

March 28, 1988

Docket No. 50-254

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Mr. L. D. Butterfield, Jr.  
Nuclear Licensing Manager  
Commonwealth Edison Company  
Post Office Box 767  
Chicago, Illinois 60690

Dear Mr. Butterfield:

SUBJECT: STANDBY LIQUID CONTROL SYSTEM (TAC NO. 66621)

Re: Quad Cities Nuclear Power Station, Unit 1

The Commission has issued the enclosed Amendment No. 106 to Facility Operating License No. DPR-29 for the Quad Cities Nuclear Power Station, Unit 1. This amendment is in response to Commonwealth Edison Company's application dated November 17, 1987. It incorporates changes to the Limiting Conditions for Operations, Surveillance Requirements and Bases of the 3.4/4.4 Technical Specifications for the Unit 1 Standby Liquid Control System in compliance with 10 CFR 50.62.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notices.

Sincerely,

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Thierry Ross, Project Manager  
Project Directorate III-2  
Division of Reactor Projects - III,  
IV, V and Special Projects

Enclosures:

1. Amendment No. 106 to License No. DPR-29
2. Safety Evaluation

cc w/enclosures:

See next page

(\*See Previous Concurrence)

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Mr. L. D. Butterfield, Jr.  
Commonwealth Edison Company

Quad Cities Nuclear Power Station  
Units 1 and 2

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

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

DOCKET NO. 50-254

QUAD CITIES NUCLEAR POWER STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 106  
License No. DPR-29

1. The Nuclear Regulatory Commission (the Commission) has found that:
  - A. The application for amendment by Commonwealth Edison Company (the licensee) dated November 17, 1987, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;
  - B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;
  - C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;
  - D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and
  - E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B. of Facility Operating License No. DPR-29 is hereby amended to read as follows:

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B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 106, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Daniel R. Muller, Director  
Project Directorate III-2  
Division of Reactor Projects - III  
IV, V and Special Projects

Attachment: Changes to the Technical  
Specifications

Date of Issuance: March 28, 1988

ATTACHMENT TO LICENSE AMENDMENT NO.106

FACILITY OPERATING LICENSE NO. DPR-29

DOCKET NO. 50-254

Revise the Appendix A Technical Specifications by removing the pages identified below and inserting the attached pages. The revised pages are identified by the captioned amendment number and contain marginal lines indicating the area of change.

REMOVE

3.4/4.4-1  
3.4/4.4-2  
3.4/4.4-3  
Figure 3.4-1

INSERT

3.4/4.4-1  
3.4/4.4-2  
3.4/4.4-3  
3.4/4.4-3a

### 3.4/4.4 STANDBY LIQUID CONTROL SYSTEM

#### LIMITING CONDITIONS FOR OPERATION

##### Applicability:

Applies to the operating status of the standby liquid control system.

##### Objective:

To assure the availability of an independent reactivity control mechanism.

#### SURVEILLANCE REQUIREMENTS

##### Applicability:

Applies to the periodic testing requirements for the standby liquid control system.

##### Objective:

To verify the operability of the standby liquid control system.

#### SPECIFICATIONS

##### A. Normal Operation

During periods when fuel is in the reactor and prior to startup from a cold condition, the standby liquid control system shall be operable except as specified in Specification 3.4.B. This system need not be operable when the reactor is in the cold shutdown condition, all control rods are fully inserted, and Specification 3.3.A is met.

##### A. Normal Operation

The operability of the standby liquid control system shall be verified by performance of the following tests:

1. At least once per month

Demineralized water shall be recycled to the test tank. Pump minimum flow rate of 40 gpm shall be verified against a system head of 1275 psig.

2. At least once during each operating cycle

Manually initiate the system, except the explosion valves and pump solution in the recirculation path, to demonstrate that the pump suction line from the storage tank is not plugged.

Explode two of six charges or two of four charges manufactured in the same batch using the permanent system wiring to verify proper function. Then install the untested charges in the explosion valves.

Demineralized water shall be injected via a test connection into the reactor vessel to test that valves (except explosion valves) not checked by the recirculation test are not clogged.

Test that the setting of the system pressure relief valves is between 1455 and 1545 psig.

3. Disassemble and inspect one explosion valve so that it can be established that the valve is not clogged. Both valves shall be inspected in the course of two operating cycles.

B. Operation with Inoperable Components

From and after the date that a redundant component is made or found to be inoperable, Specification 3.4.A shall be considered fulfilled and continued operation permitted provided that the component is returned to an operable condition within 7 days.

C. Liquid Poison Tank-Boron Concentration

The liquid poison tank shall contain a boron-bearing solution of at least 3733 gallons of at least 14 WT percent sodium pentaborate Decahydrate ( $\text{Na}_2 \text{B}_{10} \text{O}_{16} - 10\text{H}_2\text{O}$ ) at all times when the standby liquid control system is required to be operable and the solution temperature shall not be less than the temperature presented in Figure 3.4-2.

- D. If Specifications 3.4.A through C are not met, an orderly shutdown shall be initiated and the reactor shall be in the cold shutdown condition within 24 hours.

B. Operation with Inoperable Components

When a component becomes inoperable, its redundant component shall be demonstrated to be operable immediately and daily thereafter.

C. Liquid Poison Tank-Boron Concentration

The availability of the proper boron-bearing solution shall be verified by performance of the following tests:

1. At least once per month

Boron concentration shall be determined. In addition, the boron concentration shall be determined any time water or boron are added or if the solution temperature drops below the limits specified by Figure 3.4-2.

2. At least one per day

Solution volume shall be checked.

3. At least once per day

The solution temperature shall be checked.

### 3.4 LIMITING CONDITIONS FOR OPERATION BASES

- A. The design objective of the standby liquid control system is to provide the capability of bringing the reactor from full power to a cold, xenon-free shutdown assuming that none of the withdrawn control rods can be inserted. To meet this objective, the liquid control system is designed to inject a quantity of boron which produces a concentration of no less than 600 ppm of boron in the reactor core in approximately 83 minutes with imperfect mixing. A boron concentration of 600 ppm in the reactor core is required to bring the reactor from full power to 3%  $\Delta k$  or more subcritical condition considering the hot to cold reactivity swing, xenon poisoning and an additional margin in the reactor core for imperfect mixing of the chemical solution in the reactor water. A normal quantity of 3,321 gallons of solution having a 14% sodium pentaborate concentration is required to meet this shutdown requirement.

For a required pumping rate of 40 gpm, 3321 gallons of at least 14 WT percent solution will be inserted in approximately 83 minutes. This insertion rate of boron solution will override the rate of reactivity insertion due to cool down of the reactor following the xenon peak. Two pump operation will enable faster reactor shutdown for ATWS events. The monthly pump minimum flowrate test shall require a minimum flowrate of 40 gpm. This requirement, combined with the solution concentration requirements of at least 14 WT percent, will demonstrate that the Standby Liquid Control System meets the requirements of 10CFR50.62.

Boron concentration, solution temperature, and volume are checked on a frequency to assure a high reliability of operation of the system should it ever be required. Experience with pump operability indicates that monthly testing is adequate to detect if failures have occurred.

The only practical time to test the standby liquid control system is during a refueling outage and by initiation from local stations. Components of the system are checked periodically as described above and make a functional test of the entire system on a frequency of less than once each refueling outage unnecessary. A test of explosive charges from one manufacturing batch is made to assure that the charges are satisfactory. A continual check of the firing circuit continuity is provided by pilot lights in the control room.

- B. Only one of two standby liquid control pumping circuits is needed for proper operation of the system. If one pumping circuit is found to be inoperable, there is no immediate threat to shutdown capability, and reactor operation may continue while repairs are being made. Assurance that the remaining system will perform its intended function and that the reliability of the system is good is obtained by demonstrating operation of the pump in the operable circuit at least once daily. A reliability analysis indicates that the plant can be operated safely in this manner for 7 days.

The Standby Liquid Control System is operated by a five position control switch (SYS 1&2, SYS 1, OFF, SYS 2, and SYS 2&1). The single pump operation positions are for operating cycle surveillance testing. This testing demonstrates the capability of firing the explosive trigger assemblies. Also during this testing, sodium pentaborate is circulated from the storage tank, through one suction line, through a pump, and back into the storage tank. This is done separately for each system demonstrating that both suction lines are not plugged. The two pump operation positions will be used for the injection of the sodium pentaborate into the vessel during an ATWS event. By using the two pump operation position, the Standby Liquid Control System will be meeting the requirements of 10CFR50.62 (Requirements for reduction of risk from ATWS events for light-water-cooled nuclear power plants).

- C. The solution saturation temperature of 13% sodium pentaborate, by weight, is 59°F. The solution shall be kept at least 10°F above the saturation temperature to guard against boron precipitation. The 10°F margin is included in Figure 3.4-2. Temperature and liquid level alarms for the system are annunciated in the control room.

Pump operability is checked on a frequency to assure a high reliability of operation of the system should it ever be required.

Once the solution has been made up, boron concentration will not vary unless more boron or more water is added. Level indication and alarm indicate whether the solution volume has changed, which might indicate a possible solution concentration change. Considering these factors, the test interval has been established.

- D. Periodic tests to demonstrate two-pump flow capability are not feasible in the present system configuration and are unnecessary because the flow path integrity can be determined from the test of a single pump. Comparison of single-pump test pressures with previous results and correlation of these data with initial two-pump tests are used to verify the capability of the piping.



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 106 TO FACILITY OPERATING LICENSE NO. DPR-29

COMMONWEALTH EDISON COMPANY

AND

IOWA-ILLINOIS GAS AND ELECTRIC COMPANY

QUAD CITIES NUCLEAR POWER STATION, UNIT 1

DOCKET NOS. 50-254

1.0 INTRODUCTION

By letter dated November 17, 1987, Commonwealth Edison Company (CECo), the licensee for Quad Cities Nuclear Power Station (QCNP), Unit 1, requested changes to Technical Specifications (TS) 3.4/4.4 with regard to the Standby Liquid Control System (SLCS). These proposed TS changes reflect a plant modification which increased the concentration of sodium pentaborate in the SLCS tank to 14 weight percent. This increase in concentration in conjunction with the capability to operate both SLCS pumps simultaneously at a total combined flow rate of 80 gpm was done to satisfy, in part, the requirements of 10 CFR 50.62. The SLCS design modification and implementation schedule to comply with 10 CFR 50.62 was described by CECo in letter dated September 30, 1987. CECo has also proposed (in the November 17 letter) TS changes to decrease the minimum required liquid poison volume from 3470 gallons to 3321 gallons, to periodically test the SLCS pumps (one pump at a time), and increase the relief valve pressure setting range by 55 psig.

2.0 EVALUATION

TS changes proposed by CECo, and their description of unit modifications to the SLCS, have been reviewed by the staff against the requirements of the ATWS rule (10 CFR 50.62), and Generic Letter 85-03 "Clarification of Equivalent Control Capacity for Standby Liquid Control Systems" dated January 28, 1985. Increasing the SLCS sodium pentaborate concentration to 14 weight percent in conjunction with a flow rate of 80 gpm provides a boron content equivalent in control capacity to 86 gpm of 13 weight percent sodium pentaborate. This is in compliance with 10 CFR 50.62 and is therefore acceptable.

The licensee's proposal to change the TS required liquid poison tank volume from a minimum of 3,470 gallons to a minimum 3,321 gallons is acceptable because with an increased solution concentration of 14%, 3,321 gallons will provide the same total amount of poison and shutdown margin as the lower concentration/higher volume solution currently used.

Additionally, the proposal to periodically test only one SLCS pump at a time instead of both pumps simultaneously is also acceptable. This is based upon CECO's performance of initial two-pump tests, correlation of single pump data to the initial two-pump data, and subsequent comparison of the periodic single pump test data to the initial test data for verification of system capability.

Revised surveillance requirements were also proposed to increase the allowable TS setpoint band for the system pressure relief valves from the current range of 1400 - 1490 psig, to a band of 1455 - 1545 psig because of increased pump discharge pressure during two pump operation. A result of two pump SLCS operation is that discharge pressures will be higher. Accordingly, the allowable system pressure relief valve setpoints have been increased by approximately 55 psig.

Furthermore, new and revised TS bases were proposed to reflect the above changes and SLCS modifications. All aforementioned TS changes are consistent with modification made to the SLCS to comply with 10 CFR 50.62, and are therefore acceptable.

### 3.0 ENVIRONMENTAL CONSIDERATION

This amendment involves a change to a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20, and changes to surveillance requirements. The staff has determined this amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, the amendment meets eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement nor environmental assessment need be prepared in connection with the issuance of this amendment.

### 4.0 CONCLUSION

The staff has concluded, 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 this amendment will not be inimical to the common defense and security nor to the health and safety of the public.

Principal Contributor: T. Collins and T. Ross

Dated: March 28, 1988