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April 26, 1989

1CANØ48914

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ATTN: Mr. Jose A. Calvo, Director
Project Director, Region IV
Division of Reactor Projects
III, IV, V and Special Projects

SUBJECT: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR-51
Request for Additional Information
ANO-1 ATWS Conceptual Design

Dear Mr. Calvo:

The Arkansas Power & Light Company (AP&L) has reviewed your correspondence of February 23, 1989 (1CNAØ289Ø5) which transmitted a request for additional information regarding the conceptual design for the modification of Arkansas Nuclear One, Unit 1 (ANO-1) pursuant to 10CFR50.62.

The attached information provides AP&L's responses to the areas of interest and, we believe, fully addresses the Staff concerns in this regard.

As a result of the approval of the ANO-1 ATWS conceptual design included in your aforementioned correspondence, AP&L is proceeding along a normal design path to implement these modifications during our 1R9 refueling outage. The start date of 1R9 may be pushed from the spring of 1990 to late summer-early fall 1990 due to the 1R8 outage extension and the current operation of ANO-1 at the 50% power limit. We will keep you informed as this schedule becomes firm.

Very truly yours,

Dale E. James
Supervisor, Licensing

DEJ:MWT:de

Attachment

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AP&L Response to NRC Request For Additional Information

10CFR50.62 (ATWS Rule) Review

Arkansas Nuclear One

Unit 1 (ANO-1)

(TAC No. 62122) of February 23, 1989

The following is the response to the Request for Additional Information dated February 23, 1989 (1CNA028905). The ten items are in reference to the conceptual design for the Diverse Scram System (DSS) and the ATWS Mitigation System Actuation Circuitry (AMSAC) provided in AP&L's Conceptual Design for Compliance with the Requirements of 10 CFR 50.62 dated December 16, 1988 (1CAN128804). The terminology and abbreviations contained in this response are consistent with those provided in the Conceptual Design.

1. Diversity from the Existing RPS

   a. AP&L's "conceptual design" does not indicate how diversity of the DSS logic and final actuation devices for interrupting power for the SCR's will be accomplished.

   Response

   The DSS logic will be implemented with microprocessors resident in a two channel single control board computer based ATWS system called DROPS (for Diverse Reactor Overpressure Prevention System) which provides the logic for input signal conditioning, bistable action at the trip setpoints, bypass action at the trip bypass setpoints and automatic system test functions. The diversity between the DSS and the Reactor Protection System (RPS) logic is therefore provided by components from different manufacturers using different manufacturing processes, and equipment employing different principles of operation and construction technology.

   The DSS final actuation devices for interrupting power to the SCR's will be DC relays (powered by the DC power source in the DROPS) which energize to remove DC power from the lamps in the Control Rod Drive Control System (CRDCS) programmers controlling power to the gate circuits for the Silicon Controlled Rectifiers (SCR's). The diversity between the DSS and the RPS final actuation devices for interrupting power to the SCR's is therefore provided by components from different manufacturers using different manufacturing processes, and equipment using AC versus DC and energize versus de-energize for trip operation.

   b. "EFIC may be used as part of the AMSAC only if it can be demonstrated that the EFIC equipment is diverse from the equipment used in the RPS. Therefore, the final plant-specific ANO-1, design provided by AP&L should address, in detail, how diversity is achieved between the AMSAC logic and the RPS."

Response

The Emergency Feedwater Initiation and Control (EFIC) is a safety related four input/two output one-out-of-two-times-two coincidence logic system intended to start emergency feedwater upon detection of several different initiators including the loss of both feedwater pumps. The ATWS loss of main feedwater flow inputs from DROPS to EFIC (as determined by main feedwater flow measurements in Non-Nuclear Instrumentation (NNI) will enter through existing (but previously unused) non-1E-to-1E isolators provided in the original EFIC design. The EFIC is manufactured by Vitro Laboratories using digital techniques implemented with large scale integration technology. The diversity between the EFIC equipment and the RPS is therefore provided by components from different manufacturers using different manufacturing processes, and equipment employing different principles of operation and construction technology.

For responses to the concerns about diversity between the AMSAC logic and the RPS see the response to Item 1a.

2. Electrical Independence from the Existing RPS

"The Option 2 criteria state that if EFIC is powered from 120 VAC RTS buses, then AP&L must identify all DSS and AMSAC system components at ANO-1 that receive power from the same sources used to provide power to the existing RTS."

Response

The DSS and AMSAC equipment that receive power from the same sources used to provide power to the existing Reactor Trip System (RTS) are listed below as follows:

DSS - The power supplies for the reactor coolant pressure sensors, signal conditioning modules and 1E-to-non-1E isolation modules currently existing in both channels of the Reg. Guide 1.97 Post Accident Monitoring (PAM) system receive AC power from the same sources used to provide power to the existing RTS.

AMSAC - The power supplies for the linear power neutron flux detectors, signal conditioning modules and 1E-to-non-1E isolation modules currently existing in both channels of the Reg. Guide 1.97 PAM system receive AC power from the same sources used to provide power to the existing RTS.

AMSAC - The power supplies for the feedwater flow sensors and signal conditioning modules currently existing in both channels of the NNI system receive AC power from the same sources used to provide power to the existing RTS.

3. Environmental Qualification (EQ), Quality Assurance (QA) for Testing, Maintenance, and Surveillance

"In its plant-specific submittal, AP&L should provide a description of the measures/programs implemented for ANO-1 to assure that the equipment diversity provided in accordance with the ATWS Rule will be maintained during component repair, replacement, and modifications and/or design changes, etc., throughout the life of the plant."

Response

The programs description will be provided in the system final design package.

4. Safety-Related (1E) Power Supplies

"Therefore, the AP&L final submittal should indicate how the UPS or battery supply will be implemented. Also, for the staff to make a final determination of acceptance, the concerns noted in the diversity and independence sections with respect to the use of EFIC equipment in the ATWS designs should be addressed."

Response

The battery supply will be implemented in a battery pack module in the DROPS. The batteries will be heavy duty commercial grade alkaline cells with sufficient capacity to power the DROPS for more than 15 minutes after loss of offsite power. The battery voltage is indicated on a Digital Voltmeter (DVM) on the face of the battery pack module. Low battery voltage is sent as an alarm to the plant annunciator in the main control room. (See "DSS/AMSAC Trouble" in Item 8.)

For responses to the concerns about the use of EFIC equipment in the ATWS designs, see the responses to Items 1 and 2.

5. Testability at Power

"However, the plant-specific submittal should also address the time limits associated with channel testing, disabling of channels, actions to be taken if one channel fails, etc."

Response

Testing of the DSS and AMSAC channels are initiated by the operator using pushbuttons on the face of the DROPS modules and thereafter are carried to completion automatically by the microprocessors in DROPS. The automatically run tests include testing the trip setpoint and completion of trip action up to and including the terminating relays in the actuated systems. The trip setpoint at which trip occurs can be read on a DVM plugged into the front face of the DROPS modules. The completion of trip action is confirmed by indicating lights on the face of the DROPS modules.

One pushbutton allows the operator to select testing of the DSS high RC pressure trip. A second pushbutton allows the operator to select by toggling action testing of the AMSAC low main feedwater flow trip in each loop and the low neutron flux bypass of the AMSAC low main feedwater flow trips. A third pushbutton allows the operator to start the automatic test procedure for the selected test to be run.

The automatic test of one function in one channel requires about two minutes, so that testing of all functions in both channels requires about one hour including operator initiation and evaluation time. Since the ATWS systems are designed to be automatically bypassed during channel testing no ATWS trip action is possible during this period of time, but the operator is aware of this through the DROPS IN TEST alarm in the main control room.

No means for bypassing individual channels or functions are built into DROPS (other than those automatically implemented and alarmed during channel testing), since the ATWS system is a two channel two-out-of-two coincidence logic system. Likewise no maintenance bypasses are provided. Maintenance can only be carried out with the power removed from DROPS in which case the DROPS IN TEST alarm in the main control room will actuate alerting the operator to the unavailability of the ATWS system.

Since maintenance will normally consist of module replacement with module repair being done off-line, the length of time during which the system power is off should not exceed the time required to replace a module, typically about four hours. Corrective maintenance will occur consistent with current practices regarding operationally significant non-safety related system.

6. Maintenance Bypasses, Operating Bypasses, Indication of Bypasses, and Means for Bypassing

"However, for the staff to make a determination of complete compliance, AP&L should assure that all items of concern addressed in the testability section of this document and that are applicable to bypassing at ANO-1 are discussed in the plant-specific submittal".

Response

For the responses to the concerns about testability and bypassing see the response to Item 5.

7. Completion of Protective Action

"AP&L should provide specific information which confirms that both the DSS and AMSAC at ANO-1 are designed such that, upon receipt of a trip signal, the protective action goes to completion and deliberate operator action is required to reset the systems in order to comply with the ATWS Rule. In addition to the specific information on the system's design, AP&L should include a discussion of any required operator actions."

Response

The microprocessors in the DROPS modules are programmed to latch both the DSS and AMSAC trip actions in the trip state when the trip actions are initiated by true trip conditions (i.e., two-out-of-two signals of high RC pressure, low main feedwater flow). Operator action is required to reset the DROPS to normal operating status with the channel reset buttons on the DROPS modules for both channels when the cause (high RC pressure, low main feedwater flow) for the trip has cleared. Latching of the trip channels does not occur during channel testing.

8. Information Readout

"However, in the AP&L plant-specific submittal for ANO-1, more detailed information relating to how the operator is provided with accurate, complete, and timely information (i.e., what actuates or deactuates alarms, annunciators, lights, and what functions are performed by specific switches, etc.) pertinent to system status should be provided. In addition, AP&L should provide a discussion of how human factors engineering practices are incorporated into the design of ATWS prevention/mitigation system components located in the control room. The coordination of displays used to provide the status of ATWS systems/equipment to the operator with existing displays should be addressed specifically."

Response

The operator interface with the ATWS system is via alarms on the plant annunciator in the main control room, since the DROPS modules are located in cabinets outside the control room. The operator is not required to take action in the control room in response to ATWS alarms other than to acknowledge the alarms when they occur and reset them when they clear. All of the ATWS annunciator windows will be located consistent with our pre-established criteria established during the Control Room Design Review (CRDR) of ANO-2.

ATWS alarms on the plant annunciator are as follows:

DSS TRIP - This alarm will originate in the DROPS. It will actuate when both DSS channels have tripped as confirmed by the terminating relays for DSS channels A and B in the CRDCS cabinets. It will deactuate when the cause (high RC pressure) for the trip has cleared and the DROPS has been reset to normal operating status with the channel reset buttons on the DROPS modules for both channels.

AMSAC TRIP - This alarm will originate in the DROPS. It will actuate when both AMSAC channels have tripped as confirmed by the terminating relays for AMSAC channels A and B in the EFIC and turbine trip cabinets. It will deactuate when the cause (low main feedwater flow) for the trip has cleared and the DROPS has been reset to normal operating status with the channel reset buttons on the DROPS modules for both channels.

DSS/AMSAC IN TEST - This alarm will originate in the DROPS modules. It will actuate when either channel is placed in the test mode at the DROPS modules to test DSS or AMSAC. It will deactuate when testing in both channels has been completed.

DSS/AMSAC TROUBLE - This alarm will originate from a number of different sources in the DSS and AMSAC as follows:

DSS Channel A Trip - This input to the DSS/AMSAC Trouble alarm will originate in the DROPS. It will actuate when DSS channel A has tripped as confirmed by the terminating relay for DSS channel A in the CRDCS cabinets. It will deactuate when the cause (high RC pressure) for the trip has cleared and DROPS channel A has been reset to normal operating status with the channel A reset button on the DROPS module. It will not actuate during channel test.

DSS Channel B Trip - This input to the DSS/AMSAC Trouble alarm will originate in the DROPS. It will actuate when DSS channel B has tripped as confirmed by the terminating relay for DSS channel B in the CRDCS cabinets. It will deactuate when the cause (high RC pressure) for the trip has cleared and DROPS channel B has been reset to normal operating status with the channel B reset button on the DROPS module. It will not actuate during channel test.

AMSAC Channel A Trip - This input to the DSS/AMSAC Trouble alarm will originate in the DROPS. It will actuate when AMSAC channel A has tripped as confirmed by the terminating relay for AMSAC channel A in the EFIC and turbine trip cabinets. It will deactuate when the cause (low main feedwater flow) for the trip has cleared and DROPS channel A has been reset to normal operating status with the channel A reset button on the DROPS module. It will not actuate during channel test.

AMSAC Channel B Trip - This input to the DSS/AMSAC Trouble alarm will originate in the DROPS. It will actuate when AMSAC channel B has tripped as confirmed by the terminating relay for AMSAC channel B in the EFIC and turbine trip cabinets. It will deactuate when the cause (low main feedwater flow) for the trip has cleared and DROPS channel B has been reset to normal operating status with the channel B reset button on the DROPS module. It will not actuate during channel test.

DROPS Battery Voltage Low - This alarm will originate in the DROPS battery pack module. It will actuate when the DROPS battery pack voltage falls below the alarm setpoint. It will deactuate when the DROPS battery pack voltage is restored by replacing the batteries and repeats in DSS/AMSAC Trouble Alarm. (does not actuate in Test)

9. Safety Related Interfaces

"These concerns (i.e., the sharing of power supplies via EFIC/AMSAC and the adequacy of isolation devices) should be adequately addressed in the plant-specific submittal in order for the staff to evaluate the applicability of the devices for use in the DSS/AMSAC systems."

Response

For responses to the concerns about sharing of power supplies via EFIC/AMSAC see the response to Item 2.

1E-to-non-1E isolation devices will be used in two places in the ANO-1 ATWS system design, in both cases existing isolation devices will be utilized:

DSS - The RC pressure signals from the safety related Reg. Guide 1.97 PAM cabinets will use existing qualified 1E-to-non-1E isolation devices located in the PAM cabinets to provide isolated output signals to the DSS.

AMSAC - The linear power neutron flux signals from the safety related Reg. Guide 1.97 PAM cabinets will use existing qualified 1E-to-non-1E isolation devices located in the PAM cabinets to provide isolated output signals to the AMSAC.

Non-1E-to-1E isolation devices will be used in one place in the ANO-1 ATWS system design as was the case above existing isolation devices will be utilized:

AMSAC - The emergency feedwater initiation signals from AMSAC will use existing qualified non-1E-to-1E isolation devices located in the EFIC cabinets to provide isolated input signals to the safety related EFIC system.

10. Conclusion

"This additional information, as well as pertinent previously supplied information, should be submitted to the staff in a single ATWS system final design package."

Response

As you are aware, we are currently in the design process for the ATWS modifications. The information supplied in this transmittal is based upon our knowledge of the design to date. The ANO-1 ATWS final design package will not be available until December 1989, at which time all of the requested additional information will be integrated with the pertinent previously supplied information and submitted to the staff in a single ATWS system final design package.

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UNION ELECTRIC

May 5, 1989

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ULNRC-1999

Gentlemen:

DOCKET NUMBER 50-483
CALLAWAY PLANT
ATMOSPHERIC STEAM DUMP VALVE TECHNICAL SPECIFICATIONS

Reference: ULNRC-1978 dated April 14, 1989

This letter corrects the discussion relating to testing of the Steam Generator Atmospheric Steam Dump (ASD) valves provided in the reference letter. Testing of the ASD's, which involves stroking the valves, is performed in accordance with the NRC approved Callaway Inservice Testing Program. This surveillance is normally performed in Mode 3 to preclude plant transients associated with cycling the valves. In the event post-maintenance testing is required at power, the ASD is stroked with the block valve open to provide a more meaningful test. The stroke time is small which limits any transient associated with the test.

If there are any questions relating to this please contact us.

Very truly yours,

A C Passwater
for Donald F. Schnell

DS/sla

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STATE OF MISSOURI)
) S S
CITY OF ST. LOUIS)

Alan C. Passwater, of lawful age, being first duly sworn upon oath says that he is Manager, Licensing and Fuels (Nuclear) for Union Electric Company; that he has read the foregoing document and knows the content thereof; that he has executed the same for and on behalf of said company with full power and authority to do so; and that the facts therein stated are true and correct to the best of his knowledge, information and belief.

By Alan C Passwater
Alan C. Passwater
Manager, Licensing and Fuels
Nuclear

SUBSCRIBED and sworn to before me this 5th day of May, 1989.

Barbara J. Pfaff
BARBARA J. PFAFF
NOTARY PUBLIC, STATE OF MISSOURI
MY COMMISSION EXPIRES APRIL 22, 1993
ST. LOUIS COUNTY

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