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DTE Energy

February 23, 2017 10 CFR 50.90
NRC-17-0010

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

References: 1) Fermi 2
NRC Docket No. 50-341
NRC License No. NPF-43

Subject: License Amendment Request to Revise Technical Specifications for Emergency Core Cooling System Instrumentation and Reactor Core Isolation Cooling System Instrumentation

In accordance with the provisions of 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," DTE Electric Company (DTE) requests amendment to Appendix A, Technical Specifications of Renewed Facility Operating License NPF-43 for Fermi Unit 2 (Fermi 2).

This submittal requests modification of the Technical Specifications (TS) for Emergency Core Cooling System (ECCS) Instrumentation (TS 3.3.5.1) and Reactor Core Isolation Cooling (RCIC) System Instrumentation (TS 3.3.5.2). The proposed changes are to add footnotes indicating that the injection functions of "Drywell Pressure – High" for High Pressure Coolant Injection (HPCI) and "Manual Initiation" for HPCI and RCIC are not required to be operable under low reactor pressure conditions.

In accordance with 10 CFR 50.91, a copy of this application, with enclosures, is being provided to the designated Michigan State Official.

Enclosure 1 provides a detailed description and evaluation of the proposed changes, including an analysis of the significant hazards considerations using the standards of 10 CFR 50.92. DTE has concluded that the changes proposed herein do not result in a significant hazards consideration. Enclosure 2 provides the existing TS pages marked up to show the proposed changes. Enclosure 3 provides revised (clean) TS pages. Enclosure 4 provides a markup of the existing TS Bases pages. Changes to the existing TS Bases, consistent with the technical and regulatory analyses, will be implemented under the TS Bases Control Program. Enclosure 4 is provided for information only.

This license amendment request contains no regulatory commitments.

DTE requests approval of the proposed License Amendment by April 13, 2017 to allow normal plant startup from the upcoming refueling outage as described in Enclosure 1. Upon approval, the amendment will be implemented immediately.

Should you have any questions or require additional information, please contact Mr. Scott A. Maglio, Manager – Nuclear Licensing at (734) 586-5076.

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

Executed on February 23, 2017

Keith J. Polson
Site Vice President
Nuclear Generation

Enclosures:

1. Evaluation of the Proposed License Amendment
2. Marked-up Pages of Existing Fermi 2 TS
3. Clean Pages of Fermi 2 TS with Changes Incorporated
4. Marked-up Pages of Existing Fermi 2 TS Bases (For Information Only)

cc: NRC Project Manager
NRC Resident Office
Reactor Projects Chief, Branch 5, Region III
Regional Administrator, Region III
Michigan Public Service Commission
Regulated Energy Division (kindschl@michigan.gov)

Enclosure 1 to
NRC-17-0010

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

License Amendment Request to Revise Technical Specifications
for Emergency Core Cooling System Instrumentation
and Reactor Core Isolation Cooling System Instrumentation

Evaluation of the Proposed License Amendment

Evaluation of the Proposed License Amendment

Contents

Acronym List

ADS	Automatic Depressurization System
BWR	Boiling Water Reactor
BWROG	Boiling Water Reactor Owners Group
CDF	Core Damage Frequency
CFR	Code of Federal Regulations
CSS	Core Spray System
DTE	DTE Electric Company
ECCS	Emergency Core Cooling System
GEH	General Electric Hitachi
HPCI	High Pressure Coolant Injection
LERF	Large Early Release Frequency
LOCA	Loss of Coolant Accident
LPCI	Low Pressure Coolant Injection
NRC	Nuclear Regulatory Commission
PCT	Peak Cladding Temperature
RCIC	Reactor Core Isolation Cooling
RCPB	Reactor Coolant Pressure Boundary
RHR	Residual Heat Removal
TS	Technical Specifications
UFSAR	Updated Final Safety Analysis Report

1.0 SUMMARY DESCRIPTION

In accordance with the provisions of 10 Code of Federal Regulations (CFR) 50.90, DTE Electric Company (DTE) is submitting a request for an amendment to the Technical Specifications (TS), Appendix A of Renewed Facility Operating License No. NPF-43 for Fermi 2.

The proposed amendment would modify the Fermi 2 TS (Reference 7.2) and associated TS Bases for Emergency Core Cooling System (ECCS) Instrumentation (TS 3.3.5.1) and Reactor Core Isolation Cooling (RCIC) System Instrumentation (TS 3.3.5.2). Specifically, the proposed changes are to add footnotes indicating that the injection functions of "Drywell Pressure – High" for High Pressure Coolant Injection (HPCI) and "Manual Initiation" for HPCI and RCIC are not required to be operable under low reactor pressure conditions.

2.0 DETAILED DESCRIPTION

Fermi 2 is a Boiling Water Reactor 4 (BWR 4) plant with a HPCI and RCIC system. The HPCI system provides coolant to the reactor vessel following a small break loss of coolant accident (LOCA) until reactor pressure is below the pressure at which the low pressure coolant injection systems, i.e., the Core Spray System (CSS) or the Low Pressure Coolant Injection (LPCI) mode of the Residual Heat Removal (RHR) system, maintain core cooling. The HPCI system is also capable of providing sufficient coolant to the reactor vessel to prevent actuation of the Automatic Depressurization System (ADS) and ensure that the reactor core remains covered in the event of a small pipe break with a break size of 0.1 ft^2 or less for liquid breaks (0.5 ft^2 or less for steam breaks). The HPCI system is described in the Fermi 2 Updated Final Safety Analysis Report (UFSAR) (Reference 7.1) Sections 6.3.2.2.1 and 7.3.1.2.1. The HPCI system is also described in the TS Bases (Reference 7.3) Sections B 3.5.1 and B 3.3.5.1.

The RCIC system is designed to ensure that sufficient reactor water inventory is maintained in the reactor vessel to permit adequate core cooling in the event of a loss of normal feedwater flow. The RCIC system is described in the Fermi 2 UFSAR (Reference 7.1) Section 7.4.1.1. The RCIC system is also described in the TS Bases (Reference 7.3) Sections B 3.5.3 and B 3.3.5.2.

The HPCI and RCIC systems consist of a steam driven turbine pump unit and associated system piping, valves, controls and instrumentation. HPCI and RCIC system controls automatically start the systems from the receipt of a reactor vessel water level low-low signal (Level 2). In addition, the HPCI system is designed to automatically start on high primary containment (drywell) pressure. Primary containment high pressure is an indication that a breach of the reactor coolant pressure boundary (RCPB) has occurred inside the drywell. The systems can also be initiated manually. In all actuation modes, the systems are prevented from operating above high reactor vessel water level (Level 8) using signals that originate from wide range reactor vessel level instrumentation. The HPCI and RCIC system controls function to provide design makeup water flow to the reactor vessel until the amount of water delivered to the reactor vessel is adequate (i.e. Level 8), at which time the HPCI and RCIC systems automatically shut down. The HPCI and RCIC systems are designed to automatically cycle between the low-low (i.e. Level 2) and high (i.e. Level 8) reactor vessel water levels.

Low reactor vessel water level is monitored by four level sensors that sense the difference between the pressure of the water column in a constant reference leg (which is independent of reactor water level and density) and the pressure of the water column in the variable leg which varies linearly with the reactor vessel water level but is also dependent on the reactor water density. Each level sensor provides input to a trip unit and the four trip units are connected in a one-out-of-two twice logic to provide an automatic HPCI and RCIC actuation signal. Low reactor vessel water level is an indication that reactor coolant is being lost and that the fuel is in danger of being overheated. The reactor vessel low-low water level setting for HPCI and RCIC system actuation (Level 2) is selected high enough above the active fuel to start the HPCI and RCIC systems in time to maintain level above the top of the active fuel, thereby preventing excessive fuel cladding temperatures during a small break LOCA as analyzed in UFSAR (Reference 7.1) Section 15.6.5. The Level 2 setpoint corresponds to +110.8 inches of water level measured from the top of the active fuel as indicated in UFSAR (Reference 7.1) Figure 7.3-12 Sheet 3.

The same four wide range reactor vessel water level sensors that provide the HPCI and RCIC low-low water level actuation signals also provide the HPCI and RCIC high reactor vessel water level trip signals. Two sensors are used in a two-out-of-two logic to automatically shut down the HPCI system and the other two sensors are used in a two-out-of-two logic to automatically shut down the RCIC system. High water level in the reactor vessel indicates that the HPCI and RCIC systems have performed satisfactorily in providing makeup water to the reactor vessel and core cooling requirements are satisfied. The reactor vessel high water level setting that shuts down HPCI and RCIC (Level 8) is near the top of the steam separators and is sufficient to prevent gross moisture carry over to the HPCI and RCIC turbines. The Level 8 setpoint corresponds to +214.0 inches of water level measured from the top of the active fuel as indicated in UFSAR (Reference 7.1) Figure 7.3-12 Sheet 3.

To prevent potential turbine damage due to flooding the reactor vessel above the main steam lines, the HPCI and RCIC systems are prevented from operating above the high reactor vessel water level (Level 8) setting in all actuation modes. Once actuated, the HPCI high reactor vessel water level trip is sealed in and will inhibit automatic (or manual) system actuation until indicated water level drops below the Level 8 setting and the high reactor vessel water level trip is manually reset, or the trip signal is automatically reset when indicated reactor vessel water level reaches the Level 2 actuation setting. For RCIC, there is no seal-in circuit for the Level 8 trip, so once reactor vessel water level drops below the Level 8 setting, the RCIC system can be manually initiated, or the system is automatically initiated when indicated reactor vessel water level reaches the Level 2 actuation setting.

As described in UFSAR (Reference 7.1) Section 7.5.1.4.2.1, the Fermi 2 wide range reactor vessel level instruments are differential pressure type instruments that are reactor coolant density sensitive and are calibrated to be most accurate at normal reactor pressure and temperature conditions. As a result, at low reactor coolant temperatures and pressures, because the reactor vessel water density is higher than at calibration conditions, these instruments read higher than actual water level. The wide range level indication condition at low reactor pressures is acknowledged in plant procedures and training material. As a result of this level instrumentation condition, a high reactor vessel water level (Level 8) trip signal is present for the HPCI and RCIC systems at low reactor pressures (up to 600 psig), but above the pressure at which the systems are required to be operable (150 psig) per TS 3.5.1 and 3.5.3 (Reference 7.2).

TS Table 3.3.5.1-1 (Reference 7.2) requires HPCI "Drywell Pressure – High" and "Manual Initiation" actuation instrumentation to be operable when HPCI is required to be operable. Any challenge to the RCPB that results in a high drywell pressure condition will result in an automatic actuation of the HPCI system actuation logic; however, the system will not start (either automatically or manually) with the Level 8 trip present, as designed. The system would automatically start, without operator intervention, when a demand for inventory is sensed at reactor vessel water low-low level (Level 2). This operation is the same for a high reactor vessel water level occurring at rated pressure and temperature, or at low reactor vessel pressures and temperatures. An evaluation (see Section 4.0) has shown that high drywell pressure automatic initiation and manual initiation of the HPCI system while at low reactor pressure and temperature conditions are not necessary for HPCI to perform its intended safety function.

Similar to HPCI, TS Table 3.3.5.2-1 (Reference 7.2) requires RCIC "Manual Initiation" actuation instrumentation to be operable when RCIC is required to be operable. However, as a result of the level instrumentation condition, a high reactor vessel water level trip signal is present for the RCIC system at low reactor pressures (up to 600 psig), but above the pressure at which the RCIC system is required to be operable (150 psig), and the system will not manually start with the Level 8 trip present, as designed. The system would automatically start, without operator intervention, when a demand for inventory is sensed at reactor vessel water low-low level (Level 2). This operation is the same for a high reactor vessel water level occurring at rated pressure and temperature, or at low reactor vessel pressures and temperatures. An evaluation (see Section 4.0) has shown that manual actuation of the RCIC system while at low reactor pressure and temperature conditions is not necessary for RCIC to perform its intended safety function.

Therefore, in accordance with the provisions of 10 CFR 50.90, DTE is submitting a request for an amendment to the TS for Fermi 2 (Reference 7.2). The proposed amendment would modify the Fermi 2 TS and associated TS Bases for ECCS Instrumentation (TS 3.3.5.1) and RCIC System Instrumentation (TS 3.3.5.2). The proposed changes are to add footnotes indicating that the injection functions of "Drywell Pressure – High" for HPCI and "Manual Initiation" for HPCI and RCIC are not required to be operable under low reactor pressure conditions. Specifically, the proposed TS changes:

1. Revise the footnote for the HPCI "Drywell Pressure – High" and "Manual Initiation" functions (i.e. Functions 3.b and 3.f) in TS Table 3.3.5.1-1, "Emergency Core Cooling System Instrumentation," from (d) to (e).
2. Define new footnote (e) for TS Table 3.3.5.1-1, "Emergency Core Cooling System Instrumentation," to state that "The injection functions of Drywell Pressure – High and

Manual Initiation are not required to be OPERABLE with reactor steam dome pressure less than 600 psig."

3. Add the new footnote (a) for the RCIC "Manual Initiation" function (i.e. Function 4) in TS Table 3.3.5.2-1, "Reactor Core Isolation Cooling System Instrumentation."
4. Define new footnote (a) for TS Table 3.3.5.2-1, "Reactor Core Isolation Cooling System Instrumentation," to state that "The injection function of Manual Initiation is not required to be OPERABLE with reactor steam dome pressure less than 600 psig."

See Enclosure 2 for a copy of the marked-up TS pages that reflect the proposed changes described above.

3.0 BACKGROUND

Unresolved Issue (URI) 05000352,05000353/2015001-03 was opened in May 2015 for the Limerick Generating Station regarding "Operability of High Pressure Coolant Injection and Entries into Operational Conditions at Low Reactor Pressures with High Reactor Water Level Trip Actuated" (Reference 7.4). Subsequently, Limerick submitted a license amendment request on April 4, 2016 to add a footnote clarifying that certain HPCI and RCIC injection functions were not required to be operable at low reactor pressures (Reference 7.5). DTE learned of the Limerick URI and subsequent license amendment request through participation in a Boiling Water Reactor Owners Group (BWROG) meeting. DTE then entered this information into the Fermi 2 Corrective Action Program in August 2016 for evaluation to determine if the issue identified at Limerick would require a license amendment for Fermi 2.

In late November 2016, Nine Mile Point 2 experienced an unexpected shutdown. During that shutdown, it was determined that Nine Mile Point 2 would not be able to restart without the approval of a license amendment request similar to that submitted by Limerick. Therefore, Nine Mile Point 2 submitted, and received approval for, an emergency license amendment request at the end of November 2016 (References 7.6 and 7.7).

Subsequently, DTE became aware of the Nine Mile Point 2 emergency license amendment request and added it to the Fermi 2 Corrective Action Program for evaluation in December 2016. DTE reviewed the Fermi 2 design and licensing basis documentation in comparison to Limerick and Nine Mile Point 2. Since the issue was in regards to the original design of Fermi 2 and not the result of any change to the plant made by DTE, the original design vendor, General Electric Hitachi (GEH), was engaged for assistance in evaluating the issue. In January 2017, after discussion with GEH, DTE determined that the occurrence of the Level 8 trip signal at low pressure conditions does impact the operability of certain HPCI and RCIC functions and also has the potential to effect operability of HPCI and RCIC themselves as a result of the TS Limiting Condition for Operation (LCO) Conditions and Required Actions.

TS LCO 3.0.4 prohibits entry into a Mode or other specified condition in the Applicability unless the associated Actions to be entered permit continued operation for an unlimited period of time. As a result, DTE determined that a license amendment request was required in order to avoid a situation where compliance with the Fermi 2 TS LCO 3.0.4 would prevent plant startup following the next plant shutdown.

Fermi 2 is currently scheduled to begin a plant shutdown for a refueling outage in mid-March 2017. The refueling outage is expected to last approximately 30 days such that plant startup would commence in mid-April 2017. For this reason, approval of the license amendment is requested by April 13, 2017. If this license amendment request is not reviewed and approved by that date, it would prevent the normal plant startup following this refueling outage due to TS LCO 3.0.4.

Note that the delay in determining the impact on operability (i.e. between August 2016 and January 2017) was entered into the Fermi 2 Corrective Action Program. In addition, DTE will evaluate 10 CFR 50.73 reporting requirements with respect to the Level 8 trip signal.

The proposed TS changes are administrative in nature and there is no change in the Fermi 2 baseline risk from 1.73E-06/yr core damage frequency (CDF) and 5.73E-07/yr large early release frequency (LERF).

4.0 TECHNICAL EVALUATION

4.1 Effect of HPCI and RCIC Injection Function Unavailability on Plant Operation and Safety

Although the injection functions of HPCI and RCIC are technically not available when the indicated reactor vessel water level is above Level 8, the HPCI and RCIC systems are not needed under normal operating conditions when the reactor vessel water level is at some steady high level, and are only needed during a loss of level transient (e.g., loss of normal feedwater flow) or LOCA when the level has decreased to Level 2. For Fermi 2, the level above which the injection functions of HPCI and RCIC become technically unavailable due to the wide range off-calibration condition at the lowest applicable reactor steam dome pressure of 150 psig is approximately +180 inches from the top of the active fuel. This is well above the Fermi 2 Level 2 setpoint of +110.8 inches from the top of the active fuel. Thus, even the highest wide range off-calibration condition (corresponding to the lowest applicable dome pressure of 150 psig), is not large enough to prevent the Level 2 actuation. In addition, both the Level 8 trip and the Level 2 actuation for the HPCI and RCIC systems come from the same wide range instrumentation, so the Level 8 trip signal clears before the level reaches the Level 2 actuation, regardless of the off-calibration conditions. Thus, if a loss-of-level event (e.g., LOCA or loss of feedwater flow) occurred at 150 psig, the wide range off-calibration condition does not prevent HPCI and RCIC from performing their water injection function when the indicated reactor vessel water level reaches Level 2. Although the indicated level is higher than the calibrated level at Level 2, the water mass inventory is the same when the indicated Level 2 setpoint is reached; therefore, the HPCI and RCIC system response with respect to the core cooling function remains the same.

The unavailability of the injection functions of HPCI and RCIC due to the wide range off-calibration condition is not an operational or safety problem for the following reasons described below.

1. The system response for LOCA and loss of feedwater flow events is governed by the liquid mass inventory in the reactor vessel. The difference between the indicated level in the vessel and the actual level in the vessel does not reflect a change in the liquid mass inventory in the downcomer region of the vessel because the level indication is a function of the total mass above the variable leg level tap elevation (approximately a function of liquid density times height). This makes the level indication effectively self-compensating with respect to tracking the liquid mass inventory. Therefore, there is approximately the same liquid mass in the downcomer region at the same indicated level, regardless of the vessel pressure conditions. At the very low reactor powers considered in the off-calibrated conditions, the liquid mass inventory in the vessel is higher than the vessel inventory in the full power analyses of record because there is substantially less steam voiding in the core and upper plenum regions of the vessel. Because the HPCI and RCIC Level 2 system actuations occur on indicated level, the system response for LOCA and loss of feedwater flow events at the low reactor pressure off-calibration events is bounded by the full power analyses of record.
2. From the safety point of view, HPCI and RCIC are systems designed to mitigate events such as LOCA or loss of feedwater flow, and assure that the reactor vessel water level stays high enough to provide adequate core cooling. According to the boiling water reactor design basis, HPCI and RCIC are only required to inject water into the reactor when the reactor vessel water level decreases to Level 2. For Fermi 2, the Level 2 setpoint is +110.8 inches from the top of the active fuel. Because the HPCI and RCIC level trips/actuations come from the same wide range level instrumentation, the Level 8 trip clears and the injection functions of the HPCI and RCIC systems are available when the Level 2 actuation occurs, regardless of the off-calibration condition. When the calibration condition (due to low reactor pressure) is present, then for the same level loss scenario, the Level 2 actuation is reached at a later time than it would under calibrated conditions; however, the actual level is still well above the top of active fuel. Since the Level 2 actuation occurs, and HPCI and RCIC systems are available at that time, adequate core cooling is assured.
3. Once the reactor vessel water level reaches Level 2, the HPCI and RCIC actuation logic is designed to automatically trigger HPCI and RCIC injection. Depending upon the accident scenario and/or size of break, this injection could start to raise the water level inside the reactor, so the HPCI and RCIC trip logic is designed to automatically trip HPCI and RCIC if the reactor vessel water level reaches Level 8 to protect the steam lines and turbines. The systems stay in the tripped configuration when the indicated level is above Level 8. If this level decreases below Level 8, the Level 8 trip signal is lifted, and when the level reaches Level 2, the HPCI and RCIC trip logic automatically clears the Level 8 trip and the actuation logic starts HPCI and RCIC injection. Thus, if the accident/break is such that the HPCI and RCIC systems can provide enough water to raise the reactor vessel water level above Level 2, the HPCI and RCIC trip/actuation logic is designed to allow the system to automatically maintain level between Level 2 and

Level 8 with no operator intervention (until these systems isolate on their steam supply line low pressure signal). If the accident/break is such that HPCI and RCIC cannot provide enough water to maintain level, then the ADS and low pressure ECCS (CSS and LPCI) are initiated when the indicated reactor vessel water level drops to Level 1 (+31.8 inches from the top of the active fuel) and the reactor vessel pressure is reduced so that low pressure ECCS can inject. (Note that both CSS and LPCI also initiate on high drywell pressure, but cannot inject until the reactor vessel pressure is reduced to low pressure.) Once the low pressure systems are initiated, HPCI and RCIC are not needed, although they would continue to inject (assuming the vessel pressure was high enough to drive the turbines) unless the reactor vessel water level recovered sufficiently to initiate the Level 8 trip.

4. When the reactor vessel water level is above Level 8, the HPCI and RCIC systems stay in a tripped configuration and cannot be manually initiated as long as the Level 8 trip signal is present. However, once the level drops below Level 8 and the Level 8 trip signal lifts, the systems can be manually initiated by the operator before auto-initiation at Level 2. Once the level decreases below Level 8, the high reactor vessel water level HPCI Level 8 seal-in can be cleared by pushing the manual reset button, and the HPCI system can then be manually initiated, assuming the HPCI turbine is in the standby mode. There is no seal-in circuit for the RCIC Level 8 trip, so once the level decreases below Level 8 and the Level 8 trip signal lifts, the RCIC system can be manually initiated, assuming the RCIC turbine is in the standby mode. For normal system operation, manual action is not required, and the systems automatically cycle and maintain the reactor vessel water level between Level 2 and Level 8. However, the systems can be manually initiated between Level 2 and Level 8 if required, as described above.
5. When the HPCI and RCIC systems are injecting between Level 2 and Level 8, the systems can be manually stopped regardless of what level trip signals are present. HPCI can be manually stopped by pushing the HPCI trip push button (and turning off the HPCI auxiliary oil pump), and RCIC can be manually stopped by pushing the RCIC trip push button.
6. The HPCI system is also initiated by the high drywell pressure LOCA actuation signal, and the TS state that HPCI should be available for dome pressures as low as 150 psig. So the wide range off-calibration Level 8 trip also affects the TS related to high drywell pressure HPCI initiation. Functionally, HPCI is only required to maintain sufficient water inventory in the reactor, and HPCI initiation is not required until the reactor vessel water level reaches Level 2. Therefore, initiation of HPCI on high drywell pressure is not required until the reactor vessel water level reaches Level 2, and because the wide range off-calibration condition does not affect reaching Level 2, the unavailability of the injection function of HPCI on high drywell pressure is not a safety concern. If a LOCA occurs, HPCI is automatically initiated on either low-low reactor vessel water level or high drywell pressure, but once initiated, the HPCI cycles on and off between Level 2 and Level 8 automatically regardless of whether the high drywell pressure trip is on or off. Manual initiation can be performed if required as described above (Section 4.1 Item #4). Automatic HPCI injection on high drywell pressure would not be available when the Level 8 trip is sealed-in due to off-calibration low pressure operation. The LOCA mitigation analysis of record (Reference 7.8) at full power and high dome

pressure takes credit for the high drywell pressure trip. However, based on the previous discussion regarding the sufficiency of the HPCI response to reaching the Level 2 signal, for low pressure conditions, the availability of the high drywell pressure signal can be ignored and still conclude that sufficient water level will be available in the core to avoid uncovery of the top of the active fuel (see additional discussion specific to high drywell pressure later in Section 4.3).

4.2 HPCI and RCIC Performance at Low Pressure

The function of the HPCI and RCIC systems is to provide make-up coolant at high reactor pressure conditions to prevent core uncovery when the reactor vessel water level is low. The functional pressure range for the HPCI and RCIC systems overlaps the operational range of the low pressure systems (i.e., CSS and LPCI) as well as the safety relief valve overpressure setpoints. While the HPCI and RCIC systems are primarily designed to operate effectively at near rated operating conditions, they are also effective near the low end of their operating pressure range at mitigating coolant losses from decay heat (RCIC) and small leaks or vessel line breaks (HPCI). The following discussion addresses three scenarios that demonstrate the adequacy of the HPCI and RCIC performance considering the wide range level instrumentation behavior. These three scenarios are: 1) licensing basis LOCA analyses, 2) licensing basis loss of feedwater flow analyses, and 3) loss of inventory under low pressure start-up and shut-down operations.

1. For the licensing basis large break LOCA analysis (Reference 7.8), the HPCI system, which is most effective for small breaks, is disabled by the limiting assumed single failure (the RCIC system is not credited in the LOCA analysis). So for this case, the off-calibration of the wide range level instrumentation and the delay of HPCI injection at low pressure are of no consequence. For the small break cases where the HPCI system may be credited in the LOCA analysis, the consequences of off-calibration of the wide range level instrumentation at low pressure is not significant because the mass of water that provides the core cooling is unaffected by the density differences and so the core cooling analysis results would not be significantly affected. The Level 2 initiation is still available to ensure that the top of the active fuel would not be reached as a result of mass inventory lost through the break such that there would be no core uncovery. Therefore, no appreciable heat up of the core would be expected and no Peak Cladding Temperature (PCT) transient as relevant to 10 CFR 50.46 acceptance criteria would be predicted at these low pressure conditions. For larger break sizes, where the vessel depressurizes faster, the mitigation capability of HPCI is minimal and instead the low pressure ECCS systems take over to ensure core cooling. For these cases, the consequences of off-calibration of the wide range level instrumentation at low pressure are not significant and would not affect the core cooling analysis results.
2. For the licensing basis loss of feedwater flow analyses at rated conditions (UFSAR (Reference 7.1) Section 15.2.7), following a reactor scram, the mitigation by the RCIC and HPCI systems is demonstrated to be effective in preventing core uncovery and actuation of the ADS and low pressure ECCS at Level 1. Because there is no wide range off-calibration condition at rated pressure, the low pressure wide range level off-

calibration behavior is not of concern for the short-term. However, for the long-term mitigation following the event, as the vessel is depressurized, the RCIC and HPCI systems maintain the level consistent with the wide range level indication as described previously, and there would be no core cooling or core uncovery concerns. Note that the high drywell pressure signal would not occur and is not applicable for this event.

3. When the plant is in start-up or shut-down low pressure conditions, and an assumed loss of normal make-up flow or water inventory loss causes a reactor vessel water level decrease, the HPCI and RCIC systems would be initiated on low-low reactor vessel water level (Level 2) in a similar way as in the case of the licensing basis LOCA or loss of feedwater flow events described above. However, because the initial power conditions at low pressure would be in the 0 to 2% level plus decay heat, and more energy is required to boil the water at low pressure, the HPCI and RCIC systems provide more than enough water to mitigate the event and are more effective at providing core cooling than either the licensing basis LOCA or loss of feedwater flow events initiated at rated power and high pressure.

Therefore, the consequences of wide range reactor vessel water level off-calibration do not lead to a more severe reactor condition when low pressure conditions are considered. The effect of pressure on water density results in comparable mass inventory above the lower instrument tap; therefore, the wide range off-calibration condition has a minimal effect on the reactor water inventory available for core cooling.

4.3 <u>HPCI Discussion Specific to the High Drywell Pressure Initiation Function</u>

Automatic actuation of the HPCI system on the high drywell pressure signal is not required at low (150 to 600 psig) reactor pressures when it may not be available because of a Level 8 trip, in order to satisfy HPCI system safety functions. The ECCS, including the HPCI system, are actuated on either of two separate and diverse indications of a pipe break LOCA: high drywell pressure or low-low reactor vessel water level. The high drywell pressure is the leading LOCA indicator, i.e., the high drywell pressure actuation occurs before the low-low reactor vessel water level (Level 2) actuation. Phenomenologically, there is no need for any of the ECCS, including HPCI, to be actuated on the earlier of the LOCA indications. The ECCS-LOCA analysis of record (Reference 7.8) takes credit for the earlier high drywell actuation of the ECCS in the determination of the licensing basis PCT for compliance with the 10 CFR 50.46 acceptance criteria. The analysis of record assumes a full power initial condition. For a LOCA event initiating at low reactor pressures, HPCI automatically actuates and injects into the vessel when the wide range indicated level reaches the Level 2 low-low level initiation setpoint, with or without the presence of the high drywell pressure actuation. This low reactor pressure case is shown by methodology to be bounded by the full power cases, and is not included in the ECCS-LOCA analysis. In this sense, for a LOCA event initiating at low reactor pressures, the HPCI system initiation on Level 2 is sufficient, suitable with regard to the HPCI actuation assumptions in the ECCS-LOCA analysis of record. This is relevant only for small break LOCA scenarios. For design bases accident breaks, a single active failure assumption is applied which has the effect of removing HPCI from being credited in the analysis. For Fermi 2, with a small break size being limiting for the ECCS-LOCA analysis for 10 CFR 50.46 compliance, then for low pressure conditions, automatic actuation of the HPCI system on the high drywell pressure signal is not required in order to satisfy HPCI system safety functions.

The ECCS-LOCA analysis of record for 10 CFR 50.46 compliance was performed assuming the normal operating conditions of full core thermal power and normal reactor vessel pressure. This analysis is bounding for LOCAs that initiate at low core power levels and reactor pressures in general because the low initial core power results in a much lower core heat-up rate compared to the heat-up rate for the full power condition, and the low initial vessel pressures result in a much lower break mass and energy loss rate for a given break size and a much shorter time for the vessel to depressurize to the point when the low pressure ECCS can inject. In addition, specific to the limiting small break sizes of concern from the analysis of record, the previous discussion concluded that there will not be any core uncovery. With a covered core, and sufficient cooling, such an event would not be expected to result in core heat up, or any appreciable cladding temperature. For these reasons, the ECCS LOCA analysis of record is bounding for LOCAs that initiate at low reactor pressure conditions.

The ECCS low-level initiation signals come from the wide range reactor level instrumentation which, because of the off-calibration conditions, indicate a higher water level than is actually in the reactor vessel when the reactor pressure is low. At a reactor vessel pressure of 150 psig, the actual reactor vessel water level is approximately +94 inches (approximately 17 inches below the Level 2 setpoint) when the wide range indicated level reaches the Level 2 setpoint. However, the actual liquid mass inventory in the vessel is more than the liquid mass inventory in the vessel at Level 2 for the LOCA event starting at normal full power operating conditions. The increase in liquid mass inventory at low reactor pressure is due to the fact that the power level in the core is very low and there is very little steam being produced. At full power, steam makes up approximately 15% of the mass flow through the core, upper plenum, and separator standpipe regions below the reactor vessel water level. At very low powers, this steam volume is filled with liquid mass. The difference between the indicated level in the vessel and the actual level in the vessel does not reflect a change in the liquid mass inventory in the downcomer region of the vessel because the level indication is a function of the total mass above the variable leg level tap elevation (approximately a function of liquid density times height). This makes the level indication effectively self-compensating with respect to tracking the liquid mass inventory. Therefore, there is approximately the same liquid mass in the downcomer region at the same indicated level, regardless of the vessel pressure conditions.

As the LOCA event proceeds, the low initial reactor vessel pressure results in a much lower break mass and energy loss rate for a given break size and a much shorter time required for the vessel to depressurize to the point when the low pressure ECCS can inject. The HPCI system was sized to effectively quench the steam in the vessel and rapidly depressurize the vessel to allow the low pressure ECCS to inject without the aid of the ADS. For a LOCA event initiating at low reactor pressure, HPCI operates for only a very brief period before the vessel depressurizes below the lower end of the HPCI operating pressure range (i.e., 150 psig), which limits the contribution of the HPCI in mitigating the event.

For these reasons, the ECCS-LOCA analysis of record at full power and normal operating pressure is bounding for a LOCA in the 150 to 600 psig range, and automatic actuation of the HPCI system on the high drywell pressure signal is not required for the HPCI to perform its system safety functions in mitigating the consequences of a LOCA initiating at low reactor pressure.

4.4 Conclusion

The proposed changes make the Fermi 2 TS consistent with the plant design and licensing basis. Further, they clarify that the required injection functions of the HPCI (high drywell pressure and manual) and RCIC (manual) actuation instrumentation are not required to be operable below 600 psig, and that the indications of high reactor vessel water level due to instrumentation design and calibration requirements do not affect the safe operation of the plant.

5.0 REGULATORY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

The following regulatory requirements have been considered.

10 CFR 50.36:

10 CFR, Section 50.36, "Technical specifications," in which the Commission established its regulatory requirements related to the contents of the TS. Specifically, 10 CFR 50.36(c)(2) states, in part, "*Limiting conditions for operation are the lowest functional capability or performance levels of equipment required for safe operation of the facility.*"

The proposed changes to the HPCI and RCIC actuation instrumentation requirements do not affect compliance with these regulations.

10 CFR 50 Appendix A:

The applicable 10 CFR Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," was considered as follows:

> *Criterion 13 – Instrumentation and control. Instrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety, including those variables and systems that can affect the fission process, the integrity of the reactor core, the reactor coolant pressure boundary, and the containment and its associated systems. Appropriate controls shall be provided to maintain these variables and systems within prescribed operating ranges.*

The proposed changes would retain the necessary safety function on low-low reactor vessel water level at reactor coolant system pressures below 600 psig because the measurement condition in reactor vessel water level decreases as the reactor vessel water level decreases and actuation of HPCI and RCIC would still occur.

5.2 Precedent

There are two very recent examples of domestic BWRs that have submitted license amendment requests and received NRC approval to add footnotes indicating that the injection functions of "Drywell Pressure – High" for HPCI and "Manual Initiation" for HPCI and RCIC are not required to be operable under low reactor pressure conditions. These plants were:

- Limerick – submitted in April 2016 (Reference 7.5)
- Nine Mile Point – submitted and approved in November 2016 (References 7.6 & 7.7)

In addition, a similar change, to add a footnote to the High Pressure Core Spray system actuation instrumentation TS indicating that the injection functions of Drywell Pressure – High and Manual Initiation are not required to be operable when the indicated reactor vessel water level on the wide range instrument is greater than Level 8 coincident with low reactor pressure conditions, was requested by Mississippi Power & Light Company for Grand Gulf Nuclear Station, Unit 1 and was approved by the NRC in 1983 (References 7.9 and 7.10), and then again in 1986 (References 7.11 and 7.12). The 1983 change was initially a one-time change which was made permanent in 1986.

5.3 No Significant Hazards Consideration

DTE has concluded that the proposed changes to the Fermi 2 TS to add footnotes indicating that the injection functions of "Drywell Pressure – High" for HPCI and "Manual Initiation" for HPCI and RCIC are not required to be operable under low reactor pressure conditions do not involve a Significant Hazards Consideration. In support of this determination, an evaluation of each of the three standards, set forth in 10 CFR 50.92, "Issuance of amendment," is provided below.

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

   Response: No.

   The proposed changes involve the addition of clarifying footnotes to the HPCI and RCIC actuation instrumentation TS to reflect the as-built plant design and operability requirements of HPCI and RCIC instrumentation as described in the Fermi 2 UFSAR.

   HPCI is an initiator of the increase in reactor coolant inventory accident in UFSAR (Reference 7.1) Section 15.5.1. However, the accident assumes inadvertent manual startup of HPCI. The change being requested in this amendment is administrative in nature and does not make any changes to the HPCI system or procedures that would increase the probability for inadvertent manual startup of HPCI. RCIC is not an initiator of any accident previously evaluated. As a result, the probability of any accident previously evaluated is not increased. In addition, the manual initiation of HPCI and RCIC are not credited to mitigate the consequences of design basis accidents or transients within the current Fermi 2 design and licensing basis and automatic actuation of the HPCI system on the high drywell pressure signal is not required for the HPCI to perform its system safety functions in mitigating the consequences of a LOCA initiating at low reactor pressure.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

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

   Response: No.

   The proposed changes do not alter the protection system design, create new failure modes, or change any modes of operation. The proposed changes do not involve a physical alteration of the plant, and no new or different kind of equipment will be installed. Consequently, there are no new initiators that could result in a new or different kind of accident.

   Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

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

   Response: No.

   The proposed changes have no adverse effect on plant operation. The plant response to the design basis accidents does not change. The proposed changes do not adversely affect existing plant safety margins or the reliability of the equipment assumed to operate in the safety analyses. There is no change being made to safety analysis assumptions, safety limits or limiting safety system settings that would adversely affect plant safety as a result of the proposed changes.

   Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

5.4 Conclusion

There are no changes being proposed in this license amendment request such that commitments to applicable regulatory requirements and guidance documents described above would come into question. The evaluations documented above confirm that DTE will continue to comply with all applicable regulatory requirements. In conclusion, based on the considerations discussed above, (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 NRC'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.

Based on the above, DTE concludes that the proposed change 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.

6.0 ENVIRONMENTAL CONSIDERATION

These proposed changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, in accordance with 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 REFERENCES

7.1 Fermi 2 Updated Final Safety Analysis Report, Revision 20, dated May 2016 (ML16165A442)

7.2 Appendix A to Renewed Facility Operating License No. NPF-43, “Technical Specifications,” dated December 15, 2016 (ML16270A531)

7.3 Fermi 2 Technical Specification Bases, Revision 69, dated December 15, 2016

7.4 Letter from U. S. Nuclear Regulatory Commission to Exelon, “Limerick Generating Station – NRC Integrated Inspection Report 05000352/2015001 and 05000353/2015001,” dated May 14, 2015 (ML15133A242)

7.5 Letter from Exelon (Limerick) to U. S. Nuclear Regulatory Commission, “License Amendment Request - Proposed Changes to the High Pressure Coolant Injection System and Reactor Core Isolation Cooling System Actuation Instrumentation Technical Specifications,” dated April 4, 2016 (ML16095A275)

7.6 Letter from Exelon (Nine Mile Point 2) to U. S. Nuclear Regulatory Commission, “Emergency License Amendment Request - Proposed Changes to the High Pressure Coolant Injection System and Reactor Core Isolation Cooling System Actuation Instrumentation Technical Specifications,” dated November 26, 2016 (ML16333A001)

7.7 Letter from U. S. Nuclear Regulatory Commission to Exelon, “Nine Mile Point Nuclear Station, Unit 2 - Issuance of Amendment Regarding High Pressure Core Spray System and Reactor Core Isolating Cooling System Actuation Instrumentation Technical Specifications (Emergency Circumstances),” dated November 29, 2016 (ML16333A000)

7.8 Letter from DTE to U. S. Nuclear Regulatory Commission, NRC-17-0016, "Submittal of Plant Specific Emergency Core Cooling System (ECCS) Evaluation Model Reanalysis," dated February 13, 2017 (ML17045A668 / ML17045A669)

7.9 Letter from L. F. Dale, Mississippi Power & Light Company, to H. R. Denton, U. S. Nuclear Regulatory Commission, "Transmittal of Proposed Changes to Grand Gulf Technical Specifications," dated August 1, 1983.

7.10 Letter from A. Schwencer, U.S. Nuclear Regulatory Commission, to J. P. McGaughy, Mississippi Power & Light Company, "Amendment No. 10 to Facility Operating License No. NPF-13 - Grand Gulf Nuclear Station, Unit 1," dated September 23, 1983.

7.11 Letter from O. D. Kingsley, Jr., Mississippi Power & Light Company, to H. R. Denton, U. S. Nuclear Regulatory Commission, "Proposed amendment to the Operating License," dated January 29, 1986.

7.12 Letter from L. L. Kintner, U. S. Nuclear Regulatory Commission, to O. D. Kingsley, Jr., Mississippi Power & Light Company, "Change to Technical Specifications and Operating License Condition," dated October 17, 1986.

Enclosure 2 to
NRC-17-0010

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

License Amendment Request to Revise Technical Specifications
for Emergency Core Cooling System Instrumentation
and Reactor Core Isolation Cooling System Instrumentation

Marked-up Pages of Existing Fermi 2 TS

Table 3.3.5.1-1 (page 3 of 5)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. High Pressure Coolant Injection (HPCI) System					
a. Reactor Vessel Water Level - Low Low, Level 2	1, $2^{(d)}$, $3^{(d)}$	4	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ 103.8 inches
b. Drywell Pressure - High	1, 2~~(d)~~(e), 3~~(d)~~(e)	4	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ 1.88 psig
c. Reactor Vessel Water Level - High, Level 8	1, $2^{(d)}$, $3^{(d)}$	2	C	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ 219 inches
d. Condensate Storage Tank Level - Low	1, $2^{(d)}$, $3^{(d)}$	2	D	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ 0 inches
e. Suppression Pool Water Level - High	1, $2^{(d)}$, $3^{(d)}$	2	D	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ 5.0 inches
f. Manual Initiation	1, 2~~(d)~~(e), 3~~(d)~~(e)	$1^{(c)}$	C	SR 3.3.5.1.6	NA

(continued)

(c) Individual component controls.

(d) With reactor steam dome pressure > 150 psig.

(e) The injection functions of Drywell Pressure - High and Manual Initiation are not required to be OPERABLE with reactor steam dome pressure less than 600 psig.

Table 3.3.5.2-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level – Low Low, Level 2	4	B	SR 3.3.5.2.1 SR 3.3.5.2.2 SR 3.3.5.2.3 SR 3.3.5.2.4 SR 3.3.5.2.5	≥ 103.8 inches
2. Reactor Vessel Water Level – High, Level 8	2	C	SR 3.3.5.2.1 SR 3.3.5.2.2 SR 3.3.5.2.3 SR 3.3.5.2.4 SR 3.3.5.2.5	≤ 219 inches
3. Condensate Storage Tank Level – Low	2	D	SR 3.3.5.2.1 SR 3.3.5.2.2 SR 3.3.5.2.3 SR 3.3.5.2.4 SR 3.3.5.2.5	≥ 0 inches
4. Manual Initiation (a)	1 per valve	C	SR 3.3.5.2.6	NA

(a) The injection function of Manual Initiation is not required to be OPERABLE with reactor steam dome pressure less than 600 psig.

Enclosure 3 to
NRC-17-0010

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

License Amendment Request to Revise Technical Specifications for Emergency Core Cooling System Instrumentation and Reactor Core Isolation Cooling System Instrumentation

Clean Pages of Fermi 2 TS with Changes Incorporated

Table 3.3.5.1-1 (page 3 of 5)
Emergency Core Cooling System Instrumentation

FUNCTION	APPLICABLE MODES OR OTHER SPECIFIED CONDITIONS	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
3. High Pressure Coolant Injection (HPCI) System					
a. Reactor Vessel Water Level — Low Low, Level 2	1, $2^{(d)}$, $3^{(d)}$	4	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ 103.8 inches
b. Drywell Pressure — High	1, $2^{(e)}$, $3^{(e)}$	4	B	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ 1.88 psig
c. Reactor Vessel Water Level — High, Level 8	1, $2^{(d)}$, $3^{(d)}$	2	C	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ 219 inches
d. Condensate Storage Tank Level — Low	1, $2^{(d)}$, $3^{(d)}$	2	D	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≥ 0 inches
e. Suppression Pool Water Level — High	1, $2^{(d)}$, $3^{(d)}$	2	D	SR 3.3.5.1.1 SR 3.3.5.1.2 SR 3.3.5.1.3 SR 3.3.5.1.4 SR 3.3.5.1.5	≤ 5.0 inches
f. Manual Initiation	1, $2^{(e)}$, $3^{(e)}$	$1^{(c)}$	C	SR 3.3.5.1.6	NA

(continued)

(c) Individual component controls.

(d) With reactor steam dome pressure > 150 psig.

(e) The injection functions of Drywell Pressure – High and Manual Initiation are not required to be OPERABLE with reactor steam dome pressure less than 600 psig.

Table 3.3.5.2-1 (page 1 of 1)
Reactor Core Isolation Cooling System Instrumentation

FUNCTION	REQUIRED CHANNELS PER FUNCTION	CONDITIONS REFERENCED FROM REQUIRED ACTION A.1	SURVEILLANCE REQUIREMENTS	ALLOWABLE VALUE
1. Reactor Vessel Water Level – Low Low, Level 2	4	B	SR 3.3.5.2.1 SR 3.3.5.2.2 SR 3.3.5.2.3 SR 3.3.5.2.4 SR 3.3.5.2.5	≥ 103.8 inches
2. Reactor Vessel Water Level – High, Level 8	2	C	SR 3.3.5.2.1 SR 3.3.5.2.2 SR 3.3.5.2.3 SR 3.3.5.2.4 SR 3.3.5.2.5	≤ 219 inches
3. Condensate Storage Tank Level – Low	2	D	SR 3.3.5.2.1 SR 3.3.5.2.2 SR 3.3.5.2.3 SR 3.3.5.2.4 SR 3.3.5.2.5	≥ 0 inches
4. Manual Initiation[(a)]	1 per valve	C	SR 3.3.5.2.6	NA

(a) The injection function of Manual Initiation is not required to be OPERABLE with reactor steam dome pressure less than 600 psig.

Enclosure 4 to
NRC-17-0010

Fermi 2 NRC Docket No. 50-341
Operating License No. NPF-43

License Amendment Request to Revise Technical Specifications
for Emergency Core Cooling System Instrumentation
and Reactor Core Isolation Cooling System Instrumentation

Marked-up Pages of Existing Fermi 2 TS Bases (For Information Only)

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level – Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level – Low Low, Level 2 Allowable Value is high enough such that for complete loss of feedwater flow, the Reactor Core Isolation Cooling (RCIC) System flow with HPCI assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Reactor Vessel Water Level – Low Low Low, Level 1.

Four channels of Reactor Vessel Water Level – Low Low, Level 2 Function are required to be OPERABLE only when HPCI is required to be OPERABLE to ensure that no single instrument failure can preclude HPCI initiation. Refer to LCO 3.5.1 for HPCI Applicability Bases.

3.b. Drywell Pressure – High

High pressure in the drywell could indicate a break in the RCPB. The HPCI System is initiated upon receipt of the Drywell Pressure – High Function in order to minimize the possibility of fuel damage. The Drywell Pressure – High Function, along with the Reactor Water Level – Low Low, Level 2 Function, is directly assumed in the analysis of the recirculation line break (Ref. 4). The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

High drywell pressure signals are initiated from four pressure transmitters that sense drywell pressure. The Allowable Value was selected to be as low as possible to be indicative of a LOCA inside primary containment.

, except when reactor steam dome pressure is less than 600 psig,

Four channels of the Drywell Pressure – High Function are required to be OPERABLE when HPCI is required to be OPERABLE to ensure that no single instrument failure can preclude HPCI initiation. Refer to LCO 3.5.1 for the Applicability Bases for the HPCI System.

The injection function of Drywell Pressure - High is not required to be OPERABLE when reactor steam dome pressure is less than 600 psig since it may be inhibited in that pressure range by Reactor Vessel Water Level - High, Level 8.

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Two channels of Suppression Pool Water Level — High Function are required to be OPERABLE only when HPCI is required to be OPERABLE to ensure that no single instrument failure can preclude HPCI swap to suppression pool source. Refer to LCO 3.5.1 for HPCI Applicability Bases.

3.f. Manual Initiation

The Manual Initiation channel provides manual initiation capability by means of individual component controls. There is one manual initiation channel for the HPCI System.

The Manual Initiation Function is not assumed in any accident or transient analyses in the UFSAR. However, the Function is retained for overall redundancy and diversity of the HPCI function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of individual controls. The Manual Initiation Function is required to be OPERABLE only when the HPCI System is required to be OPERABLE. Refer to LCO 3.5.1 for HPCI Applicability Bases.

The injection function of Manual Initiation is not required to be OPERABLE when reactor steam dome pressure is less than 600 psig since it may be inhibited in that pressure range by Reactor Vessel Water Level - High, Level 8.

, except when reactor steam dome pressure is less than 600 psig

Automatic Depressurization System

4.a, 5.a. Reactor Vessel Water Level — Low Low Low, Level 1

Low RPV water level indicates that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, ADS receives one of the signals necessary for initiation from this Function. The Reactor Vessel Water Level — Low Low Low, Level 1 is one of the Functions assumed to be OPERABLE and capable of initiating the ADS during the accident analyzed in Reference 1. The core cooling function of the ECCS, along with the scram action of the RPS, ensures that the fuel peak cladding temperature remains below the limits of 10 CFR 50.46.

Reactor Vessel Water Level — Low Low Low, Level 1 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel. Four channels of

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

The individual Functions are required to be OPERABLE in MODE 1, and in MODES 2 and 3 with reactor steam dome pressure > 150 psig since this is when RCIC is required to be OPERABLE, except as noted for the Manual Initiation Function. (Refer to LCO 3.5.3 for Applicability Bases for the RCIC System.)

The specific Applicable Safety Analyses, LCO, and Applicability discussions are listed below on a Function by Function basis.

1. Reactor Vessel Water Level – Low Low, Level 2

Low reactor pressure vessel (RPV) water level indicates that normal feedwater flow is insufficient to maintain reactor vessel water level and that the capability to cool the fuel may be threatened. Should RPV water level decrease too far, fuel damage could result. Therefore, the RCIC System is initiated at Level 2 to assist in maintaining water level above the top of the active fuel.

Reactor Vessel Water Level – Low Low, Level 2 signals are initiated from four level transmitters that sense the difference between the pressure due to a constant column of water (reference leg) and the pressure due to the actual water level (variable leg) in the vessel.

The Reactor Vessel Water Level – Low Low, Level 2 Allowable Value is set high enough such that for complete loss of feedwater flow, the RCIC System flow with high pressure coolant injection assumed to fail will be sufficient to avoid initiation of low pressure ECCS at Level 1.

Four channels of Reactor Vessel Water Level – Low Low, Level 2 Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC initiation. Refer to LCO 3.5.3 for RCIC Applicability Bases.

2. Reactor Vessel Water Level – High, Level 8

High RPV water level indicates that sufficient cooling water inventory exists in the reactor vessel such that there is no danger to the fuel. Therefore, the Level 8 signal is used to close the RCIC steam supply, steam supply bypass, and cooling water supply valves to prevent overflow into the

BASES

APPLICABLE SAFETY ANALYSES, LCO, and APPLICABILITY (continued)

Two channels of Condensate Storage Tank Level – Low Function are available and are required to be OPERABLE when RCIC is required to be OPERABLE to ensure that no single instrument failure can preclude RCIC swap to suppression pool source. Refer to LCO 3.5.3 for RCIC Applicability Bases.

4. Manual Initiation

The Manual Initiation channel provides manual initiation capability to individual valves. There is one manual initiation channel for the RCIC System.

The Manual Initiation Function is not assumed in any accident or transient analyses in the UFSAR. However, the Function is retained for overall redundancy and diversity of the RCIC function as required by the NRC in the plant licensing basis.

There is no Allowable Value for this Function since the channel is mechanically actuated based solely on the position of the valve control. One channel of Manual Initiation is required to be OPERABLE when RCIC is required to be OPERABLE.

, except when reactor steam dome pressure is less than 600 psig. The injection function of Manual Initiation is not required to be OPERABLE when reactor steam dome pressure is less than 600 psig since it may be inhibited in that pressure range by Reactor Vessel Water Level - High, Level 8

ACTIONS

A Note has been provided to modify the ACTIONS related to RCIC System instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition discovered to be inoperable or not within limits will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable RCIC System instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable RCIC System instrumentation channel.