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November 16, 2007

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

Clinton Power Station, Unit 1
Facility Operating License No. NPF-62
NRC Docket No. 50-461

Subject: Additional Information Supporting the Request for a License Amendment to Revise Local Power Range Monitor Calibration Frequency

References:

1. Letter from Mr. K. R. Jury (AmerGen Energy Company, LLC) to U. S. NRC, "Request for a License Amendment to Revise Local Power Range Monitor Calibration Frequency," dated December 12, 2006

2. Letter from U. S. NRC to Mr. C. M. Crane (AmerGen Energy Company, LLC), "Clinton Power Station, Unit No. 1 – Request for Additional Information Related to Revision of Local Power Range Monitor Calibration Frequency," dated September 20, 2007

In Reference 1, AmerGen Energy Company, LLC (AmerGen) requested an amendment to the facility operating license for Clinton Power Station (CPS), Unit 1. Specifically, the proposed changes will revise Surveillance Requirement (SR) 3.3.1.1.8 and SR 3.3.1.3.2 to increase the interval between Local Power Range Monitor (LPRM) calibrations from 1000 megawatt-days per ton (MWD/T) average core exposure to 2000 MWD/T average core exposure. Increasing the interval between required LPRM calibrations is acceptable due to improvements in fuel analytical bases, core monitoring processes, and nuclear instrumentation.

In Reference 2, the NRC requested that AmerGen provide additional information in support of their review of Reference 1. The attachment to this letter provides the requested information.

AmerGen has reviewed the information supporting a finding of no significant hazards consideration that was previously provided to the NRC in Reference 1. The additional information provided in this submittal does not affect the bases for concluding that the proposed license amendment does not involve a significant hazards consideration. No new regulatory commitments are established by this submittal.

If you have any questions concerning this letter, please contact Mr. Timothy A. Byam at (630) 657-2804.

I declare under penalty of perjury that the foregoing is true and correct. Executed on the 16th day of November 2007.

Respectfully,

Darin M Benyak

Darin M. Benyak
Director – Licensing and Regulatory Affairs
AmerGen Energy Company, LLC

Attachment: Additional Information Supporting the Request for a License Amendment to Revise Local Power Range Monitor Calibration Frequency

ATTACHMENT

Additional Information Supporting the Request for a License Amendment
to Revise Local Power Range Monitor Calibration Frequency

NRC Request for Additional Information states:
In reviewing AmerGen Energy Company's submittal dated January 12, 2007, related to your request to modify Technical Specification (TS) Surveillance Requirements (SR) 3.3.1.1.8 and SR 3.3.1.3.2 to increase the interval between local power range monitor (LPRM) calibrations from 1000 megawatt-days per ton (MWD/T) average core exposure to 2000 MWD/T average core exposure, for the Clinton Power Station, Unit No. 1 (CPS), the NRC staff has determined that the following information is needed in order to complete its review:

Request 1:
Confirm that the change in LPRM calibration frequency continues to allow the 25% extension of the calibration interval as stated in the TS provisions in SR 3.0.2.

Request 2:
Provide the analysis that shows that the LPRM response uncertainty remains bounded by the minimum critical power ratio (MCPR) safety limits at 2500 MWD/T. In light of current operating strategies at CPS, this analysis will need to demonstrate:

(a) The currently licensed safety limit MCPR is based on power distribution uncertainties that are consistent with the referenced technical basis documentation.

(b) A sufficient data base exists to cover the 2500 MWD/T calibration interval, because some of the referenced documentation is based on exposure measured in effective full-power hours rather than MWD/T, and assuming 1:1 conversion between the two is non-conservative.

(c) The safety limit MCPR is licensed consistent with current General Electric interim methods employed at plants operating with expanded operating domains.

Discussion
The overall LPRM signal uncertainty component of the total nodal power distribution uncertainty results from four factors. These factors are: (1) uncertainty from axial interpolation in between detectors; (2) random signal noise; (3) system non-linearity; and (4) instrument sensitivity decay arising from the period between LPRM calibrations. Of these four factors, only item (4), instrument sensitivity decay arising from the period between LPRM calibrations (hereafter referred to as the "LPRM update" subcomponent of the overall LPRM signal uncertainty), is affected by the requested revision to the LPRM calibration frequency.

Reference 1 states that an LPRM calibration interval of 2000 Effective Full Power Hours (EFPH) has been evaluated and it has been concluded that the small increase in "LPRM update" uncertainty arising from an increase to a 2000 EFPH calibration interval does not violate the total nodal power distribution uncertainty limit. This is referenced in several places in the document, in particular in Section 3.2, "Uncertainty due to LPRM Updates and Instrument Failure." The NRC has accepted this conclusion as documented in Reference 2.

The increase in LPRM signal uncertainty as a function of LPRM calibration interval length is presented in Reference 3. The LPRM signal uncertainty is shown to be 2.1% for an LPRM

calibration interval of 265 EFPH, 3.7% for 976 EFPH, 4.2% for 2078 EFPH, and 4.3% for 2991 EFPH. The NRC indicated that a 1:1 conversion between EFPH and MWD/T is not exact. This is a true statement as 2500 MWD/T is approximately equal to 2118 EFPH. The above data, therefore, demonstrates that the LPRM update subcomponent of the overall LPRM signal uncertainty increases by approximately 0.1% over the range of 2000 to 2500 MWD/T. This conclusion is further validated by information in the Reference 1 conclusion discussion that the total bundle power uncertainty value due to the LPRM update process for a 2000 EFPH LPRM calibration interval is 0.30%. Therefore, it is evident, that in this range the overall LPRM signal uncertainty component of the total nodal power distribution uncertainty does not significantly change with increasing LPRM exposure.

This small LPRM update uncertainty increase of 0.1%, when increasing the LPRM calibration interval from 2000 to 2500 MWD/T, is offset with significant margin by a number of other conservatisms in the total nodal power distribution uncertainty analysis which include:

- The PANAC11 version of the 3D MONICORE reactor analysis software used at CPS is substantially more accurate and contains less uncertainty than do the previous versions of PANACEA, which were the basis for Reference 1. Reference 4 demonstrates that for PANAC11 3D MONICORE, such as CPS, the overall bundle power uncertainty is 2.69%. This is significantly less than the bundle power design basis uncertainty of 3.19% in Reference 1.

- As discussed in Reference 4, the bundle power uncertainty includes an allowance for an LPRM calibration with one missing Traversing In-Core Probe (TIP) machine (i.e., one TIP machine out of service) which is 0.10%. This is considered conservative because CPS routinely completes LPRM calibrations with zero missing TIP strings.

- As discussed in Reference 4, the bundle power uncertainty allowance for the failure of 25% of the LPRMs is 0.14%. This is considered conservative because CPS routinely operates with significantly fewer (i.e., approximately 6 to 8 of a total of 132) than 25% of the LPRMs failed.

- The TIP signal nodal uncertainty is evaluated experimentally once per cycle and is a measure of TIP signal asymmetry arising from instrument tube orientation and the placement of fuel in the core loading pattern. As discussed in Reference 1, the TIP signal nodal uncertainty limit is 6.0%. This value is typically demonstrated to be in the range of 2 - 3%.

- The LPRM update uncertainty increase of 0.1% assumes that the detector sensitivity is decreasing with increasing neutron exposure. In fact, due to the sensitivity plateau of the advanced General Electric (GE) LPRMs which breed U-235 from U-234, the LPRM update uncertainty could be effectively zero in the detector exposure range where U-235 generation approximately equals U-235 depletion. The NA-250 LPRM detectors used at CPS are an example of this advanced model of LPRM.

- The total nodal power distribution uncertainty evaluation also contains conservatisms associated with core loading pattern asymmetries, control rod pattern asymmetries, and control rod pattern changes between LPRM calibrations. Typical CPS practice is to operate with symmetric control rod patterns and core loading patterns, and relatively long intervals between significant control rod pattern adjustments. Therefore, the total nodal power distribution uncertainty evaluation is conservative when applied to CPS.

- The practice at CPS is to avoid the routine use of TS grace (i.e., application of TS SR 3.0.2). However, while CPS typically does not schedule the LPRM calibrations to the late date, the TS grace period provides flexibility in scheduling the activity to meet station resource needs.

It is important to note, that the cited references are not specific to any particular plant, but rather are based upon the use of 3D MONICORE reactor analysis software and advanced NA-250 LPRM detectors, which are used at CPS.

Response to Request 1

The detailed information presented above demonstrates that, even in the unlikely event of an interval of 2500 MWD/T between LPRM calibrations (i.e., 25% extension of the calibration interval), the total nodal power distribution uncertainty limits are not violated. All components of the overall LPRM signal uncertainty are either unaffected or are negligibly affected and all licensing basis requirements are satisfied.

Response to Request 2

As discussed in response to Request 1, the detailed information presented above demonstrates that, even in the unlikely event of an interval of 2500 MWD/T between LPRM calibrations, the total nodal power distribution uncertainty limits are not violated.

As stated above, Reference 1 states that an LPRM calibration interval of 2000 Effective Full Power Hours (EFPH) has been evaluated and it has been concluded that the small increase in LPRM update uncertainty arising from an increase to a 2000 EFPH calibration interval does not violate the total nodal power distribution uncertainty limit. This is referenced in several places in the document, in particular in Section 3.2, "Uncertainty due to LPRM Updates and Instrument Failure." The NRC has accepted this conclusion as documented in Reference 2. The CPS safety limit MCPR analysis is based on 'Reduced' power distribution uncertainties for all licensed operating domains, and is fully consistent with and bounded by the information provided in References 1 and 2.

The NRC indicated that a 1:1 conversion between EFPH and MWD/T is not exact. This is a true statement as 2500 MWD/T is approximately equal to 2118 EFPH. The justification presented in Reference 6 and in this response to Reference 7, does demonstrate that operation up to and beyond a 2500 MWD/T LPRM calibration interval is acceptable. Note that the Reference 3 value of 2991 EFPH corresponds to a current cycle exposure interval of approximately 3529 MWD/T.

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References

1. General Electric Licensing Topical Report NEDC-32694P-A, "Power Distribution Uncertainties for Safety Limit MCPR Evaluations," dated August 1999

2. Letter from F. Akstulewicz (NRR) to G.A Watford (GE), "Acceptance for Referencing of Licensing Topical Reports NEDC-32601P, 'Methodology and Uncertainties for Safety Limit MCPR Evaluations'; NEDC-32694P, 'Power Distribution Uncertainties for Safety Limit MCPR Evaluation'; and 'Amendment 25 to NEDE-24011-P-A on Cycle-Specific Safety Limit MCPR' (TAC Nos. M97490, M99069 and M97491)," dated March 11,1999

3. General Electric Report entitled "Justification for Operating 2000 EFPH Between OD-1 and LPRM Calibration (Rev 3) and Justification for Allowing LPRM GAF Range of .85 to 1.15 Following LPRM Calibration (Rev 3)," prepared by G. R. Parkos, dated October 7, 1993, revised June 16, 1994

4. GE Nuclear Energy Report NEDC-32773P, Revision 1, "Advanced Methods Power Distribution Uncertainties for Core Monitoring," dated January 1999

5. General Electric Licensing Topical Report NEDO-10958-P-A, "General Electric BWR Thermal Analysis Basis (GETAB) Data, Correlation and Design Application," dated January 1977

6. Letter from Mr. K. R. Jury (AmerGen Energy Company, LLC) to U. S. NRC, "Request for a License Amendment to Revise Local Power Range Monitor Calibration Frequency," dated December 12, 2006

7. Letter from U. S. NRC to Mr. C. M. Crane (AmerGen Energy Company, LLC), "Clinton Power Station, Unit No. 1 – Request for Additional Information Related to Revision of Local Power Range Monitor Calibration Frequency," dated September 20, 2007