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Nuclear LLC

TS 6.9.1.1
TS 6.9.1.3

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U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

Hope Creek Generating Station
Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: Hope Creek Technical Specifications 6.9.1.1 and 6.9.1.3

Reference: 1) Hope Creek Generating Station – Issuance of Amendment Re: Use of Isotope Test Assemblies for Cobalt-60 production (TAC No. ME-2949)

Hope Creek Generating Station introduced a new fuel design, GE14i Isotope Test Assemblies (ITAs), in Cycle 17, which was authorized per reference 1. Hope Creek Technical Specification (TS) 6.9.1.1 requires a submittal of a startup report following the installation of fuel that has a different design. The Attachment to this letter provides the information for TS 6.9.1.1 in accordance with TS 6.9.1.3.

There are no new or revised regulatory commitments contained in this letter.

If you have any questions, please contact Mr. Philip J. Duca, Hope Creek Regulatory Assurance, at 856-339-1640.

Sincerely,

John F. Perry
Site Vice President - Hope Creek
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A001
NRR

Attachment: 1) Hope Creek Cycle 17 Startup Report

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Attachment 1
Hope Creek Generating Station
Facility Operating License NPF-57
Docket No. 50-354

Hope Creek Cycle 17 Startup Report

Table of Contents

1.0	Introduction	2
2.0	Control Rod Drive System	2
2.1	Control Rod Scram Time	2
3.0	Full Core Shutdown Margin	3
3.1	Shutdown Margin Demonstration	3
4.0	Core Performance	5
4.1	Thermal Limits	5
5.0	References	6

List of Tables

Table 1: Individual Scram Time 3
Table 2: Acceptance Criteria 3
Table 3: BOC Variations in Measure vs. Calculated SDM 4
Table 4: Confirmation of GE14i ITA Non-limiting Shutdown Margin 4
Table 5: Cycle Management Report Predictions to CMS Thermal Limits Comparison for GE14 and GE14i ITA 6

List of Figures

Figure 1: Confirmation of GE14i ITA Non-limiting Shutdown Margin 5

1.0 Introduction

Hope Creek Generating Station introduced a new fuel design, GE14i Isotope Test Assemblies (ITAs), in Cycle 17. There are twelve bundles of the GE14i ITA design operating in the core while the remaining fuel is of the GE14 fuel design. The GE14i ITA fuel consists of fuel rods, some cobalt isotope rods, and two large central water rods in a 10x10 array. The GE14 fuel is a 10x10 design with two large central water rods, consisting of 92 fuel rods. Hope Creek Technical Specification 6.9.1.1 requires a submittal of a startup report following the installation of fuel that has a different design. This startup report will address each of the initial startup tests identified in the Final Safety Analysis Report (FSAR) that could be impacted by the introduction of the GE14i ITA fuel design.

During Hope Creek's sixteenth refueling outage (RF16), that began on October 15, 2010 and was completed on November 11, 2010, 12 GE14i ITAs were loaded into the core. The following sections provide a description of the test results for those initial startup tests described in the Hope Creek FSAR that could be impacted by the introduction of the GE14i ITA fuel design (Reference 5.1)

2.0 Control Rod Drive System

The description of the initial startup testing for the control rod drive system is provided in Hope Creek FSAR section 14.2.12.3.5. The operability of the control rod system may be impacted by the introduction of a new fuel design. The new fuel design could cause additional friction on control rod movement, which may impact the scram speeds.

2.1 Control Rod Scram Time

The control rod drive (CRD) scram times were measured in accordance with procedure HC.RE-ST.BF-0001(Q), "Control Rod Scram Time Surveillance". The objective of this test was to verify that the CRD scram times met all Technical Specification acceptance criteria. The measured scram times for control rod locations containing GE14i ITAs were compared against acceptance criteria for the purpose of determining control rod drive system performance. The acceptance criteria for the individual scram time to notch position 05, core average scram times to notch positions 45, 39, 25, and 05, and array average scram times to notch positions 45, 39, 25, and 05, are given in the Hope Creek Technical Specifications 3.1.3.2, 3.1.3.3, and 3.1.3.4 respectively. A summary of results for the control rod locations containing GE14i ITAs with the most limiting scram insertion time for each notch position is provided in Table 1. The results indicate that the measured scram times are faster than the acceptance criteria for individual scram time, core average scram times, and array average scram times shown in Table 2. This demonstrates that the introduction of the GE14i ITA fuel design did not have an adverse effect on control rod drive system performance.

Table 1: Individual Scram Time

Notch Position	Control Rod	Most Limiting Scram Insertion Time (seconds)
45	50-11	0.278
39	50-11	0.590
25	50-11	1.328
05	50-11	2.488

Table 2: Acceptance Criteria

Test	Notch Position	Acceptance Criteria (seconds)
Individual Scram Time	05	≤ 7
Core Average Scram Time	45	≤ 0.430
	39	≤ 0.860
	25	≤ 1.930
	05	≤ 3.490
Array Average Scram Time	45	≤ 0.450
	39	≤ 0.920
	25	≤ 2.050
	05	≤ 3.700

3.0 Full Core Shutdown Margin

The description of the initial startup testing for the full core shutdown margin demonstration is provided in the Hope Creek FSAR section 14.2.12.3.4. The Cycle 17 startup testing demonstrated that the shutdown margin was greater than 0.38% Δk/k.

3.1 Shutdown Margin Demonstration

The core shutdown margin (SDM) was demonstrated in accordance with procedure HC.RE-ST.ZZ-0007(Q), "Shutdown Margin Surveillance". The objective of the test, as required by Technical Specifications, is to demonstrate that the core will remain subcritical by at least 0.38% Δk/k throughout the cycle at cold xenon free conditions, with the strongest worth control rod withdrawn. The core SDM was demonstrated during the in-sequence critical SDM measurement. The measured SDM for Cycle 17 was 1.06% Δk/k, which meets the Technical Specification minimum requirement of 0.38% Δk/k and was within the expected range for the minimum core shutdown margin at beginning of cycle based upon the cycle management predictions and from comparison to previous cycle's data as shown in Table 3. The cycle management predictions were performed in a manner that required the GE14i ITAs be non-limiting (Table 4 and Figure 1) with respect to minimum shutdown margin including consideration of a 0.001 Δk shutdown margin adder to ensure a conservative shutdown margin demonstration (Reference 5.4).

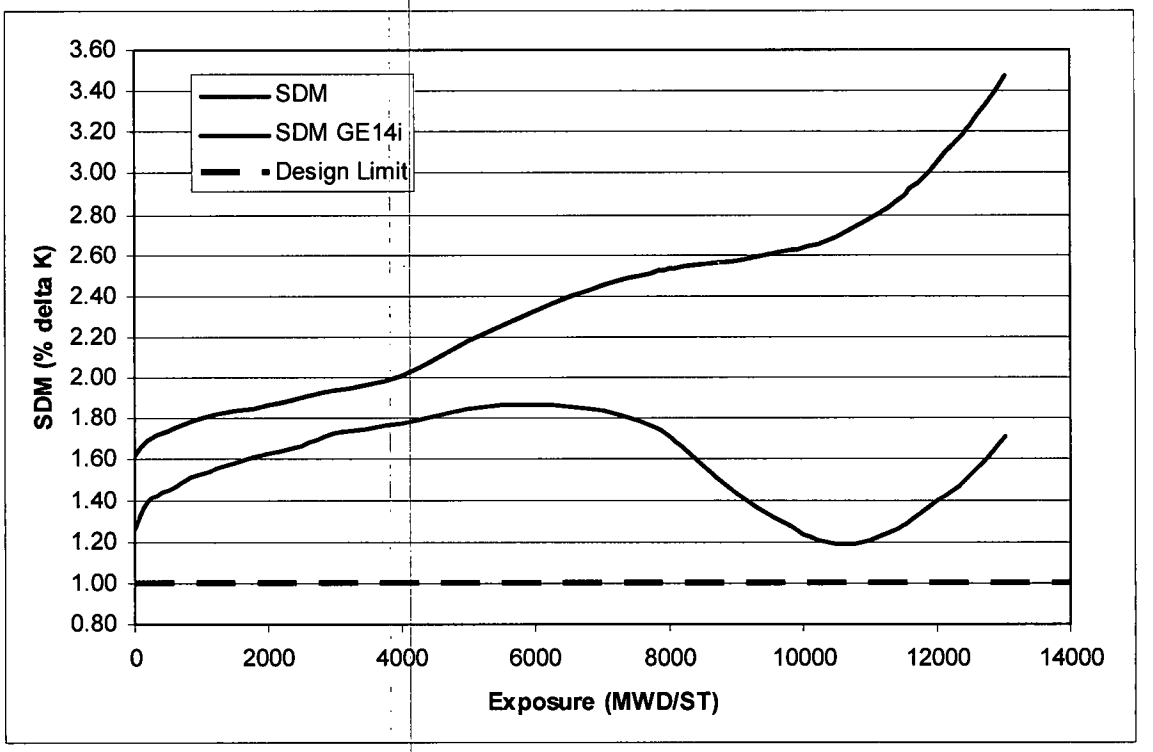
Table 3: BOC Variations in Measured vs. Predicted Cold Target Keff

Cycle	Measured	Assumed	Delta K	Delta %
13	1.0004	1.00100	-0.00060	-0.06
14	0.99849	1.00100	-0.00251	-0.251
15	1.00160	0.99950	0.00210	0.21
16	1.00038	1.00100	-0.00062	-0.062
17	0.99975	1.00100	-0.00125	-0.125

Table 4: Confirmation of GE14i ITA Non-limiting Shutdown Margin

EXP	SDM	SDM GE14i
MWD/ST	%dK	%dK
0	1.26	1.62
200	1.40	1.69
500	1.45	1.74
1000	1.53	1.80
2000	1.63	1.87
2500	1.67	1.90
3000	1.73	1.94
4000	1.78	2.01
5000	1.85	2.18
6000	1.87	2.33
7000	1.84	2.45
7700	1.77	2.51
8000	1.71	2.53
9000	1.43	2.57
10000	1.23	2.63
10000	1.23	2.63
10500	1.19	2.69
11000	1.21	2.78
11500	1.28	2.89
11600	1.30	2.92
11785	1.34	2.97
12265	1.45	3.14
12505	1.52	3.23
12745	1.60	3.34
13017	1.71	3.47

Figure 1: Confirmation of GE14i ITA Non-limiting Shutdown Margin



4.0 Core Performance

The description of the initial startup testing to evaluate the core performance, with respect to thermal limits, is provided in the Hope Creek FSAR section 14.2.12.3.16. The objective of the test is to calculate the principal thermal and hydraulic parameters associated with core behavior.

4.1 Thermal Limits

The GE14i ITAs were designed for mechanical, nuclear, and thermal-hydraulic compatibility with the GE14 fuel design currently in the core and are required to be located in non-limiting locations with respect to thermal limits (Reference 5.4). The thermal limits at full power conditions were obtained from the Core Monitoring System (CMS). According to Reference 5.4, the NRC staff has determined that the GE14i ITAs will not have any significant impact on the incore instrumentation and core monitoring system in the Hope Creek core. The Core Monitoring System (CMS) data was obtained from an edit generated on 11/22/2010 23:32, at a cycle exposure of 244.9 Mwd/St. The CMS data validated the predicted results for Cycle 17 as documented in reference 5.5. Table 5 shows the maximum GE14i ITA values from the CMS are below the maximum GE14 CMS values, which demonstrate the GE14 fuel assemblies are more limiting than the GE14i ITAs.

Table 5: CMS Thermal Limits Comparison for GE14 and GE14i ITA

	Maximum CMS GE14	Maximum CMS GE14i ITA
MFLCPR	0.851	0.748
MFLPD	0.877	0.806
MAPRAT	0.677	0.614

5.0 References

5.1 NFS-0257, HCGS Cycle 17 Evaluation of the UFSAR Chapter 14 Initial Cycle Startup Tests
5.2 HCC17CMR, PSEG Nuclear, LLC Cycle Management Report Hope Creek Cycle 17
5.3 HCG.5-0138, Hope Creek Cycle 17 Startup Data
5.4 Safety Evaluation by the Office of Nuclear Reactor Regulation Related to Amendment 184 to Facility Operating License No. NPF-57, PSEG Nuclear LLC, Hope Creek Generating Station, Docket No. 50-354, October 7, 2010.
5.5 HCP.6-0244, Hope Creek Cycle 17 Rod Pattern Design Analysis Revision 0