

NEW YORK POWER AUTHORITY  
JAMES A. FITZPATRICK NUCLEAR POWER PLANT

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SYSTEM MODIFICATION DESCRIPTION  
MODIFICATION NO. F1-85-054

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ATWS  
ARI & RPT  
SYSTEM UPGRADE

GILBERT/COMMONWEALTH, INC.

11/22/89

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## A. REFERENCES

## 1. Nuclear Regulatory Commission

- a. 10CFR50.62 "Requirements for Reduction of Risks from ATWS Events for Light Water Cooled Nuclear Power Plants".
- b. Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment that is Not Safety Related", April 16, 1987.

## 2. JAFNPP Documents

- a. GE Report NEDC-31017, "JAFNPP ATWS Assessment", September 1985.
- b. FSAR UPDATE, Section 3.5.5.2, "Control Rod Drive Hydraulic System" and Section 7.9, "Recirculation Flow Control System".
- c. Technical Specifications, Sections 3 and 4.
- d. Conceptual Design Package, "Alternate Rod Insertion System", Modification No. F1-85-054, dated April 1989.
- e. GE Report NEDO-10349, dated March 1971.
- f. Licensing Topical Report - Analog Transmitter/Trip Unit System (ATTS) for Engineered Safeguard Sensor Trip Units NEDO-21617-A, Class I, Dec. 1978.

## B. DESIGN

## 1. System Function

The function of the Recirculation Pump Trip (RPT) system is to provide a method for tripping the Recirculation Feed Pumps in the event of reactor high pressure or low level. The design is a one-out of-two logic taken twice utilizing the ATTS trip units listed below to sense reactor vessel level and pressure. The trip signals then actuate the logic which trips both motor-generator feeder breakers for the Recirculation Feed Pumps. The RPT circuitry will share the existing hardware utilized by the ARI system up to and including isolation relays 3RA thru RD and 3BA thru BD located in cabinets 09-ARI-1A and 1B. At the isolation relay spare contacts M4-T4 will be activated to provide the logic to energize the 2A-K50A and B relays located in control room panels 09-18 and 09-19. This will cause the MG feeder breaker to open, tripping the associated Recirculation Pump.

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Trip Unit Tag #	Function	Location
2-3MTU-202A	Vessel Pressure ATWS/RPT	9-95, Z1A-9
2-3MTU-202B	Vessel Pressure ATWS/RPT	9-96, Z1B-9
2-3MTU-202C	Vessel Pressure ATWS/RPT	9-95, Z1A-10
2-3MTU-202D	Vessel Pressure ATWS/RPT	9-96, Z1B-10
2-3MTU-272A	Vessel LO LVL 2 RCIC/HPCI	9-95, Z1A-1
2-3MTU-272B	Vessel LO LVL 2 RCIC/HPCI	9-96, Z1B-1
2-3MTU-272C	Vessel LO LVL 2 RCIC/HPCI	9-95, Z1A-4
2-3MTU-272D	Vessel LO LVL 2 RCIC/HPCI	9-96, Z1B-4
2-3STU-273A	Vessel LO LVL 2 RCIC/HPCI	9-95, Z1A-2
2-3STU-273B	Vessel LO LVL 2 RCIC/HPCI	9-96, Z1B-2
2-3STU-273C	Vessel LO LVL 2 RCIC/HPCI	9-95, Z1A-5
2-3STU-273D	Vessel LO LVL 2 RCIC/HPCI	9-96, Z1B-5

## 2. Summary Description

The RPT system monitors the status of reactor vessel pressure and level as indicated by the position of trip unit contacts in ATTS Cabinet 09-95 and 09-96. These cabinets are electrical Division I and II. 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, 09-ARI-1A and 1B, are used. 125 VDC Division I power is run into the Division I isolation relay panel powers the Division I isolation relays. Likewise, 125 VDC Division II power is used for the Division II relays. The development of the one-out-of-two logic taken twice will begin in the ARI Division I and II cabinets (09-ARI-1A and 1B). Contact M4-T4 will be utilized on relays 3BA thru 3BD and 3RA thru 3RD 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 relays 3BA and 3BB for reactor vessel level and 3BC in parallel with 3RD in series with the parallel combination of 3BC and 3BD for reactor vessel pressure. The output of this logic scheme will energize both 2A-K50 A & B relays which will trip the recirculation pump MG A & B feeder breakers respectively. Power to energize the 2A-K50 A & B relays will be supplied for the 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 power source. The fuses will be mounted in cabinet 09-ARI-1B for convenience and accessibility. New circuits 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-K50 A and B relays. The contacts on the 2A-K50 relays currently used for the recirculation pump MG breaker

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trip coil will remain unchanged. Annunciator contacts currently utilized on relays 2A-K50 A & 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 Acquisition System input. Power on the contact side of relay 2A-K50 A & B will continue to be fed from the respective MG breaker switch gear power source as it is currently exists.

A new test switch will replace the existing test switch mounted on cabinet 09-ARI-02. The new test switch will disable both the ARI and RPT systems simultaneously. The switch positions as read from left to right will be as follows: Div. I Level/Div. I Pressure/Normal/Div. II Pressure/Div. II Level. The new configuration will eliminate the need to install jumpers during testing. 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 demolished. Relays 2A-K50C&D will be spared in place in cabinets 9-18 and 9-19 for future plant use.

### 3. General Design Features

**Quality Assurance:** The ARI/RPT system is designed as a non-safety related system, but is implemented so that the existing protection systems continue to meet all the applicable safety criteria. Qualified isolators are used for ARI/RPT system interfaces with safety related systems. The ARI/RPT system is important to safety and Quality Assurance as outlined in NRC Generic Letter 85-06, "Quality Assurance Guidance for ATWS Equipment that is Not Safety Related", is complied with for the JAF Nuclear Power Plant ARI/RPT system.

**Separation from RPS:** The ARI/RPT systems are diverse and electrically independent of the RPS from sensor to final actuation device. The ARI/RPT systems initiating signals originate from ATTS loops associated with recirculation pump trip. These are completely independent from the RPS loops. Also, the ARI/RPT systems are a DC powered-energize to scram system rather than an AC powered-deenergize to trip system like the RPS.

**Electrical Separation:** The ARI/RPT system is designed such that separation criteria applied to existing protection systems are not violated. The initiating ATTS Division I and Division II level and pressure signals are fully electrically isolated from the ARI/RPT systems in the ARI/RPT Isolation Relay Panels. The ARI/RPT systems after the Isolation Relay Panels are non-divisional.

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Power: ARI/RPT systems controls and instrumentation are powered from DC power, independent of RPS power. This power source allows the ARI/RPT systems to perform their function during loss of offsite power.

Equipment Qualification: ARI/RPT system equipment is qualified to anticipated operational occurrences, not accidents. Design of new equipment is to temperature, pressure, humidity and radiation levels associated with anticipated operational occurrences, but not design basis accidents (LOCA or HELB). Equipment is qualified to conditions during an ATWS event up to the time that an ARI function is completed (25 seconds). Although no seismic qualification is required for ARI/RPT system equipment the equipment is supported to DBE acceleration levels to prevent any deleterious system interactions with existing safety related equipment during an earthquake.

## C. OPERATION

During normal plant operation the ARI/RPT systems will be powered, monitoring reactor vessel conditions via the ATTS and ready to function. The ARI/RPT systems will be actuated by any of the following inputs:

- a. Manual initiation from the Control Room (ARI system only).
- b. Reactor Vessel high pressure.
- c. Reactor Vessel low low water level.

The initiating signals for actuation of the ARI system are the same as the RPT signals. They are obtained from ATTS slave relays for reactor vessel low low water level (Level 2) trip and reactor vessel high pressure trip. These signals energize output relays K102A, K105A, K109A, and K110A in ECCS Division I ATTS Cabinet 09-95 and relays K102B, K105B, K109B, and K110B in ECCS Division II ATTS Cabinet 09-96. Normally open contacts of these relays are wired to the coils of the ARI/RPT isolation relays, 3BA thru BD and 3RA thru RD, in the ARI/RPT isolation relay panels, 09-ARI-1A and 1B. These isolation relays provide electrical separation between the electrical class 1E ATTS and the non-1E ARI/RPT system and provide the first half (1 out of 2 portion) of the 1 out of 2 taken twice ARI/RPT logic. The resulting low low level and/or high pressure signals are passed to the ARI/RPT logic panel for the "taken twice" logic combination and final ARI/RPT actuation signal output. The logic minimizes the risk of a single process sensor trip causing an inadvertent ARI/RPT actuation and hence inadvertent reactor scram. Inadvertent ARI/RPT actuation is also minimized because ARI/RPT high reactor vessel pressure and low low reactor vessel water level set points are achieved after the normal reactor scram set points.

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The logic up to the final ARI valve and MG feeder breaker shunt trip actuating relays are testable during plant operation. The design permits maintenance repairs, test or calibration of system logic and instrumentation up to, but not including, these final relays. Each individual level and pressure instrument is testable during plant operation without initiating the ARI/RPT system since two pressure or level signals must be present to complete the signal. To test the ARI/RPT circuitry the five position test switch on the ARI/RPT logic/test panel 09-ARI-2 is placed in one of the test position, Div I Pressure, Div I Level, Div II Pressure or Div II Level. This electrically isolates the final ARI/RPT system actuation relays, and enables the four ARI and the two RPT test lights on panel 09-ARI-2 so that all illuminate, and lights up the ARI Test light on control room panel 09-5.

The RPT logic has been modified by no longer having digital inputs directly from 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 much of the modification enhances existing conditions.

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

There will be a change in Instrument Surveillance Procedures:

- ISP-175A&B Reactor and Containment Cooling Instrument Functional Test/Calibration (ATTS).
- ISP-176A&B Reactor and Containment Cooling Instrument Master and Slave Trip Unit Alignment.
- ISP-275A&B Reactor Pressure (ECCS) Transmitter Calibration and Channel Functional Test (ATTS).
- ISP-276A&B Reactor Level (ECCS) Transmitter Calibration and Channel Functional Test (ATTS).

#### D. MONITORS

The ARI valve status lights and the RPT status lights the ARI/RPT logic panel in the relay room has the system test switch and test lights for local testing of the ARI/RPT initiation circuitry.

The RPT trip relays in Panels 9-18 and 9-19 includes a contact output. This output is connected to the EPIC system at BTSCA Ch 12 and 13, 09-DAS-11.

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The Trip Unit also is part of common alarms as follows:

- a. Trip Unit Inoperative or Gross Failure
- b. Trip Unit Out of File or Power Failure

Panel 09-05 test light indicates when the ARI/RPT test switch is in the test position.

## E. DRAWINGS

## Loop Diagrams

1. 1825-LP-02-3-2A, "Reactor Vessel Level System", Rev. 4A.
2. 1825-LP-02-3-2B, "Reactor Vessel Level System", Rev. 4A.
3. 1825-LP-02-3-2C, "Reactor Vessel Level System", Rev. ltr.
4. 1825-LP-02-3-2D, "Reactor Vessel Level System", Rev. ltr.
5. 1825-LP-02-3-3A, "Reactor Vessel Level System", Rev. 5A.
6. 1825-LP-02-3-3B, "Reactor Vessel Level System", Rev. 5A.
7. 1825-LP-02-3-3C, "Reactor Vessel Level System", Rev. 4A.
8. 1825-LP-02-3-3D, "Reactor Vessel Level System", Rev. 4A.

## Logic Diagrams

1. 11825-LSK-28-6.1D, Sh. 1, Rev. 1A, "Alternate Rod Insertion and Recirculation Pump Trip, Channel Test (Level)."
2. 11825-LSK-28-6.1D, Sh. 2, Rev. 1A, "Alternate Rod Insertion and Recirculation Pump Trip, Channel Test (Pressure)."
3. 11825-LSK-28-6.1D, Sh. 3, Rev. 1A, "Alternate Rod Insertion and Recirculation Pump Trip, System Actuation."

## Elementary Diagrams

1. 11825-1.60-23, Elem. Diag. Analog Trip Sys. ATTS Pnl. 09-91 to 96, G.E. Dwg. No. 865E365, Sh. 8.
2. 11825-1.60-24, Elem. Diag. Analog Trip Sys. ATTS Pnl. 09-91 to 96, G.E. Dwg. No. 865E365, Sh. 9.
3. 11825-1.60-26, Elem. Diag. Analog Trip Sys. ATTS Pnl. 09-91 to 96, G.E. Dwg. No. 865E365, Sh. 11.
4. 11825-1.62-150, Elem. Diag. Variable Speed Recirc. PP and MG Set, G.E. Dwg. No. 730E197BA, Sh. 1.
5. 11825-1.62-151, Elem. Diag. Variable Speed Recirc. PP and MG Set, G.E. Dwg. No. 730E197BA, Sh. 2.
6. 11825-1.62-152, Elem. Diag. Variable Speed Recirc. PP and MG Set, G.E. Dwg. No. 730E197BA, Sh. 3.



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7. 11825-1.62-156, Elem. Diag. Variable Speed Recirc. PP and MG Set, G.E. Dwg.No. 730E197BA, Sh. 7.
8. 11825-ESK-5C, DC Elem Diag. 4160 ckts. Recirc. PP. 02-2P-1A-MG DR. MOT.
9. 11825-ESK-5F, DC Elem Diag. 4160 ckts. Recirc. PP. 02-2P-1B-MG DR. MOT.
10. 11825-ESK-7FA, Elementary Diag. ARI System.
11. 11825-ESK-7FB, Elementary Diag. ARI System.
12. 11825-ESK-7FC, Elementary Diag. ARI System.
13. 11825-ESK-7FF, Elementary Diag. ARI System.
14. 11825-ESK-7FH, Elementary Diag. ARI/RPT System.

ATTACHMENT II

**Nuclear Safety Evaluation**  
**ATWS RPT Initiation Logic and**  
**ARI/RPT Test Logic Upgrade**

**New York Power Authority**

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Docket No. 50-333

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