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MEMORANDUM FOR: Paul S. Check, Chief, Reactor Safety Branch, Division of Operating Reactors

THRU: Franklin D. Coffman, Section Leader, Reactor Safety Branch, Division of Operating Reactors

FROM: Jack E. Rosenthal, Reactor Safety Branch, Division of Operating Reactors
Harold Vander Molen, Reactor Safety Branch, Division of Operating Reactors

SUBJECT: MEETING WITH JCP&L AND GPUSC TO DISCUSS §50.59 RELOADS

A meeting was conducted with representatives of Jersey Central Power and Light (JCP&L), General Public Utilities Service Corporation (GPUSC), and the NRC at the GPUSC offices in Parsippany, New Jersey on January 15 and 16, 1979. JCP&L and GPUSC are both subsidiaries of General Public Utilities Corporation. The purpose of the meeting was to discuss safety analyses for reloading of the Oyster Creek Nuclear Power Station. Reload safety analyses have been performed by the licensee, JCP&L, under the provisions of 10 CFR 50.59. Discussions were centered on the efforts of the licensee and his consultants related to past and future §50.59 reloads. A summary, meeting agenda and list of attendees are attached. We have consulted with JCP&L and GPUSC to ensure that this summary contains no proprietary information.

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Enclosures:
As stated

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OYSTER CREEK
MEETING SUMMARY DISTRIBUTION

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Attendees

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[redacted]

ATTENDANCE LIST

NAME	ORGANIZATION
Gordon Bond	GPUSC
Ronald Furia	GPUSC
Robert Lee	GPUSC
Nick G. Trikouros	GPUSC
A. H. Rone	JCP&L
K. O. E. Fickeissen	JCP&L
R. W. Keaten	GPUSC
J. E. Rosenthal	USNRC/DOR/RSB
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MEETING SUMMARY

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1. Data Interfaces

To date, calculations forming the basis for licensing decisions have been purchased by JCP&L and GPUSC from GE and, more recently, from Exxon. GPUSC has purchased the Exxon Nuclear computer codes XTRA and PTS-BWR2, with associated base input decks. Using these codes, GPUSC performs scoping and confirmatory calculations. JCP&L, GPUSC and Exxon all independently perform core burnup calculations. In addition, GPUSC performs technical reviews of Exxon calculations. The JCP&L staff and management review in depth the analyses performed by GPUSC and by Exxon. All plant modifications are reviewed with respect to §50.59. JCP&L and GPUSC use their resources to determine which safety analyses are bounding and which need review and/or reanalysis.

Generally, the quality of the review by any licensee's resources depends upon the qualifications of the review group members and their scope of review. Additionally, the quality of a review against §50.59 depends upon the licensee having information in sufficient quantity to assure that the entire basis for current technical specifications was considered in the reload safety analyses.

GPUSC is firmly commited to performing its own reload safety analyses and review. This is expected to occur in ca. 1981.

2. Core Monitoring System

Core monitoring is performed off-line using computer programs which use algorithms originally developed at GE and subsequently modified by GPUSC. Full core monitoring is performed every two weeks using the code, "Nuclear Fuels Analysis Program." Limiting fuel assemblies are monitored daily using the single-trace code, "Core Limit Fuels Analysis Program." Using data from the intercalibrated TIP detectors, these programs calculate best estimate power distributions and, in turn, operating values of MCHFR, MCPR, MLHGR, and MAPLHGR. These codes have

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not been reviewed by the staff. (It is our understanding that the staff has not requested submission of these codes for review.) Pre-operational input data for the core monitoring programs are purchased from Exxon.

JCP&L measures a new TIP trace whenever core monitoring is required. This is in contrast to the GE practice of using the LPRMs to "update" an older TIP trace if plant conditions have not greatly changed, rather than measuring new TIP traces each time.

A second difference is that the JCP&L/GPUSC calculations always use quarter-core reflective symmetry, whereas the GE codes can be run in rotational, reflective and asymmetric modes. Thirdly, the GE codes are always "full core" calculations; there is nothing analogous to the GPUSC single-trace program.

Power map measurement uncertainties associated with hardware, software and preoperational data input to these programs have not been explicitly treated. GPUSC does have preliminary studies which indicate that these uncertainties are of the order of only a few percent.

The plant has been MAPLHGR limited and operates against these limits using best estimate values of the operating MAPLHGR. (This is also true of other BWRs.) If it is assumed that the measurement uncertainties are normally distributed and unbiased, then 50% of the time the reactor operates at the MAPLHGR limits, the limits will be exceeded by a few percent. Although compensating conservatisms probably exist, no documentation was apparent. We believe this matter should receive further attention.

3. Startup Test Program

The startup programs performed after refueling outages were discussed. Highlights were as follows:

Core loading verification is performed by two observers using a TV camera. A video tape is made only when recording equipment is operational. JCP&L performs two visual scans of the core after reloading. The first searches for mislocated bundles and the second searches for misoriented fuel bundles.

Individual rod pulls are performed to verify rod operability, withdrawal/insertion rate, coupling, and stall flow. An interesting feature of the Oyster Creek program is the use of an oscilloscope trace of differential pressure across the drive during certain rod pulls to identify any "tight spots."

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Shutdown margin checks are performed in conjunction with the control rod drive tests. These checks are performed before the vessel head is installed.

Scram time testing is performed after the head is installed, as required by the technical specifications.

Power distribution is checked at low power. However, the only explicit criteria are the thermal-hydraulic limits in the technical specifications.

TIP asymmetry checks are not performed since the Oyster Creek plant has no TIP locations that are reflectively symmetric.

4. Operating Data

JCP&L presented the anomaly checks done for Cycle 7. An anomaly check consists of a plot of measured and predicted rod density vs. exposure. (During coastdown operations, plots of power vs. exposure are used.) Measurements are plotted at approximately 50 GWD intervals. The predicted rod density takes the form of a discontinuous curve because of the control rod sequence exchanges performed by all BWRs to equalize fuel burnup.

In the case of Cycle 7, the measured rod densities were well within the technical specification limits. One low point, out of line with other measurements but still within the limits, was well explained by reduced power operation.

JCP&L also stated that end-of-cycle axial power distributions have been significantly more bottom-peaked than the Haling distribution. Although this results in less efficient fuel utilization, it results in a more conservative system reactivity insertion curve.

5. Safety Analyses

The Cycle 7 Reload Information and Safety Evaluation Report was discussed. This report was written by GPUSC for internal review by GPUSC and JCP&L as required by 10 CFR 50.59. The report followed the Preliminary Guidance for Reload Submittals transmitted by DOR to all licensees in 1973. In our opinion, this report for GPUSC/JCP&L internal consumption was more detailed and complete than most of the reload submittals evaluated by the Reactor Safety Branch before the approval of NEDO-24011.

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The purpose of the meeting was not to evaluate and discuss the safety analyses in the detail typical of a normal reload review. Although some discrepancies from normal analyses were noted, further discussion generally indicated that these differences were well explained by actual hardware differences between the Oyster Creek plant and more modern plants. Discussions of the analyses is continuing via telephone.

GPUSC was aware of recent developments in transient modeling, particularly the Peach Bottom transient tests. However, except for EPRI involvement, GPUSC must depend on NRC announcements to keep up with new licensing developments including new data. There is no other formal channel for such information.

Also discussed was the question of whether or not power coastdown was allowable under the purview of 50.59. Since the safety analyses were performed assuming an EOC rod density (subject to a technical specification minimum rod density of 3-1/2%), JCP&L has judged power coastdown to be allowable.

6. Conclusion

In general, the extent of the internal procedures used by GPUSC/JCP&L is quite impressive. It is recognized that the quality of the internal procedures depends upon the analytical expertise developed by GPUSC and JCP&L, which is high.

We recommend that the adequacy of the calculational tools used to simulate plant transients continue to be formally reviewed in the light of the Peach Bottom test results. However, the review is not peculiar to Oyster Creek but is planned for all plants that no longer use the generic GE methodology.

In addition, the measurement uncertainty involved in monitoring core thermal-hydraulic limits is not well documented. This is in sharp contast to PWR practice, where specific error allowances associated with incore monitoring are explicitly listed in the technical specifications. Moreover, it should be noted that no symmetric TIP checks can be performed at Oyster Creek for the monitoring of certain error allowances. Again, this general problem is not specific to Oyster Creek. However, the single-trace monitoring methods may render GE's "self-penalizing" TIP uncertainty effects inapplicable.

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AGENDA

1. Review of organization and data interfaces. Specifically which organization (Jersey Central, GPUSC, GE, Exxon) has/will perform:

   (a) fuel management

   (b) cycle specific data generation (power distribution, kinetics parameters, rod worths, rod sequencing, etc.)

   (c) accident analyses of record

   (d) cycle specific safety analyses and/or decision that previous analyses are bounding

   (e) generation of data input to core monitoring system

2. Review status of core monitoring system computer code and associated error analysis. Typical output and comparisons of measured and predicted values should be available.

3. Review of startup test program and review and acceptance criteria currently in place. Test data should be available.

4. Review of operating data. We are particularly interested in rod sequencing and density predictions vs. actual operation, and how well a Haling power distribution is achieved.

5. Safety analyses

   a) Discussion of how generic methods revisions are learned about and implemented.

   b) Review of computer codes used in each transient and safety analyses.

   c) Detailed discussion of procedures used to insure that previous analyses are in fact bounding.

6. General discussion of how Jersey Central (the licensee) views and uses the provisions of 10 CFR 50.59 in the course of core reload.

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