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SUBJECT: "Turkey Point Unit 3 Cycle 17 Startup Rept." With 990125 ltr.

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TITLE: Startup Report/Refueling Report (per Tech Specs)

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

Re: Turkey Point Unit 3
Docket Nos. 50-250
Turkey Point Unit 3 Cycle 17 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 3 Cycle 17 started up with ZIRLO clad material in the new fuel assemblies. This is the first cycle for Unit 3 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,

R. J. Hovey
Vice President
Turkey Point Plant

RJT

Attachment

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

IE26

TURKEY POINT UNIT 3 CYCLE 17 STARTUP REPORT

1.0 DESCRIPTION AND PURPOSE

On October 28, 1998, Turkey Point Unit 3 completed the Cycle 17 refueling outage and the unit was placed on-line. Cycle 17 was the first cycle that Florida Power & Light Company operated with Zirlo clad material in the new fuel assemblies. Zirlo material replaced the standard Zircaloy-4 material. Forty-eight 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 17 is made up of 157 Debris Resistant Fuel Assemblies (DRFA) 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 16 thrice burned and 11 of the Region 17 twice burned fuel assemblies with 48 fresh Region 19 fuel assemblies. Region 19 consists of 16 assemblies at 4.0 w/o U-235 and 32 assemblies at 4.4 w/o U-235. The remainder of the 157 assemblies is made up of 49 twice burned Region 17 fuel assemblies and 60 once burned Region 18 fuel assemblies carried over from Cycle 16.

Startup Test Program

Turkey Point's Startup Test Program includes initial dilution to criticality, Low Power Physics Testing, Power Ascension Testing and RCS Flow Verification. Low Power Physics Testing 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 3 Cycle 17 startup the desired critical rod height was D-Bank at 193 steps withdrawn. The design critical boron concentration at the desired rod position on D-Bank was 1740 ppm. The reactor was declared critical and data was taken at an equilibrium value of approximately 1E-08 Amps as indicated by the excore detectors, indicated at D-Bank position of 187 steps and a critical boron concentration of 1737 ppm.

Low Power Physics Testing

Following dilution to criticality, Low Power Physics Testing (LPPT) was commenced. The purpose of this test is to ensure 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. Low Power Physics Testing 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 Low Power Physics Testing:

- ARO Boron Endpoint,
- Positive Period Check,
- Differential Boron Worth,
- ARO HZP Isothermal Temperature Coefficient (ITC) and Moderator Temperature Coefficient (MTC),
- Reference Bank-In Rod Worth (by dilution) and
- Non-Reference Bank Rod Worth (by inference).

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%, 50% and 100% power. Additionally, at less than 50% power and again at 100% power, an incore-excore calibration was performed to generate full power total currents and AFD Calibration data for input into the overtemperature delta-T protection channel. Once the unit reached 100% power, an RCS flow verification was performed, as well as a Hot Full Power (HFP) 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 287,000 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 3 fuel reliability continues to indicate a defect-free core, and the core continues to operate consistently with design predictions.

Table 1
Turkey Point Unit 3 Cycle 17
Low Power Physics Test Results

Physics Test	Acceptance Criteria	Measured Value (M)	Predicted Value (P)	Difference*
All Rods Out (ARO) Boron Concentration	within 50 ppm	1754 ppm	1752 ppm	-2 ppm
HZP Isothermal Temperature Coefficient	+/- 2 pcm/deg F	-1.796 pcm/deg F	-1.952 pcm/deg F	-0.156 pcm/deg F
HZP Moderator Temperature Coefficient	< 5 pcm/deg F	-0.110 pcm/deg F	-0.266 pcm/deg F	-0.156 pcm/deg F
Positive Period Check	within +/- 4%	129.27 pcm	130.81 pcm	1.19%
Reference Bank In Boron Endpoint	within +/- 50 ppm	1591 ppm	1558 ppm	-33 ppm
Individual Bank Worth				
CBD	+/- 15% or	883.3	903	2.2% / 19.7 pcm
CBA	+/- 100 pcm,	1329.0	1419	6.8% / 90 pcm
CBB	whichever is	243.8	253	3.8% / 9.2 pcm
SBB	greater	1070.8	1108	3.5% / 37.2 pcm
SBA		1077.6	1081	0.3% / 3.4 pcm
Reference Bank Worth				
CBC	+/-10%	1394.3	1446	3.7%
Total Bank Worth	+/- 7%	5998.8	6210	3.5%
Differential Boron Worth	within +/- 15%	8.62 pcm/ppm	7.45 pcm/ppm	-13.60%

* Difference = (Predicted - Measured)

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

Figure 1

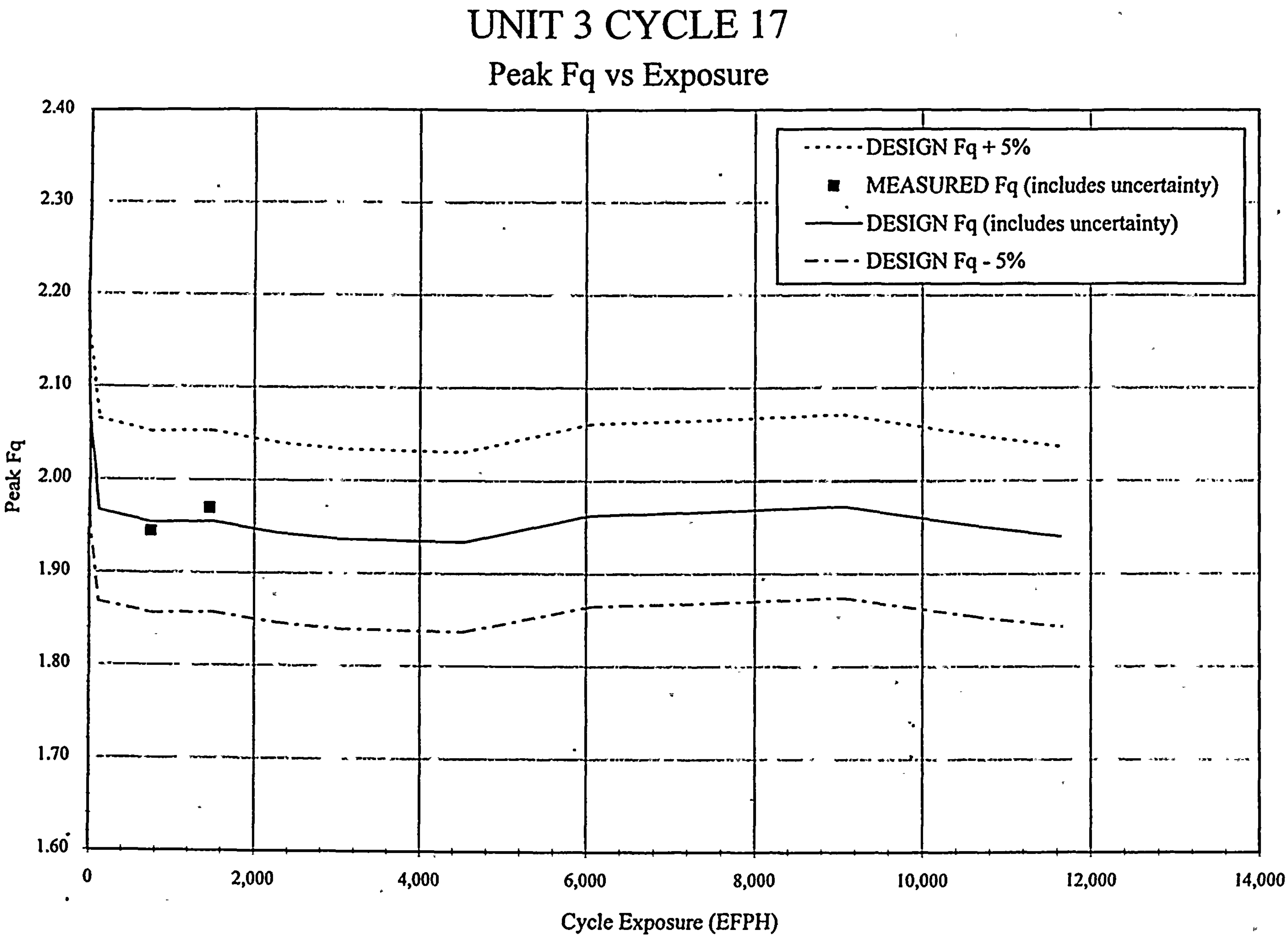
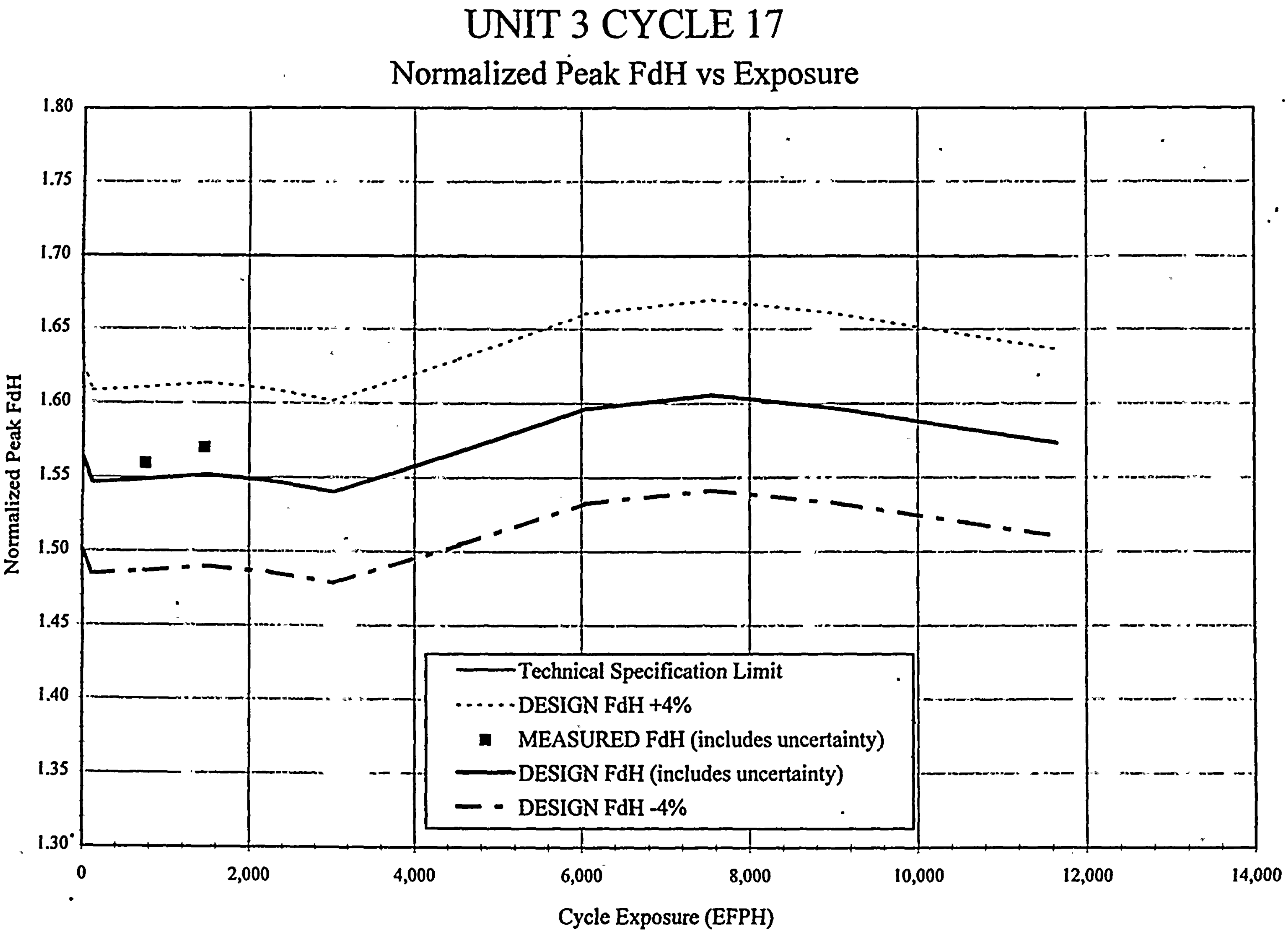

UNIT 3 CYCLE 17
Peak Fq vs Exposure
DESIGN Fq + 5%
MEASURED Fq (includes uncertainty)
DESIGN Fq (includes uncertainty)
DESIGN Fq - 5%
Peak Fq
2.40
2.30
2.20
2.10
2.00
1.90
1.80
1.70
1.60
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
Cycle Exposure (EFPH)

Figure 2


UNIT 3 CYCLE 17
Normalized Peak FdH vs Exposure
1.80
1.75
1.70
1.65
1.60
1.55
1.50
1.45
1.40
1.35
1.30
Normalized Peak FdH
0
2,000
4,000
6,000
8,000
10,000
12,000
14,000
Cycle Exposure (EFPH)
Technical Specification Limit
DESIGN FdH +4%
MEASURED FdH (includes uncertainty)
DESIGN FdH (includes uncertainty)
DESIGN FdH -4%