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SUBJECT: "Turkey Point Unit 4 Cycle 18 Startup Rept." With 990628 ltr.

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U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
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Re: Turkey Point Unit 4
Docket No. 50-251
Turkey Point Unit 4 Cycle 18 Startup Report

Technical Specification (TS) 6.9.1.1, Startup Report, states that a summary report of plant startup and power escalation testing shall be submitted following installation of fuel that has a different design. Turkey Point Unit 4 Cycle 18 started up with ZIRLO clad material in the new fuel assemblies. This is the first cycle for Unit 4 with a fuel assembly design with ZIRLO material and in accordance with TS 6.9.1.1 the attached startup report is provided.

Should there be any questions, please contact us.

Very truly yours,

DE Jernigan For

R. J. Hovey
Vice President
Turkey Point Plant

OIH

Attachment

cc: Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, Turkey Point Plant

IE26

TURKEY POINT UNIT 4 CYCLE 18 STARTUP REPORT

1.0 DESCRIPTION AND PURPOSE

On April 19, 1999, Turkey Point Unit 4 completed the Cycle 18 refueling outage and the unit was placed on-line. Cycle 18 was the first cycle that Unit 4 operated with Zirlo clad material in the new fuel assemblies. Turkey Point Unit 3 has operated with Zirlo clad fuel assemblies since the beginning of Cycle 17 (October 28, 1998). Zirlo material replaced the standard Zircaloy-4 material. Fifty-six fresh assemblies used Zirlo material in the fuel rod cladding, guide tubes, instrument tubes and mid-span spacer grids.

Technical Specification (TS) 6.9.1.1, Startup Report, states that a summary report of plant startup and power escalation testing shall be submitted following: ... (3) installation of fuel that has a different design or has been manufactured by a different fuel supplier. TS 6.9.1.1 states that the report shall address each of the tests identified in the FSAR and shall in general include a description of the measured values of the operating conditions of characteristics obtained during the test program and a comparison of these values with design predictions and specifications. Any corrective actions that were required to obtain satisfactory operation shall be described. Any additional specific details required in license conditions based on other commitments shall be included in this report. Subsequent Startup Reports shall address startup tests that are necessary to demonstrate the acceptability of changes and/or modifications.

This startup report is generated on the basis that the use of Zirlo represents a different fuel assembly design.

2.0 ANALYSIS/EVALUATION

Core Design and Cycle Burnup

The core design of Cycle 18 is made up of 157 Debris Resistant Fuel Assemblies that contain a nominal 6 inch axial blanket of natural uranium dioxide pellets at both the top and the bottom of the fuel stack. The fuel assemblies are arranged in a low leakage pattern.

The core design is accomplished by replacing 37 of Region 17 thrice burned and 20 of the Region 18 twice burned fuel assemblies with 56 fresh Region 20 fuel assemblies and one reinserted Region 16 twice burned assembly. Region 20 consists of 12 assemblies at 4.0 w/o U-235 and 44 assemblies at 4.4 w/o U-235. The remainder of the 157 assemblies is made up of 44 twice burned Region 18 fuel assemblies and 56 once burned Region 19 fuel assemblies carried over from Cycle 17.

Startup Test Program

Turkey Point's Startup Test Program includes initial dilution to criticality, Low Power Physics Testing (LPPT), Power Ascension Testing and Reactor Coolant System (RCS) Flow Verification. LPPT is

performed in accordance with ANSI/ANS-19.6.1 1985, Reload Startup Physics Tests for Pressurized Water Reactors. Power Ascension Testing addresses the various flux maps and RCS temperature measurements performed at intermediate power levels as the unit ascends to 100% power. The RCS Flow Verification is performed per Technical Specification 3/4.2.5, after each fuel loading and at least once per 18 months. Each phase of the Startup Test Program is discussed in more detail in the following paragraphs.

Initial Dilution to Criticality

Following the refueling outage, Turkey Point performs a dilution to criticality by withdrawing the shutdown banks followed by the control banks in overlap, and performing 1/M calculations at selected intervals. Control Bank D is withdrawn to a pre-determined core height position and then the reactor is slowly diluted to criticality.

For the Unit 4 Cycle 18 startup the desired critical rod height was D-Bank at 190 steps withdrawn. The design critical boron concentration at the desired rod position on D-Bank was 1802 ppm. The reactor was declared critical and data was taken at an equilibrium value of approximately 5E-08 Amps as indicated by the power range excore detectors, indicated at D-Bank position of 192 steps and a critical boron concentration of 1804 ppm.

Low Power Physics Testing

Following dilution to criticality, LPPT was commenced. The purpose of this test is to ensure that the physics characteristics of the new core are consistent with the core operating limits and the operating characteristics of the core are consistent with the design predictions. LLPT is performed in accordance with ANSI/ANS-19.6.1 1985, Reload Startup Physics Tests for Pressurized Water Reactors.

The following tests were performed during the LLPT:

- All Rods Out (ARO) Boron Endpoint,
- Positive Period Check,
- Differential Boron Worth,
- ARO Hot Zero Power Isothermal Temperature Coefficient and Moderator Temperature Coefficient,
- Reference Bank-In Rod Worth (by dilution) and
- Non-Reference Bank Rod Worth (by Rod Swap).

The results of each of these tests are provided in Table 1, with a comparison of the predicted value and the measured value. As indicated in Table 1, all of the LPPT performed met their acceptance criteria.

Power Ascension Testing

Turkey Points Power Ascension Testing included performing incore flux maps at approximately 30%, 75% and 100% power. During this startup, Turkey Point implemented the Westinghouse Single Point Excore Calibration method which predicted excore detector behavior following the refueling. In addition, at 75% power and 100% power, an incore-excore calibration was performed to generate full power total currents and Axial Flux Difference Calibration data. Once the unit reached 100% power, an RCS flow verification was performed, as well as a Hot Full Power Boron Concentration Test. Figures 1 and 2 display the Beginning of Cycle peaking factors.

RCS Flow Verification

The RCS flow verification was performed to satisfy the requirements of TS 4.2.5.4. This Technical Specification requires that after each fuel loading and at least once per 18 months, the RCS flow rate shall be determined by precision heat balance after exceeding 90% power. TS 3.2.5 requires that the measured RCS flow shall be greater than or equal to 264,000 gpm. The measured RCS flow was approximately 284,986 gpm.

3.0 CONCLUSION

As demonstrated in this report, the transition from Zircaloy-4 to Zirlo cladding has resulted in no deviation in predicted core design behavior. Unit 4 fuel reliability continues to indicate a defect-free core, and the core continues to operate consistently with design predictions.

Table 1
Turkey Point Unit 4 Cycle 18
Low Power Physics Test Results

Physics Test	Acceptance Criteria	Measured Value (M)	Predicted Value (P)	Difference*
All Rods Out (ARO) Boron Concentration	+/- 50 ppm	1813 ppm	1812 ppm	-1 ppm
HZP Isothermal Temperature Coefficient	+/- 2 pcm/°F	-0.643 pcm/°F	-1.198 pcm/°F	-0.555 pcm/°F
HZP Moderator Temperature Coefficient	< 5 pcm/°F	1.027 pcm/°F	0.472 pcm/°F	-0.555 pcm/°F
Positive Period Check	+/- 4%	83.17 pcm	83.28 pcm	0.13%
Reference Bank In Boron Endpoint	+/- 50 ppm	1619 ppm	1622 ppm	3 ppm
Individual Bank Worth				
CBD	+/- 15% or	714.7	743	4.0% / 28.3 pcm
CBA	+/- 100 pcm,	1195.2	1211	1.3% / 15.8 pcm
CBB	whichever is	233.8	261	11.6% / 27.2 pcm
SBB	greater	1174.6	1202	2.3% / 27.4 pcm
SBA		999.3	1055	5.6% / 55.7 pcm
Reference Bank Worth				
CBC	+/-10%	1355.4	1400	3.3%
Total Bank Worth	+/- 10%	5673	5872	3.5%
HZP Differential Boron Worth	+/- 15%	6.85 pcm/ppm	7.37 pcm/ppm	7.6%

* Difference = (Predicted - Measured)
Percent Difference = ((Predicted/Measured) - 1) x 100

FIGURE 1

UNIT 4 - CYCLE 18

Peak Fq vs Exposure

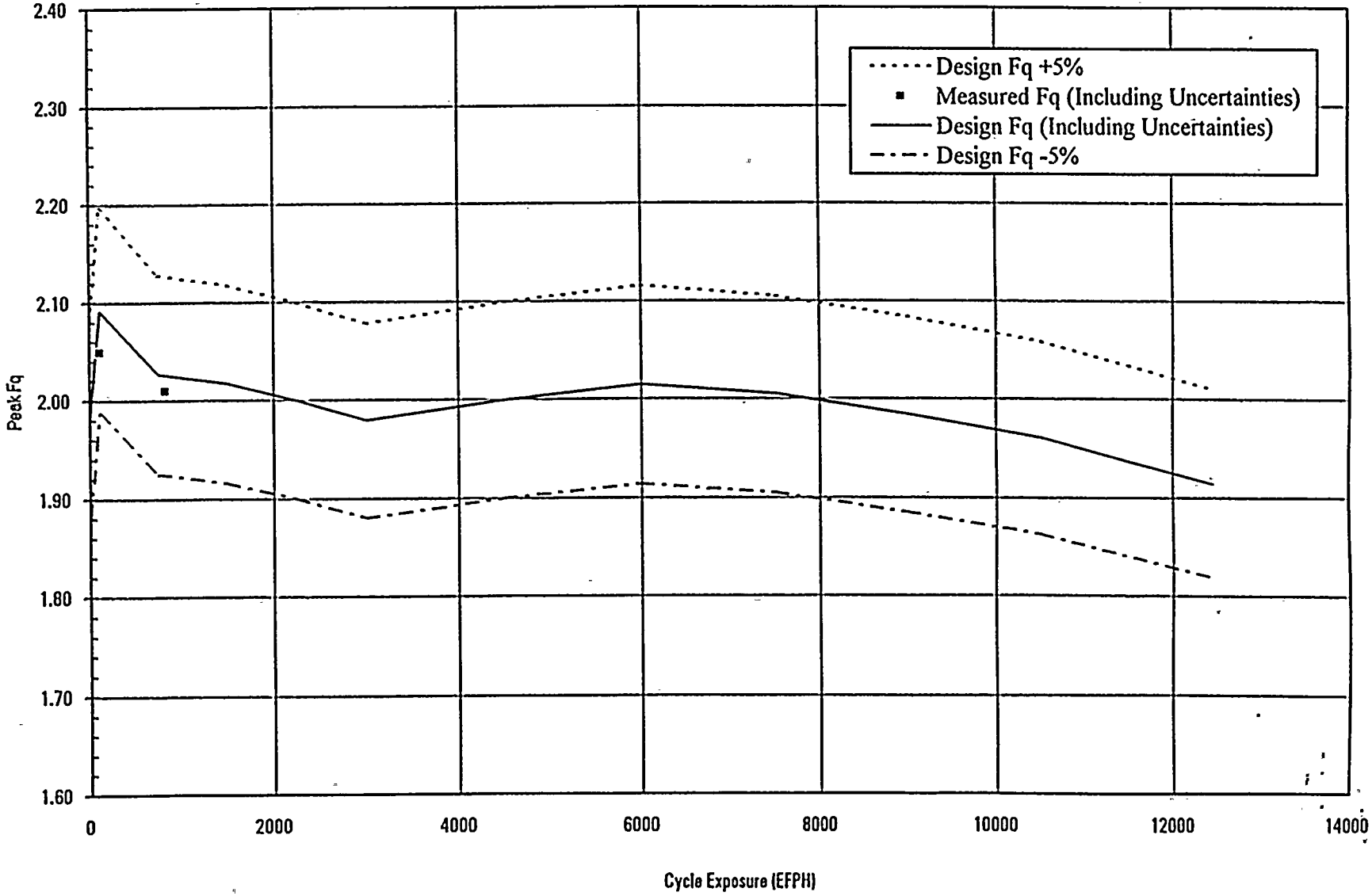

Figure 2

UNIT 4 - CYCLE 18

Normalized Peak FdH vs Exposure