Entergy

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2CAN120701

December 5, 2007

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: Supplement to Amendment Request
To Revise Technical Specification 3.1.3.4, CEA Drop Time
Arkansas Nuclear One, Unit 2
Docket No. 50-368
License No. NPF-6

REFERENCES: 1. Entergy letter dated August 30, 2007, "License Amendment Request to Revise Technical Specification 3.1.3.4, CEA Drop Time" (2CAN080701) (TAC NO: MD6627)

Dear Sir or Madam:

By letter (Reference 1), Entergy Operations, Inc. (Entergy) proposed a change to the Arkansas Nuclear One, Unit 2 (ANO-2) Technical Specifications (TSs) to revise the individual Control Element Assembly (CEA) maximum drop time requirement of TS 3.1.3.4.

On October 24, 2007, Entergy was notified of a request for additional information (RAI) with regard to the subject letter. A conference call was held with the NRC staff on October 29, 2007, to ensure clear understanding of the information being requested. Attachment 1 includes Entergy's response to this RAI.

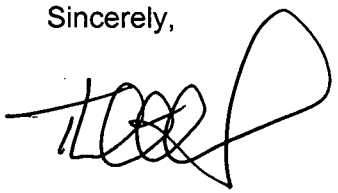
There are no technical changes proposed that impact the original no significant hazards consideration included in Reference 1. There are no new commitments contained in this letter.

A001
NRR

If you have any questions or require additional information, please contact Bob Clark at 479-858-4663.

I declare under penalty of perjury that the foregoing is true and correct. Executed on December 5, 2007.

Sincerely,



TGM/rwc

Attachment: Response to Request for Additional Information

cc: Mr. Elmo E. Collins
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Attachment 1

To

2CAN120701

Response to Request for Additional Information

Response to Request for Additional Information Related to License Amendment Request to Revise Technical Specification 3.1.3.4, CEA Drop Time

NRC Introductory Paragraph:

As the submittal pointed out the two major factors in the CEA drop time are core ΔP and the weight of the extension shafts. It is assumed that other factors do not change, i.e., fuel management and CEDM circuits. Your TA states that "... While the slowest individual CEA is expected to fall up to 0.2 seconds slower and the distance between the fastest and slowest CEAs is increasing, the average CEA drop time concept has been re-verified for a NGF core..."

Question 1:

a. *If all other factors are the same and the slowest CEA slows by 0.2 seconds the only reasonable conclusion is that the average is slower by 0.2 seconds. Yet you conclude that the average stays unchanged. Please justify this conclusion.*

b. *If the slowest CEA drop gets slower and the distance (slowest to fastest) increases how does the average stay constant?*

Response 1:

The introduction of Next Generation Fuel (NGF) will raise the pressure drop across the reactor core as described in the NGF topical report (WCAP-16500-P-A). The higher pressure drop across the core results in higher bypass flow rates in Control Element Assembly (CEA) guide tubes, thus more hydraulic flow resistance will be encountered by CEAs during insertion upon a reactor trip. This increases the drop time for all CEAs.

The average drop time for NGF cores is predicted to be slower than a standard assembly core by ~0.150 seconds. This prediction includes uncertainties. When this is added to the worst (over the last four cycles at ANO-2) measured average drop time, the expected worst case average drop time in a full NGF core becomes 3.140 seconds, which remains less than the current Technical Specification (TS) limit of 3.2 seconds for the average drop time.

In summary, the measured average CEA drop time will increase, but not to an extent that requires changing the current TS limit for average drop time. Measured average drop times in the full NGF core (including the transition core) are expected to remain within the current average drop time limit, with margin. Entergy Operations, Inc. (Entergy) did not intend to imply in its August 30, 2007 letter that the average CEA drop time did not increase, but that the final average CEA drop time remained within current TS limits.

Question 2:

The TA indicates that the full NGF core to be the limiting case. Please discuss the transition core (ANO-2 Cycle 20) expected drop times especially if some NGF and CE assemblies are not in uniformly mixed regions.

Response 2:

Evaluations were performed for both the transition core's pressure drop and the full NGF core's pressure drop. A full core of NGF fuel produces a higher core pressure drop than does the transition core. The evaluations examined the expected drop times for the heaviest extension shaft / CEA combination and separately, the lightest extension shaft / CEA combination for both the transition and full NGF cores. For each combination, the evaluations indicated that the full NGF core resulted in the slowest CEA drop times.

Question 3:

The TA states that an evaluation was performed for the CE and the NGF that added the difference of the calculated insertion time to the worst average drop time. The result showed that there is sufficient margin compared to the limit of 3.2 seconds.

a) *How did you perform those calculations and what were the numerical results?*

b) *How the calculations are relevant for time differences of 0.2 seconds?*

c) *What were the criteria of sufficiency?*

d) *Did the CEA drop distribution that produced less fission energy include the 0.2 second delay in the slowest CEA drop?*

Response 3:

The Westinghouse analyses simulate the guide path / CEA / extension shaft configuration for both the standard fuel design and the NGF design; the core's pressure drop for a full core of standard fuel, a full core of NGF fuel and the transition core; and the weights of the extension shaft / CEA (includes a weighted average, the lightest and the heaviest). CEA drop times were predicted under a variety of operating conditions. The methodology used in these analyses is the same that has been used to determine the current Arkansas Nuclear One, Unit 2 (ANO-2) TS limits and the current limits at other facilities. As noted in Entergy's August 30, 2007 letter to the NRC, the analysis for the current TS limits can be reviewed in previous correspondence associated with the NRC Safety Evaluation Report (SER) for ANO-2 TS Amendment 100. To provide additional confidence, the computer code used to implement the methodology was benchmarked against actual plant measured data.

Calculations were performed with uncertainties on the core pressure drop and the extension shaft / CEA combination weight to address "criteria sufficiency." These cases were performed to predict relative changes in CEA drop time between the standard core and the full NGF core. Predicted changes in CEA drop time were added to actual plant measured drop times to identify what margin (if any) to the current limits would exist after implementation of NGF.

The analysis indicated positive margin would be maintained with respect to the average CEA drop time, but the individual drop time limit would be exceeded for peripheral CEAs. Given the uncertainties included in the analysis, the margin to the average drop time limit is judged to be adequate. The difference between the slowest individual CEA drop time predicted and the requested individual drop time limit should provide sufficient margin to ensure the TS individual CEA drop time limit is not exceeded upon application of either partial or full NGF cores.

Engineering evaluations illustrate that increasing the drop time limit for individual CEAs, while maintaining the average drop time limit, will not result in actual "fission power versus time during a scram" being non-conservative with respect to what is currently assumed in the safety analyses.

Question 4:

The 0.2 second change represents almost the entire spread in the drop distribution for both fuels, i.e., 3.2 x .079 = 0.25 seconds. Therefore, the proposed change is significant.

Response 4:

Entergy acknowledges that the magnitude of the requested individual CEA drop time limit increase is similar to the variation in drop times that exist. However, as discussed above, negative reactivity insertion remains within that assumed in the safety analyses provided the average CEA drop time remains within the TS limit. Therefore, if a number of individual CEAs are measured to have greater than predicted drop times, reactor safety is maintained provided the average of the increased drop times remain less than the TS average CEA drop time limit. In addition, as stated in the aforementioned August 30, 2007 letter, only those CEAs along the core periphery are expected to approach a 0.2 second increase in drop time. Based on the information provided, the associated proposed individual CEA drop time TS limit request does not pose a significant change with regard to reactivity control.

Question 5:

Have you accounted for the case in cycle 20 when the new fuel will be at its peak reactivity? (That is about 10 to 14 MWD/MT of burn up.)

Response 5:

Based upon the conference call between the NRC and ANO of October 29, 2007, Entergy understands this question to be concerned with potential changes in the RCS flow during the cycle. The average and individual drop times are both measured at the beginning of cycle as part of the startup testing program. The associated TS surveillance requires drop times to be measured when the reactor coolant system temperature is greater than or equal to 525 °F with all four reactor coolant pumps operating. The flow conditions present during the surveillance are consistent with those present during operation throughout the cycle. Changes in core dynamics due to application of NGF have been previously reviewed and approved by the NRC in the associated NGF topical report (WCAP-16500-P-A).

"Reactivity and/or fission power versus time during CEA drop" were evaluated at extremes of the axial shape index that bound the core operating limits.