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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

SUPPORTING AMENDMENT NO. 11 TO FACILITY OPERATING

LICENSE NO. DPR-22

NORTHERN STATES POWER COMPANY

MONTICELLO NUCLEAR GENERATING PLANT

DOCKET NO. 50-263

I. INTRODUCTION

By letters dated July 12, 1982 and September 17, 1982 (References 1 and 2), the Northern States Power Company (the licensee) proposed changes to the Technical Specifications and to the body of the license of Facility Operating License No. DPR-22 for the Monticello Nuclear Generating Plant. By letters dated September 7 and 23, 1982 (References 3 and 4), the licensee submitted additional information to support the proposed changes.

These proposed changes involve:

(1) Revised operating limits as a result of the long-term modifications to the Scram Discharge Volume (SDV);

(2) Removal of license conditions for the air dump header imposed by the Commission's Order of January 9, 1981; and

(3) Clarification as to when the control rod accumulators must be operable.

II DISCUSSION

The first change proposed by the licensee reflects the modifications to the SDV system to improve hydraulic coupling and provide diverse instrumentation. These modifications will be undertaken (during the refueling outage for Cycle 10 operation) to comply with the design and performance criteria described in the staff's December 1, 1980 Generic Safety Evaluation Report (Generic SER), "BWR Scram Discharge System" (Reference 5). Change (2), above, removes the license conditions because the improved hydraulic coupling achieved by the modifications noted in change (1) above, will replace the requirement for the air dump header to provide the reactor protection system with a scram function. Change (3), above, clarifies the requirements when the control rod accumulators must be operable.

After analyzing events at several operating reactors that involved the SDV system, the staff recommended that SDV systems in all BWRs be modified to assure long-term reliability. To achieve these objectives, an NRC task force and a subgroup of the BWR Owners Group convened to develop revised SDV system design and safety criteria to be used in establishing acceptable SDV system modifications. Short-term and long-term actions were recommended by the staff in the Generic SER. The staff evaluated the licensee's actions under the short-term phase of the program in a May 20, 1982 license amendment. The May 20, 1982 amendment revised the Technical Specifications by adding surveillance requirements for the vent and drain valves and level switches in the instrument volume. The staff also issued an Order which implemented license conditions for an automatic scram function from degraded air supply conditions as an interim measure until the long-term modifications for improved hydraulic coupling were implemented.

The long-term program identifies improvements in three major areas: SDV - Instrument Volume (IV) hydraulic coupling, diverse level instrumentation, and system isolation. The Generic SER states the various criteria, the technical bases, and an acceptable means of compliance. This Safety Evaluation, summarizes the staff's review of the actions taken by the licensee under the long-term program.

III. EVALUATION

A. Change (1) - SDV Modifications

We have reviewed the licensee's submittals to determine compliance with the design, safety, functional and operational criteria of the Generic SER by evaluating them against the stated acceptance criteria in the Generic SER. Our evaluation of the licensee's long-term modifications to improve the SDV reliability at Monticello is discussed below. For reference, the numbering system used to evaluate each criterion parallels that of the Generic SER.

4.2.1 Functional Criteria

4.2.1.1 Functional Criterion 1

The scram discharge volume shall have sufficient capacity to receive and contain water exhausted by a full reactor scram without adversely affecting control rod drive scram performance.

Licensee Response

The scram discharge system is comprised of two instrument volumes and their associated piping. The two systems, designated east side and west side, serve 60 control rod drives and 61 control rod drives, respectively. Assuming 3.34 gallons per drive, the systems have the capability of receiving a full reactor scram. The systems provide a scram volume margin of 96.75 gallons for the east side and 141.46 gallons for the west side. Volume available in instrument, vent, or drain lines is not utilized in these calculations. See Table 1.

Staff Evaluation

An acceptable means of meeting this criterion is to provide a minimum scram discharge volume of 3.34 gallons per drive in accordance with the General Electric letter OER 54, dated March 14, 1972, which we previously found acceptable.

We have reviewed the licensee's response against the requirements of the acceptance criterion and have determined that the licensee has used the sizing criterion of 3.34 gallons per drive.

TABLE 1

Volume available in the scram discharge volume

	East volume	West volume
Volume in existing 4" and 6" diameter headers	96.5	97.06 gal
Volume in 12" diameter header leading to the SDIV	144.0 gal	207.04 gal
Volume in SDIV above worst case scram setpoint (57 gal)	56.65 gal	41.1 gal
Volume in SDIV below wors case scram setpoint	57 gal	57 gal
Total volume	354.15 gal	402.2 gal
Total volume above worst case scram setpoint	279.15 gal	345.2 gal

Required Scram Volume

	East volume	West volume
	200.4 gal	203.74 gal

Based on the data presented in Table 1, we conclude that the SDV high water level scram setpoint of 56 gallons has been conservatively selected and provides sufficient margin under worst case conditions. Therefore, the design modifications meet the requirements and are, acceptable.

Based on the above discussion, the proposed changes to the Technical Specification on (p. 28) Table 3.1.1 (and associated T/S on pages 30 and 36) which set the scram setpoint at 56 gallons is found acceptable.

4.2.2 Safety Criteria

4.2.2.1 Safety Criterion 1

No single active failure of a component or service function shall prevent a reactor scram, under the most degraded conditions that are operationally acceptable.

Licensee Response

Redundant components in the scram discharge system assure that failure of a single valve, instrument, or other component will not prevent a reactor scram. No single intentional bypass, maintenance or calibration operation, or test to verify operational availability of the scram volume instrumentation will disable the scram discharge system. Partial loss of service functions (e.g., degraded control air pressure) will not adversely affect system function. Design Criterion 1 analyzes this case.

Staff Evaluation

An acceptable means of complying with this criterion is to design the system such that partial losses of service function (e.g., degraded control air pressure) as well as full losses do not adversely affect system functions.

Under Design Criterion 1, the licensee states that in the event of vent valve failure, the system would drain to the SDV/IV as a result of hydraulic coupling. With the drain disabled, inleakage will initiate the SDV high level scram at the 56 gallon setpoint. The scram discharge headers have been sized so the system automatically scrams, without the need for vents or drains, with a maximum simultaneous inleakage of 5 gpm per drive while sufficient volume remains to accommodate a scram.

Under Design Criterion 4, the licensee states that each instrumented volume has two sets of instrument taps, providing two parallel circuits. Scram level instruments in both hydraulic circuits assure that failure of a single instrument will not prevent scram initiation.

After evaluating the licensee's modifications against this criterion and Design Criteria 1 and 4, we have determined that the licensee's design meets the requirements and is therefore, acceptable.

4.2.2.2 Safety Criterion 2

No single active failure shall prevent uncontrolled loss of reactor coolant.

Licensee Response

Two isolation valves in series are provided in all SDV vent and IV drain lines. To make these valves sufficiently independent, the four inboard valves are supplied air by one set of solenoids and the outboard valves by another set of solenoids. Hence, a single solenoid failure would not allow an uncontrolled loss of reactor coolant.

Staff Evaluation

An acceptable way of meeting this criterion is to provide two isolation valves in series in all SDV vent and IV drain lines which are sufficiently independent to avoid failure due to solenoid failures. This resolution will also correct the potential for excessive hydrodynamic force generation.

We have evaluated the licensee's modifications against this criterion and have concluded that the licensee has designed the system in accordance with the criterion and is therefore, acceptable.

4.2.2.3 Safety Criterion 3

The scram discharge system instrumentation shall be designed to provide redundancy, to operate reliably under all conditions, and shall not be adversely affected by hydrodynamic forces or flow characteristics.

Licensee Response

With regard to single random failures, redundancy in the automatic scram level instrumentation has been provided for each instrument volume in accordance with Safety Criterion 1.

With respect to common-cause failures, diversity of level-sensing instrumentation has been provided. Both float type and thermally-actuated instruments have been employed in the design. For these types of instruments, common-cause failures, such as those identified by operating history and those identified in the Foreword to IEEE 379-1977 have been considered, in that the thermally-actuated switches are not susceptible to the type of common-cause failures previously experienced (crushed floats due to hydrodynamic forces). Furthermore, the instruments are designed, qualified, and installed to be immune from external environmental effects such as earthquakes; are subjected to separate design and manufacturing quality assurance programs from each supplier and are tested and maintained by qualified personnel using approved procedures subject to a quality assurance program.

Staff Evaluation

An acceptable means of complying with this criterion and addressing the additional staff concerns on common-cause failure of instrumentation is as follows:

(1) With respect to single failures (random) provide sufficient redundancy in the automatic scram level instrumentation to meet the single failure criterion on each instrumented portion of the SDV; and

(2) With respect to common-cause failures;

   a. provide additional (or substitute) level-sensing instrumentation for the automatic scram function to include diversity as well as redundancy. The diversity should, as a minimum, be achieved by level sensors that employ different operating principles for measuring the water level, and

   b. for the instrumentation selected, demonstrate how common-cause failures; such as those identified by operating history and those identified in the Foreword to IEEE 379-1977 will be considered.

We have evaluated the licensee's response to this safety criterion and find that sufficient redundancy has been provided to meet the single failure criterion. As stated in the response to Criterion 1, redundant components in the scram discharge system assure that failure of a single valve, instrument, or other component will not prevent a reactor scram. The response to Design Criterion 4 states that each instrumented volume will be equipped with two sets of instrument taps. As shown in Figure 1, (see Design Criterion 5) a set of float-type and a set of thermally-activated level instruments will be installed, thereby providing both redundancy and diversity. Therefore, we also find that sufficient redundancy has been achieved through the use of float-type and thermally-activated water level instruments.

With respect to common-cause failures, the licensee has provided for diversity by using thermally-activated and float-type instrumentation. The thermally-activated switches are not susceptible to the hydrodynamic forces experienced with crushed floats. Therefore, we find that sufficient diversity has been accounted for through the use of float and thermally-activated level sensing instruments; each type using different principles of sensing the water level.

For these types of instruments, the licensee has considered common-cause failures as identified by previous operating history and by the Foreword to IEEE 379-1977. Operating history has shown that floats could be crushed because of hydrodynamic forces. As discussed above, the licensee has installed diverse instrumentation to account for this problem.

To protect the instrument from common-cause failures resulting from the external environmental effects, the Foreword to IEEE 379-1977 suggests that system components be designed, qualified and installed to be immune from earthquakes and floods, design and manufacturing errors, and operator and maintenance errors. The licensee has stated that environmentally qualified equipment will be installed and will be subjected to separate design and manufacturing quality assurance programs from each supplier. Since the licensee will be installing safety-related equipment, Appendix B of 10 CFR Part 50, Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants, requires, in part, that licensees assure that manufacturers who provide equipment for use in safety-related applications have design and manufacturing quality assurance programs consistent with Appendix B requirements. Therefore, the use of safety-related equipment in the SDV modifications and qualified maintenance personnel who use approved procedures subject to a quality assurance program, all meet the intent of the IEEE Foreword and are therefore acceptable.

We have reviewed the licensee's proposed changes to the Technical Specification on Table 4.1.2 (p. 34) and find it acceptable because it incorporates into the surveillance testing both the float and thermally-activated instruments.

4.2.2.4 Safety Criterion 4

System operating conditions which are required for scram shall be continuously monitored.

Licensee Response

Diverse and redundant instrumentation will be installed on each instrument volume to continuously monitor system operating conditions.

Staff Evaluation

An acceptable means of complying with this criterion is provided under Safety Criterion 3. Since diverse and redundant instrumentation will be installed, and the licensee's response was found acceptable for Safety Criterion 3, we therefore find this item acceptable.

4.2.2.5 Safety Criterion 5

Repair, replacement, adjustment, or surveillance of any system component shall not require the scram function be bypassed.

Licensee Response

Isolation valves for each scram level switch make it possible to isolate any single instrument for repair, replacement, adjustment, or surveillance without disabling the scram function. The alarm and rod block level instruments can also be isolated without disabling the scram function. For instrument repair or replacement, the appropriate trip systems will be placed in the trip condition per Technical Specification 3.1.B.1. Bypassing of a channel per Table 3.1.1 note "f" is allowed for surveillance testing. The bypassing of a channel per Table 3.1.1 note "f" does not defeat the scram function or bypass the scram function.

Staff Evaluation

An acceptable way of complying with this criterion is for instrument (or instrument channel) repair or replacement to implement a half-scram (1 out of 2) in accordance with existing Technical Specifications.

We have evaluated the licensee modifications against this criterion and the Technical Specifications (T/S 3.1.B.1) and have determined that the system has been designed in accordance with the criterion and is therefore acceptable.

4.2.3 Operational Criteria

4.2.3.1 Operational Criterion 1

Level instrumentation shall be designed to be maintained, tested, or calibrated during plant operation without causing a scram.

Licensee Response

The 1-out-of-2-twice instrumentation scram logic and the individual level switch isolation capability permits maintenance, testing, and calibration of the level instrumentation without causing a scram.

Staff Evaluation

The technical basis on page 42 of the Generic SER states that these criteria are based upon operational convenience and are not directly related to safety given that both the hydraulic coupling between the SDV and IV is sufficient to quickly detect an accumulation of water in the volume and the instrumentation available to detect the water is extremely reliable. For example, operational criteria 1 and 2 are meant to prevent inadvertent scrams resulting from maintenance and test operations and to assure that the operator has enough information available to permit him to take corrective action prior to conditions which would cause an inadvertent scram. Similarly, operational criterion 4 would facilitate placing the plant back in operation after a scram. Yet, these criteria are indirectly related to safety in that they prevent unnecessary challenges to the safety systems and so should be followed.

We have reviewed the licensee's response that the level instrumentation has been designed to allow maintenance, testing, or calibration during plant operation without causing a scram and conclude that the requirements for this criterion have been met.

4.2.3.2 Operational Criterion 2

The system shall include sufficient supervisory instrumentation and alarms to permit surveillance of system operation.

Licensee Response

Each SDIV will be instrumented to initiate alarms to warn the operator of water accumulation in the instrument volume and of a control rod block prior to scram initiation.

Staff Evaluation

We have reviewed the licensee's response and find that it meets the criterion and therefore, is acceptable.

4.2.3.3 Operational Criterion 3

The system shall be designed to minimize the exposure of operating personnel to radiation.

Licensee Response

The system is designed to provide an unobstructed flow path from the CRDs to the SDIVs. The piping slopes toward the drain and increases in diameter at each transition as it approaches the instrument volume. No pockets exist to trap and hold contaminants. New materials are stainless steel. All of these factors reduce the probability of radioactive materials remaining in the discharge piping to create a source of radiation exposure.

Headers and large diameter piping in the system are fitted with blind flanges to facilitate use of a hydrolaser for cleaning.

All level instruments are flange-mounted to allow expeditious removal for repair, replacement, or decontamination.

All instrument piping contains test connections with appropriate valves to expedite test and calibration.

Staff Evaluation

We have reviewed the licensee's response and find it is acceptable because the system has been designed to minimize radiation exposure.

4.2.3.4 Operational Criterion 4

Vent paths shall be provided to assure adequate drainage in preparation for scram reset.

Licensee Response

As discussed in Operational Criterion 3, the hydraulic coupling between the drives and the SDIV is sufficient to assure adequate drainage to the SDIV without benefit of the vent system. Further, venting capability is provided by redundant series high point vent valves following scram reset.

Staff Evaluation

We have reviewed the licensee's response and find that adequate drainage has been provided because of improved hydraulic coupling and venting capability.

4.2.3.5 Operational Criterion 5

Vent and drain functions shall not be adversely affected by other system interfaces. The objective of this requirement is to preclude water backup in the scram instrument volume which could cause spurious scram.

Licensee Response

Each SDIV has an independent drain line, connected directly to a closed radwaste system drain tank. The drain lines are continuously sloped to the draintank with no loop seals in the line. The interface at the drain tank is above normal water level, assuring undisturbed flow into the tank. The drain tank is vented to atmosphere.

Staff Evaluation

We have reviewed the licensee's response and find that the system design precludes water backup and therefore avoids spurious scrams.

4.2.4 Design Criteria

4.2.4.1 Design Criterion 1

The scram discharge headers shall be sized in accordance with GE OER-54 and shall be hydraulically coupled to the instrumented volume(s) in a manner to permit operability of the scram level instrumentation prior to loss of system function. Each system shall be analyzed based on a plant-specific maximum inleakage to ensure that the system function is not lost prior to initiation of automatic scram. Maximum inleakage is the maximum flow rate through the scram discharge line without control rod motion summed over all control rods. The analysis should show no need for vents or drains.

Licensee Response

The design of the scram discharge headers incorporates the recommendation proposed by GE OER-54 of March 14, 1972. The scram discharge headers are hydraulically coupled to their respective SDIVs with downward sloping piping. The scram discharge headers (4-inch and 6-inch diameter) are connected to large diameter (12-inch) piping that is coupled to the 24-inch diameter vertical pipe which forms the instrument volumes, providing 297.15 gallon and 345.2 gallon capacity (not including volume below Technical Specification scram setting) for east and west side scram discharge fluids. Required minimum volumes per scram are 200.4 gallons and 203.74 gallons, respectively (see Table 1). As described in response to functional criterion 1, the system provides sufficient capacity to receive the exhaust from a full scram after the automatic scram function is initiated.

In the event of vent valve failure, the system would drain to the SDIV as a result of the hydraulic coupling described above. With the drain disabled, inleakage will initiate the SDIV high level alarm at an accumulation of 21.8 gallons. A rod block with associated alarm, will be initiated below 40 gallons prior to reactor scram below 57 gallons.

The scram discharge headers have been sized so that the system automatically scrams, without need for vents or drains, with a maximum simultaneous inleakage of 5 gpm per drive. An analysis has been performed to verify that sufficient volume remains to accommodate a scram when level in the SDIV reaches the scram setpoint.

Staff Evaluation

One method acceptable to the staff in meeting the criterion is to provide an IV for each SDV which is an integral part of the SDV (i.e., connecting directly to SDV with piping of a diameter equal to or greater than the diameter of the SDV headers). General Electric recommendation for the use of independent IVs that are attached directly to the low point of the SDV piping and are essentially a vertical extension of the SDV satisfies this criterion. In discussions with GE, the NRC staff has concluded that a maximum flow rate past the scram outlet valve without rod motion is 5 gpm per rod and this value should be used in the analysis to assure system function, or justification should be provided for using a different value. Any value that is used must be verified to be conservative by assured CRD seal maintenance requirements based on stall flow tests. The only driving force for the fluid in this analysis should be that provided by the gravity drainage that has been verified from as-built drawings. Further, the analysis must be performed according to the criteria, with no reliance on header venting. Given these assumptions are used by the licensee we would find the analysis to be acceptable.

We have evaluated the licensee's response and have determined that the licensee, has provided an IV which is an integral part of the SDV for each of the two SDVs. The licensee has also designed the system in accordance with the GE recommendations and has performed the supporting analyses. We therefore find the licensee's response meets this design criterion and is acceptable.

We have reviewed the licensee's proposed changes to Table 3.2.3 (p. 57) to set the rod block setpoint to 40 gallons and we conclude that this setpoint is acceptable. Leakage beyond this point will automatically result in a reactor scram.

4.2.4.2 Design Criterion 2

Level instrumentation shall be provided for automatic scram initiation while sufficient volume exists in the scram discharge volume.

Licensee Response

As discussed in Design Criteria 1 and previous responses, the piping volumes are sufficient to contain the water released from a full scram based on Functional Criteria 1. Each discharge volume is equipped with two thermally actuated and two float type level switches for scram initiation.

Staff Evaluation

Acceptable compliance with Design Criterion 1 is an acceptable means of complying with this design criterion. The licensee will provide redundant and diverse instrumentation. Having found the licensee response to Design Criterion 1 acceptable, we find that this item is also acceptable.

4.2.4.3 Design Criterion 3

Instrumentation taps shall be provided on the vertical instrument volume and not on the connected piping.

Licensee Response

The SDIV level instrument piping is connected to the vertical large diameter piping (24" diameter) which functions as the Instrument Volume (IV) and are independent of the drain and vent lines.

This design protects the instruments from hydrodynamic forces produced during scram or reset. The level switches will be functionally tested using water after the operational test scram to be performed at rated temperature and pressure following installation of this modification to ensure no problem exists in the new piping arrangements. The level switches will not be functionally tested after subsequent scrams. There will be diversity in the measurement of the level in the new instrument volumes (see Attachment B). Only two of the level switches (float type) could be affected by hydraulic shocks. The other two switches (thermally actuated) send a signal to each trip system, which is sufficient to initiate a scram. Therefore, it is not necessary to functionally test the level switches after every scram. If in the unlikely event that the float type switches were made inoperable, in such a way that the operator would not be aware of the problem, this would be discovered in the next monthly functional test (during this time the thermally activated switches would be available to initiate reactor scram on high level in the SDIV if necessary). It should also be noted that the alarm and rod block level switches are the thermally actuated type and those are also not susceptible to hydraulic shock damage.

Attachment B:

The Scram Discharge Volume modification will provide diverse instrumentation. Each SDIV has four level sensing instruments that provide inputs to the scram circuitry. In the past, all four instruments were float type, i.e., passive type devices. The new SDIVs will have two float type and two thermally activated instruments.

The thermally activated instruments are not sensitive to instrument drift in the same way that other instruments in Table 4.1.2 listed as belonging to group "E" are affected. However, the thermally activated instruments do not precisely fall into the category of passive type devices either. Therefore, we propose listing a "D" and an "E" for the scram discharge instrumentation under "group" in Table 4.1.2

The calibration and testing method will be the same for both types of instruments. Due to the low drift associated with this type of device and the lack of sensitivity to drift, the 3 month minimum frequency of calibration and the monthly frequency for functional tests is more than adequate.

Staff Evaluation

The acceptable compliance section states that this criterion must be satisfied in order for the modification to be acceptable. Functional tests of the level switches using water after each scram must be continued since there remains concern for residual common-cause failures. An acceptable alternative is specified in the model Technical Specifications surveillance guidelines which allow monthly functional testing when scram level instrumentation is used which employs an operating principle other than float type level sensors. As stated in Attachment B of the licensee's September 7 and 23, 1982 submittals, diverse instrumentation will be installed whereby each SDIV will have two float type and two thermally-actuated instruments. Current Technical Specifications (T/S Table 4.1.1 and Table 4.1.2) require functional testing on a monthly basis and calibration on a three-month basis. Because of the new diverse instrumentation to be installed, the licensee has elected to perform functional testing on a monthly basis rather than after each scram.

We have reviewed the licensee's response against this criterion and have determined that the instrumentation taps have been provided on the vertical IV (and not on the connected piping) in accordance with the Generic SER criteria. We, therefore, conclude that the licensee's modifications meet the criteria and are acceptable. Based on having installed the design modification in accordance with the Generic SER criteria, we find the licensee's proposed surveillance frequency to be in accordance with our guidelines and is acceptable.

4.2.4.4 Design Criterion 4

The scram instrumentation shall be capable of detecting water accumulation in the instrumented volume(s) assuming a single active failure in the instrumentation system or the plugging of an instrument line.

Licensee Response

Each instrumented volume has two sets of instrument taps, providing two parallel hydraulic circuits. Scram level instruments in both hydraulic circuits assure that failure of a single instrument, or plugging of one instrument line will not prevent scram initiation. (See Figure 1.)

Staff Evaluation

An acceptable means of meeting this criterion is to satisfy the requirments under Safety Criterion 3 and to install the instrumentation in such a manner that no credible active or passive failure can significantly impact the ability of the instrumentation to monitor the SDV for the presence or accumulation of water.

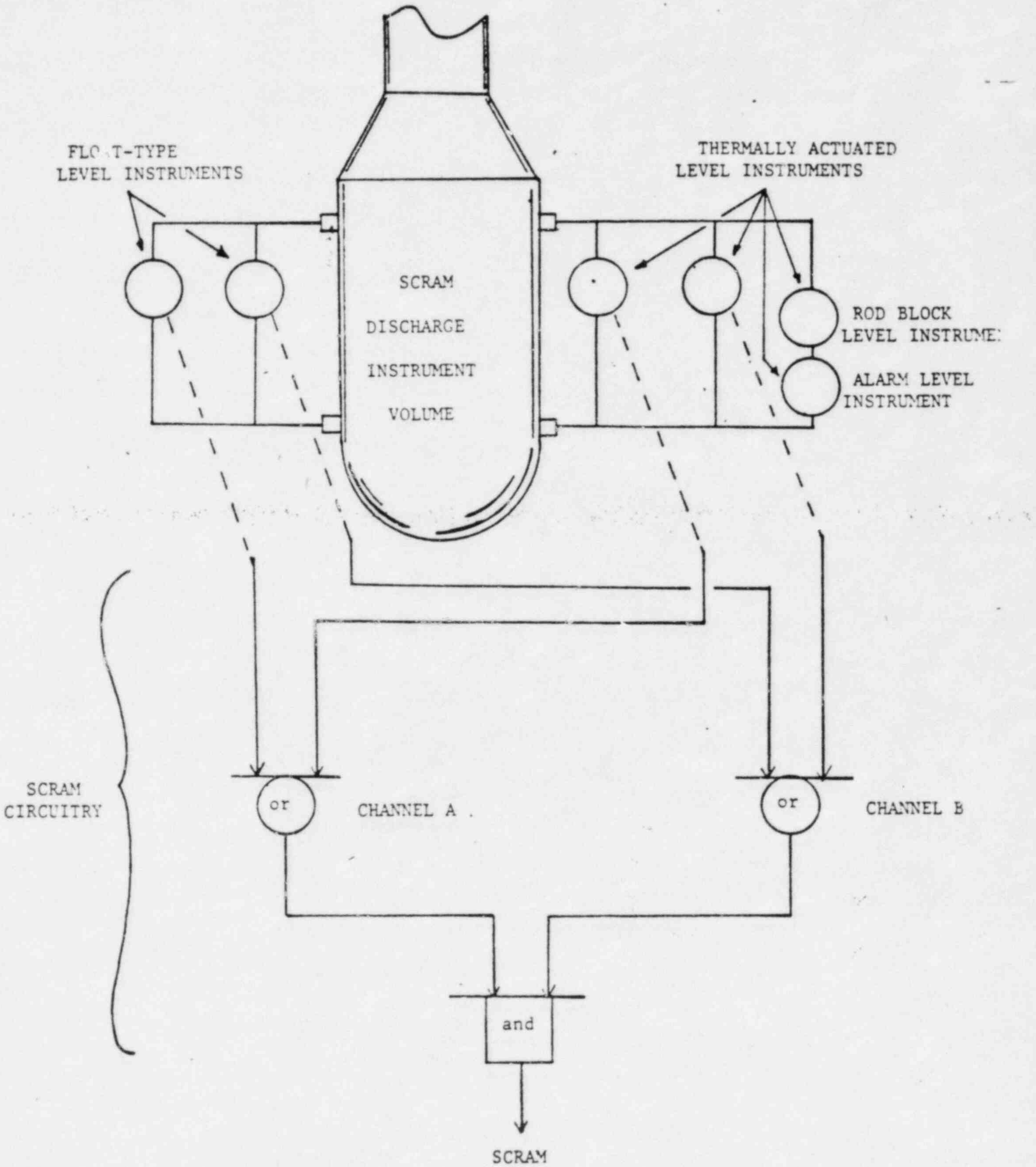
The licensee has satisfied the requirements of Safety Criterion 3. Scram level instruments will be installed such that no credible active or passive failure can significantly affect its ability to detect water. Since each instrument volume has two sets of instrument taps, parallel hydraulic circuits exist and therefore plugging of one line or failure of a single instrument will not prevent scram initiation. Therefore, we conclude that the licensee meets the requirements of this criterion.

4.2.4.5 Design Criterion 5

Structural and component design shall consider loads and conditions, including those due to fluid dynamics, thermal expansion, internal pressure, seismic considerations, and adverse environments.

FIGURE 1

SCRAM DISCHARGE VOLUME INSTRUMENTATION (TYPICAL OF EAST AND WEST INSTRUMENT VOLUMES)



Licensee Response

The conditions considered in the design of structure and components include steady-state operating conditions in the design power range, and the transient conditions that occur in the course of system startup, shutdown, and testing.

Per ASME Code Section XI modifications shall meet the requirements of the edition of the construction code to which the plant was constructed. The plant was built to ANSI B 31.1 1967 edition. The code used for this modification is ANSI B 31.1 1977 edition. The equation in ANSI B 31.1 1977 edition used to calculate the primary stresses for occasional loads is identical to ASME Code, 1974, edition, Winter 1976 addenda, Section III, Paragraph NC 3652.2 equation 9. The load combinations analyzed are identified in Table 2. These combinations were selected using the applicable codes and good engineering judgment. These combinations were analyzed and evaluated to ensure they were less than the limiting stresses (see Table 2).

Staff Evaluation

The licensee has included in his calculations the design criteria noted in Design Criterion 5 above. The licensee has calculated the stresses by superimposing combinations of loads, as noted in Table 2, to get the limiting worst-case conditions per node. The methodology from ANSI B 31.1, 1977 edition was used to calculate these stresses. The total stress levels were all below the stress limits of Table 2. We have reviewed the licensee's response and find that the structural and component design has considered the loads and conditions required by the criterion and therefore, is acceptable.

TABLE 2

Scram discharge volume piping load combinations

Loading Combination	Service limits	Stress limits
PO + DW	Sustained	(B32.1-1977 $1.0S_h$)
PO + DW + OBE	Occasional	$1.2S_h$
PO + DW + FV	Occasional	$1.2S_h$
PO + DW + SSE	Faulted (FSAR)	$2.4S_h$ (FSAR)

NOTE: In addition to the primary stress, thermal expansion and OBE anchor movement stresses are considered in accordance with Code B31.1-1977.

Thermal Expansion (104.8.3A) *EQN. 13	TH + SAM	S_A
Thermal Expansion (104.8.3B) *EQN. 14	PD + DW + TH + SAM	$S_A + S_h$

*Either EQN. 13 or EQN. 14 must be met B31.1-1977

Pipe supports

Service limits	Loading combinations	Stress limits
Sustained	TH + DW	B31.1 - 1977
Occasional	DW + FV + TH DW + OBE + TH + SAM	B31.1 - 1977
Occasional	DW + SSE + TH	B31.1 - 1977

Where:

- PD - Design Pressure
- PO - Operating pressure
- DW - Piping dead weight
- OBE - Operational Basis Earthquake
- SSE - Safe Shutdown Earthquake
- FV - Fast Valve Closure
- TH - Loads due to thermal expansion of pipe
- SAM - Seismic Anchor Movement

4.2.4.6 Design Criterion 6

The power-operated vent and drain valves shall close under loss of air and/or electric power. Valve position indication shall be provided in the control room.

Licensee Response

The air-operated vent valves and drain valves will close in the event of loss of air supply or electrical power. Valve positions will be indicated in the control room.

Staff Evaluation

We have evaluated the licensee's response and conclude that the requirements of this criterion have been satisfied.

4.2.4.7 Design Criterion 7

Any reductions in the system piping flow path shall be analyzed to assure system reliability and operability under all modes of operation.

Licensee Response

There will be no diameter reduction in the scram discharge system piping. The system piping increases in diameter from the 3/4-inch drainage lines to the 24-inch instrument volumes, and slopes toward the drain to assure adequate draining during plant operation. Plugging of a single instrument, vent or drain line is considered a single failure and will not prevent scram initiation. All other SDV piping is greater than 2 inches.

Staff Evaluation

This criterion requires the analysis of piping systems when a reduction in the available flow area is caused through a reduction in piping diameter in the

SDV and SDV to SDV-IV piping. For lines less than two-inch inner diameter, the NRC staff has traditionally required that hydraulic line plugging be assumed as a single failure. Therefore, acceptable system function must be demonstrated, given this potential single failure.

The licensee has addressed the issue by stating that there will be no reduction in the scram discharge system piping. Plugging of a single instrument, vent or drain line is considered a single failure (which is addressed in the response to Safety Criterion 1) and will not prevent scram initiation.

We have reviewed the licensee's response to this criterion and conclude that the requirements have been met.

4.2.4.8 Design Criterion 8

System piping geometry (i.e., pitch, line size, orientation) shall be such that the system drains continuously during normal plant operation.

Licensee Response

Refer to Response to Design Criteria 1 and 7 and Operational Criterion 5.

Staff Evaluation

This criterion addresses the need to provide a flow path which permits the continuous draining of coolant that results from normal rod leakage past the individual scram outlet valves. It requires a positive downward slope of the SDV and associated drain piping, as well as piping that is free of loop seals and adequate in size, to prevent buildup of water in the SDV. This criterion must be satisfied to ensure the assumptions used in the analyses for system function under Design Criterion 1.

In his response, the licensee references the response to Design Criteria 1, 7 and Operational Criterion 5. Under those responses, the licensee respectively states that "The scram discharge headers are hydraulically coupled to their respective SDIVs with downward sloping piping; the system piping... slopes toward the drain to assure adequate draining during plant operation; and the drain lines are continuously sloped to the drain tank."

We have reviewed the licensee's response and find that the system has been designed such that it continuously drains during normal plant operation. Since the requirements to this criterion have been satisfied, the assumptions to the system function analysis used in Design Criterion 1 have been ensured. We, therefore, find the licensee's response to this criterion acceptable.

4.2.4.9 Design Criterion 9

Instrumentation shall be provided to aid the operator in the detection of water accumulation in the instrumented volume(s) prior to scram initiation.

Licensee Response

Each SDIV will have a water level alarm and rod block instrumentation which initiate below the scram level setpoint. Hydraulic coupling is addressed in response to Design Criteria 1 and 7.

Staff Evaluation

The present alarm and rod block instrumentation meets this criterion given adequate hydraulic coupling with the SDV headers.

The licensee will install a water level alarm and a rod block instrument. The water level alarm notifies the reactor operator when water is present in the instrument volume. The rod block instrumentation notifies the reactor operator that the water level is continuing to rise and prevents further control rod withdrawal. The licensee has proposed changes to the Technical Specification that will reflect the revised rod block setpoints of the instrumentation as a result of the modification for improved hydraulic coupling. The licensee has addressed hydraulic coupling in the response to Design Criteria 1 and 7. Since we have found the response to Design Criteria 1 and 7 acceptable, and present alarm and rod block instrumentation is adequate, we find that the licensee's response to this criterion is acceptable.

4.2.4.10 Design Criterion 10

Vent and drain line valves shall be provided to contain the scram discharge water, with a single active failure and to minimize operational exposure.

Licensee Response

As indicated in the response to Safety Criterion 2, the drain and vent lines contained two air-operated, fail closed valves in series. A check valve is also provided in each vent line to minimize the spread of contamination upon scram reset.

Staff Evaluation

An acceptable way of meeting this criterion is to provide two isolation valves in series for all SDV vent and IV drain lines.

The licensee stated that the drain and vent lines contain two air-operated valves in series and discusses them further in the response to Safety Criterion 2.

We have reviewed the licensee's response noted above and the response to Safety Criterion 2 and conclude that the requirements to this criterion have been met.

4.2.5 Surveillance Criteria

4.2.5.1 Surveillance Criterion 1

Vent and drain valves shall be periodically tested.

Licensee Response

The drain and vent valves will be periodically tested per the Monticello Code Section XI Inservice Inspection and Testing Program.

Staff Evaluation

An acceptable way for meeting this criterion is that this testing should show valve closure in less than thirty seconds (current GE specifications). Additional conditions will be required in the Technical Specification.

As stated in the Discussion section, the staff evaluated the licensee's short-term program and issued the May 20, 1982 amendment which incorporated into the Technical Specifications surveillance requirements for the vent and drain valves and level switches in the instrument volume . Technical Specification 4.3.F.1.a requires that during each refueling outage the scram discharge volume drain and vent valves be tested to verify that they close within thirty seconds after receipt of a reactor scram signal. Since the licensee has surveillance requirements in the current Technical Specifications, additional conditions, as stated in the acceptable compliance, are not necessary.

In his response, the licensee states that the valves will [illegible]iodically tested per the Monticello Code Section XI Inservice Inspection and Testing Program. We, therefore, conclude that the requirements to this criterion have been satified.

4.2.5.2 Surveillance Criterion 2

Verifying and level detection instrumentation shall be periodically tested in place.

Licensee Response

The rod block and scram instruments will be periodically tested as stated in Technical Specifications Table 4.1.1. After testing, the instrument chamber will be drained to the SDIV through the instrument lines to assure proper valve lineup. A post scram comparison is made to determine that the draining time is consistent with previous measurements.

Staff Evaluation

An acceptable method to meet this criterion is to require that the instrument chamber is drained after functional tests through the taps off the IV and that post-scram, a comparison is made to determine that the response (time to lower level) is consistent with previous measurements.

The licensee states that the instrument chamber will be drained to the SDIV through the instrument lines to assure proper valve lineup. The licensee is writing operating procedures for a post-scram comparison between the response time to previous measurements. Therefore, we have reviewed the licensee's response to this criterion and find it acceptable.

4.2.5.3 Surveillance Criterion 3

The operability of the entire system as an integrated whole shall be demonstrated periodically and during each operating cycle, by demonstrating scram instrument response and valve function at pressure and temperature at approximately 50% control rod density.

Licensee Response

Once a cycle,instrument response and valve function will be demonstrated by scramming the plant from approximately 50% or less control rod density.

Staff Evaluation

A total integrated system test will demonstrate that the system retains its capability to monitor the accumulation of water in the SDV and to scram the plant when required. This test checks the spectrum of operation that system components and instrumentation experience when going from normal to scram conditions. Acceptable compliance is for the licensee to show reasonable agreement with design analysis and any previous measurement. Additional conditions will be required by Technical Specifications.

The licensee has stated that once a cycle, instrument response and valve function will be be demonstrated by scramming the plant from approximately 50% or less control rod density. We have reviewed the licensee's response and find that the proposed surveillance meets the criterion and follows the guidance of the Model Technical Specifications and therefore, is acceptable.

B. Change (2) - Air Dump Header

We have reviewed the licensee's proposed changes to the Monticello license that were transmitted in a letter dated September 17, 1982. The proposed changes would remove the conditions to the license that were implemented by the Commission's Order dated January 9, 1981. These conditions required, as an interim measure, for the licensee to provide an automatic scram from degraded air supply conditions until improved hydraulic coupling was incorporated into the system.

As part of the short-term requirements, the Commission issued Orders for Modification of License which required licensees to promptly implement certain actions to assure the safe operation of BWRs with inadequate SDV-to-IV hydraulic coupling. One of the deficiencies identified in the Generic SER was a failure mode of the control air system, which could conceivably cause an inability to scram the control rods. Sustained low pressure in the control air system could result in complete or partial opening of multiple scram outlet valves before the opening of scram inlet valves, thereby causing the SDV to fill rapidly, thus leaving a relatively short time for the operator to take corrective action before scram capability is lost.

Therefore, as part of the short-term program to provide prompt added protection for credible degraded air conditions in BWR control air supply systems, the staff added license conditions that required an automatic system to be operable by April 9, 1981. The automatic system would initiate control rod insertion by rapidly dumping the control air system header if the air pressure decreased below a prescribed value. The long-term solution to this problem is improved hydraulic coupling. During the September 1982 reload 9 outage, the licensee will modify the SDV system to improve hydraulic coupling. Hydraulic coupling will assure detection by level instrumentation and thereby provide a timely automatic scram, independent of the inleakage rate when the SDV headers fill.

Therefore, we have reviewed the licensee's request to remove the interim conditions from the license and find the licensee's proposed changes acceptable because long-term hydraulic coupling will be improved between the scram discharge headers and the instrument volume as discussed above.

C. Change (3) - Control Rod Accumulators

We have reviewed the licensee's proposed changes to Technical Specification 3.3.D transmitted by letter dated July 12, 1982 supporting the limiting conditions of operation for the control rod accumulator. The proposed changes clarify the mode of operation as to when the control rod accumulator must be operable. Operability of the accumulator ensures that control rods can be inserted even under the most unfavorable depressurization of the reactor. At low-reactor pressures, such as refueling, the accumulator supplies the force needed for a scram. We have reviewed the licensee's proposed changes and conclude that the objective of the Technical Specification is still met. We, therefore, conclude that the proposed changes are acceptable.

Subsequently, the licensee rescinded the request to change the frequency of surveillance testing. Therefore, accumulator pressure and level alarms will continue to be checked once per shift.

IV. ENVIRONMENTAL CONDITIONS

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 Section 51.5(d)(4) that an environmental impact statement, or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of the amendment.

V. CONCLUSION

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated, does not create the possibility of an accident of a type different from any evaluated previously, and does not involve a significant reduction in a margin of safety, the amendment 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.

Dated: October 8, 1982

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REFERENCES

1. Letter, D. M. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (USNRC), July 12, 1982 (with attachments).

2. Letter, D. M. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (USNRC), September 17, 1982.

3. Letter, D. M. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (USNRC), September 7, 1982.

4. Letter, D. M. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (USNRC), September 23, 1982.

5. "Generic Safety Evaluation Report, BWR Scram Discharge System," December 1, 1980, USNRC.