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October 25, 2012

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

ATTENTION: Document Control Desk

SUBJECT: **R.E. Ginna Nuclear Power Plant**
Docket No. 50-244

Response to NRC Bulletin 2012-01

REFERENCE: (1) NRC Bulletin 2012-01, "Design Vulnerability in Electric Power System," dated July 27, 2012

The U. S. Nuclear Regulatory Commission (NRC) Bulletin 2012-01 (Reference [1]) was issued to request (1) information; and (2) that licensees verify compliance with applicable regulatory requirements or applicable principal design criteria in light of the recent operating experience at Byron Station, Unit 2, on the loss of one of the three phases of the offsite power circuit.

The NRC bulletin requested a response within 90 days of the date of the bulletin (Reference [1]). The information and verification of compliance with applicable regulatory requirements or applicable principal design criteria as described in the current licensing basis is presented in Enclosure 1. There are no regulatory commitments identified in this letter.

If there are any questions regarding this submittal, please contact Thomas Harding at 585-771-5219 or Thomas.HardingJr@cengllc.com.

Very truly yours,

Joseph E. Pacher

IE76
NRR

STATE OF NEW YORK :
: TO WIT:
COUNTY OF WAYNE :

I, Joseph E. Pacher, being duly sworn, state that I am Vice President, R.E. Ginna Nuclear Power Plant, LLC (Ginna LLC), and that I am duly authorized to execute and file this request on behalf of Ginna LLC. To the best of my knowledge and belief, the statements contained in this document are true and correct. To the extent that these statements are not based on my personal knowledge, they are based upon information provided by other Ginna LLC employees and/or consultants. Such information has been reviewed in accordance with company practice and I believe it to be reliable.

Subscribed and sworn before me, a Notary Public in and for the State of New York and County of Monroe, this 25th day of October, 2012.

WITNESS my Hand and Notarial Seal:

Sharon L Miller
Notary Public

SHARON L. MILLER
Notary Public, State of New York
Registration No. 01MI6017755
Monroe County
Commission Expires December 21, 20 14

My Commission Expires:

12-21-14

Enclosure: (1) Response to NRC Bulletin 2012-01

cc: M. C. Thadani, NRC
W. M. Dean, NRC
Ginna Resident Inspector, NRC

ENCLOSURE 1

RESPONSE TO NRC BULLETIN 2012-01

R. E. Ginna Nuclear Power Plant
October 25, 2012

Attachment 1 - Bulletin Response

Bulletin Response

Overview:

- System Description - Items 2., 1.d, 2.a, 2.c
- System Protection - 1., 1.a, 2.b, 2.d
- Consequences - 1.b, 1.c, 2.e
- Attachment 2 - Simplified One-Line Diagram
- Attachment 3 - Tables
    - Table 1 - ESF Buses Continuously Powered From Offsite Power Source(s)
    - Table 2 - ESF Buses Not Continuously Powered From Offsite Power Source(s)
    - Table 3 - ESF Buses Major Loads
    - Table 4 - Offsite Power Transformers
    - Table 5 - Protective Devices

System Description

Items 2., 1.d, 2.a, and 2.c request system information and will be addressed in this section:

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).

See Attachment 2, for a simplified one-line diagram.

The plant AC sources consist of an independent offsite power source and the onsite standby emergency power source. Atomic Industrial Forum (AIF) GDC 39 requires emergency power sources be provided and designed with adequate independence, redundancy, capacity, and testability to permit the functioning of the Engineered Safety Features (ESF) and protection systems. The offsite and onsite AC sources can each supply power to 480 V safeguards buses to ensure that reliable power is available during any normal or emergency mode of plant operation. The 480 V safeguards buses are divided into redundant trains so that the loss of any one train does not prevent the minimum safety functions from being performed. Safeguards Buses 14 and 18 are associated with Train A and safeguards Buses 16 and 17 are associated with Train B. Since only the onsite standby power source is classified as Class 1E, the offsite power source is not required to be separated into redundant trains.

The independent offsite power source consists of breakers, transformers, switches, interrupting devices, cabling, and controls required to transmit power from the offsite transmission network to the onsite 480 V safeguards buses. The independent offsite power source essentially begins from two station auxiliary transformers (SAT 12A and 12B) each supplied from an independent transmission line emanating from the same switchyard (see Attachment 2). SAT 12A is connected to the 115 kV transmission system (via 34.5 kV circuit 7T) and SAT 12B is connected to the 115 kV transmission system (via 34.5 kV circuit 767). The SATs may be configured in the following modes:

a) SAT 12A supplies safeguards Buses 14 and 18 or Buses 16 and 17 and SAT 12B supplies safeguards Buses 16 and 17 or Buses 14 and 18 (50/ 50 mode);

b) SAT 12A supplies all safeguards Buses (0/100 mode); or

c) SAT 12B supplies all safeguards Buses (100/0 mode).

The preferred configuration is the 50/50 mode; however, all three modes of operation meet applicable design requirements for normal operation. Offsite power can also be provided during an emergency through the plant auxiliary transformer 11 by backfeeding from the 115 kV transmission system and main transformer.

SATs 12A and 12B are each connected to two non-Class 1E, 4.16 kV buses (12A and 12B). The 4.16 kV Bus 12A feeds the Class 1E loads on the 480 V safeguards Buses 14 and 18 and 4.16 kV Bus 12B feeds the Class 1E loads on the 480 V safeguards Buses 16 and 17 (see Figure B 3.8.1-1). Loss of power to any of the safeguards buses, as a result of inoperable offsite circuit component(s), is a loss of offsite power. The offsite power source ends after the feeder breaker supplying each 480 V safeguards bus.

1.d. Describe the offsite power transformer (e.g., start-up, reserve, station auxiliary) winding and grounding configurations.

See Attachment 3, Table 4 for offsite power transformer winding and grounding configurations.

2.a. Are the ESF buses powered by offsite power sources? If so, explain what major loads are connected to the buses including their ratings.

For at power (normal operating condition) configurations, ESF buses are powered by offsite sources.

See Attachment 3, Tables 1 and 2 for ESF bus power sources.

See Attachment 3, Table 3 for ESF bus major loads energized during normal power operations, including their ratings.

2.c. 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.

The following at power (normal operating condition) configurations have been confirmed to be consistent with the current licensing basis:

Bus 12A provides power to ESF Buses 14 and 18; Bus 12B provides power to ESF Buses 16 and 17. Breakers 12AX, 12AY, 12BX, and 12BY (Attachment 2) permit the station auxiliary transformers to be lined up so that transformer 12A supplies one engineered safeguards bus and transformer 12B supplies the other (50/50 mode), transformer 12A supplies both safeguards buses (0/100 mode), or transformer 12B supplies both safeguards buses (100/0 mode). The 50/50 mode is the normal configuration.

Ginna Station was originally designed with a single station auxiliary transformer 12A. Though a single station auxiliary transformer (12A) was found to be sufficient during original plant licensing and in subsequent evaluations including SEP Topic VII-3, a spare station auxiliary transformer 12B was acquired and in 1977 the spare transformer was permanently connected to the 34.5-kV bus. To increase the availability margin in the event of a single system failure, the 34.5-kV bus was later split and the system configured as shown in Attachment 2. Station auxiliary transformer 12A is connected to circuit 7T and station auxiliary transformer 12B is connected to circuit 767. Circuit 7T receives 34.5 kV from RG&E station 13A via 115 kV to 34.5 kV stepdown transformer 7, which has an integral load tap changer (LTC) for voltage regulation. Circuit 767 receives 34.5 kV from RG&E Station 13A via 115 kV to 34.5-kV stepdown transformer 6. This information is reflected in the Ginna Technical Specifications.

Reference:

1. Ginna Station UFSAR Revision 23
2. Ginna Station Technical Specifications Amendment No. 112
3. Ginna Station Technical Specifications Bases Revision 64
4. Letter from D. M. Crutchfield, NRC, to J. E. Maier, RG&E, Subject: SEP Topic VIII-1.A, Potential Equipment Failures Associated with Degraded Grid Voltage, dated January 29th, 1982.
5. Letter from D. M. Crutchfield, NRC, to J. E. Maier, RG&E, Subject: SEP Topics VII-3 and VIII-2 (R. E. Ginna Nuclear Power Plant), dated April 2, 1981.

System Protection

Items 1., 1.a, 2.b, and 2.d request information regarding electrical system protection and will be addressed in this section:

> ***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. Also, include the following information:***

Consistent with the current licensing basis and GDC 17, existing protective circuitry will separate the ESF buses from a connected failed offsite source due to a loss of voltage or a sustained, balanced degraded grid voltage concurrent with certain design basis accidents. The relay systems were not designed to detect an open single phase of a three phase system. Detection of a single-open phase condition is beyond the approved design and licensing basis of the plant. The NRC review and acceptance of the design basis of the Ginna offsite power system is provided in SEP Topic VIII-1.A, Potential Equipment Failures Associated with Degraded Grid Voltage.

> ***1.a. The sensitivity of protective devices to detect abnormal operating conditions and the basis for the protective device setpoint(s).***

Consistent with the current licensing basis and GDC 17, existing electrical protective devices are sufficiently sensitive to detect design basis conditions of loss of voltage or degraded voltage, but were not designed to detect a single phase open circuit condition.

Each 480V ESF bus at Ginna Station is equipped with one set of two Degraded Voltage Relays (DVR) and one set of two Loss of Voltage (LOV) relays. Upon receipt of either two-out-of-two logic signal, the bus normal feeder breakers are tripped and power is supplied by the on-site Emergency Diesel Generators (EDG's). The undervoltage relays sense voltage levels at the 480V bus between phases A-B and phases B-C.

See Attachment 3, Table 5 for undervoltage protective devices and the basis for the device setpoint(s).

Ginna Station has developed a preliminary simplified ElectroMagnetic Transient Program (EMTP) model of the electrical system to analyze a single open phase circuit at the 34kv and 115kV systems with and without a high impedance ground. An evaluation of the model shows that the amount of voltage imbalance is a function of load and whether or not the open phase condition introduces a ground on the auxiliary system. The degree of voltage imbalance is increased (i.e. more easily detected) if the open phase condition is accompanied by a ground on the open terminal on the service transformer. The voltage imbalance is significantly reduced at lower system loading. This evaluation indicates that undervoltage relaying may not operate when the offsite power circuits are lightly loaded, though for most cases, at least 1 relay will operate, resulting in annunciation to the control room.

The electrical analyses for off-site circuits have also been reviewed with regard to high impedance grounds. The effect of a high impedance ground has been determined to be of minimal concern. A high impedance ground will have no immediate effect on plant operation. If the ground fault current is substantial to the point of affecting plant operation, protective relaying will isolate the ground automatically.

Attachment 3, Table 5 lists ground protection on the ESF buses and the basis for the device setpoint(s).

2.b. 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.

Not Applicable - the ESF buses at Ginna Station are powered by offsite power sources.

2.d. Do the plant operating procedures, including off-normal operating procedures, specifically call for verification of the voltages on all three phases of the ESF buses?

The current plant normal operating procedures and ESF bus undervoltage alarm response procedures specifically call for verification of the voltages on all three phases of the ESF buses. Additional procedure changes are in progress to address other alarm response procedures and reactor trip conditions. Further, the voltage meter selector switch is set on the one phase not monitored by the existing degraded voltage relays such that a loss of phase voltage would be immediately visible to operators.

Consequences

Items 1.b, 1.c, and 2.e request information regarding the electrical consequences of an event and will be addressed in this section:

> ***1.b. 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.***

Offsite power sources at Ginna Station are loaded while at power (normal operating condition) as the ESF buses are powered by the offsite power transformers.

The installed relays were not designed to detect single phase open circuit conditions. Existing loss of voltage and degraded voltage relays are expected to respond depending on load and possible ground conditions. The Station Aux Transformers are normally lightly loaded when the plant is operational.

> ***1.c. 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.***

1. Ginna Station did not credit in the Current Licensing Basis (CLB) that the Class 1E protection scheme for ESF buses was designed to detect and automatically respond to a single-phase open circuit condition on the credited off-site power source as described in the UFSAR and Technical Specifications.

2. Since Ginna Station did not credit the ESF bus protection scheme as being capable of detecting and automatically responding to a single phase open circuit condition, an open phase fault was not included in the design criteria for either the loss of voltage or the degraded voltage relay (DVR) scheme. Since open phase detection was not credited in the design or licensing basis, no design basis calculations or design documents exist that considered this condition.

Ginna Station's loss of voltage and degraded voltage protection was reviewed and approved by the Nuclear Regulatory Commission. The NRC Technical Evaluation states that proposed design and Technical Specification change review criteria was based on IEEE 308-1974, and the Generic Design Criteria 17 of the Code of Federal Regulations, Title 10, part 50, Appendix A.

<u>Reference:</u>

1. Ginna Station Technical Specifications Amendment No. 38
2. Letter from D. M. Crutchfield, NRC, to J. E. Maier, RG&E, Subject: Issuance of Amendment No.38 to Provisional Operating License No. DPR-18, dated March 26th, 1981.
3. Letter from D. M. Crutchfield, NRC, to J. E. Maier, RG&E, Subject: SEP Topic VIII-1.A, Potential Equipment Failures Associated with Degraded Grid Voltage, dated January 29th, 1982.

3. Without formalized engineering calculations or engineering evaluations, the electrical consequences of such an open phase event (including plant response), can only be evaluated to the extent of what has already been published by EPRI and Basler; which is a generic overview. The difficulty in applying these documents to the Ginna Station specific response is that these are generic assessments and cannot be formally credited as a basis for an accurate response. The primary reason is that detailed plant specific models would need to be developed (e.g., transformer magnetic circuit models, electric distribution models, motor models; including positive, negative, and zero sequence impedances (voltage and currents), and the models would need to be compiled and analyzed for the Ginna Station specific Class 1E electric distribution system).

Because of the separation between Ginna's offsite power sources, and because Ginna Station normally operates in a 50/50 line-up, only one train of electrical power would normally be impacted by an open phase condition.

Based on the best available information at the time of this writing, operation of the UV scheme (meaning the 2/2 logic is satisfied) is expected for the majority of cases of a design basis accident with a grounded or ungrounded open phase condition. Operation of undervoltage relaying will result in automatic tripping the affected ESF buses, starting the DG and sequencing loads.

While operating in a 100/0 or 0/100 electric plant alignment, automatic operation is expected for all cases of a design basis accident (DBA) or a plant trip with an open phase condition.

For cases of a design basis accident or plant trip while in a 50/50 electric plant alignment, approximately 95% of the open phase scenarios will result in UV relay scheme operation; in the cases where the UV scheme does not operate, only one UV relay is expected to operate, resulting in annunciation to the control room. In this case, one ESF train will still be available, as the 50/50 alignment will prevent the open phase from impacting both ESF trains.

With the plant online (normal operation) in a 100/0 or 0/100 electric plant alignment, operation of the UV scheme will occur for approximate 50% of the evaluated open phase scenarios. In all cases, at least one UV relay will operate, which will provide operations indication of the issue if automatic tripping does not occur.

For cases with the plant online in a 50/50 electric plant alignment, operation of the UV relaying may not occur in all cases; in approximately 15% of the cases reviewed, no UV relays will operate. In these scenarios, voltage imbalances are projected to be greater than 10%, resulting in significantly increased losses; running motors are expected to trip on overcurrent.

As a result of the findings above, the following compensatory actions have been completed:

- Alarm response procedures have been revised to require verification of voltages on all 3 phases. This action will ensure that operators diagnose the open phase condition immediately.

- Night orders were issued briefing Operators on the procedure changes and the basis. A Read & Acknowledge was also issued to ensure all operators understand the design vulnerability.

- MCB voltmeters will be maintained in the V_{ca} position to ensure operators have a visual indication that offsite power is degraded.

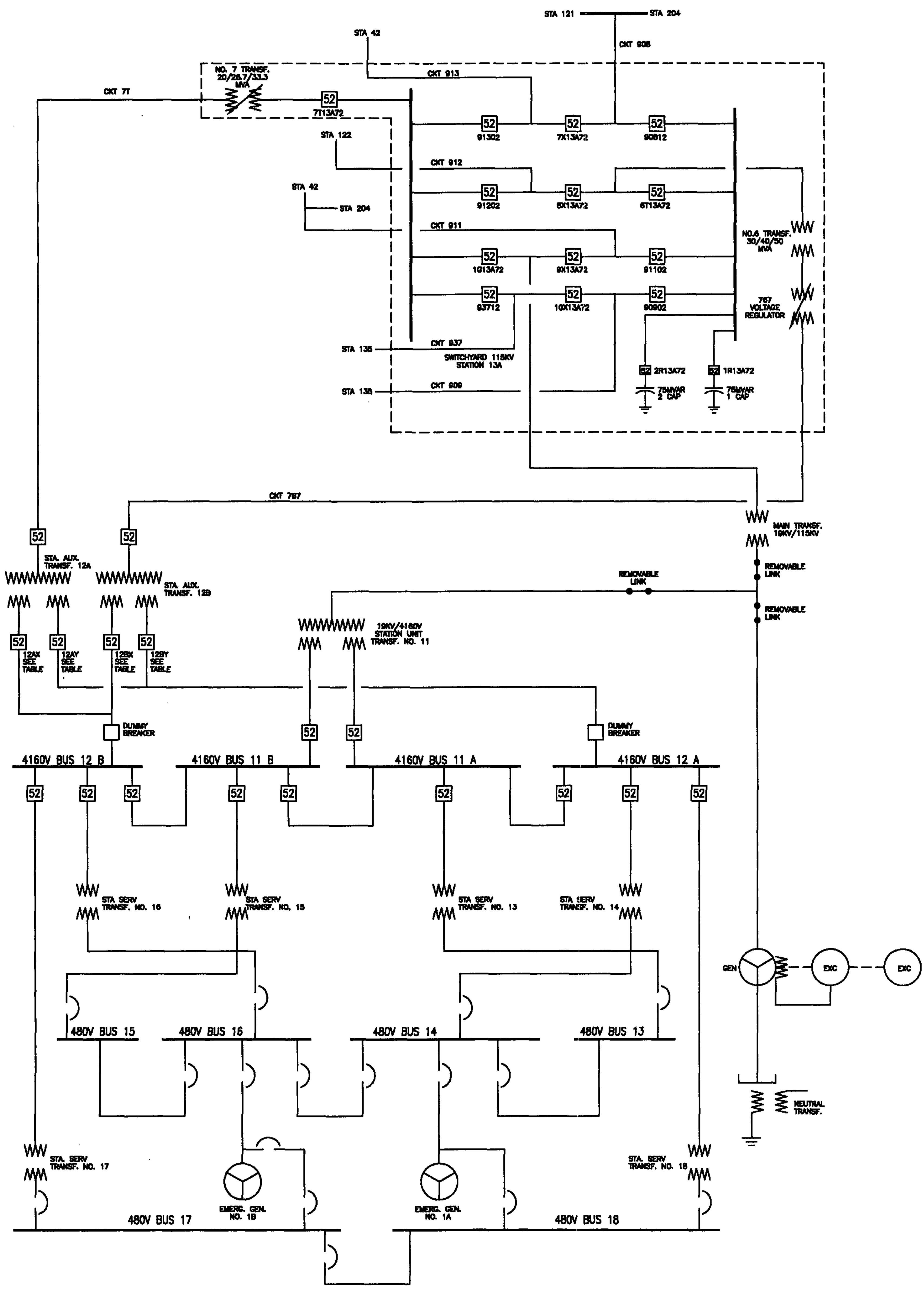
- Electrician routine checks of the onsite Transformer Yard and 115kV Switchyard have been modified to include an inspection of the overhead sections of Ginna's offsite power system.

2.e. 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.

While operating in a 100/0 or 0/100 electric plant alignment, automatic operation is expected for all cases of a design basis accident (DBA) with an open phase condition.

For cases with the plant online (normal operation) in a 100/0 or 0/100 electric plant alignment, operation of the UV scheme will occur for approximate 50% of the evaluated open phase scenarios. In all cases, at least one UV relay will operate, which will provide operations indication of the issue if automatic tripping does not occur. All ESF buses will be impacted until operators take corrective action.

Attachment 2



OFFSITE POWER ALIGNMENT	52/12BX	52/12BY	52/12AX	52/12AY
50/50 NORMAL	NC	NO	NO	NC
50/50 ALTERNATE	NO	NC	NC	NO
100/0	NC	NC	NO	NO
0/100	NO	NO	NC	NC

Attachment 3 - Tables

Table 1 - ESF Buses Continuously Powered From Offsite Power Source(s)

Description of ESF Bus Power Source	ESF Bus Name (normal operating condition).	Original licensing basis configuration (Y/N)
Bus 12A to Station Service Transformer 14	480V Bus 14	Y
Bus 12B to Station Service Transformer 16	480V Bus 16	Y
Bus 12B to Station Service Transformer 17	480V Bus 17	Y
Bus 12A to Station Service Transformer 18	480V Bus 18	Y

Table 2 - ESF Buses Not Continuously Powered From Offsite Power Source(s)

Description of ESF Bus Power Source	ESF Bus Name (normal operating condition).	Original licensing basis configuration (Y/N)
Note: Table 2 is not applicable to Ginna Station		

Table 3 - ESF Buses Normally Energized Major Loads

ESF Bus	Load	Voltage Level	Rating
Bus 14	Charging Pump A	480V	100 HP
Bus 14	Containment Recirc Fan A and/or D	480V	300HP Each
Bus 14	Component Cooling Water Pump A	480V	150 HP
Bus 16	Charging Pump B	480V	125 HP
Bus 16	Charging Pump C	480V	100 HP
Bus 16	Containment Recirc Fan B and/or C	480V	300 HP Each
Bus 16	Component Cooling Water Pump B	480V	150 HP
Bus 17	Service Water Pump B and/or D	480V	350 HP Each
Bus 18	Service Water Pump A and/or C	480V	350 HP Each

Table 4 - Offsite Power Transformers

Transformer	Winding Configuration	MVA Size (AO/FA/FOA)	Voltage Rating (Primary/Secondary)	Grounding Configuration
115/34 kV Transformer 6	Delta-Wye	30/40/50 MVA	115/34 kV	Solidly Grounded
767 Autovoltage Regulator	Wye-Wye (Common Winding)	20/26.6/- MVA	34/34 kV	Solidly Grounded
115/34 kV Transformer 7	Delta-Wye	20/33.3/- MVA	115/34 kV	Solidly Grounded
Transformers 12A / 12B	Delta-Wye	28/37.3/- MVA	34/4 kV	Resistance Grounded
Transformers 14 / 16	Delta-Delta	1.5/2.0/- MVA	4160/480V	Ungrounded
Transformers 17 / 18	Delta-Delta	1.0/-/- MVA	4160/480V	Ungrounded

Table 5 - Protective Devices

Protection Zone	Protective Device	UV Logic	Setpoint (Nominal)	Basis for Setpoint
480V ESF Bus	*Loss of Voltage Relay*	*2 of 2*	*372.8V (77.67% of 480V)*	*To actuate upon complete loss of ESF Bus voltage condition*
480V ESF Bus	*Degraded Grid Undervoltage*	*2 of 2*	*423.6V (88.25% of 480V)*	*To actuate upon degraded ESF Bus voltage condition; Inverse time delay for faster response on decreasing voltage*
4 KV Loads	*Ground Protection*	N/A	*20A*	*50G - Instantaneous ground protection, setting coordinates with upstream relay. Setting based on EPRI station protection book and Section 9.3.6.2 of IEEE-242-1986*
4 KV Bus	*Ground Protection*	N/A	*300A*	*51N -Time Overcurrent ground protection, setting coordinates with downstream relays and expected range of ground faults (600A), and protects the switchgear bus and transformer neutral grounding resistor.*
4 KV Bus and Bus Feeder	*Ground Protection*	N/A	*Bus 12A: 150A Bus 12B: 240A*	*51GBU – Time Overcurrent ground protection, setting coordinates with expected range of ground faults (600A) and protects the bus feeder and transformer neutral grounding resistor.*
4 KV Bus Feeder	*Differential*	N/A		Protection for internal faults, secure against external faults
12A/12B Transformer	*Differential*	N/A		Protection for internal faults, secure against external faults
7T / 767 Feeder	*Differential*	N/A		Protection for internal faults, secure against external faults
7T / 6T&767 Transformer	*Differential*	N/A		Protection for internal faults, secure against external faults