Florida Power & Light Company, 9760 SW 344 St., Fla City, FL 33035

FPL

L-2001-34
10 CFR 54

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

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Response to Request for Additional Information for the Review of the Turkey Point Units 3 and 4 License Renewal Application

By letter dated January 17, 2001, the NRC requested additional information regarding the Turkey Point Units 3 and 4 License Renewal Application (LRA). Attachment 1 to this letter contains the responses to the Requests for Additional Information (RAIs) associated with Section 4.4, Environmental Qualification, Appendix B Subsection 3.2.6, Environmental Qualification Program, and Section 3.7, Electrical and Instrumentation and Controls, of the LRA.

Should you have any further questions, please contact E. A. Thompson at (305)246-6921.

Very truly yours,

R. J. Hovey
Vice President - Turkey Point

RJH/EAT/hlo

Attachment

A084

cc: U.S. Nuclear Regulatory Commission, Washington, D.C.

Chief, License Renewal and Standardization Branch
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Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251

Response to Request for Additional Information for the Review of the Turkey Point Units 3 and 4, License Renewal Application

STATE OF FLORIDA)
) ss.
COUNTY OF MIAMI-DADE)

R. J. Hovey being first duly sworn, deposes and says:

That he is Vice President - Turkey Point of Florida Power and Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

R. J. Hovey

Subscribed and sworn to before me this

30 day of March, 2001.

Olga Hanek

Olga Hanek
Name of Notary Public (Type or Print)

OLGA HANEK
MY COMMISSION # CC 926970
EXPIRES: June 18, 2004
Bonded Thru Notary Public Underwriters

R. J. Hovey is personally known to me.

ATTACHMENT 1
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION DATED JANUARY 17, 2001 FOR THE REVIEW OF THE TURKEY POINT UNITS 3 AND 4, LICENSE RENEWAL APPLICATION

SECTION 4.4 ENVIRONMENTAL QUALIFICATION

RAI 4.4.1-1:

In the LRA Section 4.4.1, you have stated that the wear cycle aging effect is only applicable to ASCO solenoid valves for Turkey Point. Provide justification why wear cycle aging effect is not applicable to motors (i.e., Joy motors, Westinghouse motors, MOV actuators, etc.), limit switches, and electrical connectors.

FPL RESPONSE:

Wear cycling is addressed in the test reports in the Turkey Point Environmental Qualification (EQ) Documentation Packages for motors, limit switches and electrical connectors when appropriate and is reviewed as part of the aging affects. Typically, the cycling done during testing is significantly more than the application in the plant requires as shown in the discussions below. Therefore, wear cycling is normally not the limiting factor in the qualified life of the equipment and may or may not be specifically discussed in the qualification package. Experience has shown that in certain applications, solenoid valve cycling can approach and even exceed the tested values over the design life of the plant. Thus, it can become the limiting factor in the qualified life of the solenoid valve and therefore was specifically addressed in the LRA. Other wear cycle aging evaluations are discussed below.

The wear cycle for a motor is a start/stop cycle. The Joy and Westinghouse motors in the Turkey Point EQ Program are only used in applications where the component is idle (in standby) for a significant portion of its operating life. Of these motors, the motors that experience the most start/stop cycles are the Residual Heat Removal (RHR) Pump Motors. The design specification for these motors states that the expected number of cycles during design life, including testing, is 1000. For these motors, motor operation consists of monthly performance testing, maintenance testing, and operation during plant outages for decay heat removal. Allowing for a conservative number of motor start/stop cycles for maintenance testing and refueling outages, in addition to monthly performance tests, the number of start/stop cycles would not exceed 1000 for these motors over a 60-year plant life. The EPRI Power Plant Electrical Reference Series Volume 6 on Motors, page 6-46, states that a motor should be able to withstand 35,000 to 50,000 starts. Thus, the wear cycle aging effect is considered insignificant for Westinghouse and Joy motors.

This is further supported by IEEE 334-1974 (IEEE Standard for Type Testing of Continuous Duty Class 1E Motors for Nuclear Power Generating Stations). This daughter standard of IEEE 323-1974 provides component specific instructions for demonstrating environmental qualification of motors. In this standard, instructions are given on equipment qualification related aging of motors. These instructions do not identify wear cycle aging of motors to be performed prior to design basis event testing. In other IEEE standards, where wear cycle aging warrants consideration, a specific number of cycles is suggested. Since instructions for wear cycle aging is not contained in IEEE 334 - 1974, it is concluded that wear cycle aging is not applicable or significant for these motors.

For the motors in Limitorque actuators in the Turkey Point EQ Program, the actuators that would be subjected to the most cycles are those associated with valves in the RHR System. Considering there are two actuator motor start/stop cycles for every open/close cycle of its associated valve, and conservatively assuming the valves are subjected to an open/close cycle each time the RHR pumps are operated, motor start/stop cycles associated with Limitorque actuators would not exceed 2000 over a 60-year plant life. As recommended in IEEE 382-1980, Limitorque cycled the actuators 2000 times as part of the environmental qualification testing.

There are no TLAAs associated with limit switches in the EQ Program at Turkey Point. The limit switches have a qualified life of less than 40 years based on thermal aging.

The wear cycle for a connector is a mate-demate cycle and the EQ consideration is the effect on the sealing surfaces of the connector. The seal on a Patel/EGS Grayboot connector is created between the outside rubber surface of the plug and the inside rubber surface of the receptacle making inspection of the receptacle sealing surface difficult. Thus, cycling as part of qualification testing is relied upon to demonstrate wear resistance. The Patel/EGS Grayboot electrical connectors that would be cycled most frequently in EQ applications at Turkey Point are the ones associated with normally energized ASCO solenoid valves that are replaced every third refueling cycle. Since Grayboot electrical connectors were not used at Turkey

Point until late 1991, this would result in an expected cycling frequency of 10 cycles through the end of the extended period of operation. In the EQ testing done by EGS, the connectors were cycled at least 140 times prior to being subjected to postulated Design Basis Accident test conditions. Therefore, the cycling is bounding for the expected license renewal period at Turkey Point. It should also be noted that half of the connector would be replaced each time the solenoids are replaced. Therefore, wear cycle aging on the Grayboot connectors is considered insignificant.

The only other connectors in the EQ Program at Turkey Point are those associated with the heated-junction and core exit thermocouples. Two different connector designs are used and cycling as part of qualification testing ranged from 5 to 50 mate-demate cycles depending on whether they would be taken apart only for trouble-shooting or for disassembly of the reactor each refueling outage. However, unlike the Grayboot connectors, these connectors have grafoil gaskets, which are easily inspected for flaws each mate-demate cycle, or copper crush rings that are replaced every mate-demate cycle. Thus, seal qualification is based on inspection or seal ring replacement rather than the mate-demate cycles and wear cycle aging is considered insignificant.

There are no other TLAAs for EQ equipment that consider wear cycling aging effect, therefore this aging effect is only significant for ASCO solenoid valves as described in the LRA Subsection 4.4.1, page 4.4-3.

RAI 4.4.1-2:

The LRA does not address whether there have been any major plant modifications or events at Turkey Point, Units 3 and 4 of sufficient duration to have changed the temperature and radiation values that were used in the underlying assumptions in the EQ calculations, and whether the conservatism in the EQ equipment qualification analyses are sufficient to absorb environmental changes occurring due to plant modification and events. Also, the LRA does not address the controls used to monitor changes in plant environmental conditions to periodically validate the environmental data used in the analyses.

Please provide additional information on the following:

a) Whether there have been any major plant modifications or events at Turkey Point of sufficient duration to have changed the temperature and radiation values that were used in the underlying assumptions in the EQ calculations,

b) Whether the conservatism in the EQ equipment qualification analyses are sufficient to absorb environmental changes occurring due to plant modification and events, and

c) The specific controls used to monitor changes in plant environmental conditions to periodically validate the environmental data used in analyses.

FPL RESPONSE:

a) There have not been any major plant modifications or events at Turkey Point of sufficient duration to change the temperature and radiation values that were used in the underlying assumptions in the EQ calculations due to the conservative profile of the temperature and radiation values used. In 1992, FPL chose to increase the EQ temperature profile for conservatism to provide the maximum design margin between the actual calculated profile and the EQ profile. The EQ equipment in Containment was then shown to meet the new profile.

   For radiation values, the postulated normal operating dose rates are based on the assumption of 1% failed fuel which is ten times the amount of fuel leakage than has ever been recorded at Turkey Point. The postulated accident doses are based on the conservative assumptions and methodologies in NUREGs 0578, 0737 and 0588.

b) Section 4.4 of the LRA, page 4.4-2, states that the Turkey Point Environmental Qualification Program includes three main elements. The third element includes preventive maintenance processes (for replacing parts and components at specified intervals), design control processes (ensuring changes to the plant are evaluated for impact to the EQ Program), procurement processes (ensuring new and replacement components are purchased to applicable environmental qualification requirements), and corrective action processes in accordance with the FPL Quality Assurance Program. As part of the design control aspect of the EQ Program, any plant modification that could affect the qualification of a component in the program is addressed and resolved in the modification package. Similarly for events, the effect on the qualification is addressed and resolved by the corrective action process. These controls assure any environmental changes occurring due to plant modifications and events are properly dispositioned for the remainder of the current license and throughout the renewal period.

Subsection 4.4.1, page 4.4-3 of the LRA, also identifies the equipment that had enough conservatism in the equipment qualification analyses to absorb the environmental changes that occur due to the decision to apply for a renewed license. However, as indicated in the LRA Section 4.4, page 4.4-2, 10 CFR 50.49 requires environmentally qualified components to be refurbished, replaced, or have their qualification extended, prior to reaching their aging limits established in the Turkey Point EQ Program aging evaluations. Therefore, although the preferred method is to demonstrate that there is enough conservatism in the EQ analyses to absorb environmental changes occurring due to plant modifications and events, there are other options available (e.g., replacement). As described in Subsection 3.2.6 of Appendix B of the Turkey Point LRA, page B-52, the EQ Program will be maintained through the extended period of operation.

c) Subsection 4.4.1 of the LRA, page 4.4-3, states that the temperature and radiation values used for service conditions in the environmental qualification analyses are the maximum design operating values for Turkey Point. With regard to radiation, equipment qualification is based on area radiation dose rate values for continuous operation with 1% failed fuel. This is conservative because Turkey Point has never operated with more than 0.1% fuel clad leaks, and has had a number of fuel cycles with no fuel clad leaks. The maximum, continuous containment temperature of 120°F is a Technical Specification limit at Turkey Point. Containment temperature is continuously monitored by three temperature monitors at the

58 foot elevation of containment. Adverse changes to the containment temperature would be detected by plant personnel and corrected under FPL's Corrective Action program. Since the qualified life calculations take into account increases in temperature due to self-heating and are done at a continuous temperature 2°F higher than the maximum continuous temperature allowed by the Technical Specifications, these temperature monitors ensure that the qualified life of EQ equipment inside containment will not be exceeded.

For the balance of the plant, operator walkdowns as part of their daily rounds, Health Physics radiation monitoring, and maintenance and system engineering personnel provide feedback to engineering through FPL's Corrective Action program when changes to the plant environment or EQ equipment are encountered. Since maximum design temperatures were used as normal continuous temperatures in the Arrhenius aging calculations, changes to temperature, which would affect the qualified life of the equipment, will be significant enough to be readily identified. The same is true for the normal 40-year radiation doses. The total integrated radiation doses for EQ equipment are primarily due to doses following a postulated design basis accident. Therefore, changes to normal operating dose rates that would affect the qualification of EQ equipment would have to be so significant that they would be readily identified. An example of this was the inside containment radiation dose. After multiplying the 40-year normal dose by 1.5 to obtain the 60-year normal dose and adding it to the design basis accident dose, the original 40-year, rounded off, total integrated dose was not exceeded.

Based on the original Turkey Point cable routing design, plant specific operating experience, and periodic walkdowns that have been performed, there are no adverse localized environments caused by heat or radiation present in areas where EQ equipment are located.

RAI 4.4.1-3:

In Section 4.4.1 of the LRA, the applicant stated that for conservatism, a temperature rise of 10°C was added to the maximum operating temperature for continuous duty power cables to account for ohmic heating. Provide basis for a temperature rise of 10°C.

FPL RESPONSE:

As indicated in the summary of the October 31, 2000 meeting between the NRC and FPL to discuss TLAAs related to EQ equipment, there are no continuously energized power cables in the EQ Program at Turkey Point. However, the 10°C rise is applied to all power cables continuously for the 60-year life to account for the affects of ohmic heating.

The 10°C rise is conservative based on the maximum cable temperature rise of 3.2°C for the 4160 VAC EQ motors (Safety Injection and Residual Heat Removal pumps). Additional screenings of cable temperature rise for the 480 VAC EQ motors inside and outside containment (Emergency Containment Filters, Emergency Containment Coolers, and Containment Spray pumps) were performed. For the Emergency Containment Cooler and Filter Motor cable inside containment, the temperature rises are 13.31°C and 9.72°C respectively over the 50°C ambient. For the Emergency Containment Cooler, Filter, and Containment Spray Pump Motor cable outside containment, the temperature rises are 22.89°C, 9.39°C and 18.63°C respectively over a 40°C ambient. Although the actual temperature rises are greater than the 10°C continuous temperature rise assumption, when actual operating times of the Emergency Containment Cooler and Containment Spray Pump Motors are considered (0.25 and 0.3 years respectively over a 60 year period), the 10°C continuous temperature rise assumption is over three times as harsh for both inside and outside containment. Therefore, the 10°C rise applied continuously for 60 years is a conservative value to use for ohmic heating.

RAI Appendix B-3.2.6-1:

In Section 3.2.6 of Appendix B, under Operating Experience and Demonstration, the applicant stated that the program provides assurance that the environments to which installed devices are exposed will not exceed the qualified lives associated with the devices. This is accomplished through effective monitoring of key parameters (temperature, radiation) at established frequencies with well-defined acceptance criteria.

Please provide a summary description of how key parameters (temperature and radiation) were monitored, including the instrumentation and procedures used to obtain the temperature and radiation data, measurement locations, the frequency of the measurements and the plant status during measurements. In the discussion, please address the measures taken to ensure that the temperature and radiation data obtained are representative of the service environment in which the equipment being evaluated are installed.

FPL RESPONSE:

As indicated in the response to RAI 4.4.1-2 c) and Subsection 4.4.1, page 4.4-3 of the Turkey Point LRA, the temperature and radiation values used for service conditions in the environmental qualification analyses are the maximum design operating values for Turkey Point. Containment temperature is monitored continuously by three temperature monitors at the 58 foot elevation of the containment to meet Technical Specification 3/4.6.1.5 (120°F). These values are recorded and logged shiftly under all plant conditions by control room personnel. To ensure monitored temperatures are bounding for the service environment of EQ equipment, the monitors are located at the highest level of EQ equipment inside containment. Since the qualified life calculations take into account increases in temperature due to self-heating and are done at a continuous temperature 2°F higher than the maximum continuous temperature allowed by the Technical Specifications, these monitors ensure that the qualified life of EQ equipment inside containment will not be exceeded.

Outside containment, the qualified life calculations are based on a continuous, maximum design temperature of 104°F. The only defined harsh temperature areas in the EQ Program outside of containment are located in outdoor areas (e.g., Main Steam Platforms). Outside containment equipment on the EQ List that is located in the Auxiliary Building is only required to be qualified for harsh radiation environments. Per Table 2.6-1 in the Turkey Point UFSAR, the actual average yearly temperature is between 74°F and 76.2°F. This 28°F (15°C) difference in temperature indicates that the qualified life based on actual average temperature is more than double the life used by the Turkey Point analyses. As indicated in the response to RAI 4.4.1-2 c), operator walkdowns as part of their daily rounds, Health Physics radiation monitoring, and maintenance and system engineering personnel provide feedback to engineering through FPL's Corrective Action program when changes to the plant environment or EQ equipment are encountered. As a result of the significant difference between the average temperature and the temperature used for qualified life calculations, any change in temperature that could adversely affect qualification would be readily identified. The same applies for radiation. The dose calculations assume over 10 times the fuel leakage that has ever been experienced at Turkey Point. Turkey Point plant procedures govern the frequency of surveillances, radiation surveys, and plant walkdowns. The frequencies range from shiftly to annual surveys, and these activities are performed during all modes of plant operation.

Containment temperature and radiation are logged at least daily, and all other EQ areas have operator walkdowns as part of their rounds at least daily while the plant is operating. The temperature and radiation data obtained is representative of the service conditions of EQ equipment and any change in temperature or radiation that could adversely affect qualification would be readily identified.

RAI Appendix B-3.2.6-2:

In Section 3.2.6, under Acceptance Criteria, you have stated that the program requires replacement, refurbishment, or requalification prior to exceeding the life limit (qualified life) of each installed device.

Please provide additional information on what procedures and controls will be used to ensure that the qualification status of the equipment is preserved when replacement and refurbishment are used.

FPL RESPONSE:

LRA Section 4.4, pages 4.4-1 and 4.4-2, states that the Environmental Qualification Program established a qualified life for the equipment within the scope as defined by 10 CFR 50.49. Once the equipment reaches the end of its qualified life the only acceptable corrective actions are replacement, refurbishment, or requalification. Turkey Point EQ Program and the procedures and administrative controls related to the Turkey Point EQ Program are implemented in accordance with the requirements of Appendix B to 10 CFR 50 and will continue to be adequate for the period of extended operation. Replacement and refurbishment of EQ components is a part of the EQ Program and its procedures.

The EQ Program relies on specific equipment configurations, operational limitations, and bounding environmental limits. This program requires specific preventive or corrective actions to address the effects of aging (e.g., periodic part replacement) and restoration of configurations and conditions. This program also requires appropriate verification of these actions (e.g., documented completion of required maintenance activities). The documentation required by the EQ Program, including the TLAAs, for each qualified component is maintained in an auditable form in accordance with the FPL Quality Assurance Program.

Turkey Point maintenance and administrative procedures provide specific directions to maintenance personnel on what equipment to replace, when the equipment needs replacing, how to replace such equipment, and what post maintenance testing needs to be performed to demonstrate that the item has been replaced correctly. Such procedures also provide forms required to document that the required maintenance actions have been completed, and such forms are maintained as Quality Assurance Program records.

RAI 3.7.1-1:

In Sections 3.7.1.1.3, 3.7.1.1.4, and 3.7.1.1.5 of the LRA evaluate the aging effects applicable for electrical components that can be expected to occur due to: (1) moisture-produced water trees, (2) radiation, and (3) heat, depending on environmental conditions. Further, the LRA states that water trees occur when the insulating materials are exposed to long term continuous electrical stress and moisture. These trees eventually result in breakdown of the dielectric materials and ultimate failure. However, the LRA concludes that because Turkey Point uses lead sheath cable to prevent effects of moisture on the cables, there are no requirement[s] for aging management program for medium voltage cable and connections. The LRA also concludes that because the maximum operating doses to insulation material will not exceed the moderate damage dose and because the maximum operating temperature of insulation material will not exceed the maximum temperature for 60-year life, no aging management are required for heat or radiation effects.

Most electrical cables in nuclear power plant[s] are located in dry environments. However, some cables may be exposed to condensation and wetting in inaccessible locations, such as conduits, cables trenches, cable troughs, duct banks, underground vaults or direct buried installations. When energized cable not specifically designed for submergence is exposed to these conditions, water treeing or a decrease in dielectric strength of the conductor insulation can occur. This can potentially lead to electrical failure. The radiation levels most equipment experience during normal service have little degrading effect on most insulation materials. Design-basis calculations or evaluation determine or bound the expected radiation doses for all plant areas. These evaluations usually account for additional doses seen in these areas during to infrequent operations. However, some localized areas may experience higher than expected radiation condition. Typical areas prone to elevated radiation levels include areas near primary reactor-coolant system piping or the reactor-pressure vessel, areas near waste processing systems and equipment, and areas subject to radiation streaming. The most common adverse localized equipment environments are those created by elevated temperature. Elevated temperature can cause equipment to age prematurely, particularly equipment containing organic materials and lubricants. The effects of elevated temperature can be quite dramatic.

Therefore, for non-EQ cables, connections (connectors, splices, and terminal blocks), and electrical/I&C penetration insulation within the scope of license renewal located in the turbine building, intake structure, main steam and feedwater platforms, yard structures, containment, diesel generator building, and the auxiliary building, provide a description of the following:

- An aging management program for accessible and inaccessible electrical cables, connections, and electrical/I&C penetration insulation exposed to an adverse localized environmental caused by heat or radiation.

- An aging management program for accessible and inaccessible electrical cables used in instrumentation circuits that are sensitive to reduction in conductor insulation resistance exposed to an adverse localized environment caused by heat or radiation.

- An aging management program for accessible and inaccessible medium-voltage (2kV to 15kV) cables (e.g., installed in conduit or directly buried) exposed to an adverse localized environmental caused by moisture-produced water trees and voltage stress.

FPL RESPONSE:

BULLET POINTS 1 & 2

As indicated in Subsection 3.7.2.2 of the LRA, page 3.7-8, FPL performed an extensive review of Turkey Point plant operating experience associated with cables, connections (connectors, splices, and terminal blocks), and electrical/I&C penetrations, in part to determine the existence of adverse localized environments. This review did not identify any adverse localized environments caused by heat or radiation that might be detrimental to cables, connections, and penetrations. Occurrences of degraded cable are identified and dispositioned routinely through the Corrective Action and maintenance programs.

In addition, FPL personnel performed walkdowns of accessible non-EQ cables, connections, and penetrations within the scope of license renewal and found no adverse localized environments caused by heat or radiation.

The potential sources of adverse localized heat environments at Turkey Point are from high temperature Reactor Coolant, Main Steam, Feedwater and Blowdown System piping and components. Most areas of the Turkey Point Plant are not likely to have adverse localized heat environments because of the following:

1. The Intake Structure, Main Steam and Feedwater Platforms, and Yard Structures are outdoor areas where cable, connections, and penetrations are not subject to adverse localized temperature and radiation effects.

2. The Turbine Building is an outdoor area with no external walls or roof.

3. The Auxiliary Building does not contain any high temperature Reactor Coolant, Main Steam, or Feedwater and Blowdown System piping and components.

With regard to radiation, the only buildings with any appreciable radiation levels are the Containments and the Auxiliary Building.

As stated in Subsections 3.7.1.1.4 and 3.7.1.1.5, page 3.7-5, summarized in Tables 3.7-3 and 3.7-4, pages 3.7-13 and 3.7-14, of the Turkey Point LRA, the evaluation of non-EQ cables, connections, and penetrations determined that each cable/ connection/penetration type was capable of performing its function for the entire plant life, including the renewal term. The evaluation was based on the very conservative assumption that non-EQ cables, connections, and penetrations were subjected to continuous maximum design plant temperature and radiation levels. These temperature and radiation levels have been compared to the temperature and radiation levels each cable/connection/ penetration type is capable of withstanding for a 60-year life. All in scope cable/connection/penetration types are capable of withstanding the design temperature and radiation levels to which they will be exposed in the plant for the full 60-year period.

Inside containment, as indicated in the response to RAI 4.4.1-2 c), the containment temperature is monitored continuously by three temperature monitors at the 58 foot elevation of the containment to meet Technical Specification 3/4.6.1.5 (120°F). These values are recorded under all plant conditions in the control room. To ensure that the temperatures are bounding for the service environment, the monitors are located at the highest level of electrical equipment inside containment that is within the scope of license renewal. Note that all cable, connection, and penetration insulation materials that are located within the Containment Buildings are the same as cable, connection, and penetration insulation materials already included in the EQ Program at Turkey Point.

As indicated in the response to RAI 4.4.1-2 c), operator walkdowns as part of their daily rounds, Health Physics radiation monitoring, and the maintenance and system engineering personnel provide feedback to engineering through FPL's Corrective Action program when changes to the plant environment are encountered. Any change in temperature that could adversely affect non-EQ cables, connections, and penetrations would readily be noticed. The same situation would apply for radiation. The normal 40-year radiation doses are based on the assumption of operation with 1% failed fuel. This is conservative because Turkey Point has never operated with more than 0.1% fuel clad leaks, and has had a number of fuel cycles with no fuel clad leaks. Therefore, changes to the normal operation dose that would affect the life of equipment would have to be so significant that they would be readily identified. Turkey Point plant procedures govern the frequency of surveillances, radiation surveys, and plant walkdowns. The frequencies range from shiftly to per cycle surveys, and these activities are performed during all modes of plant operation.

In addition, the 60-year life maximum temperature and radiation values for non-EQ cables, connections, and penetration insulation materials are also conservative. The typical "endpoint" for cable thermal aging data is 40% to 60% retention-of-elongation. Research funded by the NRC and published in NUREG/CR-6384 determined that the retention-of-elongation of most cable insulation materials can be reduced to 0% and the insulation will still be capable of withstanding a loss-of-coolant accident (LOCA) and remain functional. As the insulated cables, connections, and penetrations subject to an AMR will either not be subjected to an accident environment or are not required to function after being subjected to an accident environment, the endpoints chosen for this review are extremely conservative. The insulated cable, connection, and penetration materials could be aged a great deal more, possibly to the point where retention-of-elongation reaches 0%, without loss of intended function.

Preliminary results of the environmental qualification research on low-voltage electrical cables were presented by Brookhaven National Laboratories at an NRC public meeting on March 19, 1999. As added indication that there is margin in the thermal aging, preliminary conclusions from LOCA tests 1, 2, and 3 of the NRC research program indicate that, "Electric cables with insulation EAB (elongation-at-break) values as low as 5% performed acceptably under accident conditions."

Therefore, the useable 60-year life temperature for a typical cable insulation is significantly higher than the values shown in Table 3.7-4 of the Turkey Point LRA.

Table 3.7-3 of the Turkey Point LRA shows that the radiation values that non-EQ cable, connection, and penetration insulation material can withstand is much greater than the actual design value for 60-year life of the plant.

Based on the original Turkey Point cable routing design, plant specific operating experience, and periodic walkdowns that have been performed, there are no adverse localized environments caused by heat or radiation present in areas where non-EQ cables, connections, and penetrations are located.

Due to the absence of adverse localized environments caused by heat or radiation in areas where, non-EQ cables, connections, and penetrations are present, inspection of these non-EQ cables, connections, and penetrations would be of little value, since temperature and radiation levels are not high enough to be of concern. However, based on discussions with the NRC Staff and in order to provide reasonable assurance that the intended functions of non-EQ cables, connections, and penetrations exposed to postulated adverse localized equipment environments caused by heat or radiation will be maintained consistent with the current licensing basis through the period of extended operation, FPL proposes an aging management program for non-EQ cables, connections, and penetrations in the Containments at Turkey Point. The non-EQ cables, connections and penetrations managed by this program include those used for power and instrumentation and control that are within the scope of license renewal. The program attributes are discussed below.

Scope -

This inspection program includes accessible non-EQ cables, connections and penetrations within the scope of license renewal in the Containment structures at Turkey Point that are installed in adverse localized environments caused by heat or radiation in the presence of oxygen. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service condition for the electrical cable, connection, or penetration.

Preventive Actions -

No actions are taken as part of this program to prevent or mitigate aging degradation.

Parameters Monitored or Inspected -
Accessible non-EQ cables, connections and penetrations within the scope of license renewal in the Containment structures installed in adverse localized environments are visually inspected for cable and connection jacket surface anomalies such as embrittlement, discoloration, cracking or surface contamination.

Detection of Aging Effects -
Cable and connection jacket surface anomalies are precursor indications of conductor insulation aging degradation from heat or radiation in the presence of oxygen and may indicate the existence of an adverse localized equipment environment. An adverse localized environment is a condition in a limited plant area that is significantly more severe than the specified service condition for the electrical cable, connection, or penetration. Accessible non-EQ cables, connections and penetrations within the scope of license renewal in the Containment structures installed in adverse localized environments are visually inspected at least once every 10 years, which is an adequate period to preclude failures of the conductor insulation. The first inspection will be performed before the end of the initial 40-year license term. EPRI TR-109619, *Guideline for the Management of Adverse Localized Equipment Environments*, will be used as guidance in performing the inspections.

Monitoring and Trending -
Trending actions are not included as part of this program because the ability to trend inspection results is limited.

Acceptance Criteria -
No unacceptable visual indications of cable and connection jacket surface anomalies, which suggest that conductor insulation degradation exists, as determined by engineering evaluation. An unacceptable indication is defined as a noted condition or situation that, if left unmanaged, could lead to a loss of the intended function.

Corrective Actions -
Further investigation is performed through the corrective action program on non-EQ cables, connections and penetrations when the acceptance criteria are not met in order to ensure that the intended functions will be maintained consistent with the current licensing basis. Corrective actions may include, but are not limited to, testing, shielding or otherwise changing the environment,

relocation or replacement of the affected cable, connection, or penetration. Corrective actions implemented as part of the corrective action program are performed in accordance with FPL's 10 CFR 50, Appendix B Quality Assurance Program.

Confirmation Process -
The confirmation process implemented as part of the corrective action program is performed in accordance with FPL's 10 CFR 50, Appendix B Quality Assurance Program.

Administrative Controls -
Administrative controls associated with this program will be performed in accordance with FPL's 10 CFR 50, Appendix B Quality Assurance Program.

Operating Experience -
Operating experience has not identified the presence of adverse localized heat and radiation environments in the Containments at Turkey Point. However, operating experience identified by NRC in the draft GALL Report has shown that adverse localized environments caused by heat or radiation for electrical cables and connections may exist next to or above (within three feet of) steam generators, pressurizers or hot process pipes such as feedwater lines.

The program described above for the Turkey Point Containments is consistent with the program accepted by the NRC in the draft GALL Report. Accordingly, this program is an acceptable aging management program for non-EQ cables, connections and penetrations within the scope of license renewal exposed to adverse localized equipment environments due to heat and radiation in the Turkey Point Containments. This program will be added to the Turkey Point License Renewal Application.

BULLET POINT 3

Subsection 3.7.1.1.3, page 3.7-4, of the Turkey Point LRA states that the Turkey Point medium voltage applications (4.16kV) uses lead sheath cable to prevent effects of moisture on the cables. This cable is designed with a thick layer of lead over the cable insulation with an overall jacket over the lead and insulation. This differs from the typical medium voltage cable design of insulation with an overall jacket. FPL uses lead sheath cables as a standard for medium voltage applications because of its good characteristics in moisture environments. The FPL cable specification and ICEA Publication S-68-516-1984 for lead sheath power cables states that lead sheath cables are designed to be installed in wet environments for extended periods. In addition, the cable manufacturer specification for lead sheath cables states that "...EPR/lead sheath cable is designed for applications in which liquid contamination is present and reliability is paramount. The sheath combined with the overall jacket provides a virtually impenetrable barrier against hostile environments - liquids, fire hydrocarbons, acids, caustic, sewage, etc." As an additional level of protection, Turkey Point underground medium voltage cables are only routed in concrete encased duct banks.

The effects of moisture-produced water treeing on medium-voltage cable were examined in Section 4.1.2.5 of the DOE Cable AMG. Water trees occur when the insulating materials are exposed to long-term, continuous electrical stress and moisture; these trees eventually result in breakdown of the dielectric and ultimate failure. The growth and propagation of water trees is somewhat unpredictable and few occurrences have been noted for cables operated below 15kV. Water treeing is a degradation and long-term failure phenomenon that is documented for medium-voltage electrical cable with XLPE or high molecular weight polyethylene (HMWPE) insulation. In addition, Section 4.1.2.5 of the DOE Cable AMG states: "Jackets and semiconductor shields may substantially reduce the ingress of moisture and ion migration, thereby, reducing the rate of tree formation and propagation".

Industry experience shows no failures of the medium voltage lead sheath cable under various environments including moisture. Turkey Point does not use XLPE or HMWPE insulated cables in medium-voltage applications (4.16kV). FPL performed an extensive review of Turkey Point plant operating experience and found no cases of medium voltage cable failures due to adverse localized environments.

Therefore, based on the above, an aging management program for accessible and inaccessible medium-voltage cable to address adverse localized environments caused by moisture-produced water trees and voltage stress is not required.