September 16, 1983

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Docket No. 50-334

Mr. J. J. Carey, Vice President
Duquesne Light Company
Nuclear Division
Post Office Box 4
Shippingport, PA 15077

Dear Mr. Carey:

The Commission has issued the enclosed Amendment No. 71 to Facility Operating License No. DPR-66 for the Beaver Valley Power Station, Unit No. 1. The amendment consists of changes to the Technical Specifications in response to your application transmitted by letter dated April 4, 1983 and amended by letters dated July 15 and August 19, 1983.

The amendment changes the Technical Specifications on boron concentration in the Boron Injection Tank from a range of 20000-22500 ppm to a range of 2000-7700 ppm. The minimum temperature in the tank is also reduced to correspond to the solubility limit for 7700 ppm boron.

A copy of the related Safety Evaluation is enclosed. The Notice of Issuance will be included in the Commission's next regular monthly Federal Register notice.

Sincerely,

Peter S. Tam, Project Manager
Operating Reactors Branch #1
Division of Licensing

Enclosures:
1. Amendment No. 71 to DPR-66
2. Safety Evaluation

cc w/enclosures:
See next page

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

DUQUESNE LIGHT COMPANY

OHIO EDISON COMPANY

PENNSYLVANIA POWER COMPANY

DOCKET NO. 50-334

BEAVER VALLEY POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 71
License No. DPR-66

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Duquesne Light Company, Ohio Edison Company and Pennsylvania Power Company (the licensees) dated April 4, 1983 as supplemented by letters dated July 15, and August 19, 1983, 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.

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2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-66 is hereby amended to read as follows:

   (2) Technical Specifications

   The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 71, 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

Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: September 16, 1983

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 71 TO FACILITY OPERATING LICENSE NO. DPR-66

DOCKET NO. 50-334

Revise Appendix A as follows:

Remove Pages	Insert Pages
3/4 5-7	3/4 5-7
3/4 5-8	3/4 5-8
B3/4 5-1	B3/4 5-1
B3/4 5-2	B3/4 5-2

3/4.5.4 BORON INJECTION SYSTEM

BORON INJECTION TANK ≥350°F

LIMITING CONDITION FOR OPERATION

3.5.4.1.1 The boron injection tank shall be OPERABLE with:

* a. A minimum contained volume of 900 gallons of borated water,

+* b. Between 2,000 and 7,700 ppm of boron, and

#* c. A minimum solution temperature of 120°F.

* 1 hour deviation is permitted to correct the out of specification condition.

\+ To permit adequate recirculation and sampling following actions taken to correct the boron concentration, 4 hours is allowed for verification of the sample results providing corrective action was taken within the first hour.

\# With the Boron Injection Flow Path temperature <120°F but >65°F, verify Recirculation Flow Path temperature and stagnant piping temperature by local monitoring of the ambient air temperature in the 1) Blender Cubicle (722 elevation PAB), and 2) Safeguards Penetration Area A (722 elevation Safeguards building) hourly.

APPLICABILITY: MODES 1, 2, 3

ACTION:

With the boron injection tank inoperable or <65°F, be in HOT STANDBY and borated to a SHUTDOWN MARGIN equivalent to 1% Δk/k at 200°F within the next 6 hours; restore the tank to OPERABLE status within the next 7 days or be in HOT SHUTDOWN within the next 12 hours.

SURVEILLANCE REQUIREMENTS

4.5.4.1.1 The boron injection tank shall be demonstrated OPERABLE by:

a. Verifying the water level in the surge tank at least once per 7 days.

b. Verifying the boron concentration of the water in the surge tank at least once per 7 days.

c. Verifying the water temperature and recirculation flow at least once per 24 hours, and

d. Verifying that the injection flow path temperature is >120°F (no low temperature alarms or by local monitoring of temperature) each shift.

NOTE: This specification applicable for N & N-1 loop operation with all Loop stop valves open.

HEAT TRACING

LIMITING CONDITION FOR OPERATION

3.5.4.2

THIS SPECIFICATION DELETED

3/4.5.1 ACCUMULATORS

The OPERABILITY of each of the RCS accumulators ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs in the event the RCS pressure fails below the pressure of the accumulators. This initial surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures.

The limits on accumulator volume, boron concentration and pressure ensure that the assumptions used for accumulator injection in the accident analysis are met.

The limit of one hour for operation with an inoperable accumulator minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional accumulator which may result in unacceptable peak cladding temperatures.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two separate and independent ECCS subsystems ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the accumulators is capable of supplying sufficient core cooling to limit the peak cladding termperatures within acceptable limits for all postulated break sizes ranging form the double ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long term core cooling capability in the recirculation mode during the accident recovery period.

The Surveillance Requirements provided to ensure OPERABILITY of each component ensures that at a minimum, the assumptions used in the accident analysis are met and that subsystem OPERABILITY is maintained.

3/4.5.4 BORON INJECTION SYSTEM

The OPERABILITY of the boron injection system as part of the ECCS ensures that sufficient negative reactivity is injected into the core to limit the positive increase in reactivity caused by RCS system cooldown. RCS cooldown can be caused by inadvertent depressurization, a loss-of-coolant accident or a steam line rupture.

BORON INJECTION SYSTEM (Continued)

The analysis of a main steam pipe rupture is performed to demonstrate that the following criteria are satisified:

1. Assuming a stuck rod cluster control assembly, with or without offsite power, and assuming a single failure in the engineered safeguards, there is no consequential damage to the primary system and the core remains in place and intact.

2. Energy release to containment from the worst steam pipe break does not cause failure of the containment structure.

3. Radiation doses are not expected to exceed the guidelines of the 10CFR100.

The limits on injection tank minimum volume and boron concentration ensure that the assumptions used in the steam line break analysis are met.

Verification of 120°F in the injection flow path assures an 8-hour margin to the time at which precipitation of a 7700 ppm boric acid solution would occur without benefit of the building heating system.

Verifying the recirculation flow path and stagnant piping temperatures, when the Boron Injection Flow Path temperature is <120°F and >65°F, by monitoring the ambient air temperatures in the building areas containing that piping provides assurance that boron precipitation will not occur.

3/4.5.5 REFUELING WATER STORAGE TANK (RWST)

The OPERABILITY of the RWST as part of the ECCS ensures that a sufficient supply of borated water is available for injection by the ECCS in the event of a LOCA. The limits on RWST minimum volume and boron concentration ensure that 1) sufficient water is available within containment to permit recirculation cooling flow to the core, and 2) the reactor will remain subcritical in the cold condition following mixing of the RWST and the RCS water volumes with all control rods inserted except for the most reactive control assembly. These assumptions are consistent with the LOCA analysis.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 71 TO FACILITY OPERATING LICENSE NO. DPR-66

DUQUESNE LIGHT COMPANY

OHIO EDISON COMPANY

PENNSYLVANIA POWER COMPANY

BEAVER VALLEY POWER STATION, UNIT NO. 1

DOCKET NO. 50-334

BACKGROUND

Westinghouse has incorporated a Boron Injection Tank (BIT) into the Emerency Core Cooling System design to mitigate the consequences of postulated steam line break events by purging the highly concentrated boron solution (20,000ppm) into the primary system. In reference (1) the licensee has submitted a request for Technical Specification (TS) changes to reduce the boron concentration requirements in the BIT from a range of 20,000ppm to 22,500ppm to a range of 2000ppm to 7700ppm. The minimum temperature requirement would be reduced to correspond to the solubility limit for 7700ppm. The limiting condition for operation would be revised to allow one hour for corrective action of a deviation and four hours for recirculation prior to boron concentration verification by sampling. A surveillance requirement would be added to verify recirculation flow and that minimum temperature is maintained when the ambient temperature is low. The surveillance requirements for heat tracing would be deleted. The bases would be revised to reflect changes in the analyses and the limiting conditions for operation. The

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stated purpose of these proposed changes is "to increase the reliability of the BIT by decreasing the likelihood of boron solidification." The staff was concerned that deletion of the surveillance requirements for heat tracing would decrease assurance that there would be no boron precipitation in stagnant piping.

EVALUATION

Accident Analyses

The design basis accident for which the BIT was designed is the large steam line break (SLB). Other accidents considered are "accidental depressurization of the main steam system (MSS)" and "spurious operation of the safety injection system (SIS) at power" In reference (1) the licensee has submitted revised safety analyses for these accidents with lowered BIT boron concentration (i.e., 2000ppm).

The revised SLB accident analysis assumes double ended rupture of a main steam line, a single failure in the engineered safeguards (e.g., failure of an SI train), end of life shutdown margin at no load, equilibrium xenon conditions, and the most reactive control assembly stuck in its fully withdrawn position after reactor trip. The main steam isolation valves (MSIVs) are automatically tripped on evidence of a SLB (e.g., on high-high containment pressure, or low steam line pressure). The revised analysis conservatively assumes that the MSIVs would close in 10 seconds (the design closing time is 5 seconds). For breaks in any location no more than one steam generator would blow down even if one of the MSIVs fail to close because of the check valves in the steam lines. A BIT concentration of 2000ppm boron was assumed. The main feedwater system is isolated from the steam generators upon SI initiation. The rapid steam release from the SLB results in a corresponding reduction in

RCS temperature and pressure, with a resultant increase in reactivity.

The SLB analysis was performed using standard Westinghouse computer codes. Four combinations of break sizes and plant conditions were analyzed: pipe break outside containment (1.4 ft^2) with and without offsite power and pipe break inside containment, upstream of the flow limiting nozzle (4.6 ft^2) with and without offsite power. As a result of the negative reactivity feedback, return to criticality occurs in all 4 cases, with the highest power level (about 22%) attained for the case of the SLB inside containment with offsite power available. The core is rapidly shutdown by the boron introduced with the SI flow. A DNB analysis was performed which showed that minimum DNBR was greater than 1.3 in all cases. The resulting offsite doses were less than a small part of the 10 CFR Part 100 guideline limits in all cases. We conclude that the licensee's reanalysis of the large SLB accident meets the acceptance criteria of SRP Part 15.1.5 and is, therefore, acceptable.

The reduction in boron concentration in the BIT will affect the containment pressure and temperature response under main steam line break accident conditions through changes in the mass and energy release rates. The licensee has reanalyzed a spectrum of main steam line break accidents, based on a boron concentration of 2000 ppm in the BIT. The spectrum of accidents analyzed included varying the initial power level from 102% of full power to 0% power at hot shutdown, along with various pipe break sizes and types. The mass and energy release data were generated using the Westinghouse LOFTRAN Code (Topical Report WCAP-7907). The analytical methodology of the LOFTRAN Code has been reviewed and found acceptable by the staff. The spectrum of

postulated steamline break accidents was analyzed using the Stone & Webster LOCTIC Code. The LOCTIC Code, although not approved by the staff, has been used extensively by applicants and licensees of Stone & Webster designed plants, and, based on numerous confirmatory analyses, the staff has found that it provides acceptable results. For the various steamline breaks, the results show a maximum containment pressure of 41.1 psig with a corresponding temperature of 270F, which are below the containment design conditions of 45 psig and 280F. By way of comparison, the design basis LOCA is calculated to result in a peak pressure of 41.4 psig.

Based on the above discussion, the staff concludes that the licensee's revised main steam line break analysis is acceptable, and that the proposed boron concentration reduction in the BIT does not adversely affect the containment functional performance.

With regard to the other transients and accidents reanalyzed the "accidental depressurization of a main steam system" analysis assumes inadvertent opening of a single steam dump, relief or safety valve, using assumptions and methods similar to the large SLB analysis. This transient results in sufficient RCS cooldown to cause a return to criticality, but of a lower magnitude ($\sim$ 2.5%) and duration than for the large SLB, which thus remains bounding. The other transient analyzed "spurious operation of the SIS at power" can result from operator error or a spurious signal. This occurrence results in a drop in T_{avg}, pressurizer level and pressure. The reactor may trip immediately due to a SI actuation signal, or else it would trip on low pressurizer pressure. The DNBR would not decrease from its initial value. Thus there is no cladding damage and no release of fission products.

We conclude that the proposed TS 3.5.4.1.1.b revision, involving reduction of the BIT boron concentration to a range between 2000ppm to 7700ppm will not result in unacceptable consequences in the event of the design base accident and is therefore, acceptable.

Temperature Control Of Safety Injection Piping

In order to maintain the BIT contents at the desired boron concentration and temperature (minimum 120°F) the boric acid solution is continuously recirculated between the BIT and the boron injection surge tank (BIST) by means of the boron injection recirculation pumps (BIRPs). This flow path includes a section of the HHSI line. However, the major portion of this line is stagnant. The piping is normally maintained at a temperature sufficiently high to prevent boron precipitation by means of heat tracing. The existing TS 3.5.4.2 includes a limiting condition for operation (LCO) requiring that at least two independent channels of heat tracing be operable. In reference (1), the licensee proposes deletion of this TS.

For the 7700ppm boron concentration, the minimum solution temperature is approximately 65°F. If the heat tracing for a stagnant pipe is not functional, the stagnant fluid can be expected to cool and eventually reach ambient temperature, which would normally by 76°-78°F. However, the Auxiliary Building heating system is not safety grade and its failure could result in ambient temperatures less than 65°F. In reference (2) the licensee submitted a conservative heat loss calculation for 3 inch insulated stagnant pipe, which showed that with an initial fluid temperature of 120°F and a severe drop in ambient temperature, it would take over 8 hours to reach the minimum solubility

temperature of $65^{o}F$, while for an initial fluid temperature of 76°-$78^{o}F$ the corresponding time period would be 2-3 hours.

In order to provide assurance that there would be no boron precipitation in stagnant HHSI piping with the above scenario, the Technical Specification is revised to require a normal minimum temperature of $120^{o}F$ for both the BIT recirculation flow path and stagnant HHSI piping. Such requirement assures at least an 8-hour margin to the time at which precipitation of boron could occur without benefit of the heat tracing and the Auxiliary Building heating systems. The proposed technical specification contains surveillance requirements consistent with this time.

A boron injection flow path temperature of less than $120^{o}F$ would be automatically alarmed at the boron injection flow path monitor heat trace panel. The temperature would be verified once per shift to make sure it is $>120^{o}F$ at the panel or locally. With the boron injection flow path temperature less than $120^{o}F$ but greater than $65^{o}F$ the ambient air temperature in the BIT area would be monitored hourly to assure that the HHSI line temperature does not drop below $65^{o}F$.

We conclude that the licensee's proposed Technical Specification provides adequate assurance that boron precipitation will not occur in the HHSI flow path, and is therefore acceptable.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is

insignificant from the standpoint of environmental impact and, pursuant to 10 CFR 51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have 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 or to the health and safety of the public.

References

(1) Letter of April 4, 1983 from J. Carey, Duquesne Light to S.A. Varga, NRC, forwarding Proposed Change Request No. 79 to Operating License.

(2) Letter of June 29, 1983 from K.D. Grada, Duquesne Light, to Bernard Mann, NRC, forwarding additional information on boron concentration reduction (including piping drawings, pipe heat loss calculations, and T.S. revision proposals) (informal submittal).

(3) Letter of Augut 19, 1983 from J. J. Carey, Duquesne Light Company to S.A. Varga, NRC, providing additional information on Change Request No. 79.

Principal Contributors:

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J. Guo

Dated: September 16, 1983