

10 CFR 50.55a

RS-19-105  
NMP2L2711

October 16, 2019

U.S. Nuclear Regulatory Commission  
Attn: Document Control Desk  
Washington, DC 20555-0001

Braidwood Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-72 and NPF-77  
NRC Docket Nos. STN 50-456 and STN 50-457

Byron Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-37 and NPF-66  
NRC Docket Nos. STN 50-454 and STN 50-455

Calvert Cliffs Nuclear Power Plant, Units 1 and 2  
Renewed Facility Operating License Nos. DPR-53 and DPR-69  
NRC Docket Nos. 50-317 and 50-318

Clinton Power Station, Unit 1  
Facility Operating License No. NPF-62  
NRC Docket No. 50-461

LaSalle County Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-11 and NPF-18  
NRC Docket Nos. 50-373 and 50-374

Limerick Generating Station, Units 1 and 2  
Renewed Facility Operating License Nos. NPF-39 and NPF-85  
NRC Docket Nos. 50-352 and 50-353

Nine Mile Point Nuclear Station, Unit 2  
Renewed Facility Operating License Nos. DPR-63 and NPF-69  
NRC Docket Nos. 50-220 and 50-410

Subject: Proposed Alternative to Utilize Code Case N-879

- References:
1. Letter from J. Barstow to U.S. Nuclear Regulatory Commission, "Proposed Alternative to Utilize Code Case N-879," dated April 30, 2018.
  2. Email from B. Purnell (U.S. Nuclear Regulatory Commission) to T. Loomis (Exelon Generation Company, LLC), "Exelon Generation Company, LLC - Acceptance of Fleet Request for Alternative to Use ASME Code Case N-879 (EPID L-2019-LLR-0037)," dated May 31, 2019.
  3. Letter from B. Purnell (U.S. Nuclear Regulatory Commission) to B. Hanson (Exelon Generation Company, LLC), Supplemental Information Needed to Support Request for Withholding Information Regarding Proposed Alternative to Use ASME Code Case N-879 (EPID L-2019-LLR-0037), dated July 19, 2019.
  4. Letter from D. Gudger (Exelon Generation Company, LLC) to U.S. Nuclear Regulatory Commission, "Proposed Alternative to Utilize Code Case N-879," dated August 15, 2019.
  5. Email from B. Purnell (U.S. Nuclear Regulatory Commission) to T. Loomis (Exelon Generation Company, LLC), "Exelon Generation Company, LLC - Request for Additional Information Regarding Request to Use ASME Code Case N-879 (EPID L-2019-LLR-0037)," dated October 2, 2019.
  6. Letter from B. Purnell (U.S. Nuclear Regulatory Commission) to B. Hanson (Exelon Generation Company, LLC), "Request for Withholding Information Regarding Proposed Alternative to Use ASME Code Case N-879 (EPID L-2019-LLR-0037)," dated October 3, 2019.

In the Reference 1 letter, Exelon Generation Company, LLC (Exelon) requested a proposed alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," on the basis that the proposed alternative provides an acceptable level of quality and safety, equivalent to compliance with ASME Section III and XI requirements.

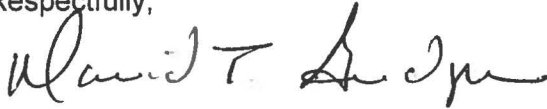
Specifically, this proposed alternative concerns the use of Code Case N-879, "Use of Micro-Alloyed Carbon Steel Bar in Patented Mechanical Joints and Fittings, Classes 1, 2, and 3 Section III, Division 1." This Code Case permits use of a material that does not comply with the limitations on material specifications and grades mandated by ASME Section III, NB/NC/ND-2121(a).

In the Reference 5 email, the U.S. Nuclear Regulatory Commission requested additional Information. Attached is our response.

There are no regulatory commitments contained in this letter.

If you have any questions, please contact Tom Loomis (610) 765-5510.

Respectfully,



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David T. Gudger  
Acting Director - Licensing  
Exelon Generation Company, LLC

Attachments: 1) Response to Request for Additional Information  
2) Revised Proposed Alternative to Use Code Case N-879

cc: Regional Administrator - NRC Region I  
Regional Administrator - NRC Region III  
NRC Senior Resident Inspector - Braidwood Station  
NRC Senior Resident Inspector - Byron Station  
NRC Senior Resident Inspector - Calvert Cliffs Nuclear Power Plant  
NRC Senior Resident Inspector - Clinton Power Station  
NRC Senior Resident Inspector - LaSalle County Station  
NRC Senior Resident Inspector - Limerick Generating Station  
NRC Senior Resident Inspector - Nine Mile Point Nuclear Station  
NRC Project Manager - Braidwood Station  
NRC Project Manager - Byron Station  
NRC Project Manager - Calvert Cliffs Nuclear Power Plant  
NRC Project Manager - Clinton Power Station  
NRC Project Manager - LaSalle County Station  
NRC Project Manager - Limerick Generating Station  
NRC Project Manager - Nine Mile Point Nuclear Station  
Illinois Emergency Management Agency - Department of Nuclear Safety  
R. R. Janati - Bureau of Radiation Protection, Commonwealth of Pennsylvania  
D. A. Tancabel - State of Maryland  
A. L. Peterson - NYSERDA

**ATTACHMENT 1**

**Response to Request for Additional Information**

**Request 1:**

For each plant, either (1) limit the scope of the request to the current 10-year inservice inspection interval or (2) identify the specific ASME Code edition and addenda applicable to future 10-year inservice inspection intervals in which the proposed alternative will be used. In addition, provide a basis for each plant where use of the alternative is requested beyond the current interval.

**Response:**

The relief request has been revised to limit the relief request to the 10-year interval. The revised relief request is contained in Attachment 2. Changes are identified with revision bars.

**Request 2:**

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-879. Clarify if the specific sizes of fittings used for repairs will be tested or will credit be taken for the testing of fitting of other sizes (e.g., specify whether NPS 2 fitting will be specifically tested or will NPS 2 fittings credit the testing of smaller fittings). If credit will be taken for fitting sizes other than those that were or will be specifically tested, provide a justification.

**Response:**

The relief request has been revised to delete reference to NC/ND-3671.7. The revised relief request is contained in Attachment 2. Changes are identified with revision bars.

We also note that reference to Three Mile Island Nuclear Station, Unit 1 has been deleted as denoted by the revision bars.

The previously supplied enclosures are still applicable.

**ATTACHMENT 2**

**Revised Proposed Alternative to Use Code Case N-879**

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**Proposed Alternative to Use Code Case N-879 in Accordance with 10 CFR 50.55a(z)(1)**

**1. ASME Code Component(s) Affected:**

All ASME Class 2 and 3 carbon steel piping systems Nominal Pipe Size (NPS) 2 and smaller. Note that Case N-879 is also applicable to Class 1 piping; however, Exelon is not requesting permission to use Case N-879 for Class 1 fittings. This request applies only to Class 2 and 3 fittings.

**2. Applicable ASME Section XI Edition and Addenda:**

<u>PLANT</u>	<u>INTERVAL</u>	<u>EDITION</u>	<u>START</u>	<u>END</u>
Braidwood Station, Units 1 and 2	Fourth	2013 Edition	August 29, 2018 November 5, 2018	July 28, 2028 October 16, 2028
Byron Station, Units 1 and 2	Fourth	2007 Edition, through 2008 Addenda	July 16, 2016	July 15, 2025
Calvert Cliffs Nuclear Power Plant, Units 1 and 2	Fifth	2013 Edition	July 1, 2019	June 30, 2029
Clinton Power Station, Unit 1	Third	2004 Edition	July 1, 2010	June 30, 2020
Clinton Power Station, Unit 1	Fourth	2013 Edition	July 1, 2020	June 30, 2030
LaSalle County Stations, Units 1 and 2	Fourth	2007 Edition, through 2008 Addenda	October 1, 2017	September 30, 2027
Limerick Generating Station, Units 1 and 2	Fourth	2007 Edition, through 2008 Addenda	February 1, 2017	January 31, 2027
Nine Mile Point Nuclear Station, Unit 2	Fourth	2013 Edition	October 6, 2018	August 22, 2028

**3. Applicable Code Requirements:**

ASME Code, Section III, NC/ND-2121(a), of the 1971 Edition through the 2017 Edition, provides requirements for materials to be used in Class 2 and 3 piping systems. This requirement is mandated by IWA-4220, of the ASME Section XI Edition and Addenda applicable to each nuclear power plant. Exelon has determined that relief is not needed from ASME Code B31.1 and B31.7.

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**4. Reason for Request:**

In accordance with 10 CFR 50.55a(z)(1), Exelon Generation Company, LLC (Exelon) is requesting a proposed alternative from the ASME Section III, NC/ND-2121(a) requirements for compliance with the specifications for material given in ASME Section II, Part D (previously Section III, Division 1, Appendix I, Tables I-1.1, I-7.1, and I-8.1), Subpart 1, Table 1A, for ferrous materials, on the basis that Code Case N-879 provides an acceptable level of quality and safety, equivalent to compliance with the requirements of ASME Section III, NC/ND-2121(a) and Section II, Part D Subpart 1, Table 1A, for ferrous materials.

Exelon desires to use nonstandard, proprietary, welded, or nonwelded pipe fittings in applications requiring compliance with ASME Section III, without having to comply with the limitations on material specifications and grades mandated by Section III, NC/ND-2121(a).

Most piping fabrication and installation joints have been traditionally fabricated by welding. Installation of pipe and piping subassemblies by mechanical means can save significant amounts of time, money, critical path time, and radiation exposure to plant personnel and installation and examination contractors. In systems containing radioactive materials, or in systems near irradiated components, personnel can be subjected to significant amounts of radiation during preparation for welding, during welding, and nondestructive examination (NDE) of the welds. Most of this exposure can be eliminated by use of mechanical connections. The amount of time to which mechanical installation personnel are exposed is a fraction of the time to which a welder or a nondestructive examiner would be exposed. Without installation welds, there is no associated installation NDE.

**5. Proposed Alternative and Basis for Use:<sup>1</sup>**

Exelon proposes to implement the requirements of Code Case N-879 for procurement of nonstandard, proprietary, welded and nonwelded pipe fittings, NPS 2 or smaller.

ASME Section XI requires fittings to be designed and manufactured in accordance with the original Construction Code, which, for these specific applications, is ASME Section III. The only ASME Code requirement for which Exelon is seeking an alternative is that of ASME Section III, NC/ND-2121(a), which requires compliance with the specifications for material given in ASME Section II, Part D (previously Section III, Division 1, Appendix I, Tables I-1.1, I-7.1, and I-8.1), Subpart 1, Table 1A, for ferrous materials.

The requested alternative is provided in Code Case N-879, "Use of Micro-Alloyed Carbon Steel Bar in Patented Mechanical Joints and Fittings, Classes 1, 2, and 3 Section III, Division 1," which permits use of a micro-alloyed steel composition similar to that of ASME SA-675 and ASTM A 576 Grade 1524, with additions of carbon, manganese, vanadium, and nitrogen, to increase the yield strength to 80 ksi, to ensure a high-strength, leak-tight, mechanical joint. The material meets all other requirements of ASME Section II, Part A, SA-675. It has chemical composition similar to ASME SA-737, Grade C, which is approved for use in ASME Section III applications. The additional material strength ensures that the

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<sup>1</sup> Responds to NRC Question 4 (Reference 1).



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deformation produced during installation of the fittings occurs in the pipe material, rather than in the fitting material. It is this deformation that produces the stresses necessary for the joint structural and leak-tight integrity.

This Code Case will expand Exelon's ability to use these proprietary fittings in safety-related piping, by including coverage for ASME Section III, Class 2 and 3 systems NPS 2 or smaller.

The material described in Code Case N-879 is already permitted to be used in safety-related pipe fittings manufactured in accordance with ASME B31.1, paragraph 123.1.2. This material is also already permitted to be used in compression-type fittings in ASME Section III, Class 1, 2, and 3 instrument lines, up to NPS 1, in accordance with NB/NC/ND-2121, in the 1971 Edition through the 2017 Edition. However, for piping systems in nuclear power plants for which Section III was used for construction, the applicable material requirements in NB/NC/ND-2121 do not address, or specifically permit, use of this material in fittings other than instrument lines up to NPS 1.

Section III does not require fracture toughness testing for this material, because tubular products of the desired size are too small and too thin to make fracture toughness test specimens. Nonetheless, this material has been impact tested in bar form. The fracture toughness values are attached in Enclosure 1. The results demonstrate that fracture toughness testing is not necessary, and that the increase in hardness in the HAZ is minimal. Lokring imposes a maximum tensile strength of 130 ksi.<sup>2</sup>

P-Numbers for welding procedure and performance qualification are normally provided by ASME Section IX. Because this material is not a standard product and is used only in limited applications, the Section IX committee has not been requested to provide a P-Number. Section IX, QW-420 identifies that P-Numbers are provided for the purpose of reducing the number of welding qualifications required, but are not necessary. Materials not having a P-Number are required to be qualified separately. Separate qualifications have been performed for this material welded to P-No. 1 piping materials, such as SA-106 Grade B.<sup>3</sup> The filler material is that most applicable to welding of SA-106 Grade B pipe, such as ER70.<sup>4</sup> Any welds will be preheated to 70°F and will not be post-weld heat treated. Post-weld heat treatment (PWHT) is undesirable, as it decreases the yield strength to the point that the fittings would not be able to resist the compression forces necessary to produce a leak-tight joint.<sup>5</sup> A typical welding procedure and results of welding qualifications are shown in Enclosure 2. There is minimal heat-affected-zone hardening and no evidence of martensite formation in the HAZ. A metallurgical test report, with photomicrographs, is shown in Enclosure 3. HAZ hardness testing results are shown in Enclosure 4. Bend tests have been demonstrated to meet ASME Section IX requirements as shown in Enclosure 2.

The Section III Code Editions and Addenda used in constructing the Class 2 and 3 piping systems at Braidwood, Byron, Calvert Cliffs, Clinton, LaSalle, Limerick, and Nine Mile Point Nuclear Station, Unit 2 include primarily the Winter 1972 Addenda, the 1974 Edition, including the Summer 1974 and Summer 1975 Addenda, and the 1977 Edition with the Summer 1978

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<sup>2</sup> Responds to NRC Question 5 (Reference 1).

<sup>3</sup> Responds to NRC Question 8 (Reference 1).

<sup>4</sup> Responds to NRC Question 7 (Reference 1).

<sup>5</sup> Responds to NRC Question 6 (Reference 1).

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and Summer 1979 Addenda. At Calvert Cliffs Nuclear Power Plant, Units 1 and 2, several new post-TMI modifications were designed to add systems constructed using the 1977 Edition of Section III, including the Summer 1978 Addenda.<sup>6</sup>

Exelon desires to be able to install fittings made using the material permitted by Code Case N-879 for any application in which plain carbon steel materials, such as SA-106 Grade B are used, subject to the NPS 2 size limitation of Code Case N-879. However, 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, but will generally be less than 200°F. Design pressures could be as high as 1000 psi, 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 10 to 160, subject to the manufacturer's recommendations and limitations.<sup>7</sup>

The material addressed in Code Case N-879 is somewhat unique in that it will be used in fittings designed and qualified by testing, rather than by calculating stresses. Due to the complex shape of the fittings, calculating stresses is not practical. For this reason, B31.1 and Section III contain provisions for proving the capability of such fittings by testing. These requirements do not include design margins or load combinations based on allowable stresses.<sup>8</sup> 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. The results of these tests are shown in Enclosure 5.

The proprietary fittings that Exelon desires to use are designed in accordance with ASME Section III, NB-3671.7, "Sleeve Coupled and Other Patented Joints," using the option of prototype testing. The fittings will also comply with similar requirements in ASME B31.1, paragraph 123.1.2.<sup>9</sup> All fittings sizes will be tested prior to installation.

The fittings Exelon desires to use have been extensively tested by Exelon and Lokring 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.<sup>10</sup>

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<sup>6</sup> Responds to NRC Question 1 (Reference 1).

<sup>7</sup> Responds to NRC Questions 2 and 4 (Reference 1).

<sup>8</sup> Responds to NRC Question 10 (Reference 1).

<sup>9</sup> Responds to NRC Question 9 (Reference 1).

<sup>10</sup> Responds to NRC Question 10 (Reference 1).

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Reconciliation and use of editions and addenda of ASME Section III will be in accordance with ASME Section XI, IWA-4220, and only editions and addenda of ASME Section III that have been accepted by 10 CFR 50.55a may be used. The Code of Record for the specific 10-year ISI interval at each nuclear unit as identified under Section 2 above, will be used when applying the requirements of Section XI, unless specific regulatory relief to use other editions or addenda is approved.

All other ASME Section XI requirements for which relief was not specifically requested and authorized by the NRC Staff will remain applicable, including third party review by the Authorized Nuclear Inservice Inspector. All other Section III requirements, other than NC/ND-2121, will also remain applicable.

Based on the above, use of Code Case N-879 provides an acceptable level of quality and safety when compliance with the ASME Section III requirements for material given in ASME Section II, Part D (previously Section III, Division 1, Appendix I, Tables I-1.1, I-7.1, and I-8.1), Subpart 1, Table 1A, for ferrous materials are mandatory.

Code Case N-879 was approved by the ASME Board on Nuclear Codes and Standards on May 10, 2017, and was published in ASME Nuclear Code Cases, 2017 Edition, Supplement 1. It has not yet been incorporated into NRC Regulatory Guide 1.84, "Design, Fabrication, and Materials Code Case Acceptability, ASME Section III," and thus is not available for application at nuclear power plants without specific NRC approval. Therefore, Exelon requests use of the alternative material requirements described in this Code Case via this relief request.

In addition to the above-referenced documents, attached is the PowerPoint Presentation from the NRC-Exelon meeting on January 23, 2019 (Enclosure 6).<sup>11</sup>

**6. Duration of Proposed Alternative:**

The proposed alternative is for use of the Code Case for the remainder of each plant's 10-year Inservice Inspection interval as specified in Section 2.

**7. Precedent:**

None

**8. Enclosures:**

- 1) Affidavit and "Impact Test Results"
- 2) Affidavit and "Welding Procedure and Qualification Record"
- 3) Affidavit and "Metallurgical Test Report"
- 4) Affidavit and "HAZ Hardness Testing"
- 5) Affidavit and "Elevated Temperature Tensile Testing"
- 6) Exelon PowerPoint Presentation, "Request for Use of ASME Code Case N-879 for Exelon Nuclear Power Plants," January 23, 2019 (ML19022A200)

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<sup>11</sup> Responds to NRC Question 3 (Reference 1).

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**9. References:**

- 1) Letter from B. Purnell (U.S. Nuclear Regulatory Commission) to B. Hansen (Exelon Generation Company, LLC), Supplemental Information Needed for Acceptance of Requests to Use ASME Code Cases N-878, N-879, and N-880 (EPIDS L-2018-LLR-0076 and L-2018-LLR-0077), dated July 10, 2018