

December 14, 1989

Docket Nos.: 50-369
and 50-370

Mr. H. B. Tucker, Vice President
Nuclear Production Department
Duke Power Company
422 South Church Street
Charlotte, North Carolina 28242

Dear Mr. Tucker:

SUBJECT: ISSUANCE OF AMENDMENT NO.101 TO FACILITY OPERATING LICENSE NPF-9 AND
AMENDMENT NO.83 TO FACILITY OPERATING LICENSE NPF-17 - MCGUIRE
NUCLEAR STATION, UNITS 1 AND 2 (TACS 74188 AND 74189)

The Nuclear Regulatory Commission has issued the enclosed Amendment No.101 to Facility Operating License NPF-9 and Amendment No. 83 to Facility Operating License NPF-17 for the McGuire Nuclear Station, Units 1 and 2. These amendments consist of changes to the Technical Specifications (TS) in response to your application dated August 3, 1989, as supplemented November 9, 1989.

The amendments change the TS to reduce from 75% to 50% the number of movable incore detector thimbles in McGuire Unit 1 required to be available during the remainder of the present fuel cycle for the Movable Incore Detector System to be declared operable. As committed to in your letter of November 9, 1989, and stated in the enclosed Safety Evaluation, should an excore detector become inoperable, while less than 75% of the the incore detectors are available, you will lower power to 75% within four hours.

The enclosed Safety Evaluation also notes your intention to utilize all available incore detectors if less than 75% are available. This clarification is based upon my conversation with Mr. P. Nardocci of your company on December 7, 1989.

Notice of issuance of amendments will be included in the Commission's biweekly Federal Register notice.

Sincerely,

/s/

Darl Hood, Project Manager
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Enclosures:

- 1. Amendment No. 101 to NPF-9
- 2. Amendment No. 83 to NPF-17
- 3. Safety Evaluation

cc w/enclosures:
See next page

*See previous concurrence

*LA:PDII-3

*PM:PDII-3

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*DET:SRXB

*OGC

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Document Name: MCGUIRE AMEND 74188/74189

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Duke Power Company

McGuire Nuclear Station

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DATED: December 14, 1989

AMENDMENT NO.101 TO FACILITY OPERATING LICENSE NPF-9 - McGuire Nuclear Station, Unit 1
AMENDMENT NO.83 TO FACILITY OPERATING LICENSE NPF-17 - McGuire Nuclear Station, Unit 2

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Docket File

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PD#II-3 R/F

McGuire R/F

S. Varga	14-E-4
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GPA/PA	17-F-2
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E. Butcher	11-F-23
D. Hagan	MNBB-3302
R. Jones	8-E-23



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

DUKE POWER COMPANY

DOCKET NO. 50-369

McGUIRE NUCLEAR STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 101
License No. NPF-9

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the McGuire Nuclear Station, Unit 1 (the facility) Facility Operating License No. NPF-9 filed by the Duke Power Company (the licensee) dated August 3, 1989, as supplemented November 9, 1989, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations as 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 set forth in 10 CFR Chapter I;
 - 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 hereby 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. NPF-9 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 101, are hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

FOR THE NUCLEAR REGULATORY COMMISSION

Robert N. Jalloum

David B. Matthews, Director
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: December 14, 1989



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

DUKE POWER COMPANY

DOCKET NO. 50-370

McGUIRE NUCLEAR STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 83
License No. NPF-17

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment to the McGuire Nuclear Station, Unit 2 (the facility) Facility Operating License No. NPF-17 filed by the Duke Power Company (the licensee) dated August 3, 1989, as supplemented November 9, 1989, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations as 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 set forth in 10 CFR Chapter I;
 - 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 hereby 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. NPF-17 is hereby amended to read as follows:

Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 83 , are hereby incorporated into the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

FOR THE NUCLEAR REGULATORY COMMISSION


David B. Matthews, Director
Project Directorate II-3
Division of Reactor Projects - I/II
Office of Nuclear Reactor Regulation

Attachment:
Technical Specification
Changes

Date of Issuance: December 14, 1989

ATTACHMENT TO LICENSE AMENDMENT NO.101

FACILITY OPERATING LICENSE NO. NPF-9

DOCKET NO. 50-369

AND

TO LICENSE AMENDMENT NO.83

FACILITY OPERATING LICENSE NO. NPF-17

DOCKET NO. 50-370

Replace the following pages of the Appendix "A" Technical Specifications with the enclosed pages. The revised pages are identified by Amendment number and contain vertical lines indicating the areas of change.

Amended Page

3/4 2-7
3/4 2-9
3/4 2-9b
3/4 2-14
3/4 3-45

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS

4.2.2.1 The provisions of Specification 4.0.4 are not applicable.

4.2.2.2 For RAOC operation, $F_Q(z)$ shall be evaluated to determine if $F_Q(z)$ is within its limit by:

- a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER greater than 5% of RATED THERMAL POWER.
- b. Increasing the measured $F_Q(z)$ component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5%** to account for measurement uncertainties. Verify the requirements of Specification 3.2.2 are satisfied.

c. Satisfying the following relationship:

$$F_Q^M(z) \leq \frac{2.32}{P \times W(z)} \times K(z) \text{ for } P > 0.5$$

$$F_Q^M(z) \leq \frac{2.32}{W(z) \times 0.5} \times K(z) \text{ for } P \leq 0.5$$

where $F_Q^M(z)$ is the measured $F_Q(z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty, 2.32 is the F_Q limit, $K(z)$ is given in Figure 3.2-2, P is the relative THERMAL POWER, and $W(z)$ is the cycle dependent function that accounts for power distribution transients encountered during normal operation. This function is given in the Peaking Factor Limit Report as per Specification 6.9.1.9.

d. Measuring $F_Q^M(z)$ according to the following schedule:

1. Upon achieving equilibrium conditions after exceeding by 10% or more of RATED THERMAL POWER, the THERMAL POWER at which $F_Q(z)$ was last determined,* or
2. At least once per 31 Effective Full Power Days, whichever occurs first.

*During power escalation at the beginning of each cycle, power level may be increased until a power level for extended operation has been achieved and a power distribution map obtained.

**For Unit 1, Cycle 6, when the number of available movable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 5% measurement uncertainty shall be increased to $[5\% + (3-T/14.5)(2\%)]$ where T is the number of available thimbles.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Continued)

- g. The limits specified in Specifications 4.2.2.2c, 4.2.2.2e., and 4.2.2.2f. above are not applicable in the following core plane regions:

1. Lower core region from 0 to 15%, inclusive.
2. Upper core region from 85 to 100%, inclusive.

4.2.2.3 Base Load operation is permitted at powers above APL^{ND} if the following conditions are satisfied:

- a. Prior to entering Base Load operation, maintain THERMAL POWER above APL^{ND} and less than or equal to that allowed by Specification 4.2.2.2 for at least the previous 24 hours. Maintain Base Load operation surveillance (AFD within $\pm 5\%$ of target flux difference) during this time period. Base Load operation is then permitted providing THERMAL POWER is maintained between APL^{ND} and APL^{BL} or between APL^{ND} and 100% (whichever is most limiting) and F_Q surveillance is maintained pursuant to Specification 4.2.2.4. APL^{BL} is defined as:

$$APL^{BL} = \text{minimum over } Z \left[\frac{2.32 \times K(Z)}{F_Q^M(Z) \times W(Z)_{BL}} \right] \times 100\%$$

where: $F_Q^M(z)$ is the measured $F_Q(z)$ increased by the allowances for manufacturing tolerances and measurement uncertainty. The F_Q limit is 2.32. $K(z)$ is given in Figure 3.2-2. $W(z)_{BL}$ is the cycle dependent function that accounts for limited power distribution transients encountered during base load operation. The function is given in the Peaking Factor Limit Report as per Specification 6.9.1.9.

- b. During Base Load operation, if the THERMAL POWER is decreased below APL^{ND} then the conditions of 4.2.2.3.a shall be satisfied before re-entering Base Load operation.

4.2.2.4 During Base Load Operation $F_Q(Z)$ shall be evaluated to determine if $F_Q(Z)$ is within its limit by:

- a. Using the movable incore detectors to obtain a power distribution map at any THERMAL POWER above APL^{ND} .
- b. Increasing the measured $F_Q(Z)$ component of the power distribution map by 3% to account for manufacturing tolerances and further increasing the value by 5%* to account for measurement uncertainties. Verify the requirements of Specification 3.2.2 are satisfied.

*For Unit 1, Cycle 6, when the number of available movable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 5% measurement uncertainty shall be increased to $[5\% + (3-T/14.5)(2\%)]$ where T is the number of available thimbles.

POWER DISTRIBUTION LIMITS

SURVEILLANCE REQUIREMENTS (Continued)

2. Comply with the requirements of Specification 3.2.2 for $F_Q(Z)$ exceeding its limit by the percent calculated with the following expression:

$$\left[\left(\max. \text{ over } z \text{ of } \left[\frac{F_Q^M(Z) \times W(Z)_{BL}}{\frac{2.32}{P} \times K(Z)} \right] - 1 \right) \right] \times 100 \text{ for } P \geq APL^{ND}$$

- g. The limits specified in 4.2.2.4.c, 4.2.2.4.e, and 4.2.2.4.f above are not applicable in the following core plan regions:

1. Lower core region 0 to 15 percent, inclusive.
2. Upper core region 85 to 100 percent, inclusive.

4.2.2.5 When $F_Q(Z)$ is measured for reasons other than meeting the requirements of specification 4.2.2.2 an overall measured $F_Q(z)$ shall be obtained from a power distribution map and increased by 3% to account for manufacturing tolerances and further increased by 5%* to account for measurement uncertainty.

*For Unit 1, Cycle 6, when the number of available movable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 5% measurement uncertainty shall be increased to $[5\% + (3-T/14.5)(2\%)]$ where T is the number of available thimbles.

POWER DISTRIBUTION LIMITS

3/4.2.3 RCS FLOW RATE AND NUCLEAR ENTHALPY RISE HOT CHANNEL FACTOR

LIMITING CONDITION FOR OPERATION

3.2.3 The combination of indicated Reactor Coolant System (RCS) total flow rate and R shall be maintained within the region of allowable operation shown on Figure 3.2-3 for four loop operation:

Where:

a.
$$R = \frac{F_{\Delta H}^N}{1.49 [1.0 + 0.3 (1.0 - P)]}$$
,

b.
$$P = \frac{\text{THERMAL POWER}}{\text{RATED THERMAL POWER}}$$
,

c. $F_{\Delta H}^N$ = Measured values of $F_{\Delta H}^N$ obtained by using the movable incore detectors to obtain a power distribution map. The measured values of $F_{\Delta H}^N$ shall be used to calculate R since Figure 3.2-3 includes penalties for undetected feedwater venturi fouling of 0.1% and for measurement uncertainties of 1.7% for flow and 4%* for incore measurement of $F_{\Delta H}^N$.

APPLICABILITY: MODE 1.

ACTION:

With the combination of RCS total flow rate and R outside the region of acceptable operation shown on Figure 3.2-3:

- a. Within 2 hours either:
 1. Restore the combination of RCS total flow rate and R to within the above limits, or
 2. Reduce THERMAL POWER to less than 50% of RATED THERMAL POWER and reduce the Power Range Neutron Flux - High Trip Setpoint to less than or equal to 55% of RATED THERMAL POWER within the next 4 hours.

*For Unit 1, Cycle 6, when the number of available movable detector thimbles is greater than or equal to 50% and less than 75% of the total, the 4% measurement uncertainty shall be increased by changing 1.49 in the R equation to $[(0.0149/14.5) T + 1.4453]$ where T is the number of available thimbles.

INSTRUMENTATION

MOVABLE INCORE DETECTORS

LIMITING CONDITION FOR OPERATION

- 3.3.3.2 The Movable Incore Detection System shall be OPERABLE with:
- At least 75%* of the detector thimbles,
 - A minimum of two** detector thimbles per core quadrant, and
 - Sufficient movable detectors, drive, and readout equipment to map these thimbles.

APPLICABILITY: When the Movable Incore Detection System is used for:

- Recalibration of the Excore Neutron Flux Detection System,
- Monitoring the QUADRANT POWER TILT RATIO, or
- Measurement of $F_{\Delta H}^N$ and $F_Q(Z)$

ACTION:

With the Movable Incore Detection System inoperable, do not use the system for the above applicable monitoring or calibration functions. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

- 4.3.3.2 The Movable Incore Detection System shall be demonstrated OPERABLE at least once per 24 hours by normalizing each detector output when required for:
- Recalibration of the Excore Neutron Flux Detection System, or
 - Monitoring the QUADRANT POWER TILT RATIO, or
 - Measurement of $F_{\Delta H}^N$ and $F_Q(Z)$

*For Unit 1, Cycle 6, the minimum percentage of detector thimbles may be reduced to 50% provided the applicable provisions for >50% and <75% of the total detector thimbles of Specifications 4.2.2.2.b, 4.2.2.4.b, 4.2.2.5, 3.2.3.c, and 3.3.3.2.b are followed.

**For Unit 1, Cycle 6, when the number of available movable detector thimbles is >50% and <75% of the total, a minimum of four detector thimbles per quadrant is required (where quadrant includes both horizontal-vertical quadrants and diagonally bounded quadrants).



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO.101 TO FACILITY OPERATING LICENSE NPF-9
AND AMENDMENT NO. 83 TO FACILITY OPERATING LICENSE NPF-17
DUKE POWER COMPANY
MCGUIRE NUCLEAR STATION, UNITS 1 AND 2
DOCKET NOS. 50-369 AND 50-370

1.0 INTRODUCTION AND BACKGROUND

By letter dated August 3, 1989, as supplemented by letter dated November 9, 1989, Duke Power Company (the licensee) proposed a change to the McGuire Nuclear Station, Unit 1, Technical Specifications (TS), pertaining only to the remainder of Cycle 6 scheduled to be completed about March 1990. The proposed change would relax the required number of available incore detector thimbles from 75 percent to 50 percent of the total number (i.e., from 44 to 29 thimbles based on the total 58). Although the change is applicable to Unit 1 only, Unit 2 is included administratively because the TS are combined in one document for both units.

During the last refueling, the detector thimbles were cleaned and eddy current examined. Upon restart, the detectors had sticking problems that prevented some of them from traveling the entire length of the incore thimble tubes. The mechanical problems subsided in time and for the January 17, 1989, flux map, 55 thimbles were used. After an unrelated steam generator tube rupture outage and subsequent return to power, the plant has again experienced detector sticking problems. During the flux map taken on July 14, 1989, only 43 thimble tubes could be fully accessed. On July 18, 1989, another map was taken with 44 thimbles, thus satisfying the 75 percent requirement.

The licensee suspects that a residue left from the cleaning process is causing the sticking problems. (This is the first time this particular cleaning method has been used at McGuire.) The thimbles will be cleaned again (by a different

method) at the next refueling outage or during a shutdown should one of sufficient duration occur. Failure to have at least 75 percent of the thimbles accessible would result in a forced shutdown due to the inability to meet the requirements of existing TS 3/4.2.2 and 3/4.2.3. Because of this, the licensee has requested relaxation from the 75 percent criterion. This relaxation, as evaluated below, applies only until the next Unit 1 refueling outage. The licensee has proposed increased uncertainty to be applied to the peaking factors if flux maps are taken with fewer than 75 percent of the thimbles. By letter dated November 9, 1989, the licensee committed that if an excore detector becomes inoperable while less than 75 percent of the incore detectors are available, power will be lowered to 75 percent within four hours. This change in the licensee's procedures clarifies the changes noticed in the Federal Register on August 21, 1989, and does not alter the initial determination of no significant hazards. We have approved similar changes for continued operation at lowered power for other plants.

2.0 EVALUATION

Essentially all Pressurized Water Reactor (PWR) TS contain a requirement of operability of 75 percent of the incore detector locations for periodic mapping of the core power distribution. On several occasions, for various reasons, failures in operating PWRs have approached or exceeded 25 percent, and a relaxation of the 75 percent requirement has been permitted for the remainder of the affected operating cycle.

The licensee's proposed change allows for the increase in the movable incore map measurement uncertainty in F_Q above the 5 percent normal allowance by the relationship $5\% + [3 - (T/14.5)] \times 2\%$ where T is the number of available detectors. This relationship increases the uncertainty allowance to 7 percent when only half of the thimbles are used. The uncertainty in the measurement of $F_{\Delta H}^N$ is 4 percent and is proposed to be increased to 5 percent if only half the detectors are used. These are the same allowances that were approved for similar plants. In addition to the uncertainty, a minimum of four thimbles per quadrant is required (where quadrant includes both horizontal-vertical quadrants and diagonally bounded quadrants). Duke Power Company requested Westinghouse to assess the incremental peaking factor measurement uncertainties and incore

calibration impact associated with a reduction to a minimum of 29 (i.e., 50 percent) of the 58 movable detector thimbles. The study indicates that additional uncertainties of 1.0 percent for $F_{\Delta H}^N$ and 2 percent of F_Q are appropriate when the number of instrumented assemblies is reduced from 58 to 29.

The licensee has provided the results of recent core maps which show that currently there is approximately 6.4 percent margin in total core peaking factor and 6.1 percent margin in the $F_{\Delta H}^N$ to the TS limits for steady state operating conditions. Since the unit does not load follow and both the total core peaking factor and $F_{\Delta H}^N$ normally tend to decrease with burnup, we conclude that these margins, along with the proposed increases in measurement uncertainty, are sufficient to preclude concern that the required monitoring of the limits could fail to detect a problem for the remainder of the operating cycle.

Another safety concern relating to degradation of incore mapping ability is the ability to detect anomalous conditions in the core. Most anomalous conditions produce either an axial or radial effect, which would cause either a change in quadrant tilt ratio or axial offset ratio. These are monitored by the excore detectors. Should an excore detector become inoperable while less than 75 percent of the incore detectors are available, the licensee has committed in the letter of November 9, 1989, to lowering power to 75 percent within four hours. As indicated in the letter, the licensee's procedures will be revised consistent with this commitment. Furthermore, the core exit thermocouples in the reactor provide a useful supplement to the incore detectors to detect problems.

Our review of the suitability of operation of the McGuire Unit 1 reactor with a reduced number of available movable incore thimble locations to as few as 50 percent indicates that adequate margin exists at this time in Cycle 6 and sufficiently increased uncertainty allowance has been made to insure that TS peaking factor limits will be met. This finding recognizes that excore detectors are operable, or that power will be lowered to 75 percent if an excore detector becomes inoperable while less than 75 percent of the incore detectors are available. In addition, we find that there are adequate supplemental indicators of anomalous conditions to preclude an unsafe condition from escaping detection in the absence of full incore detector mapping capability.

Consistent with the intent of these amendments, the licensee has indicated that all available incore detectors will be used if less than 75 percent are available.

Based on the above considerations, we conclude that the proposed TS changes for continued operation with less than 75 percent of the incore detectors available are acceptable for the remainder of Unit 1 Cycle 6 provided all excore detectors are operable, or provided reactor power is reduced to 75 percent if one excore detector becomes inoperable. Station procedures are being revised accordingly.

3.0 ENVIRONMENTAL CONSIDERATION

These amendments involve changes to the installation or use of facility components located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendments involve 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 exposure. The Commission has previously published a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding. Accordingly, the amendments meet the 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 or environmental assessment need be prepared in connection with the issuance of these amendments.

4.0 CONCLUSION

The Commission made a proposed determination that the amendments involve no significant hazards consideration which was published in the Federal Register (54 FR 34633) on September 21, 1989. The Commission consulted with the State of North Carolina. No public comments were received, and the State of North Carolina did not have any comments.

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 these amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: M. Chatterton, SRXB/DST
S. Kirslis, PD#II-3/DRP-I/II

Dated: December 14, 1989