

## LimerickNPEm Resource

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**From:** Kuntz, Robert  
**Sent:** Tuesday, May 01, 2012 2:25 PM  
**To:** Anthony Z. Roisman; gfettus@nrdc.org  
**Cc:** Smith, Maxwell; Kanatas, Catherine  
**Subject:** FW: DRAFT Request for Information related to the Limerick license renewal application  
**Attachments:** DRAFT RAPB AMR RAIs.docx

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**From:** Kuntz, Robert  
**Sent:** Thursday, January 05, 2012 2:10 PM  
**To:** 'Christopher.Wilson2@exeloncorp.com'  
**Subject:** DRAFT Request for Information related to the Limerick license renewal application

Chris,

Attached is a DRAFT request for information related to the Limerick license renewal application. If Exelon would like clarification on the attached let me know and we can set up a teleconference.

Robert Kuntz  
Sr. Project Manager  
NRR/ADRO/DLR/RPB1  
(301) 415-3733  
[robert.kuntz@nrc.gov](mailto:robert.kuntz@nrc.gov)

**Hearing Identifier:** Limerick\_LR\_NonPublic  
**Email Number:** 221

**Mail Envelope Properties** (Robert.Kuntz@nrc.gov20120501142400)

**Subject:** FW: DRAFT Request for Information related to the Limerick license renewal application  
**Sent Date:** 5/1/2012 2:24:49 PM  
**Received Date:** 5/1/2012 2:24:00 PM  
**From:** Kuntz, Robert

**Created By:** Robert.Kuntz@nrc.gov

**Recipients:**

"Smith, Maxwell" <Maxwell.Smith@nrc.gov>  
Tracking Status: None  
"Kanas, Catherine" <Catherine.Kanas@nrc.gov>  
Tracking Status: None  
"Anthony Z. Roisman" <aroisman@nationallegalscholars.com>  
Tracking Status: None  
"gfettus@nrdc.org" <gfettus@nrdc.org>  
Tracking Status: None

**Post Office:**

<b>Files</b>	<b>Size</b>	<b>Date &amp; Time</b>
MESSAGE	535	5/1/2012 2:24:00 PM
DRAFT RAPB AMR RAIs.docx	43812	

**Options**

**Priority:** Standard  
**Return Notification:** No  
**Reply Requested:** No  
**Sensitivity:** Normal  
**Expiration Date:**  
**Recipients Received:**

LIMERICK GENERATING STATION  
LICENSE RENEWAL APPLICATION  
REQUESTS FOR ADDITIONAL INFORMATION

**DRAI 3.1.1.38-1**

Background

License renewal application (LRA) item 3.1.1-38 addresses the aging management for cast austenitic stainless steel (CASS) Class 1 pump casings and valve bodies and bonnets exposed to reactor coolant >250 °C (>482 °F). LRA Table 3.1.1 item 3.1.1-38 and Table 3.3.2-21 indicate that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is used to manage loss of fracture toughness due to thermal aging embrittlement of the pump casing in the reactor water cleanup (RWCU) system. LRA Table 3.1.1 item 3.1.1-38 also indicates that the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program has been substituted for the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program to manage loss of fracture toughness of the pump casing in the RWCU system.

LRA Section B.2.1.26, which describes the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program, does not provide specific information on how this program will manage loss of fracture toughness of the pump casing in the RWCU system. In comparison, GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components Program," states that for changes in material properties visual examinations are supplemented so changes in the properties are readily observable.

Issue

The staff needs information on the operating temperature of the pump in the RWCU system to confirm the applicability of loss of fracture toughness due to thermal aging embrittlement. The staff also needs clarification as to whether the pump casing in the RWCU system is an ASME Code Class 1 component, for which the GALL Report recommends the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program to manage loss of fracture toughness due to thermal aging embrittlement.

The staff needs additional information on how the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will manage loss of fracture toughness of the pump casing. In addition, the staff needs information on the previous operating experience of this pump casing in terms of occurrence of cracking and leakage.

Request

- 1) Provide the operating temperature of the pump in the RWCU system to confirm whether loss of fracture toughness due to thermal aging embrittlement is applicable to this component (i.e.,  $T > 482$  °F).
- 2) Clarify whether the pump casing in the RWCU system is an ASME Code Class 1 component, for which the GALL Report recommends the ASME Section XI Inservice Inspection, Subsections IWB, IWC, and IWD program to manage loss of fracture toughness

due to thermal aging embrittlement. As part of the clarification, describe the ASME Code Class of this pump. In addition, provide the examination categories and methods of the ASME Code Section XI that are required for this pump casing.

- 3) Describe the operating experience of this pump casing in terms of occurrence of cracking and leakage, including the results of the ASME Code Section XI inservice inspections.

If the component has experienced leakage or does contain a flaw (e.g., a flaw due to fatigue, stress corrosion cracking, or fabrication processes), provide the basis as to why the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is adequate to manage loss of fracture toughness of this pump casing, without an analytical evaluation for acceptance of the flaw.

- 4) Describe how the applicant's Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program will manage loss of fracture toughness of the pump casing in the RWCU system. As part of the response, clarify whether the applicant's aging management program includes supplemental activities or analyses to adequately manage loss of fracture toughness of this component, as recommended in GALL AMP XI.M38.

If existent, describe the inspection method, schedule and extent (e.g., how many pump casings will be inspected out of total xx number of pumps). In addition, provide the applicant's basis as to why the applicant's aging management method is adequate to manage loss of fracture toughness.

- 5) Revise the LRA consistent with the applicant's response

#### **DRAI 3.1.2.1.1-1**

##### Background

LRA Table 3.1.1, item 3.1.1-62 states that the item is applicable to PWRs only. SRP-LR Table 3.1-1, item 62 addresses high-strength, low alloy steel, or stainless steel closure bolting and stainless steel control rod drive head penetration flange bolting exposed to air with reactor coolant leakage being managed for cracking due to stress corrosion cracking (SCC).

##### Issue

Although the SRP-LR states that Table 3.1-1, item 62 is applicable to PWRs, the applicant has carbon and low alloy steel bolting exposed to air with reactor coolant leakage within the scope of license renewal. The staff noted that the applicant is managing these items for loss of material and loss of preload, but not cracking due to SCC.

### Request

State the basis for why cracking due to stress corrosion cracking is not applicable for carbon and low alloy steel closure bolting within the scope of license renewal exposed to air with reactor coolant leakage (external) in the reactor coolant system, or provide an AMP to manage this aging effect.

### **DRAI 3.3.1.33-1**

#### Background

LRA Table 3.3.1, item 3.3.1-33 addresses concrete and cementitious material piping, piping components, and piping elements exposed to raw water, which will be managed for loss of material due to abrasion, cavitation, aggressive chemical attack, and leaching. LRA Table 3.3.2-9 contains an AMR for cement piping, piping components, and piping elements exposed to raw water being managed for loss of material by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting program. This AMR includes reference to note E indicating that the program selected is different than the one recommended by the GALL Report and plant-specific note 5. Plant-specific note 5 states: "Cement lined piping is used for the buried fire loop main. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components (B.2.1.26) program is substituted to manage the aging effect(s) applicable to this component type, material, and environment combination."

GALL Report AMP XI.M27, "Fire Water System," manages aging for fire protection system components exposed to fire water and recommends using either flow testing, visual inspections, or volumetric examinations as well as preventive measures including periodic flushes and system performance testing to manage loss of material. System flow testing, flushes, performance testing, and inspections are performed in accordance with the applicable National Fire Protection Association (NFPA) codes and standards. NFPA 25 includes requirements for periodic flow testing of underground fire mains. The Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program proposes to use visual inspections to manage loss of material for cement components exposed to raw water, and does not include flow testing or any preventive measures.

#### Issue

It is not clear to the staff how the visual inspections performed by the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program are adequate to manage loss of material for the cement lined buried fire main given that the program does not include flow testing or preventive measures, as recommended by the GALL Report AMP XI.M27.

### Request

Explain how the Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components program is adequate to manage loss of material for components exposed to raw water.

**DRAI 3.3.2.1.14-1**Background

LRA Table 3.3.2-14 states that aluminum alloy piping, piping components, and piping elements exposed to air/gas – wetted (internal) will be managed for loss of material by the Compressed Air Monitoring program. LRA Section B.2.1.15, Compressed Air Monitoring program, states that the program will conduct preventive maintenance inspections of compressors, filters, accumulators, receivers, and drain traps.

Issue

It is unclear to the staff if any of the preventive maintenance inspections of the Compressed Air Monitoring program will be conducted on aluminum alloy piping, piping components, and piping elements exposed to air/gas – wetted (internal).

Request

State whether any of the preventive maintenance inspections of the Compressed Air Monitoring program will be conducted on aluminum alloy piping, piping components, and piping elements exposed to air/gas – wetted (internal). If not, justify the use of the Compressed Air Monitoring program for managing loss of materials for these aluminum alloy piping, piping components, and piping elements.

**DRAI 3.3.2.1.1-1**Background

LRA Table 3.3.1, item 3.3.1-11 addresses steel, high-strength high-pressure pump, closure bolting exposed to air with steam or water leakage being managed for cracking due to stress corrosion cracking and cyclic loading. The LRA states that this item is not applicable because SRP-LR item 3.3.1-11 is only applicable to PWRs.

Issue

The staff lacks sufficient information to evaluate the applicant's claim because although the GALL Report, Table VII. E1, item AP-122 addresses high pressure pump closure bolting in a chemical volume and control system (PWR), the reactor water cleanup recirculation pump is equivalent to a charging pump at a PWR. The staff noted that in LRA Table 3.3.2-21, Reactor Water Cleanup System, bolting is managed for loss of material and loss of preload, but not cracking due to stress corrosion cracking and cyclic loading.

Request

State the basis for why cracking due to stress corrosion cracking and cyclic loading is not applicable to reactor water cleanup recirculation pump closure bolting, or provide an AMP to manage this aging effect.

**DRAI 3.3.2.1.13-1**Background

LRA Table 3.5.2-13 states that elastomeric compressible joints and seals (including inflatable pool seals and gate seals) exposed to an air-indoor uncontrolled (external) and treated water (internal) environment will be managed for hardening and loss of strength by the Structures Monitoring program. LRA Section B.2.1.35 Structures Monitoring program states that inspection frequencies will not exceed five years. Enhancement number nine of this program states that plant procedures will be enhanced to include physical manipulation to detect hardening when a vibration isolation function is suspect; however, it does not state that structural seal inspections will be augmented with physical manipulation.

The GALL Report recommends AMP XI.M36, "External Surfaces Monitoring of Mechanical Components," to manage the aging of external surfaces of elastomeric items and GALL Report AMP XI.M38, "Inspection of Internal Surfaces in Miscellaneous Piping and Ducting Components," for the internal surfaces. GALL Report AMP XI.M36 recommends that inspections be conducted on a not-to-exceed refueling outage interval. GALL Report AMP XI.M38 recommends periodic opportunistic inspections. Both AMPs recommend that visual inspections of elastomeric components be augmented by physical manipulation to detect hardening and loss of strength.

Issue

The staff lacks sufficient information to reconcile the differences in inspection frequencies and lack of physical manipulation between the Structures Monitoring program and the GALL Report recommended AMPs.

Request

- 1) State the basis for why external surface inspections conducted on a not-to-exceed five-year interval will be sufficient to detect hardening and loss of strength in compressible joints and seals (including inflatable pool seals and gate seals) or revise the program to be consistent with the GALL Report recommendation of a not-to-exceed refueling outage interval.
- 2) State whether physical manipulation of elastomeric compressible joints and seals is included in the Structures Monitoring program, or state the basis for how hardening and loss of strength will be detected without physical manipulation, or revise the program to include physical manipulation.

**DRAI 3.4.2.3.1-1**Background

LRA Table 3.4.2-1 states that there is no aging effect for fiber-reinforced polymeric strainer elements exposed to an air-outdoor (external) environment and therefore no AMP is proposed. The associated AMR items cite generic note G and plant-specific note 3 which states there are

no aging effects based on the material being comparable to polyvinyl chloride (PVC) exposed to an air-indoor environment.

Issue

The staff does not have sufficient information to justify that the air-outdoor environment is comparable to the air-indoor environment due to the higher amount of sunlight related ultraviolet (UV) exposure in the air-outdoor environment. In addition, different material types of fiber reinforced material (e.g., epoxy resin, reinforced vinyl ester resin) respond differently to UV exposure.

Request

- 1) State the specific specification/grade of fiber-reinforced material used in the polymeric strainer element components within the scope of license renewal used in the circulating water system, including the binding agent.
- 2) State the basis for why exposure to outdoor UV does not require age managing of these components or propose an AMP.

**DRAI 3.5.2.1.1-1**

Background

LRA Table 3.5.1, item 3.5.1-68 addresses high-strength structural bolting and states that it is not applicable because high strength structural bolts subject to SCC are not used in this application. The GALL Report recommends GALL Report AMP XI.S3, "ASME Section XI, Subsection IWF" to manage cracking due to stress corrosion cracking for this component group.

Issue

The staff lacks sufficient information to evaluate the applicant's claim because a review of UFSAR Sections 3.8.3.1.2, Reactor Pedestal, 3.8.6.2.1, Structural Steel Materials, and 3A.7.1.2.2.1, Downcomer Bracing System, state that high strength structural steel bolting is used. It is reasonable to assume that at least some of the referenced UFSAR sections are describing components that contain bolting within the scope of license renewal. The staff reviewed the LRA and did not find any other means by which SCC would be managed for high strength structural bolting.

Request

- 1) Are any of the components described in the above three referenced UFSAR sections within the scope of license renewal and does the bolting tensile strength exceed 170 ksi? If this is the case, state the basis for why SCC does not have to be managed or propose an AMP to manage the aging.
- 2) If the response to the first question in this RAI is affirmative, please confirm that there are no other in-scope high strength structural bolts subject to SCC.

**DRAI 3.5.2.3.2-1**Background

LRA Tables 3.5.2-2, 3.5.2-3, and 3.5.2-16 state that PVC roofing scuppers exposed to air-outdoor have no aging effects and no AMP is proposed. The AMR items cite generic note J.

Issue

The staff does not have sufficient information to justify that the air-outdoor environment is comparable to the air-indoor environment due to the higher amount of sunlight related UV exposure in the air-outdoor environment. In addition, different material types of PVC respond differently to UV.

Request

- 1) State the specific PVC material used in the in-scope roofing scuppers.
- 2) State the basis for why exposure to outdoor UV does not require age managing of these components or propose an AMP.

**DRAI 3.5.2.3.10-1**Background

LRA Table 3.5.2-10 includes items for calcium silicate, fiberglass, foamed plastic, insulation cement and finishing cement, caulking and lagging adhesive, and insulation jacketing exposed to an air-outdoor environment. The LRA states that there are no aging effects requiring management (AERM) and no AMP is proposed. The AMR items cite generic note J.

LRA Table 3.5.2-10 lists the following Components and Intended Functions

<b>Component</b>	<b>Material</b>	<b>Intended Function</b>
Insulation	Calcium Silicate	Thermal Insulation
Insulation	Fiberglass	Thermal Insulation
Insulation	Foamed Plastic (includes Rubatex)	Thermal Insulation
Insulation	Insulation cement and finishing cement	Thermal Insulation
Insulation jacketing (includes integral vapor barrier, wire mesh, tie wires, straps, bands, clamps, fasteners, breather springs)	Caulking and lagging adhesive	Shelter Protection

<b>Component</b>	<b>Material</b>	<b>Intended Function</b>
Insulation jacketing (includes integral vapor barrier, wire mesh, tie wires, straps, bands, clamps, fasteners, breather springs)	Plastic mastic jacketing	Shelter Protection

LRA Table 2.1-1 states that the thermal insulation function is the, “Control of heat loss to preclude overheating of nearby safety related SSCs, 10 CFR 54.4 (a)(2),” the shelter protection function is to “Provide shelter/protection to safety-related components,” and the insulation jacket integrity function is to, “Prevent moisture absorption and provide physical support of thermal insulation.”

### Issue

- 1) The staff notes that in a dry environment without potential for water leakage, spray, or condensation, fiberglass and calcium silicate are expected to be inert to environmental effects. However, in moist environments calcium silicate has been found to degrade. In addition, both fiberglass and calcium silicate insulation have the potential for prolonged retention of any moisture to which they are exposed; prolonged retention of moisture may increase thermal conductivity, thereby degrading the insulating characteristics, and also could accelerate the aging of insulated components. In addition, the staff notes that in LRA Table 3.5.2-10 the applicant selected the shelter protection function in lieu of the jacket integrity function for the items associated with insulation jacketing. Therefore it is not clear to the staff whether the jacketing for outdoor insulation is waterproof. In addition, if the jacket integrity function had been selected, the applicant did not provide any plant-specific notes stating how installation of jacketing will prevent moisture intrusion in the insulation (e.g., axial jacket gaps located on bottom of piping, circumferential jacket gaps overlapped). As a result, the staff lacks sufficient information to conclude that there is no AERM for the insulation components.
- 2) Given long term exposure to direct sunlight UV, it is unclear to the staff how the applicant concluded that the foamed plastic, including Rubatex insulation, material is not subject to aging.
- 3) For the items associated with insulation cement and the jacket components (i.e., integral vapor barrier, straps, bands, clamps, fasteners, breather springs, caulking and lagging adhesive, plastic mastic jacketing) where the specific material type is not clear (e.g., elastomeric composition), the staff lacks sufficient information to conclude that there is no AERM for these insulation components because the specific material is unknown. Elastomeric and polymeric materials have different aging effects when exposed to direct sunlight UV.

### Request

- 1) For the fiberglass and calcium silicate insulation components in LRA Table 3.5.2-10 with a function to limit heat transfer, state how the configuration of the jacketing ensures that it is

properly installed so as to prevent water intrusion into the insulation (e.g., seams on the bottom, overlapping seams) such that aging management is not required, or state an AMP to manage the aging of the insulation components.

- 2) State the specific material types for any foamed plastic insulation material other than Rubatex and state the basis for why these materials are not subject to aging due to direct exposure to sunlight UV, or state an AMP to manage the aging of the insulation components.
- 3) State the specific materials of construction for the items associated with insulation jacketing including insulation cement and the jacket components where the material type is not clear (i.e., integral vapor barrier, straps, bands, clamps, fasteners, breather springs, caulking and lagging adhesive), and state the basis for why these materials are not subject to aging due to direct exposure to sunlight UV, or state an AMP to manage the aging of the insulation components.

#### **DRAI 3.5.2.3.10-2**

##### Background

LRA Table 3.5.2-10 lists an item for Insulation constructed of “Min-K.”

##### Issue

The staff doesn’t know what Min-K thermal insulation is (e.g., product form, installation methods), its function (e.g., mechanical or electrical thermal insulation), or the specific material of construction of the insulation.

##### Request

Provide sufficient detail on the product form, installation methods, function and material of fabrication for Min-K insulation for the staff to independently research and conclude that there is no AERM for this component.

#### **DRAI 3.5.2.3.10-3**

##### Background

LRA Table 3.0-2 states that the air-indoor, uncontrolled environment can result in the surfaces of components being wet. LRA Table 3.5.2-10 includes items for calcium silicate, cellular glass, ceramic fiber, fiberglass, fiberglass (molded), foamed plastic, mineral fiber and NUKON insulation; and insulation jacketing, cement and finishing cement exposed to air-indoor uncontrolled environment and states that there is no aging effect and no AMP is proposed. The staff noted that the insulation jacketing materials include caulking adhesive, lagging adhesive, fiberglass cloth (including silicone coated fiberglass cloth), or plastic mastic. The AMR items cite generic note F and J.

LRA Table 3.3.2-8, Emergency Diesel Generator System, and LRA Table 3.4.2-2, Condensate System, have stainless steel components exposed to the outdoor air environment that could be insulated.

#### Issue

- 1) The staff notes that in a dry environment of indoor air, without potential for water leakage, spray, or condensation, insulation materials listed by the applicant such as fiberglass, calcium silicate, foamed plastic, and NUKON are expected to be inert to environmental effects. However, in moist environments, calcium silicate has been found to degrade. In addition, insulation materials have the potential for prolonged retention of any moisture to which they are exposed; prolonged retention of moisture may increase thermal conductivity, thereby degrading the insulating characteristics, and also could accelerate the aging of insulated components. Given the definition of the air-indoor, uncontrolled environment, it is not clear to the staff how water would not accumulate in the insulation material during periods when insulated systems are at ambient shutdown conditions.
- 2) UFSAR Section 5.2.3.2.4 describes the compatibility of thermal insulation to the underlying external surfaces of the piping it encloses. It states, "Chemical analyses are required to verify that the leachable sodium, silicate, and chloride are within acceptable levels. Insulation is packaged in waterproof containers to prevent damage or contamination during shipment and storage." It is not clear to the staff that this section of the UFSAR is applicable to insulation materials not associated with the reactor coolant pressure boundary.
- 3) The staff lacks sufficient information on whether the stainless steel components in LRA Tables 3.3.2-8 and 3.4.2-2 are insulated, and if insulated, the potential for the insulation to have deleterious compounds (e.g., chlorides, halogens) that could leach out of the insulation and cause SCC of the stainless steel materials in light of its potentially significantly longer and greater exposure to water than insulation in an indoor air environment.

#### Request

- 1) State the basis for why the insulation materials exposed to the air-indoor uncontrolled environment listed in LRA Table 3.5.2-10 will not accumulate moisture resulting in degradation of the thermal insulation function, or state an AMP to manage the aging of the insulation components.
- 2) State whether UFSAR Section 5.2.3.2.4 applies to all insulation within the plant, or state the basis for why deleterious compounds (e.g., chlorides, halogens) will not leach out of the insulation and cause SCC or loss of material for the components the insulation encloses.
- 3) State whether the stainless steel components exposed to outdoor air (and therefore potentially significantly longer and greater exposure to water than insulation in an indoor air environment) in LRA Tables 3.3.2-8 and 3.4.2-2 are insulated. If they are insulated state the basis for why deleterious compounds (e.g., chlorides, halogens) will not leak out of the insulation and cause SCC of the stainless steel materials (this response could be included in the response to request 2), or state whether the External Surfaces Monitoring of Mechanical

Components program will have the insulation removed on a sufficient enough interval to detect potential SCC prior to impacting the CLB function(s) of these components.

#### **DRAI 3.5.2.3.11-1**

##### Background

LRA Table 3.5.2-11 states that for fiberglass metal components (permanent drywell shielding) exposed to air-indoor uncontrolled there is no aging effect and no AMP is proposed. The AMR item cites generic note J.

##### Issue

The staff lacks sufficient information to conclude that no aging management is required for these components given that the fiberglass material is located in the drywell where it is susceptible to high radiation levels. The staff noted that radiation can break down the molecule chains in the fiberglass structure. In addition, the applicant has not supplied the material of the matrix (e.g., polyester or vinylester) in which the glass fibers are set. The matrix material can impact component aging.

##### Request

For the LRA Table 3.5.2-11 fiberglass metal components (permanent drywell shielding) exposed to air-indoor uncontrolled environment, state the composition of the matrix (e.g., polyester or vinylester) in which the glass fibers are set and state the basis for why there are no aging effects for this component, or state an AMP to manage the aging of the insulation components.