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Director of Nuclear Reactor Regulation
ATTN: Mr. J. F. Stolz, Chief
Operating Reactors Branch #4
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Subject: Arkansas Nuclear One - Unit 1
Docket No. 50-313
License No. DPR 51
EFW System Upgrade Response to NRC Questions
(File: 1510.3)

Gentlemen:

Your letter of January 12, 1981 requested AP&L to respond to several questions in the four enclosures. AP&L responded to Enclosure 3 on December 3, 1980 and Enclosures 1 & 2 on March 13, 1981. Per our February 13, 1981 letter we are attaching our responses to Enclosure 4 questions.

Very truly yours,

David C. Trimble

David C. Trimble
Manager, Licensing

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Attachments

ARKANSAS NUCLEAR ONE - UNIT 1

EMERGENCY FEEDWATER SYSTEM AUTOMATIC INITIATION AND FLOW INDICATION

INSTRUMENTATION & CONTROL

REQUEST FOR ADDITIONAL INFORMATION

CONCERN 1.

Provide the basis for not starting P7B (motor driven EFW pump) on a channel B EFW initiation signal (refer to page 18 of the attachment to the October 15, 1980 letter).

RESPONSE 1.

The EFW System is designed to deliver the minimum required EFW flowrate to the steam generators assuming a single failure. To implement this requirement, the system utilizes two separate trains, each capable of delivering the minimum required EFW flowrate. The EFIC System, which initiates and controls EFW flow to the steam generators, uses two separate channels for these functions, Channels "A" and "B". Channel "A" signals the AC powered motor driven pump (P7B) to start. Channel "B" opens steam admission valve CV-Y1 and allows the steam turbine driven pump (P7A) to start. Channel "B" opens steam admission valve CV-Y1 and allows the steam turbine driven pump (P7A) to start. With this arrangement, the system will deliver the minimum required flow rate if either Channel "A" or "B" fails. Additionally, a loss of all AC power would not preclude the EFW system delivering the required flowrate as the steam turbine powered EFW pump would be started when the steam admission valve (CV-Y1, battery backed DC power) is opened by Channel "B". Since the EFW system utilizes two, separate, singly sufficient trains, there is no requirement to send a second (Channel "B") initiate signal to pump P7B.

In addition to the above, the parallel steam admission valve to CV-Y1, CV-Y2 (also battery backed DC Power), is opened on a Channel "A" signal. Although this arrangement is not required to meet the single failure criterion, it enhances system reliability.

CONCERN 2:

It appears that a single failure of the Channel A signal would prevent the automatic initiation of pump P7B and the opening of steam admission valve CV-Y2 (refer to Figure 3.1-1). Since the discharge control valves for EFW pump P7A (CV-X1 & CV-X4 normally open; fail as is) are controlled via channel A signal, the only way to control EFW flow to the steam generators is to close isolation valves CV-2620 & CV-2627 and to open the two normally closed series cross-connect valves CV-2813 & CV-2814 such that EFW flow is through the channel B control valves. A discussion of the basis for this pump/control valve channel configuration should be provided.

RESPONSE 2:

The basis for the final pump/control valve channel configuration selection will be to provide a two-train EFW system capable of delivering at least 500 gpm of EFW to the steam generators, taking into account a single failure. For purposes of discussion, we will call the trains Train "A" and Train "B". Train "A" includes the electric motor driven EFW pump (P7B) and EFW flow control valves CV-X2 CV-X3. Train "B" includes the steam turbine driven EFW pump (P7A) and EFW flow control valves CV-X1 and CV-X4. Instrumentation Channel "A" controls EFW flow in EFW Train "A" by controlling valves CV-X2 and CV-X3. In like manner, instrumentation Channel "B" controls EFW flow in EFW Train "B" by controlling valves CV-X1 and CV-X4. Train "A" EFW pump (P7B) is started by an initiation signal from instrumentation Channel "A". Train "B" EFW Pump (P7A) is started by opening steam admission valves CV-Y1 and CV-Y2. It should be noted that these two valves are parallel valves and add a greater degree of reliability to the system since a signal from instrumentation Channel "B" opens CV-Y1, and Channel "A" opens CV-Y2.

Using the train assignments as described above, the system can sustain a single failure of either instrumentation Channel "A" or "B" and deliver EFW flow to the steam generators. Flow would be delivered and controlled using system components associated with the particular train to which they are assigned, i.e., Train "A" or Train "B". There will be no requirement to close any steam generator isolation valve (CV-2620, CV-2626, CV-2627, and CV-2670) since they are backed up by check valves. Additionally, for a single failure of either instrumentation channel ("A" or "B"), there is no requirement to open normally closed cross-connect valves CV-2813 and CV-2814.

Final valve assignments as depicted on Figure 3.1-1 will be in accordance with the pump/control valve configuration basis described above.

CONCERN 3:

Furnish schematic diagrams for the motor driven EFW pump and all ac and dc operated valves in the EFW system.

RESPONSE 3:

The schematic diagrams requested are not complete at this time. Detailed design of the electrical system is estimated for completion in December, 1981. Therefore, we will supply the requested information by December 31, 1981.

CONCERN 4:

Provide a description of the EFW flow indication channels at ANO-1, including the electrical power supply from which each channel is powered, the independence between channels, the type of control room indication provided and the capability for testing this instrumentation.

RESPONSE 4:

Each of the four flow paths (2 for each steam generator) will have flow indication as shown on Figure 3.1-1 submitted to the NRC October 15, 1980. Each flowmeter will receive electrical power from one of the four EFIC channels A, B, C, and D. Each EFIC channel will receive vital power from one of the four inventers RS1, RS2, RS3, or RS4. Each inverter has power supplied from a diesel generator backed A.C. bus and a battery backed D.C. bus.

Each flowmeter system will be independent from the other flowmeters. Channel separation will be maintained as with any Class 1E wiring system.

Each flowmeter will have an indicator in the central control room. The system will be testable on an individual flowmeter basis, similar to any differential pressure type flowmeter system.

CONCERN 5:

Provide a description of how physical separation and electrical independence is maintained within the redundant EFIC logics.

RESPONSE 5:

The detailed design of the EFIC system will be done by the system supplier. The following physical separation and electrical independence requirements will be imposed through the EFIC system specification and BOP criteria.

a. Redundant elements of the EFIC system will be housed in separate cabinets.

b. Redundant EFIC system sensors will be located so that a single event (pipe whip, jet impingement, etc.) will not affect more than one EFIC system channel.

c. The EFIC system will be powered from vital power surces with each channel on a different vital source.

d. Class 1E input and output wiring and peripheral devices will be maintained in the division of plant redundancy assigned to the associated EFIC system channel.

e. Inter-channel signals paths will be separated by space and/or physical barriers.

f. Inter-channel signal paths will be electrically isolated as part of the EFIC system.

g. Where the EFIC system provides signals to Class 1E indicators, etc., outside the EFIC system cabinets, the signal transmission lines will be electrically buffered or otherwise decoupled from the EFIC system.

h. Where the EFIC system provides signals to Non Class 1E equipment, the signal paths will be electrically isolated as part of the EFIC system.

CONCERN 6:

Provide the proposed test frequencies for the EFIC signals and circuits and the steam generator level channels (proposed and existing).

RESPONSE 6:

Presently, the ANO-1 Technical Specifications require the EFW Actuation Control Logic to be tested monthly and calibrated once every 18 months. No Technical Specification requirements apply to our existing steam generator level channels. Future test frequencies are proposed to be monthly on the EFIC signals and circuits with an 18 month calibration interval and a monthly test on the steam generator level channels with an 18 month calibration.

CONCERN 7:

Identify the specific power sources from which each steam generator level channel is powered.

RESPONSE 7:

Power sources for each steam generator level channel will be from the vital inverter power sources providing power to the 4 EFIC channels as described in Response 4 above. Present design calls for two level sensors per EFIC channel per steam generator.

CONCERN 8:

Furnish logic drawings and electrical schematics for transfer T, (Figure 3.4-2a) showing how the 2' level (one or more RC pumps running) or 20' level (no RC pumps running) is selected.

RESPONSE 8:

The detailed logic drawings and electrical schematics will be prepared by the EFIC system supplier who will do the detailed system design. This will follow vendor selection and purchase order placement as mentioned in Response 3. Therefore, this information will be supplied by December 31, 1981.

CONCERN 9:

Provide electrical schematics showing circuits used for bypassing of RC pumps, main feedwater pumps, and SG pressure initiation of EFW.

RESPONSE 9:

See the response to Question 8.