



UNITED STATES
NUCLEAR REGULATORY COMMISSION

WASHINGTON, D.C. 20555-0001

June 21, 2000

Mr. Samuel L. Newton
Vice President, Operations
Vermont Yankee Nuclear Power Corporation
185 Old Ferry Road
P.O. Box 7002
Brattleboro, VT 05302-7002

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - ISSUANCE OF
AMENDMENT RE: REACTOR POWER DISTRIBUTION LIMITS
APPLICABILITY (TAC NO. MA7120)

Dear Mr. Newton:

The Commission has issued the enclosed Amendment No. 188 to Facility Operating License DPR-28 for the Vermont Yankee Nuclear Power Station, in response to your application dated November 5, 1999, as supplemented December 3, 1999.

The amendment revises Technical Specifications (TSs) to change the applicability for the reactor power distribution limits and the Average Power Range Monitor gain adjustments. The applicability is revised to operation at greater than or equal to 25% of rated thermal power. A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly Federal Register notice.

Sincerely,

Richard P. Croteau, Project Manager, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-271

Enclosures: 1. Amendment No. 188 to
License No. DPR-28
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
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VERMONT YANKEE NUCLEAR POWER CORPORATION

DOCKET NO. 50-271

VERMONT YANKEE NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 188
License No. DPR-28

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment filed by the Vermont Yankee Nuclear Power Corporation (the licensee) dated November 5, 1999, as supplemented December 3, 1999, 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-28 is hereby amended to read as follows:

(B) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 188 , 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 its date of issuance and shall be implemented within 60 days.

FOR THE NUCLEAR REGULATORY COMMISSION



James W. Clifford, Chief, Section 2
Project Directorate I
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of Issuance: June 21, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 188

FACILITY OPERATING LICENSE NO. DPR-28

DOCKET NO. 50-271

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the area of change.

<u>Remove</u>	<u>Insert</u>
7	7
8	8
9	9
20	20
33	33
33a	33a
224	224
225	225
226	226
228	228

1.1 SAFETY LIMIT

B. Core Thermal Power Limit
(Reactor Pressure < 800 psia
or Core Flow < 10% of Rated)

When the reactor pressure is <800 psia or core flow <10% of rated, the core thermal power shall not exceed 25% of rated thermal power.

C. Power Transient

To ensure that the safety limit established in Specification 1.1A and 1.1B is not exceeded, each required scram shall be initiated by its expected scram signal. The safety limit shall be assumed to be exceeded when scram is accomplished by means other than the expected scram signal.

D. Whenever the reactor is shutdown with irradiated fuel in the reactor vessel, the water level shall not be less than 12 inches above the top of the enriched fuel when it is seated in the core.

2.1 LIMITING SAFETY SYSTEM SETTING

ΔW = difference between two loop and single loop drive flow at the same core flow. This difference must be accounted for during single loop operation. $\Delta W = 0$ for two loop operation.

In the event of operation at $\geq 25\%$ Rated Thermal Power with the ratio of MFLPD to FRP greater than 1.0, the APRM gain shall be increased by the ratio: $\frac{\text{MFLPD}}{\text{FRP}}$

where:

MFLPD = maximum fraction of limiting power density where the limiting power density is defined in the Core Operating Limits Report.

FRP = fraction of rated power (1593 MWt).

In the event of operation at $\geq 25\%$ Rated Thermal Power with the ratio of MFLPD to FRP equal to or less than 1.0, the APRM gain shall be equal to or greater than 1.0.

1.1 SAFETY LIMIT

2.1 LIMITING SAFETY SYSTEM SETTING

For no combination of loop recirculation flow rate and core thermal power shall the APRM flux scram trip setting be allowed to exceed 120% of rated thermal power.

b. Flux Scram Trip Setting (Refuel or Startup and Hot Standby Mode)

When the reactor mode switch is in the REFUEL or STARTUP position, average power range monitor (APRM) scram shall be set down to less than or equal to 15% of rated neutron flux (except as allowed by Note 12 of Table 3.1.1). The IRM flux scram setting shall be set at less than or equal to 120/125 of full scale.

B. APRM Rod Block Trip Setting

1. When the mode switch is in the RUN position, the APRM rod block trip setting shall be as shown in Figure 2.1.1 and shall be:

$$S_{RB} \leq 0.66(W - \Delta W) + 42\%$$

where:

S_{RB} = rod block setting in percent of rated thermal power (1593 MWt)

W = percent rated two loop drive flow where 100% rated drive flow is that flow equivalent to 48×10^6 lbs/hr core flow

1.1 SAFETY LIMIT

2.1 LIMITING SAFETY SYSTEM SETTING

ΔW = difference between two loop and single loop drive flow at the same core flow. This difference must be accounted for during single loop operation. $\Delta W = 0$ for two loop operation.

In the event of operation at $\geq 25\%$ Rated Thermal Power with the ratio of MFLPD to FRP greater than 1.0, the APRM gain shall be increased by the ratio:

$$\frac{\text{MFLPD}}{\text{FRP}}$$

where:

MFLPD = maximum fraction of limiting power density where the limiting power density is defined in the Core Operating Limits Report.

FRP = fraction of rated power (1593 MWt).

In the event of operation at $\geq 25\%$ Rated Thermal Power with the ratio of MFLPD to FRP equal to or less than 1.0, the APRM gain shall be equal to or greater than 1.0.

- C. Reactor low water level scram setting shall be at least 127 inches above the top of the enriched fuel.

3.1 LIMITING CONDITIONS FOR OPERATION

3.1 REACTOR PROTECTION SYSTEM

Applicability:

Applies to the operability of plant instrumentation and control systems required for reactor safety.

Objective:

To specify the limits imposed on plant operation by those instrument and control systems required for reactor safety.

Specification:

- A. Plant operation at any power level shall be permitted in accordance with Table 3.1.1. The system response time from the opening of the sensor contact up to and including the opening of the scram solenoid relay shall not exceed 50 milliseconds.
- B. During operation at $\geq 25\%$ Rated Thermal Power with the ratio of MFLPD to FRP greater than 1.0 either:
 - a. The APRM System gains shall be adjusted by the ratios given in Technical Specifications 2.1.A.1 and 2.1.B or
 - b. The power distribution shall be changed to reduce the ratio of MFLPD to FRP.

4.1 SURVEILLANCE REQUIREMENTS

4.1 REACTOR PROTECTION SYSTEM

Applicability:

Applies to the surveillance of the plant instrumentation and control systems required for reactor safety.

Objective:

To specify the type and frequency of surveillance to be applied to those instrument and control systems required for reactor safety.

Specification:

- A. Instrumentation systems shall be functionally tested and calibrated as indicated in Tables 4.1.1 and 4.1.2, respectively
- B. Once within 12 hours after $\geq 25\%$ Rated Thermal Power and once a day during operation at $\geq 25\%$ Rated Thermal Power thereafter, the maximum fraction of limiting power density and fraction of rated power shall be determined and the APRM system gains shall be adjusted by the ratios given in Technical Specifications 2.1.A.1.a and 2.1.B.

BASES: 4.1 REACTOR PROTECTION SYSTEM

- A. The scram sensor channels listed in Tables 4.1.1 and 4.1.2 are divided into three groups: A, B and C. Sensors that make up Group A are the on-off type and will be tested and calibrated at the indicated intervals.

Group B devices utilize an analog sensor followed by an amplifier and bistable trip circuit. This type of equipment incorporates control room mounted indicators and annunciator alarms. A failure in the sensor or amplifier may be detected by an alarm or by an operator who observes that one indicator does not track the others in similar channels. The bistable trip circuit failures are detected by the periodic testing.

Group C devices are active only during a given portion of the operating cycle. For example, the IRM is active during start-up and inactive during full-power operation. Testing of these instruments is only meaningful within a reasonable period prior to their use.

The basis for a three-month functional test interval for group (A) and (B) sensors is provided in NEDC-30851P-A, "Technical Specification Improvement Analysis for BWR Reactor Protection Systems," March 1988.

SRM/IRM/APRM overlap Surveillances are established to ensure that no gaps in neutron flux indication exist from subcritical to power operation for monitoring core reactivity status.

The overlap between SRMs and IRMs is required to be demonstrated to ensure that reactor power will not be increased into a neutron flux region without adequate indication. This is required prior to withdrawing SRMs from the fully inserted position since indication is being transitioned from the SRMs to the IRMs.

The overlap between IRMs and APRMs is of concern when reducing power into the IRM range. On power increases, the system design will prevent further increases (by initiating a rod block) if adequate overlap is not maintained. Overlap between IRMs and APRMs exists when sufficient IRMs and APRMs concurrently have onscale readings such that the transition between the RUN and STARTUP/HOT STANDBY Modes can be made without either APRM downscale rod block, or IRM upscale rod block. Overlap between SRMs and IRMs similarly exists when, prior to withdrawing the SRMs from the fully inserted position, IRMs are above mid-scale on range 1 before SRMs have reached the upscale rod block.

As noted, IRM/APRM overlap is only required to be met during entry into STARTUP/HOT STANDBY Mode from the Run Mode. That is, after the overlap requirement has been met and indication has transitioned to the IRMs, maintaining overlap is not required (APRMs may be reading downscale once in the STARTUP/HOT STANDBY Mode).

If overlap for a group of channels is not demonstrated (e.g., IRM/APRM overlap), the reason for the failure of the Surveillance should be determined and the appropriate channel(s) declared inoperable. Only those appropriate channels that are required in the current condition should be declared inoperable.

BASES: 4.1 (Cont'd)

- B. The ratio of MFLPD to FRP shall be checked once per day when operating at $\geq 25\%$ Rated Thermal Power to determine if the APRM gains require adjustment. Because few control rod movements or power changes occur, checking these parameters daily is adequate. The 12 hour allowance after thermal power $\geq 25\%$ Rated Thermal Power is achieved is acceptable given the large inherent margin to operating limits at low power levels.

3.11 LIMITING CONDITIONS FOR OPERATION

3.11 REACTOR FUEL ASSEMBLIES

Applicability:

The Limiting Conditions for Operation associated with the fuel rods apply to these parameters which monitor the fuel rod operating conditions.

Objective:

The Objective of the Limiting Conditions for Operation is to assure the performance of the fuel rods.

Specifications:

A. Average Planar Linear Heat Generation Rate (APLHGR)

During operation at $>25\%$ Rated Thermal Power, the APLHGR for each type of fuel as a function of average planar exposure shall not exceed the limiting values provided in the Core Operating Limits Report. For single recirculation loop operation, the limiting values shall be the values provided in the Core Operating Limits Report listed under the heading "Single Loop Operation." If at any time during operation at $>25\%$ Rated Thermal Power it is determined by normal surveillance that the limiting value for APLHGR is being exceeded, APLHGR(s) shall be returned to within prescribed limits within two (2) hours; otherwise, the reactor shall be brought to $<25\%$ Rated Thermal Power within 4 hours. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits.

4.11 SURVEILLANCE REQUIREMENTS

4.11 REACTOR FUEL ASSEMBLIES

Applicability:

The Surveillance Requirements apply to the parameters which monitor the fuel rod operating conditions.

Objective:

The Objective of the Surveillance Requirements is to specify the type and frequency of surveillance to be applied to the fuel rods.

Specifications:

A. Average Planar Linear Heat Generation Rate (APLHGR)

The APLHGR for each type of fuel as a function of average planar exposure shall be determined once within 12 hours after $>25\%$ Rated Thermal Power and daily during operation at $>25\%$ Rated Thermal Power thereafter.

3.11 LIMITING CONDITIONS FOR OPERATION

B. Linear Heat Generation Rate (LHGR)

During operation at $>25\%$ Rated Thermal Power, the linear heat generation rate (LHGR) of any rod in any fuel assembly at any axial location shall not exceed the maximum allowable LHGR provided in the Core Operating Limits Report.

If at any time during operation at $>25\%$ Rated Thermal Power it is determined by normal surveillance that the limiting value for LHGR is being exceeded, LHGR(s) shall be returned to within the prescribed limits within two (2) hours; otherwise, the reactor shall be brought to $<25\%$ Rated Thermal Power within 4 hours.

Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits.

4.11 SURVEILLANCE REQUIREMENTS

B. Linear Heat Generation Rate (LHGR)

The LHGR as a function of core height shall be checked once within 12 hours after $>25\%$ Rated Thermal Power and daily during operation at $>25\%$ Rated Thermal Power thereafter.

3.11 LIMITING CONDITIONS FOR OPERATION

C. Minimum Critical Power Ratio (MCPR)

1. During operation at $>25\%$ Rated Thermal Power the MCPR operating value shall be equal to or greater than the MCPR limits provided in the Core Operating Limits Report. For single recirculation loop operation, the MCPR Limits at rated flow are also provided in the Core Operating Limits Report. For core flows other than rated, the Operating MCPR Limit shall be the above value multiplied by K_f where K_f is provided in the Core Operating Limits Report. If at any time during operation at $>25\%$ Rated Thermal Power it is determined by normal surveillance that the limiting value for MCPR is being exceeded, MCPR(s) shall be returned to within the prescribed limits within two (2) hours; otherwise, the reactor power shall be brought to $<25\%$ Rated Thermal Power within 4 hours. Surveillance and corresponding action shall continue until reactor operation is within the prescribed limits.

4.11 SURVEILLANCE REQUIREMENTS

C. Minimum Critical Power Ratio (MCPR)

MCPR shall be determined once within 12 hours after $>25\%$ Rated Thermal Power, daily during operation at $>25\%$ Rated Thermal Power thereafter, 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.6.

BASES:4.11 FUEL RODS

- A. The APLHGR, LHGR and MCPR shall be checked daily when operating at $>25\%$ Rated Thermal Power to determine if fuel burnup, or control rod movement has caused changes in power distribution. Since changes due to burnup are slow, and only a few control rods are removed daily, a daily check of power distribution is adequate. For a limiting value to occur below 25% of rated thermal power, an unreasonably large peaking factor would be required, which is not the case for operating control rod sequences. The 12 hour allowance after thermal power $>25\%$ Rated Thermal Power is achieved is acceptable given the large inherent margin to operating limits at low power levels.
- B. At certain times during plant startups and power changes the plant technical staff may determine that surveillance of APLHGR, LHGR and/or MCPR is necessary more frequently than daily. Because the necessity for such an augmented surveillance program is a function of a number of interrelated parameters, a reasonable program can only be determined on a case-by-case basis by the plant technical staff. The check of APLHGR, LHGR and MCPR will normally be done using the plant process computer. In the event that the computer is unavailable, the check will consist of either a manual calculation or a comparison of existing core conditions to those existing at the time of a previous check to determine if a significant change has occurred.

If a reactor power distribution limit is exceeded, an assumption regarding an initial condition of the DBA analysis, transient analyses, or the fuel design analysis may not be met. Therefore, prompt action should be taken to restore the APLHGR, LHGR or MCPR to within the required limits such that the plant operates within analyzed conditions and within design limits of the fuel rods. The 2 hour completion time is sufficient to restore the APLHGR, LHGR, or MCPR to within its limits and is acceptable based on the low probability of a transient or DBA occurring simultaneously with the APLHGR, LHGR, or MCPR out of specification.

C. Minimum Critical Power Ratio (MCPR) - Surveillance Requirement

At core thermal power levels less than or equal to 25%, the reactor will be operating at minimum recirculation pump speed and the moderator void content will be very small. For all designated control rod patterns which may be employed at this point, operating plant experience indicated that the resulting MCPR value is in excess of requirements by a considerable margin. With this low void content, any inadvertent core flow increase would only place operation in a more conservative mode relative to MCPR. During initial start-up testing of the plant, a MCPR evaluation will be made at 25% thermal power level with minimum recirculation pump speed. The MCPR margin will thus be demonstrated such that future MCPR evaluation below this power level will be shown to be unnecessary. The daily requirement for calculating MCPR above 25% rated thermal power is sufficient since power distribution shifts are very slow when there have not been significant power or control rod changes. The requirement for calculating MCPR when a limiting control rod pattern is approached ensures that MCPR will be known following a change in power or power shape (regardless of magnitude) that could place operation at a thermal limit.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 188 TO FACILITY OPERATING LICENSE NO. DPR-28

VERMONT YANKEE NUCLEAR POWER CORPORATION

VERMONT YANKEE NUCLEAR POWER STATION

DOCKET NO. 50-271

1.0 INTRODUCTION

By letter dated November 5, 1999, as supplemented December 3, 1999, the Vermont Yankee Nuclear Power Corporation (the licensee) submitted a request to amend the Vermont Yankee Nuclear Power Station (VY) Technical Specifications (TSs). The amendment would clarify the applicability of the TS governing average power range monitor (APRM) gain adjustments. During power operation the gain of the APRMs need to be adjusted periodically to accurately reflect the actual power peaking condition. For example, if there are indications of excessive power peaking the gain is increased to ensure that fuel safety limits such as the plastic strain limit are not exceeded. An indication of an excessive peaking condition is the ratio of the largest value of the fraction of limiting power in the core to the fraction of rated thermal power. If this ratio is greater than one it is indicative of an excessive power peaking condition and the APRM gain values should be increased.

2.0 EVALUATION

The licensee proposed to adopt the practices outlined in NUREG 1433, Rev 1, "Standard Technical Specifications - General Electric Plants, BWR/4," (STS). The specifications in the STS are generally considered to be acceptable provided they are applied without substantive modifications and that they are used appropriately. The licensee has directly applied the guidance in the STS and proposed modifications to the following specifications:

- (1) Use the STS statement "...during operation at \geq 25% Rated Thermal Power (RTP)..." to the specifications governing plant thermal limits;
- (2) TS 2.1.B.1;
- (3) Surveillance requirements 4.1.B, 4.11.A, 4.11.B, and 4.11.C;
- (4) LCOs 3.11.A, 3.11.B, and 3.11.C.

The licensee proposed modifications to TS Section 2.1 to apply the clarification that the TS is applicable during power operations with RTP \geq 25%. This change is acceptable because at power levels below 25% RTP significant margin exists to the thermal limits and the assumptions

of the safety analysis will continue to be met. In addition, the change is consistent with the STS. The licensee also proposed a change to section 2.1.B.1 to state that the APRM rod block function is only needed when the mode switch is in the RUN position. This change is not substantive because the absence of an applicability is an obvious oversight since the intent of the TS is for the function to be applicable when the APRM Flux Scram Trip Setting (Run Mode) is applicable; i.e. when the mode switch is in the RUN position. The proposed change is acceptable because this clarification has no impact on safety.

The licensee proposed modifications to TS LCO 3.1.B to clarify that it only applies when RTP \geq 25%. This change is acceptable because there is considerable margin to thermal limits when RTP is below 25% of RTP and the assumptions of the safety analysis will continue to be met.

The licensee proposed modifications to TS SR 4.1.B to state that the fraction of limiting power density and the fraction of rated power (used to assess excessive peaking) shall be determined "Once within 12 hours of reaching 25% RTP and once a day during operation at \geq 25% RTP thereafter." This change is more restrictive than the current TS and continues to provide adequate assurance that the APRM gain settings will be acceptable. This change is also acceptable because it ensures that within a reasonable time after reaching 25% RTP, the reactor is operating within the assumptions of the safety analysis.

The licensee proposed modifications to TS LCOs 3.11.A, 3.11.B., and 3.11.C, and SRs 4.11.A, 4.11.B, and 4.11.C as follows:

- a. They will be applicable during operation at \geq 25% RTP;
- b. They will be checked within 12 hours of reaching 25% RTP and at least once per day thereafter;
- c. A requirement to initiate action within 15 minutes to restore thermal limits within acceptable values is deleted, but the requirement that they be restored within 2 hours is retained.

Item a is simply a clarification consistent with the same change being proposed elsewhere and is acceptable because at power levels below 25% of RTP, significant margin exists to the thermal limits and the assumptions of the safety analysis will continue to be met. Item b is also the same change as was proposed for SR 4.1.B and is acceptable because the change ensures that the reactor is operating within the assumptions of the safety analysis within a reasonable time after reaching 25% of RTP. Item c reflects the fact that what is important to safety is the restoration of the thermal limits within 2 hours, not the fact that the action be taken within 15 minutes. This change is acceptable because it ensures that the reactor is restored to operating within the assumptions of the safety analysis within a reasonable time. In addition, this change is consistent with the STS.

The licensee also proposed changes to the TS Bases to reflect the TS changes. The staff does not object to the proposed Bases changes.

In summary, the staff has reviewed the TS changes proposed by the licensee and has found them to be acceptable because at power levels below 25% RTP significant margin exists to the

thermal limits, the assumptions of the safety analysis will continue to be met, and the changes ensure that the reactor is operating within the assumptions of the safety analysis within a reasonable time.

3.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Vermont State official was notified of the proposed issuance of the amendment. The State official had no comment.

4.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. The NRC staff has determined that the amendment involves no significant increase in 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 that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (64 FR 73102). Accordingly, the amendment meets 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 the amendment.

5.0 CONCLUSION

The Commission 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: A. Ulses

Date: June 21, 2000