October 16, 2008

Mr. Michael P. Gallagher
Vice President License Renewal Projects
AmerGen Energy Company, LLC
200 Exelon Way
Kennett Square, PA 19348

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION, AGING MANAGEMENT REVIEW RESULTS, THREE MILE ISLAND NUCLEAR STATION, UNIT 1, LICENSE RENEWAL APPLICATION (TAC NO. MD7701)

Dear Mr. Gallagher:

By letter dated January 8, 2008, AmerGen Energy Company, LLC (AmerGen) submitted an application pursuant to 10 *Code of Federal Regulations* part 10 (10 CFR Part 54) to renew the operating license for Three Mile Island Nuclear Station, Unit 1 for review by the U.S. Nuclear Regulatory Commission (NRC or the staff). The staff is continuing to review the information contained in the license renewal application and has identified, in the enclosure, areas where additional information is needed to complete the review. Further requests for additional information may be issued in the future.

Items in the enclosure were discussed with Chris Wilson, of your staff, and a mutually agreeable date for the response is within 30 days from the date of this letter. If you have any questions, please contact me at 301-415-2878 or e-mail Jay.Robinson@nrc.gov.

Sincerely,

\RA

Jay Robinson, Sr. Project Manager
Projects Branch 1
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure:
As stated

cc w/encl: See next page

October 16, 2008

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Vice President License Renewal Projects
AmerGen Energy Company, LLC
200 Exelon Way
Kennett Square, PA 19348

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Dear Mr. Gallagher:

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Jay Robinson, Sr. Project Manager
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As stated

cc w/encl: See next page

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ADAMS Accession No.: ML082520614

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NAME	SFigueroa	RAuluck	JDozier	JRobinson	DPelton
DATE	9/15/08	10/07/08	10/01/08	10/16/08	10/16/08

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Letter to AmerGen Energy Company, LLC from J. Robinson dated October 16, 2008

DISTRIBUTION:

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION, AGING MANAGEMENT REVIEW RESULTS, THREE MILE ISLAND NUCLEAR STATION, UNIT 1, LICENSE RENEWAL APPLICATION (TAC NO. MD7701)

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REQUEST FOR ADDITIONAL INFORMATION (RAI)

AGING MANAGEMENT REVIEW RESULTS

THREE MILE ISLAND NUCLEAR STATION, UNIT – 1

LICENSE RENEWAL APPLICATION

RAI#: AMR-GENERIC-1

LRA Section: 3.X.1 Tables, Associated Evaluation Paragraphs

Background:

In the Three Mile Island, Unit – 1, (TMI-1) License Renewal Application (LRA) for multiple line items in the 3.X.1 Tables and for associated evaluation paragraphs where the Generic Aging Lessons Learned (GALL) Report specifies further evaluation, line items that are designated as "not applicable" are explained with wording similar to the following:

> "The component, material, environment, and aging effect/mechanism does not apply to {systems}."

In the typical text "{systems}" is replaced with "Reactor Vessel, Internals, and Reactor Coolant System" or "ESF Systems" or "Auxiliary Systems," etc, as applicable.

Issue:

Although the staff believes it understands the intention of this wording, the wording is ambiguous because it could mean that "the component, material and environment combination does not exist in the system" but, as worded, it could also mean that "the component, material and environment combination exists but the aging effect does not occur in the system," in which case generic Note I would be applicable.

Request:

Please clarify the intention of this wording in unambiguous terms.

RAI#: 3.1.1-1

LRA Section(s): 3.1.1, Table of Summary of Aging Management Evaluations for the Reactor Vessel, internals, and Reactor Coolant System

Table 3.2.2-1, Core Flooding System, Summary of Aging Management Evaluation

ENCLOSURE

Background:

In LRA Table 3.1.1 and Table 3.2.2-1, it is stated that American Society for Mechanical Engineering (ASME) Section XI Inservice Inspection (ISI) program, Subsections IWB, IWC, and IWD, Aging Management Program (AMP) B.2.1.1, are credited with aging management of Class 1 small-bore piping in lieu of the Gall Report AMP XI.M35, "One Time Inspection of ASME Code Class 1 Small-Bore Piping." The staff noted that XI.M35, One Time Inspection of ASME Code Class 1 Small-Bore Piping provides for one-time volumetric inspection of welds in small bore piping where cracking has not occurred.

Issue:

The discussion column of LRA Table 3.1.1, for Item No. 3.1.1-70 on page 3.1-36, indicates that TMI-1 has experienced an occurrence of cracking of ASME Code Class 1 small-bore piping resulting from thermal and mechanical cyclic loading and that the GALL Report AMP XI.M35 is not credited to manage degradation of Class 1 small-bore piping. However, the LRA does not provide the detail of the methods used to detect degradation (in particular cracking) of small bore piping (including inspection and evaluation methods, inspection scope and frequency) of the Reactor Coolant System and piping and fittings of the Core Flooding System (Table 3.2.2-1).

Request:

Provide additional information that provides the activities used to detect degradation of small bore piping.

RAI#: 3.1.2.2.7-1

LRA Section: 3.1.2.2.7, Cracking due to Stress Corrosion Cracking

Background:

On page 3.1-10 of the LRA, in section 3.1.2.2.7.1, it is stated that Item 3.1.1-23 which refers to the stainless steel reactor vessel closure head flange leak detection line and the stainless steel bottom-mounted instrument guide tubes is not applicable to TMI-1.

Issue:

No additional information was found in the LRA to explain why this AMR result is not applicable for TMI-1.

Request:

With regard to the vessel closure head flange leak detection line and the bottom-mounted instrument guide tubes:

1. Do these components exist at TMI-1?
2. If these components exist, are they in scope for license renewal? If not, why not?
3. If these components exist and are in scope, what is the material of construction and environment for each component type? And, where are the AMR results for these components documented in the LRA?

RAI#: 3.1.2.2.14-1

LRA Section: 3.1.2.2.14, Wall Thinning due to Flow-Accelerated Corrosion

Background:

On page 3.1-23 of the LRA in Table 3.1-1, Item 3.1.1-32 which applies to the component "steel steam generator feedwater inlet ring and supports" with "wall thinning due to flow accelerated corrosion" as an aging effect, references LRA section 3.1.2.2.14 to provide further discussion and states that the line is not applicable.

Issue:

On page 3.4-35 of the LRA in Table 3.4-1, Item 3.4.1-29, there is no discussion of steel steam generator feedwater inlet ring. It is further stated that the line item is not consistent with the GALL Report and provides an explanation for the emergency feedwater system. SRP-LR Section 3.1.2.2.14 states that wall thinning could occur in steel feedwater inlet rings and supports, and recommends a plant-specific program to be evaluated.

Request:

Provide justification why line item 3.1.1-32 is not applicable and explain how item 3.4.1-29 discussion applies to item 3.1.1-32.

RAI#: 3.1.2.3-1

LRA Section: Table 3.1.2-1, Reactor Coolant System

Background:

On page 3.4-50 of the LRA in rows 9 & 10 of Table 3.1.2-1, for piping and fittings made of lexan material in an air with borated water leakage environment, there are no aging effects requiring management identified.

Issue:

Justification for why there are no aging effects requiring management for the line item referenced above was not provided.

Request:

Provide justification why there are no aging effects requiring management for the material/environment combination identified above.

RAI#: 3.2.2.2.6-1

LRA Section: 3.2.2.2.6, Loss of Material Due to Erosion

Background:

On page 3.2-53 of the LRA in Table 3.2.2-3 for the Makeup and Purification System (High Pressure Injection), the AMR result for a stainless steel flow element in a treated water environment with an aging effect of loss of material/erosion shows that the Water Chemistry (B.2.1.2) AMP is the only AMP credited. On page 3.2-14 of the LRA in section 3.2.2.2.6, it is stated that plant Technical Specifications require periodic surveillance testing of the pumps which would give early indication of orifice degradation.

Issue:

In the GALL Report, the corresponding AMR result line recommends further evaluation, and the SRP-LR Section 3.2.2.2.6 recommends that a plant-specific AMP be evaluated. Since the pump testing would give only an indirect indication of orifice degradation due to erosion, and may not give any indication until significant degradation has occurred, the Staff is not convinced that the Water Chemistry Program, alone, provides adequate aging management for this aging effect in this component.

Request:

Provide an additional AMP to directly confirm the effectiveness of the Water Chemistry Program in managing the aging effect of loss of material due to erosion in this component, or provide a detailed technical justification of why an additional AMP is not needed.

RAI#: 3.3.1.21-1

LRA Section: Table 3.3.1, Summary of Aging Management Evaluations for the Auxiliary Systems, Item 3.3.1-21

Background:

On page 3.3-58 of the LRA in Table 3.3.1, the discussion column for item 3.3.1-21 (steel heat exchanger components exposed to lubricating oil) states: “Not consistent with NUREG-1801.” It also states that: “Fouling is not predicted for this component, material and environment combination.”

Issue:

For managing the other aging effects of general, pitting, and crevice corrosion, and microbiologically influenced corrosion (MIC) for steel piping, piping components, and piping elements exposed to lubricating oil in the RCS, the LRA specifies the use of the Lubricating Oil Analysis (B.2.1.23) AMP and the One-Time Inspection (B.2.1.18) AMP, which are the same AMPs recommended in the GALL Report for item 3.3.1-21.

Request:

1. Provide justification for the LRA’s statement that the aging effect of fouling “is not predicted for this component, material and environment combination.”

2. Explain why the LRA states that the item is not consistent with the GALL Report and uses generic Note "I", indicating that the aging effect in the GALL Report does not apply for this component, material, and environment combination.

RAI#: 3.3.1.32-1

LRA Section: Table 3.3.1, Summary of Aging Management Evaluations for the Auxiliary Systems, Item 3.3.1-32

Background:

In LRA Tables 3.3.2-2, -9, -12 and -24, for AMR results that refer to Table 3.3.1, Item 3.3.1-32, where the material is copper alloy with less than 15% Zinc, generic Note "I" is used, along with a plant specific note that states: "pitting and crevice corrosion are not predicted for this combination, and microbiologically influenced corrosion is predicted for this combination."

Issue:

Justification indicating that "pitting and crevice corrosion are not predicted" is not provided. Since loss of material due to MIC is predicted, no explanation is given as to why generic Note "I" is used. It is not clear as to why item number 3.3.1-32 states "Not consistent with NUREG-1801", when the AMPs all appear to match the GALL Report's comparable AMR result.

Request:

1. Provide technical justification, including applicable technical reference(s), for the statement that "pitting and crevice corrosion are not predicted."
2. Would one-time inspection procedures be materially changed if pitting and crevice corrosion were predicted for the components in which only MIC is currently predicted? If so, in what ways would the procedures be changed?
3. Explain why generic Note "I" is used since loss of material due to MIC is predicted.
4. Since component, material, environment, aging effect (except due to certain mechanisms) and the AMPs all appear to match the GALL Report's comparable AMR result, explain why the discussion for Item 3.3.1-32 states, "Not consistent with NUREG-1801."

RAI#: 3.3.1-48-1

LRA Section: Table 3.1.1, Summary of Aging Management Evaluations for the Auxiliary Systems

Background:

For a number of AMR results lines where the aging effect is loss of material, the LRA uses generic Note "I" and a plant-specific note stating that galvanic corrosion is not applicable for this component due to absence of unlike materials to form a galvanic couple – or similar wording. Similarly, for a stainless steel structural support in treated water, the aging effect of general corrosion (but not pitting and crevice corrosion) is denied and Note "I" is used. See Item 3.3.1-

48 on page 3.3-72; Item 3.3.1-51 on page 3.3-74; Item 3.3.1-82 on page 3.3-94, and Item 3.4.1-5 on page 3.4-24..

Issue:

Note "I" means that the aging effect in the GALL Report is not applicable for the component, material and environment combination. However, it appears that Note "I" is being used to indicate that a specific aging mechanism (not an aging effect) is not present.

Request:

Explain why the use of Note "I" is considered to be appropriate for these types of line items.

RAI#: 3.3.2.2-1

LRA Section: 3.3.2.2, Aging Management Review (AMR) Results for Which Further Evaluation is Recommended by the GALL Report

Background:

In various parts of LRA Section 3.3.2.2, it is stated that loss of material due to crevice corrosion in copper alloys with zinc content less than 15% is not predicted in a fuel oil environment.

Issue:

Sufficient information is not provided in the LRA to verify that loss of material due to crevice corrosion in copper alloys with zinc content less than 15% will not occur in a fuel oil environment.

Request:

Provide additional information that demonstrates copper alloys with zinc content less than 15% are not subject to pitting and crevice corrosion in a fuel oil environment.

RAI#: 3.3.2.2-2

LRA Section: 3.3.2.2, Aging Management Review (AMR) Results for Which Further Evaluation is Recommended by the GALL Report

Background:

In Auxiliary System Tables 3.3.2-2, 3.3.2-9, 3.3.2-12, and 3.3.2-24, it is stated that for copper alloy (Zn content less 15%) piping, fittings, and valves exposed to a fuel oil environment, loss of material due microbiologically influence corrosion (MIC) is managed with the Fuel Oil Chemistry (B.2.16) and One-Time Inspection (B.2.1.18) programs.

Issue:

Note "I" which states that the aging effect in the Gall Report for the component, material, and environment combination is not applicable, is assigned for these cases even though the assignment of the Fuel Oil Chemistry and One-Time Inspection program to manage loss of material due to MIC is in accordance with the GALL Report. In addition, loss of material due to MIC for copper alloys with zinc content less than 15% is addressed in Section 3.3.2.2.12 of the LRA.

Request:

Provide additional information that justifies using note "I" for copper alloy (Zn content less 15%) piping, fittings, and valves exposed to a fuel oil environment, when loss of material due to MIC is managed with the Fuel Oil Chemistry (B.2.16) and One-Time Inspection (B.2.1.18) programs in accordance with the GALL Report.

RAI#: 3.3.2.2-3

LRA Section: 3.3.2.2, Aging Management Review (AMR) Results for Which Further Evaluation is Recommended by the GALL Report

Background:

On page 3.3-39 of the LRA, in section 3.3.2.2.9.2, it is stated that fouling of heat exchanger steel piping, piping components, and piping elements exposed to a lubricating oil environment is not predicted and therefore it is not addressed.

Issue:

Fouling of heat exchanger steel piping, piping components, and piping elements exposed to a lubricating oil environment is not addressed.

Request:

Provide additional information that demonstrates steel piping, piping components and piping elements are not subject to fouling when exposed to lubricating oil.

RAI#: 3.3.2.3-1

LRA Section: Table 3.3.2-10, Fire Protection System
Table 3.3.2-11, Fuel Handling and Fuel Storage System
Table 3.3.2-18, Miscellaneous Floor and Equipment Drains System
Table 3.3.2-21, Radwaste System

Background:

The LRA identifies several elastomer/polymer components/material environment grouping combinations with an aging effect of "none" and an aging management program of "none" and references footnote F in auxiliary systems as follows:

1. Table 3.3.2-10, page 3.3-211, rows 5 and 6: Polymer piping and fittings in the fire protection system in air-indoor external and air/gas wetted internal environments.

2. Table 3.3.2-11, page 3.3-236, rows 1 & 2: Tygon hoses in fuel handling and fuel storage system in air with borated water leakage external and treated water internal environments.

3. Table 3.3.2-18, page 3.3-279, row 10 & Table 3.3.2-18, page 3.3-280, rows 1 through 3: Various organic polymers tanks in the miscellaneous floor and equipment drains system in air with borated water leakage, air/gas – wetted, concrete, and raw water environments.

4. Table 3.3.2-21, page 3.3-323, row 11: Titanium alloy tank in radwaste system in air with borated water leakage environment.

Issue:

The polymer material for piping and fittings and tanks is not identified. Justification for why there are no aging effects requiring management for the line items referenced above was not provided.

Request:

1. Identify what polymer material is used for piping and fittings, and tanks.

2. Provide justification for why there are no aging effects requiring management for the material/environment combinations identified above.

RAI#: 3.3.2-3-1

LRA Section: Table 3.3.2-3, Circulating Water System

Background:

On page 3.3-127 of the LRA, row 8 in Table 3.3.2-3 refers to Table 1 item 3.5.1-27, for piping and fittings made of concrete in a raw water (internal) environment where the aging effect is cracking due to expansion and reaction with aggregates and is managed by the Open-Cycle Cooling Water System (B.2.1.9) AMP.

On page 3.3-127 of the LRA, row 7 of Table 3.3.2-3, and on page 3.3-128 of the LRA, row 1 of Table 3.3.2-3, refer to Table 1 item 3.5.1-31. Both line items are for piping and fittings made of concrete in a raw water (internal) environment. For the item on page 3.3-127 the aging effect is cracking, loss of bond, and loss of material (spalling, scaling) due to corrosion of embedded steel; for the item on page 3.3-128, the aging effect is increase in porosity and permeability, cracking, loss of material (spalling, scaling) due to aggressive chemical attack. For both items the Open-Cycle Cooling Water System (B.2.1.9) AMP is credited.

On page 3.3-128 of the LRA, row 2 of Table 3.3.2-3 refers to Table 1 item 3.5.1-37 for piping and fittings made of concrete in a raw water (internal) environment where the aging effect is increase in porosity and permeability and loss of strength due to leaching of calcium hydroxide.

Issue:

In order to complete the review, a more detailed description of the components included in the above reference line items is needed along with a more detailed description of the examination techniques used to detect each of the aging effects listed in the AMR result.

Request:

1. Provide a more detailed description of the components that are included in these line items (i.e. pipe size, type of fittings, construction of the pipe, etc.).
2. Provide a more detailed description of the examination techniques used to detect each of the aging effects listed in the AMR result. (How the examination is conducted, what frequency, what acceptance criteria is used for identifying age-related degradation?)
3. Identify any preventive actions in the Open-Cycle Cooling Water System AMP that mitigate aging effects.

RAI#: 3.3.2-10-1

LRA Section: Table 3.3.2-10, Fire Protection System

Background:

On page 3.3-206 of the LRA, in row 8 of Table 3.3.2-10, and on page 3.3-207 of the LRA, in row 5 of Table 3.3.2-10, for carbon steel fire barriers (doors and penetration seals), in an environment of air with borated water leakage, the Fire Protection AMP is credited and the GALL Report item VII.A1-1 is referenced along with footnote E.

Issue:

The GALL Report item VII.A1-1 is for structural steel in air-indoor uncontrolled environment, which is a different environment than what is identified in the LRA. Also, the Fire Protection AMP is credited in lieu of Boric Acid Corrosion AMP.

Request:

1. Explain why the GALL Report item VII.A1-1 is referenced instead of the GALL Report item III.B5-8 (support members; welds; bolted connections; support anchorage to building structure in an environment of air with borated water leakage), which is what is referenced for doors in LRA Tables 3.5.2-2 and 3.5.2-7 (see row 2 on page 3.5-82 and row 1 on page 3.5-131) for steel material in an environment of air with borated water leakage.
2. Provide justification for why the Fire Protection AMP is referenced and not the Boric Acid Corrosion AMP.
3. If the Fire Protection AMP is used, explain which AMP will be used to evaluate and control boric acid leakage.

RAI#: 3.3.2-24-1

LRA Section: Table 3.3.2-24, Station Blackout and UPS Diesel Generator Systems

Background:

On page 3.3-345 of the LRA, row 9 of Table 3.3.2-24, is for stainless steel piping and fittings in an environment of fuel oil (internal) where the AMP is One-Time Inspection (B.2.1.18).

Issue:

The Fuel Oil Chemistry (B.2.1.16) AMP does not appear to be credited for aging management of this component.

Request:

Indicate if the correct AMP is credited. If yes, then explain why the Fuel Oil Chemistry AMP is not credited for aging management of this component.

RAI#: 3.3.2-25-1

LRA Section: Table 3.3.2-25, Water Treatment and Distribution System, Summary of Aging Management Evaluation

Background:

In LRA Table 3.3.2-25, for components made of carbon steel, ductile cast iron and gray cast iron exposed to a raw water environment in the water treatment and distribution system, the aging effect of loss of material is managed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.22) AMP, rather than by the Open-Cycle Cooling Water (B.2.1.9) AMP. Items include: Row 4 on page 3.3-356; Rows 1 and 5 on page 3.3-357; Row 9 on page 3.3-358; Rows 1, 2, 4 and 6 on page 3.3-360; Rows 1, 3 and 5 on page 3.3-362; Rows 3 and 8 on page 3.3-363; and, Rows 3 and 5 on page 3.3-365.

Issue:

The GALL Report recommends use of the Open-Cycle Cooling Water AMP for this component, material, environment and aging effect combination.

Request:

1. Explain why a different AMP from the one recommended in the GALL Report is being used?
2. Provide justification and explain how the AMP used provides aging management protection for the identified components that is comparable to the protection that would be provided by the AMP recommended in the GALL Report.

RAI#: 3.4.2.3-1

LRA Section: Table 3.4.2-6, Main Generator and Auxiliary Systems

Background:

On page 3.4-120 of the LRA in rows 5 and 6, of Table 3.4.2-06, for PTFE piping and fittings in air-indoor and treated water environments, there are no aging effects requiring management identified.

Issue:

Justification for why there are no aging effects requiring management for the line item referenced above was not provided.

Request:

Provide justification why there are no aging effects requiring management for the material/environment combination identified above.

RAI#: 3.4.2-8-1

LRA Section: Table 3.4.2-8, Steam Turbine and Auxiliary Systems

Background:

In LRA Table 3.4.2-8, row 6, on page 3.4-154, it is proposed to manage loss of material due to erosion for carbon steel piping and fittings in a treated water (external) environment with AMP B.2.1.22, “Inspection of Internal Surfaces of Miscellaneous Piping and Ducting Components.”

Issue:

It is not clear how the inspection of the internal surfaces of piping and fittings will be representative of the degradation that has occurred on the external surface due to the external treated water environment.

Request:

Clarify how the inspection of the internal surfaces of piping and fittings will be representative of the degradation that has occurred on the external surface due to the external treated water environment?

RAI#: 3.6-1

LRA Section: 3.6, Aging Management of Electrical Commodity Groups

Background:

The GALL Report, Item VI.A-8 identifies corrosion as one of the aging effects/mechanisms for fuse holders (metallic clamp) that requires an AMP (GALL Report XI.E5).

Issue:

On page 3.6-10 of the LRA in section 3.6.2.3.1, it is stated that fuse holders are located in a controlled environment and are not subject to corrosion. During the on-site audit, the staff reviewed Issue Report (IR) 00461358, which described a root cause of a control circuit failure in a controlled environment due to a corroded fuse holder clip.

Request:

Explain why oxidation is not an aging effect requiring management for fuse holders when plant specific operating experience has shown that oxidation is a potential aging effect in the same environmental condition.

RAI#: 3.6-2

LRA Section: 3.6, Aging Management of Electrical Commodity Groups

Background:

On page 3.6-9 of the LRA in section 3.6.2.2.3, it is stated that tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength (over time) of an 80-year-old aluminum conductor steel reinforced (ACSR) conductor due to corrosion. It is further stated that the Ontario Hydroelectric study is considered to bound the TMI-1 configuration.

Issue:

It is not clear how the Ontario Hydroelectric test was conducted. It is not clear how the TMI-1 transmission conductor configuration is bounded by these tests and if the configuration will have adequate margin for 60 years.

Request:

1. Describe in detail how the test conducted at Ontario Hydroelectric was performed.

2. Explain how the TMI-1 transmission conductor configuration is bounded by the tests performed at Ontario Hydroelectric and how the conductor configuration will have adequate margin for 60 years?

RAI#: 3.6-3

LRA Section: 3.6, Aging Management of Electrical Commodity Groups

Background:

On page 3.6-10 of the LRA in section 3.6.2.2.3 it is stated that the transmission conductor bolted connections are designed and installed using lock and Belleville washers that provide vibration absorption and prevent loss of preload.

Issue:

Electric Power Research Institute (EPRI) document TR-104213, "Bolted Joint Maintenance & Application Guide," identifies a special problem with Belleville washers. It states that hydrogen embrittlement is a recurring problem with Belleville washers and other springs. When springs are electroplated, the plating process forces hydrogen into the metal grain boundaries. If the hydrogen is not removed, the spring may spontaneously fail at any time while in service.

Request:

1. Are electroplated Belleville washers currently in use at TMI-1?

2. Describe any current activity used to confirm the effectiveness of switchyard bolted connections that will be used in the period of extended operation to prevent this aging effect.