

December 23, 2002

Mr. Anthony Pietrangelo  
Nuclear Energy Institute  
1776 I Street, N. W.  
Suite 400  
Washington, DC 20006-3708

Dear Mr. Pietrangelo:

This letter is to inform you of changes made to NUREG-1432, Rev. 2, "Standard Technical Specifications Combustion Engineering Plants." The Nuclear Energy Institute Technical Specification Change Traveler, TSTF-445, "Revision to Peak Linear Heat Rate Safety Limit" proposed to replace Technical Specification (TS) Safety Limit 2.1.1.2, "Peak Linear Heat Rate" with a "Peak Fuel Centerline Temperature" Safety Limit. This change is necessary such that the Safety Limit adequately conforms to 10 CFR 50.36(c)(1)(ii)(A) which requires that Limiting Safety System Settings prevent a Safety Limit from being exceeded during normal operations and Anticipated Operational Occurrences. This proposed change is consistent with the Westinghouse and B&W improved Standard Technical Specifications with one modification which allows for adjustments for burnable poisons. TSTF-445 proposed to reference the approved methodology for the adjustments for burnable poisons in the TS 2.1.1.2 Bases.

As stated in my letter dated October, 21, 2002 (ADAMS Accession Number ML022950161), the proposed location of the NRC approved methodology is not consistent with the recent TS amendments for Arkansas Nuclear One, Unit 2, dated March 4, 2002, (ADAMS Accession Number ML020640603), and Waterford Steam Electric Station dated March 5, 2002, (ADAMS Accession Number ML 020640587). We have considered the concerns expressed by the CEOG TSTF regarding the ability of plant operators to observe and implement a peak fuel centerline temperature. However, based on consultation with our Office of General Counsel, the staff has concluded that the NRC approved methodology for adjusting the burnable poisons should be listed in TS 2.1.1.2. Therefore, we have changed NUREG-1432, Rev. 2, accordingly. In addition, NUREG-1432, Rev. 2 Bases have been modified to adopt the proposed wording in TSTF-445. Enclosed is the staff safety evaluation approving the change to TS 2.1.1.2 for plant-specific license amendment requests and for incorporation into NUREG-1432, Rev. 2. The staff concludes that this change will not have a significant impact on the remaining seven Combustion Engineering sites, four of which have already converted to standard technical specifications.

Mr. Anthony Pietrangelo

- 2 -

December 23, 2002

Please contact me at (301) 415-1161 or e-mail [wdb@nrc.gov](mailto:wdb@nrc.gov) if you have any questions or need further information on these proposed changes.

Sincerely,

***/RA/***

William D. Beckner, Program Director  
Operating Reactor Improvements Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Enclosure: As stated

cc: T. Silko, BWROG  
D. Bice, CEOG  
P. Infanger, BWOG  
S. Wideman, WOG  
D. Hoffman, EXCEL  
B. Mann, EXCEL

Mr. Anthony Pietrangelo

- 2 -

December 23, 2002

Please contact me at (301) 415-1161 or e-mail [wdb@nrc.gov](mailto:wdb@nrc.gov) if you have any questions or need further information on these proposed changes.

Sincerely,

***/RA/***

William D. Beckner, Program Director  
Operating Reactor Improvements Program  
Division of Regulatory Improvement Programs  
Office of Nuclear Reactor Regulation

Enclosure: As stated

cc: T. Silko, BWROG  
D. Bice, CEOG  
P. Infanger, BWOOG  
S. Wideman, WOG  
D. Hoffman, EXCEL  
B. Mann, EXCEL

DISTRIBUTION:

ADAMS	DMatthews/FGillespie	WDBeckner
RORP R/F	RLDennig	KKavanagh
LHill	FAkstulewicz	JMoore
MKowal	JWermiel	

ADAMS ACCESSION NUMBER: ML023570417  
DOCUMENT NAME: G:\RORP\KAVANAGH\CE PLHR letter and SE.wpd

OFFICE	TSS:RORP:DRIP	SC:TSS:RORP:DRIP	PD:RORP:DRIP	
NAME	KAKavanagh	RLDennig	WDBeckner	
DATE	12/20/2002	12/23/2002	12/23/2002	

**OFFICIAL RECORD COPY**

**SAFETY EVALUATION ON  
PROPOSED CHANGES TO NUREG-1432,  
STANDARD TECHNICAL SPECIFICATIONS  
COMBUSTION ENGINEERING PLANTS**

1.0 INTRODUCTION

The NRC staff has proposed changes to replace the Peak Linear Heat Rate (PLHR) Safety Limit (SL) with a Peak Fuel Centerline Temperature (PFCT) SL. This change is necessary such that the Safety Limit adequately conforms to 10 CFR 50.36(c)(1)(ii)(A) which requires that Limiting Safety System Settings prevent a Safety Limit from being exceeded during normal operations and Anticipated Operational Occurrences. This change is consistent with the Westinghouse and B&W improved Standard Technical Specifications with one exception. The new peak fuel centerline temperature safety limit allows for adjustments for burnable poisons for the Combustion Engineering (CE) plants. Additionally, changes are proposed to the associated TS Bases to appropriately reflect the new Safety Limit.

2.0 BACKGROUND

Section 182a of the Atomic Energy Act of 1954, as amended, requires applicants for nuclear power plant operating licenses to include Technical Specifications (TSs) as a part of the license. The Nuclear Regulatory Commission's (NRC or the Commission) regulatory requirements related to the content of TSs are set forth in Title 10 of the Code of Federal Regulations (10 CFR), Section 50.36, which requires that the TSs include items in five specific categories. These include (1) safety limits, limiting safety system settings and limiting control settings; (2) Limiting Conditions for Operation (LCOs); (3) Surveillance Requirements (SRs); (4) design features; and (5) administrative controls.

10 CFR 50.36(c)(1)(i)(A) and 10 CFR 50.36(c)(1)(ii)(A) sets forth the criteria for safety limits and limiting safety system settings included in the TSs:

*10 CFR 50.36(c)(1)(i)(A): Safety limits for nuclear reactors are limits upon important process variables that are found to be necessary to reasonably protect the integrity of certain of the physical barriers that guard against the uncontrolled release of radioactivity.*

*10 CFR 50.36(c)(1)(ii)(A): Limiting safety system settings for nuclear reactors are settings for automatic protective devices related to those variables having significant safety functions. Where a limiting safety system setting is specified for a variable on which a safety limit has been placed, the setting must be so chosen that automatic protective action will correct the abnormal situation before a safety limit is exceeded.*

The proposed change will replace the current TS 2.1.1.2 PLHR SL of [21] kW/ft with a PFCT SL and a statement that this temperature will be adjusted for effects of fuel burnup and burnable poisons. As such, the proposed PFCT SL will conform to the requirements of 10 CFR 50.36(c)(1)(ii)(A).

Enclosure

The NRC has previously approved the subject change on a plant specific basis. These previous approvals include Arkansas Nuclear One, Unit 2, dated March 4, 2002 (ADAMS Accession Number ML020730211), Waterford Steam Electric Station, Unit 3, dated March 5, 2002 (ADAMS Accession Number ML020640587) and Maine Yankee Atomic Power Station (Amendment No. 124, November 18, 1991).

### 3.0 EVALUATION

The current Standard Technical Specification (STS) 2.1.1.2 requires that in Modes 1 and 2, the peak linear heat rate shall be  $\leq$  [21] kiloWatt/foot (kW/ft). During a recent review, the staff identified that the [21] kW/ft SL would be exceeded for two Anticipated Operational Occurrences (AOOs). The two AOOs for which the PLHR SL is exceeded are the control element assemblies (CEA) withdrawal events from subcritical and low power conditions. These events and their acceptance criteria are discussed in Standard Review Plan (SRP) Section 15.4.1 (Reference 1).

The Uncontrolled CEA Withdrawal from Subcritical and Low Power transients are classified as moderate frequency events (AOO, as defined in 10 CFR Part 50, Appendix A) and the acceptance criteria are discussed in Reference 1, General Design Criteria (GDC) -10, "Reactor Design," and GDC-20, "Protection System Functions." These GDCs ensure that acceptable fuel design limits are not exceeded during the transient. The acceptable fuel design limits for this transient are 1) no fuel pins experience departure from nucleate boiling limit, and 2) fuel centerline temperature does not exceed the melting point. Most CE plants define the fuel centerline melt specified acceptable fuel design limit (SAFDL) in terms of PLHR SL.

The intent of the PLHR SL is to prevent the fuel centerline temperature from reaching the melting point, which conservatively assures that there will be no breach in cladding integrity. The current [21] kW/ft limit was chosen because it is the highest steady state linear heat rate at which the fuel can operate without causing the centerline temperature to reach the melting point. This limit adequately addresses steady state operation (normal operation). For the two transients of interest, the PLHR exceeds [21] kW/ft. However, due to the short duration of these AOOs, deposited energy calculations demonstrate that the true acceptance criteria, namely the peak fuel centerline temperature, is not exceeded.

In accordance with Appendix A to 10 CFR Part 50, GDC-10, and GDC-20, the acceptance criteria for normal operation and AOOs is that the SAFDLs will not be exceeded. The SAFDL of interest is the PFCT limit. This SAFDL is discussed in detail in SRP Section 4.2 (Reference 2), which states:

(II)(A)(2)(e) "Overheating of Fuel Pellets: It has also been traditional practice to assume that failure will occur if centerline melting takes place...For normal operation and anticipated operational occurrences, centerline melting is not permitted...The centerline melting criterion was established to assure that axial or radial relocation of molten fuel would neither allow molten fuel to come into contact with the cladding nor produce local hot spots. The assumption that centerline melting results in fuel failure is conservative."

Most CE plants comply with GDC-10 and GDC-20 as discussed in their Final Safety Analysis Report (FSAR). As such, a more appropriate SL would be one that is based upon the peak fuel

centerline temperature. A PFCT SL would address both normal operations and AOOs, and would be consistent with Appendix A to 10 CFR Part 50, the SRP, the plant's licensing basis, and 10 CFR 50.36.

The melting point of the fuel is dependent on fuel burnup and the amount and type of burnable poison used in the fuel. The design melting point of new fuel with no burnable poison is 5080 degrees Fahrenheit. The melting point is adjusted downward from this temperature based on the amount of burnup and amount and type of burnable poison in the fuel. The adjustment for burnup is 58 degrees Fahrenheit per 10,000 MWD/MTU, which was accepted by the NRC staff in TR CEN-386-P-A (Reference 3). The burnable poison adjustments are determined in accordance with the NRC staff approved methodology in [TR CENPD-382-P-A (Reference 4)]. The licensee considers the adjustment for burnable poison to be proprietary information and, therefore, will reference this TR in the TS Safety Limit. The mode of applicability and Actions required if the Safety Limit is exceeded would be the same as they are for the current PLHR Safety Limit. These changes will be incorporated into TS 2.1.1.2.

The NRC staff has concluded that the PFCT Safety Limit of less than 5080 degrees Fahrenheit (decreasing by 58 degrees Fahrenheit per 10,000 MWD/MTU for burnup and adjusting for burnable poisons per [CENPD-382-P-A] is more appropriate than the current PLHR Safety Limit for the following reasons:

- addresses both normal operation and AOOs,
- is consistent with 10 CFR Part 50 Appendix A criteria,
- is consistent with SAFDLs,
- is consistent with SRP acceptance criteria,
- is consistent with the licensee's licensing basis,
- is determined using NRC approved methodologies, and
- clearly conforms to 10 CFR 50.36(c)(1)(ii)(A).

#### 4.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and such activities will be conducted in compliance with the Commission's regulations.

#### 5.0 REFERENCES

1. NUREG-800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 15.4.1, Uncontrolled Control Rod Assembly Withdrawal From a Subcritical or Low Power Startup Condition.
2. NUREG-800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants," Section 4.2, Fuel System Design.
3. Topical Report CEN-386-P-A, "Verification of the Acceptability of a 1-Pin Burnup Limit of 60 MWD/kdU for Combustion Engineering 16x16 PWR Fuel," August 1992.
4. [Topical Report CENPD-382-P-A, "Methodology for Core Designs Containing Erbuim Burnable Absorbers," Revision 0, August 1993.]