## 1.0 INTRODUCTION

Section 6.7.A.1 of the Monticello Technical Specifications, Appendix A, specifies that a summary report shall be submitted following installation of fuel of a different design (i.e. the P8x8R fuel type). This report is to be submitted within 90 days following completion of the startup test program.

In addition, the NRC Safety Evaluation supporting Amendment No. 43 to License No. DPR-22 required: (1) "a written reporting describing the results of the physics startup tests" for Cycle 8, and (2) "a brief summary of the results and findings of the end of Cycle 7 fuel examinations".

The NRC Safety Evaluation supporting Amendment No. 37 to License No. DPR-22 addressed EOC inspections of fuel channels to detect anomalies associated with using fuel having drilled lower tieplates.

This report summarizes test data required by the Technical Specifications and aforementioned SER's.

## 2.0 STARTUP PHYSICS TESTS

Tests conducted are described below:

Final fuel moves for the as-loaded CYCLE 8 core were completed on March 16, 1980, and core verification followed immediately thereafter.

Shutdown margin testing completed on the NSP-calculated strongest rod in the core demonstrated SDM of greater than 0.7% delta K; testing completed on the GE-calculated strongest rod demonstrated SDM of greater than 0.9% delta K. These demonstrations account for the Technical Specification-required amount of shutdown ability with the strongest rod withdrawn, plus additional amounts to compensate for calculational uncertainty, temperature differences, fission product poisons, and any "R" factor which may be applicable.

A benchmark 4-rod critical was performed to provide verification of the NSP core analysis code used to follow and predict the Monticello core. Criticality was attained well within the expected $\pm$1% delta K band. With this knowledge, two additional 4-rod, or "local", criticals were achieved for the purpose of irradiating flux wires inserted into four TIP locations. The flux wires were subsequently shipped to GE's Vallecitos Nuclear Center for analysis. This was in accordance with plans to obtain data regarding the placement of assemblies into the core intened to achieve exposure above 40,000 MWD/STU as part of the GE/DOE Extended Burnup Program. Results of the flux wire analyses will be conveyed as part of the "final report on the results of the end of Cycle 7 examinations" referred to in Section 2.2.2 of the SER Supporting Amendment No. 43.

Criticality was achieved within the predicted band utilizing a normal, dispersed "B" Sequence control rod pattern. Using this symmetric configuration, the pattern was rotated 90° to verify core symmetry by achieving similar reactor periods. In both cases, periods close to 200 seconds were measured.

Criticality for startup and power operation was achieved within the predicted band utilizing a normal, dispersed "A" sequence control rod pattern. During heatup, temperature defect data were obtained approximately every 50°F up to 509°F. From this data the Monticello CYCLE 8 moderator temperature coefficient was determined to be 0.60 X $10^{-4}$ delta K per degree Fahrenheit. With this information, the temperature bias applicable to the critical predictions made using the NSP code was found to be -0.0009 delta K. Results of the sequence criticals showed a difference of 0.0023 delta K between the critical positions predicted and those actually achieved. The net result is that the criticalities were within 0.0014 delta K of the predictions. This information will be used to predict critical for all subsequent CYCLE 8 startups/restarts at Monticello, consistent with practices employed during all previous cycles of operation of the Monticello core.

## 3.0 EXTENDED EXPOSURE FUEL INSPECTION

At EOC-7 the three highest exposure bundles considered as part of the Extended Burnup Program were examined in detail. These included MTB-48, MTB-71, and the pre-characterized bundle MTB-99. Visual inspection of the water rod lower endplugs revealed them to be raised above the fully-seated position in the lower tie-plate. The water rod lower endplugs were moved downward to the fully-seated position. Seating of the water rods was confirmed by visual observtion and measurement of the distances of fuel bundle spacers above the lower tieplate. Plunge gauge measurements of the water rod upper end plug were performed after seating of the water rods. It was found necessary to increase the length of the water rod by placing an extender with spring over the upper end plug.

Peripheral visual inspections showed MTB-99 bundle components to be covered by a moderately heavy layer of red crud. Class 2 nodular oxides were observed on some fuel rods between 2 and 10 inches from the bottom. Above the 10-inch elevation crud obscured detailed observations of nodular oxides; however, crud deposits on all Monticello fuel continue to be minimal compared to most GE plants according to the GE inspection supervisor. Visual inspection of MTB-48 yielded similar observations.

Dimensional measurements of rod-to-rod spacing indicated minima of 76 mils for MTB-99, 90 mils for MTB-48, and 100 mils for MTB-71. The minimum bundle design requirement for <u>new fuel</u> is 99 mils. The situation was reviewed by GE fuel design engineering personnel and concurrence was obtained to allow continued operation of each bundle.

Ten rods in MTB-99 and five rods in MTB-48 were profiled with charts to be analyzed by GE and results provided in a later (final) report. Additional details of the extensive examinations performed are available at the Monticello plant filed with Special Procedure No. 8788.

## 4.0 8X8R CHANNEL INSPECTION

Channel measurement over the full length of all four sides of each channel was accomplished using the In-Base Inspection System (IBIS) during the refueling outage. This was done for 35 channels of special interest to the channel manufacturer, Carpenter Technology Corp. Among the 35 were 15 which were on retrofit 8X8R fuel and of special interest to NSP. Visual observation in the fuel storage pool revealed no anomalous appearance; in fact, the channels all appeared to be extremely clean and free of any unusual oxide deposition. Measurement results are detailed below in TABLE 1.

TABLE 1
MONTICELLO FUEL CHANNELS MEASURED @ EOC-7

| CHANNEL NUMBER | FUEL ASS'Y NUMBER | EXPOSURE MWD/STU | MAXIMUM O.D. (INCHES) | MAXIMUM CONVEXITY (INCHES) | MAXIMUM PERPEND. (INCHES) | MAXIMUM TWIST (INCHES) | MAXIMUM BOW (INCHES) |
|---|---|---|---|---|---|---|---|
| 625C | LJB-651 | 9571 | 5.484 | 0.019 | 0.006 | 0.007 | 0.023 |
| 692C | LJB-676 | 8951 | 5.488 | 0.020 | 0.008 | 0.006 | 0.020 |
| 632C | LJB-677 | 11208 | 5.486 | 0.020 | 0.008 | 0.007 | 0.037 |
| 637C | LJB-678 | 10608 | 5.491 | 0.023 | 0.007 | 0.005 | 0.034 |
| 687C | LJB-679 | 10106 | 5.490 | 0.020 | 0.009 | 0.008 | 0.018 |
| 812C | LJB-693 | 9182 | 5.469 | 0.018 | 0.054 | 0.018 | 0.032 |
| 606C | LJB-700 | 10291 | 5.490 | 0.021 | 0.080 | 0.073 | 0.046 |
| 642C | LJB-704 | 9527 | 5.495 | 0.023 | 0.051 | 0.033 | 0.032 |
| 790C | LJB-708 | 9570 | 5.470 | 0.020 | 0.045 | 0.040 | 0.032 |
| 603C | LJB-606 | 7271 | 5.467 | 0.013 | 0.045 | 0.026 | 0.041 |
| 618C | LJB-604 | 7305 | 5.482 | 0.020 | 0.067 | 0.057 | 0.032 |
| 724C | LJB-636 | 8037 | 5.480 | 0.016 | 0.036 | 0.029 | 0.033 |
| 641C | LJB-638 | 7504 | 5.476 | 0.016 | 0.052 | 0.032 | 0.058 |
| 690C | LJB-627 | 7304 | 5.479 | 0.016 | 0.045 | 0.035 | 0.032 |
| 405C | LJB-625 | 7271 | 5.473 | 0.014 | 0.031 | 0.031 | 0.058 |

The "as-built" outside dimension is 5.438"; the O.D. in TABLE 1 is across two opposite sides. Convexity, or outward bulge of a channel sidewall at a given axial position, is the difference between a probe located on the center of the wall and two other probes near the corners of the same side. Perpendicularity is the squareness of adjacent sides. Twist and bow are for a given side measured from top to bottom of the channel. In each case, the maxima of the four sides are reported in TABLE 1. Evaluation of the measurements shown above indicates acceptable channel condition and no unusual wear or deterioration apparent as a result of residing on fuel bundles having drilled lower tieplates.