059

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

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

2) NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System," dated July 27, 2012 [ML12074A115]

Subject: Fermi 2 90-Day Response to NRC Bulletin 2012-01:
Design Vulnerability in Electric Power System

The Nuclear Regulatory Commission (NRC) issued Bulletin 2012-01 (Reference 2), to request each licensee to provide a comprehensive verification of their compliance with the regulatory requirements of General Design Criterion (GDC) 17, "Electric Power Systems," in Appendix A, "General Design Criteria for Nuclear Power Plants," to 10 CFR Part 50 or the applicable principal design criteria in the updated final safety analysis report; and the design criteria for protection systems under 10 CFR 50.55a(h)(2) and 10 CFR 50.55a(h)(3). Addressees were required to provide a written response to the NRC in accordance with 10 CFR 50.54(f).

In Bulletin 2012-01, the NRC requested each licensee to submit a written response within 90 days of the date of the Bulletin.

The enclosure to this letter provides the requested response.

There are no new commitments included in this document.

Should you have any questions or require additional information, please contact Zackary Rad, Manager - Nuclear Licensing at (734) 586-5076.

Sincerely,

Enclosure: 90-Day Response to NRC Bulletin 2012-01: Design Vulnerability in Electric Power System

cc: NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 4, Region III verify
Regional Administrator, Region III
Supervisor, Electric Operators,
Michigan Public Service Commission

I, J. Todd Conner, do hereby affirm that the foregoing statements are based on facts and circumstances which are true and accurate to the best of my knowledge and belief.

J. Todd Conner
Site Vice President

On this 24 day of October, 2012 before me personally appeared J. Todd Conner, being first duly sworn and says that he executed the foregoing as his free act and deed.

Sharon S. Marshall
Notary Public

SHARON S. MARSHALL
NOTARY PUBLIC, STATE OF MI
COUNTY OF MONROE
MY COMMISSION EXPIRES Jun 14, 2013
ACTING IN COUNTY OF Monroe

Enclosure to
NRC-12-0059

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

90-Day Response to NRC Bulletin 2012-01: Design Vulnerability in Electric Power System

Detroit Edison's 90-Day Response to NRC Bulletin 2012-01: Design Vulnerability in Electric Power System

Fermi 2 System Description

Fermi 2 takes credit for two physically independent offsite power sources from the Transmission Grid System. These two offsite power sources are derived from different sections of the Grid and feed into Fermi 2 at two different transmission voltages via two Switchyards, physically and geographically apart. These two offsite power sources supply the two Divisional safety related (Class 1E) loads at Fermi 2 and also power the AC chargers for the respective Divisional battery and DC distribution system. Divisional Class 1E loads are powered both during plant operation (normal) and during shutdown from these offsite sources. Each Divisional safety related AC distribution system is also supported by two onsite Emergency Diesel Generators (EDG), each EDG connects to its own 4.16kV dedicated bus (Buses 11EA, 12EB for Division 1; Buses 13EC, 14ED for Division 2). In the event of Loss of Offsite Power (LOOP), each one of the 4 EDGs will accept its assigned Class 1E loads, independently of the other EDGs.

Initiation of EDG start at a Design Basis Event (DBE) and transfer of loads between the Divisional offsite power source and the respective onsite emergency generation is direct and does not depend on any intermediate transfer steps between system and auxiliary buses, transformers or on tripping of the Main Generator. See attached one line diagram of 4.16kV and 480V ESF and BOP Buses for configuration.

For Degraded Voltage (DV) relaying in either Division, four undervoltage (UV) [type 27N] relays monitor across each phase (YN, ZN, YZ and XY) in a 2 out of 2 logic actuation configuration. Similarly, for Loss of Voltage (LOV) relaying, four UV [type 27D] relays monitor across each phase (XN, YN, YZ and XY) in a 2 out of 2 logic actuation configuration.

Consistent with the current licensing basis, 10 CFR 50 Appendix A General Design Criteria (GDC) 17 and IEEE Standards of commitment, Fermi 2 maintains physical and electrical independence of its two Divisional AC distribution systems from the respective source to the actual load.

Offsite supply to the Division 1 Switchyard is powered by three (3) 120kV transmission lines connected to a common 120kV bus, formed in two sections, Bus 101 and Bus 102, which are connected by Breaker GH (normally closed). Bus 101 voltage is stepped down to supply Division 1 Class 1E loads. 120k-13.2kV Transformer 1, in series with 13.2k-4.16kV System Service (SS) Transformer SS64, supplies all Division 1 safety related and selected Balance of Plant (BOP) loads.

Offsite supply to the Division 2 Switchyard is powered by two (2) 345kV transmission lines connected to a ring formed by double bus (Buses 301 and 302), double breaker, and three interconnecting rows between Buses 301 and 302, from which (Bus 301) voltage is stepped

down to supply Division 2 Class 1E loads. 345k-4.16kV Transformer SS65 supplies all Division 2 safety related and selected BOP loads.

To facilitate the discussion below, the 120kV lines into Division 1 switchyard and the 345kV lines into Division 2 switchyard will be referred to collectively as Extra High Voltage (EHV) transmission lines. All EHV transmission lines together with the Switchyard bus structures are owned, operated and maintained by International Transmission Company (ITC). Fermi 2 and ITC have a Nuclear Plant Operating Agreement, which provides the bases for reliable protective relaying systems.

Extent of Susceptibility to a Single-Phase Open Circuit Event (OPE)

A single phase open circuit event is also referred to as "Open Phase Event" (OPE) which includes high impedance faults with zero or negligible ground current. Standard transmission protective relaying schemes presently known in the industry are insufficient to detect and provide reliable automatic clearance of the OPEs.

Protective relaying schemes for ITC transmission lines and bus structures would clear most faults including short circuits, but are not designed to detect and automatically respond to OPEs (including high impedance ground fault). Postulation of OPEs without a preceding short circuit event is not a credible scenario within the Fermi 2 switchyard bus structures (EHV bus). Fermi 2 EHV sources are comprised of three EHV lines for Division 1 and 2 EHV lines for Division 2. Based on the configuration by which ITC EHV transmission lines are connected to the EHV bus (forming a common bus for Division 1 and a double bus, double breaker, three row ring for Division 2), a single OPE on one EHV line and the failure to detect does not result in a degraded condition at Fermi 2 given the robustness of the offsite Transmission Grid System.

The power supply to Division 1 4.16kV and 480V ESF buses and Class 1E loads plus selected BOP loads is derived from the 120kV Bus 101 via a short radial overhead tap line to the high side of 120k-13.2kV Transformer 1 and then via underground cabling to 13.2k-4.16kV transformer SS64. The total length of this radial tap line is estimated to be less than 50 feet. Further step-down is via underground / insulated cabling in protected raceways and 4.16k-480V transformers. The supply to Division 2 4.16kV and 480V ESF buses and Class 1E loads plus selected BOP loads is derived from the 345kV Bus 301 via a short radial overhead tap line to the high side of 345k-4.16k-4.16kV transformer SS65. The total length of this radial tap line is estimated to be less than 1000 feet. Further step-down is via insulated cabling and 4.16k-480V transformers. Connections to ESF buses from onsite emergency diesel generators are accomplished via underground cabling and switchgear. See the attached simplified switchyard diagrams. Based on the protected environment for underground / insulated cabling and switchgear, an OPE in the cabling and switchgear systems without a preceding short circuit event is not considered a credible postulation.

Therefore, the extent of the susceptibility to a Single-Phase Open Circuit Event at Fermi 2 is limited to the short radial overhead tap line in each Division. Additionally, Fermi 2 does not

have the problematic insulator stack identified in Bulletin 2012-01. A single OPE failure at the vulnerable location in a single Division will not impact the other Division; therefore, Fermi 2 is protected by at least one Division of safety related equipment in accordance with GDC 17 requirements.

Response to Specific Requested Actions

Item 1:

"Given the requirements above, describe how the protection scheme for ESF buses (Class 1E for current operating plants or non-Class 1E for passive plants) is designed to detect and automatically respond to a single-phase open circuit condition or high impedance ground fault condition on a credited off-site power circuit or another power sources."

Response to Item 1:

As described in the Fermi 2 System Description and Extent of OPE Susceptibility an undetected single-phase open circuit condition including high impedance ground fault condition on a credited EHV offsite power circuit does not adversely impact the safety related systems and does not lead to an unbalanced voltage situation for Class 1E loads at Fermi 2.

Fermi 2 has a limited susceptibility to an OPE including a high impedance ground fault condition where a postulated OPE occurs at a single EHV radial overhead tap line for either Division (to the high side of Transformer 1 for Division 1 and the high side of SS65 for Division 2).

The 4.16kV and 480V ESF buses at Fermi 2 are equipped with two types of UV relaying. Due to incomplete monitoring of all the line-to-line and line-to-neutral voltages, Fermi 2 does not have detection or automatic response to an OPE for all conditions.

A single OPE failure at the vulnerable location in one Division will not impact the other Division and Fermi 2 remains protected by at least one Division of safety related equipment in accordance with GDC 17 requirements.

Item 1.a:

"Also, include the following information: The sensitivity of protective devices to detect abnormal operating conditions and the basis for the protective device setpoint(s)."

Response to Item 1.a:

This item is not applicable to Fermi 2. Fermi 2 conservatively assumes that the UV relays installed at 4.16kV and 480V ESF buses are not capable of detecting OPE at the EHV radial tap lines.

Item 1.b:

"Also, include the following information: The differences (if any) of the consequences of a loaded (i.e., ESF bus normally aligned to offsite power transformer) or unloaded (e.g., ESF buses normally aligned to unit auxiliary transformer) power source."

Response to Item 1.b:

The ESF buses at Fermi 2 are aligned to offsite power sources, both during normal plant operation and during shutdown.

The respective Divisional system service transformers also power BOP loads (major BOP loads include 3 condensate pumps, 3 heater feed pumps and 3 heater drain pumps, of which two are running at any one time; and the reactor recirculation pumps) in addition to Class 1E loads and are therefore always loaded at power.

Fermi 2 does not have an unloaded scenario. The Divisional system service transformers are also loaded during plant shutdown to meet safety related cooling and BOP requirements. Fermi 2 is designed with two credited offsite transmission sources with no unit auxiliary transformers, hence the situation with an unloaded system service transformer never arises.

For Fermi 2, initiation of EDG start as a result of a DBE and transfer of loads between the Divisional offsite power source and the respective onsite emergency generation is direct and not dependent upon any intermediate transfer steps between system and auxiliary buses, transformers, or on tripping of the Main Generator.

Item 1.c:

"Also, include the following information: If the design does not detect and automatically respond to a single phase open circuit condition or high impedance ground fault condition on a credited offsite power circuit or another power sources, describe the consequences of such an event and the plant response."

Response to Item 1.c:

As described in the Fermi 2 System Description and Extent of OPE Susceptibility, a single-phase open circuit condition including high impedance ground fault condition on a credited EHV offsite power circuit will be undetected by ITC's protective relaying systems, have no impact on the Fermi 2 systems because multiple ITC EHV lines are available to each division. Therefore, this will not lead to an unbalanced voltage situation for Class 1E loads.

Fermi 2 has a limited susceptibility to an OPE including a high impedance ground fault condition where a postulated OPE occurs at the EHV radial overhead tap line for either Division (to the high side of Transformer 1 for Division 1 and the high side of SS65 for Division 2).

The 4.16kV and 480V ESF buses are equipped with two types of UV relaying. Due to incomplete monitoring of all the line-to-line and line-to-neutral voltages, Fermi 2 does not have detection or automatic response to an OPE for all conditions.

An OPE at a susceptible location will likely result in loss of a single division power supply (e.g., motor trips, running motor high vibration and high bearing temperatures, motor failure to start, pumps unable to develop rated head/flow, motor heating).

The mitigating circumstances for an OPE occurrence at the vulnerable locations at Fermi 2 include the limited physical extent of OPE susceptibility, absence of the problematic insulator stacks, improved Operator Rounds, increased thermography and enhanced training for Operators.

Each Divisional system service transformer (Transformer 1 for Division 1 and SS65 for Division 2) supplies Class 1E and BOP loads including major equipment that are required to run on balanced 3-phase supply, occurrence of an OPE on the respective EHV radial tap lines (Division 1 and Division 2) will distort the voltage balance and alert the Operators due to tripping of such loads, inability to start other 3-phase loads and /or failure to develop rated torque /head /flow. Additionally, any single OPE occurrence to the radial tap line of one Division will not affect the other Division and will not cause both Divisions to become inoperable. Abnormal Operating Procedure, 20.300.PHASE, was written to guide the Operators on response to such an event. Fermi 2 Operators completed training in detection and diagnostics of OPE events.

A single OPE failure at the vulnerable location in one Division will not impact the other Division and Fermi 2 remains protected by at least one Division of safety related equipment in accordance with GDC 17 requirements.

Item 1.d:

"Also, include the following information: Describe the offsite power transformer (e.g., start-up, reserve, station auxiliary) winding and grounding configurations."

Response to Item 1.d:

The Divisional system service transformers (Transformer 1 and SS64 for Division 1 and SS65 for Division 2) derive their power from the respective EHV transmission sources and power both the respective Divisional Class 1E loads and selected BOP loads. The Divisional system service transformers are loaded both at normal operation and at shutdown.

Transformer 1 is a delta primary (120kV), resistance-grounded wye secondary (13.2kV) transformer. SS64 is delta on primary (13.2kV), and resistance-grounded wye on secondary (4.16kV). SS65 is a three-winding transformer, one primary and two secondaries (345k wye-G – 4.16kV wye R-G – 4.16kV wye R-G), solidly grounded on the primary and the two secondaries are resistance-grounded wye. One set of secondaries supplies the 4.16kV ESF Buses 65E, 65F and BOP Buses 65D and 65L. The other secondary supplies BOP Bus 65G. BOP Bus 65G

supplies the two motor-generator sets which drive the Reactor Recirculation Pumps . All except one 4.16k-480V transformers are delta on primary and solidly grounded wye on secondary.

Item 2:

"Briefly describe the operating configuration of the ESF buses (Class 1E for current operating plants or non-Class 1E for passive plants) at power (normal operating condition)."

Response to Item 2:

ESF buses at Fermi 2 are divided into two divisions, each powered by its respective AC Divisional offsite source from the Transmission Grid System. Each Divisional offsite source as well as the related divisional system service transformer is loaded at power (normal operating condition). ESF buses and related Class 1E loads in each Division are supported by two onsite Emergency Diesel Generators (EDG), each connected onto its own 4.16kV dedicated bus (Buses 11EA, 12EB for Division 1; Buses 13EC, 14ED for Division 2). From this dedicated bus, the EDG is ready to pick up its section of Class 1E loads within the same Division sequenced back on in a DBE. The onsite Emergency Diesel Generation System remains on standby at power. Initiation of EDG start at a DBE and transfer of loads between Divisional offsite power source and the respective onsite emergency generation is direct and not dependent upon any intermediate transfer steps between system and auxiliary buses, transformers, or on tripping of the Main Generator. Consistent with the current licensing basis, GDC 17 and IEEE Standards of commitment, Fermi 2 maintains this physical and electrical independence of the two Divisional AC distribution systems, from the respective power source (for either offsite or onsite source) through all voltage levels down to the load so that any single failure event would not cause both Divisions to malfunction or become inoperable simultaneously. Operationally, Fermi 2 is always protected by at least one Division of safety related equipment.

Item 2.a:

"Include the following details: Are the ESF buses powered by offsite power sources? If so, explain what major loads are connected to the buses including their ratings."

Response to Item 2.a

Yes, ESF buses are powered by offsite power sources. Each offsite power source together with the Divisional system service transformer supplies ESF and BOP loads. Major loads for Divisional ESF Buses:

Division 1 – 4.16kV Buses

ESF Bus 64B:

4.16kV Bus 64B is powered by SS64 via Breaker B6, and also supplies, during normal operation, Bus 11EA. Major loads include:

- Residual Heat Removal (RHR) Pump 'A' - 2000hp
- Core Spray (CS) Pump 'A' - 800hp
- Control Rod Drive (CRD) Water Pump 'A' - 250hp
- Mechanical Draft Cooling Tower (MDCT) Fan A - 150 / 37.5hp
- Reactor Building (RB) Supply Fan East - 75hp
- RB Exhaust Fan East - 75hp
- RHRSW Pump 'A' - 300hp
- 750 kVA Transformer 72EA
- 300kVA House Service Transformer 1

ESF Bus 64C:

4.16kV Bus 64C is powered by SS64 via Breaker C6, and also supplies, during normal operation, Bus 12EB. Major loads include:

- RHR Pump 'C' - 2000hp
- CS Pump 'C' - 800hp
- MDCT Fan C - 150 / 37.5hp
- Emergency Equipment Service Water (EESW) Pump A - 100hp
- Reactor Building Closed Cooling Water (RBCCW) System Pump N - 200hp
- Emergency Equipment Cooling Water (EECW) Pump North - 100hp
- Division 1 Control Center Chiller - 130hp
- RHR Service Water Pump 'C' –-300hp
- 750 kVA Transformer 72EB

Division 2 – 4.16kV Buses

ESF Bus 65E:

4.16kV Bus 65E is powered by SS65 via Breaker E6, and also supplies, during normal operation, Bus 13EC. Major loads include:

- RHR Pump 'B' - 2000hp
- CS Pump 'B' - 800hp
- CRD Water Pump 'B' - 250hp
- MDCT Fan B - 150 / 37.5hp

- Motor-Generator (MG) Oil Pump B1 - 100hp
- RB Exhaust Fan West - 75hp
- RB Supply Fan West - 75hp
- MG Oil Pump A-2 - 100hp
- RBCCW Pump South - 200hp
- RHR Service Water Pump 'B' - 300 hp
- 750 kVA Transformer 72EC

ESF Bus 65F:

4.16kV Bus 65F is powered by SS65 via Breaker F6, and also supplies, during normal operation, Bus 14ED. Major loads include:

- RHR Pump 'D' - 2250hp
- CS Pump 'D' – 800 hp
- MDCT Fan D - 150 / 37.5hp
- MG Oil Pump B2 - 100hp
- RB Exhaust Fan Center - 75hp
- RB Supply Fan Center - 75hp
- MG Oil Pump A-1 - 100hp
- RBCCW Pump Center - 200hp
- EECW Pump South - 100hp
- Division 2 Control Center Chiller - 130hp
- RHR Service Water Pump 'D' – 300 hp
- 750 kVA Transformer 72ED

Item 2.b:

"Include the following details: If the ESF buses are not powered by offsite power sources, explain how the surveillance tests are performed to verify that a single-phase open circuit condition or high impedance ground fault condition on an off-site power circuit is detected."

Response to Item 2.b:

This item is not applicable to Fermi 2. Fermi 2 ESF buses are powered by offsite power sources.

Item 2.c:

"Include the following details: Confirm that the operating configuration of the ESF buses is consistent with the current licensing basis. Describe any changes in offsite power source alignment to the ESF buses from the original plant licensing."

Response to Item 2.c:

The operating configuration of Fermi 2's ESF buses is consistent with the current licensing basis. Since original licensing, minor changes internal to the Division 1 120kV Switchyard have been made whereby transformers that previously provided power to Fermi 1 were eliminated. The Division 2 345kV Switchyard was modified during refueling outage RF-15 (2012) from the existing two row configuration to a three row, double bus configuration with two breakers in each row and the Main Turbine Generator (MTG) in its own row, isolated from the incoming offsite lines. This modification improved the overall reliability of the offsite power source to Division 2 system transformer SS65 in the events of (a) a single breaker failure, (b) MTG trip and (c) single failure of one incoming offsite line. The modification also improved the availability of offsite power to Division 2 system transformer SS65 and that of the MTG to the Grid by eliminating the need for an outage in order to perform EHV line or breaker maintenance. There have been no other changes in the offsite power source alignment to the ESF buses from the original plant licensing.

Item 2.d:

"Include the following details: Do the plant operating procedures, including off-normal operating procedures, specifically call for verification of the voltage on all three phases of the ESF buses?"

Response to Item 2.d:

Plant operating procedures, including off-normal operating procedures, do not specifically call for verification of the voltage on all three phases of the ESF buses, however, monthly surveillance procedures for the four EDGs include verification of voltages on all three phases of 4.16kV buses. A single EDG is run weekly on a staggered basis. Voltage is monitored in the RHR complex at the respective EDG panel, with a voltmeter selectable to read the three phases. EDGs 11 and 12 are connected to Division 1 ESF buses and EDGs 13 and 14 are connected to Division 2 ESF buses. Therefore each Divisional voltage on all three phases are checked twice each month.

Monthly surveillance checks, improved Operator Rounds, and Operator training in detection and diagnostics elevate the Operator's awareness of the need to inspect connections at all three phases and whenever it is safe and feasible, check for voltages on all three phases.

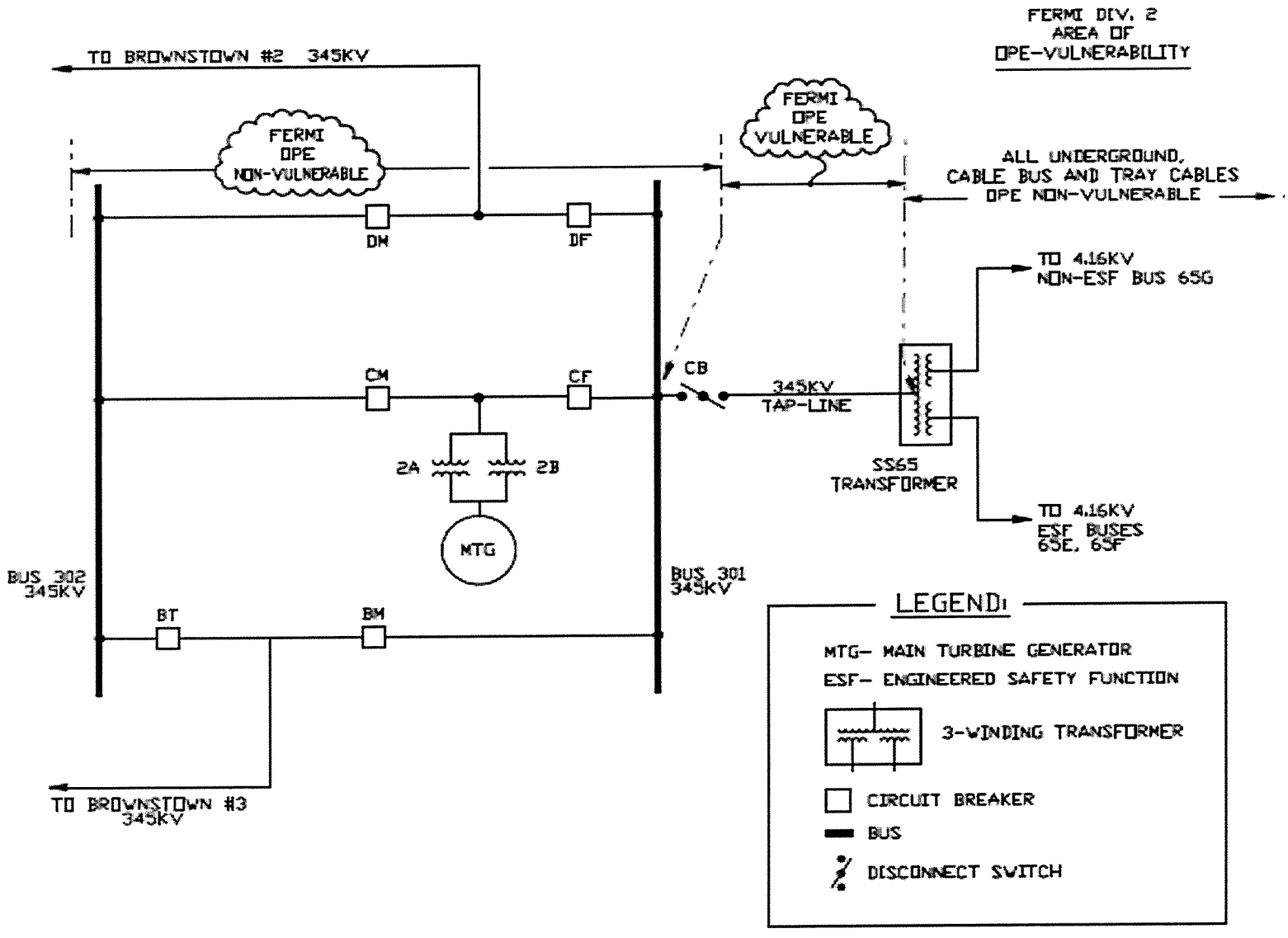
Item 2.e:

"Include the following details: If a common or single offsite circuit is used to supply redundant ESF buses, explain why a failure, such as a single-phase open circuit or high impedance ground fault condition, would not adversely affect redundant ESF buses."

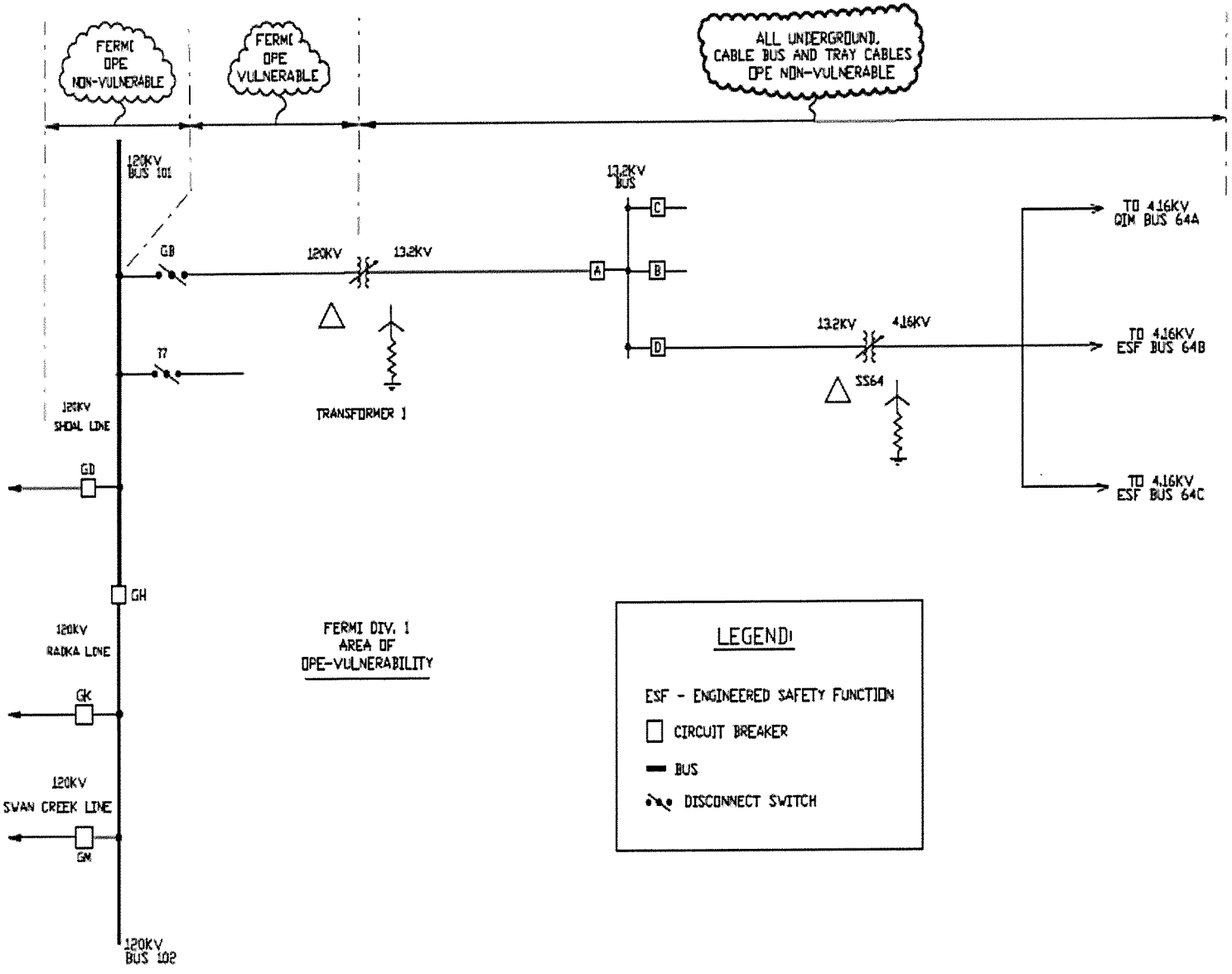
Response to Item 2.e:

This item does not apply to Fermi 2. Fermi 2 credits two physically independent offsite power sources. Division 1 offsite source has three transmission circuits at 120kV connected to form a common bus. Division 2 offsite source has two transmission circuits at 345kV connected to form a ring with double bus, double breaker and three rows. A single OPE on one EHV line from the grid does not result in a degraded condition at Fermi 2, given the robustness of the Transmission Grid System.

Simplified 345 kV Switchyard Diagram



Simplified 120 kV Switchyard Diagram



Simplified 4160V and 480V One Line Diagram