August 13, 1999

Mr. Robert J. Wanczyk
Acting Director of Operations
Vermont Yankee Nuclear Power Corporation
185 Old Ferry Road
Brattleboro, VT 05301

SUBJECT: VERMONT YANKEE NUCLEAR POWER STATION - ISSUANCE OF AMENDMENT RE: LOW POWER SCRAM BYPASS (TAC NO. MA5970)

Dear Mr. Wanczyk:

The Commission has issued the enclosed Amendment No. 173 to Facility Operating License DPR-28 for the Vermont Yankee Nuclear Power Station, in response to your application dated June 24, 1999.

The amendment clarifies the basis for the reactor protection system bypass of the turbine stop valve closure and turbine control valve fast closure scram signals at low power. The amendment clarifies that the analytical basis for this bypass corresponds to a fraction of reactor rated thermal power and not other measures of power, for instance, turbine 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,

ORIGINAL SIGNED BY:

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. 173 to License No. DPR-28
2. Safety Evaluation

cc w/encls: See next page

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

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

VERMONT YANKEE NUCLEAR POWER CORPORATION

DOCKET NO. 50-271

VERMONT YANKEE NUCLEAR POWER STATION

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 173
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 June 24, 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. 173, 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 30 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: August 13, 1999

ATTACHMENT TO LICENSE AMENDMENT NO. 173

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 areas of change.

Remove	Insert
10	10
17	17
24	24
30	30
31	31
32	32

1.1 SAFETY LIMIT

2.1 LIMITING SAFETY SYSTEM SETTING

D. Reactor low-low water level Emergency Core Cooling System (ECCS) initiation shall be at least 82.5 inches above the top of the enriched fuel.

E. Turbine stop valve scram shall, when operating at greater than 30% of Rated Thermal Power, be less than or equal to 10% valve closure from full open.

F. Turbine control valve fast closure scram shall, when operating at greater than 30% of Rated Thermal Power, trip upon actuation of the turbine control valve fast closure relay.

G. Main steam line isolation valve closure scram shall be less than or equal to 10% valve closure from full open.

H. Main steam line low pressure initiation of main steam line isolation valve closure shall be at least 800 psig.

BASES: 2.1 (Cont'd)

metal-water reaction to less than 1%, to assure that core geometry remains intact.

The design of the ECCS components to meet the above criteria was dependent on three previously set parameters: the maximum break size, the low water level scram setpoint, and the ECCS initiation setpoint. To lower the ECCS initiation setpoint would now prevent the ECCS components from meeting their design criteria. To raise the ECCS initiation setpoint would be in a safe direction, but it would reduce the margin established to prevent actuation of the ECCS during normal operation or during normally expected transients.

E. Turbine Stop Valve Closure Scram Trip Setting

The turbine stop valve closure scram trip anticipates the pressure, neutron flux and heat flux increase that could result from rapid closure of the turbine stop valves. With a scram trip setting of <10% of valve closure from full open, the resultant increase in surface heat flux is limited such that MCPR remains above the fuel cladding integrity safety limit even during the worst case transient that assumes the turbine bypass is closed. This scram signal may be bypassed at ≤30% of reactor Rated Thermal Power.

F. Turbine Control Valve Fast Closure Scram

The control valve fast closure scram is provided to limit the rapid increase in pressure and neutron flux resulting from fast closure of the turbine control valves due to a load rejection coincident with failure of the bypass system. This transient is less severe than the turbine stop valve closure with failure of the bypass valves and therefore adequate margin exists. This scram signal may be bypassed at ≤30% of reactor Rated Thermal Power.

G. Main Steam Line Isolation Valve Closure Scram

The isolation valve closure scram anticipates the pressure and flux transients which occur during normal or inadvertent isolation valve closure. With the scram setpoint at 10% of valve closure, there is no increase in neutron flux.

H. Reactor Coolant Low Pressure Initiation of Main Steam Isolation Valve Closure

The low pressure isolation of the main steam lines at 800 psig is provided to give protection against rapid reactor depressurization and the resulting rapid cooldown of the vessel. Advantage is taken of the scram feature which occurs when the main steam line isolation valves are closed, to provide the reactor shutdown so that high power operation at low reactor pressure does not occur. Operation of the reactor at pressures lower than 800 psig requires that the reactor mode switch be in the startup position where protection of the fuel cladding integrity safety limit is provided by the IRM high neutron flux scram.

Thus, the combination of main steam line low pressure isolation and isolation valve closure scram assures the availability of neutron scram protection over the entire range of applicability of the fuel cladding integrity safety limit.

TABLE 3.1.1 NOTES (Cont'd)

9. Channel signals for the turbine control valve fast closure trip shall be derived from the same event or events which cause the control valve fast closure.

10. Turbine stop valve closure and turbine control valve fast closue scram signals may be bypassed at $\leq$30% of reactor Rated Thermal Power.

11. The IRM scram is bypassed when the APRMs are on scale and the mode switch is in the run position.

12. While performing refuel interlock checks which require the mode switch to be in Startup, the reduced APRM high flux scram need not be operable provided:

    a. The following trip functions are operable:

        1. Mode switch in shutdown,
        2. Manual scram,
        3. High flux IRM scram
        4. High flux SRM scram in noncoincidence,
        5. Scram discharge volume high water level, and;

    b. No more than two (2) control rods withdrawn. The two (2) control rods that can be withdrawn cannot be faced adjacent or diagonally adjacent.

BASES: 3.1 (Cont'd)

The Control Rod Drive Scram System is designed so that all of the water that is discharged from the reactor by the scram can be accommodated in the discharge piping. This discharge piping is divided into two sections. One section services the control rod drives on the north side of the reactor, the other serves the control rod drives of the south side. A part of the piping in each section is an instrument volume which accommodates in excess of 21 gallons of water and is at the low point in the piping. No credit was taken for this volume in the design of the discharge piping as concerns the amount of water which must be accommodated during a scram. During normal operation, the discharge volume is empty; however, should it fill with water, the water discharged to the piping from the reactor could not be accommodated, which would result in slow scram times or partial or no control rod insertion. To preclude this occurrence, level instrumentation has been provided for the instrument volume which scram the reactor when the volume of water reaches 21 gallons. As indicated above, there is sufficient volume in the piping to accommodate the scram without impairment of the scram times or amount of insertion of the control rods. This function shuts the reactor down while sufficient volume remains to accommodate the discharged water, and precludes the situation in which a scram would be required but not be able to perform its function adequately. The present design of the Scram Discharge System is in concert with the BWR Owner's Group criteria, which have previously been endorsed by the NRC in their generic "Safety Evaluation Report (SER) for Scram Discharge Systems", dated December 1, 1980.

Loss of condenser vacuum occurs when the condenser can no longer handle the heat input. Loss of condenser vacuum initiates a closure of the turbine stop valves and turbine bypass valves which eliminates the heat input to the condenser. Closure of the turbine stop and bypass valves causes a pressure transient, neutron flux rise, and an increase in surface heat flux. To prevent the clad safety limit from being exceeded if this occurs, a reactor scram occurs on turbine stop valve closure. The turbine stop valve closure scram function alone is adequate to prevent the clad safety limit from being exceeded in the event of a turbine trip transient without bypass.

Turbine stop valve (TSV) closure and turbine control valve (TCV) fast closure scram signals may be bypassed at $\leq$30% of reactor Rated Thermal Power since, at low thermal power levels, the margins to fuel thermal-hydraulic limits and reactor primary coolant boundary pressure limits are large and an immediate scram is not necessary. This bypass function is normally accomplished automatically by pressure switches sensing turbine first stage pressure. The turbine first stage pressure setpoint controlling the bypass of the scram signals on TCV fast closure and TSV closure is derived from analysis of reactor pressurization transients. Certain operational factors, such as turbine bypass valves open, can influence the relationship between turbine first stage pressure and reactor Rated Thermal Power. However, above 30% of reactor Rated Thermal Power, these scram functions must be enabled.

High radiation levels in the main steam line tunnel above that due to the normal nitrogen and oxygen radioactivity is an indication of leaking fuel. A scram is initiated whenever such radiation level exceeds three times normal background. The purpose of this scram is to reduce the source of such radiation to the extent necessary to prevent release of radioactive materials to the turbine. An alarm is initiated whenever the radiation level exceeds 1.5 times normal background to alert the operator to possible serious radioactivity spikes due to abnormal core behavior. The air ejector off-gas monitors serve to back up the main steam line monitors to

BASES: 3.1 (Cont'd)

provide further assurance against release of radioactive materials to site environs by isolating the main condenser off-gas line to the main stack.

The main steam line isolation valve closure scram is set to scram when the isolation valves are 10 percent closed from full open in 3-out-of-4 lines. This scram anticipates the pressure and flux transient, which would occur when the valves close. By scramming at this setting, the resultant transient is insignificant.

A reactor mode switch is provided which actuates or bypasses the various scram functions appropriate to the particular plant operating status.

The manual scram function is active in all modes, thus providing for manual means of rapidly inserting control rods during all modes of reactor operation.

The IRM system provides protection against short reactor periods and, in conjunction with the reduced APRM system provides protection against excessive power levels in the startup and intermediate power ranges. A source range monitor (SRM) system is also provided to supply additional neutron level information during startup and can provide scram function with selected shorting links removed during refueling. Thus, the IRM and the reduced APRM are normally required in the startup mode and may be required in the refuel mode. During some refueling activities which require the mode switch in startup; it is allowable to disconnect the LPRMs to protect them from damage during under vessel work. In lieu of the protection provided by the reduced APRM scram, both the IRM scram and the SRM scram in noncoincidence are used to provide neutron monitoring protection against excessive power levels. In the power range, the normal APRM system provides required protection. Thus, the IRM system and 15% APRM scram are not required in the run mode. The requirement that the IRMs be inserted in the core until the APRMs read at least 2/125 of full scale assures that there is proper overlap in the neutron monitoring systems.

If an unsafe failure is detected during surveillance testing, it is desirable to determine as soon as possible if other failures of a similar type have occurred and whether the particular function involved is still operable or capable of meeting the single failure criteria. To meet the requirements of Table 3.1.1, it is necessary that all instrument channels in one trip system be operable to permit testing in the other trip system.

Thus, when failures are detected in the first trip system tested, they would have to be repaired before testing of the other system could begin. In the majority of cases, repairs or replacement can be accomplished quickly. If repair or replacement cannot be completed in a reasonable time, operation could continue with one tripped system until the surveillance testing deadline.

The requirement to have all scram functions, except those listed in Table 3.1.1, operable in the "Refuel" mode is to assure that shifting to this mode during reactor operation does not diminish the need for the reactor protection system.

The ability to bypass one instrument channel when necessary to complete surveillance testing will preclude continued operation with scram functions which may be either unable to meet the single failure criteria or completely inoperable. It also eliminates the need for an unnecessary shutdown if the remaining channels and subsystems are found to be operable.

BASES: 3.1 (Cont'd)

The conditions under which the bypass is permitted require an immediate determination that the particular function is operable. However, during the time a bypass is applied, the function will not meet the single failure criteria; therefore, it is prudent to limit the time the bypass is in effect by requiring that surveillance testing proceed on a continuous basis and that the bypass be removed as soon as testing is completed.

Sluggish indicator response during the perturbation test will be indicative of a plugged instrument line or closed instrument valves. Testing immediately after functional testing will assure the operability of the instrument lines. This test assures the operability of the reactor pressure sensors as well as the reactor level sensors since both parameters are monitored through the same instrument lines.

The independence of the safety system circuitry is determined by operation of the scram test switch. Operation of this switch during the refueling outage and following maintenance on these circuits will assure their continued independence.

The calibration frequency, using the TIP system, specified for the LPRMs will provide assurance that the LPRM input to the APRM system will be corrected on a timely basis for LPRM detector depletion characteristics.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 173 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 June 24, 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 proposed amendment clarifies the basis for the reactor protection system bypass of the turbine stop valve (TSV) closure and turbine control valve (TCV) fast closure scram signals at low power. The amendment clarifies that the analytical basis for this bypass corresponds to a fraction of reactor rated thermal power (RTP) and not other measures of power, for instance, turbine power.

2.0 EVALUATION

A reactor scram is initiated at the start of TSV closure and TCV fast closure in anticipation of the reactor pressure and power transients that could result from the valves' closure when operating at power. For these events the reactor scram provides protection of the fuel and (in combination with the safety and relief valves) pressure vessel.

At low-power levels the pressure rise associated with the TSV and TCV closure events is not as rapid or as large as at higher power levels. The TCV fast closure or TSV closure scrams are unnecessary at low-power levels because the margins to fuel thermal limits and reactor coolant pressure boundary limits are large at low-power levels. Therefore, these scrams are automatically bypassed at low-power. The licensee stated that this automatic bypass is a design basis assumption in the transient analyses for VY. The diverse high neutron flux or high vessel pressure scrams are adequate to terminate the transients at low-power levels. The scram bypass power level is currently limited by the transient analysis to operation at or below 32.2 percent RTP. This is the reactor power level at which sufficient fuel thermal margin is available to allow bypass of the TSV and TCV based trips, and place reliance on the neutron flux or high pressure scrams to terminate over-pressure events.

The licensee stated that the TCV fast closure and TSV closure scram bypass are controlled by four pressure switches which sense turbine first-stage pressure. These switches have a setpoint, which is slightly lower than the analytical limit, that automatically removes the scram bypass when the turbine first stage pressure exceeds a preset value corresponding to 30 percent of reactor RTP. The lower operational limit provides additional conservatism by maintaining the TSP and TCV trips functional to a lower power than required by the analysis.

The licensee stated that a non-conservative first-stage pressure setpoint had been established at another facility because personnel responsible for defining the instrument setpoint were incorrectly led to believe that the basis for the setpoint was 30 percent of rated turbine power instead of 30 percent of rated RTP. To avoid confusion and the potential for erroneous setpoints with consequent non-conservative operation concerning this scram bypass signal, the licensee proposed the following changes to the TSs.

The licensee proposed changing TS 2.1, Limiting Safety System Setting, paragraphs E and F to indicate that the TSV scram and TCV fast closure scram are applicable "when operating at greater than 30 percent of rated thermal power".

The licensee also proposed changing Table 3.1.1, Reactor Protection System (Scram) Instrument Requirements, Note 10 to read "Turbine stop valve closure and turbine control valve fast closure scram signals may be bypassed at $\leq$ 30% of reactor Rated Thermal Power." Previously this note stated that the scrams could be bypassed "when the first stage turbine pressure is less than 30% of normal (220 psia)."

The proposed amendment also changes the Bases sections of these TSs to reflect these clarifications.

The staff finds the proposed changes to be acceptable since they will clarify that the subject scrams can be bypassed at less than 30 percent of reactor rated thermal power consistent with the design basis assumptions for VY and will prevent confusion with other measures of power, for instance, turbine power. The staff has no objection to the proposed Bases changes associated with this amendment request.

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 comments.

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. 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 38038). 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: R. Croteau

Date: August 13, 1999