CP&L
Carolina Power & Light Company

H. B. ROBINSON STEAM ELECTRIC PLANT
Post Office Boz 790
Hartsville, South Carolina

January 13, 1975

Robinson File No. 2-0-4-a-1

Mr. Neal Bender
U. S. Atomic Energy Commission
230 Peachtree Street
Suite 818
Atlanta, Georgia 30303

REACTOR TRIP OF AUGUST 11, 1974

Dear Mr. Bender:

As discussed in the exit interview of December 13, 1974, I have attached a copy of a report on the reactor trip of August 11, 1974.

If you have any questions, please contact me.

Yours very truly,

Jack B. McGirt, Manager
H. B. Robinson SEG Plant

ACT:gg

Letter to N. Bender from Carolina Power and Light Company dated January 13, 1975.

50-261

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Robinson File No. 2-0-1-e

PLANT OPERATING EXPERIENCE

1a. Date: January 13, 1975

1b. Event Date: August 11, 1974

2. Identification of Event: Reactor Trip due to Loss of Instrument Busses 4 and 9 and MCC 6

3. Conditions Prior to Event:

The plant was operating normally at 100% power with a net electrical output of 650 MWe. RCS boron concentration was 842 ppm, and control rod bank "D" was at 211 steps. Auxiliary building ventilation fan HVE-2A was running.

4. Description of Event:

The Control Operator was asked to start the second Auxiliary Building Ventilation Exhaust Fan, HVE-2B, so that an air flow reading up the stack could be taken with both fans operating. At 2230, when HVE-2B was started, a reactor trip, safety injection, and loss of MCC-6 and Instrument Busses 4 and 9 occurred. The following is the sequence of events as can best be reconstructed:

Approximate Time	Event
2230	HVE-2B was started from the RTGB by the Control Operator. This fan receives power from MCC-6 which is in turn powered from bus E-2. The breaker which supplies MCC-6 from E-2 tripped due to the starting surge of HVE-2B motor. This de-energized Instrument Busses 4 and 9 which are fed from MCC-6. This interrupted power to Nuclear Instrumentation Power Range Channel N-44 (Instrument Bus 4) causing a 30% turbine runback at 200% per minute. N-44 is also the channel which contributes to the automatic rod control system. Since it was de-energized, the rod control system did not accomplish automatic rod insertion at a rate which would begin to reduce TAVE (the turbine first stage pressure/TAVE comparison was probably still operable).
+ 10 Sec.	As a result of the above conditions, a reactor trip occurred due to high pressurizer pressure (2385 psig). This pressure increase did not indicate on the RTGB strip chart since power had been lost to the recorder for pressurizer pressure, PR-444. This reduced TAVE, RCS pressure

and steam generator levels rapidly. The Steam Flow/Feed Flow Mismatch (caused electrically by the loss of Instrument Busses 4 and 9 and Analog Instrument Racks (AIR) 24 and 25) with Low Steam Generator Level first-out annunciators and the Low-Low Steam Generator Level first-out annunciato energized when steam generator levels decreased.

+ 30 Sec. — When TAVE decreased to 543°F, a safety injection and steam line isolation were initiated on High Steam Line Flow With Low Tave. The High Steam Line Flow signal was caused by the loss of Instrument Busses 4 and 9 and AIR's 24 and 25. When TAVE dipped below 543°F following the reactor trip, the SI and steam line isolation were automatically actuated.

+ 2 Min. — The Operators recognized the loss of electrical power to Instrument Bus 4 and MCC-6 and the unnecessary safety injection. The MCC-6 breaker at E-2 was reset restoring power to MCC-6 and the instrument busses. "B" Battery Charger was restarted.

+ 15 Min. — Power was lost to MCC-5 for an unknown reason. It was re-energized from its supply breaker in E-1 about one minute later.

+ 17 Min. — It was noted by the Auxiliary Operator that MCC-6 had again tripped. It was immediately reset at E-2. This could have possibly been due to HVE-2B starting automatically when MCC-5 and HVE-2A were lost. The breaker for HVE-2B was racked out and disabled pending investigation maintenance.

+ 49 Min. — The diesels were secured, and all safeguards syste were returned to normal. The plant was stable in a hot shutdown condition. Investigation into the cause was continued.

5. Designation of Apparent Cause of Event:

Investigation revealed the primary cause of the incident to be a leaking dischar damper on Auxiliary Building Ventilation Fan HVE-2B. Because this damper did no seal tightly, back pressure from running fan HVE-2A caused idle fan HVE-2B to rotate backwards at a rate of 155 RPM. When HVE-2B was started it experienced a much higher and longer duration starting (locked rotor) current surge due to the time required to stop and reverse the rotation of the fan. Counter EMF was not produced quickly enough to prevent a large starting current. This resulted in tripping the MCC-6 supply breaker.

A secondary cause of the incident was that the breaker supplying MCC-6 tripped instead of the breaker supplying HVE-2B. This has not been fully explained, but an investigation will be conducted regarding the possibility that the magnetic instantaneous trip setting on the HVE-2B breaker was high enough to prevent its tripping.

6. Analysis of Event:

This event resulted in automatic actions which placed the plant in a hot shutdown condition. The reactor protection system and safeguards system operated properly. MCC-6 was de-energized for approximately three minutes. This disabled redundant components including the following:

a. V1-8B and 8C - Main Steam to Steam Driven AFWP
b. RHR-751 - RHR Suction from RCS (not redundant)
c. RHR-744B-RHR Pump Discharge to RCS
d. Boric Acid Transfer Pump "B"
e. RHR-863B - RHR Pump Discharge to SI Pump Suction
f. Service Water Booster Pump "B"
g. SI-880B and 880D - C.V. Spray Pump Discharge to Spray Headers
h. SI-845B - Spray Additive Tank Suction
i. RHR-860B and 861B - RHR C.V. Sump Suction
j. SI-867B - Boron Injection Tank Inlet

MCC-5 was de-energized for about one minute. This disabled components including the following:

a. V1-8A-Main Steam to Steam Driven AFWP
b. RHR-750-RHR Suction from RCS (not redundant)
c. RHR-744A-RHR Pump Discharge to RCS
d. Boric Acid Transfer Pump "A"
e. RHR-863A-RHR Pump Discharge to SI Pump Suction
f. Service Water Booster Pump "A"
g. SI-880A and 880C - C.V. Spray Pump Discharge to Spray Headers
h. SI-845A - Spray Additive Tank Suction
i. RHR-860A and 861A-RHR C.V. Sump Suction
j. SI-867A-Boron Injection Tank Inlet
k. CVC-350 - Charging Pump Suction from B.A. Pump

Disabling RHR-750or 751 negates the use of the RHR System, but, for the time intervals involved here, use of the RHR System would not have been required.

As shown in the sequence of events, there was approximately a two minute interval in which it is possible, although not confirmed, that MCC-5 and MCC-6 were de-energized simultaneously. If this were the case, the SI, RHR, and boron addition systems would have been incapable of performing their full functions. However, the likelihood of an incident requiring those systems is small and is even less likely when the two minute time span is considered.

Operator error was not involved in this incident. No damage to systems or components, personnel injuries, radiation exposures, or radioactive material releases occurred.

7. Corrective Action:

The mechanical linkages on the discharge damper of HVE-2B were adjusted so that the damper properly sealed and backwards rotation of the fan was eliminated. The corresponding damper on HVE-2A was checked and found satisfactory. The breakers for HVE-2B and MCC-6 were carefully inspected, and no abnormal

conditions were found. These components have operated properly since these corrective actions were taken.

An investigation will be pursued regarding the magnetic trip settings in the breaker for HVE-2B.

8. Failure Data:

No previous incidents of this type have occurred. Manufacturer's data for the breakers involved are as follows:

HVE-2B

Westinghouse Type KA
225 AMP Continuous Rating
600 Volt, 3 Pole
HKA Trip Unit, Magnetic
Issue A-390
Starter: Size 4, 440v/100hp, 135 AMPS
Thermal Overloads: H-89 (88-95 AMP Trip)
Magnetic Trips: Adjustable, low-1125 AMPS, High 2250 AMPS

MCC-6

Westinghouse Type DB-50
S.N. 24Y4959M4
Coil Rating 600 AMPS
Trip Unit Type: 24Y4959M4
Long Delay Setting: 60 Sec. @ 300%
Short Delay Setting: 6 Cycles @ 300%
Instantaneous Setting: 4800 AMPS

A. C. Tollison, Jr.
Operating Supervisor

Jack B. McGirt, Manager
H. B. Robinson SEG Plant

ACT:gg

CC: Operating Supervisor (7)
Maintenance Supervisor (5)
Administrative Supervisor (5)
Engineering Supervisor
Environmental and Radiation Control Supervisor
Engineers
Training Coordinator
T. E. Bowman
Bill Tucker

PLANT OPERATING EXPERIENCE (REV. 1)

1a. Date: January 15, 1975

1b. Event Date: August 11, 1974

2. Identification of Event: Reactor Trip due to Loss of Instrument Busses 4 and 9 and MCC 6

3. Conditions Prior to Event:

The plant was operating normally at 100% power with a net electrical output of 650 MWe. RCS boron concentration was 842 ppm, and control rod bank "D" was at 211 steps. Auxiliary building ventilation fan HVE-2A was running.

4. Description of Event:

The Control Operator was asked to start the second Auxiliary Building Ventilation Exhaust Fan, HVE-2B, so that an air flow reading up the stack could be taken with both fans operating. At 2230, when HVE-2B was started, a reactor trip, safety injection, and loss of MCC-6 and Instrument Busses 4 and 9 occurred. The following is the sequence of events as can best be reconstructed:

Approximate Time	Event
2230	HVE-2B was started from the RTGB by the Control Operator. This fan receives power from MCC-6 which is in turn powered from bus E-2. The breaker which supplies MCC-6 from E-2 tripped due to the starting surge of HVE-2B motor. This de-energized Instrument Busses 4 and 9 which are fed from MCC-6. This interrupted power to Nuclear Instrumentation Power Range Channel N-44 (Instrument Bus 4) causing a 30% turbine runback at 200% per minute. N-44 is also the channel which contributes to the automatic rod control system. Since it was de-energized, the rod control system did not accomplish automatic rod insertion at a rate which would begin to reduce TAVE (the turbine first stage pressure/TAVE comparison was probably still operable).
+ 10 Sec.	As a result of the above conditions, a reactor trip occurred due to high pressurizer pressure (2385 psig). This pressure increase did not indicate on the RTGB strip chart since power had been lost to the recorder for pressurizer pressure, PR-444. This reduced TAVE, RCS pressure

and steam generator levels rapidly. The Steam Flow/Feed Flow Mismatch (caused electrically by the loss of Instrument Busses 4 and 9 and Analog Instrument Racks (AIR) 24 and 25) with Low Steam Generator Level first-out annunciators and the Low-Low Steam Generator Level first-out annunciato energized when steam generator levels decreased.

+ 30 Sec. — When TAVE decreased to 543°F, a safety injection and steam line isolation were initiated on High Steam Line Flow With Low Tave. The High Steam Line Flow signal was caused by the loss of Instrument Busses 4 and 9 and AIR's 24 and 25. When TAVE dipped below 543°F following the reactor trip, the SI and steam line isolation were automatically actuated.

+ 2 Min. — The Operators recognized the loss of electrical power to Instrument Bus 4 and MCC-6 and the unnecessary safety injection. The MCC-6 breaker at E-2 was reset restoring power to MCC-6 and the instrument busses. "B" Battery Charger was restarted.

+ 15 Min. — Power was lost to MCC-5 for an unknown reason. It was re-energized from its supply breaker in E-1 about one minute later.

+ 17 Min. — It was noted by the Auxiliary Operator that MCC-6 had again tripped. It was immediately reset at E-2. This could have possibly been due to HVE-2B starting automatically when MCC-5 and HVE-2A were lost. The breaker for HVE-2B was racked out and disabled pending investigation maintenance.

+ 49 Min. — The diesels were secured, and all safeguards syste were returned to normal. The plant was stable in a hot shutdown condition. Investigation into the cause was continued.

5. Designation of Apparent Cause of Event:

Investigation revealed the primary cause of the incident to be a leaking dischar damper on Auxiliary Building Ventilation Fan HVE-2B. Because this damper did nc seal tightly, back pressure from running fan HVE-2A caused idle fan HVE-2B to rotate backwards at a rate of 155 RPM. When HVE-2B was started it experienced a much higher and longer duration starting (locked rotor) current surge due to the time required to stop and reverse the rotation of the fan. Counter EMF was not produced quickly enough to prevent a large starting current. This resulted in tripping the MCC-6 supply breaker.

A secondary cause of the incident was that the breaker supplying MCC-6 tripped instead of the breaker supplying HVE-2B. This has not been fully explained, but an investigation will be conducted regarding the possibility that the magnetic instantaneous trip setting on the HVE-2B breaker was high enough to prevent its tripping.

6. Analysis of Event:

This event resulted in automatic actions which placed the plant in a hot shutdown condition. The reactor protection system and safeguards system operated properly. MCC-6 was de-energized for approximately three minutes. This disabled redundant components including the following (excluding normally open valves and non-safeguards equipment):

a. V1-8B and 8C - Main Steam to Steam Driven AFWP
b. RHR-744B-RHR Pump Discharge to RCS
c. Boric Acid Transfer Pump "B"
d. RHR-863B - RHR Pump Discharge to SI Pump Suction
e. SI-866A-SI Pump Discharge to RCS Hot Leg
f. Service Water Booster Pump "B"
g. SI-880B and 880D - C.V. Spray Pump Discharge to Spray Headers
h. SI-845B - Spray Additive Tank Suction
i. RHR-860B and 861B - RHR C.V. Sump Suction
j. SI-867B - Boron Injection Tank Inlet
k. SI-870B - Boron Injection Tank Outlet

MCC-5 was de-energized for about one minute. This disabled redundant components including the following (excluding normally open valves and non-safeguards equipment):

a. V1-8A - Main Steam to Steam Driven AFWP
b. RHR-744A-RHR Pump Discharge to RCS
c. Boric Acid Transfer Pump "A"
d. RHR-863A-RHR Pump Discharge to SI Pump Suction
e. SI-866B-SI Pump Discharge to RCS Hot Leg
f. Service Water Booster Pump "A"
g. SI-880A and 880C - C.V. Spray Pump Discharge to Spray Headers
h. SI-845A - Spray Additive Tank Suction
i. RHR-860A and 861A-RHR C.V. Sump Suction
j. SI-867A - Boron Injection Tank Inlet
k. SI-870A-Boron Injection Tank Outlet
l. CVC-350 - Charging Pump Suction from B.A. Pump

The safeguards system is capable of performing its intended function with either emergency bus E-1 or E-2 and its associated busses dead.

As shown in the sequence of events, there was approximately a two-minute interval in which it is possible, although not confirmed, that MCC-5 and MCC-6 were de-energized simultaneously. When the safety injection at plus 30 seconds occurred, MCC-6 was de-energized, but MCC-5 was energized, and the safeguards equipment associated with MCC-5 actuated. At plus 2 minutes when MCC-6 was re-energized, the safeguards equipment associated with it may have actuated, but this can not be confirmed. The SI signal was not reset and the valves and components remained in their SI position. Therefore, at plus 15 minutes, when both MCC-5 and MCC-6 may have been de-energized, at least those valves on MCC-5 previously open due to the SI signal would have remained open. These valves included RHR-744A, SI-870A, and SI-867A, establishing an SI and RHR flowpath to the RCS cold legs. The accumulator isolation valves are normall open. The other equipment on these two busses would have been inoperative for about 2 minutes. However, the likelihood of an incident requiring safeguards in small and is even less likely when this two minute time interval is considere

Operator error was not involved in this incident. No damage to systems or components, personnel injuries, radiation exposures, or radioactive material releases occurred.

7. Corrective Action:

The mechanical linkages on the discharge damper of HVE-2B were adjusted so that the damper properly sealed and backwards rotation of the fan was eliminated. The corresponding damper on HVE-2A was checked and found satisfactory. The breakers for HVE-2B and MCC-6 were carefully inspected, and no abnormal conditions were found. These components have operated properly since these corrective actions were taken.

An investigation will be pursued regarding the magnetic trip settings in the breaker for HVE-2B.

8. Failure Data:

No previous incidents of this type have occurred. Manufacturer's data for the breakers involved are as follows:

HVE-2B

Westinghouse Type KA
225 AMP Continuous Rating
600 Volt, 3 Pole
HKA Trip Unit, Magnetic
Issue A-390
Starter: Size 4, 440v/100hp, 135 AMPS
Thermal Overloads: H-89 (88-95 AMP Trip)
Magnetic Trips: Adjustable, low 1125 AMPS, High 2250 AMPS

MCC-6

Westinghouse Type DB-50
S.N. 24Y4959M4
Coil Rating 600 AMPS
Trip Unit Type: 24Y4959M4
Long Delay Setting: 60 Sec. @ 300%
Short Delay Setting: 6 Cycles @ 300%
Instantaneous Setting: 4800 AMPS

A. C. Tollison, Jr.
Operating Supervisor

Jack B. McGirt, Manager
H. B. Robinson SEG Plant

ACT:gg

CC: Operating Supervisor (7)
Maintenance Supervisor (5)
Engineering Supervisor
Environmental and Radiation Control Supervisor

Letter to N. C. Moseley from Carolina Power and Light Company dated December 23, 1974.

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