STP Nuclear Operating Company

South Texas Project Electric Generating Station P.O. Box 289 Wadsworth, Texas 77483

September 26, 2001
NOC-AE-00000981
File No.: G09.16
10CFR50.55a

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

South Texas Project
Units 1 and 2
Docket Nos. STN 50-498, STN 50-499
Request for Approval of an Alternative Approach for
Containment Tendon Surveillances (RR-ENG-37)

Reference: Proposed Amendment to Technical Specification 3/4.6.1.6, "Containment Structural Integrity," J. J. Sheppard to NRC Document Control Desk, dated August 2, 2001 (NOC-AE-01001137)

In accordance with the provisions of 10CFR50.55a(a)(3)(i), the South Texas Project requests approval of an alternative to ASME Section XI, paragraph IWL-2421, which specifies the intervals between inspections of containment concrete and unbonded post-tensioning systems. The proposed alternative will extend the interval between demonstrations of the structural integrity of the containment from five years to ten years for each unit. The requested interval extension for performance of the Unit 1 and Unit 2 reactor containment examinations from five years to ten years will not present an undue risk to the public health and safety, and provides an acceptable level of quality and safety.

The South Texas Project requests Nuclear Regulatory Commission approval of this proposed schedule by March 31, 2002, in order to facilitate scheduling for subsequent inspections of containment concrete and unbonded post-tensioning systems. Although this request is neither exigent nor an emergency, prompt review by the Nuclear Regulatory Commission is requested.

This proposed alternative is submitted in conjunction with a proposed license amendment (referenced above) which incorporates the requirements of Technical Specification 3/4.6.1.6 in a reference to the Containment Tendon Surveillance Program. Once that proposed amendment is approved, the Technical Specifications will no longer explicitly state the required interval between tendon surveillances, and this proposed alternative can be implemented.

If there are any questions, please contact either Mr. R. L. Engen at (361) 972-7363 or me at (361) 972-7902.

T. J. Jordan
Manager,
Engineering

PLW

Attachments:
1) Request for Approval of an Alternative Approach for Containment Tendon Surveillances (RR-ENG-37)
2) Current Test Schedule
3) Proposed Test Schedule

A047

cc:

Ellis W. Merschoff
Regional Administrator, Region IV
U.S. Nuclear Regulatory Commission
611 Ryan Plaza Drive, Suite 400
Arlington, Texas 76011-8064

John A. Nakoski
Addressee Only
U. S. Nuclear Regulatory Commission
Project Manager, Mail Stop OWFN/7-D-1
Washington, DC 20555-0001

Mohan C. Thadani
Addressee Only
U. S. Nuclear Regulatory Commission
Project Manager, Mail Stop OWFN/7-D-1
Washington, DC 20555

Cornelius F. O'Keefe
c/o U. S. Nuclear Regulatory Commission
P. O. Box 910
Bay City, TX 77404-0910

A. H. Gutterman, Esquire
Morgan, Lewis & Bockius
1800 M. Street, N.W.
Washington, DC 20036-5869

M. T. Hardt/W. C. Gunst
City Public Service
P. O. Box 1771
San Antonio, TX 78296

A. Ramirez/C. M. Canady
City of Austin
Electric Utility Department
721 Barton Springs Road
Austin, TX 78704

Jon C. Wood
Matthews & Branscomb
112 East Pecan, Suite 1100
San Antonio, Texas 78205-3692

Institute of Nuclear Power
Operations - Records Center
700 Galleria Parkway
Atlanta, GA 30339-5957

Richard A. Ratliff
Bureau of Radiation Control
Texas Department of Health
1100 West 49th Street
Austin, TX 78756-3189

R. L. Balcom/D. G. Tees
Houston Lighting & Power Co.
P. O. Box 1700
Houston, TX 77251

C. A. Johnson/R. P. Powers
AEP - Central Power and Light Company
P. O. Box 289, Mail Code: N5012
Wadsworth, TX 77483

U. S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555-0001

ATTACHMENT 1

REQUEST FOR APPROVAL OF AN ALTERNATIVE APPROACH FOR CONTAINMENT TENDON SURVEILLANCES (RR-ENG-37)

SOUTH TEXAS PROJECT
UNITS 1 AND 2
Request for Approval of an Alternative Approach for Containment Tendon Surveillances (RR-ENG-37)

Reference Code: ASME Boiler & Pressure Vessel Code, Section XI, 1989 Edition

A. Components for Which Exemption is Requested

(a) Component: Reactor Containment Concrete and Unbonded Post-Tensioning Systems

(b) Function: The components support continued containment structural integrity in the event of a loss of coolant or steam line break accident.

(c) Class: ASME Code Class CC

B. Code Requirements from Which Relief is Requested

The South Texas Project is a two unit facility:

- both containments utilize the same pre-stressing system and are essentially identical in design;
- post-tensioning operations were completed less than two years apart; and
- both containments are similarly exposed to the outside environment.

IWL-2421(b) describes the inservice inspection schedule to be followed for examination of containment concrete and unbonded post-tensioning systems for sites with two plants:

(1) For the containment with the first Structural Integrity Test, all examinations required by IWL-2500 shall be performed at 1, 3, 10, 20, and 30 years. Only the examinations required by IWL-2524 and IWL-2525 need be performed at 5, 15, 25, and 35 years.

(2) For the containment with the second Structural Integrity Test, all examinations required by IWL-2500 shall be performed at 1, 5, 15, 25, and 35 years. Only the examinations required by IWL-2524 and IWL-2525 need be performed at 3, 10, 20, and 30 years.

IWL-2500 describes requirements for examination of concrete and unbonded post-tensioning systems. IWL-2524 addresses examination of tendon anchorage areas, and IWL-2525 covers examination of corrosion protection medium and free water.

C. Basis for Relief from Code Requirements

Based on the inspection results from previous cycles, there is little value to be gained by conducting the inspections every five years. Given the expected rate of change in the material condition of the reactor containment structure, inspections at the specified intervals are not needed, and result in unnecessary expense and risk to workers performing the inspections.

D. Alternate Examination

The South Texas Project requests approval to apply an alternative inspection schedule from that specified in ASME Section XI, Subsection IWL-2421(b), for performing the containment Structural Integrity Test. In accordance with 10CFR50.55a(a)(3)(i), the South Texas Project proposes an alternative approach that will provide an acceptable level of quality and safety:

- For the containment with the first Structural Integrity Test, all examinations required by IWL-2500 shall be performed at 1, 3, 10, and 30 years. Only the examinations required by IWL-2524 and IWL-2525 need be performed at 5 and 20 years.
- For the containment with the second Structural Integrity Test, all examinations required by IWL-2500 shall be performed at 1, 5, and 20 years. Only the examinations required by IWL-2524 and IWL-2525 need be performed at 3, 10, and 30 years.

E. Justification for Granting Relief

Containment Structural Design

The South Texas Project containment structure is a post-tensioned concrete cylinder with steel liner plates, hemispherical top, and flat bottom. The cylindrical portion and the hemispherical dome of the Containment are pre-stressed by a post-tensioning system consisting of horizontal and vertical tendons. Three buttresses equally spaced around the Containment provide anchor points for the horizontal tendons. The cylinder and the lower half of the dome are pre-stressed by horizontal tendons anchored 360 degrees apart, bypassing the intermediate buttresses. Each successive hoop is progressively offset 120 degrees from the one beneath it. The vertical U-shaped tendons are continuous over the dome, forming a two-way post-tensioning system for the dome. These tendons are anchored in a continuous gallery beneath the base slab which provides for installation and inspection of the vertical tendons. The reinforced concrete containment structure is designed to resist loads imposed by external events such as wind, seismic activity, or tornado. The purpose of the containment post-tensioning system is to provide strength to resist internal pressure during postulated design basis accidents.

Margin of Safety

The South Texas Project containment structure includes a substantial design margin for pressure. The design pressure for the building is 56.5 psig, but the calculated maximum pressure that could occur following a design basis accident is 41.2 psig. The resulting design margin is 37% [56.5/41.2 = 1.37]. This exceeds the 10% design margin discussed in Chapter 6 of NUREG-0800, “Standard Review Plan.”

Previous Examination Results

Examinations have been conducted at one, three, five, and ten years following the initial post-tensioning operations for Unit 1, and for Unit 2.

The containment concrete surface, including coated areas, was visually examined to detect areas of large spall, severe scaling, D-cracking in an area of 25 sq. ft. or more, other surface deterioration or disintegration, or significant grease leakage. No damage or degradation of the concrete surfaces was identified during the examinations.

The condition of unbonded post-tensioning systems has been determined by:

- tendon force measurements;

  Test results are summarized in Table 1.

- tendon wire and strand sample examination and testing;

  A tendon wire was removed during the surveillances along with the anchorage hardware and inspected for deterioration or corrosion. The tendon wires and anchorage hardware were free of corrosion with no signs of cracking and no evidence of any wires broken since installation.

- examination of tendon anchorage areas;

  The anchor components were inspected after end-cap removal for corrosion protection medium coverage. All were properly covered.

  The concrete surface surrounding the bearing plates was visually inspected for evidence of cracks greater than 0.01-inch in width. The only cracks identified were minor surface shrinkage cracks, a normal characteristic of concrete.

- examination of corrosion protection medium and free water;

  Samples of the corrosion protection medium were tested for water content, reserve alkalinity, concentrations of water soluble chlorides, nitrates, and sulfides. The values were well below the acceptable limits as specified in Table IWL-2525-1.

- addition of corrosion protection medium.

  Grease additions have been evaluated and found acceptable. No evidence of internal grease leakage has been found.

<u>Trend Analysis</u>

Review of data from previous surveillances shows that the progression of tendon pre-stress loss is close to the predicted behavior. The IWL-3221.1(b) limit for acceptability is 95% of the predicted value. Using regression analysis (NRC Information Notice 99-10, "Degradation of Prestressing Tendon Systems in Prestressed Concrete Containments," October 7, 1999), the trend lines for the four tendon groups indicate that pre-stress loss will remain in the acceptable range for the life of the plant. The trend data are summarized in Table 2 and Figure 1. The worst-case trend is for Unit 1 horizontal tendons, which are trending toward 96.5% of predicted lift-off force at year 40 of plant life (i.e., predicted value minus 3.5%).

Figure 1 reflects the belief (supported both theoretically and by experience) that pre-stress loss should occur linearly with the logarithm of time, but nonlinearly on a linear time scale. A consequence of the non-linearity is that the majority of the lifetime loss is expected to occur during the first ten years. Even though data points are available only for the first ten years of plant life, this period covers the majority of the expected pre-stress losses. Therefore, ten-year data provides a high confidence that the projected lifetime trend lines are reasonably representative of actual lifetime behavior.

Probabilistic Safety Assessment

The frequency of radionuclide release due to reactor containment failures at the time of an accident has been determined by a Level 2 Probabilistic Safety Assessment for the South Texas Project. The Large Early Release Frequency (LERF) due to all analyzed accident sequences and containment failure modes is 6.1E-07 events/year. The major contributors to this release frequency are from containment bypass sequences involving an induced steam generator tube rupture or interfacing LOCA. The containment building failure mode is a very small contributor to LERF.

Summary

Over the ten-year history of test and examination, the post-tensioning system has behaved as designed, and no damage or degradation of the concrete surfaces was identified during the examinations. All tendon groups at the South Texas Project are following a trend that is projected to remain acceptable for 40 years of plant life. Furthermore, the design has a substantial margin of safety, such that pre-stress loss would have to be far greater than predicted to reduce the ability of the containment structure to withstand the calculated accident pressure loads. Therefore, extending the surveillance interval from five years to ten years is appropriate.

F. Implementation Schedule

The South Texas Project requests Nuclear Regulatory Commission approval by March 31, 2002, to support scheduling activities for the following refueling outage.

Table 1

Tendon Force Measurement Summary:

Deviation from Predicted Values (%)

	Unit 1-Horizontal	Unit 1-Vertical	Unit 1-All	Unit 2-Horizontal	Unit 2-Vertical	Unit 2-All	All-Horizontal	All-Vertical	All
Low	-5.9	-1.7	-5.9	-5.9	-1.0	-5.9	-5.9	-1.7	-5.9
Median	1.1	0.7	1.0	0.3	2.3	1.1	0.7	1.3	1.1
Mean	0.7	0.9	0.7	1.3	2.5	1.7	1.0	1.6	1.2

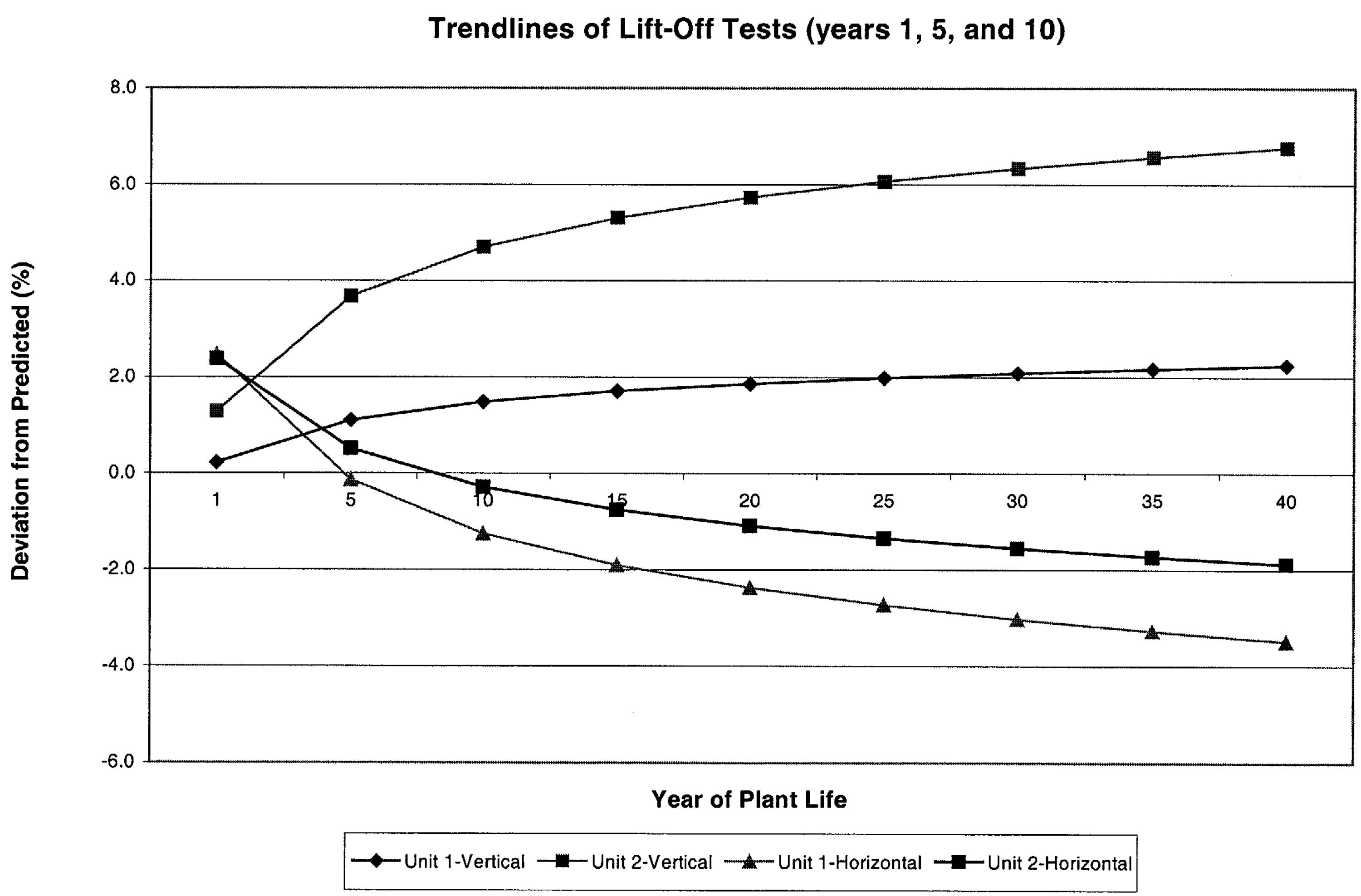
Table 2

Tendon Force Projected Trends:

Projected Deviation from Predicted Values (%)

Trend	Unit 1-Horizontal	Unit 1-Vertical	Unit 1-All	Unit 2-Horizontal	Unit 2-Vertical	Unit 2-All	All-Horizontal	All-Vertical	All
Yr. 15	-1.91	1.71	-0.68	-0.75	5.32	0.68	-1.45	2.63	-0.21
Yr. 20	-2.38	1.87	-0.94	-1.08	5.75	0.52	-1.87	2.81	-0.44
Yr. 30	-3.03	2.09	-1.31	-1.55	6.35	0.30	-2.45	3.07	-0.77
Yr. 40	-3.50	2.25	-1.57	-1.88	6.78	0.14	-2.86	3.25	-1.01

Figure 1


Trendlines of Lift-Off Tests (years 1, 5, and 10)
8.0
6.0
4.0
2.0
0.0
-2.0
-4.0
-6.0
Deviation from Predicted (%)
1
5
10
15
20
25
30
35
40
Year of Plant Life
Unit 1-Vertical
Unit 2-Vertical
Unit 1-Horizontal
Unit 2-Horizontal