Attachment 1

Response to Request for Additional Information
(Non-Confidential Information)

Request for Additional Information (RAI) #1:

Background

Section 5 of the November 16, 2020, application states, in part:

> ... the typical applications in which the subject proprietary fittings will be used are generally limited to instrumentation, sampling, and cooling water piping lines. They exclude Class 1 systems and any systems containing boric acid. Design temperatures may be up to 650°F [degrees Fahrenheit]. Design pressures could be as high as 2000 psi [pounds per square inch] but will generally be less than 200 psi. The environmental conditions are anything in the nuclear power plant environment, including air, water, or steam systems, and possibly lube oil or fuel systems. They could be inside or outside containment. Prior operating experience for these fittings in these environments have shown successful performance, with no leaks or structural failures, as long as they are installed in accordance with the manufacturer's instructions. They have been successfully used in pipe schedules from 40 to 160, subject to the manufacturer's recommendations and limitations.

The application states that prior operating experience demonstrated successful performance of fittings from the material listed in Code Case N-893. However, the application does not provide specific details of the operating experience, such as fitting size, corrosion performance and failure rates, as it related to the environmental conditions.

Request

Provide details related to prior operating experience in nuclear and non-nuclear applications. Include corrosion performance and failure rates for these fittings, up to nominal pipe size 4, in the environments which they will be used or similar environments.

Response:

The following is a listing of the application of the fittings with the material requested by Code Case N-893. No known nuclear applications are in use for the LTCS-333 material, which is the subject material of Code Case N-893.

Lokring LTCS-333 Installations.

Company	Type of facility	Date	Size & Schedule	Pipe Spec.	Service	Max. Press	Temp.	CA*

Lokring LTCS-333 Installations.

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Company	Type of facility	Date	Size & Schedule	Pipe Spec.	Service	Max. Press	Temp.	CA*

*Corrosion Allowance

Field failures of the Lokring LTCS-333 material are at a rate of [ ]. The LTCS-333 product was introduced in the late 1990s in partnership with BP and ConocoPhillips for upstream oil and gas applications. In approximately 2010, the product line was further developed into a wider range of product configurations and sizes (up to NPS 4"). To date, it is estimated that 40,000 LTCS-333 products are installed and in service. And to date, the total combined return rate for product field performance related issues is [ ], which is a return rate = [ ]. The following are details on the return date, product affected, quantity, effect and root cause determined from an evaluation of the returned product

Return Year	Product	Quantity Affected	Effect	Root cause
[				
				]

The following is a detailed summary of the effect, quantity, and percentage of failure rate (%):

Total Lokring fittings	**40,000**	
[		
		]

With regards to corrosion, Attachment 5 contains an "Executive Summary - Crevice Corrosion Test of Lokring LTSC-333 and Socket weld Fittings" (Confidential Information).

RAI #2:

Background

Section 5 of the November 16, 2020, application states, in part:

> ... Rather, the margins are based on the ratio between burst pressure and the design pressure of the coupled piping. The rated pressure is downrated from the burst pressure, based on elevated-temperature tensile testing, in the same manner as was used to rate the fittings made from the material in Code Case N-879.
>
> The proprietary fittings that Exelon desires to use are designed in accordance with ASME Section III, NC/ND-3671.7, "Sleeve-Coupled and Other Patented Joints," using the option of prototype testing. All fittings sizes will be tested prior to installation.
>
> The fittings Exelon desires to use have been extensively tested to demonstrate that the fittings will not fail before the pipe on which they are installed. The fittings have been tested by tensile (pull-out) testing, pressurization to burst, fatigue testing, and torsion testing. Fatigue analysis is not required for the requested applications but is performed for the purpose of establishing a stress intensification factor (SIF), for use by the piping system designer.

While the licensee's application states that all fitting sizes will be tested prior to installation, prototype testing is not specified in paragraphs NC/ND-3671.7 of the ASME BPV Code, Section III. Specifically, paragraphs NC/ND-3671.7 state, "Coupling-type, mechanical gland type, and other patented joints may be used where experience or tests have demonstrated to the satisfaction of the designer that the joint is safe for the Design Loadings and when adequate provision is made to prevent separation of the joint." The application also indicates that tensile testing, pressurization testing to burst, fatigue testing, and torsion testing have been performed, and this testing is provided as a basis for the acceptability of fabricating fittings from the material listed in Code Case

N-893. This testing appears similar to the prototype testing required by paragraph NB-3671.7 of the ASME BPV Code, Section III. However, paragraphs NC/ND-3671.7 do not require prototype testing and do not provide guidance on what types of testing should be performed.

Request

Provide a summary of the qualification testing (with applicable testing specifications) that has been or will be performed for all Class 2 and 3 Lokring fittings made using Code Case N-893 material. Clarify if the specific sizes of all fittings used for repairs will be subject to tensile (pull-out) testing, pressurization to burst, fatigue testing, and torsion testing. If not, provide a technical basis for not performing tensile (pull-out) testing, pressurization to burst, fatigue testing, and torsion testing on all fitting sizes.

Response:

Test Summary Matrix for LTCS-333 product made with Code Case N-893 material. Tests performed per NC/ND 3671.7							
Product	**Pipe Size NPS**	**Pipe Spec, Grade**	**Burst - Test per ANSI B16.9**	**Flex- Test per ASME B31J**	**Tensile - Test to max. load capacity**	**Torsion - Test to max. load capacity**	**Vibration - Test per EPRI High Cycle Fatigue method**
LTCS-333-CPL-P08	1/2	A106 Grade B, A53 Grade B, API 5L Grade B	√	√	(1)	(1)	(1)
LTCS-333-CPL-P12	3/4		√	√	√	√	√
LTCS-333-CPL-P16	1		√	√	(1)	(1)	(1)
LTCS-333-CPL-P24	1 1/2		√	√	√	(1)	(1)
LTCS-333-CPL-P32	2		√	√	√	√	√
LTCS-333-CPL-P48	3		√	√	√	√	(1)
LTCS-333-CPL-P64	4		√	√	√	√	√
Notes:							
1.	The results of tested size may be extrapolated between one half and 1.5 times the NPS size of the tested specimen (NC/ND-3671.7).						
2.	Qualification testing of LTCS-333 on ASTM A335 Grades P11 and P22 is underway. Qualification testing estimated completion in 2021.						

Attachment 2

Executive Summary - Crevice Corrosion Test of Lokring LTSC-333 and Socket weld Fittings (Non-Confidential Information)

LOKRING TECHNOLOGY, LLC
38376 APOLLO PARKWAY • WILLOUGHBY • OHIO 44094-7724
TEL.: (440) 942-0880 FAX: (440)-942-1186

Date: March 8, 2013

Executive Summary - Crevice Corrosion Test of Lokring LTCS-333 and Socket weld Fittings

(Ref: Element Report No. 12040601)

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Test Results:

[

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Discussion:

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