November 3, 2009

Mr. Jon Franke, Vice President
Crystal River Nuclear Plant (NA1B)
ATTN: Supervisor, Licensing & Regulatory
Programs
15760 W. Power Line Street
Crystal River, FL 34428-6708

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE CRYSTAL RIVER, UNIT 3, NUCLEAR GENERATING PLANT, LICENSE RENEWAL APPLICATION (TAC NO. ME0274)

Dear Mr. Franke:

By letter dated December 16, 2008, Florida Power Corporation submitted an application pursuant to Title 10 of the *Code of Federal Regulations* Part 54, to renew the operating license for Crystal River, Unit 3, Nuclear Generating Plant, for review by the U.S. Nuclear Regulatory Commission (the staff). The staff is reviewing 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 Mr. Michael Heath, 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 301-415-3733 or by e-mail at Robert.Kuntz@nrc.gov.

Sincerely,

/RA/

Robert F. Kuntz, Sr. Project Manager
Projects Branch 2
Division of License Renewal
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure:
As stated

cc w/encl: See next page

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NAME		RKuntz	DWrona	RKuntz (Signature)
DATE	10/ /09	10/30/09	11/03/09	11/03/09

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Letter to Jon Franke from Robert F. Kuntz dated November 3, 2009

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION FOR THE REVIEW OF THE CRYSTAL RIVER, UNIT 3, NUCLEAR GENERATING PLANT, LICENSE RENEWAL APPLICATION (TAC NO. ME0274)

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REQUEST FOR ADDITIONAL INFORMATION
CRYSTAL RIVER, UNIT 3, NUCLEAR GENERATING PLANT
LICENSE RENEWAL APPLICATION

RAI 3.5.2.1-1

Background

The Generic Aging Lessons Learned (GALL) Report assigns several aging effects to concrete in various environments, but makes no mention of the aging effect “change in material properties.”

Issue

License renewal application (LRA) Section 3.5 lists the aging effect “change in material properties” for multiple concrete line items which reference license renewal Generic Note A.

Request

1. Explain what the aging effect “change in material properties” includes and how the aging effect is managed.
2. Explain which GALL recommended aging effects are covered by the aging effect “change in material properties” and how the LRA aging effect is equivalent to the GALL Report recommended aging effects which it replaces.

RAI 3.5.2.2-1

Background

Standard Review Plan for License Renewal Applications of Nuclear Power Plants (SRP-LR) Section 3.5.3.2.1.1 discusses the evaluation of the acceptability of inaccessible areas of concrete containments when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas.

Issue

LRA Section 3.5.2.2.1.1 does not discuss the evaluation of the acceptability of inaccessible areas of concrete containments when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas for inaccessible concrete areas of the Reactor Building structure.

Request

Explain which aging management program (AMP) addresses the evaluation of the acceptability of inaccessible areas of concrete containments when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas and how it is being fulfilled.

ENCLOSURE

RAI 3.5.2.2.1.2-1

Background

SRP-LR Section 3.5.2.2.1.2 recommends that cracks and distortion due to increased stress levels from settlement could occur in concrete and steel containments. Also, reduction of foundation strength, cracking, and differential settlement due to erosion of porous concrete subfoundations could occur in all types of containments. SRP-LR Section 3.5.2.2.1.2 also states that no further evaluation is necessary if this activity is within the scope of the applicant's structures monitoring program.

Issue

LRA Section 3.5.2.2.1.2 states that the aging effects caused by settlement are managed by the Structures Monitoring Program. Reactor Building settlement analysis determined the upper limit settlement of about 0.875 in., and most of it would have occurred during construction. The LRA Section 3.5.2.2.1.2 also states that no cracking due to settlement has been observed. However, the procedure and criteria for settlement monitoring are not stated in the LRA.

Request:

1. Describe the procedure for monitoring settlement under the Structures Monitoring Program.
2. What inspection criteria are (or were) selected to identify if the cracking or other aging effect (if any) in concrete and steel components of the Crystal River, Unit 3, Nuclear Generating Plant (CR-3) containment were due to increased stress levels from settlement.

RAI 3.5.2.2.1.4-1

Background

GALL Report Item II.A1-11 states that corrosion is not significant for inaccessible areas of steel containments (embedded containment steel shell or liner) if four conditions are satisfied. One of the conditions is the concrete is monitored to ensure that it is free of penetrating cracks that provide a path for water seepage to the surface of the containment shell or liner.

Issue

LRA Section 3.5.2.2.1.4 does not discuss whether or not the concrete is monitored for penetrating cracks.

Request

1. Explain if the concrete is monitored for penetrating cracks, and if so which program monitors the program.
2. Discuss plant-specific operating experience with cracks in the concrete covering the inaccessible areas of the containment liner.
3. If no program exists to monitor the concrete, please provide the further evaluation of this aging effect, as recommended by the GALL Report and SRP-LR Section 3.5.2.2.1.4.

RAI 3.5.2.2.2.1-1

Background

SRP-LR Section 3.5.2.2.2.1 recommends that lock-up due to wear could occur for Lubrite® radial beam seats in boiling-water reactor drywell, reactor pressure vessel support shoes for pressurized water reactor with nozzle supports, steam generator supports, and other sliding support bearings and sliding support surfaces. The existing program relies on the Structures Monitoring Program or American Society of Mechanical Engineers (ASME) Section XI, Subsection IWF Program to manage this aging effect. The GALL Report recommends further evaluation only for structure/aging effect combinations that are not within the ASME Section XI, Subsection IWF Program or the Structures Monitoring Program.

Issue:

LRA Section 3.5.2.2.2.1 states that lock-up due to wear is not applicable because CR-3 does not utilize Lubrite® in these applications. However, the LRA has included lock-up as an aging effect in AMR Table 3.5.2-1 with a plant-specific note 510. According to the plant-specific note 510, the same aging effect used in the GALL Report, Items III.A4-6, for Lubrite® plates (lock-up) is assigned to Fluorogold slide bearing plates used for structural steel supports. In addition, CR-3 determined change in material properties due to radiation is an applicable aging effect. The Structures Monitoring Program is credited for inspecting the sliding bearing plates which includes the Fluorogold plates.

LRA Section 3.5.2.2.2.1 does not include lock-up due to wear for the sliding bearing plates including the Fluorogold plates which have been used in CR-3 for the same application as Lubrite® plates.

Request

1. Discuss how the aging management of Lubrite® plates is applicable to Fluorogold plates and any other sliding bearing plates used in CR-3. Also describe what inspection criteria are (or will be) followed for identification of change of material properties of these plates due to radiation. Indicate if any other aging effect is applicable to the sliding bearing plates including the Fluorogold plates.
2. Describe how the criteria of the SRP-LR Section 3.5.2.2.2.1 on lock-up due to wear have been met, and no further evaluation is required.
3. Discuss accumulation of debris which may resist sliding.

RAI 3.5.2.2.2.1-2

Background

SRP-LR Section 3.5.2.2.2.1 and GALL Report Generic Item T-03 recommend the Structures Monitoring Program to manage cracking due to expansion and reaction with aggregates in accessible concrete areas regardless of how the concrete was constructed or how the aggregates were tested.

Issue

LRA Section 3.5.2.2.2.1 states that the aging effect is not applicable because of the tests done on the aggregates and the method of construction.

Request

Explain why the Structures Monitoring Program does not inspect accessible concrete for the aging effect of cracking due to expansion and reaction with aggregates, when the GALL Report recommends inspections of accessible areas regardless of the construction and testing methods.

RAI 3.5.2.2.2.2-1

Background

The GALL Report states that aging management is not necessary for inaccessible concrete cracking due to expansion and reaction with aggregate if ASTM C227 or C295 were used to demonstrate that the aggregates do not react within the concrete.

Issue

The LRA states that the aggregates were tested in accordance with ASTM C227; however, the staff was unable to verify this in the Final Safety Analysis Report (FSAR).

Request

Provide documentation showing the aggregates are not reactive in accordance with ASTM C227 or C295, or explain how the standards documented in the FSAR meet or exceed the requirements of ASTM C227 or C295.

RAI 3.5.2.2.2.2-2

Background

The GALL Report states that aging management is not necessary for increase in porosity and permeability and loss of strength due to leaching in inaccessible concrete if the concrete was constructed in accordance with the recommendations in ACI 201.2R-77. However, further evaluation is necessary if the concrete is not constructed in accordance with the recommendations in ACI 201.2R-77.

Issue

The LRA states that CR-3 concrete was constructed in accordance with ACI 301-66, which provides guidance similar to the recommendations in ACI 201.2R-77.

Request

Clearly explain how ACI 301-66 meets the intent of ACI 201.2R-77. Include important concrete design parameters (e.g. water-cement ratio, air entrainment, etc.) which demonstrate CR-3 concrete meets the recommendations in ACI 201.2R-77.

RAI 3.5.2.2.2.2-3

Background

SRP-LR Sections 3.5.2.2.2.2.4 and 3.5.2.2.2.4.1 recommend further evaluation and a plant-specific AMP for concrete structural elements exposed to aggressive groundwater.

Issue

LRA Plant-Specific Note 543 states that the seawater at CR-3 is aggressive and that the Structures Monitoring Program will be used to manage the aging effects of the concrete exposed to seawater.

Request

1. Explain why the Structures Monitoring Program, including existing inspection methods and frequencies is adequate to manage the aging effects of concrete exposed to an aggressive seawater environment and why a plant-specific AMP is not necessary. Provide any further evaluation that was performed to support this conclusion.
2. Explain how an aggressive seawater environment affects the necessary aging management of inaccessible areas of Groups 1-3, 5, and 7-9 structures and Group 6 structures as discussed in LRA Sections 3.5.2.2.2.2.4 and 3.5.2.2.2.4.1, respectively.

RAI 3.5.2.3-1

Background

Several Table 2's in LRA Section 3.5 list the aging effect and AMP as none for carbon steel, stainless steel and galvanized steel anchorage and embedment component groups embedded in concrete. The plant-specific note also compares the line items to mechanical piping components in the GALL Report with no aging effect listed for carbon and stainless embedded in concrete.

Issue

The components under consideration occur throughout the plant, including areas where moisture may be present in the concrete. The GALL Report for items in which moist concrete may occur identifies an aging effect of cracking, loss of bond, and loss of material (spalling, scaling)/corrosion of embedded steel managed by the Structures Monitoring Program (e.g. generic item T-05).

Request

Explain the evaluation which concluded these items could be compared to mechanical piping systems with no aging effects, as opposed to steel and concrete in an environment that may be wet and require aging management. Include a discussion of the environments the surrounding concrete is exposed to (i.e. seawater, aggressive groundwater, contaminants, etc.).

RAI 3.5.2.3-2

Background

Under item III.A6-9 (T-22), the GALL Report specifies an aging effect requiring management (AEM) as loss of material, loss of form/erosion, settlement, frost action, waves, currents, surface runoff, and seepage for earth in flowing and standing water.

Issue

In LRA Table 3.5.2-7, CR-3 has specified only loss of material and loss of form of earth in raw water (sea water) environment. The AEM erosion, settlement, frost action, waves, currents, surface runoff, and seepage are not listed.

Request

Provide justification for not addressing the AEM erosion, settlement, frost action, waves, currents, surface runoff, and seepage. If it is an oversight, describe how these aging effects will be managed by the Structures Monitoring Program so that the structures will perform the intended functions and maintained consistent with the current licensing basis (CLB) during the period of extended operation.

RAI 3.5.2.3-3

Background

In LRA Table 3.5.2–12, CR-3 has credited the Structures Monitoring Program for managing the aging effect of loss of material of carbon steel and stainless steel in treated water. Also the applicant has added plant-specific notes 546 and 527. Note 546 states that the CR-3 aging management review (AMR) methodology concluded that carbon steel in a treated water environment has loss of material as aging effect. Note 527 states that the CR-3 methodology concluded that stainless steel conduits and support steel located in the dedicated EFW Tank Enclosure Building northwest corner recessed area (similar to a sump) will have the aging effect of loss of material. Also these two line items are assigned with general note G which represents environment not in the GALL Report for this component and material.

For similar material/environment/aging effect combinations involving stainless steel and steel, treated water, and loss of material, the GALL Report, Item VII.E3.15 (A-58), and VII.E3-18 (A-35) recommends the aging management program described in GALL Report Section XI.M2, "Water Chemistry." Also the GALL Report recommends that the AMP is to be augmented by verifying the effectiveness of water chemistry control. An acceptable verification program is recommended in the GALL Report Chapter XI.M32, "One-Time Inspection."

Issue

In LRA Table 3.5.2-12, CR-3 has credited the Structures Monitoring Program for managing the aging effect of loss of material of carbon steel in treated water. However, for similar material/environment/aging effect combinations the GALL Report recommends XI.M2, "Water Chemistry", and XI.M32, "One-Time Inspection."

Request

Describe how the Structures Monitoring Program will monitor and manage the aging of stainless steel and steel in treated water environment.

RAI 3.5.2.3-4

Background

In LRA Table 3.5.2-2, CR-3 states that no AEM and therefore no AMP is required for copper components in an environment including borated water leakage. The LRA includes plant-specific note 525 with this AMR line item. Note 525 states that the CR-3 AMR methodology concluded that copper materials in air-indoor or borated water leakage environments have no aging effect. This applies only to straps for copper tubing. Also a Generic Note J is assigned to this line item which represents that neither the component nor the material and environment combination is evaluated in the GALL Report.

For similar material/environment/aging effect items, the GALL Report (Item V.E-11 (EP-38)) recommends the Boric Acid Corrosion Program for managing the aging effect of loss of material for copper alloy components in air with borated water leakage.

Issue:

In LRA Table 3.5.2-2, CR-3 identifies an AEM of none and therefore no AMP required for copper components in an environment of borated water leakage. The GALL Report identifies loss of material as an aging effect of concern for copper components in an environment including borated water leakage with the Boric Acid Corrosion recommended to manage the aging effect of concern.

Request

Justify why loss of material is not an aging effect of concern for copper components in an environment that includes borated water leakage.

RAI 3.5.2.3-5

Background:

The GALL Report identifies aging effects of cracking, loss of bond, and loss of material (spalling, scaling)/corrosion for embedded steel components. In LRA Tables 3.5.2-1 to 3.5.2-19 the corresponding aging effect is described as change in material properties.

The GALL Report identifies aging effects of loss of sealing/deterioration of seals, gaskets, and moisture barriers (caulking, flushing, and other sealants). In LRA Tables 3.5.2-1 to 3.5.2-19 the corresponding aging effect is described as cracking in some places and change in material properties in other cases.

The GALL Report identifies aging effects of increase in porosity and permeability, cracking, loss of material (spalling, scaling)/aggressive chemical attack. In LRA Tables 3.5.2-1 to 3.5.2-19 corresponding aging effect is listed as loss of material.

Issue

The aging effects listed in the LRA tables do not appear to be consistent with the GALL Report, but Generic Note A has been assigned to these AMR items which represents that these lines are consistent with the GALL Report.

Request

Describe how all the various aging effects described above will be managed so that the structures will be able to perform their intended functions consistent with the CLB during the period of extended operation.

RAI 3.6-1

Background

In the discussion column in LRA Table 3.6.1, the LRA stated that the Metal-Enclosed Bus (MEB) Inspection Program is credited for the aging management of elastomer seals associated with MEB enclosure assemblies. The LRA further states that the MEB program will perform an internal inspection of the enclosure assembly for cracks, corrosion, foreign debris, excessive dust buildup, and evidence of moisture intrusion which may indicate degradation of the elastomer seal. The AMR results line that points to Table 3.6.1, Item 3.6.1-10 includes a reference to Note E.

The AMR result lines referenced to Note E means that the component type, material, environment, and aging effect are consistent with the corresponding line of the GALL Report; however, where the GALL Report recommends AMP XI.S6, “Structures Monitoring Program,” the LRA has proposed the Metal-Enclosed Bus Inspection Program. The LRA stated that it proposed to perform internal inspection of the enclosure assembly for foreign debris, excessive bus buildup, and evidence of moisture intrusion as an evidence of elastomer degradation. The applicant stated in LRA Section B.2.34 that the MEB program is consistent with GALL AMP

XI.E4 with no exception or enhancement. The staff audited this program and verified that it was consistent with GALL AMP XI.E4. The LRA did not discuss the inspection aspects of elastomers as an enhancement to MEB program. However, the LRA proposed to use the Metal Enclosed Bus Program to take credit for elastomer inspection.

Issue

Inspecting the internals of the MEB alone may not detect elastomer aging because elastomers may be installed outside between the transformer and bus duct. In addition, there is no direct relationship between moisture intrusion and degradation of the elastomer. Moisture intrusion or dust buildup may not mean that the elastomer is degraded. It could be from another source such as missing seal at the panel below or above the bus duct.

Request

Explain how the internal inspection of MEBs alone will detect elastomer degradation.

RAI 3.6-2

Background

In LRA Section 3.6.2.2.3, the LRA stated that loss of transmission conductor strength due to corrosion is an applicable aging effect but ample design margin ensures that it is not significant enough to cause a loss of intended function. The LRA stated that the National Electrical Safety Code (NESC) requires that tension on installed conductors be a maximum of 60% of the ultimate conductor strength. The NESC also sets the maximum tension a conductor must be designed to withstand under heavy load requirements, which includes consideration of ice, wind, and temperature. The LRA further stated that tests performed by Ontario Hydroelectric showed a 30% loss of composite conductor strength of an 80-year-old transmission conductor due to corrosion. The LRA used a typical 954 MCM ACSR transmission conductor in the switchyard to illustrate how the transmission conductor aging due to corrosion is insignificant. The LRA stated that the ultimate strength of a 954 MCM (24/7 strand) ACSR conductor is 33,500 lbs. and the maximum design tension for this conductor is 15,000 lbs. The LRA also stated that the margin between the maximum design tension and the ultimate strength is 18,500 lbs. The LRA further stated that there is a 55.2% ultimate strength margin. With the loss 30% conductor strength due to corrosion, the applicant stated that there would still 25.2% ultimate strength margin between what is required by the NESC and the actual conductor strength in an 80-year old conductor.

The staff reviewed the LRA calculation. The staff noted that a loss of conductor strength of 30% on 954 MCM ACSR transmission conductors would mean that the conductor strength would be 22,450 lbs. (33,500 lbs. x 0.7). The ratio between heavy loading and the ultimate conductor strength would be approximately 67% by the staff's calculation. The tension on an installed conductor may exceed the maximum of 60% the ultimate conductor strength of NESC.

Issue

The tension (heavy load) of a typical transmission conductor as illustrated by the LRA would exceed the NESC maximum requirement of 60% of the ultimate conductor strength during the period of extended operation.

Request:

Explain why loss of conductor strength due to corrosion is not a significant aging effect requiring management at CR-3 during the extended period of operation.

RAI 3.6-3

Background

In LRA, Table 3.6.2-1, under Non-EQ Electrical/I&C Penetration Assemblies, the LRA indicated that there is no aging effect which will require management for non-EQ electrical/I&C penetration assemblies (XLPO, SR, Kapton, CSPE, EPR, Kynar material) installed in an adverse localize environment caused by heat, radiation, or moisture. The LRA included Note J and plant-specific note 604. Plant-specific note 604 stated that evaluation has shown that the insulation materials for this commodity group are aptly suited for their service condition and acceptable for the period of extended operation.

Issue

Various organic polymers (etc., XLPO, SR, Kapton, CSPE, CSPE, EPR, Kynar) material used in Non-EQ electrical/I&C penetration assemblies could degrade in an adverse localized environment due to heat, radiation, or moisture. The LRA did not provide a technical justification to demonstrate that the insulation material of non-EQ electrical/I&C penetration assemblies are not subject to aging degradation.

Request

Explain why the insulation materials of non-EQ electrical/I&C penetration installed in adverse localized environment are not subject to aging effect requiring management.

RAI B.2.36-1

Background

GALL AMP XI.E6 under Program Description states that cable connections within the scope of license renewal should be tested to provide an indication of the integrity of the cable connections. GALL AMP XI.E6 uses a sampling method to select cable connections to be tested. Among the factors considered in connection selection are high, medium, and low voltages. GALL AMP XI.E6 Parameters Monitored/Inspected also references high, medium, and low voltages as being a factor considered in the sampling method. ISG LR-ISG-2007-02 removed high voltage connections from GALL AMP XI.E6.

Issue

The AMP B.2.36 program description states that the program does not include high-voltage (>35KV) switchyard connections. The second paragraph of the program description of AMP B.2.36 states that factors considered for sample selection are application (high, medium and low voltage). AMP B.2.36 does not take exception to GALL AMP XI.E6 with regard to voltage selection or reference ISG LR-ISG-2007-02.

Request

Reconcile the sample program voltage selection of AMP B2.36 and the AMP basis document, if required, consistent with GALL AMP XI.E6 or ISG LR-ISG-2007-02 with a documented basis as applicable.

RAI B.3.38-1

Background

The "Detection of Aging Effects" program element criterion in SRP-LR Appendix A.1.2.3.4 states that the parameters to be monitored or inspected should be appropriate to ensure that the structures and components intended function(s) will be adequately maintained for license renewal under all CLB design conditions. This includes aspects such as method or technique (e.g., visual, volumetric, surface inspection), frequency and timing of inspection to ensure timely detection of aging effects. In LRA Section B.3.38, under the same program element, the LRA states that the high-voltage insulators within the scope of this program are to be inspected at least once every four years. The first inspection for license renewal is to be completed prior to the period of extended operation.

Issue

The LRA's "Detection of Aging Effect" program element did not identify the method or technique of inspection. The appropriate method or technique should be identified to ensure that high-voltage insulators will perform their intended functions for license renewal under all CLB design conditions.

Request:

Identify the inspection technique for detecting degradation of insulator quality due to salt deposit.

RAI B.3.38-2

Background

The "Acceptance Criteria" program element criterion in SRP-LR Appendix A.1.2.3.6 states that the acceptance criteria for the program and its basis should be described. The acceptance criteria, against which the need for corrective actions will be evaluated, should ensure that the structure and component intended function(s) are maintained under all CLB design conditions

during the period of extended operation. In LRA Section B.3.38, under the same program element, the LRA states that inspection results are to be within the acceptance criteria to ensure component intended function(s) are maintained under all CLB design conditions during the period of extended operation. Acceptance criteria will be delineated in the applicable inspection procedure.

Issue

The LRA's "Acceptance Criteria" program element did not describe the acceptance criteria to ensure that insulator's function(s) are maintained under CLB design condition.

Request

Describe the acceptance criteria for inspecting surface contamination of high-voltage insulators due to salt deposit.

RAI B.3.38-3

Background

The "Detection of Aging Effects" program element criterion in SRP-LR Appendix A.1.2.3.4 states that the frequency (of inspection) should be linked to plant-specific operating experience.

On March 17, 1993, CR-3 experienced a loss of the 230 kV switchyard (normal off-site power to safety-related busses) when a light rain caused arcing across salt-laden 230 kV insulators and opened breakers in the switchyard. During tropical storm Frances on September 6, 2004, CR-3 experienced phase-to-ground faults concurrently on a 230KV transmission line and a 230KV switchyard south bus breaker. The transmission line fault was caused by mechanical failure of a carbon steel pin in a vertical string of insulators due to high wind conditions. The breaker fault was caused by flashover due to contamination from wind and salt spray.

Issue

Section B.3.38 of the LRA proposed a four-year inspection interval and justified the four-year inspection frequency based on a slow aging process. However, it appears that a four-year inspection frequency may not be adequate given the plant-specific operating experience and the location of the plant which is in the vicinity of salt water bodies.

Request

Provide additional justification technical basis for how a four-year inspection frequency is adequate to detect degradation of insulator quality due to salt deposit.

Crystal River, Unit 3, Nuclear Generating Plant

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