PHILADELPHIA ELECTRIC COMPANY

NUCLEAR GROUP HEADQUARTERS

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August 24, 1990

Docket Nos. 50-352
50-353

License Nos. NPF-39
NPF-85

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D.C. 20555

SUBJECT: Limerick Generating Station, Units 1 and 2
Philadelphia Electric Company In-House Reactor
Core Reload Methodology Topical Reports

Gentlemen:

References 1 through 4, identified in the Attachment, submitted Philadelphia Electric Company (PECo) Topical Reports describing in-house reactor core reload analysis methodologies and requested NRC approval for their use in performing reload analyses for our Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. Our letter dated May 30, 1989, "In-House Reload Licensing for Peach Bottom Atomic Power Station," submitted the last reload methodology Topical Report. References 5 through 8 provided the NRC approval of the previous Topical Reports for PBAPS and forwarded the associated NRC Safety Evaluation Reports (SERs). NRC letter dated June 15, 1990, approved the last PECo Topical Report for PBAPS and forwarded the associated SER. The purpose of this letter is to provide justification for the applicability of these reload methodology Topical Reports to the Limerick Generating Station (LGS), Units 1 and 2, and request NRC approval of their use for LGS, Units 1 and 2 core reload analyses. This request was discussed during a conference call held on May 23, 1990, between NRC and PECo representatives. Based on that discussion, we understand that the NRC will need to review additional information to that provided below in order to approve PECo Topical Report PECo-FMS-0006, "Methods for Performing BWR Reload Safety Evaluations," for LGS core reload analyses. Accordingly, we will be submitting additional information to support NRC approval of PECo-FMS-0006 for LGS, Units 1 and 2, by the end of the second quarter of 1991.

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We request NRC approval for application of the PECo reload analysis methodologies, described in the Topical Reports submitted to the NRC by References 1 through 4, to the LGS, Units 1 and 2, with the same restrictions specified in the NRC SERs forwarded by References 5 through 8. All of the LGS and PBAPS units are of the General Electric Boiling Water Reactor (BWR) -4 design, having very similar primary reactor systems, rated operating parameters, reload fuel designs, and core loading configurations. Furthermore, the PECo reactor analysis methods were developed to explicity account for the minor differences that do exist between PBAPS and LGS. Therefore, for the reasons discussed below, the computer codes and procedures described in the Topical Reports identified in References 1 through 4 can be used to perform reload analyses for the LGS, Units 1 and 2 cores.

The PBAPS and LGS units are very similar from a reactor thermal-hydraulic and fuel performance standpoint. The component designs and ranges of operation to be analyzed are essentially the same. For example, fuel rods in the PBAPS and LGS cores are identical in design (for a given fuel product line), and are analyzed for fuel performance evaluations over the same range of power history. Similarly, there are no differences in fuel assembly mechanical designs between stations for a given fuel product line. Thus, the specific PECo methods (References 1 and 2) are equally applicable to the LGS units.

Within the primary reactor system (i.e., Nuclear Steam Supply System, NSSS), there exists a variety of a minor physical differences (e.g., length of steam lines, number of steam separators, etc.) between the PBAPS and LGS units. However, these differences are not conceptual in nature (i.e., these differences do not affect the analysis methods) and the same engineering methods (i.e., modelling techniques) are fully applicable to the LGS as well as PBAPS units. Specifically, the RETRAN computer code analyses for LGS will be based upon the same nodalization techniques, neutronic models, hydraulic models, etc. as those developed for PBAPS (Reference 3), with physical plant design differences explicitly accounted for using previously approved engineering methods (e.g., References 5, 6, 7, and 8).

From a reactor physics perspective, the PBAPS and LGS units are also very similar. All units' cores are comprised of standard, enriched uranium Light Water Reactor (LWR) fuel assemblies that are operated under essentially identical ranges of nodal conditions (power, pressure, temperature, moderator void content, etc.). The only significant in-core difference between the PBAPS and LGS units is the reactor core radial geometry. The geometrical differences between "C" (i.e., LGS reactor cores) and "D" (i.e., PBAPS reactor cores) lattice configurations have a minimal impact on the methods described or results reported in Reference 4. "C" lattice plants are typically loaded with assemblies which have different nuclear design characteristics (i.e., fuel pin enrichment distributions) than "D" lattice assemblies. This, however, is essentially no different than varying nuclear designs with a "D" lattice design; a typical practice used during the analysis of PBAPS reload fuel. Secondly, while a given fuel assembly, loaded in the same core location and operated under the same gross core conditions at both stations, will experience somewhat different localized (i.e., nodal) operating parameters, the overall range of

nodal operating conditions is very consistent between "C" and "D" lattice cores, further supporting the applicability of the PBAPS steady-state core physics methodology benchmarks to LGS. We also note that our core physics methods explicitly evaluate and account for observed differences between unit operating data and pure analytical solutions. While the observed accuracy of our core physics methods may vary somewhat from unit to unit and from fuel cycle to fuel cycle, the NRC SERs state that the techniques used by PECo to account for core modelling biases and uncertainties are reasonable. Finally, much of the benchmarking reported in Reference 4 (i.e., isotopic inventory, fuel pin power distributions, reactivity coefficients, etc.) is of a generic nature, reflecting a variety of plant designs, fuel designs, and core configurations. This confirms the general applicability of our core physics methods to a wide range of reactor designs and analyses.

The fact that many of the benchmarks also discussed in the referenced PECo reports are of a generic nature is significant. Examples of this include benchmarks to the ATLAS test loop critical quality data, Yankee Rowe isotopics measurements, Halden fuel performance test rods, Kritz pin power distribution data, A.B. Atomenergi Doppler measurements, PECo/Yankee Atomic/Studsvik Energiteknik-AB KENO-IV (Monte Carlo Program) pin power and reactivity coefficient results, and the NRC RETRAN-02 standard test problem. Reliance on generic benchmarks and safety evaluations which frequently reflect different LWR reactor designs, fuel designs, and core loading configurations is a common industry practice for benchmarking methods. A substantial portion of the material presented in the referenced reports is, therefore, equally applicable to the LGS units as it is to the PBAPS units.

The NRC has approved our reactor analysis methods for application to the PBAPS units' core reloads (References 5, 6, 7, and 8) based on a significant volume of generic industry benchmarks, generic computer safety evaluations, and a variety of PBAPS specific qualification studies. The methods that we employ have been demonstrated to be applicable to a variety of LWR designs, fuel designs, and core loading configurations by a number of other licensees and vendors. The NRC has also cited, in References 5, 6, 7, and 8, the expertise of PECo personnel, and the acceptability of the engineering methods which we apply to the PBAPS reactor analyses, methods which account for observed biases and uncertainties relative to actual plant data.

Based on the above discussion, and the fact that the PBAPS and LGS units are BWR-4s with primary reactor systems and cores configured in a nearly identical manner, we consider that there is sufficient justification for the NRC to approve this request to use the methods described in References 1, 2, 3, and 4 for the core reload analyses for LGS, Units 1 and 2. As stated in the referenced PECo reports, we will continue to monitor the accuracy of our core reload analysis methods relative to measurements obtained from both the PBAPS and LGS units to assure the continued applicability of these methods.

If you have any questions, or require additional information, please contact us.

Very truly yours,

RM Kacich for

G. A. Hunger, Jr.
Manager
Licensing Section
Nuclear Engineering and Services

Attachment

cc: T. T. Martin, Administrator, Region I, USNRC
T. J. Kenny, USNRC Senior Resident Inspector, LGS

ATTACHMENT

References

1. Letter from S. L. Daltroff (PECo) to D. R. Muller (NRC), "Philadelphia Electric Company In-House Reload Licensing," dated August 29, 1986.

2. Letter from J. W. Gallagher (PECo) to W. R. Butler (NRC), "Philadelphia Electric Company In-House Reload Licensing Methods Reports," dated July 13, 1987.

3. Letter from J. W. Gallagher (PECo) to W. R. Butler (NRC), "Philadelphia Electric Company In-House Reload Licensing," dated September 28, 1987.

4. Letter from J. W. Gallagher (PECo) to W. R. Butler (NRC), "Philadelphia Electric Company In-House Reload Licensing," dated February 1, 1988.

5. Letter from R. E. Martin (NRC) to E. G. Bauer (PECo), "Safety Evaluation for Reports PECo-FMS-0001 and PECo-FMS-0002 for Core Reload Analyses," dated October 22, 1987.

6. Letter from R. E. Martin (NRC) to G. A. Hunger, Jr. (PECo), "Safety Evaluation of PECo's FROSSTEY Fuel Performance Code: PECo-FMS-0003," dated September 21, 1989.

7. Letter from R. E. Martin (NRC) to G. A. Hunger, Jr. (PECo), "Safety Evaluation for Topical Report PECo-FMS-0004, 'Methods for Performing BWR System Transient Analysis'," dated November 23, 1988.

8. Letter from Gene Y. Suh (NRC) to G. A. Hunger, Jr. (PECo), "Safety Evaluation for Topical Report PECo-FMS-0005, 'Methods for Performing BWR Steady-State Reactor Physics Analyses'," dated November 9, 1989.