



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION  
RELATED TO AMENDMENT NO. 150 TO FACILITY OPERATING LICENSE NO. DPR-49

IOWA ELECTRIC LIGHT AND POWER COMPANY  
CENTRAL IOWA POWER COOPERATIVE  
CORN BELT POWER COOPERATIVE

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

The Duane Arnold Energy Center (DAEC) Technical Specification (TS) definition of a Logic System Functional Test (page 1.0-6) states that "a logic system functional test means a test of all relays and contacts of a logic circuit to ensure all components are operable per design intent." The design of the DAEC's Engineered Safety Feature (ESF) logic systems does not allow for testing to the degree necessary to meet the above definition without utilizing a large number of electrical jumpers or lifting a large number of lead wires.

Currently, the DAEC TS require that several ESF logic system functional tests be performed annually. These surveillance requirements are given in Tables 4.2-A, 4.2-B, and 4.2-D of the DAEC TS's. With the recent issuance of License Amendment 143, the DAEC now operates on a nominal 18-month fuel cycle. To avoid plant shutdown solely to perform the annual logic system functional tests, a permanent change to the frequency of these tests is requested by the licensee.

Other requested administrative changes to the DAEC TS are as described below:

- 1) The requirement to perform a logic system functional test of the logic controlling the Head Spray Mode of the Residual Heat Removal (RHR) system is deleted. During the Cycle 8/9 refueling outage, the equipment associated with the Head Spray Mode of RHR was retired in place under the provisions of 10 CFR 50.59, thereby eliminating the need for this test.
- 2) Tables 4.2-A and 4.2-B of the TS erroneously list a "Calibration Frequency" associated with each Logic System Functional Test. In fact, any actuating device requiring calibration has an associated calibration frequency specified elsewhere in these tables. This change deletes this tabular entry and thereby corrects an administrative error made by the licensee in Amendment No. 143. Also, an editorial footnote referring to the conversion from an annual to an 18-month operating cycle has been deleted.
- 3) The definition of a Logic System Functional Test (Definition 1.22e) is revised to more closely conform to BWR Standard Technical Specifications and the revised DAEC testing practices.

- 4) Note 4 of the "Notes for Tables 4.2-A through 4.2-F" is deleted to ensure consistency with the revised DAEC testing practices. Note 4 describes the use of test jacks, which the NRC has found to be unacceptable for this testing.

The licensee based their proposed change on the following:

The licensee's proposed amendment (Reference 1) of December 11, 1987 revises Technical Specification Tables 4.2-A, 4.2-B, and 4.2-D to extend the surveillance intervals for all ESF Logic System Functional Tests from annually to once per operating cycle. This proposal is based upon engineering judgment with regard to the degree of complexity of the logic system functional testing, i.e., many jumpers and lifted leads must be used to test each logic system to the necessary level to demonstrate that all components are operable per design. The proposed change is in response to the staff's recommendation to Iowa Electric Light and Power Company (IELP) that all Logic System Functional Test intervals be changed to once per operating cycle (Reference 2).

## 2.0 BACKGROUND

On May 14, 1987, during an inspection related to the IELP program to improve High Pressure Coolant Injection (HPCI) and Reactor Core Isolation Cooling (RCIC) reliability, a Region III inspector determined that a certain surveillance test appeared not to meet the requirements of the DAEC Technical Specifications (TS). These apparent TS discrepancies involved the functional testing of relay contacts in the isolation logics of the HPCI/RCIC systems. Essentially, the initiating isolation relay contacts were jumpered out, not proving them operable per the TS definitions.

A conference was held on June 5, 1987 to discuss this issue, including the basis for the IELP interpretation of TS definition 1.22e. During the June 5, 1987 conference, the NRC stated that, per the staff's interpretation of the DAEC TS, all relay contacts were to be tested and that testing the logic circuits by blocking the master relay isolation contact and jumpering the signal past the initiating contact failed to test initiating logic per definition 1.22e. Following the June 5, 1987 conference, the licensee performed augmented testing of relay contacts per the staff's interpretation transmitted in Reference 3. The results of the augmented testing program were documented in a followup letter (Ref. 4) dated June 26, 1987.

On July 13, 1987, the NRC staff met with the licensee in Bethesda, Maryland. The purpose of that meeting was to discuss the DAEC logic system functional tests as required by the TS and IELP proposals for meeting the staff's interpretation of the DAEC TS.

The licensee presented their basis for concluding that they were in compliance with their TS, but also indicated that improvements could be made to the DAEC surveillance program for logic system functional testing to include testing of certain relay contacts.

Based upon the July 13, 1987 meeting, the NRC staff concluded that the current TS requires that all engineered safety features actuation logic relay contacts be tested. The NRC staff's position is that these tests include all relay contacts and are to be conducted each refueling outage.

In Reference 2, the NRC requested that IELP submit a change to the DAEC TS to comply with the NRC staff's position. The licensee's letter (Reference 1), dated December 11, 1987 is their compliance with this request.

### 3.0 EVALUATION

The staff has reviewed the DAEC proposed TS change in accordance with Section 7 of the Standard Review Plan and has noted the following:

- 1) The requested change meets the present TS definition of Logic System Functional Testing in that the enhanced testing to be performed once per operating cycle is a complete test from sensor to actuated device, while the existing annual test is not. The present annual Logic System Functional Test does not verify the operation of the isolation relay contacts. The contacts are bypassed with jumpers, therefore operability is not proven during the test.
- 2) It has been noted that the licensee's proposed change to the definition of Logic System Functional Test only clarifies the previous definition and in no way changes its existing meaning.
- 3) In order to meet the TS definition of Logic System Functional Test, as defined in the meeting of July 13, 1987, the licensee is required to perform the Logic System Functional Testing as defined in Reference 3. This testing requires the use of over 200 jumpers, contact blocks and lifting of circuit leads to verify proper operation.

The augmented Logic System Functional Test will require the particular system/train to be tested to be taken out of service for approximately 4 hours, on average. During this period, the system/train will be unavailable to perform its safety function. A complete test of the Residual Heat Removal (RHR) System would disable or remove different trains or modes of operation for a period of 1 to 2 days to complete testing.

- 4) The potential for disabling safety equipment or challenging systems and components by lifted leads, installed contact blocks or jumpers and incorrect system lineups as a result of human error will exist as the result of performing the augmented Logic System Functional Testing. Requiring the testing less frequently and conducting the testing while the plant is shutdown will reduce this risk.

- 5) The DAEC proposed TS change does not change setpoints, plant operations, protective functions, or the design basis of the plant. Therefore, these proposed changes do not create the possibility of a new or different kind of accident from any previously analyzed.
- 6) During the last outage, the licensee performed a complete (augmented) Logic System Functional Test as documented in Reference 4. The results of the augmented Logic Functional Testing showed no component failures; however, during an earlier special test a single relay (GE HGA series) in the Low Pressure Coolant Injection loop system logic was found to have a failed contact. This single failure would not have disabled the safety function, because the logic is a one-out-of-two taken twice.
- 7) The staff has reviewed the licensee's administrative changes and notes the following:
  - a) The deletion of Logic System Functional testing of the Head Spray Mode of RHR is acceptable, since this mode of operation has been retired.
  - b) The staff agrees with the licensee that calibration frequency associated with each Logic System Functional Test can be deleted since system calibration is specified elsewhere in these tables.
  - c) The staff concurs with revising the definition of Logic System Functional Test to clarify the requirements of this testing.
  - d) The staff agrees with the licensee's intention to delete Note 4 of the "Notes for Tables 4.1.2-A through 4.2-F." This revision will clarify the licensee's method for performing Logic System Functional Testing.

It should be noted that the NRC does not generally find the use of test jacks to be unacceptable. NRC considers the use of test jacks a more preferable method of testing than the use of jumpers. However, for certain Logic System Functional testing at the DAEC, test jacks were used to bypass relay contacts that should be tested. In this application the staff finds the use of test jacks to be unacceptable.

The staff has reviewed the IELP submittal for DAEC and has concluded that changing the Logic System Functional Test Intervals from annually to once per operating cycle for the Duane Arnold Energy Center is acceptable. The staff bases this conclusion on the following:



1. Requiring the augmented testing to be performed annually with the plant operating creates a situation for potential inadvertent scrams, actuations of equipment, and resultant transients which create unnecessary risks. Once-per-operating cycle testing is performed with the plant shut down. Testing with the plant shut down poses fewer operational challenges to the plant.
2. Existing annual (nonaugmented) testing is incomplete due to isolation logic relay contacts not being properly tested and verified. The once-per-operating cycle test is a complete system test from sensor to actuator.
3. The annual augmented testing requires removing safety-related systems from service while the plant is operating, which is undesirable. The once-per-operating cycle test is performed only with the plant shut down, when the demand for safety systems is considerably reduced.
4. The proposed change does not change setpoints, plant operations, protective functions, or design bases of the plant. The change will not create the possibility of a new or different kind of accident from those previously analyzed.
5. In this case, the once-per-operating cycle test is more desirable since there will be less chance for human error that could inadvertently leave safety-related systems inoperable. The staff defines these human errors as mistakes made by individuals, such as leaving safety systems with improper system line ups, or jumpers left installed or leads lifted which would adversely affect the proper initiation of a safety-related system. Increasing the test interval decreases the chance for human error, thus reducing the chance of unknowingly making safety-related systems inoperable.
6. The staff has reviewed the licensee's proposed administrative changes and concludes that they are acceptable for the reasons listed in Section 3.0, paragraph 7.

In summary the staff finds the once-per-operating cycle Logic System Functional Testing to be a more complete Logic System Functional Test as compared to the existing or augmented annual test. The test and test intervals are consistent with those found in the STS and are sufficient for monitoring the operability of system logic. In addition, since the testing will be performed when the plant is shut down, requiring less system reconfiguration and minimizing human error, the staff believes this test to be a safety improvement.

#### 4.0 ENVIRONMENTAL CONSIDERATION

Pursuant to 10 CFR 51.21, 51.32, and 51.35, an environmental assessment and finding of no significant impact has been prepared and published in the Federal Register on June 16, 1988 (53 FR 22588). Accordingly, based upon the environmental assessment, the Commission has determined that the issuance of this amendment will not have a significant effect on the quality of the human environment.

## 5.0 CONCLUSION

Based on the above the staff finds the proposed TS changes to be acceptable. The staff concludes, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

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Dated: June 23, 1988

6.0 REFERENCES

1. Letter, W. Rothert (IELP) to T. Murley (NRC), "Technical Specification Change (RTS-222) Logic System Functional Test Surveillance Interval Extension," dated December 11, 1987.
2. Letter from A. Capucci (NRC) to L. Liu (IELP), "Duane Arnold Energy Center (DAEC)," dated August 13, 1987.
3. Letter, R. McGaughy (IELP) to A. Davis (Region III), "Augmented Logic Circuitry Testing." dated June 11, 1987.
4. Letter, R. McGaughy (IELP) to A. Davis (Region III), "Augmented Logic Circuitry Testing," dated June 26, 1987.