FLORIDA POWER & LIGHT COMPANY

July 16, 1984
L-84-177

Office of Nuclear Reactor Regulation
Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Generic Letter 83-28
Item 4.3 - Shunt Trip

Generic Letter 83-28 Item 4.3, "Reactor Trip System Reliability (Automatic Actuation of Shunt Trip Attachment for Westinghouse and B & W Plants)", required the addition of an automatic shunt trip attachment to the reactor trip system. By Letters L-83-555 (11/8/83) and L-84-126 (5/9/84), FPL committed to provide a proposed design and implementation schedule by July 15, 1984. The proposed design including responses to the thirteen concerns identified in the NRC SER (for the WOG generic design modification) dated August 10, 1983, are included in the attachment. These proposed modifications will be implemented in the first refueling outage starting 4 months after issuance of the Turkey Point SER for Item 4.3.

Very truly yours,

for J. W. Williams, Jr.
Group Vice President
Nuclear Energy

JWW/PLP/js

Attachment

cc: J. P. O'Reilly, Region II
Harold F. Reis, Esquire
PNS-LI-84-241

A001 3/3 Aperture Card Dist. Drawings To: Reg File-1 D. McDonald - 2 cys Advanced #0181

TURKEY POINT UNITS 3 & 4
CONCEPTUAL DESIGN FOR AUTOMATIC SHUNT TRIP OF REACTOR TRIP BREAKERS AND BREAKER RESPONSE TIME TESTING

In the present Reactor Protection System (RPS) design, automatic trip signals actuate only the undervoltage trip devices of the main circuit breakers in the Reactor Trip Switchgear (RTS). The breaker shunt trip feature can be manually actuated only. In order to provide additional assurance of tripping the breakers, this design modification, based on the WOG generic design, adds automatic trip signals to the shunt trip devices. In addition, the modification includes provisions for response time testing of the breakers.

Automatic Shunt Trip Modifications

Figure 1 shows the modifications for both breakers 52/RTA and 52/RTB. A control relay (STA or STB) and two test pushbuttons are mounted in the RTS and wired to the existing UV trip and shunt trip circuits. The relay (STA or STB) is energized from the Reactor Protection System logic train (A or B) voltage to the UV trip coil. When the voltage is removed by an automatic reactor trip signal, the relay (STA or STB) will be de-energized and its "b" contact will close to energize the shunt trip coil of the breaker. Thus the mechanical linkages of both the UV and shunt trip devices of the breaker will be actuated. Two pushbuttons (test & block) are used during testing to individually confirm the operability of the UV and the shunt trip mechanisms.

The following provides the plant specific design information requested by the NRC in the SER on the WOG generic design dated August 10, 1983.

Question 1

"Provide the electrical schematic/elementary diagrams for the reactor trip and bypass breakers showing the undervoltage and shunt trip coil actuation circuits as well as the breaker control (e.g., closing) circuits, and circuits providing breaker status information/alarms to the Control Room."

Response

Attached Figure 1 for Turkey Point Units 3 and 4 shows the reactor trip and bypass breakers with associated closing and tripping circuits as well as the breaker status information in the Control Room.

Question 2

"Identify the power sources for the shunt trip coils. Verify that they are Class 1E and that all components providing power to the shunt trip circuitry are Class 1E and that any faults within non-Class 1E circuitry will not degrade the shunt trip function. Describe the annunciation/indication provided in the Control Room upon loss of power to the shunt trip circuits. Also describe the overvoltage protection and/or alarms provided to prevent or alert the operator(s) to an overvoltage condition that could affect both the UV coil and the parallel shunt trip actuation relay."

Response 2.A

UNIT	Rx TRIP BREAKER	CHANNEL	125 VDC FEED	BKR RATING	SWGR PANEL
3	52/RTA	A	3D0138	30A	3C35
3	52/RTB	B	3D2312	30A	3C35
4	52/RTA	A	4D2312	30A	4C35
4	52/RTB	B	4D0138	30A	4C35

All existing components providing power to the shunt trip were qualified as safety related under the original license requirements of Turkey Point. These include the main station batteries and DC distribution panels, manual pushbuttons and indicating lights furnished with the plant control boards, various components of the Reactor Protection System, fuses within the Reactor Trip Switchgear, and interconnecting cable.

Added components include pushbuttons and control relays. These components will be fully qualified for their intended applications.

All non-safety related circuits will be electrically isolated and physically separated from the safety related tripping circuits. Closing and tripping circuits are isolated through the use of fuses to ensure that a fault in the closing circuit will not prevent breaker trip. Adequate physical separation and/or barriers will also be provided to protect safety related circuits from faults in non-safety circuits.

Response 2.B

It is not necessary to add new control room indication/annunciation as a result of incorporating the shunt trip modification. Existing indication for breaker operation on the main vertical panels and control consoles consist of red and green position lights. These lights are powered from the same fused 125 VDC supplies used for closing and shunt tripping the circuit breakers. The green lights being on indicate that the breaker is open and power is available for closing the breaker. The red lights indicate that the breaker is closed and power is available for tripping the breaker. Since the red light is connected in series with the shunt trip coil and an "a" auxiliary contact, the red light also indicates that power is available to the shunt trip device and that there is circuit continuity in the shunt trip coil. This provides an indication that the shunt trip coil is ready to perform its function when required.

Loss of DC power to the circuits would result in loss of indicating lights, which would alert the operator.

Response 2.C

The added shunt trip circuitry is powered from the reactor protection logic voltage supply. Components in the added shunt trip circuitry have been selected based on their ability to perform their intended function up to a voltage as high as 115% of nominal voltage.

The shunt trip coils in the reactor trip breakers are powered from 125 VDC via the station batteries. Normally the shunt trip coils are in a de-energized condition. When the trip breakers are closed, the red lamp current (approximately 50 m.a.) flows through the trip coil to monitor the circuit continuity. This current is not large enough to actuate the trip coil armature. The reactor trip signal applies a nominal voltage of 125 VDC to each shunt trip coil in the redundant trains. As the breaker trips, its auxiliary switch opens to de-energize the shunt trip coil. Since the 125 VDC voltage is supplied from the battery system, it may temporarily rise to the battery equalizing voltage (not exceeding 115% of nominal voltage). The shunt trip coil will cause the breaker to open, despite an overvoltage condition, since it is energized to operate.

Question 3

"Verify that the relays added for the automatic shunt trip function are within the capacity of their associated power supplies and that the relay contacts are adequately sized to accomplish the shunt trip function. If the added relays are other than the Potter & Brumfield MDR series relays (P/N 2383A38 or P/N 955655) recommended by Westinghouse, provide a description of the relays and their design specifications."

Response

The added relays (STA and STB) will be the Potter & Brumfield MDR series relay (P/N 2383A38) as recommended by Westinghouse.

The relay contacts are adequately sized for the shunt trip function and are within the capacity of their associated power supplies.

Question 4

"State whether the test procedure/sequence used to independently verify operability of the undervoltage and shunt trip devices in response to an automatic reactor trip signal is identical to the test procedure proposed by WOG. Identify any differences between the WOG test procedure and the test procedure to be used and provide the rationale/justification for these differences."

Response

As per existing operating Procedure 1004.2, the Reactor Trip Breakers are tested as follows:

1. Verify that Reactor Trip Breakers "A" & "B" are racked in and closed and that Bypass Breakers "A" & "B" are racked out and open.

2. Rack Bypass Breaker "A" into the TEST position and manually close and trip the breaker to verify operation.

3. Close Bypass Breaker "A" using the pushbutton on the breaker.

4. Trip Bypass Breaker "A" from the test panel on the Reactor Protection (R.P.) rack.

5. Rack in Bypass Breaker "A" to operating position.

6. Close Bypass Breaker "A" from the RP rack.

(The following steps will be added to the Operating Procedure to incorporate the WOG proposed test procedure).

7. Depress the "Auto Shunt Trip Block" push button on Reactor Trip Breaker "A" and hold.

8. Depress the "Auto Shunt Trip Test" pushbuttons on Reactor Trip Breaker "A" and verify that the breaker does not trip.

9. Release the "Auto Shunt Trip Test" pushbutton only. MAINTAIN the "Auto Shunt Trip Block" pushbutton in the depressed position.

10. Trip Reactor Trip Breaker "A" from the RP Rack (UV trip only).

11. Close Reactor Trip Breaker "A" using the pushbutton on the control console in the Control Room.

12. Verify that Reactor Trip Breakers "A" and "B" are closed.

13. Release the "Auto Shunt Trip Block" pushbutton on Reactor Trip Breaker "A".

14. Depress the "Auto Shunt Trip Test" pushbutton on Reactor Trip Breaker "A" momentarily.

15. Verify the breaker trip.

16. Perform Reactor Protection Logic Test.

17. Close Reactor Trip Breaker "A" using the pushbutton on the control console.

18. Verify that Reactor Trip Breakers "A" and "B" are closed.

19. Trip Reactor Trip Bypass Breaker and rackout.

20. Obtain Reactor Trip Breaker Response Time from the plant computer.

21. This completes test of one reactor trip breaker. This procedure is repeated for the "B" train trip breaker.

QUESTION 5

"Verify that the circuitry used to implement the automatic shunt trip function is Class 1E (safety related) and that the procurement, installation, operation, testing, and maintenance of this circuitry will be in accordance with the quality assurance criteria set forth in Appendix B to 10CFR Part 50."

RESPONSE

All modifications to implement the automatic shunt trip function will be within the reactor trip switchgear cabinet and the main control boards. All internal wiring and devices used to implement the automatic shunt trip function will be safety related. Procurement, installation, operation, testing and maintenance of this equipment will be in accordance with the plant specific quality assurance procedures which satisfy the quality assurance requirements of Appendix B to 10 CFR Part 50.

QUESTION 6

"Verify that the shunt trip attachments and associated circuitry are/will be seismically qualified (i.e., be demonstrated to be operable during and after a seismic event) in accordance with the provisions of Regulatory Guide 1.100, Revision 1 which endorses IEEE Standard 344, and that all non-safety related circuitry/components in physical proximity to or associated with the automatic shunt trip function will not degrade this function during or after a seismic event.

RESPONSE

The WOG is working with Westinghouse to obtain seismic qualification of the shunt trip attachments. Seismic qualification will also be provided for any circuitry added to the reactor trip switchgear. If qualification tests show that the shunt trip attachments do not perform their intended function during or after a postulated seismic event, those components will be replaced at the next scheduled outage of sufficient duration subsequent to receipt of the replacement components. An auditable link will be established for those components that may not be replaced due to unavailability of qualified replacements.

QUESTION 7

"Verify that the components used to accomplish the automatic shunt trip function are designed for the environment where they are located."

RESPONSE

All equipment added to implement this change will be located in a mild environment as defined by 10 CFR 50.49-(c). The plant specific environmental conditions defined in the WOG Generic Design Package, Table 1 envelope the Turkey Point requirements for this equipment. The components added for the automatic shunt trip feature are qualified for the environment where they are located.

QUESTION 8

"Describe the physical separation provided between the circuits used to manually initiate the shunt trip attachments of the redundant reactor trip breakers. If physical separation is not maintained between these circuits, demonstrate that faults within these circuits can not degrade both redundant trains."

RESPONSE

The manual shunt trip circuits between reactor trip switchgear & control panels are routed in two separate, redundant trains. These circuits are landed at separate terminal blocks in the reactor trip switchgear, control console and vertical panel. In the reactor protection relay rack the circuits land at different racks for the redundant trains. However, in the control consoles and vertical control panels, these redundant circuits are internally wired to one pushbutton which is common for both trains. This switch will be modified or replaced to provide separation between wiring of redundant trains, and suitable physical separation or barriers will be provided for wiring within the control boards.

All modifications for the automatic shunt trip feature are made inside the reactor trip switchgear. A metal barrier is provided between redundant trains and the switchgear and modifications are done within the respective compartment of each train.

QUESTION 9

"Verify that the operability of the control room manual reactor trip switch contacts and wiring will be adquately tested prior to startup after each refueling outage. Verify that the test procedure used will not involve installing jumpers, lifting leads, or pulling fuses and identify any deviations from the WOG procedure. Permanently installed test connections (i.e., to allow connection of a voltmeter) are acceptable."

RESPONSE

All control room manual reactor trip switch contacts will be tested during each refueling outage via the following method:

1. Check that rod drive motor generators are secured with their output breakers open.
2. Disable the UV Trip Device on Reactor Trip Breakers A and B using a temporary restraint.
3. Close Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker B.
4. Trip Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker B using the manual pushbutton on the control console.
5. Close Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker B.
6. Trip Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker B using the manual pushbutton on the control console.

7. Close Reactor Trip Bypass Breaker A.

8. Close Reactor Trip Bypass Breaker B. Check that both Reactor Trip Bypass Breakers do not stay closed.

9. Manually Trip and Reactor Trip Bypass Breaker which is still closed.

10. Remove the temporary restraint from the Reactor Trip Breaker UV Trip Devices.

11. Close Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker A.

12. Depress the "Auto Shunt Trip Block" pushbutton on Reactor Trip Breakers A and B and hold.

13. Trip Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker A using the manual pushbutton from the console.

14. Close Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker A.

15. Trip Reactor Trip Breakers A and B and Reactor Trip Bypass Breaker A using the manual pushbutton from the console.

16. Release the "Auto Shunt Trip Block" pushbutton on Reactor Trip Breakers A and B.

17. Rack out Reactor Trip Bypass Breakers A and B.

QUESTION 10

"Verify that each bypass breaker will be tested to demonstrate its operability prior to placing it into service for reactor trip breaker testing."

RESPONSE

In accordance with Turkey Point Operating Procedure 1004.2 (periodic test of the reactor trip system), before a reactor trip breaker is removed for testing, the parallel bypass breaker is manually closed and tripped to verify operability. (Section 8.15)

Per Technical Specification 4.1, Table 4.1-1, Item 24, this testing is to be conducted monthly during plant operation and prior to startup after each refueling outage as part of reactor trip logic test.

QUESTION 11

"Verify that the test procedure used to determine reactor trip breaker operability will also demonstrate proper operation of the associated control room indication/annunciation."

RESPONSE

Existing Turkey Point Operating Procedure 1004.2 addresses this requirement. At the start of testing, communication is established with the control room. Section 8.24 of this procedure states that the operator at the test panel shall notify the operator in the control room which matrix is being tested. The operator in the control room shall verify that the appropriate annunciators alarm, (both single channel and first out trips) and that the appropriate status lights come on.

This statement will cover the addition of new test procedures for operability testing of the undervoltage and shunt trip devices. Although the revised test procedures add intermediate testing provisions, the information presented to the control room operators is unchanged, i.e., operation of red and green indication lights to confirm breaker position.

QUESTION 12

"Verify that the response time of the Automatic Shunt Trip feature will be tested periodically and shown to be less than or equal to that assumed in the FSAR analyses or that specified in the technical specifications."

RESPONSE

Modified Operating Procedure 1004.2, as discussed in item 4, provides for independent verification of the reactor trip breaker operability with UV trip and automatic shunt trip. Figure 1 shows the contact inputs to a computer to check the circuit breaker opening response time. The reactor trip breaker response can be checked as follows:

1. Depress the "Auto Shunt Trip Block" pushbutton on Trip Breaker "A" and hold.

2. Depress the "Auto Shunt Trip Test" pushbutton on Trip Breaker "A" and verify that the breaker does not trip.

3. Release the "Auto Shunt Trip Test" pushbutton only. Maintain the "Auto Shunt Trip Block" pushbutton in the depressed position.

4. Trip Reactor Trip Breaker "A" from the Reactor Protection Rack. Simultaneously a contact input signal is sent to the computer simulating a UV trip signal.

5. Verify the breaker trip. As soon as the breaker opens, a signal is sent to the same computer from the breaker auxiliary switch contact. From the computer printout obtain the time from switch actuation (equivalent to reactor protection output) to the reactor trip breaker opening. This is the breaker response time with UV trip.

6. Release the "Auto Shunt Trip Block" pushbutton on Trip Breaker "A".

7. Reclose the Reactor Trip Breaker "A" with the pushbutton on the control console.

8. Depress the "Auto Shunt Trip Test" pushbutton on Reactor Trip Breaker "A" momentarily. This pushbutton also provides a contact input to the computer.

9. Verify the breaker trip to confirm breaker opening through shunt trip only. A contact input signal is also provided to the computer from the trip breaker auxiliary switch.

10. From the computer printout obtain the time from the shunt trip test switch (equivalent to reactor protection output or manual UV actuation from the control board) to the reactor trip breaker opening. This is the breaker response time with shunt trip.

    (It should be noted that this shunt trip response time check also covers breaker response due to manual shunt trip from the existing control board switches as it includes the additional time delay inherent to the shunt trip relay (STA or STB).)

    The maximum allowable circuit breaker response time is 167 msec.

11. This testing should be done concurrently with monthly verification testing to minimize breaker wear.

QUESTION 13

"Propose Technical Specification changes to require periodic testing of the undervoltage and shunt trip functions and the manual reactor trip switch contacts and wiring."

RESPONSE

The Technical Specifications (Table 4.1-1, Item 24) require monthly tests of logic channels during operation and before startup. Since the addition of the automatic shunt trip feature is a change to the breaker tripping logic, the testing would be required by the existing Technical Specifications.

A proposed License Amendment will be submitted after issuance of the SER to coincide with implementation of the proposed modification. Table 4.1-1 of the Technical Specifications will be modified similar to the following.

Channel Description	Check	Calibrate	Test	Remarks
34 Reactor Trip Breakers	M(1) (3)	-	R(2)	(1) check ability of UV and Shunt Trip to open Reactor Trip Breakers, check Reactor Trip Bypass Breaker UV device prior to use. (2) Manual Trip Test using Control Room Push button. (3) Check Breaker Response Time

SCALING RULES

CLOSE | TRIP | CLOSE | TRIP

REACTOR PROTECTION RELAY RACKS

CONTROL BOARD

SWITCHGEAR

125 VDC +15V −20V (SAFETY RELATED) CH. A

RT-1 RT-2 RT-3 RT-4 RT-5 RT-6 RT-7 RT-8 RT-9 RT-10 — TRAIN "A"

TO COMPUTER NOTE NO 3

TO COMPUTER NOTE NO 3

CLOSE G | TRIP R | M

CLOSE G G

SHUNT TRIP R

SHUNT TRIP R

UV TRIP

UV TRIP

125 VDC +15V −15V (SAFETY RELATED) CH. A

STA b

AUTO SHUNT TRIP BLOCK

AUTO SHUNT TRIP TEST

a (RTA)

RTX A

2CH

2CH CLOSE

2CH TRIP

52a BYA

52H BYA

X X

CC X b

TC a

STA UV STX A

TO COMPUTER NOTE NO 3

TO COMPUTER NOTE NO 3

52/RTA
(SWGR CELL 1B)

52/BYB
(SWGR CELL 2C)

CLOSE | TRIP | CLOSE | TRIP

125 VDC +15V −20V (SAFETY RELATED) CH. B

RT-1 RT-2 RT-3 RT-4 RT-5 RT-6 RT-7 RT-8 RT-9 RT-10 — TRAIN "B"

CLOSE G | TRIP R | M

FB RTR (CONSOLE)

CLOSE G G

SHUNT TRIP R

SHUNT TRIP R

UV TRIP

CLOSE G | TRIP R

PBA RT

PBB RT

CONTROL CONSOLE VERTICAL PANEL

125 VDC +15V −15V (SAFETY RELATED) CH. B

STB b

AUTO SHUNT TRIP BLOCK

AUTO SHUNT TRIP TEST

Q (RTB)

RTX B

2BH

2BH CLOSE

2BH TRIP

52a BYB

52H BYB

X X

CC X b

TC a

STB UV STX B

TO COMPUTER NOTE NO 3

TO COMPUTER SEE NOTE NO 3

52/RTB
(SWGR CELL 1C)

52/BYA
(SWGR CELL 2B)

TRAIN "A" ⟷ TRAIN "B"

LEGEND

——— CLOSING CIRCUIT

——— TRIPPING CIRCUIT

REFERENCE DRAWING

F.P. 5610-M-430-146 SH. 6

NOTES:

1. ADDITIONAL BREAKER AUXILIARY SWITCH CONTACTS NOT SHOWN FOR CLARITY.
2. CIRCUITRY SHOWN IS TYPICAL OF EITHER UNIT 3 & 4.
3. THESE INPUTS ARE TO THE SAME COMPUTER TO CHECK BREAKER RESPONSE TIME.

E

BECHTEL
GAITHERSBURG, MARYLAND

FLORIDA POWER & LIGHT COMPANY
TURKEY POINT NUCLEAR UNITS
UNIT NO. 3 1970-760 MW INSTALLATION
UNIT NO. 4 1971-760 MW INSTALLATION

REACTOR TRIP SWITCHGEAR SHUNT TRIP MODIFICATIONS

DRAWN CHL | DATE 6-4-84 | DRAWING NO. FIGURE 1 | SCALE NONE

PC/M

30x42