TOLEDO EDISON

LOWELL E. ROE
Vice President
Facilities Development
(419) 259-5242

Docket No. 50-346

License No. NPF-3

Serial No. 522

June 23, 1979

Director of Nuclear Reactor Regulation
Attention: Mr. Robert N. Reid, Chief
Operating Reactors Branch No. 4
Division of Operating Reactors
United States Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Reid:

This letter transmits the following information requested by G. R. Mazetis:

1) An analysis on the capability of a dry and isolated steam generator to start an auxiliary feedwater pump 30 minutes after the loss of all main and auxiliary feedwater.

2) The test results for anticipatory reactor trip system.

Yours very truly,

Lowell E. Roe

LER:FRM

Attachment

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Docket No. 50-346
License No. NPF-3
Serial No. 522
June 23, 1979

Attachment 1

Question 1

Discuss the ability of the secondary system to support AFW steam turbine operation at 20 minutes after loss of feedwater to the generator.

Response

Davis-Besse Nuclear Power Station Unit 1 (DB-1) is designed to redundantly isolate each steam generator (SG) upon initiation of SFRCS. The steam generators are not cross-connected on either the feed or steam system side when isolated. In any loss of feedwater condition, SFRCS isolates the steam generators and starts the auxiliary feedwater (AFW) steam turbines to provide auxiliary feedwater flow to the generators within 40 seconds. If for some reason one or both redundant safety grade AFW trains do not initiate for thirty minutes there will be adequate pressure to start the pumps.

This is illustrated by both calculation and experience at DB-1. The sequence of events would be as follows:

a) LOFW
b) Reactor trip
c) SFRCS - isolated steam generators (assume no AFW initiation)
d) Decay heat removal due to primary to secondary heat transfer to steam generator inventory, boiling off the inventory to atmosphere via main steam safety valves. Secondary system pressure 1050 psig $\approx$550°F.
e) As soon as the generator inventory boils off from a reactor trip at any previous power level, decay heat removal to that generator is lost. If both generators are dry, all decay heat is removed via the boil-off of the primary system through the PORV, pressurizer code safety valves and/or break. This has been analyzed in Volume III of the "Evaluation of Transient Behavior and Small Reactor Coolant System Breaks in the 177 Fuel Assembly Plant", dated May 16, 1979. This will let pressure fall to main steam safety reseat setpoint and isolate all dry steam loss from the steam generator. With this total SG isolation the steam generator should be at approximately 1000 psig and will remain pressurized indefinitely. During this time, the dry superheated steam in the steam generators will be at primary system temperature and there will be no heat transfer through the steam generator. There will be 3412 Cu.Ft. ($\approx$1600 lb.) of dry superheated steam in the SG at 1000 psig available to start the AFW pumps. At a full rated flow, the AFW turbine conservatively requires 33,000 lb./hr. steam flow. The turbine starts in 30 seconds after steam inlet valves start to open which means that it will require about 275 lbs. of steam to start and bring the AFW pump up to full speed at full rated flow against full steam generator pressure.

As a bounding argument to this case, DB-1 has had one event in which a steam generator did not receive AFW when actuated on September 24, 1977.

During this event one AFW pump was running at 2600 rpm while the SG was dry. During this condition the SG pressure reduced to about 650 psig in 16 minutes. At that time the operator manually increased the AFW pump speed and the SG pressure immediately increased, due to the introduction of AFW to the SG. Additional details are found in the Supplement to the September 24, 1977 Licensee Event Report dated November 14, 1977.

Docket No. 50-346
License No. NPF-3
Serial No. 522
June 23, 1979 Attachment 2

DAVIS BESSE NUCLEAR POWER STATION
DATA COVER SHEET
ED 6823

TEST NO. ST 5030.02 T-3807 | TITLE ART System Func Test

COMPLETED TEST

TEST PERSONNEL
TEST COMPLETED 6/14/79 (DATE) BY Melson (TEST PERSONNEL)

SECTION T-3807

EQUIPMENT CODE (IF APPLICABLE) ARTS.

☐ PERFORMED TO MEET SCHEDULE
☒ PERFORMED TO ENSURE OPERABILITY AFTER ~~MAINTENANCE~~ FCR 79-176

SHIFT FOREMAN

SHIFT FOREMAN ACKNOWLEDGEMENT THAT SURVEILLANCE REQUIREMENTS ARE SATISFIED AND THE EQUIPMENT IS DECLARED OPERABLE

SHIFT FOREMAN Snyder DATE 6/14 TIME 1145

FORWARDED TO SURVEILLANCE TEST ENGINEER 6/14/79 (DATE)

SURVEILLANCE TEST ENGINEER

CHECKLIST
☒ DATA AND ENCLOSURES INCLUDED
☐ SIGN-OFFS COMPLETED
☐ DEFICIENCY LIST ATTACHED, IF NEEDED
☒ N/A COMPUTER TEST SCHEDULE UPDATED

REMARKS

FORWARDED TO Deakyne (DESIGNATED REVIEWER) ON 6-15-79 (DATE) BY [illegible] (ENGINEER)

DESIGNATED REVIEWER

☒ APPROVED
☐ FURTHER REVIEW NECESSARY

REMARKS

☐ CENTRAL FILES (PERIODIC TESTS)
☒ STE FOR FILING (SURVEILLANCE TESTS)

FORWARDED TO ☐ _____ (SECTION HEAD) ON 6-15-79 (DATE) BY [illegible] (REVIEWER)

SECTION HEAD

☐ APPROVED
☐ FURTHER REVIEW NECESSARY

REMARKS

☐ CENTRAL FILES (PERIODIC TESTS)
☐ STE FOR FILING (SURVEILLANCE TESTS)
☐ SRB FOR REVIEW ON _____ (DATE) BY _____ (SECTION HEAD)

FORWARDED TO

STATION REVIEW BOARD

☐ APPROVED
☐ OTHER RESOLUTION _____

FORWARDED TO _____ (STE) ON _____ (DATE) BY _____ (SRB CHAIRMAN)

SURVEILLANCE TEST ENGINEER

☒ DOCUMENT RECEIVED [illegible] (ENGINEER) 6-15-79 (DATE)

CENTRAL FILES

☐ DOCUMENT RECEIVED _____ (BY) 6/18/79 (DATE)

SUSPENDED TEST

SHIFT FOREMAN

TEST SUSPENDED _____ (DATE) _____ (TIME) BY _____ (SHIFT FOREMAN)

REASON FOR SUSPENSION _____

WAS SIGNIFICANT CONDITION ADVERSE TO QUALITY OR NON-ROUTINE REPORTABLE OCCURRENCE INVOLVED? ☐ YES ☐ NO
IF YES, DEVIATION REPORT MUST BE INITIATED-SUPT OR TECH ENGR NOTIFIED
IF NO, ACTION TAKEN

☐ WORK REQUEST, MAINTENANCE WORK ORDER INITIATED ☐ FCR INITIATED
☐ PROCEDURE MODIFICATION REQUEST ☐ OTHER (EXPLAIN BELOW)
☐ ACTION ITEM REQUEST INITIATED

EXPLANATION OF OTHER ACTION _____

FORWARDED TO STE _____ (DATE) BY _____ (SHIFT FOREMAN)

SURVEILLANCE TEST ENGINEER

☐ DELAY NOTED ON TEST SCHEDULE
☐ YES ☐ NO - SIGNIFICANT CONDITION ADVERSE TO QUALITY OR NON-ROUTINE REPORTABLE OCCURRENCE?

ACTION TAKEN/REMARKS _____

FORWARDED TO _____ (DESIGNATED REVIEWER) ON _____ (DATE) BY _____ (ENGINEER)

DESIGNATED REVIEWER

TEST LATE DATE _____ (ENTERED BY STATION)

REPORTABLE OCCURRENCE IF NOT RUN? ☐ YES ☐ NO

☐ MALFUNCTIONS RESOLVED - RETURNED TO SHIFT FOREMAN FOR RETEST
☐ MALFUNCTIONS WILL DELAY TEST BEYOND LATE DATE
☐ OTHER - EXPLAIN _____

FORWARDED TO ☐ SHIFT FOREMAN ☐ _____ (SECTION HEAD) ON _____ (DATE) BY _____ (REVIEWER)

SECTION HEAD

☐ TEST POSTPONED - DVR INITIATED
☐ OTHER ACTION _____

FORWARDED TO STE ON _____ (DATE) BY _____ (SECTION HEAD)

SURVEILLANCE TEST ENGINEER

☐ DOCUMENT RECEIVED _____ (ENGINEER)

FURTHER ACTION TAKEN _____

CODES
STE - Surveillance Test Engineer
SRB - Station Review Board
FCR - Facility Change Request

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T-3807

DISTRIBUTION
X Original, Responsible Section Head Action
___ File Copy, Master File

COPIES TO BE MODIFIED FOR IMMEDIATE IMPLEMENTATION
N/A

DAVIS-BESSE NUCLEAR POWER STATION - UNIT 1
TEMPORARY MODIFICATION REQUEST
ED 6926

SECTION 1

PROCEDURE TITLE AND NUMBER
ST 5030.02 RPS MONTHLY TEST

REASON FOR CHANGE
FUNCTIONAL TEST OF FCR 79-176, A.R.T.S.

CHANGE
AS PER ATTACHED

SRB reviewed ~~Power Engineering comments~~ ~~Safety Evaluation dated~~ - 6/5/79

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IS PROCEDURE REVISION REQUIRED Yes ☐ No ☒ If no, this modification is valid until COMPLETION OF TEST

PREPARED BY		DATE 5/25/79
APPROVED BY	Michael L. Bouquiak	DATE 5/25/79
APPROVED BY		DATE 5/26/79
SUBMITTED BY (Section Head)		DATE 5/31/79
RECOMMENDED BY (SRB Chairman)	D. W. Binder 6/5/79	DATE 5/31/79
QA APPROVED BY (Manager of Quality Assurance)	N/A	DATE
APPROVED BY (Station Superintendent)	6/6/79	DATE 6/3/79

TEST PROCEDURE FOR THE CONTROL GRADE
ANTICIPATORY REACTOR TRIP SYSTEM
FCR 79-176

1. PURPOSE

The purpose of this procedure is to functionally test the Control Grade Anticipatory Reactor Trip System (ARTS) FCR 79-176. This test will also show that there is no degrading of the SFRCS. ST 5030.12, Channel Functional Test of Rx Trip Module logic and CRD Trip Breaker and ST 5030.13 Channel Functional Test of Manual Rx Trip will be performed also to show there is no degradation to the RPS trip function.

2. PRECAUTIONS & LIMITATIONS

2.1 During Phase II the SFRCS will be placed in the half trip condition on Channel 2/4.

2.2 Do NOT exceed the limit of electrically tripping the Reactor Trip Breakers more than once per half hour.

3. PREREQUISITES

3.1 The station is in Mode 4 or Mode 5.

Verified _____ Date 6-11-79 6-12

3.2 The SFRCS is energized and all applicable lamps are "ON" for present plant conditions. Phase II only.

Verified _____ Date 6-11-79 6-12

3.3 Circuit 33 in Y3602 has been en[illegible]ed.

Verified _____ Date 6-11-79 6-12

3.4 MS 375 is closed. Phase II only.

Verified _____ Date 6-11-79 6-12

3.5 SP 7A is closed. Phase II only.

Verified _____ Date 6-11-79 6-12

3.6 MS 100-1 is closed. Phase II only.

Verified _____ Date 6-11-79 6-12

3.7 ICS 11A is closed. Phase II only.

Verified _____ Date 6-11-79 6-12

3.8 The EHC has been simulated to the point that it can be reset. Phase III only.

Verified _____ Date 6-11-79

3.9 The AC Supply to the CRD has been disconnected in the CRD cabinets for all SCR Groups.

Verified _____ Date 6-11-79 6-12

3.10 The Breakers to the CRD system are capable of being reset.

Verified _____ Date 6-11-79 6-12

3.11 Verify that both Blower A and Blower B in the Motor Return Cabinet are operating.

Blower A Verified _____ Date 6-5-79 6-12

Blower B Verified _____ Date 6-6-79 6-12

3.12 Shift Foreman has given permission to run this test.

Shift Foreman G L Ammon Time 1000 Verified _____ Date 6-11-79
R FLOOD 0810 6-13-79

4. PROCEDURE

The procedure is divided into three (3) phases:

Phase I - Testing of the Test Pushbuttons located in C5741, C5742, C5743, and C5744.

Phase II - Testing of the Differential Pressure Switches (Loss of Feedwater)

Phase III-Testing of the Turbine Trip

4.1 Phase I

4.1.1 Place the T/G Block Switch HS NI51 in the "BLOCK" position. Verify Q779 status is "BLOCK".

Verified _____ Date 6-11-79

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4.1.2 Reset "A", "B", "C" and "D" Breakers. Verify computer/annunciator point Q777 is not alarmed.

Verified _____ Date 6/11/79

4.1.3 In C5741, momentarily depress HS NI47 and verify "B" Breaker trips and computer/annunciator point Q777 alarms.

Verified _____ Date 6/11/79

4.1.4 Reset B Breakers. Verify computer/annunciator point Q777 clears.

Verified _____ Date 6/11/79

4.1.5 In C5742, momentarily depress HS NI48. Verify "A" Breaker trips and computer/annunciator point Q777 alarms.

Verified _____ Date 6/11/79

4.1.6 Reset "A" Breaker. Verify computer/annunciator point Q777 clears.

Verified _____ Date 6/11/79

4.1.7 In C5743, momentarily depress HS NI49. Verify "D" and "B" Breakers trip and computer/annunciator point Q777 alarms.

Verified _____ Date 6/11/79

4.1.8 Reset "D" and "B" Breakers. Verify computer/annunciator point Q777 clears.

Verified _____ Date 6/11/79

4.1.9 In C5744, momentarily depress HS NI50. Verify "C" and "A" Breakers trip and computer/annunciator point Q777 alarms.

Verified _____ Date 6/11/79

4.1.10 Reset "C" and "A" Breakers. Verify computer/annunciator point Q777 clears.

Verified _____ Date 6/11/79

4.2 Phase II

4.2.1 Verify HS NI51 is in the "BLOCK" position, Q779 status is "BLOCK" and computer/annunciator points Q778, Q777 are NOT alarmed.

Verified _____ Date 6/12/79

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4.2.2 Valve out and equalize PDIS 2685B. Vent the low leg to atmosphere and connect a water test pump and test gauge to the high leg. Close the equalizing valve.

Verified _____ Date 6/12/79

4.2.3 Slowly increase the test pressure to approximately 200 psid. Verify a dP trip in Channel 4 SFRCS, P702 alarms and the CRD breakers did NOT trip.

Verified _____ Date 6/12/79

4.2.4 Decrease the test pressure to 0 psid. Verify the SFRCS dP trip reset and P702 clears.

Verified _____ Date 6/12/79

4.2.5 Valve out and equalize PDIS 2686D. Vent the low leg to atmosphere and connect a water test pump and test gauge to the high leg. Close the equalizing valve.

Verified _____ Date 6/12/79

4.2.6 Slowly increase the test pressure gauge to approximately 200 psid. Verify a dP trip in Channel 4 SFRCS, P701 alarms and the CRD breakers did NOT trip.

Verified _____ Date 6/12/79

4.2.7 Again increase the test pressure on PDIS 2685B to approximately 200 psid. Verify computer/annunciator point Q777 is in alarm, and all CRD breakers are tripped.

Verified _____ Date 6/12/79

4.2.8 Decrease the test pressure in PDIS 2685B and PDIS 2686D to 0 psid. Valve both PDIS's back into service. Verify the dP trip in SFRCS Channel 4 has cleared and P701 and P702 have cleared.

Verified _____ Date 6/12/79

4.2.9 Reset "A", "B", "C" and "D" Breakers. Verify computer/annunciator point Q777 clears

Verified _____ Date 6/12/79

4.2.10 Independently verify that PDIS 2685B has been returned to service.

Independently Verified C Cousino Date 6/12/79

4.2.11 Independently verify that PDIS 2686D has been returned to service.

Independently Verified C Cousino Date 6/12/79

4.3 Phase III

4.3.1 Reset the turbine.

Verified _____ Date 6/12/79

4.3.2 Verify CRD Breakers "A", "B", "C" and "D" are reset.

Verified _____ Date 6/12/79

4.3.3 Verify HS NI51 is in the "BLOCK" position, Q779 status is "BLOCK", and computer/annunciator points Q778, Q777 are NOT alarmed.

Verified _____ Date 6/12/79

4.3.4 Trip the turbine and verify that CRD Breakers "A", "B", "C" and "D" DO NOT trip.

Verified _____ Date 6/12/79

4.3.5 Reset the turbine.

Verified _____ Date 6/12/79

4.3.6 Remove the 15% block by using HS NI51. Verify Q779 status is NOT blocked.

(NORMAL) Verified _____ Date 6/12/79

4.3.7 Trip the turbine. Verify all CRD breakers have tripped and computer/annunciator point Q777 is in alarm.

Verified _____ Date 6/12/79

4.3.8 Place HS NI51 in the "BLOCK" position. Verify Q779 status is "BLOCK" and computer/annunciator point Q777 is NOT alarmed.

Verified _____ Date 6/12/79

4.3.9 Simulate greater than 15% power in the computer. C913 Verify computer/annunciator point Q778 alarms.

Verified [signature] Date 6/12/79

4.3.10 Remove the "BLOCK" using HS NI51. Verify computer/annunciator point Q778 clears.

Verified [signature] Date 6/13/79

4.3.11 Place HS NI51 in the block position.

Verified [signature] Date 6/12/79

4.4 Connect the AC Supply in the CRD cabinets to the CRD for all SCR Groups.

Verified [signature] Date 6.12.79

4.5 Perform ST 5030.12 on all four (4) RPS Channels.

Date completed 6/12/79 Verified [signature] Date 6/12/79

4.6 Perform ST 5030.13.

Date completed 6/13/79 Verified [signature] Date 6/14/79

5. ACCEPTANCE CRITERIA

5.1 The "Test" pushbuttons for the ARTs operated as designed per Phase I.

Verified [signature] Date 6/14/79

5.2 The Loss of Feedwater Differential Pressure Switch circuit operated as designed per Phase II.

Verified [signature] Date 6/14/79

5.3 The Turbine Trip circuit and the "Block" function operated as designed per Phase III.

Verified [signature] Date 6/14/79

END