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Docket No. 50-324

Carolina Power & Light Company
ATTN: Mr. J. A. Jones, Executive
Vice President
Engineering, Construction
and Operations
336 Fayetteville Street
Raleigh, North Carolina 27602

Gentlemen:

The Commission has issued the enclosed Amendment No. 23 to Facility Operating License No. DPR-62 for the Brunswick Steam Electric Plant, Unit No. 2. The amendment consists of changes to the Technical Specifications in response to your request dated August 11, 1976.

This amendment reduces the operating limit minimum critical power ratio to 1.23 during Cycle 1 for fuel exposures below 6000 MWD/T, and lowers the rod block monitor setpoint to 106%. In addition, we have included corrected Technical Specification page 3.2-6, which was approved and issued with Amendment No. 17 but inadvertently changed when Amendment No. 20 was issued.

Copies of the Safety Evaluation and the Federal Register Notice are also enclosed.

Sincerely,

Original signed by

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating reactors

Enclosures:
1. Amendment No. 23 to DPR-62
2. Safety Evaluation
3. Federal Register Notice

Const. 1

cc w/enclosures:
See next page

OFFICE	ORB#1	OELD	ORB#1			
x27433:tsb						
SURNAME	CMTrammell	MMitchell	ASchwencer			
DATE	11/10/76	11/12/76	11/16/76			

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

CAROLINA POWER & LIGHT COMPANY

DOCKET NO. 50-324

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 23
License No. DPR-62

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

   A. The application for amendment by Carolina Power & Light Company (the licensee) dated August 11, 1976, 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.

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

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Attachment:
Changes to the Technical
Specifications

Date of Issuance: November 16, 1976

ATTACHMENT TO LICENSE AMENDMENT NO. 23 TO DPR-62

DOCKET NO. 50-324

Revise Appendix A as follows:

Remove the following pages and replace with identically numbered revised pages:

1.1-5
1.1-10
1.1-12
3.1-1
3.2-6
3.2-42

BASES:

1.1 FUEL CLADDING INTEGRITY SAFETY LIMIT (Cont'd)

the core is the minimum critical power ratio (MCPR). It is assumed that the plant operation is controlled to the nominal protective setpoints via the instrumented varables, i.e., normal plant operation presented on Figure 1.1-1 by the nominal expected flow control line. The safety limit (MCPR of 1.05) has sufficient conservatism to assure that in the event of an abnormal operational transient initiated from a normal operating condition (MCPR > 1.23 at less then 6000 MWD/t cycle exposure and MCPR > 1.28 for greater than or equal to 6000 MWD/t cycle exposure) more than 99.9% of the fuel rods in the core are expected to avoid boiling transition. The margin between MCPR of 1.0 (onset of transition boiling) and the safety limit of 1.05 is derived from a detailed statistical analysis considering all of the uncertainties in monitoring the core operating state including uncertainty in the boiling transition correlation as described in Reference 1.

Because the boiling transition correlation is based on a large quantity of full scale data, there is a very high confidence that operation of a fuel assembly at the condition of MCPR = 1.05 would not produce boiling transition.

However, if boiling transition were to occur, clad perforation would not necessarily be expected. Cladding temperatures would increase to approximately 1100°F which is below the perforation temperature of the cladding material. This has been verified by tests in the General Electric Test Reactor (GETR) where fuel similar in design to Brunswick operated above the critical heat flux for a significant period of time without clad perforation.

If reactor pressure should ever exceed 1400 psia during normal power operation (the limit of applicability of the boiling transition correlation), it would be assumed that the fuel cladding integrity safety limit has been violated.

In addition to the boiling transition limit (MCPR = 1.05), operation is constrained to maximum LHGR $\leq$ 18.5 Kw/ft. At 100% power this limit is reached with a maximum total peaking factor (MTPF) of 2.60. For the case of the MTPF exceeding 2.60, operation is permitted only at less than 100% of rated thermal

BASES:

2.1
LIMITING SAFETY SYSTEM SETTINGS RELATED TO FUEL CLADDING INTEGRITY (Cont'd)

The time for 50 percent and 90 percent insertions are given to assure proper completion of the insertion stroke, to further assure the expected performance in the earlier portion of the transient, and to establish the ultimate fully shutdown steady-state conditon.

For analyses of the thermal consequences of the transients a MCPR of 1.23 at cycle exposures less than 6000 MWD/t and 1.28 for 6000 MWD/t or higher exposures is conservatively assumed to exist prior to initiation of the transients.

This choice of using conservative values of controlling parameters and initiating transients at the rated power level produces more pessimistic answers than would result by using expected values of control parameters and analyzing at higher power levels.

BASES:

2.1

LIMITING SAFETY SYSTEM SETTINGS RELATED TO FUEL CLADDING INTEGRITY (Cont'd)

The scram trip setting must be adjusted to ensure that the LHGR transient peak is not increased for any combination of MTPF and reactor core thermal power. The scram setting is adjusted in accordance with the formula in Specification 2.1.A.1, when the maximum total peaking factor is greater than 2.60.

Analyses of the limiting transients show that no scram adjustment is required to assure MCPR > 1.05 when the transient is initiated from MCPR > 1.23 before 6000 MWD/t cycle exposure and from MCPR > 1.28 for 6000 MWD/t or higher exposures.

For operation in the startup mode while the reactor is at low pressure, APRM scram is set at $\leq$15 percent of rated power. This provides an adequate thermal margin between the setpoint and the safety limit, 25 percent rated power. The margin adequately accommodated anticipated maneuvers associated with plant startup. Effects of increasing pressure at zero or low void content are minor, cold water from sources available during startup is not much colder than that already in the system, temperature coefficients are small, and control rod patterns are constrained to be uniform by operating procedures backed up by the rod worth minimizer and the rod sequence control system.

Worth of individual rods is very low in a uniform rod pattern. Thus, of all possible sources of reactivity input, uniform control rod withdrawal is the most probable case of significant power rise. Because the flux distribution associated with uniform rod withdrawals does not involve high local peaks, and because several rods must be moved to change power by a significant percentage of rated power, the rate of power rise is slow. Generally, the heat flux is in near equilibrium with the fission rate. In an assumed uniform rod withdrawal approach to the scram level, the rate of power rise is no more

LIMITING CONDITIONS FOR OPERATION	SURVEILLANCE REQUIREMENTS
4.1 Reactor Protection System	4.1 Reactor Protection System
Applicability:	Applicability:
Applies to the operability of plant instrumentation and control systems required for reactor safety.	Applies to the surveillance of the plant instrumentation and control systems required for reactor safety.
Objective:	Objective:
To specify the limits imposed on plant operation by those instrument and control systems required for reactor safety.	To specify the type and frequency of surveillance to be applied to those instrument and control systems required for reactor safety.
Specification:	Specification:
A. Plant Operation	A. Plant Operation
Plant operation at any power level shall be permitted only in accordance with Table 3.1-1.	Instrumentation systems shall be functionally tested and calibrated as indicated in Table 4.1-1.
B. System Response	B. System Response
The designated system response time from actuation of the sensor contact or trip output to the de-energization of the scram solenoid relay shall not exceed 100 milliseconds.	The system response time will be checked prior to initial fuel loading.
C. Minimum Critical Power Ration (MCPR)	C. Minimum Critical Power Ratio (MCPR)
During steady state power operation, MCPR shall be $\geq$ 1.23 below 6000 MWD/t cycle exposure and MCPR $\geq$ 1.28 for 6000 MWD/t or higher exposures at rated power and flow. For core flows other than rated, the MCPR shall be >1.23 below 6000 MWD/t or >1.28 above 6000 MWD/t times K_f, where K_f is as shown in Figure 3.1-1.	MCPR shall be determined daily during reactor power operation at $\geq$ 25% rated thermal power and following any change in power level or distribution that would cause operation with a limiting control rod pattern as described in the bases for Specification 3.3.B.5.

TABLE 3.2-1

PRIMARY CONTAINMENT ISOLATION INSTRUMENTATION

GROUP I ISOLATION (1) (Cont'd)

Trip Function	Trip Setting	Minimum Number of Operable Instrument Channels per Trip System	Required Action When Minimum Condition for Operation are not Satisfied	Remarks
7. Low condenser vacuum B21-PS-N056A,B,C,D	≥ 18" Hg.	Two	(2.b.)	
8. Turbine building area high temperature B21-TS-3225A,B,C,D B21-TS-3226A,B,C,D B21-TS-3227A,B,C,D B21-TS-3228A,B,C,D B21-TS-3229A,B,C,D B21-TS-3230A,B,C,D B21-TS-3231A,B,C,D B21-TS-3232A,B,C,D	≤ 200°F	Two of four in each of four channels	(2.b.)	

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NOTES:

(1) Group I isolation includes:

a. Main steamline isolation valves
b. Main steamline drain valves
c. Reactor water sample valves **(only on low water level #2 or high main steam line radiation signal)**
d. Mechanical vacuum pump trip **(only on high main steamline radiation signal)**

(2) If the minimum number of operable instrument channels is not available for one trip system, that trip system shall be tripped. However, when necessary, one channel may be inoperable without tripping the instrument channel for two (2) hours to conduct required functional tests and calibrations provided that at least one operable channel in the same trip system is monitoring that parameter. If the minimum number of operable or tripped instrument channels is not available for both trip systems, the appropriate actions listed below shall be taken:

a. Initiate an orderly shutdown and have reactor in the cold shutdown condition in 24 hours.
b. Initiate an orderly load reduction and have reactor in Hot Standby within 8 hours.

(3) The main steam line low pressure need be available only in the RUN mode.

(4) Not required in RUN mode. Applies to Unit 2 only.

TABLE 3.2-11 (Cont'd)

CONTROL ROD BLOCKS INITIATED FROM NEUTRON MONITORING SYSTEM

Trip Function	Minimum Number of Operable Instrument Channels (3)	Modes in Which Function Must Be Operable: Refuel	Startup	Run	Trip Setting	Remarks
4. Rod block monitor						
a. Upscale RBM channels A,B Relay K1	2			X (4)	$\leq$ (0.66W+40) 2.60 MTPF	
b. Downscale RBM channels A,B Relay K2	2			X (4)	$\geq$ 3/125 of full scale	
c. Inoperative RBM channels A,B Relay K3	2			X (4)	(1)	

NOTES:

1) The inoperative trips are produced by the following conditions:

(a) SRM and IRM

1) Mode switch not in OPERATE
2) High voltage power supply voltage low
3) Circuit boards not in circuit

(b) APRM

1) Mode switch not in OPERATE
2) Less than 11 LPRM inputs
3) Circuit boards not in circuit

(c) RBM

1) Mode switch not in OPERATE
2) Circuit boards not in circuit
3) RBM fails to null
4) Less than required number of LPRM inputs for rod selected.

(2) If the minimum number of channels cannot be met for one out of two trip systems, seven days are allowed before requiring the affected trip system to be tripped. If both trip systems do not meet the minimum number of operable channels for operation, both trip systems shall be tripped.

(3) If the minimum number of channels per trip system cannot be met, see Specifications 3.2.C and 3.3.B.5 for required action.

(4) Only required operable when mode switch is in RUN and reactor power is $\geq$30%.

SSEP-1 & 2

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 23 TO FACILITY OPERATING LICENSE NO. DPR-62

CAROLINA POWER & LIGHT COMPANY

BRUNSWICK STEAM ELECTRIC PLANT, UNIT NO. 2

DOCKET NO. 50-324

INTRODUCTION

By letter dated August 11, 1976, Carolina Power and Light Company (the licensee) proposed changes to the Technical Specifications to Facility Operating License No. DPR-62, for the Brunswick Steam Electric Plant Unit No. 2. The proposed changes provide for a reduced operating limit minimum critical power ratio (MCPR) during Cycle 1 for fuel exposures below 6000 megawatt-days per ton (MWD/T), and a reduced rod block monitor setpoint.

BACKGROUND

We previously issued a Safety Evaluation (1) supporting a license amendment wherein we approved a minimum critical power ratio (MCPR) for operation of 1.28 with a Safety Limit MCPR of 1.05.

For the Brunswick Unit No. 2 core, the safety limit MCPR of 1.05 is the point at which more than 99.9% of the fuel rods would be expected to avoid boiling transition. Boiling transition represents an unstable heat transfer condition on the fuel clad surface and could result in fuel clad temperatures exceeding allowable limits. The operating limit MCPRs are determined by adding the effect of decrease in MCPR due to the most limiting operational transient (ΔMCPR) to the Safety Limit MCPR. In reference (1) a ΔMCPR of 0.23 was derived for end-of-cycle (EOC) core conditions; hence the operating limit MCPR was 1.28 (1.05 + .23).

Our analysis was based on a General Electric Report, NEDO-21200 (2). Reference (2) was based on EOC conditions and resulted in the imposition of requirements consistent with EOC conditions throughout the entire first cycle. As part of the August 11, 1976, proposed license amendment, the licensee submitted an amended General Electric Report, NEDO-21200 Supplement 1 (3), with an operating MCPR limit derived at a cycle exposure of 6000 MWD/T. The proposed operating MCPR limits are tabulated below. At the present time (November 1976) the

core has experienced about 4200 MWD/T of fuel exposure. Reference (3) and the proposed Technical Specification changes would allow the plant to immediately reduce the operating limit MCPR to 1.23. At 6000 MWD/T exposure the operating limit MCPR must be raised to the previously approved value 1.28.

EVALUATION

Operating Limit MCPR

Various transient events will reduce the operating CPR. To assure that the fuel cladding integrity safety limit (MCPR of 1.05) is not exceeded during anticipated abnormal operational transients, the most limiting transients have been analyzed to determine which one results in the largest reduction in critical power ratio. The licensee has submitted the results of the transient analyses which cause a significant decrease in CPR. Types of transients evaluated were loss of flow, pressure and power increase, coolant temperature decrease, and rod withdrawal error. The most limiting transients in the stated categories are as follows:

Event	ΔCPR 104% Rated Power BOC to 6000 MWD/T	ΔCPR 104% Rated Power 6000 MWD/T to EOC
Rod Withdrawal Error (RBM Setpoint = 106%)	0.18	0.18
Load Rejection	0.14	0.23

For end of cycle conditions, the Load Rejection w/o Bypass transient is the most limiting. From beginning of cycle to 6000 MWD/T exposure the Rod Withdrawal Error is the most severe abnormal operational transient. Addition of the maximum ΔCPRs to the safety limit MCPR of 1.05 gives the minimum operating limit MCPRs required to avoid violating the safety limit, should the limiting transients occur. Minimum critical power ratio operating limits are summarized below:

Cycle Exposure	MCPR Operating Limit
BOC to 6000 MWD/T	1.23
6000 MWD/T to EOC	1.28

The transient analyses were evaluated with the scram reactivity insertion rates at 6000 MWD/T and at EOC using an acceptable design conservatism factor. The initial parameters used for the worst operational transient analyses were acceptable and included CPRs equal to or greater than the established operating MCPR values for each core exposure.

The ECCS performance analysis assumed that reactor operation will be limited to operating MCPR no lower than 1.18. The proposed operating limits are higher than 1.18, thus are acceptable in terms of ECCS performance.

Rod Withdrawal Error Transient

The licensee discussed the rod withdrawal error transient in terms of worst case conditions. The analysis shows that the local power range monitor subsystem (LPRM's) will detect high local powers and alarm. However, if the operator ignores the LPRM alarm, the rod block monitor subsystem (RBM) must stop rod withdrawal while the critical power ratio is still greater than the 1.05 MCPR safety limit and the cladding plastic strain limit of one percent is not exceeded. In order to accomplish this, the licensee has proposed lowering the rod block monitor setpoint from 108% to 106%. We conclude that with the change in RBM setpoint the consequences of this localized transient are acceptable.

Operating MCPR Limits for Less than Rated Power and Flow

For the limiting transient of recirculation pump speed control failure at lower than rated power and flow conditions, the licensee will conform to Technical Specifications limiting conditions for operation, Figure 3.1-1. This requires the licensee to maintain the required operating MCPR greater than the MCPR limit times the K_f factor for core flows less than rated. The K_f factor curves were generically derived to assure that the most limiting transient occurring at less than rated flow will not result in a MCPR below the safety limit of 1.05. We conclude that the submitted safety analyses of abnormal operational transients for the Brunswick Steam Electric Plant, Unit No. 2 are acceptable. The minimum operating limit MCPR established for BSEP that is required to avoid violation of the Safety Limit MCPR, should the most limiting occur, is acceptable.

Overpressurization Protection

The licensee's previous submittal (Reference 2) on overpressure protection was based upon end of cycle conditions. It showed that there was adequate margin to meet the ASME code allowable pressure in the event of MSIV closure with flux scram, no relief function of the safety relief valves and one failed safety valve. That analysis is valid throughout fuel Cycle 1 since it was performed for the most severe conditions (end of cycle). Hence, as in Reference 1, we find the overpressure protection to be 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 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) because the change does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the change does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) 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.

Date: November 16, 1976

REFERENCES

1. Safety Evaluation by the Office of Nuclear Reactor Regulation Supporting Amendment No. 14 to Facility Operating License No. DPR-62 May 13, 1976.

2. "Brunswick Steam Electric Plant Unit 2 Channel Inspection and Safety Analysis With Bypass Holes Plugged" NEDO-21200 Class 1 February, 1976.

3. "Brunswick Steam Electric Plant Unit 2 Channel Inspection and Safety Analysis with Bypass Flow Holes Plugged", NEDO-21200 Class 1 - Supplement 1 May, 1976.

UNITED STATES NUCLEAR REGULATORY COMMISSION

DOCKET NO. 50-324

CAROLINA POWER & LIGHT COMPANY

NOTICE OF ISSUANCE OF AMENDMENT TO FACILITY OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 23 to Facility Operating License No. DPR-62, issued to Carolina Power & Light Company (the licensee), which revised Technical Specifications for operation of the Brunswick Steam Electric Plant, Unit No. 2 (the facility) located in Brunswick County, North Carolina. The amendment is effective as of its date of issuance.

This amendment reduces the operating limit minimum critical power ratio to 1.23 for fuel exposures of less than 6000 megawatt-days per ton, and lowers the rod block monitor setpoint to 106%.

The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since the amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR 51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated August 11, 1976, (2) Amendment No. 23to License No. DPR-62, and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N. W., Washington, D. C. and at the Southport Brunswick County Library, 109 W. Moore Street, Southport, North Carolina 28461. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D. C. 20555, Attention: Director, Division of Operating Reactors.

Dated at Bethesda, Maryland, this 16th day of November 1976.

FOR THE NUCLEAR REGULATORY COMMISSION

A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors