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BVY 12-018

April 17, 2012

ATTN: Document Control Desk
U.S. Nuclear Regulatory Commission
Washington, DC 20555

SUBJECT: Technical Specifications Proposed Change No. 299
Recirculation System Discharge Bypass Valve Change
Vermont Yankee Nuclear Power Station
Docket No. 50-271
License No. DPR-28

Dear Sir or Madam:

In accordance with 10CFR50.90, Vermont Yankee (VY) is proposing an amendment to Renewed Operating License DPR-28. The proposed amendment would revise VY Technical Specification (TS) 3.5.A.5 and TS 4.5.A.5 associated with the recirculation pump discharge bypass valves. The normal position of the recirculation pump discharge bypass valves has been changed from "open" to "closed" and therefore the safety function to close in support of accident mitigation has been eliminated. Based on this, the TS are being revised to require the valves to remain closed and that their position be verified once per operating cycle.

VY has reviewed the proposed amendment in accordance with 10CFR50.92 and concludes it does not involve a significant hazards consideration. In accordance with 10CFR50.91, a copy of this application, with attachments, is being provided to the State of Vermont, Department of Public Service.

Attachment 1 to this letter provides a detailed description and evaluation of the proposed change. Attachment 2 contains a markup of the current TS and Bases pages. Attachment 3 contains the retyped TS and Bases pages. Bases changes are provided for information only.

VY requests review and approval of the proposed license amendment by May 1, 2013 and a 60 day implementation period from the date of the amendment approval.

There are no new regulatory commitments made in this letter.

If you have any questions on this transmittal, please contact Mr. Robert Wanczyk at 802-451-3166.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on April 17, 2012.

Sincerely,

for CJW

CJW/JMD

Attachments
1. Description and Evaluation of the Proposed Changes
2. Markup of the Current Technical Specifications and Bases Pages
3. Retyped Technical Specifications and Bases Pages

cc: Mr. William M. Dean
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Attachment 1

Vermont Yankee Nuclear Power Station

Proposed Change 299

Description and Evaluation of Proposed Changes

1. SUMMARY DESCRIPTION

This evaluation supports a request by Vermont Yankee (VY) to amend Renewed Operating License DPR-28. The proposed change would revise VY Technical Specification (TS) 3.5.A.5 and TS 4.5.A.5 requirements associated with the recirculation pump discharge bypass valves.

While performing valve testing, during the recent refueling outage, issues were identified on the "A" recirculation pump discharge bypass valve (V2-54A). Following an evaluation of the dose exposure, parts availability, special tooling and engineering and maintenance resources needed to support repair of the discharge bypass valve, a decision was made to change the normal position of the valve from "open" to "closed." Also, because the valve could not be stroked, the surveillance requirements of TS 4.5.A.5 could not be satisfied for the "A" discharge bypass valve. The discharge bypass valves were electrically and mechanically disabled to ensure that they remain closed, which is their safety related position.

TS allows reactor startup with the discharge bypass valves operable or closed so both the discharge bypass valves were declared inoperable and placed in the closed position. Both discharge bypass valves (V2-54A/B) were closed to provide for common operation of both recirculation loops and to minimize human errors.

An engineering change was processed under 10CFR50.59 to change the normal position of the discharge bypass valves to "closed" and to use the recirculation pump discharge valves to perform the operational functions relative to plant startup and system operations previously performed by the discharge bypass valves. The 10CFR50.59 evaluation was reported to the NRC in Reference 6.a.

Both the discharge valves and discharge bypass valves have a safety function to close to support accident mitigation. Therefore, having the bypass valves in the normally closed position does not adversely affect the station safety analysis.

2. DETAILED DESCRIPTION

The following changes are proposed to TS 3.5.A.5 and TS 4.5.A.5:

Current TS 3.5.A.5	Proposed TS 3.5.A.5
5. All recirculation pump discharge valves and bypass valves shall be operable or closed prior to reactor startup.	5. All recirculation pump discharge valves shall be operable or closed and all recirculation pump discharge bypass valves shall be closed prior to reactor startup.
Current TS 4.5.A.5	Proposed TS 4.5.A.5
5. Operability testing of recirculation pump discharge valves and bypass valves shall be in accordance with Specification 4.6.E.	5. Operability testing of recirculation pump discharge valves shall be in accordance with Specification 4.6.E. The recirculation pump discharge bypass valves shall be verified closed once per operating cycle.

3. TECHNICAL EVALUATION

The reactor recirculation system consists of two recirculation pump loops external to the reactor vessel which provide the driving flow of water to the reactor vessel jet pumps. Each external loop consists of a downcomer, a motor-operated pump suction valve, a high capacity motor-driven pump, a motor-operated discharge valve with a motor-operated discharge bypass valve, a discharge riser containing a venturi-type flow meter nozzle and a ring header which supplies five jet pump risers each with two jet pumps (for a total of ten per loop).

The water pumped through the external loops becomes the driving force for twenty jet pumps located in the reactor vessel annulus between the vessel wall and the core shroud. The water in the reactor annulus becomes the driven flow of the jet pumps which is accelerated by and mixed with the driving flow. The two flows are discharged below the core and provide core coolant flow up through the cooling channels.

An increase in recirculation flow temporarily reduces the steam void volume in the core by removing the steam at a faster rate and replacing it with water. Since voids act as negative reactivity, this increase in removal rate adds positive reactivity to the core, which in turn causes reactor power level to increase. The increased steam generation rate increases the steam void volume in the core with a subsequent negative reactivity effect, and thereby, a new higher power level is established. When recirculation flow is reduced, the power level is reduced in a similar manner, i.e., by the formation of voids.

The four inch recirculation system pump discharge bypass valves were originally used to preheat an idle loop by reverse flow and were open during pump starting. An engineering change was implemented to have the discharge bypass valve in the closed position and to jog open the discharge valve in conjunction with a pump start. Prior to the engineering change, after the pump had been started, the main discharge valve was opened and the discharge bypass valve remained open. The discharge bypass valves were electrically and mechanically disabled to ensure that they remain closed, which is their safety related position.

Recirculation discharge valves and discharge bypass valves have a safety function to close following a Loss of Coolant Accident (LOCA) to support Low Pressure Coolant Injection (LPCI) with the Residual Heat Removal System pumps into the recirculation piping loops to maintain reactor vessel water inventory and satisfy the acceptance criteria provided in 10CFR50.46.

The engineering change evaluated the discharge bypass valve being permanently closed and jogging open the discharge valve during system startup. The discharge valve will continue to have a safety function to close to support the LPCI function. Since the discharge bypass valves will be closed they will normally be in the position that is consistent with the accident analysis.

In 1974, General Electric (GE) recommended operating with the recirculation pump discharge bypass valve in the open position (Reference 6.b). Primarily, it was to avoid thermal stresses in the bypass line by eliminating temperature differences between the bypass line and main recirculation line and to eliminate the "dead leg" condition which potentially causes stress corrosion cracking. The recirculation piping at VY was reanalyzed and replaced so that it is no longer susceptible to stress corrosion cracking and thermal stress is not a concern.

Subsequently, GE safety analysis (Reference 6.c) determined that operation of the recirculation system with the recirculation pump discharge bypass valve open or closed has an indeterminately negligible effect on the primary coolant system flow. Operation with this valve in either position does not affect core characteristics, primarily void fraction. Therefore, there is no effect on total core steady state and transient operation. Transient effects due to cold loop startup remain unchanged from existing safety analysis, since the transient is based on the recirculation pump discharge valve being closed and the discharge bypass valve open. Based on this, GE maintains that there is no change in previously reviewed and accepted safety analysis.

The VY investigation into operation with a closed discharge bypass valves has identified that similar BWRs have eliminated the discharge bypass valves. Units that have eliminated the discharge bypass valves start the recirculation pump with a closed pump discharge valve and they jog open the pump discharge valve to assist in minimizing reactivity changes.

With the discharge bypass valves in the closed position, the discharge valve will be operated differently when starting a recirculation pump. The discharge bypass valves will remain closed. The discharge valves will be initially closed and, coincident with the recirculation pump start, the discharge valve is jogged open. This mode of operation is primarily for starting an idle recirculation loop during reactor operation.

The jogging sequence results in a more conservative opening transient than provided by the pre-outage operation. This jogging sequence is similar to that recommended by GE SIL No. 133S1 (Reference 6.d) and has been adjusted and tested per Reference 6.e based on VY operational experience.

The changes to TS 3.5.A.5 require all recirculation pump discharge valves to be operable or closed prior to reactor startup and all recirculation pump discharge bypass valves shall be closed. This ensures that the recirculation pump bypass valves are in the closed position prior to reactor startup consistent with station safety analysis. The changes to TS 4.5.A.5 will ensure that operability testing of recirculation pump discharge valves continues to be performed in accordance with Specification 4.6.E and that the recirculation pump discharge bypass valves are verified closed once per operating cycle. The recirculation pump discharge bypass valves are located in the primary containment so they will be verified to be closed prior to startup from each refueling outage and are not normally accessible when the plant is operating. This combined with the fact that the recirculation pump discharge bypass valves were electrically and mechanically isolated provides assurance that they will remain in the closed position consistent with station safety analysis.

4. EVALUATION OF SIGNIFICANT HAZARDS CONSIDERATION

Pursuant to 10CFR50.92, Vermont Yankee (VY) has reviewed the proposed amendment and concludes that the change does not involve a significant hazards consideration since the proposed amendment satisfies the criteria in 10CFR50.92(c). These criteria require that operation of the facility in accordance with the proposed amendment would not (1) involve a significant increase in the probability or consequences of an accident previously evaluated; (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety.

The proposed amendment would revise VY Technical Specification (TS) 3.5.A.5 and TS 4.5.A.5 associated with the recirculation pump discharge bypass valves. The normal position of the recirculation pump discharge bypass valves has been changed from "open" to "closed" and therefore the safety function to go closed in support of accident mitigation has been eliminated. Based on this, the TS are being revised to require the valves to remain closed and that their position be verified once per operating cycle. The discharge bypass valves were electrically and mechanically disabled to ensure that they remain closed, which is their safety related position.

The discussion below addresses each of these criteria and demonstrates that the proposed amendment does not constitute a significant hazard.

1. Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The proposed amendment does not significantly increase the probability or consequences of an accident. The recirculation system discharge bypass valve normal position has been changed from "open" to "closed." The safety function of the discharge bypass valves is to be closed to support accident mitigation. Placing the discharge bypass valves in the normally closed position is consistent with station safety analysis and therefore does not have a significant impact on the probability or consequences of an accident. Therefore, the proposed amendment does not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously evaluated?

   Response: No.

   The proposed amendment does not involve any new modes of operation. The recirculation system discharge bypass valve normal position has been changed from "open" to "closed." The valves previously had a safety function to close and are designed to meet all code requirements in the closed position. No new accident precursors are introduced. Recirculation pump operating procedures have been revised consistent with vendor guidance. No new or different types of equipment will be installed. The methods governing plant operation remain bounded by current safety analysis assumptions. Therefore, the proposed change does not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed amendment involve a significant reduction in a margin of safety?

   Response: No.

   The recirculation system discharge bypass valve normal position has been changed from "open" to "closed." With the valves normally in the closed position safety margins are maintained. The station safety analysis results are unchanged and margin to regulatory limits in not affected. Therefore, the proposed amendment will not involve a significant reduction in the margin of safety.

Based on the above, Entergy concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5. ENVIRONMENTAL CONSIDERATIONS

This amendment request meets the eligibility criteria for categorical exclusion from environmental review set forth in 10CFR51.22(c)(9) as follows:

(i) The amendment involves no significant hazards determination.

As described in Section 4 of this evaluation, the proposed change involves no significant hazards consideration.

(ii) There is no significant change in the types or significant increase in the amounts of any effluent that may be released offsite.

The proposed amendment does not involve any physical alterations to the plant configuration that could lead to a change in the type or amount of effluent release offsite.

(iii) There is no significant increase in individual or cumulative occupational radiation exposure.

The proposed amendment does not involve a significant increase in individual or cumulative occupational radiation exposure.

Based on the above, VY concludes that the proposed change meets the eligibility criteria for categorical exclusion as set forth in 10CFR51.22(c)(9). Pursuant to 10CFR51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of this amendment.

6. REFERENCES

a) Letter, VY to USNRC, "Cycle 28 10CFR50.59 Report," BVY 11-076, dated November 23, 2011

b) GE Nuclear Service Information Letter SIL No. 104, Operation with Open Bypass Valve in Recirc System, dated October 18, 1974

c) GE Nuclear Service Information Letter No. 104S1, Operation with Open Bypass Valve in Recirc System, dated October 31, 1974

d) GE Nuclear Service Information Letter No. 133S1, Recommended Recirculation Discharge Valve Jogging Sequence, dated May 30,1975

e) GE Nuclear Service Information Letter No. 133, Recirculation Four-Inch Bypass Line Removal Operational Demonstration Test, dated April 30, 1975

Attachment 2

Vermont Yankee Nuclear Power Station

Proposed Change 299

Markup of the Current Technical Specifications and Bases Pages

3.5 LIMITING CONDITION FOR OPERATION	4.5 SURVEILLANCE REQUIREMENT
~~5. All recirculation pump discharge valves and bypass valves shall be operable or closed prior to reactor startup.~~	~~5. Operability testing of recirculation pump discharge valves and bypass valves shall be in accordance with Specification 4.6.E.~~
6. If the requirements of Specifications 3.5.A cannot be met, an orderly shutdown of the reactor shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.	
B. Containment Spray Cooling Capability	B. Containment Spray Cooling Capability
1. Both containment cooling spray loops are required to be operable when the reactor water temperature is greater than 212°F except that a Containment Cooling Subsystem may be inoperable for thirty days.	1. Surveillance of the drywell spray loops shall be performed as follows. An air test shall be performed on the drywell spray headers and nozzles following maintenance that could result in nozzle blockage.
2. If this requirement cannot be met, an orderly shutdown shall be initiated and the reactor shall be in the cold shutdown condition within 24 hours.	2. Deleted.

5. All recirculation pump discharge valves shall be operable or closed and all recirculation pump discharge bypass valves shall be closed prior to reactor startup.

5. Operability testing of recirculation pump discharge valves shall be in accordance with Specification 4.6.E. The recirculation pump discharge bypass valves shall be verified closed once per operating cycle.

BASES: 3.2.A/4.2.A EMERGENCY CORE COOLING SYSTEM (ECCS)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Low - Low Reactor Vessel Water Level Trip Setting is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling. The Trip Setting is referenced from the top of enriched fuel.

Four channels of Low - Low Reactor Vessel Water Level Trip Function are only required to be operable when the ECCS or DG(s) are required to be operable to ensure that no single instrument failure can preclude ECCS and DG initiation.

1.c, 2.a. Low Reactor Pressure (Initiation)

Low reactor pressure signals, in conjunction with low RPV level, indicate that the capability to cool the fuel may be threatened. The low pressure ECCS are initiated upon simultaneous receipt of a low reactor pressure and a low-low reactor vessel water level signal to ensure that the core spray and flooding functions are available to prevent and minimize fuel damage. The Low Reactor Pressure (Initiation) is one of the Trip Functions assumed to be operable and capable of permitting initiation of the ECCS during the accidents analyzed in References 1 and 2. In addition, the Low Reactor Pressure (Initiation) Trip Function is directly assumed in the analysis of the recirculation line break (Ref. 1). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the requirements of 10 CFR 50.46 are met.

The Low Reactor Pressure (Initiation) signals are initiated from two pressure transmitters that sense the reactor pressure. Each transmitter provides an input to both low pressure ECCS logic trains, such that failure of one transmitter will cause a loss of redundancy but will not result in a loss of automatic low pressure ECCS pump start capability.

The Trip Setting is low enough to prevent overpressurizing the equipment in the low pressure ECCS, but high enough such that the ECCS injection will ensure the requirements of 10 CFR 50.46 are met.

Two channels per trip system of Low Reactor Pressure (Initiation) Trip Function are only required to be operable when the ECCS or DG(s) are required to be operable to ensure that no single instrument failure can preclude ECCS and DG initiation.

1.d, 2.h. Low Reactor Pressure (System Ready and Valve Permissive)

Low reactor pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. These low reactor pressure signals are also used as permissives for recirculation pump discharge valve closure, ~~and recirculation pump discharge bypass valve closure~~. This ensures that the LPCI subsystems inject into the proper RPV location assumed in the safety

BASES: 3.2.A/4.2.A EMERGENCY CORE COOLING SYSTEM (ECCS)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

analysis. Low Reactor Pressure (System Ready and Valve Permissive) is one of the Trip Functions assumed to be operable and capable of permitting initiation and injection of the ECCS and capable of closing the recirculation pump discharge valve(s) ~~and recirculation pump discharge bypass valve(s)~~ during the accidents and transients analyzed in References 1 and 2. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the requirements of 10 CFR 50.46 are met. The Low Reactor Pressure (System Ready and Valve Permissive) Trip Function is directly assumed in the analysis of the recirculation line break (Ref. 1).

The Low Reactor Pressure (System Ready and Valve Permissive) signals are initiated from four pressure transmitters that sense the reactor pressure.

The Trip Setting is chosen to be low enough to prevent overpressurizing the equipment in the low pressure ECCS, but high enough such that the ECCS injection will ensure the requirements of 10 CFR 50.46 are met and to ensure that the recirculation pump discharge valves ~~and recirculation pump discharge bypass valves~~ close prior to commencement of LPCI injection flow into the core, as assumed in the safety analysis.

Four channels of the Low Reactor Pressure (System Ready and Valve Permissive) Trip Function are only required to be operable when the ECCS or DG(s) are required to be operable to ensure that no single instrument failure can preclude proper ECCS initiation and injection.

1.e, 2.e. CS and LPCI B and C Pump Start Time Delay

The purpose of these time delays is to stagger the start of the CS and RHR (LPCI) B and C pumps on the associated Division 1 and Division 2 buses, thus limiting the starting transients on the 4.16 kV emergency buses. These Trip Functions are necessary when power is being supplied from the standby power sources. The Core Spray Pump Start Time Delay and the LPCI B and C Pump Start Time Delay Trip Functions are assumed to be operable in the accident and transient analyses requiring ECCS initiation. That is, the analyses assume that the pumps will initiate when required and excess loading will not cause failure of the power sources.

There are two Core Spray Pump Start Time Delay relays, one for each trip system. Each time delay relay is dedicated to a single pump start logic, such that a single failure of a Core Spray Pump Start Time Delay relay will not result in failure of more than one CS pump. In this condition, one of the two CS pumps will remain operable; thus, single failure criterion is satisfied.

There are two LPCI B and C Pump Start Time Delay relays, one for each trip system. Each time delay relay is dedicated to a single pump start logic, such that a single failure of a LPCI B or C Pump Start Time Delay relay will not result in failure of more than one of the two associated LPCI pumps. In this condition, one of the two associated LPCI pumps will remain operable; thus, single failure criterion is satisfied.

Attachment 3

Vermont Yankee Nuclear Power Station

Proposed Change 299

Retyped Technical Specifications and Bases Pages

3.5 LIMITING CONDITION FOR OPERATION	4.5 SURVEILLANCE REQUIREMENT
5. All recirculation pump discharge valves shall be operable or closed and all recirculation pump discharge bypass valves shall be closed prior to reactor startup.	5. Operability testing of recirculation pump discharge valves shall be in accordance with Specification 4.6.E. The recirculation pump discharge bypass valves shall be verified closed once per operating cycle.
6. If the requirements of Specifications 3.5.A cannot be met, an orderly shutdown of the reactor shall be initiated and the reactor shall be in a cold shutdown condition within 24 hours.	
B. Containment Spray Cooling Capability	B. Containment Spray Cooling Capability
1. Both containment cooling spray loops are required to be operable when the reactor water temperature is greater than 212°F except that a Containment Cooling Subsystem may be inoperable for thirty days.	1. Surveillance of the drywell spray loops shall be performed as follows. An air test shall be performed on the drywell spray headers and nozzles following maintenance that could result in nozzle blockage.
2. If this requirement cannot be met, an orderly shutdown shall be initiated and the reactor shall be in the cold shutdown condition within 24 hours.	2. Deleted.

BASES: 3.2.A/4.2.A EMERGENCY CORE COOLING SYSTEM (ECCS)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The Low - Low Reactor Vessel Water Level Trip Setting is chosen to allow time for the low pressure core flooding systems to activate and provide adequate cooling. The Trip Setting is referenced from the top of enriched fuel.

Four channels of Low - Low Reactor Vessel Water Level Trip Function are only required to be operable when the ECCS or DG(s) are required to be operable to ensure that no single instrument failure can preclude ECCS and DG initiation.

1.c, 2.a. Low Reactor Pressure (Initiation)

Low reactor pressure signals, in conjunction with low RPV level, indicate that the capability to cool the fuel may be threatened. The low pressure ECCS are initiated upon simultaneous receipt of a low reactor pressure and a low-low reactor vessel water level signal to ensure that the core spray and flooding functions are available to prevent and minimize fuel damage. The Low Reactor Pressure (Initiation) is one of the Trip Functions assumed to be operable and capable of permitting initiation of the ECCS during the accidents analyzed in References 1 and 2. In addition, the Low Reactor Pressure (Initiation) Trip Function is directly assumed in the analysis of the recirculation line break (Ref. 1). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the requirements of 10 CFR 50.46 are met.

The Low Reactor Pressure (Initiation) signals are initiated from two pressure transmitters that sense the reactor pressure. Each transmitter provides an input to both low pressure ECCS logic trains, such that failure of one transmitter will cause a loss of redundancy but will not result in a loss of automatic low pressure ECCS pump start capability.

The Trip Setting is low enough to prevent overpressurizing the equipment in the low pressure ECCS, but high enough such that the ECCS injection will ensure the requirements of 10 CFR 50.46 are met.

Two channels per trip system of Low Reactor Pressure (Initiation) Trip Function are only required to be operable when the ECCS or DG(s) are required to be operable to ensure that no single instrument failure can preclude ECCS and DG initiation.

1.d, 2.h. Low Reactor Pressure (System Ready and Valve Permissive)

Low reactor pressure signals are used as permissives for the low pressure ECCS subsystems. This ensures that, prior to opening the injection valves of the low pressure ECCS subsystems, the reactor pressure has fallen to a value below these subsystems' maximum design pressure. These low reactor pressure signals are also used as permissives for recirculation pump discharge valve closure. This ensures that the LPCI subsystems inject into the proper RPV location assumed in the safety

BASES: 3.2.A/4.2.A EMERGENCY CORE COOLING SYSTEM (ECCS)

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

analysis. Low Reactor Pressure (System Ready and Valve Permissive) is one of the Trip Functions assumed to be operable and capable of permitting initiation and injection of the ECCS and capable of closing the recirculation pump discharge valve(s) during the accidents and transients analyzed in References 1 and 2. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the requirements of 10 CFR 50.46 are met. The Low Reactor Pressure (System Ready and Valve Permissive) Trip Function is directly assumed in the analysis of the recirculation line break (Ref. 1).

The Low Reactor Pressure (System Ready and Valve Permissive) signals are initiated from four pressure transmitters that sense the reactor pressure.

The Trip Setting is chosen to be low enough to prevent overpressurizing the equipment in the low pressure ECCS, but high enough such that the ECCS injection will ensure the requirements of 10 CFR 50.46 are met and to ensure that the recirculation pump discharge valves close prior to commencement of LPCI injection flow into the core, as assumed in the safety analysis.

Four channels of the Low Reactor Pressure (System Ready and Valve Permissive) Trip Function are only required to be operable when the ECCS or DG(s) are required to be operable to ensure that no single instrument failure can preclude proper ECCS initiation and injection.

1.e, 2.e. CS and LPCI B and C Pump Start Time Delay

The purpose of these time delays is to stagger the start of the CS and RHR (LPCI) B and C pumps on the associated Division 1 and Division 2 buses, thus limiting the starting transients on the 4.16 kV emergency buses. These Trip Functions are necessary when power is being supplied from the standby power sources. The Core Spray Pump Start Time Delay and the LPCI B and C Pump Start Time Delay Trip Functions are assumed to be operable in the accident and transient analyses requiring ECCS initiation. That is, the analyses assume that the pumps will initiate when required and excess loading will not cause failure of the power sources.

There are two Core Spray Pump Start Time Delay relays, one for each trip system. Each time delay relay is dedicated to a single pump start logic, such that a single failure of a Core Spray Pump Start Time Delay relay will not result in failure of more than one CS pump. In this condition, one of the two CS pumps will remain operable; thus, single failure criterion is satisfied.

There are two LPCI B and C Pump Start Time Delay relays, one for each trip system. Each time delay relay is dedicated to a single pump start logic, such that a single failure of a LPCI B or C Pump Start Time Delay relay will not result in failure of more than one of the two associated LPCI pumps. In this condition, one of the two associated LPCI pumps will remain operable; thus, single failure criterion is satisfied.