NEW YORK POWER AUTHORITY

NUCLEAR SAFETY EVALUATION

NO. JAF-SE-89-066 REV 0

___ IP3 X JAF

X MOD ___ TEST

___ EXPERIMENT

___ OTHER

FI-85-054
NUMBER

TITLE: ATWS RPT INITIATION LOGIC AND ARI/RPT TEST LOGIC UPGRADE

A. The proposed change, test or experiment:

1. [ ] Does [X] Does Not - Increase the probability of occurrence or consequences of an accident or malfunction of structures, systems, or components important to safety previously evaluated in the FSAR.
2. [ ] Does [X] Does Not - Create the possibility of an accident or malfunction of safety-related structures, systems, or components of a different type than any evaluated previously in the FSAR.
3. [ ] Does [X] Does Not - Reduce the margin of safety as defined in the basis for Technical Specification.
4. [ ] Does [X] Does Not - Involve an unreviewed safety question based on 1, 2 and 3 above.
5. [ ] Does [X] Does Not - Involve a change in the Technical Specification (Section(s) N/A).
6. [ ] Does [X] Does Not - Require pre-implementation review by the NRC.
7. [ ] Does [X] Does Not - Degrade the Security Plan, Quality Assurance Program or the Fire Protection System.
8. [ ] Does [X] Does Not - Affect the environmental impact of the plant or involve an unreviewed environmental question.

Dan Shih 1/4/90
Prepared By/Date

Review — Smullerjee 1/5/90
Designated Individual/Date

Approved — Victor M. Walz 1/9/90
Tech. Serv. Supt./Date

Reviewed — [illegible] 90-04 [illegible]
PORC/Date

Distribution:
PORC Chairman
Q.A. Superintendent
SRC Chairman
Licensing (WPO)

NEW YORK POWER AUTHORITY
JAMES A. FITZPATRICK NUCLEAR POWER PLANT
NUCLEAR SAFETY EVALUATION
NO. JAF-SE-89-066

I. PURPOSE AND SCOPE

The purpose of the JAF ATWS RPT Initiation Logic and ARI/RPT Test Logic upgrade is to meet the NRC requirements for Anticipated Transients Without Scram (ATWS) as delineated in 10CFR50.62, "Requirements for Reduction of Risk from ATWS Events for Light Water Cooled Nuclear Power Plants". The RPT initiation logic will be modified from "one-out-of-two" to "one-out-of-two" taken twice logic, that will enhance the reliability of the ATWS RPT trip logic as suggested in General Electric's ATWS Assessment NEDC-31017-1, Rev.1(Ref.6). The ARI/RPT test logic will be modified to allow surveillance tests at power without tripping the final actuation devices (ARI solenoid valves and Recirculation Pump Motor Generator Set trip coil).

The scope of the modification will consist of the following:

1. Spare contacts M4-T4 on ARI relays 3BA thru 3BD (relay cabinet 09-ARI-1B), and spare contacts M4-T4 on ARI relays 3RA thru 3RD (cabinet 09-ARI-1A), will be wired to provide "one-out-of-two" taken twice RPT initiation logic.

2. A new five position ARI/RPT test switch will replace the existing two position test swith located on panel 09-ARI-02. The five position switch will allow for Normal Operation, Division I Level Logic Test, Division I Pressure Logic Test, Division II level Logic Test, and Division II Pressure Logic Test.

3. Deletion of existing test switches 2-3-S12A and 2-3-S24A, and associated indicating lights, used to test the 2A-K50A thru D relays which are part of the Recirculation Pump Motor Generator Feeder Breaker Trip circuit will be required.

4. Consolidation of the 2A-K50 relays from a quantity of four (4) to a quantity of two (2), one for MG Set A and one for MG Set B, will be necessary.

5. Installation of four fuses in the 09-ARI-1B cabinet to utilize the Division II 125 VDC power supply for the RPT logic.

II. DESCRIPTION

The modification consists of redesigning the RPT trip logic to provide one-out-of-two taken twice logic configuration. The JAF RPT design currently utilizes differential pressure sensors which provide analog signals to the Analog Transmitter Trip System (ATTS) trip units 2-3MTU-202A thru D, 2-3MTU-272A thru D, and 2-3STU-273A thru D. The trip units provide digital outputs which are connected to relay logic arranged in a one-out-of-two for level and pressure for each recirculation pump motor generator set. The trip signal from each set of logic is applied to a single trip coil in the MG set drive motor feeder breaker. NRC review of the JAF RPT design concluded that the single trip coil arrangement is acceptable, but the one-out-of-two logic is not as reliable as the one-out-of-two taken twice logic used for the ARI system. This task modifies the RPT initiation logic to provide a one-out-of-two taken twice similar to the ARI logic, thus providing for more reliability and testing features in accordance with the ATWS Rule.

The new design will incorporate the following features: To generate an RPT signal the system monitors the status of reactor vessel pressure and level as indicated by the position of slave relay contacts in ATTS cabinets 09-95 and 09-96. These cabinets are Division I and II, respectively. To provide full electrical separation between the electrical class 1E ATTS and the non-1E ARI/RPT circuitry, isolation relays located in two separate enclosures are used. 125 VDC Division I power run into Division I isolation relay panel powers the Division I isolation relays. Likewise, 125 VDC Division II power is used for Division II isolation relays. This separation assures that no faults or problems in the ARI/RPT systems can propagate back into the ATTS and affect that system.

The reactor vessel pressure and level signals used by the Reactor Protection System (RPS) are also processed by the RPS. To assure separate and diverse means of ARI/RPT initiation, the signals originate from different pressure/level transmitters than the RPS signals and are independently processed in the ATTS. Thus ARI/RPT actuation is totally independent from RPS actuation equipment.

The Division II 125 VDC in isolation relay panel 09-ARI-1B is used to power the RPT logic relays, associated control, test, and indication circuitry. Double fuse isolation on both the hot and neutral legs of this power feed is provided to prevent any faults or problems in the RPT system from effecting the Division II power source.

The development of the one-out-of-two taken twice logic will begin in the ARI Division I and II cabinets (09-ARI-1A and 09-ARI-1B).
Spare contacts M4-T4 on relays 3BA thru 3BD and 3RA thru 3RD will be utilized to accomplish the logic change. The contacts will be wired such that 3RA will be in parallel with 3RB and in series with the parallel combination of 3BA and 3BB for reactor vessel level, and 3RC in parallel with 3RD and in series with the parallel combination of 3BC and 3BD for reactor vessel pressure. The output of this logic scheme will energize both 2A-K50A & 2A-K50B relays which will trip the recirculation pump MG A & B feeder breakers respectively. Power to energize the 2A-K50A & 2A-K50B relays will be supplied from Division II power source located in cabinet 09-ARI-1B. The 125 VDC source will be isolated using dual, series connected , 5 amp fuses to prevent any faults or problems in the RPT system from affecting the Division II source. The fuses will be mounted in cabinet 09-ARI-1B for convenienceand accessibility. New circiuts will be routed from relay contacts located in cabinets 09-ARI-1A & B to control room panels 9-18 and 9-19 where the electrical connection will be made to the 2A-K50A & B relays. The contacts on the 2A-K50 relays currently used for the recirculation pump MG breaker trip coil will remain unchanged. Annunciator contacts currently utilized on relays 2A-K50A & B will remain the same and the M1-T1 contacts will be activated to provide an input to cabinet 09-DAS-11, BTSCA Ch. 12 and 13, providing a digital Data Aquisition System input. Power on the contact side of relays 2A-K50A & B will continue to be fed from the respective MG breaker switchgear power source as it currently exists.
The demolition/sparing of equipment associated with this task is as follows: The contacts associated with the ATTS trip units K102A/B, K105A/B, K109A/B, and K110A/B will be spared. Test switches 2-3-S12A on panel 9-18 and 2-3-S24A on panel 9-19 along with their associated indicating lights will be disconnected and rmoved. Relays 2A-K50C & D will be spared in place in cabinets 9-18 and 9-19 for future plant use.

III. REVIEW AND ANALYSIS

The following design bases were reviewed for the impact of this modification on plant safety:

- Separation
  Seismic Support Design
- Modified Instrument Cabinets
- Routing Design
- Power Supplies

Each of the design bases were reviewed against the FSAR and Technical Specifications, to evaluate potential accidents that may result from this modification.

The RPT logic has been modified by no longer having digital inputs directly from the ATTS trip units, but utilizing the same trip units currently used by the ARI system, and configuring the logic to a one-out-of-two taken twice for added reliability. The evaluation of the design bases discussed in this section indicates that the overall performance of the plant has not been degraded and that the modification enhances existing conditions.

Implementation of the modification will be in accordance with the existing FSAR and Technical Specifications.

The following is a summary of the evaluation conducted for each design base:

1. SEPARATION

The new cables added for the RPT upgrade have been designed in accordance with the separation requirements of the James A FitzPatick Nuclear Power Plant. The requirements are identified in sections 7.1.7, 7.1.9, 7.1.15, 7.1.16, 8.5.4.2, 8.5.6, and 8.9 of the FSAR. Each ECCS division (I, II) have been provided with a separate system cabinet. As such, separation from the individual ATTS cabinet to the instrument is maintained. Outputs of the system are are separated as they exit the ATTS cabinets and are routed to the same existing cabinets and terminations as did the corresponding relays. Cables entering the existing cabinets have been separated in the same method used for the corresponding relay circuits they replace. As such, these existing cabinets will posess the same degree of separation that existed prior to the modification. Since function of the existing cabinets are outside the scope of this modification, no further evaluation has been conducted.

2. SEISMIC SUPPORT DESIGN

New cables added per this modification are routed through existing raceways. No new raceways are required. Seismic design of specific equipment components are evaluated in the next section.

3. MODIFIED INSTRUMENT CABINETS

Each of the cabinets to be modified has been seismically and environmentally qualified based upon postulated DBE conditions at the James A. FitzPatrick Nuclear Plant. Qualification for

these instrument cabinets is based upon IEEE-344-1975. The change in weight of these cabinets due to the demolition of test switches and indicating lights is insignificant. The change in weight due to installation of a new test switch is also insignificant, since the new switch is approximately the same weight as the existing switch it replaces.

The modification modifies the following cabinets:

09-ARI-1B

This cabinet was installed by Mod. No. F1-85-053. This installation adds new fuse blocks to accommodate four new isolation fuses to power the 2A-K50A $ B relays, used to provide the trip signal to the MG feeder breaker trip circuit. Postulated failure modes of the fuse will not degrade the Division II 125 VDC power source.

09-ARI-1A

Additional wiring added to this cabinet will not impact the function of the cabinet.

09-ARI-2

New test switch, indicating lights, and additional wiring will not impact the function of the cabinet.

09-18 and 09-19

As part of this modification one relay will be spared in place along with the demolition of the test switches and associated indicating lights in each cabinet.

4. ROUTING DESIGN

Cable routing is in accordance with JAFNPP Engineering and Design Procedure EDP-17 (Ref. 9). All RPT syatem cable after the ARI/RPT isolation relay panel is non-divisional. This cable is routed in new conduit or the existing tray and conduit system. Compliance with plant separation criteria for its routing assures that no single cable or circuit crosses from one division tray system to another division tray system. Also, to assure that there is no possibility of interaction between ARI/RPT and RPS, none of the new cables are routed in the RPS raceways. The routing of conduits has been in accordance with the separation requirements of FSAR sections 7.1.7, 7.1.9, 7.1.15, 7.1.16, 8.5.4.2, 8.5.6, and 8.9.

In addition, each new or rerouted circuit has been installed to comply the JAFNPP Appendix R Evaluation Report(Ref.5) and reviwed per JAFNPP Engineering and Design Procedure EDP-30 (Ref. 10), to ensure long term Appendix R and Fire Protection compliance. The philosophy is consistent with existing plant design and does not affect the plant's ability to perform its safety functions. High energy line breaks were not considered in this design since all circuits added are routed between the relay and control rooms.

5. POWER SUPPLIES

The Division II 125 VDC used by the RPT trip logic has been designed with dual 5 amp fuses to protect the feeder circuit from any faults or problems on the RPT logic circuits.

6. EFFECT OF INSTALLATION ON PLANT OPERATION

Modification F1-85-054 is scheduled for installation during the 1990 Refueling Outage. The reactor will be in a cold condition. Wiring for this modification requires determination and retermination of Recirculation Pumps trip circuits from ATWS loops. This should not affect any system required to maintain the plant in cold condition.

IV. SUMMARY AND CONCLUSION

Summary

The RPT logic redesign from a "one-out-of-two" to a "one-out-of-two" taken twice does not change the system's functional operability, however it does increase the reliability of the system.

From a separation standpoint, the only applicable change is the addition of isolation fuses in cabinet 09-ARI-1B. This installation will be designed to meet all class 1E requirements for separation and isolation.

Conclusions

The proposed modifications:

1. Does not increase the probability of ocurrence or consequences of an accident or malfunction of structures, systems, or components important to safety previously evaluated in the FSAR because the modification made to the RPT trip circuit will enhance the reliability of the ATWS system.

2. Does not create the possibility of an accident or malfunction of safety related structures, systems, or components of a different type than any evaluated previously in the FSAR, because essentially all system components remain functionally the same, however the logic has been changed to increase system reliability.

3. Does not reduce the margin of safety as defined in the basis for the Technical Specifications because the same system design philosophy is used to trip the Recirculation Pumps in the event of high pressure or low level in the reactor vessel. The system design philosophy utilized to trip the reactor by the ARI system in the event of high pressure or low level in the reactor vessel has not been affected by this modification.

4. Does not involve an unreviewed safety question based on items 1, 2, and 3 above.

5 Does not involve a change in the Technical Specifications because there is no functional change in the operation or trip function of the system.

6. Does not require pre-implementation review by the NRC.

7. Does not degrade the Security, Quality Assurance Program, or the Fire Protection System because the modification does not change any of these items.

8. Does not affect the environmental impact of the plant or involve any unreviewed environmental question because the functional operation of the plant has not been changed by this modification.

V. REFERENCES

1. IEEE-279-1971 - Criteria for Protection Systems for Nuclear Power Generating Stations.

2. IEEE-344-1975 - Seismic Qualification of Class 1E Equipment for Nuclear Power Generating Stations.

3. JAFNPP FSAR Sections 7.1, 8.5, 12.4

4 JAFNPP Technical Specification Section 3.2

5. JAFNPP Appendix R Evaluation Report, October 1985.

6. JAFNPP ATWS Assessment Report No. NEDC-31017-1, Rev.1

7. Separation Criteria for Safeguard Electrical Circuits for JAFNPP, revised June 15,1973.

8. Conceptual Design Package for Mod. No. F1-85-054, ATWS RPT and ARI System Upgrade.

9. JAFNPP Procedure EDP-17, Procedure for the Design and Routing of Plant Cabling and Raceways.

10. JAFNPP Procedure EDP-30, Review Procedure for Ensuring Long Term Appendix R and Fire Protection Compliance.

11. 10CFR50.62, "Requirements for Reduction of Risks from ATWS Events for Light Water Cooled Nuclear Power Plants".

ATTACHMENT III

Logic and Elementary Diagrams for the Alternate Rod Insertion and Recirculation Pump Trip Actuation and Channel Testing

Logic Diagrams

11825-LSK-28-6.1D Sheet 1 Rev. 1A
11825-LSK-28-6.1D Sheet 2 Rev. 1A
11825-LSK-28-6.1D Sheet 3 Rev. 1A

Elementary Diagrams

11825-ESK-5C Rev. 1A
11825-ESK-5F Rev. 1A

11825-ESK-7FA Rev. 1A
11825-ESK-7FB Rev. 1B
11825-ESK-7FC Rev. 1A
11825-ESK-7FF Rev. 1A
11825-ESK-7FH Rev. 0