

From: "MILLER, D BRYAN" <dmill14@entergy.com>
To: "Thomas Alexion" <TWA@nrc.gov>
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Subject: Additional (Draft) Information on Tcold in Footnote to TS 3.2.6

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CC: "SICARD, PAUL A" <PSICARD@entergy.com>

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Creation Date: 5/5/05 2:22PM
From: "MILLER, D BRYAN" <dmill14@entergy.com>

Created By: dmill14@entergy.com

Recipients

nrc.gov
owf4_po.OWFN_DO
TWA (Thomas Alexion)

entergy.com
PSICARD CC (PAUL A SICARD)

Post Office

owf4_po.OWFN_DO

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Technical Specification 3.2.6

Footnote * to Technical Specification 3.2.6 allows the upper limit on Tcold to increase to 559°F for up to 30 minutes following a reactor power cutback in which (1) regulating groups 5 and/or 6 are dropped or (2) regulating groups 5 and/or 6 are dropped and the remaining regulating groups are sequentially inserted. This value is considered an arbitrary value to which uncertainty need not be applied. Footnote * to Technical Specification 3.2.6 was in the Waterford-3 Technical Specifications at the time of initial licensing. There has been no change to that footnote between initial licensing and EPU.

A reactor power cutback is a non-safety system which is initiated in the event of a load rejection, such as a turbine trip or a loss of one of two main feedwater pumps, which exceeds the capacity of the turbine bypass valves. The reactor power cutback system initiates the dropping of one or more preselected CEA groups. This rapid reduction of plant power, at a rate which is greater than that provided by the normal high speed CEA insertion, helps to restore the plant to within prescribed operating ranges. Reactor power cutback is not credited in any FSAR Chapter 15 safety analyses.

The reactor power cutback system will also throttle the turbine admission valve (for a loss of a feedwater pump) to rebalance turbine and reactor power. If there is a minor mismatch and core power is greater than turbine demand, cold leg temperature will slowly increase. With a negative MTC, the increasing temperature will cause core power to decrease to match the turbine demand, resulting in a stable power at the reduced level set by the turbine. Since this power is substantially below full power, there is no challenge to thermal margins.

Control system analyses conducted in support of Waterford-3 EPU have modeled the plant response to transients involving reactor power cutback. For example, reactor power cutback would result in a core power of about 50% for an End of Cycle (EOC) Turbine Trip. With no operator action to drive in additional CEAs, there would be about a 7F rise in Tcold from a nominal 543F to about 550F.

As stated in Attachment 1 to W3F1-2003-0074, the 3716 MWt Extended Power Uprate License Amendment Request, this value is being revised from 568°F to 559°F for EPU, in conjunction with the change to the Tcold LCO; the LCO is being revised from a range of 541°F to 558°F to a new range of 536°F to 549°F. The revision of this value to 559°F maintains the existing 10°F difference to the maximum Tcold.

Waterford-3 was licensed with a Tcold range of 541°F to 558°F, based on a nominal temperature ramp from 545°F at Hot Zero Power (HZIP) to 553°F at Hot Full Power (HFP). Under 10CFR50.59, Waterford-3 revised this nominal temperature program to a constant 545°F value in the early 1990's. For power uprate, a 2°F ramp is being adopted, with nominal Tcold ranging from 541°F at HZIP to 543°F at HFP. Thus, with the implementation of EPU, there will be a more restrictive range of 16°F (559°F versus 543°F) to the footnote value compared to the pre-EPU range of 23°F (568°F versus 545°F).

The original 568°F value in Technical Specifications was arbitrarily chosen to be 10°F above the upper limit of the LCO, on the basis that it is reasonable to allow some deviation for a short period of time (30 minutes) to allow recovery and subsequent plant stabilization after the reactor power cutback. This also prevents unnecessary plant entries into Technical Specification ACTION statements. The 10°F offset is unchanged for 3716 MWt Power Uprate.

Operators select the appropriate CEA group(s) to drop during a reactor power cutback. The selection ensures that the reactor power following cutback will be less than the capacity of the turbine bypass valves of about 65%. Because a reactor power cutback is a plant transient of short duration, no additional accident or transient is postulated to occur simultaneously during the 30 minute time period of the TS 3.2.6 footnote where T_{cold} may be above the explicitly analyzed range. Also, due to the reduced power, there is significantly less energy and latent heat in the reactor core after the cutback.

Because the 559F value for the TS 3.2.6 footnote approved via Amendment 199 is not based on a specific analysis but is intended as a reasonable allowance for operator action to restore the plant within the normal LCO band of TS 3.2.6, there is no need to address instrument uncertainty with respect to this parameter. This footnote is not inconsistent with many other Technical Specifications for which there is not any explicit analysis that supports the time required for ACTION statements.

draft

Power Level for OPERABILITY of ADV Automatic Actuation Technical Specification 3.7.1.7

New Technical Specification 3.7.1.7 is being added due to EPU to specify OPERABILITY requirements for the Atmospheric Dump Valves. This TS is being added since the EPU Small Break LOCA Emergency Core Cooling System (ECCS) analysis credits one Atmospheric Dump Valve for the purpose of secondary pressure control; the ADV's were previously credited only for cooldown to shutdown cooling entry conditions and for their containment isolation function.

The small break LOCA analyses assume a maximum ADV setpoint of 1040 psia. This value is specified in the footnote to TS 3.7.1.7 and explicitly accounts for the instrument uncertainty offset from the nominal setpoint of 1007 psia.

The footnote to the LCO also documents that the ADV automatic actuation channels are not required to be operable when the reactor has been at less than or equal to 70% Rated Thermal Power for greater than 6 hours (following long-term operation at EPU Rated Thermal Power of 3716 MWt). The value of 70% is specified based on reasonable engineering judgment as a power level below which automatic actuation of the ADV's is not required. To verify the acceptability of this arbitrary value, a calculation was performed to demonstrate that the decay heat load associated with operation for 6 hours at 70% Rated Thermal Power is such that the ADV's need not be credited to demonstrate acceptable ECCS performance. The ADV's are not credited in the Waterford 3 Cycle 13 pre-uprate Small Break LOCA ECCS analyses, which leads to the conclusion that long-term operation at power levels of 3441 MWt (92.6% of EPU Rated Thermal Power) is acceptable without crediting ADV's in the SBLOCA analysis. The 6 hour time frame supports the Bases for ACTIONS a and b of new TS 3.7.1.7, which calls for exiting TS applicability within 6 hours after reducing power to less than or equal to 70% of Rated Thermal Power.

Margin exists in the decay heat analysis between the pre-uprate power where ADV's are not required (e.g., long term operation at 3441 MWt) and the decay heat corresponding to operation at 70% of uprated thermal power for 6 hours or less. The decay heat for a reactor trip after operation for six hours at 70% of uprated thermal power after long-term operation at 3716 MWt is around 10% below that from long term operation at 3441 MWt. A strict analytical approach would result in a curve of increasing Reactor Thermal Power as a function of time, that is, the reactor power could be slowly increased up to approximately 92.6% in order for this decay heat logic to be maintained. In consideration of this margin and the fact that the decay heat load associated with 70% power operation will decrease with longer times, it is not considered necessary to apply any explicit offset to account for power measurement uncertainty to the 70% value specified in Technical Specifications.

Based upon this reasoning, Entergy considers this to be an arbitrary value to which uncertainty need not be applied and therefore a Category D parameter. If explicit analysis were performed this value could be raised to a value closer to 92.6%.