NUCLEAR ENERGY INSTITUTE

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April 4, 2003

Dr. William D. Beckner, Program Director
Operating Reactor Improvements Program
Division of Regulatory Improvement Programs
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001

SUBJECT: Forwarding of TSTF

PROJECT NUMBER: 689

Dear Dr. Beckner:

One NEI Technical Specification Task Force (TSTF) Traveler is enclosed for NRC consideration:

- TSTF-357, Revision 1 - Revision to TS 2.1.1.2, MCPR Safety Limit.

In a Staff Requirements memorandum dated June 25, 2002, the Commission approved the staff proposal in SECY-02-0081 associated with the NRC's performance goal of reducing unnecessary regulatory burden on power reactor licensees. To assist in the implementation of the staff proposal, known as the Reduction of Unnecessary Burden Initiative (RUBI), the NEI Licensing Action Task Force has undertaken a dialogue with the NRC Licensing Action Task Force. The focus of the dialogue is a table of potential RUBI licensing actions. One of the high-priority items in the table pertains to the Standard Technical Specification for the Minimum Critical Power Ratio (MCPR) safety limit for Boiling Water Reactors. Implementation of this item is being requested by means of NRC staff review and approval of the enclosed generic TSTF Traveler. Because this submittal is being made, in large part, to support NRC's implementation of generic regulatory improvements associated with the reduction of unnecessary regulatory burden, we request that its review by the NRC staff be exempt from fees in accordance with 10 CFR 170.11.

Please contact me at (202) 739-8081 (arp@nei.org) or Mike Schoppman at (202) 739-8011 (mas@nei.org) if you have any questions or need additional information.

Sincerely,

Anthony R. Pietrangelo

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Enclosure: TSTF-357, Revision 1

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Industry/TSTF Standard Technical Specification Change Traveler

Revision to TS 2.1.1.2, MCPR Safety Limit

NUREGs Affected: ☐ 1430 ☐ 1431 ☐ 1432 ☑ 1433 ☑ 1434

Classification: 2) Consistency/Standardization Recommended for CLIIP?: Yes

Priority: 1)High

Simple or Complex Change: Complex Correction or Improvement: Improvement

Industry Contact: Silko, Tom (802)258-4146 tsilko@entergy.com

See attached.

Revision History

OG Revision 0 Revision Status: Closed

Revision Proposed by: BWROG

Revision Description:
Original Issue

Owners Group Review Information

Date Originated by OG: 16-May-99

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 16-May-99

TSTF Review Information

TSTF Received Date: 09-Sep-99 Date Distributed for Review: 09-Aug-99

OG Review Completed: ☐ BWOG ☐ WOG ☐ CEOG ☑ BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 14-Oct-99

NRC Review Information

NRC Received Date: 20-Oct-99

NRC Comments:

12/14/99 - NRC wants the SL value in the SL. BWROG to evaluate an alternative.
1/10/00 - NRC will consider further.
2/11/00 - NRC has internal meeting 2/1/00 to decide next step. Will advise the BWROG of their decision.
3/7/2000 - NRC rejects. There must be a value in the Safety limits.

Final Resolution: Superceded by Revision Final Resolution Date: 11-Apr-00

TSTF Revision 1 Revision Status: Active Next Action: NRC

Revision Proposed by: BWROG

TSTF Revision 1 Revision Status: Active Next Action: NRC

Revision Description:
At a February 13, 2003 meeting between representatives of the BWROG and the NRC, the NRC stated that the SLMCPR meets criteria in 10 CFR 50.36 and cannot be taken out of the TS. The NRC did note that if an acceptance criteria rather than a limit could be developed in the TS, this might allow the cycle specific numerical value to be moved to the COLR. In response to this meeting, TSTF-357 is revised to restate the reactor core Safety Limit (SL) to establish a requirement that MCPR be maintained greater than the boiling avoidance limit such that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling for two recirculation loop and single recirculation loop operation. This revision moves the cycle-specific MCPR SL value used to meet the acceptance criteria currently in TS 2.1.1.2 to the Core Operating Limits Report (COLR).

Owners Group Review Information

Date Originated by OG: 20-Feb-03

Owners Group Comments:
(No Comments)

Owners Group Resolution: Approved Date: 26-Mar-03

TSTF Review Information

TSTF Received Date: 31-Mar-03 Date Distributed for Review: 31-Mar-03

OG Review Completed: ☑ BWOG ☑ WOG ☑ CEOG ☑ BWROG

TSTF Comments:

(No Comments)

TSTF Resolution: Approved Date: 02-Apr-03

NRC Review Information

NRC Received Date: 07-Apr-03

Affected Technical Specifications

S/A 2.1.1 Bases	Reactor Core SLs
2.1.1.2	SLs
5.6.5	Core Operating Limits Report (COLR)

1.0 Description

The Technical Specification Task Force (TSTF) proposes a revision to TS 2.1.1.2 to establish a requirement that the Minimum Critical Power Ratio (MCPR) be maintained greater than the boiling avoidance limit that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling for two recirculation loop and single recirculation loop operation.

2.0 Proposed Change

Reactor Core Safety Limits (SLs) TS 2.1.1.2 is revised to establish a requirement that MCPR be maintained greater than the boiling avoidance limit such that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling for two recirculation loop and single recirculation loop operation. The associated TS 2.1.1.2 Bases are being likewise modified. This TSTF also moves the cycle-specific MCPR SL number values currently in TS 2.1.1.2 to the Core Operating Limits Report (COLR). In concert, TS 5.6.5, COLR, is modified to specifically require that the number values of MCPR SL be included in the COLR and that they be determined in accordance with NRC-approved methods. This change is applicable to the Boiling Water Reactor (BWR) Standard Technical Specifications (STS) NUREG-1433 and NUREG-1434. See the attached mark-ups for the specific changes.

3.0 Background

Per 10 CFR 50.36(c)(1), SLs are limits upon important process variables found to be necessary to reasonably protect the integrity of certain physical barriers that guard against the uncontrolled release of radioactivity. The reactor fuel cladding, being one such radioactivity barrier, has Specified Acceptable Fuel Design Limits (SAFDLs), which conform to General Design Criterion 10, and which ensure the cladding barrier remains intact during all postulated operating scenarios. Because SAFDLs may involve limits or parameters that are not easily monitored in actual plant operation, surrogates are used that can be shown analytically to correspond to the SAFDL of interest and which are more easily monitored during plant operations. One such surrogate, currently included in BWR STS as TS 2.1.1.2, is the MCPR SL for two loop and single recirculation loop operation. As discussed in the current TS Bases for TS 2.1.1.2, MCPR SLs are established to satisfy the specific SAFDL that at least 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling during normal operation and abnormal operational transients. The use of the MCPR SL as a surrogate for the actual SAFDL conforms to the Staff’s guidance in Standard Review Plan (SRP) Sections 4.2 (Fuel System Design) and 4.4 (Thermal and Hydraulic Design).

Historically, early in BWR operating experience, the numerical values for MCPR SL seldom changed. Hence, it made a reasonable choice as a TS SL per 10 CFR 50.36, even though it was a surrogate. In more recent times, however, with the advent of modern core design and modeling methods, the calculated MCPR SL values have become cycle (i.e., core design) specific. As a result, it has become increasingly commonplace for BWR

Licensees to need a TS change to update this number value to account for changes in successive fuel cycles. This presents a considerable hardship to BWR Licensees due to the cost and resources expenditures associated with preparing and obtaining NRC approval of frequent, routine TS changes. MCPR SL values for the next operating cycle cannot be calculated until the reload core design is complete, which in some cases occurs 3 to 4 months prior to the start of the next refueling outage. This further taxes Licensee resources since the TS request must be prepared, reviewed, and submitted in an expedited manner.

Insofar as the reload core design process is concerned, it is advantageous to finalize the core design late in the current operating cycle, when the actual end-of-cycle fuel burn-up and energy needs for the next cycle can be better estimated. Following completion of the core design, the cycle-specific MCPR SL is calculated and reload transient analyses are run to determine the core thermal operating limits for the next cycle’s COLR. This is an iterative process since core design and thermal limits are interrelated and must be balanced for optimal fuel cycle performance and economics.

To provide sufficient time for approving TS changes, Licensees must submit amendment requests to allow reasonable time for NRC review, particularly for TS changes that are tied to restart from refueling outages (such as MCPR TS changes). Otherwise, Licensees risk not having the TS approved in time for the next cycle of operation. This need to submit the TS change early on (with a time allowance for Licensee internal TS preparation/approval and NRC review) can force an earlier finalization of core design activities than advantageous in relationship to fuel cycle core design schedules. If the cycle-specific MCPR SL numerical values were maintained in the COLR as proposed by this TSTF, additional flexibility would be afforded for improved fuel management since the schedule for completion of reload core design efforts would no longer be constrained by the need to make a TS submittal.

In some cases, to avoid TS changes, Licensees have opted to retain more conservative MCPR SLs in TS than would be otherwise required based on the cycle-specific core design. While this approach avoids the expenses of a TS submittal, there is a negative effect on fuel cycle economics due to operation with overly conservative core limits. It can also limit operating performance flexibility since less MCPR operating margin is available to the operator when establishing core rod patterns.

Plants performing mid-cycle outages to replace leaking fuel bundles would also benefit from this TSTF. The objective of these mid-cycle outages is to remove leaking bundles from the reactor core, which are then replaced with previously used fuel from the fuel storage pool inventory. Mid-cycle outages are expensive in terms of disruptions to operations and lost generation time, but are very beneficial in reducing contamination in the plant, which in turn reduces worker radiation dose and generation of radioactive waste. Depending on the number of leaking bundles being replaced, other fuel bundles may also be relocated (i.e., shuffled) within the core for core design purposes. Due to time constraints for core design activities coupled with licensee TS preparation and approval times, it is usually not practical to request mid-cycle TS revisions to change MCPR SL number values. As a result, the design analysis for the reconstituted reactor core has a built-in constraint to avoid changing the numeric MCPR SL values in TS. This situation significantly limits design flexibility in reconfiguring the core following removal and replacement of leaking fuel bundles. A better approach would be to permit core designers design the best core possible and update MCPR SL values in the COLR as needed.

All other BWR numeric core thermal limits have been previously relocated to the COLR in accordance with Generic Letter (GL) 88-16, “Removal Of Cycle-Specific Parameter Limits From Technical Specifications” (Reference 1). As stated in GL 88-16:

> “A number of Technical Specifications (TS) address limits associated with reactor physics parameters that generally change with each reload core requiring the processing of changes to TS to update these limits each fuel cycle. If these limits are developed using an NRC-approved methodology, the license amendment process is an unnecessary burden on the licensee and the NRC. An alternative to including the values of these cycle-specific parameters in individual specifications is provided and is responsive to industry and NRC efforts on improvements in TS.”

The TSTF committee believes that the MCPR SL number values, being a cycle-specific reactor physics parameter, calculated by an NRC-approved methodology, qualify, based upon the above, for relocation to the COLR.

It is noted that during the development of the STS, a proposal to relocate MCPR SL number values to the COLR in accordance with GL 88-16 was considered and was agreed to in principle as discussed in the letter dated August 8, 1989, from General Electric to NRC (Reference 2). The BWROG TSTF committee could not determine why this agreement was not carried through to fruition. Perhaps at the time, MCPR SL values were not changing with sufficient regularity to further pursue the STS change. At present, however, the high number of cycle-specific TS changes has prompted a renewal of the proposal to relocate the MCPR SL numeric values to the COLR. Therefore, this TSTF proposes the replacement of the cycle-specific MCPR SL numeric values in TS 2.1.1.2 with the boiling avoidance statistical criterion (99.9% of fuel rods avoiding the onset of transition boiling) on which the numeric values are based. This change, which would be of great benefit to the BWR Licensees, is technically justified and consistent with regulatory requirements as discussed in the next section.

4.0 Technical Analysis

When a SL is violated, per 10 CFR 50.36(c)(1), in addition to restoration of compliance to the limit and placing the plant in a safe condition (TS 2.2), subsequent plant restart is dependent upon full investigation of the circumstances and justification that continued operation of the facility is in compliance with all pertinent requirements. With this in mind, SLs are chosen such that their violation indicates that plant behavior was not as analyzed or more challenging to the physical fission product barriers than previously expected and therefore, warrants such stringent scrutiny. However, 10 CFR 50.36 is not specific as to whether such a SL is a primary parameter or a readily measurable, analytically-derived surrogate.

Fuel SLs are established such that SAFDLs are not exceeded during steady-state operation, normal operational transients, and abnormal operational transients. In accordance with SRP 4.2 and 4.4, MCPR SL is an acceptable surrogate for the SAFDL that 99.9% of the fuel rods would be expected to avoid boiling transition during reactor transients, and is derived by a statistical analysis to ensure that the SAFDL is met at an upper confidence level (95%). The actual numerical values for MCPR SL are calculated, typically by fuel vendors, on a unit/cycle specific basis, using NRC-approved methodology.

This TSTF proposes that, in place of the cycle-specific numeric values, the SL in TS 2.1.1.2 become the actual SAFDL that 99.9 % of the fuel rods in the core would not be expected to experience the onset of transition boiling. In concert, the MCPR SL number values are moved to the COLR. In simple terms, this TSTF substitutes the mathematical basis description for the MCPR SL in lieu of the actual numeric MCPR SL values. This statistical description has an added advantage of being independent of cycle-specific core designs, while still conforming to the SRP and §50.36 requirements.

As noted above, MCPR SLs are established such that SAFDLs are not exceeded during steady state operation, normal operational transients, and abnormal operational transients. As such, significant fuel damage is calculated not to occur if the limit is not violated. Analytically, this is demonstrated by establishing limits such that 99.9% of the fuel rods would be expected to avoid boiling transition during reactor transients. Because boiling transition is not directly observable, a stepback approach is used to establish a corresponding MCPR operating limit (MCPR OL). In simple terms, the MCPR OL is the calculated MCPR SL value described above plus a numeric adder determined by the core reload transient analyses. Since the MCPR OL is directly tied to the numeric value of MCPR SL, it is evident that MCPR SL is, for all practical purposes, a core thermal limit.

TS 3.2.2 (MCPR), specifies Limiting Conditions for Operation (LCO) for the MCPR and Surveillance Requirements (SRs) for monitoring the actual core MCPR against the MCPR maintained OL in the COLR (TS 5.6.5.a.3). Actual MCPR is periodically computed and compared against the MCPR OL by the plant process computer at a set frequency during steady state operation and is also monitored by operators during power changes. While MCPR SL is used to calculate the MCPR OL, it is the MCPR OLs which are entered into the process computer and used to actually monitor the core. Therefore, the proposed substitution of the 99.9% boiling avoidance criterion and associated relocation of MCPR SL numeric values to the COLR would have no impact on existing TS 3.2.2 requirements for actual monitoring of MCPR or the actions taken if the limits are exceeded.

Original BWR TS typically included the numeric values of several core thermal limits such as Average Planar Linear Heat Generation Rate (APLHGR), MCPR OL, and Linear Heat Generation Rate (LHGR). The numeric value of these thermal limits tended to vary cycle-to-cycle, and the inclusion of numeric values in the actual TS caused large numbers of cycle-specific core thermal limits TS change requests to be generated. In response to this situation, NRC issued Generic Letter (GL) 88-16, “Removal of Cycle-Specific Parameter Limits from the Technical Specifications” (Reference 1). In GL 88-16, NRC noted that the frequent core thermal limit TS changes were creating an administrative burden on both Licensees and the NRC. An alternative was offered to licensees in the GL to maintain the numeric values of these cycle-specific core thermal limits in a COLR program rather than individually in TS, provided that the core thermal limits were determined and maintained using NRC-approved methodologies. The thesis of this approach is that NRC would apply their technical expertise in reviewing and auditing the calculational methodology used in determining these limits, while permitting appropriate efficiency in implementing the cycle-specific limits.

The APLHGR and LHGR limits serve the same basic function as MCPR SL and its related MCPR OL in protecting fuel integrity, i.e., they are surrogates for other SAFDLs, such as 1% cladding strain. Limits on APLHGR ensure that fuel design limits are not exceeded during abnormal operational transients and that the peak cladding temperature during the postulated design basis loss of coolant accident does not exceed the limits specified in 10 CFR 50.46. LHGR is a measure of the heat generation rate of a fuel rod in a fuel assembly at any axial location. Limits on LHGR are specified to ensure that SAFDLs are not exceeded anywhere in the core during normal operation, including abnormal operational transients. As previously discussed, MCPR SL and its related MCPR OL are established such that fuel design limits are not exceeded during steady-state operation, normal operational transients, and abnormal operational transients. APLGHR, LHGR, and MCPR all have corresponding LCOs and SRs in the STS that require monitoring of the parameters against the limits maintained in the COLR.

In response to GL 88-16, utilities requested the addition of COLR TS provisions into their TS, which allowed Licensee maintenance of core thermal operating limits in the COLR rather than TS. COLR programs were later established in STS in NUREG-1433 (BWR-4) and NUREG-1434 (BWR-6) as TS 5.6.5 and were referenced in the individual core thermal limits LCOs and SRs in TS Section 3.2. The use of COLRs has been proven effective in conserving both Licensee and NRC resources while, at the same time, continuing NRC participation by requiring that only NRC-approved analysis methodologies be used in determining the core limits. Licensees are also required in TS 5.6.5.d to submit any revisions to the COLR, including any mid-cycle changes, to NRC. Hence, with the approval of this TSTF, NRC would be routinely informed of any changes to cycle-specific MCPR SL numeric values in the same manner already established by TS 5.6.5.d for core thermal limits changes.

In lieu of including specific numeric values in TS, this TSTF proposes the substitution of the actual definition of SAFDL used to ensure margin to nucleate boiling is established and maintained, i.e., the 99.9% criterion that fuel rods in the core would not be expected to experience the onset of transition boiling. This is a generic criteria common to all BWR fuels types and has the added advantage of not changing cycle-to-cycle. The use of this boiling avoidance limit to provide core protection is a well-established BWR figure of merit as discussed in SRP Section 4.4 and has been in use for many years. It represents the underlying analytical basis for the MCPR SL numeric value and is, therefore, a suitable SL. Accordingly, application of this criterion is a basic feature in the fuel vendor core limit methodology topicals such as Global Nuclear Fuels GESTAR II, NEDE-24011-P-A, "General Electric Standard Application for Reactor Fuel" and Framatome Advanced Nuclear Power ANF-524(P)(A), "ANF Critical Power Methodology for Boiling Water Reactors". These topicals, which have been reviewed and approved by NRC, provide a detailed description of methods used to generate the cycle-specific MCPR SL numeric values including the treatment of uncertainties to achieve the required 95% upper confidence level for establishing margin to avoid nucleate boiling.

The proposed use of the 99.9% boiling avoidance limit in TS 2.1.1.2 and the relocation of the MCPR SL numeric values to the COLR serves the underlying purpose of the regulatory requirements in that the methodology used to determine the actual numeric values is NRC-reviewed and approved, thus ensuring acceptable values are derived from such NRC-approved methods as required by GL 88-16. This restriction is specifically established by the proposed change to TS 5.6.5.b, which explicitly requires the use of approved methodology and that it be referenced in the COLR TS.

Licensees seeking to use a different NRC-approved methodology to determine MCPR SL, such as that associated with different fuel vendors, would be required to request NRC approval of a TS change to TS 5.6.5.b to reference the new methodology. Similarly, vendors seeking to change methodology must also request NRC approval by means of topical reports. Hence, NRC involvement in the process is maintained by this TSTF by virtue of NRC's role in the review and approval of the methodologies used to establish MCPR SL values. Additionally, under the current process, NRC resources are being tied-up in reviewing the details of multiple plant/cycle-specific TS changes. If the TSTF is approved, NRC processing of cycle-specific TS changes would no longer be required and regulatory focus could be more aptly applied to verifying the integrity of vendor methodologies being used to derive core thermal limits.

In summary, the proposed revision to TS 2.1.1.2 to establish a requirement that MCPRs be maintained greater than the boiling avoidance limit that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling and the relocation of the MCPR SL numeric values to the COLR simplifies the core reload licensing and design process while maintaining regulatory oversight, which is provided by the TS restriction requiring use of NRC-approved methodologies to demonstrate that margin to nucleate boiling is maintained.

5.0 Regulatory Analysis

A change to Boiling Water Reactor (BWR) Standard Technical Specifications (STS), Revision 2 of NUREG-1433 and NUREG-1434 is being proposed by the Technical Specifications Task Force (TSTF). Reactor Core Safety Limits TS 2.1.1.2 is revised to establish a requirement that Minimum Critical Power Ratio (MCPR) be maintained greater than the boiling avoidance limit that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling for two recirculation loop and single recirculation loop operation. This TSTF also moves the cycle-specific MCPR Safety Limits (SL) number values currently in TS 2.1.1.2 to the Core Operating Limit Report (COLR). In concert, TS 5.6.5, COLR, is modified to specifically require that the number values of MCPR SL be included in the COLR and that they be determined in accordance with NRC-approved methods.

5.1 No Significant Hazards Consideration

The TSTF has evaluated whether or not a significant hazards consideration is involved with the proposed generic change by focusing on the three standards set forth in 10 CFR 50.92, “Issuance of Amendment” as discussed below. In accordance with the criteria set forth in 10 CFR 50.92, the TSTF has evaluated these proposed STS changes and determined that they do not represent a significant hazards consideration. The following is provided in support of this conclusion.

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

   Response: No

   The proposed change is a programmatic and administrative change that does not physically alter plant systems, nor does it impact the performance of their functions. No new equipment is added nor is installed equipment being changed or operated in a different manner.

   The cycle-specific MCPR SL numeric limits currently contained in the SL TS will be replaced with the with a fuel cycle independent limit. The numeric values are relocated to the COLR, which will continue to be controlled by the Licensee programs and procedures that comply with TS 5.6.5. Transient analyses addressed in the Final Safety Analysis Report will continue to be performed in the same manner with respect to changes in the cycle-dependent parameters obtained from the use of NRC-approved reload design methodologies, which ensures that the transient evaluation of new reloads are bounded by previously accepted analyses.

   Therefore, the proposed TS change does not involve an 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

   Replacement of the numeric MCPR SL number values with the equivalent description of the MCPR SL has no influence or impact on, nor does it contribute in any way to the probability or consequences of transients or accidents. No plant equipment, function or plant operation will be altered as a result of this proposed change. The cycle-specific parameters are calculated using NRC-approved methods, as required by TS 5.6.5.b. The TS will continue to require operation within the core operating limits and appropriate actions will be required if these limits are exceeded, in accordance with TS 2.1, 2.2, and 3.2.2. The MCPR SL numerical value will be maintained in the COLR and appropriate actions are required by TS 2.2, if these limits are exceeded.

   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 change involve a significant reduction in a margin of safety?

   Response: No

   The margin of safety is not affected by the relocation of cycle-specific MCPR SL numeric values from the TS to the COLR. Appropriate measures exist to control the values of these cycle-specific limits since it is required by TS that only NRC-approved methods be used to determine the limits. The proposed change continues to require operation within the core thermal limits as obtained from NRC-approved reload design methodologies and the actions to be taken if a limit is exceeded remain unchanged, again, in accordance with existing TS.

   For these reasons, the proposed change does not involve a significant reduction in the margin of safety.

Based on the above, the TSTF 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.

5.2 Applicable Regulatory Requirements/Criteria

10 CFR 50.36 (c) (1) requires that SLs be included in TS. However, §50.36 is not specific as to whether this SL is the actual SAFDL or an easily-measured surrogate. Currently, the TS SL for the nucleate boiling fuel limit (TS 2.1.1.2), is satisfied by including the cycle-specific numeric values of MCPR SL. This TSTF proposes the substitution of the boiling avoidance limit that 99.9 % of the fuel rods in the core would not be expected to experience the onset of transition boiling for the numeric values and

that the MCPR SL numeric values be maintained in the COLR. This 99.9 % criterion is the underlying analytical basis for the MCPR SL and is a well-established criterion used in core design and NRC-approved analysis methodologies to determine the numeric values. Thus, it is a suitable SL, which has an added advantage of being a base criterion that does not change on cycle-by-cycle. In addition, the revised TS 5.6.5 restricts the analytical methods used to determine MCPR SL to those previously approved by NRC. Therefore, the proposed change is consistent with the objectives of 10 CFR 50.36.

Regarding regulatory history, GL 88-16 previously established a precedent and approach for the relocation of cycle-specific core thermal limits from TS to COLR programs. This was done to relieve the administrative burden on Licensees and NRC related to the frequent processing of TS changes due to changes in numeric values in core thermal limits resulting from cycle-specific reload analyses, which are performed using referenced, NRC-approved methodologies. Many Licensees have adopted COLRs and use of COLRs has been successful in greatly reducing burden, while at the same time maintaining regulatory oversight by virtue of requiring that only NRC-approved methodologies be used in deriving core thermal limits.

The relocation of the numeric MCPR SL numeric values to the COLR is consistent with objectives of GL 88-16, under which many BWR core thermal such as APHLGR and LHGR limits were relocated to the COLR. These core thermal limits, including MCPR SL and the related MCPR OL, all serve the same basic function in protecting fuel integrity during normal and transient plant operations. Therefore, the proposed change to allow the relocation of the MCPR SL numeric value, upon which the MCPR OL is based, to the COLR is consistent with the regulatory precedent established in GL 88-16 and is in keeping with established TS requirements for maintenance and monitoring of core thermal limits.

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 Commission’s regulations, and (3) the approval of the proposed change will not be inimical to the common defense and security or to the health and safety of the public.

6.0 Environmental Consideration

A review has determined that the proposed amendment would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed change does 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 individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

7.0 References

1. Generic Letter 88-16, “Removal of Cycle-Specific Parameters from Technical Specifications”, October 1988.

2. Letter from J. S. Charnley, General Electric, to M. W. Hodges, NRC dated August 8, 1989.

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 25% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:

MCPR shall be ≥ ~~[1.07] for two recirculation loop operation or ≥ [1.08] for~~ single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SAFETY LIMIT VIOLATIONS

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

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the boiling avoidance limit that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling for two recirculation loop and

5.6 Reporting Requirements

5.6.2 Annual Radiological Environmental Operating Report (continued)

environmental radiation measurements taken during the period pursuant to the locations specified in the table and figures in the ODCM, as well as summarized and tabulated results of these analyses and measurements [in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979]. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radiological Effluent Release Report

- NOTE -

[A single submittal may be made for a multiple unit station. The submittal shall combine sections common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.]

The Radioactive Effluent Release Report covering the operation of the unit during the previous year shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I, Section IV.B.1.

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

and MCPR Safety Limits

[The individual specifications that address core operating limits must be referenced here.]

5.6 Reporting Requirements

5.6.5 CORE OPERATING LIMITS REPORT (continued)

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

and MCPR Safety Limits

[Identify the Topical Report(s) by number and title or identify the staff Safety Evaluation Report for a plant specific methodology by NRC letter and date. The COLR will contain the complete identification for each of the TS referenced topical reports used to prepare the COLR (i.e., report number, title, revision, date, and any supplements).]

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heat up, cooldown, low temperature operation, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

[The individual specifications that address RCS pressure and temperature limits must be referenced here.]

b. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

[Identify the NRC staff approval document by date.]

c. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.

BASES

BACKGROUND (continued)

form. This weaker form may lose its integrity, resulting in an uncontrolled release of activity to the reactor coolant.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation and AOOs. The reactor core SLs are established to preclude violation of the fuel design criterion that an MCPR limit is to be established, such that at least 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling.

boiling avoidance

(MCPR SL)

The numeric values of the boiling avoidance limit (MCPR SL) are documented and maintained in the COLR for two recirculation loop and single recirculation loop operation.

The Reactor Protection System setpoints (LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"), in combination with the other LCOs, are designed to prevent any anticipated combination of transient conditions for Reactor Coolant System water level, pressure, and THERMAL POWER level that would result in reaching the MCPR limit.

2.1.1.1a Fuel Cladding Integrity [General Electric Company (GE) Fuel]

GE critical power correlations are applicable for all critical power calculations at pressures ≥ 785 psig and core flows ≥ 10% of rated flow. For operation at low pressures or low flows, another basis is used, as follows:

> Since the pressure drop in the bypass region is essentially all elevation head, the core pressure drop at low power and flows will always be > 4.5 psi. Analyses (Ref. 2) show that with a bundle flow of 28×10^3 lb/hr, bundle pressure drop is nearly independent of bundle power and has a value of 3.5 psi. Thus, the bundle flow with a 4.5 psi driving head will be > 28×10^3 lb/hr. Full scale ATLAS test data taken at pressures from 14.7 psia to 800 psia indicate that the fuel assembly critical power at this flow is approximately 3.35 MWt. With the design peaking factors, this corresponds to a THERMAL POWER > 50 % RTP. Thus, a THERMAL POWER limit of 25% RTP for reactor pressure < 785 psig is conservative.

2.1.1.1b Fuel Cladding Integrity [Advanced Nuclear Fuel Corporation (ANF) Fuel]

The use of the XN-3 correlation is valid for critical power calculations at pressures > 580 psig and bundle mass fluxes > 0.25×10^6 lb/hr-ft^2 (Ref. 3). For operation at low pressures or low flows, the fuel cladding integrity SL is established by a limiting condition on core THERMAL POWER, with the following basis:

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 25% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:

MCPR shall be ≥ ~~[1.07] for two recirculation loop operation or ≥ [1.08] for~~ single recirculation loop operation.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be ≤ 1325 psig.

2.2 SAFETY LIMIT VIOLATIONS

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs and

2.2.2 Insert all insertable control rods.

the boiling avoidance limit that 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling for two recirculation loop and

5.6.2 Annual Radiological Environmental Operating Report (continued)

environmental radiation measurements taken during the period pursuant to the locations specified in the table and figures in the ODCM, as well as summarized and tabulated results of these analyses and measurements [in the format of the table in the Radiological Assessment Branch Technical Position, Revision 1, November 1979]. In the event that some individual results are not available for inclusion with the report, the report shall be submitted noting and explaining the reasons for the missing results. The missing data shall be submitted in a supplementary report as soon as possible.

5.6.3 Radioactive Effluent Release Report

- NOTE -

[A single submittal may be made for a multiple unit station. The submittal shall combine sections common to all units at the station; however, for units with separate radwaste systems, the submittal shall specify the releases of radioactive material from each unit.]

The Radioactive Effluent Release Report covering the operation of the unit during the previous year shall be submitted prior to May 1 of each year in accordance with 10 CFR 50.36a. The report shall include a summary of the quantities of radioactive liquid and gaseous effluents and solid waste released from the unit. The material provided shall be consistent with the objectives outlined in the ODCM and Process Control Program and in conformance with 10 CFR 50.36a and 10 CFR Part 50, Appendix I, Section IV.B.1.

5.6.4 Monthly Operating Reports

Routine reports of operating statistics and shutdown experience shall be submitted on a monthly basis no later than the 15th of each month following the calendar month covered by the report.

5.6.5 CORE OPERATING LIMITS REPORT (COLR)

a. Core operating limits shall be established prior to each reload cycle, or prior to any remaining portion of a reload cycle, and shall be documented in the COLR for the following:

and MCPR
Safety Limits

[The individual specifications that address core operating limits must be referenced here.]

5.6.5 CORE OPERATING LIMITS REPORT (continued)

and MCPR Safety Limits

b. The analytical methods used to determine the core operating limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

[Identify the Topical Report(s) by number and title or identify the staff Safety Evaluation Report for a plant specific methodology by NRC letter and date. The COLR will contain the complete identification for each of the TS referenced topical reports used to prepare the COLR (i.e., report number, title, revision, date, and any supplements).]

c. The core operating limits shall be determined such that all applicable limits (e.g., fuel thermal mechanical limits, core thermal hydraulic limits, Emergency Core Cooling Systems (ECCS) limits, nuclear limits such as SDM, transient analysis limits, and accident analysis limits) of the safety analysis are met.

d. The COLR, including any midcycle revisions or supplements, shall be provided upon issuance for each reload cycle to the NRC.

5.6.6 Reactor Coolant System (RCS) PRESSURE AND TEMPERATURE LIMITS REPORT (PTLR)

a. RCS pressure and temperature limits for heatup, cooldown, low temperature operation, criticality, and hydrostatic testing as well as heatup and cooldown rates shall be established and documented in the PTLR for the following:

[The individual specifications that address RCS pressure and temperature limits must be referenced here.]

b. The analytical methods used to determine the RCS pressure and temperature limits shall be those previously reviewed and approved by the NRC, specifically those described in the following documents:

[Identify the NRC staff approval document by date.]

c. The PTLR shall be provided to the NRC upon issuance for each reactor vessel fluence period and for any revision or supplement thereto.

BASES

BACKGROUND (continued)

cladding water (zirconium water) reaction may take place. This chemical reaction results in oxidation of the fuel cladding to a structurally weaker form. This weaker form may lose its integrity, resulting in an uncontrolled release of activity to the reactor coolant.

APPLICABLE SAFETY ANALYSES

The fuel cladding must not sustain damage as a result of normal operation and AOOs. The reactor core SLs are established to preclude violation of the fuel design criterion that an MCPR limit is to be established, such that at least 99.9% of the fuel rods in the core would not be expected to experience the onset of transition boiling.

boiling avoidance

(MCPR SL)

The numeric values of the boiling avoidance limit (MCPR SL) are documented and maintained in the COLR for two recirculation loop and single recirculation loop operation.

The Reactor Protection System setpoints (LCO 3.3.1.1, "Reactor Protection System (RPS) Instrumentation"), in combination with other LCOs, are designed to prevent any anticipated combination of transient conditions for Reactor Coolant System water level, pressure, and THERMAL POWER level that would result in reaching the MCPR limit.

2.1.1.1a Fuel Cladding Integrity [General Electric Company (GE) Fuel]

GE critical power correlations are applicable for all critical power calculations at pressures $\geq$ 785 psig and core flows $\geq$ 10% of rated flow. For operation at low pressures or low flows, another basis is used, as follows:

> Since the pressure drop in the bypass region is essentially all elevation head, the core pressure drop at low power and flows will always be > 4.5 psi. Analyses (Ref. 2) show that with a bundle flow of 28×10^3 lb/hr, bundle pressure drop is nearly independent of bundle power and has a value of 3.5 psi. Thus, the bundle flow with a 4.5 psi driving head will be > 28×10^3 lb/hr. Full scale ATLAS test data taken at pressures from 14.7 psia to 800 psia indicate that the fuel assembly critical power at this flow is approximately 3.35 MWt. With the design peaking factors, this corresponds to a THERMAL POWER > 50% RTP. Thus, a THERMAL POWER limit of 25% RTP for reactor pressure < 785 psig is conservative.

2.1.1.1b Fuel Cladding Integrity [Advanced Nuclear Fuel Corporation (ANF) Fuel]

The use of the XN-3 correlation is valid for critical power calculations at pressures > 580 psig and bundle mass fluxes > 0.25×10^6 lb/hr-ft^2 (Ref. 3). For operation at low pressures or low flows, the fuel cladding