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ACCESSION NBR: 9803110107 DOC. DATE: 98/03/02 NOTARIZED: NO DOCKET #
FACIL: 50-269 Oconee Nuclear Station, Unit 1, Duke Power Co. 05000269
50-270 Oconee Nuclear Station, Unit 2, Duke Power Co. 05000270
50-287 Oconee Nuclear Station, Unit 3, Duke Power Co. 05000287

AUTH. NAME AUTHOR AFFILIATION
MCCOLLUM, W.R. Duke Power Co.
RECIP. NAME RECIPIENT AFFILIATION
Document Control Branch (Document Control Desk)

SUBJECT: Forwards evaluation of loss of prestree in post-tensioning sys for 60 yrs of plant operation. Evaluation will be included in Chapter 5 of OLRP-1001 when next rev submitted this summer.

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Duke Power Company

A Duke Energy Company

Oconee Nuclear Site

P.O. Box 1439

Seneca, SC 29679

W. R. McCollum, Jr.
Vice President

(864) 885-3107 OFFICE

(864) 885-3564 FAX

March 2, 1998

Document Control Desk
U. S. Nuclear Regulatory Commission
Washington, DC 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287
(TAC Nos. M99141, M99121, M99122, M99123)

By letter dated March 12, 1997, Duke Energy (formerly Duke Power Company) submitted for review, "Oconee Nuclear Station, Units 1, 2, & 3, License Renewal - Technical Information Topical Report," OLRP-1001, Revision 1, February 1997. At that time, Duke Energy voluntarily committed to provide an evaluation of the loss of prestress in the post-tensioning system for 60 years of plant operation prior to or concurrent with the submittal of the renewal license application. This commitment was reiterated in a Duke Energy letter dated January 14, 1998 which provided responses to the staff requests for additional information relevant to the March 12, 1997 submittal.

Accordingly, please find attached an evaluation of loss of prestress in the post-tensioning system for 60 years of plant operation. This evaluation is being provided at this time to facilitate staff review of the Containment portion of OLRP-1001. This evaluation will be included in Chapter 5 of OLRP-1001 when the next revision is submitted this summer.

If there are any questions, please contact Bob Gill at 704-382-3339.

Very truly yours,

W. R. McCollum Jr., Site Vice President
Oconee Nuclear Station

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xc: (w/ attachment)

L. A. Reyes
Regional Administrator, Region II
U. S. Nuclear Regulatory Commission
101 Marietta Street, NW, Suite 2900
Atlanta, GA 30323-0199

C. I. Grimes
Director, License Renewal Project Directorate
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

M. A. Scott
Senior NRC Resident Inspector
Oconee Nuclear Station

D. E. La Barge
Senior Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

S. T. Hoffman
Senior Project Manager
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Max Batavia
Bureau of Radiological Health
2600 Bull St.
Columbia, SC 29201

xc: (w/ attachment)

GLRP Team

Bill Mackay - Entergy Operations, Inc..

Dave Masiero - GPU Nuclear Corporation

Dave Firth - Framatome Technologies, Inc., Lynchburg, VA (OF57)

Mark Rinckel - Framatome Technologies, Inc., Lynchburg, VA (OF51)

Bob Borsum - Framatome Technologies, Inc., Rockville, MD

Industry Contacts

John Carey - EPRI

Barth Doroshuk - BGE

Mike Henig - VEPCO

Tricia Heroux

Charles Meyer - Westinghouse Owners Group

Terry Pickens - NSP

Chuck Pierce - Southern Nuclear

Fred Polaski - PECO

Doug Walters - NEI

Attachment 1

Containment Post-Tensioning System Loss of Prestress Time-Limited Aging Analysis

Loss of prestress in the post-tensioning system is due to material strain occurring under constant stress. Loss of prestress over time is accounted for in the design and is a time-limited aging analysis requiring review for license renewal.

In accordance with ACI 318-63 [Reference 1] the design of the Oconee Containment post-tensioning system provides for prestress losses caused by the following:

- Elastic shortening of concrete
- Creep of concrete
- Shrinkage of concrete
- Relaxation of prestressing steel stress
- Frictional loss due to curvature in the tendons and contact with tendon conduit.

No allowance is provided for seating of the anchor since no slippage occurs in the anchor during transfer of the tendon load into the structure [Reference 2].

By assuming an appropriate initial stress from tensile loading and using appropriate prestress loss parameters, the magnitude of the design losses and the final effective prestress at the end of 40 years for typical dome, vertical, and hoop tendons was calculated at the time of initial licensing. This analysis is presently summarized in the Oconee UFSAR, Section 3.8.1.5.2 [Reference 2].

In 1996, Oconee provided a description of the methodology for determining the most accurate minimum required lift-off force for each tendon group for NRC review [Reference 3]. Based upon the results of the evaluation of the submitted information and commitments made by Duke, the NRC staff has determined that the integrity of the Oconee Containment is adequate to support continued operation [Reference 4].

Containment post-tensioning system surveillance will be performed in accordance with Oconee Improved Technical Specification SR3.6.1.2 (currently Oconee Custom Technical Specification 4.4.2). Acceptance criteria for tendon surveillance are given in terms of Prescribed Lower Limits and Minimum Required Values. Oconee Selected Licensee Commitment, Oconee UFSAR, SLC 16.6.2 [Reference 2] provides the required prescribed lower limits and minimum required values in Appendix 16.6-2, Figures 1, 2, and 3. These figures contain the dome, hoop and vertical tendon prescribed lower limits and minimum required values, respectively, for all three Oconee units. The figures have been developed using the guidance contained in Regulatory Guide 1.35 [Reference 5]. Each prescribed lower limit line has been extended to 60 years of

plant operation and remains above the minimum required values for all three tendon groups.

For license renewal, the existing analyses addressing loss of prestress in the Containment post-tensioning system are considered to be valid for the period of extended operation. In addition, continuation of the current surveillance program provides reasonable assurance that the post-tensioning system will remain capable of performing its intended function.

References:

1. American Concrete Institute, *Building Requirements for Reinforced Concrete*, ACI 318-63, Detroit, Michigan.
2. Oconee Nuclear Station Updated Final Safety Analysis Report, as revised.
3. J. W. Hampton (Duke) letter dated March 14, 1996 to Document Control Desk (NRC), Docket Numbers 50-269, 50-270, 50-287, Response to Request for Additional Information Concerning Reactor Building Post-Tensioning Systems, Sixth Surveillance.
4. NRC letter dated November 7, 1996, Reactor Building Post-Tensioning System Sixth Surveillance - Oconee Nuclear Station, Unit 3 (TAC NO. M93942).
5. Regulator Guide 1.35, *Inservice Inspection of UngROUTED Tendons in Prestressed Concrete Containments, Revision 3*, U. S. Nuclear Regulatory Commission, July 1990.