Entergy

Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
600 Rocky Hill Road
Plymouth, MA 02360

Stephen J. Bethay
Director, Nuclear Assessment

March 22, 2007

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

SUBJECT: Entergy Nuclear Operations, Inc.
Pilgrim Nuclear Power Station
Docket No. 50-293
License No. DPR-35

Request for Authorization Under the Provision of 10 CFR 50.55a(a)(3)(i) for Modification of the Core Shroud Stabilizer Assemblies

REFERENCES:

1. Entergy (BECo) Letter No. 2.95.004, Pilgrim Nuclear Power Station Core Shroud Stabilizer Design, dated January 16, 1995
2. NRC Safety Evaluation Regarding Pilgrim Nuclear Power Station Core Shroud Repair (TAC No. M91305), dated May 12, 1995

LETTER NUMBER: 2.07.016

Dear Sir or Madam:

By Reference 1 Pilgrim Nuclear Power Station proposed a preemptive repair to the Pilgrim core shroud by installation of four stabilizer assemblies (i.e., tie rods). By Reference 2, the NRC found the proposed repair acceptable as an alternative to the American Society of Mechanical Engineers (ASME) Code as allowed by 10 CFR 50.55a(a)(3)(i). This repair was installed during the 1995 refueling outage (RFO-10).

The purpose of this submittal is to request that the NRC authorize the use of a proposed modification to each of the four tie rod assemblies pursuant to 10 CFR 50.55a(a)(3)(i). During the upcoming refueling outage (RFO-16), Entergy proposes to replace the Pilgrim core shroud tie rod upper support assemblies and install a clamp on the upper horizontal spring torsion arm bolt. This work is planned in response to recent industry operating experience where a domestic boiling water reactor plant discovered cracking in their similar core shroud tie rod upper supports and an assessment by the General Electric Company (GE) concluded Pilgrim may have a similar condition (GE 10 CFR Part 21 Notification dated October 9, 2006). Although there is currently no indication that Pilgrim is experiencing the same condition as in the industry, and continued operation cycle-by-cycle based on inspection could be justified, Entergy has determined that the most prudent course of action is to remove the potential of degradation, whether it is present or not, by performing the proposed modification. Our commitments to safety, operational focus, and aging management are the driving factors in this proactive approach.

A047

Attachment 1 contains the design documentation that describes the proposed modification to the tie rod assemblies. Specifically, it contains a summary of the evaluations performed to confirm that the tie rod modification provides an acceptable level of quality and safety. The presentation of this information generally follows the format outlined in BWRVIP-04-A, "BWR Vessel and Internals Project Guide for Format and Content of Core Shroud Repair Design Submittals," dated April 2002, as applicable considering the scope of the proposed modification.

Attachment 2 contains the commitments made in this submittal.

Attachments 3 and 4 are GE proprietary reports related to X-750 material and stress analysis, with embedded GE Affidavits detailing the reasons requesting to withhold from public disclosure the X-750 material and stress analysis reports. These reports contain figures that depict the modification details. The information contained in Attachments 3 and 4 is considered by its preparer, GE, to contain proprietary information exempt from disclosure pursuant to 10 CFR 2.390. Therefore, on behalf of GE, Entergy hereby makes application to withhold Attachments 3 and 4 from public disclosure in accordance with 10 CFR 2.390(b)(1). A non-proprietary version of these reports is included with this letter as Attachments 5 and 6.

The tie rod assemblies are not included under the ASME Code Section XI definition for repair or replacement. As such, the design details of the proposed tie rod modification are being submitted to the NRC for review and approval as an alternative repair pursuant to 10 CFR 50.55a(a)(3)(i). This submittal contains the basis for concluding that the modification provides an acceptable level of quality and safety.

NRC authorization to use this proposed alternative is requested by April 25, 2007, to support the scheduled startup of Pilgrim following RFO-16.

This submittal follows the proposed Nine Mile Point Nuclear Station modification submittal, dated February 12, 2007, except that the Pilgrim-specific information is provided for the approval of Pilgrim core shroud stabilizer assembly modification. The uniformity in the submittal is intended to provide efficient utilization of resources both for the preparers and reviewers of this submittal.

If you have any questions or require additional information, please contact Mr. Bryan Ford, Licensing Manager, at (508) 830-8403.

Sincerely,

Stephen J. Bethay

SJB/dl

Attachments

1. Tie Rod Modification Evaluation Summary (14 pages)
2. List of Regulatory Commitments (1 page)
3. GE Proprietary Report with Embedded GE Affidavit, GE-NE-000-0064-9392-R2-P, Pilgrim Unit 1, IGSCC Assessment of Shroud Repair X-750 Component Other Than The Replacement Upper Support Assembly and Tie Rod Nut (8 pages)
4. GE Proprietary Report with Embedded GE Affidavit, GE-NE-0000-0061-6306-R4-P, Pilgrim Nuclear Power Station, Shroud Repair Replacement Upper Support Assembly-Stress Analysis Report (40 pages)
5. GE Non-Proprietary Report, GE-NE-000-0064-9392-R2-NP, Pilgrim Unit 1, IGSCC Assessment of Shroud Repair X-750 Component Other Than The Replacement Upper Support Assembly and Tie Rod Nut (5 pages)
6. GE Non-Proprietary Report, GE-NE-0000-0061-6306-R4-NP, Pilgrim Nuclear Power Station, Shroud Repair Replacement Upper Support Assembly-Stress Analysis Report (37 pages)

cc: Mr. James S. Kim, Project Manager
Plant Licensing Branch I-1
Division of Operator Reactor Licensing
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
One White Flint North 4D9A
11555 Rockville Pike
Rockville, MD 20852

Regional Administrator, Region 1
U.S. Nuclear Regulator Commission
475 Allendale Road
King of Prussia, PA 19406

Senior Resident Inspector
Pilgrim Nuclear Power Station

ATTACHMENT 1

TIE ROD MODIFICATION EVALUATION SUMMARY

TABLE OF CONTENTS

1. INTRODUCTION AND SUMMARY
2. BACKGROUND
3. DESCRIPTION OF THE PROPOSED TIE ROD ASSEMBLY MODIFICATIONS
4. STRUCTURAL AND DESIGN EVALUATION
5. SYSTEMS EVALUATION
6. MATERIALS AND FABRICATION
7. PRE-MODIFICATION AND POST-MODIFICATION INSPECTION
8. REFERENCES
9. FIGURES

1. INTRODUCTION AND SUMMARY

This request involves the modification of certain components of the existing Pilgrim core shroud tie rod assemblies (i.e., the upper support and the upper tie rod nuts). This proposed modification to the previously reviewed and accepted core shroud repair is not included under the American Society of Mechanical Engineers (ASME) Code, Section XI, definition for repair or replacement. Thus, the design details of the proposed core shroud repair modification are being submitted to the NRC for review and authorization for use as an alternative repair, pursuant to 10 CFR 50.55a(a)(3)(i). The proposed modification addresses the potential for intergranular stress corrosion cracking (IGSCC) of the tie rod upper supports that was identified in a General Electric Company (GE) 10 CFR Part 21 notification dated October 9, 2006 (Reference 1).

By letter dated January 16, 1995 and supplemented by letters dated March 21, April 14, May 3, and May 9, 1995 (References 2 to 6), Pilgrim Nuclear Power Station proposed a repair of the Pilgrim core shroud by installation of four stabilizer assemblies (i.e., tie rods). In its letter dated May 12, 1995 (Reference 7), the NRC found the proposed repair was acceptable as an alternative to the American Society of Mechanical Engineers (ASME) Code as allowed by 10 CFR 50.55a(a)(3)(i). This repair was installed during the 1995 refueling outage (RFO-10).

The purpose of this attachment is to describe the design of the Pilgrim core shroud tie rod assembly modification and to summarize the evaluations performed to confirm that the tie rod assembly modification provides an acceptable level of quality and safety. These descriptions and evaluations focus on the differences between the previously reviewed and accepted core shroud tie rod design and the proposed modifications to that design.

The repair conforms to the requirements of the core shroud repair criteria provided in BWRVIP-02-A (Reference 8) without any alternate approaches or exceptions.

2. BACKGROUND

Pilgrim installed core shroud tie rod assemblies in 1995 on a preemptive basis in lieu of ultrasonic (UT) inspection of the core shroud horizontal welds. The tie rods functionally replace the shroud horizontal welds H1 through H10. The tie rod assemblies are shown in Figure 3. GE designed and installed the Pilgrim tie rod assemblies. Recently it was discovered during an in-vessel visual inspection (IVVI) at another plant that tie rod upper supports experienced cracking. The root cause is intergranular stress corrosion cracking (IGSCC) in the Alloy X-750 tie rod upper support material. Alloy X-750 material is susceptible to IGSCC if subjected to sustained, large peak stress conditions. GE conducted an internal evaluation to determine if the potential IGSCC in the X-750 tie rod structural components of other BWR core shroud repairs designed by GE could be a reportable condition under 10 CFR Part 21. GE used the criterion provided in BWRVIP-84 (Reference 9) report for the IGSCC susceptibility assessment of the X-750 components in the tie rod vertical load path. BWRVIP-84 was issued in 2000, approximately five years following the Pilgrim tie rod installation in 1995.

GE has determined that other BWRs including Pilgrim exceed the BWRVIP-84 criteria for the upper supports. The results of the evaluation are included in the GE 10 CFR Part 21 Notification dated October 9, 2006 (Reference 1). GE has revised the assessment of the tie rod upper support design life and determined that the potential for a high peak surface stress exists for the Pilgrim tie rod design. This high peak stress reduces the design life of the tie rod upper support. Entergy has determined that the most prudent course of action and the best long-term economic solution is preemptive replacement of the tie rod upper support assembly with a modified upper support design capable of operation through the end of the proposed renewed operating license term (2032).

The potential for high peak stress in the tie rod upper support assembly design at Pilgrim and the other affected plants is attributed to the lack of a specified radius at the corner junction between horizontal and vertical legs of the upper support bracket (see Figure 2), which creates a high stress concentration.

GE conducted an extent of condition review to determine if other Alloy X-750 tie rod components had similar potential for high peak stress. GE has identified that the root radii of the threads in the tie rod threaded components may be smaller than the nominal values used in previous design evaluations. GE submitted a 10 CFR Part 21 communication by letter dated January 5, 2007 (Reference 10) to address the potential for IGSCC in tie rod threaded components. The proposed modification includes modified tie rod nuts to improve IGSCC resistance. The new tie rod nuts will include a specified root radius sufficient to minimize the peak principle stress to within the same criterion as used for the upper support.

The lower spring tie rod threaded connection and upper stabilizer torsion arm bolt were identified as areas of concern. An evaluation of the lower spring tie rod threaded connection determined that the projected life would be greater than end of renewed operating license (2032). A modification is being implemented to prevent the loss of the upper stabilizer torsion arm function due to torsion arm bolt failure.

The focus of this submittal is on the proposed replacement of the tie rod upper support assemblies and the impact that this modification has on previously performed analyses and evaluations.

2.1 Shroud Operational and Safety Functions

The core shroud operational and safety functions have previously been described in the initial core shroud repair submittals (References 2 through 6), and are also described in the Pilgrim Updated Final Safety Analysis Report (UFSAR), Section 3.3.4.1. In summary, the core shroud provides a partition to separate the upward flow of coolant through the core from the downward recirculation flow on the outside of the shroud; supports the top guide and core plate, which support the fuel and maintain core geometry; and houses the core spray spargers, which provide emergency core cooling.

2.2 NRC and Industry Actions

The NRC issued Generic Letter (GL) 94-03 (Reference 11) on July 25, 1994 requesting operating BWR licensees to address the core shroud cracking issue. For the more recent issues associated with the above-referenced GE Part 21 notifications, the BWRVIP has issued several communications to the NRC and BWRVIP member utilities. As discussed in the NRC safety evaluation (SE) for BWRVIP-76, dated July 27, 2006 (References 12 and 13), the BWRVIP has addressed the generic impact of the tie rod cracking operating experience in the BWRVIP-76 report inspection guidelines (Reference 12) in a letter dated May 30, 2006. Actions that the BWRVIP committed to take included: (1) work with the industry to understand the root cause; (2) require plants to inspect the tie rods at their next scheduled outage; and (3) take appropriate follow-up actions including revision of applicable BWRVIP documents.

In their SE for BWRVIP-76, the NRC acknowledged the BWRVIP's position and requested that if the BWRVIP determines that the root cause indicates that changes are needed to the BWRVIP material requirements or to the BWRVIP inspection guidelines, the BWRVIP take appropriate action to address the impact of the industry core shroud tie rod repair cracking as needed.

The BWRVIP is working with GE to develop an ongoing strategy to address the potential limited life of Alloy X-750 components under high-sustained peak stress. At this time, the BWRVIP has not changed the BWRVIP-84 requirement that the maximum allowable peak stress for Alloy X-750 be less than 80% of the yield strength of the material at the intended operating temperature. GE and Entergy consider the major concern to be the lack of a radius sufficient to maintain the peak principle stress below the BWRVIP-84 criterion of 0.8 Sy. Thus, Entergy is applying a conservative criterion (i.e., a lower allowable stress, compared to the BWRVIP-84 criterion) for the proposed tie rod modification.

2.3 Pilgrim Response to Generic Letter 94-03

By letters dated January 6, 1995 (Reference 2), Pilgrim Nuclear Power Station, proposed a repair of the Pilgrim core shroud, as requested by GL 94-03. The repair consisted of the installation of four stabilizer assemblies (i.e., tie rods) combined with core plate wedges to replace horizontal (circumferential) welds H1 through H10. This preemptive repair was installed during the 1995 refueling outage (RFO-10).

The NRC reviewed and accepted the original core shroud repair as an alternative to the ASME Code, pursuant to 10 CFR 50.55a(a)(3)(i). Inservice inspections of the core shroud and its repair components are performed in accordance with BWRVIP-76 (Reference 12). Entergy has been and continues to actively participate in BWRVIP activities to resolve core shroud repair issues.

Pilgrim performed VT-3 visual inspections of one tie rod assembly (315 degree) during the 1997 refueling outage (RFO-11) and examined the remaining three tie rods during the 1999 outage (RFO-12). No nonconforming conditions were detected on the tie rod assemblies during either outage.

3. DESCRIPTION OF THE PROPOSED TIE ROD ASSEMBLY MODIFICATIONS

3.1 Design Objectives

The objective of the proposed tie rod modifications is to design and install replacement upper support assemblies that interface correctly with the existing shroud repair hardware and will remain resistant to IGSCC over the remaining plant life (i.e., until 2032).

3.2 Design Criteria

The modified upper support assemblies comply with the criteria delineated in BWRVIP-02-A and BWRVIP-84 (References 8 and 9, respectively), with no exceptions taken. The original codes and design standards used for construction of the tie rod assemblies were delineated in GE Specification, which was included in the 1995 core shroud repair submittals (References 2). The original codes and design standards remain applicable to the proposed modifications, as well as other more recent standards (e.g., BWRVIP-84), as discussed in later sections of this attachment.

3.3 Description of Repair Components and Design Features

The geometry of the replacement hardware for Pilgrim (upper support, tie rod nut, and other associated upper support components) is shown in Figures 1 and 2. Figure 3 shows a complete tie rod assembly. These newly-designed components incorporate features that improve their ability to resist IGSCC. These features include: (1) a large fillet radius at the corner of the upper support; (2) increased width and thickness of the upper support; (3) sharp edges eliminated; (4) a larger root radius of the tie rod nut threads; and (5) modification of the upper support spring

torsion arm to prevent potential failure. The original tie rod installation required that cutouts be made in the shroud head flange to accommodate the upper supports, which hang over the shroud flange. The dimensions of the cutouts will not be changed for installation of the modified upper support dimensions.

The IGSCC assessment of Pilgrim Tie Rod X-750 Components documented an overstress in the upper support spring torsion arm bolt. A preliminary modification has been proposed to retain the torsion arm function and prevent the generation of loose parts in the event of failure of the bolt. Stress calculations on the conceptual design have been performed and verified. The preliminary design results indicate that the torsion arm clamp will be able to mitigate the consequences of the bolt failure. The completed preliminary ratchet u-bolt clamp calculations meet ASME stress allowable limits.

The final clamp design and associated stress calculations will be completed before the installation of the new upper support for the shroud repair. The Pilgrim Station Upper Support Stress and X-750 Reports will be revised as required to document the proposed modification and will be submitted to NRC for review before unit start up.

4. STRUCTURAL AND DESIGN EVALUATION

4.1 Analysis Models and Methodology

4.1.1 Description of Structural Models and Analysis

4.1.1.1 *Description of Seismic Model*

The proposed repair modification does not impact the seismic model described in the original 1995 core shroud repair submittal (Reference 2).

4.1.1.2 Description of Structural Models

Finite element analysis (FEA) and/or manual calculations were used to structurally analyze the modified upper support assembly components. The original FEA of the upper support brackets used the COSMOS finite element code. The mesh size in the original model was coarse and not suitable for capturing peak stresses. A revised finite element analysis (FEA) of the replacement upper support bracket with refined mesh sizes has been performed using the ANSYS computer program. Details of the analysis, such as input criteria, applied loading, material properties, boundary conditions, and analysis methods are described in the stress analysis report (Attachment 4). Entergy also contracted Structural Integrity Associates, Inc. (SIA) to perform an independent third party review of the GE upper support finite element analysis. SIA developed a separate ANSYS model and their results compared favorably to the GE results for the maximum principle tensile stress. The ANSYS program is qualified for use on safety related components.

The replacement hardware components (upper support, tie rod nut, and other tie rod components) were evaluated for their susceptibility to IGSCC. The design goal established by Entergy was to maintain sustained peak stress, below 0.8 Sy for all new Alloy X-750 upper support components and Alloy X-750 tie rod nuts, thereby providing margin to the BWRVIP-84 criteria of 0.8 Sy.

The replacement hardware components are also evaluated against ASME Code allowable stresses. The values of Sm and Sy for Alloy X-750 material were specified in accordance with

Code Case N-60-5 (Reference 14). This is consistent with BWRVIP-84, Section B.6.2. The membrane and bending stresses are calculated for these components to meet the ASME Code allowable stress limits.

4.1.2 Linear vs. Non-Linear Analysis Method

The original dynamic analysis methods are not changed by the proposed modification.

4.1.3 Load Cases and Load Combinations

The applicable normal, upset, emergency and faulted loading combinations remain bounded by the original design basis of the shroud repair tie rods. The original design basis load combinations are presented in the original 1995 core shroud repair submittals (Reference 2). The loads and load combinations are also in accordance with BWRVIP-02-A.

4.1.4 Shroud Deflections

The original shroud horizontal and vertical deflections presented in the 1995 core shroud repair submittals (References 2 to 6) are not increased by the proposed modification. Hence, there is no reduction in margin to the allowable horizontal displacements for control rod insertion. Also, since there is no increase in the shroud emergency/faulted vertical deflections, there is no additional strain imposed on shroud attached core spray piping as compared to the original analysis.

4.2 Reactor Pressure Vessel and Reactor Internals

The original tie rod design included an evaluation of the stress in the reactor pressure vessel (RPV) shell due to the horizontal load in the radial direction applied to the vessel by the upper tie rod support/spring assembly. The horizontal load is not changed as a result of the proposed upper support and tie rod nut modifications. As such, the original RPV stress report is not impacted by the proposed change.

4.3 Evaluation of Shroud Shell, Shroud Head, and Shroud Support

With the original tie rod thermal preloads maintained, there is no impact on available stress safety margins in the existing tie rod components that are not being modified or in tie rod attachment points such as the shroud gussets or support plate. Since the tie rod horizontal seismic loads and the tie rod thermal preload are not changed, there is also no change in the load imparted to the shroud shell adjacent to tie rod contact points.

4.4 Flow Induced Vibration

The GE design goal for the original tie rod design was to maintain a factor of three between the vortex shedding (excitation) frequency and the lowest natural frequency of the core shroud tie rod repair. The proposed tie rod modifications result in a minor increase in upper support stiffness and an insignificant increase in annulus flow velocity as compared to the original flow induced vibration (FIV) analysis. The original FIV analysis was included in the 1995 core shroud repair submittal (References 2 to 6). There is negligible change to the original tie rod natural frequency and vortex shedding frequency calculation and the factor-of-three design goal is maintained.

A separate evaluation of acoustic loading due to recirculation line break has also been evaluated as acceptable.

4.5 Radiation Effects

The replacement of these components does not adversely impact the original radiation effects evaluation.

4.6 Loose Parts Consideration

The redesigned upper support and tie rod nut and upper support torsion arm bolt have design features that ensure capture of all threaded parts with the potential to work loose within the reactor vessel environment. These features, such as retainer pins and ratchet mechanisms, prevent rotation of threaded fasteners by mechanically obstructing movement. The capturing mechanisms are designed to last for the design life of the repair.

5. SYSTEMS EVALUATION

5.1 Bypass Flow

There is no resultant change in the leakage bypass flow as described in the original evaluation (Reference 2).

5.2 Downcomer Flow Characteristics

There is no resultant change in the downcomer flow characteristics as described in the original evaluation (Reference 2).

6. MATERIALS AND FABRICATION

6.1 Materials Selection

The material specified for the replacement tie rod upper supports and nuts are listed below:

Component ID	Material	ASME or Other Description
Tie Rod Upper Support Main Load Path Bearing Parts and Miscellaneous Smaller Parts Not in the Main Load Path	Alloy X-750	ASME SB-637/ASTM B637 UNS N07750 Type 3
Tie Rod Nut	Alloy X-750	ASME SB-637/ASTM B637 UNS N07750 Type 3
Tie Rod Upper Support Dowel Pins	Type 316 Stainless Steel	ASME SA-479/ASTM A479, Type 316 or ASME SA-240/ASTM A240, Type 316
Upper Support Torsion Arm Bolt Retainer Clamp and Bolting	XM-19	ASME SA-479/ASTM A479, Type XM-19 or ASME SA-240/ASTM A240, Type XM-19
Upper Support Torsion Arm Retainer Ratchet Spring	X-750	ASME SB-637/ASTM B637 UNS N07750 Type 3

The above-listed materials have been used for many other reactor internal components and have demonstrated good resistance to stress corrosion cracking in laboratory testing and long-term service experience in the non-welded and low sustained operating stress condition. Alloy X-750, Type 316, and XM-19 austenitic stainless steel are acceptable BWRVIP-84 and ASME Code Section III materials. The proposed materials for the replacement parts are consistent

with those used in the original Pilgrim tie rod design, which was found acceptable by the NRC as documented in the NRC SE dated May 12, 1995.

6.2 Material Procurement Specifications

GE Materials Specification 26A5733 is being used for procurement of the tie rod upper support and nut components. This specification complies with the material requirements of BWRVIP-84 including the latest BWRVIP positions documented in BWRVIP Letter 2006-500, dated December 5, 2006 (Reference 15). No exceptions to the material and material processing practices as described in BWRVIP-84 have been taken.

6.3 Materials Fabrication

GE Fabrication Specification 26A5734 is being used for fabrication of the tie rod upper support and nut components. This specification complies with the fabrication requirements of BWRVIP-84 including the latest BWRVIP positions documented in BWRVIP Letter 2006-500, dated December 5, 2006 (Reference 15). No exceptions to the previous NRC-accepted fabrication standards in BWRVIP-84 have been taken.

The replacement upper supports are similar to the original tie rod assemblies in that they do contain threaded connections that could potentially act as crevices. No other avoidable crevices have been added to the replacement upper bracket design. BWRVIP-02-A states that it is recognized that fasteners and mechanical joints may contain crevices and it suggests the following requirements when crevices can not be avoided: (1) The design of such features should avoid sensitized areas and should utilize IGSCC-resistant materials, and (2) such features should be vented to the extent practical to minimize stagnant conditions. There are no welds in the replacement upper supports assemblies. The replacement upper support materials have been procured and processed to prevent sensitized material by meeting the requirements of BWRVIP-84. There are no threaded fasteners associated with the modification where venting is judged practical or effective.

7. PRE-MODIFICATION AND POST-MODIFICATION INSPECTION

7.1 Pre-Modification Inspection

The pre-modification inspection will include a video recording of the as-found condition of the shroud repair tie rod assemblies. This inspection is intended to confirm tie rod integrity and will satisfy the BWRVIP-76 requirements for verification of tie rod tightness.

The BWRVIP issued letters requiring plants with core shroud tie rod repairs to inspect their repairs at their next scheduled refueling outage (References 16 and 17). These letters indicated that inspections should include all the same or similar locations where the indications were observed and that consideration should also be given to other locations in the tie rod repair using X-750 material that may experience high-sustained stresses. Entergy will inspect the existing tie rod upper supports when access is provided during the planned replacement activity. The upper support inspection will be an EVT-1 exam of the high stress locations identified in the GE Part 21 notification dated October 9, 2006 (Reference 1). In addition, when access to the tie rod upper threads and the removed tie rod nut threads is available, an EVT-1 exam will be performed to the extent accessible. A review of all of the tie rod assembly X-750 components in the primary vertical and horizontal load paths has been performed. Based on this review, there are no other high stress X-750 locations, with the exception of the torsion arm bolt that require inspections provided in References 16 and 17.

7.2 Post-Modification Inspection

7.2.1 Inspections Prior to RPV Reassembly

A post-modification inspection prior to RPV reassembly will include a general post-maintenance visual inspection and recording of the fit of the shroud support hardware onto the shroud to confirm that there are no interferences at the support locations and that the installation is in accordance with the requirements of the modification drawings and the GE installation specification 26A7096. This inspection will include (as shown in Figure 4), as a minimum, the following attributes:

a. The upper supports are located between the shroud head bolt lugs (45°, 135°, 225°, and 315° azimuth locations). Verify the upper supports are fully engaged over the steam dam, and there is contact between the horizontal surface of upper support and the shroud flange.

b. Verify the upper spring contact pad is in contact with the RPV wall. Verify that the spring retainers are properly engaged to lock the jacking bolts.

c. Verify that the lower contact pads on the upper support are in contact with the shroud exterior on both sides of the upper support. Verify that the upper support retainer pin is engaged.

d. Verify that the upper mid-support is in contact with the RPV wall. Verify that the mid support latches are engaged on the tie rod collar.

e. Verify that the lower mid-support is in contact with the RPV wall. Verify that the mid support latches are engaged on the tie rod collar.

f. Verify that the lower contact block is in contact with the RPV wall. Verify that the lower contact block latch is engaged.

g. Verify that the lower spring hooks are in contact with the bottom side of the clevis pin.

h. Perform a final video-tap or DVD inspection of the completed modification.

7.2.2 Inspections During Subsequent Refueling Outages

In the first refueling outage following installation of the modified tie rod upper supports, Entergy will inspect the tie rod assemblies in accordance with the requirements defined in BWRVIP-76, Section 3.5, Option 1 or 2, and Entergy will repeat the post-installation inspections described in Section 7.2.1 (items a through h) above.

Entergy will work with GE and the BWRVIP to establish the appropriate re-inspection criteria for Alloy X-750 components.

8. REFERENCES

1. Letter from J. S. Post (GE) to Document Control Desk (NRC), dated October 9, 2006, Part 21 Notification: Completion of GE Evaluation on Core Shroud Repair Tie Rod Upper Support Cracking.

2. Boston Edison Company (BECo) Letter No. 2.95-004, Pilgrim Core Shroud Stabilizer Design, dated January 6, 1995,

3. BECo Letter No., 2.95-037, PNPS Response to the NRC Staff Request for Additional Information Concerning the Proposed Repair of the Pilgrim Core Shroud, dated March 21, 1995

4. BECo Letter No., 2.95-048, Additional Information Concerning Our Planned Modification of the Pilgrim Core Shroud, dated April 14, 1995

5. BECo Letter No., 2.95-059, Core Shroud Modification Request for Additional Information XM-19 Material (UNS S20100), dated May 3, 1995

6. BECo Letter No., 2.95-60, Core Shroud Modification Additional Information, dated May 9, 1995

7. NRC Safety Evaluation Regarding Pilgrim Nuclear Power Station Core Shroud Repair (TAC No. M91305), dated May 12, 1995

8. BWRVIP-02-A, "BWR Vessel and Internals Project BWR Core Shroud Repair Design Criteria, Rev. 2," October 2005

9. BWRVIP-84, "BWR Vessel and Internals Project Guidelines for Selection and Use of Materials for Repairs to BWR Internal Components," October 2000

10. Letter from J. S. Post (GE) to Document Control Desk (NRC), dated January 5, 2007, GE Part 21 Communication: Potential for Intergranular Stress Corrosion Cracking in Shroud Repair Tie Rod Threaded Components

11. NRC Generic Letter 94-03, "Intergranular Stress Corrosion Cracking of Core Shrouds in Boiling Water Reactors," July 25, 1994

12. BWRVIP-76, "BWR Vessel and Internals Project BWR Core Shroud Inspection and Flaw Evaluation Guidelines," November 1999

13. Letter from M. A. Mitchell (NRC) to W. Eaton (BWRVIP) dated July 27, 2006, Safety Evaluation of Proprietary EPRI Report, "BWR Vessel and Internals Project, BWR Core Shroud and Inspection and Flaw Evaluation Guidelines (BWRVIP-76)"

14. ASME Code Case N-60-5, Material for Core Support Structures, Section III, Division 1, February 15, 1994

15. Letter from W. Eaton (BWRVIP) to Document Control Desk (NRC), dated December 5, 2006, Project 704 – BWRVIP Response to NRC Safety Evaluation of BWRVIP-84 (Letter 2006-500)

16. Letter from W. Eaton (BWRVIP) to All BWRVIP Committee Members, dated March 29, 2006, BWRVIP Recommendation to Inspect Core Shroud Tie Rod Repairs

17. Letter from R. Dyle/T. Mulford (BWRVIP) to All BWRVIP Committee Members, dated April 3, 2006, Clarification to BWRVIP Recommendation to Inspect Core Shroud Tie Rod Repairs

9. FIGURES

1. Shroud Stabilizer Tie Road Installation
2. X-750 Replacement Parts
3. Shroud Stabilizer and Tie Road Assembly
4. Tie Road Assembly Inspection Points

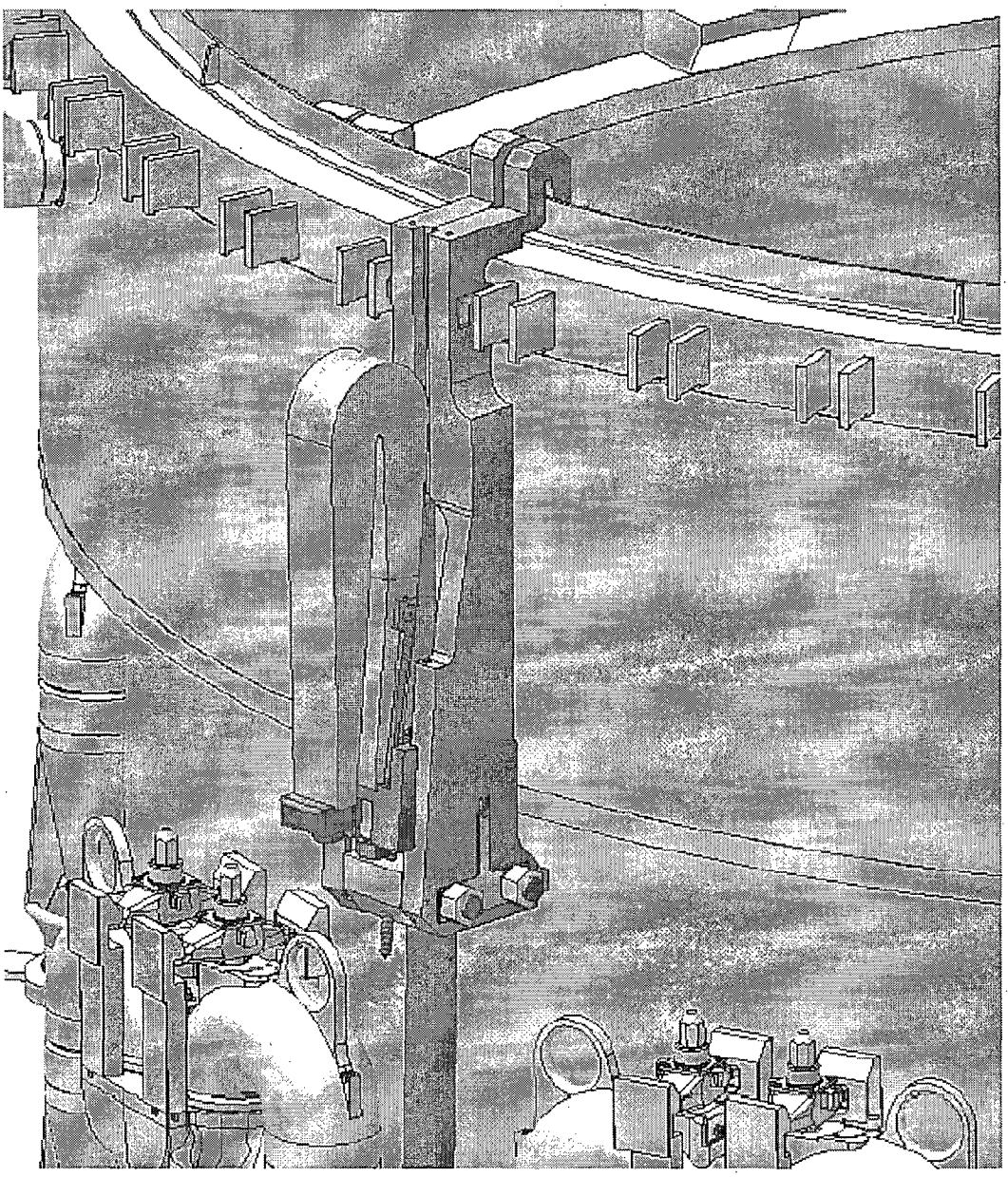


FIGURE 1: SHROUD STABILIZER TIE ROD INSTALLATION

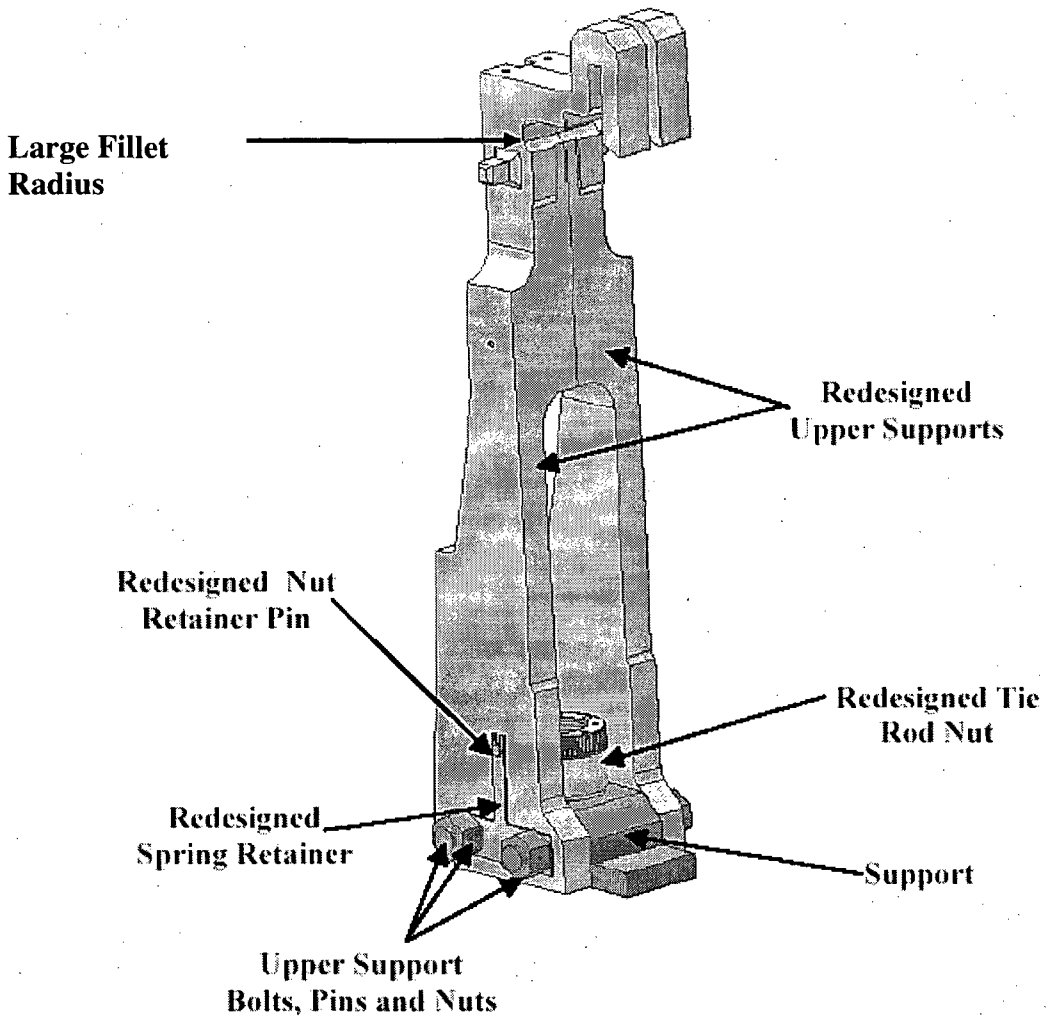


FIGURE 2: X-750 REPLACEMENT PARTS

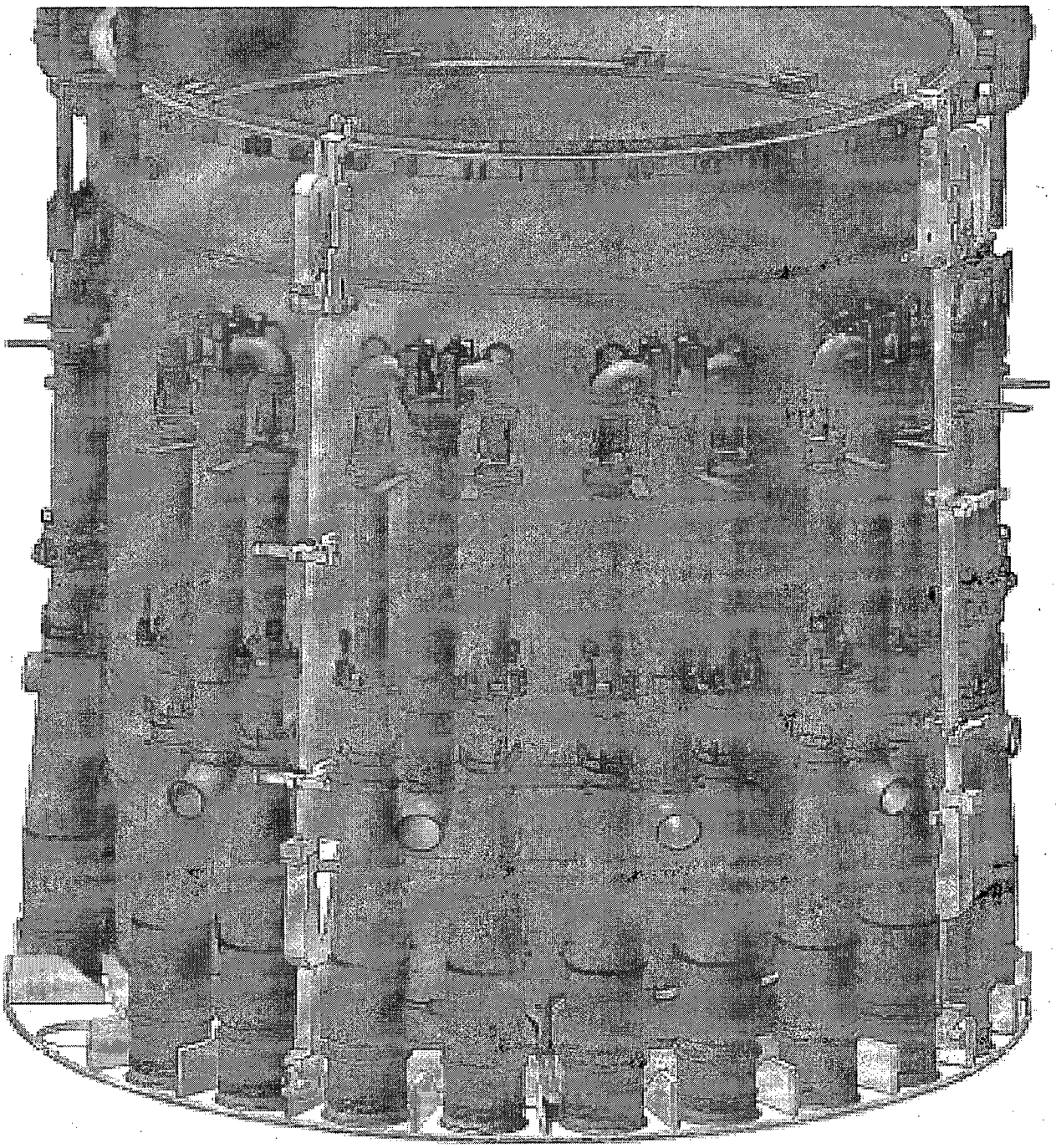
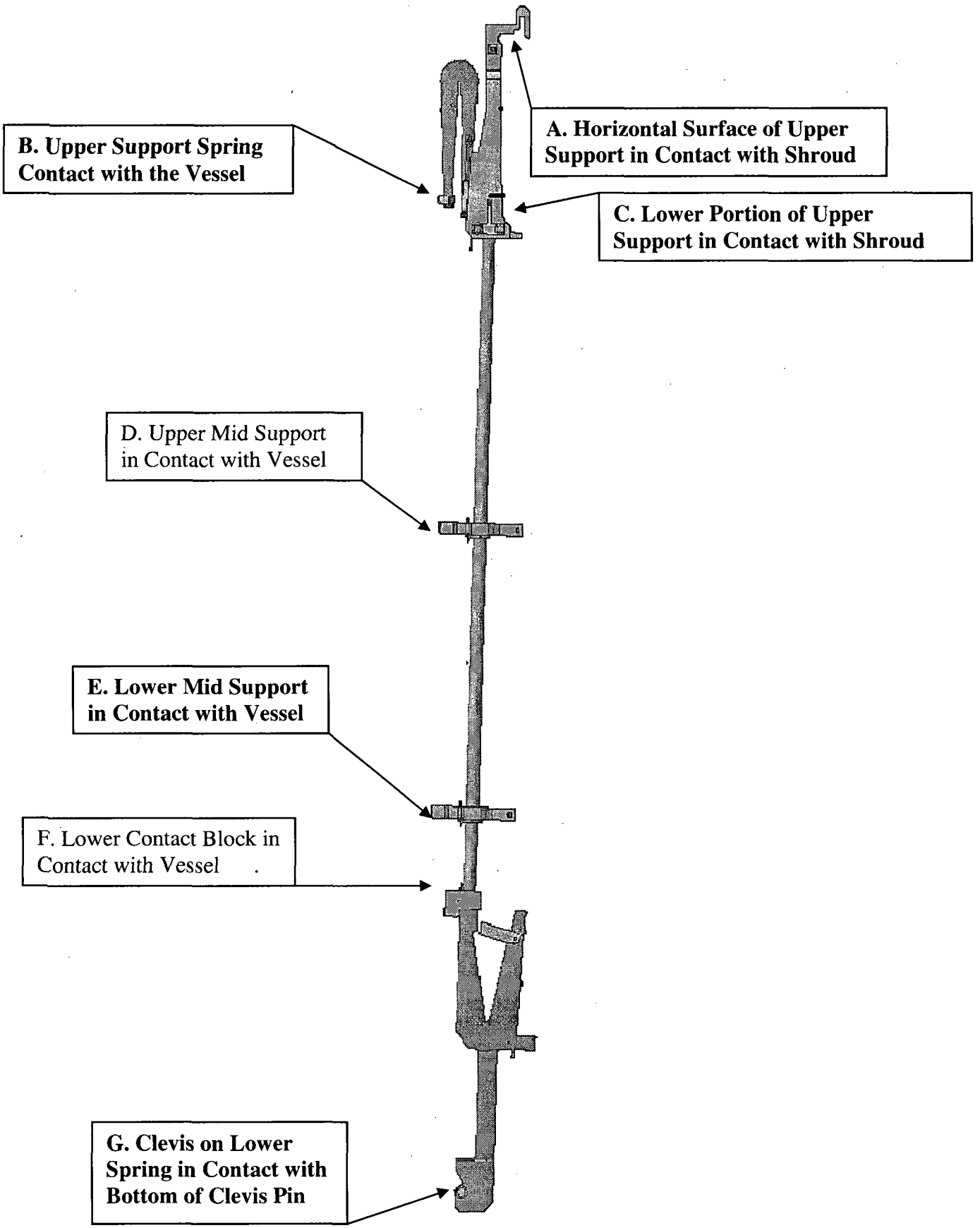


FIGURE 3: SHROUD STABILIZER AND TIE ROD ASSEMBLY

FIGURE 4: TIE ROD ASSEMBLY INSPECTION POINTS



ATTACHMENT 2

LIST OF REGULATORY COMMITMENTS

The following table identifies those actions committed by Entergy in this submittal. Any other statements in this submittal are provided for information purposes and are not considered to be regulatory commitments.

REGULATORY COMMITMENTS	DUE DATE	TYPE
Perform pre-modification inspection that includes a video recording of the as-found condition of the shroud repair tie rod assemblies, to confirm tie rod integrity and to satisfy the BWRVIP-76 requirements for verification of tie rod tightness.	Prior to completion of the upcoming refueling outage (RFO-16).	One-Time
Perform inspection of the existing tie rod upper supports when access is provided during the planned replacement activity. The upper support inspection will be an EVT-1 exam of the high stress locations identified in the GE Part 21 notification letter dated October 9, 2006.	Prior to completion of the upcoming refueling outage (RFO-16).	One-Time
Perform an EVT-1 exam of the upper tie rod and tie rod nut threads, to the extent accessible, when access to the tie rod threads and the tie rod nut threads is available.	Prior to completion of the upcoming refueling outage (RFO-16).	One-Time
Based on review of tie rod assembly X-750 components in the primary vertical and horizontal load paths, inspect high-stress X-750 locations consistent with the BWRVIP recommendations provided in BWRVIP letters dated March 29, 2006 and April 3, 2006.	Prior to completion of the upcoming refueling outage (RFO-16).	One-Time
Perform a post-modification inspection prior to RPV reassembly, including a general post-maintenance visual inspection and video recording of the fit of the shroud hardware onto the shroud, to confirm that there are no interferences at the support locations and that the installation is in accordance with the requirements of the modification drawings and the GE installation specification 26A7096. Include the inspection attributes identified in Attachment (1), Section 7.2.1 of this submittal.	Prior to completion of the upcoming refueling outage (RFO-16).	One-Time
Inspect the tie rod assemblies in accordance with the requirements defined in BWRVIP-76, Section 3.5, Option 1 or 2, and repeat the post-installation inspections described in Section 7.2.1 of this submittal.	Option 1 or Option 2 during RFO-17 and subsequent RFO's.	Continuing