



Palo Verde Nuclear
Generating Station

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10 CFR 50.90

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September 6, 2002

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Washington, DC 20555-0001

- Reference:
- 1) Palo Verde Nuclear Generating Station, U-2 – Request for Additional Information Regarding Power Uprate License Amendment Request (Tac No. MB3696), from Jack Donohew, NRC to G. R. Overbeck, dated June 6, 2002
 - 2) Request for a License Amendment to Support Replacement of Steam Generators and Up-rated Power Operations, from David Mauldin, APS, to USNRC, dated December 21, 2001

Dear Sirs:

**Subject: Palo Verde Nuclear Generating Station (PVNGS)
Units 1, 2 and 3
Docket Nos. STN 50-528/529/530
Request for a License Amendment to Revise the Peak Linear
Heat Rate Safety Limit, Technical Specification 2.1.1.2**

Pursuant to 10 CFR 50.90, Arizona Public Service Company (APS) hereby requests an amendment to Technical Specification (TS) Section 2.0 for the Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3. The proposed amendment would modify Safety Limit 2.1.1.2 by replacing the Peak Linear Heat Rate Safety Limit with a Peak Fuel Centerline Temperature Safety Limit. The associated TS Bases are also being provided (for information only) to appropriately reflect the proposed new Safety Limit.

The proposed change will replace the Peak Linear Heat Rate Safety Limit, Technical Specification 2.1.1.2, with a Peak Fuel Centerline Temperature Safety Limit. This change is necessary to more clearly conform with 10 CFR 50.36(c)(1)(ii)(A), which requires that Limiting Safety System Settings (LSSSs) prevent a Safety Limit (SL) from being exceeded during normal operations and Anticipated Operational Occurrences (AOOs). The proposed change will replace Peak Linear Heat Rate with Peak Fuel Centerline Temperature as the Safety

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Unit 1, 2 and 3 Request for a License Amendment to Revise the Peak Linear
Heat Safety Limit, Technical Specification SL 2.1.1.2
Page 2

Limit parameter. NRC has recently requested this issue to be resolved (reference 1) prior to the NRC staff's approval of PVNGS' proposed Unit 2 Power Uprate license amendment request (reference 2). This proposed license amendment request is submitted in order to resolve this identified issue.

Attachment 2 provides a description and assessment of the proposed change. Attachment 3 provides the existing TS page marked up to show the proposed change. Attachment 4 provides the revised (retyped) TS page. Attachment 5 provides the existing TS Bases pages marked up to show the proposed change.

Final TS bases changes will be implemented pursuant to TS 5.5.14, Technical Specifications Bases Control Program. Attachment 5 is provided for information only; however, APS will adopt these TS Bases changes upon implementation of the license amendment.

In accordance with the PVNGS Quality Assurance Program, the Plant Review Board and the Offsite Safety Review Committee have reviewed and concurred with this proposed amendment. By copy of this letter, this submittal is being forwarded to the Arizona Radiation Regulatory Agency (ARRA) pursuant to 10CFR 50.91(b)(1).

Approval of this amendment application is requested by August 31, 2003. Once approved, this amendment will be implemented within 90 days.

No commitments are being made to the NRC by this letter.

Should you have any questions, please contact Thomas N. Weber at (623) 393-5764.

Sincerely,

Paul F. Crawley
for CDM

CDM/TNW/RAB/jap

Attachments:

1. Notarized Affidavit
2. License Amendment Request Analysis
3. Markup of Technical Specification Pages
4. Retyped Technical Specification Pages
5. Associated Changes to Technical Specification Bases
(for information only)

cc:	E. W. Merschoff	(NRC Region IV)	(w/attachments)
	J. N. Donohew	(NRR Project Manager)	(w/attachments)
	D. G. Naujock	(NRR Project Manager)	(w/attachments)
	N. L. Salgado	(NRC Resident Inspector)	(w/attachments)
	A. V. Godwin	(ARRA)	(w/attachments)

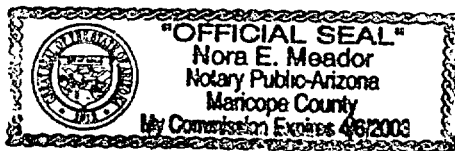
STATE OF ARIZONA)
) ss.
COUNTY OF MARICOPA)

I, Paul F. Crawley, represent that I am Director, Nuclear Fuels Management, Arizona Public Service Company (APS), that the foregoing document has been signed by me on behalf of APS with full authority to do so, and that to the best of my knowledge and belief, the statements made therein are true and correct.

Paul F. Crawley
Paul F. Crawley

Sworn To Before Me This 6 Day Of September, 2002.

Nora E. Meador
Notary Public



Notary Commission Stamp

ATTACHMENT 2

LICENSE AMENDMENT REQUEST ANALYSIS

- 1.0 DESCRIPTION
- 2.0 BACKGROUND
- 3.0 TECHNICAL ANALYSIS
- 4.0 REGULATORY ANALYSIS
- 5.0 ENVIRONMENTAL CONSIDERATIONS
- 6.0 PRECEDENT
- 7.0 REFERENCES

1.0 DESCRIPTION

The proposed change will replace the Peak Linear Heat Rate Safety Limit, Technical Specification 2.1.1.2, with a Peak Fuel Centerline Temperature Safety Limit. This change is necessary to more clearly conform with 10 CFR 50.36(c)(1)(ii)(A), which requires that Limiting Safety System Settings (LSSSs) prevent a Safety Limit (SL) from being exceeded during normal operations and Anticipated Operational Occurrences (AOOs).

Attachment 3 contains the marked-up Technical Specification (TS) page reflecting the proposed change.

The TS Bases pages for TS 2.1.1 are being revised accordingly to reflect the new Peak Fuel Centerline Temperature Safety Limit and provide a reference to the approved Topical Report for determining the new Safety Limit. Attachment 5 contains the marked-up TS Bases pages reflecting the proposed changes. The Bases pages are provided for information only.

This change deviates from NUREG-1432 (Reference 1) in that it proposes to replace the Peak Linear Heat Rate Safety Limit with the Peak Fuel Centerline Temperature Safety Limit. This deviation from NUREG-1432 is necessary to ensure this SL adequately addresses both AOOs and normal operation. Note, however, that the change is consistent with the standard improved Technical Specifications for the Westinghouse and Babcock and Wilcox plants (see Section 6.0, Precedence).

2.0 BACKGROUND

During a recent review of the Waterford Steam Electric Station, Unit 3, 1.5% Appendix K margin recovery power uprate license amendment request, the NRC staff identified that the Peak Linear Heat Rate SL of 21 kW/ft would be exceeded for an AOO. In accordance with 10 CFR 50.36(c)(1)(ii)(A), LSSSs must be chosen such that automatic action will prevent a SL from being exceeded during normal operations and AOOs. Therefore conformance with 10 CFR 50.36 is not clearly demonstrated.

A review of the PVNGS safety analyses shows that this condition also exists for PVNGS Units 1, 2 and 3. While the current steady state limit of 21 kW/ft is momentarily exceeded during two AOOs, the peak fuel centerline temperature does not exceed the melting point. The AOOs are the Control Element Assembly Withdrawal events from Subcritical and Low Power conditions. The analysis results, including the linear heat rate greater than 21 kW/ft, for these events has been previously reviewed in accordance with the Standard Review Plan (SRP) (Reference 2) and found to be acceptable by the NRC staff. Section 3.4.2.2.3, Uncontrolled CEA Withdrawal, of the "Reload Analysis Methodology for the Palo

Verde Nuclear Generating Station" Topical Report, (Reference 3) approved by the NRC on June 14, 1993, states:

"Integrated deposited energy may be examined instead of LHR to show that no fuel melting occurs."

3.0 TECHNICAL ANALYSIS

The intent of the Peak Linear Heat Rate SL is to prevent the fuel centerline temperature from reaching the melting point, which conservatively assures 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). However, during two short duration AOOs, peak linear heat rate exceeds 21 kW/ft. Due to the short duration of these AOOs, the peak fuel centerline temperature does not exceed the melting point of the fuel. A more appropriate SL would be one that addresses both normal operation and AOOs, such as peak fuel centerline temperature.

In accordance with 10 CFR 50, Appendix A, "General Design Criteria" (GDC) 10, "Reactor Design," and 20, "Protection Systems Functions," the acceptance criteria for normal operation and AOOs is that the Specified Acceptable Fuel Design Limits (SAFDLs) not be exceeded. The SAFDL of interest, in this case, is the Peak Fuel Centerline Temperature limit. This SAFDL is discussed in detail in SRP Section 4.2 (Reference 4), 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."

Palo Verde Units 1, 2 and 3 comply with GDC 10 and 20 as discussed in Updated Final Safety Analysis Report (UFSAR) Sections 3.1.6 and 3.1.16. Additionally, FSAR Section 4.4.1, notes the SAFDLs utilized for the design of the PVNGS reactors. UFSAR Section 4.4.1.3.A, states:

"The peak temperature of the fuel shall be less than the melting point...during steady-state operation and anticipated occurrences of moderate frequency."

Therefore, a more appropriate SL would be one that is based upon the peak fuel centerline temperature. A Peak Fuel Centerline Temperature SL would address

both normal operation and AOOs, and would be consistent with 10 CFR 50 Appendix A, the SRP, the PVNGS Units 1, 2 and 3 licensing bases, 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 °F. The melting point is adjusted downward from this temperature depending on the amount of burnup and amount and type of burnable poison in the fuel. The adjustment for burnup of 58 °F per 10,000 MWD/MTU is consistent with standard TSs as discussed in Section 6.0 of this attachment. The 58 °F per 10,000 MWD/MTU was accepted by the NRC staff in Topical Report CEN-386-P-A (Reference 5). The burnable poison adjustments are determined in accordance with CENPD-382-P-A (Reference 6), which has been approved by the NRC. The adjustment for the erbium burnable poison is considered to be proprietary information and therefore can not be included in the TS.

The mode of applicability and actions required if the limit were exceeded, would be the same as they are for the current Peak Linear Heat Rate SL. CENPD-382-P-A (Reference 6) will be appropriately referenced in the TS Bases for the SL.

Therefore, a Peak Fuel Centerline Temperature SL of less than 5080 °F (decreasing by 58 °F per 10,000 MWD/MTU for burnup and adjusting for burnable poisons per CENPD-382-P-A) is more appropriate than the current Peak Linear Heat Rate SL. The Peak Fuel Centerline Temperature SL will:

- address both normal operations and AOOs,
- be consistent with 10 CFR 50 Appendix A criteria,
- be consistent with SAFDLs,
- be consistent with SRP acceptance criteria,
- be consistent with the PVNGS Units 1, 2, and 3 licensing bases,
- be determined using NRC approved methodologies, and
- clearly conform to 10 CFR 50.36(c)(1)(ii)(A).

4.0 REGULATORY ANALYSIS

4.1 Applicable Regulatory Requirements/Criteria

The proposed changes have been evaluated to determine whether applicable regulations and requirements continue to be met.

The proposed change is already consistent with the Palo Verde UFSAR, and the UFSAR will require changes to indicate that the Safety Limit for fuel temperature is fuel centerline temperature and not linear heat rate.

APS has determined that the proposed changes do not require any exemptions or relief from regulatory requirements, other than the TS, and do not affect conformance with any GDC differently than described in the UFSAR. The approval of this change will clearly establish conformance with 10 CFR 50.36.

4.2 No Significant Hazards Consideration Determination

The proposed change will revise the Palo Verde Nuclear Generating Station (PVNGS) Units 1, 2 and 3 Technical Specifications to replace the Peak Linear Heat Rate Safety Limit, Technical Specification 2.1.1.2, with a Peak Fuel Centerline Temperature Safety Limit. The value of the new Safety Limit will be the melting point of the fuel, 5080 °F (decreasing by 58 °F per 10,000 MWD/MTU for burnup and adjusting for burnable poisons per CENPD-382-P-A). This change is necessary to more clearly conform with 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 (AOOs.)

Arizona Public Service Company (APS) has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The proposed change does not require any physical change to plant systems, structures, or components nor does it require any change in systems or plant operations. The proposed change does not result in any change to safety analysis methods or results. The change to establish peak fuel centerline temperature as the Safety Limit is consistent with the PVNGS Units 1, 2 and 3 licensing bases for ensuring that the fuel design limits are met. Operations and analysis will continue to be in accordance with the PVNGS Units 1,2 and 3 licensing bases. The peak fuel centerline temperature is the basis for protecting the fuel and is consistent with the safety analysis.

Therefore, the proposed change does 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 PVNGS Units 1, 2 and 3 Updated Final Safety Analysis Report (UFSAR) Chapter 15 accident analyses for AOOs where the peak linear heat rate may exceed the existing Safety Limit of 21 kW/ft are the control element assembly (CEA) Withdrawal events at Subcritical and Low Power conditions. The analyses for these AOOs indicate that the peak fuel centerline temperature is not exceeded. The existing safety analyses, which remain unchanged, do not affect any accident initiators that would create a new accident.

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

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

Response: No.

The proposed change does not result in any change to safety analysis methods or results. Therefore, by changing the Safety Limit from peak linear heat rate to peak fuel centerline temperature the margins as established in the PVNGS Units 1, 2 and 3 Technical Specifications and UFSAR are unchanged.

Therefore, the proposed change does not involve a significant reduction in a margin of safety.

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

5.0 ENVIRONMENTAL CONSIDERATIONS

Arizona Public Service Company has evaluated the proposed changes and has determined that the changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amount of effluent that may be released offsite, or (iii) a significant increase in the individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), an environmental assessment of the proposed change is not required.

6.0 PRECEDENT

A Safety Limit based on peak fuel centerline temperature is consistent with the Standard Technical Specifications for Westinghouse Plants and Babcock And Wilcox Plants (References 7 and 8, respectively). Westinghouse plants use "peak fuel centerline temperature" and Babcock and Wilcox plants use "maximum local fuel pin centerline temperature." The proposed Safety Limit for PVNGS Units 1, 2 and 3 is the same as the Westinghouse standard.

The NRC has recently approved a change from "Peak Linear Heat Rate" to "Peak Fuel Centerline Temperature" to this Safety Limit for the following facilities:

<u>Facility</u>	<u>Amendment #</u>	<u>Approval Date</u>	<u>Accession #</u>
ANO 2	238	March 4, 2002	PKG: ML020730217
Waterford 3	181	March 5, 2002	PKG: ML020720291

7.0 REFERENCES

1. NUREG-1432, "Standard Technical Specifications, Combustion Engineering Plants", Revision 2
2. NUREG-0800, "Standard Review Plan," Section 15.4.1, "Uncontrolled Rod Assembly Withdrawal From A Subcritical or Low Power Startup Condition," Rev. 2, July 1981
3. Topical Report, "Reload Analysis Methodology for the Palo Verde Nuclear Generating Station", Revision 00-P-A
4. NUREG-0800, "Standard Review Plan", Section 4.2, "Fuel System Design," Rev. 2, July 1981
5. CEN-386-P-A, "Verification of the Acceptability of a 1-Pin Burnup Limit of 60 MWD/kgU for Combustion Engineering 16x16 PWR Fuel," August 1992
6. "Topical Report, CENPD-382-P-A, "Methodology for Core Designs Containing Erbium Burnable Absorbers," Revision 0, August 1993
7. NUREG-1431, "Standard Technical Specifications, Westinghouse Plants," Revision 2
8. NUREG-1430, "Standard Technical Specifications," Babcock and Wilcox Plants," Revision 2

ATTACHMENT 3
MARKUP OF TECHNICAL SPECIFICATION PAGE

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 In MODES 1 and 2, Departure from Nucleate Boiling Ratio (DNBR) shall be maintained as follows:

≥ 1.3 (through operating cycle 10)

≥ 1.34 (operating cycle 11 and later)

2.1.1.2 In MODES 1 and 2, the peak ~~Linear Heat Rate (LHR)~~
~~(adjusted for fuel rod dynamics)~~ shall be maintained
at ≤ 21.0 kW/ft. ~~fuel centerline temperature shall be~~
~~maintained < 5080°F (decreasing by 58°F per 10,000~~
~~MWD/MTU for burnup and adjusting for burnable poisons~~
~~per CENPD-382-P-A).~~

2.1.2 Reactor Coolant System (RCS) Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained at ≤ 2750 psia.

2.2 SL Violations

2.2.1 If SL 2.1.1.1 or SL 2.1.1.2 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

2.2.3 Within 1 hour, notify the NRC Operations Center, in accordance with 10 CFR 50.72.

2.2.4 Within 24 hours, notify the Director, Operations and Vice President, Nuclear Production.

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ATTACHMENT 4
RETYPE TECHNICAL SPECIFICATION PAGE

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 In MODES 1 and 2, Departure from Nucleate Boiling Ratio (DNBR) shall be maintained as follows:

≥ 1.3 (through operating cycle 10)

≥ 1.34 (operating cycle 11 and later)

2.1.1.2 In MODES 1 and 2, the peak fuel centerline temperature shall be maintained < 5080°F (decreasing by 58°F per 10,000 MWD/MTU for burnup and adjusting for burnable poisons per CENPD-382-P-A).

2.1.2 Reactor Coolant System (RCS) Pressure SL

In MODES 1, 2, 3, 4, and 5, the RCS pressure shall be maintained at ≤ 2750 psia.

2.2 SL Violations

2.2.1 If SL 2.1.1.1 or SL 2.1.1.2 is violated, restore compliance and be in MODE 3 within 1 hour.

2.2.2 If SL 2.1.2 is violated:

2.2.2.1 In MODE 1 or 2, restore compliance and be in MODE 3 within 1 hour.

2.2.2.2 In MODE 3, 4, or 5, restore compliance within 5 minutes.

2.2.3 Within 1 hour, notify the NRC Operations Center, in accordance with 10 CFR 50.72.

2.2.4 Within 24 hours, notify the Director, Operations and Vice President, Nuclear Production.

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ATTACHMENT 5

ASSOCIATED CHANGES TO TECHNICAL SPECIFICATION BASES
(for information only)

BASES

APPLICABLE
SAFETY ANALYSES
(continued)

- h. Log Power Level – High trip;
- i. Reactor Coolant Flow – Low trip; and
- j. Steam Generator Safety Valves.

The limitation that the average enthalpy in the hot leg be less than or equal to the enthalpy of saturated liquid also ensures that the ΔT measured by instrumentation used in the protection system design as a measure of the core power is proportional to core power.

The SL represents a design requirement for establishing the protection system trip setpoints identified previously. LCO 3.2.1, "Linear Heat Rate (LHR)," and LCO 3.2.4, "Departure From Nucleate Boiling Ratio (DNBR)," or the assumed initial conditions of the safety analyses (as indicated in the UFSAR, Ref. 2) provide more restrictive limits to ensure that the SLs are not exceeded.

SAFETY LIMITS

SL 2.1.1.1 and SL 2.1.1.2 ensure that the minimum DNBR is not less than the safety analyses limit and that fuel centerline temperature remains below melting.

The minimum value of the DNBR during normal operation and design basis AOOs is limited to 1.3 (this value will be 1.34 for operating cycles 11 and later), based on a statistical combination of CE-1 CHF correlation and engineering factor uncertainties, and is established as an SL. Additional factors such as rod bow and spacer grid size and placement will determine the limiting safety system settings required to ensure that the SL is maintained. Maintaining the dynamically adjusted peak LHR to ≤ 21 kW/ft or peak fuel centerline temperature $< 5080^\circ\text{F}$ (decreasing by 58°F per 10,000 MWD/MTU for burnup and adjusted for burnable poisons per CENPD-382-P-A) ensures that fuel centerline melt will not occur during normal operating conditions or design AOOs.

The design melting point of new fuel with no burnable poison is 5080°F . The melting point is adjusted downward from this temperature depending on the amount of burnup and amount and type of burnable poison in the fuel. The 58°F per 10,000 MWD/MTU adjustment for burnup was accepted by the NRC in

(continued)

BASES

SAFETY LIMITS
(continued)

Topical Report CEN-386-P-A, "Verification of the Acceptability of a 1-Pin Burnup Limit of 60 MWD/kgU for Combustion Engineering 16x16 PWR Fuel," August 1992. Adjustments for burnable poisons are established based on NRC approved Topical Report CENPD-382-P-A, "Methodology for Core Designs Containing Erbium Burnable Absorbers," August 1993.

A steady state peak linear heat rate of 21 kW/ft has been established as the Limiting Safety System Setting to prevent fuel centerline melting during normal steady state operation. Following design basis anticipated operational occurrences, the transient linear heat rate may exceed 21 kW/ft provided the fuel centerline melt temperature is not exceeded. However if the transient linear heat rate does not exceed 21 kW/ft, then the fuel centerline melt temperature is also not exceeded.

APPLICABILITY

SL 2.1.1.1 and SL 2.1.1.2 only apply in MODES 1 and 2 because these are the only MODES in which the reactor is critical. Automatic protection functions are required to be OPERABLE during MODES 1 and 2 to ensure operation within the reactor core SLs. The steam generator safety valves or automatic protection actions serve to prevent RCS heatup to the reactor core SL conditions or to initiate a reactor trip function, which forces the unit into MODE 3. Setpoints for the reactor trip functions are specified in LCO 3.3.1.

In MODES 3, 4, 5, and 6, Applicability is not required, since the reactor is not generating significant THERMAL POWER.

SAFETY LIMIT
VIOLATIONS

The following violation responses are applicable to the reactor core SLs.

2.2.1

If SL 2.1.1.1 or SL 2.1.1.2 is violated, the requirement to go to MODE 3 places the unit in a MODE in which this SL is not applicable.

The allowed Completion Time of 1 hour recognizes the importance of bringing the unit to a MODE where this

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