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December 20, 1979

Mr. Thomas A. Ippolito, Chief
Operating Reactors - Branch 3
Division of Operating Reactors
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Quad Cities Station Unit 1 and 2
Response to Request for Information
Concerning Loss of Off-Site
Power Events
NRC Docket Nos. 50-254/265

Reference (a): T. A. Ippolito letter to C. Reed dated
September 18, 1979

Dear Mr. Ippolito:

Reference (a) requested information concerning loss of offsite power events at Quad Cities Units 1 and 2. In addition to the event of November 6, 1977 mentioned in Reference (a), we have enclosed information concerning loss of power events which occurred on August 26, 1975 and February 13, 1978.

Please address any additional questions you may have concerning this matter to this office.

One (1) signed original and thirty-nine (39) copies of this transmittal are provided for your use.

Very truly yours,

Robert F. Janecek
Nuclear Licensing Administrator
Boiling Water Reactors

Enclosure

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A. Losses of offsite power where less than all offsite power was lost:

The auxiliary power supply from the 345 KV transmission system is protected against the effect of unplanned outages by the diversity of four separate 345 KV circuits and two major generating units feeding into a ring bus in the switchyard at Quad-Cities. The auxiliary power supply for Unit 1 is divided between a unit auxiliary transformer (TR-11) connected to Unit 1 generator leads and Unit 1 reserve auxiliary transformer (TR-12) connected to the Quad-Cities 345 KV ring bus. The auxiliary power supply for Unit 2 is divided between a unit auxiliary transformer (TR-21) connected to Unit 2 generator leads and Unit 2 reserve auxiliary transformer (TR-22) connected to the Quad-Cities 345 KV ring bus.

Event of August 26, 1975

1. How many circuits to the offsite network are normally available and how many were lost during the event?

On August 26, 1975 a trip of bus tie Oil Circuit Breaker (OCB) 1-2 at Northwest Steel and Wire Company caused Ring Bus ties OCB 1-2, OCB 1-11, and OCB 2-6 to open in the switchyard at Quad-Cities Station. This event resulted in the isolation of 345 KV line 0404 and loss of Unit 1 auxiliary transformer 12. Consequently one of the four offsite circuits to the 345 KV Ring Bus at Quad-Cities station was lost.

2. What was the cause of the event?

While putting a new differential 16 relay in service at Northwest Steel and Wire Company, in an effort to remove a foreign object from the disc of the relay, the relay contacts were jarred and the relay closed, starting the chain of events as described above.

3. Why did the other lines not fail when some did fail?

Bus tie OCB 1-2 and OCB 1-11 opened as designed isolating line 0404 from the ring bus. Bus tie OCB 2-6 opened because of the failure of a diode in a 5 second time delay timer in the high speed local breaker backup relay for OCB 1-2. This caused bus tie OCB 2-6 to open, resulting in the loss of transformer 12 which was supplying Unit 1 auxiliary power. The 4KV breaker supplying power to bus 13 from transformer 12 (ACB1309) failed to trip from the local breaker backup relay for OCB 1-2, and instead tripped on overcurrent. The overcurrent trip prevented the 4KV breaker supplying power to bus 13 from transformer 11 (ACB 1303) from closing. Bus 13 was therefore de-energized, and the reactor scrambled followed by a turbine trip. The Unit 1 and Unit 1/2 diesel generators automatically started and supplied buses 13-1 and 14-1, respectively, immediately after the loss of power. Since there was no reason why the overcurrent trip relay should have actuated on Bus 13, the cause was investigated but the exact reason could not be determined. On

February 7, 1976, a simulation of the events on August 26, 1975 was accomplished with all breakers and relays operating properly.

4. Was any voltage increase or decrease experienced just prior to or during the outage? If so, please give details, voltages reached, affects, etc.

No, voltage increase or decrease was experienced as part of this event.

5. Was any frequency decay experienced just prior to or during the outage? If so, please give details, lowest frequency reached, decay rate, affects on equipment operation, etc.

None.

6. How long was power unavailable from the circuit?

7 hours and 42 minutes

Line 0404 to Northwest Steel and Wire Company was isolated at 10:30 AM by OCB 1-2 and OCB 1-11. Line 0404 was reclosed to the station ring bus as 4:12 PM. With three other offsite lines (circuits) supplying load, power to the Station ring bus was never lost during this event.

7. Date of event.

August 26, 1975

Event of February 13, 1978

1. How many circuits to the offsite network are normally available and how many were lost during the event?

On February 13, 1978 a low voltage condition was being experienced on the Commonwealth Edison System. Unit 1 was in the Startup Mode with the reactor critical and the turbine generator off line. Unit 2 was shutdown. During this event no offsite circuits to the network were lost.

2. What was the cause of the event?

At 10:25 AM the low voltage condition forced the voltage on buses 13, 13-1, 14, and 14-1 low enough to cause the undervoltage relays to actuate. The undervoltage relays isolated bus 13-1 from bus 13, and the Unit 1/2 diesel generator auto-started and loaded to bus 13-1. The under voltage relay actuation on bus 14 caused bus 14-1 to isolate, and the Unit 1 diesel generator auto-started and loaded to bus 14-1. The Unit One reactor subsequently scrammed from loss of both Reactor Protection M-G Sets.

3. Why did the other lines not fail when some did fail?

None of the four offsite circuits failed during this event. The undervoltage relays on buses 13 and 14 operated as designed.

4. Was any voltage increase or decrease experienced just prior to or during the outage? If so, please give details, voltages reached, affects, etc.

At 10:25 AM the 345 KV Ring Bus voltage dropped to approximately 330 KV.

5. Was any frequency decay experienced just prior to or during the outage? If so, please give details, lowest frequency reached, decay rate, affects on equipment operation, etc.

None.

6. How long was power unavailable from the circuit?

Power was at all times available from the network. At 10:25 AM the lower than normal network voltage caused bus 13-1 to isolate from bus 13 and bus 14-1 to isolate from bus 14. At 10:45 AM the operator restored auxiliary power. This was accomplished in conjunction with the central load dispatcher who increased the network voltage.

7. Date of event.

February 13, 1978

Event of November 6, 1979

1. How many circuits to the offsite network are normally available and how many were lost during the event?

During this event three of the four offsite network circuits were lost.

2. What was the cause of the event?

The cause of this event was a severe 345 KV fault from A phase to C phase to ground on auxiliary transformer 82. Transformer 82 feeds the spray canal system.

3. Why did the other lines not fail when some did fail?

To clear the fault, transformer 82 protective relays automatically opened Oil Circuit Breakers OCB 8-9 and OCB 9-10, isolating bus section 9 from the station ring bus. Auxiliary transformer 22, which is fed from bus section 9, was also lost.

At the time of the fault, 345 KV line 0401, which is connected to bus section 6 at the Station, tripped at Iowa-Illinois Gas

and Electric Company substation 56. Because the auto recloser at substation 56 was turned off, line 0401 remained open at that end.

At the time of the fault, 345 KV line 0402, which is connected to bus section 10 at the Station, tripped at Iowa-Illinois Gas and Electric Company substation 39. This line did reclose and fed power to the Station ring bus until bus section 10 was isolated by the loss of Unit Two.

Station ring bus 345 KV OCB 6-7 tripped when Unit One came off-system at 0729 and 24 seconds, which was about one minute after the initial fault on transformer 82. Station ring bus 345 KV OCB 10-11 and OCB 11-1 tripped when Unit Two came off-system at 0729 and 50 seconds, which was about one and a half minutes after the initial fault on transformer 82.

Station ring bus OCB 2-6 remained closed-in with 345 KV line 0404, the only line in the 345 KV yard carrying load, feeding 17 MW to Unit One auxiliary transformer 12.

4. Was any voltage increase or decrease experienced just prior to or during the outage? If so, please give details, voltages reached, affects, etc.

The fault on transformer 82 caused a 3 cycle 100% loss of voltage on 4KV Buses 12 and 13, a 6 to 9 cycle 100% loss of voltage on 4KV Buses 22 and 23, and approximately a 3 cycle 30% reduction of voltage on 4 KV Buses 11, 14, 21, and 24. This loss of voltage on the station 4KV Buses resulted in reactor scrams of both Unit One and Unit Two. The loss of Unit One and Unit Two was the direct result of the 3 to 9 cycle discontinuity in the auxiliary power busses, and the effect on critical instrumentation of the reactor, turbine, and generator. The station computer, which was being fed indirectly from 4KV bus 24, lost power at or near the initial event. There were many alarms on the computer read-out that would cause a full scram or 1/2 scram on the units. Because of the power disruption to the computer, the sequence and times of these events are in question.

5. Was any frequency decay experienced just prior to or during the outage? If so, please give details, lowest frequency reached, decay rate, affects on equipment operation, etc.

None.

6. How long was power unavailable from the circuit?

Unit Two was totally without offsite power during this event. The Unit 2 and Unit 1/2 diesel generators both started and energized their respective Unit Two busses when Transformer 21 was lost along with Unit Two. Transformer 22 and all auxiliary power to Unit Two was restored at 8:40 AM.

7. Date of event.

November 6, 1977

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