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DENTON,H.R. Office of Nuclear Reactor Regulation

SUBJECT: Responds to NRC 791001 ltr re five partial loss of offsite power events.Forwards description & one oversize drawing re loss of power events & offsite power connections.Drawings available in Central Files only.

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January 3, 1980
AEP:NRC:00292

Donald C. Cook Nuclear Plant Unit Nos. 1 and 2
Docket Nos. 50-315 and 50-316
License Nos. DPR-58 and DPR-74

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20455

Dear Mr. Denton:

This letter and its attachments transmit to the Commission the information requested in Mr. A. Schwencer's letter dated October 1, 1979 on loss-of-offsite power events experienced at the Cook Plant.

A total of five partial loss-of-offsite power events have occurred at the Cook Plant. Four of these events involved the loss of the preferred offsite power source to one or two of the redundant safety trains. The alternate offsite power source was available during these events. The fifth event involved the loss of the alternate offsite power source. The preferred offsite power source was available during this event. The Cook Plant has never experienced an event which rendered both the preferred and alternate offsite power sources unavailable. It should be noted that the emergency diesel generators have successfuly responded to all actual demand signals derived through the reactor protection system/engineered safety features actuation system logic.

Attachment No. 1 to this letter contains a description of the offsite power connections at the Cook Plant.

Attachment No. 2 is an item by item response to the questionnaire attached to Mr. Schwencer's letter.

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As the information contained herein is being submitted in response to a written request by the NRC staff, IMECo. interprets 10 CFR 170 as requiring that no fee accompany this transmittal.

Very truly yours,

John E. Dolan

JED:em

John E. Dolan
Vice President

cc: R. C. Callen
G. Charnoff
R. S. Hunter
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D. V. Shaller-Bridgman

ATTACHMENT NO. 2 TO AEP-NRC-00292

1. Event of February 17, 1975 (LER-A075-5)

Unit 1 was in Mode 2 at 5% reactor power and was receiving its auxiliary power from the Preferred Offsite source through transformers 101AB and 101CD. Unit 2 was under construction and transformers 201AB and 201CD were not yet connected to the Preferred Offsite source.

The Preferred Offsite power source was lost. The Alternate Offsite power source was still available.

A.1 Two circuits to the offsite network are normally available; one circuit was lost during the event (Trains A and B from the Preferred Offsite power source).

2. The event was caused by a poor splice in a cable, causing a ground fault. Ground fault detection circuitry tripped Preferred Offsite power circuit breakers "12AB" and "12CD." Modifications installed since the event (addition of a 34.5-kV grounding transformer) would now make it possible to discriminate on which circuit the ground fault occurred and trip only the faulted circuit. This was not possible at the time of the event.

3. The Alternate Offsite power source was not affected by the fault, as it is independent of the preferred source.

4. No voltage increase or decrease was experienced just prior to or during the outage.

5. No frequency decay was experienced just prior to or during the outage.

6. Power from the Preferred Offsite source was unavailable for 73 hours, 6 minutes.

On February 18, 1975, the generator link disconnects were removed and 3 hours and 58 minutes after the event normal offsite power was backfed to the auxiliary buses.

Faulted cable repair was completed and power through the "101AB" and "101CD" transformers restored at 0038 hrs. on February 21, 1975.

7. The date of the event was February 17, 1975.

2. Event of September 1, 1977 (LER R077-30)

Unit 1 was in operation at 100% power during the initial phase of the event. Unit 2 was under construction. Unit 1 was receiving its auxiliary power from its normal auxiliary power source through Transformers 1AB and 1CD.

During the event the Preferred Offsite power source (Trains A and B) was lost. The Alternate Offsite power source was still available.

A.1 Two circuits to the offsite network are normally available; one circuit was lost during the event (Trains A and B from the Preferred Offsite power source).

2. At 1857 hours, a fault occurred on one of the 345-kV lines terminating at D. C. Cook substation during a lightning storm. Protective relays initiated trip signals to the appropriate circuit breakers, and one of the two circuit breakers operated properly. The second circuit breaker failed to trip or failed to interrupt the fault current. The appropriate breaker failure detecting relays initiated tripping of all the circuit breakers of 345-kV Bus 1, the middle circuit breaker of the affected circuit and the 765-kV circuit breakers of Transformer 4. This resulted in the loss of the Preferred Offsite power to both Train A and Train B of the safety buses.

3. The Alternate Offsite power source was not affected by the lightning storm.

4. A subsequent lightning strike hit on another transmission line circuit and the resultant high speed opening and reclosure of the associated circuit breakers caused a voltage dip to 64% of normal. The undervoltage protection relays on the Reactor Coolant Pump bus "saw" the dip and tripped the reactor.

The unit trip was caused by an incorrect time delay setting of the undervoltage relays of the auxiliary bus. The initial setting should have had a 200-millisecond delay when in fact the delay was approximately 50 milliseconds. The time delay was increased to approximately 150 milliseconds following this event. Subsequent reviews of the safety analysis with Westinghouse have indicated that the minimum time delay could be 550 milliseconds and the maximum time delay could be greater depending on the voltage sensor location. Following these reviews

the time delay for the undervoltage trip was increased to 500 milliseconds, which is long enough to override system disturbances, and short enough to be conservative for the reactor protection.

5. No frequency decay was experienced just prior to, or during, the outage.

6. The Preferred Offsite power source was unavailable for 2 hours and 11 minutes.

7. Date of the Event: September 1, 1977.

3. Event of December 13, 1977 (LER R077-40)

Unit 1 was in Mode 1 and was receiving its auxiliary power from its normal auxiliary power source through Transformers 1AB and 1CD. Unit 2 was still under construction, but Transformers 201AB and 201CD had been connected and test energized from the Preferred Offsite power source.

A.1 Two circuits to the offsite network are normally available. Half a circuit was lost during the event (Preferred Offsite power source, Train A). The Preferred Offsite power source, Train B, and the Alternate Offsite power source circuits were still available.

2. At the time of the event, Transformer 201CD had been deenergized to permit installation of the fire protection piping.

The protective relays of Transformers 101CD and 201CD both operate the same set of lockout relays which also trip the same set of circuit breakers. The transformers share a common 34.5-kV source circuit breaker 12CD. In addition to other electrical fault detecting relays, sudden pressure relays are installed on the tanks of both transformers. These relays detect rapid changes in transformer gas space pressure and are effective in detecting low grade faults. It is postulated that the piping installation activity resulted in bumping the relay on Transformer 201CD. This probably caused the relay to operate and to trip and lockout the associated circuit breakers for both transformers. Investigation after the fact revealed that the annunciator which operates to inform the operator of a sudden pressure relay event was incorrectly specified as a non-seal in circuit. The relay contact closure is only momentary. In this case, the cause of the trip could not be confirmed.

3. The reason why the Preferred Offsite power (Train B) and the Alternate Offsite power circuits did not fail during this event is that separate sets of lockout relays are used for their protection.

4. No voltage increase or decrease was experienced just prior to, or during, the outage.

5. No frequency decay was experienced just prior to, or during, the outage.

6. Power from the circuit was unavailable for 3 hours 38 min.

7. Date of the event: December 13, 1977.

System Modifications:

The annunciators identifying the operation of the sudden pressure relays have been converted to the seal-in type to assist the operator in identifying the source of the transformer lockout operation.

4. Event of February 14, 1978

Unit 1 was in Mode 1 and was receiving its auxiliary power from its normal power source through Transformers 1AB and 1CD. Unit 2 was performing hot functional tests and had not started power operation.

A.1 Two circuits to the offsite network are normally available; one circuit was lost during the event (Trains A and B from the Preferred Offsite power source).

2. During a heavy snowstorm, a heavy accumulation of wet, slushy snow on a 345-kV bus support insulator on 345-kV Bus 1 caused it to flashover, resulting in a trip of all 345-kV Bus 1 circuit breakers, and the one 765-kV circuit breaker that had been in service. This resulted in the loss of the 765/345/34.5-kV Transformer 4 and the Preferred Offsite power source to Trains A and B of Units 1 and 2.

3. The Alternate Offsite power source does not originate on the 345-kV or 765-kV substations and, therefore, was unaffected by this event.

4. No voltage increase or decrease was experienced just prior to, or during, the outage.

5. No frequency decay was experienced just prior to, or during, the outage.

6. Power from the circuits was unavailable for 7 hours and 30 minutes. Since no unit trip occurred, the unit auxiliaries were fed from the normal auxiliary power source before, during, and after the event.

7. Date of Event: February 14, 1978.

System Modifications:

Transformer No. 5 has been installed on 345-kV Bus No. 2. The rating of the 34.5-kV winding is 150-mVa and has sufficient capacity to serve the reserve auxiliary loads of both units. In addition, 2 new 34.5-kV circuit breakers, BC and BE, have also been added to facilitate rapid switchover of the 34.5-kV bus from one source to the other. The 34.5-kV bus may be fed from only one source at a time, since the combined fault current from both sources exceeds the rating of the 34.5-kV circuit breakers.

5. Event of April 6, 1979

Units 1 and 2 were in Mode 1 and were receiving auxiliary power from their normal auxiliary power sources through Transformers 1AB and 1CD, and 2AB and 2CD, respectively.

A.1 Two circuits to the Offsite Network are normally available; one circuit was lost during the event (the Alternate Offsite power source).

2. During an intense windstorm, a jumper failed and open-circuited one phase of the 69-kV line which is the source for the Alternate Offsite power source. This resulted in the loss of the alternate source of offsite power to both safety trains of Units 1 and 2.

3. The Preferred Offsite power source was unaffected by the event.

4. No voltage increase or decrease was experienced just prior to, or during, the outage.

5. No frequency decay was experienced just prior to, or during, the outage.

6. Power from the circuit was unavailable for 10 1/2 hours.

7. Date of the event: April 6, 1979.

System Modifications:

The undervoltage alarm sensing relays are being rearranged to operate for a total loss of voltage or any single phasing condition of the Alternate Offsite power source to improve operator awareness of loss of power source availability.

ATTACHMENT NO. 1 TO AEP:NRC:00292

In answering the Questionnaire included in AEP-NRC-00292, the following comments on the D. C. Cook Plant electrical distribution system are in order. Refer to ESK-103079, Simplified Offsite Power Sources One-Line, attached.

1. During plant normal operation, the plant auxiliaries are fed from the generator bus through the normal auxiliary power transformers 1AB and 1CD for Unit 1; and 2AB and 2CD for Unit 2.

2. During plant startup and shutdown conditions, when the generator power is not available, the plant auxiliaries are fed from the offsite power grid through the reserve power transformers 101AB and 101CD for Unit 1; and 201AB and 201CD for Unit 2.

3. During plant startup and shutdown should the preferred offsite reserve power fail, the auxiliary safety buses are automatically fed from the onsite emergency diesel generators. After the diesel generators have been running for some time, the decision may be taken to transfer the auxiliary buses to the alternate offsite power source fed from the 69-kV substation. The diesel generators are then kept in standby mode.

4. Transformer No. 5 has been available since 1978 only, when D. C. Cook Unit 2 came into operation.

5. The NRC Questionnaire is divided into two parts. Part A refers to conditions when less than all offsite power has been lost. Part B refers to events where all offsite power were lost. All offsite power sources, i.e. the Preferred plus the Alternate offsite power sources have never been lost at Cook Plant. Therefore, only Part A of the Questionnaire will be answered.