**Southern Nuclear Operating Company**

**ND-21-0392**

**Enclosure 1**

**Vogtle Electric Generating Plant (VEGP) Unit 3**

**Proposed Alternative in Accordance with 10 CFR 50.55a(z)(1):**

**Alternative Requirements for ASME Section III Remediation of Containment Vessel Unistrut Welding**

**(VEGP 3-ALT-16)**

**(This Enclosure consists of 14 pages, including this cover page)**

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| **Plant Site-Unit:** | Vogtle Electric Generating Plant (VEGP) – Unit 3 |
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| **Interval-Interval Dates:** | Applies to activities related to the Containment Vessel (CV) ASME N-Certificate holder's execution of a remediation plan before the 10 CFR 52.103(g) finding, with residual weld material remaining in place for the life of the plant |
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| **Requested Date for Approval:** | Approval is requested by July 30, 2021 to support completion of the Containment System (CNS) ASME Code Section III Compliance ITAAC (ITAAC 91). |
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| **ASME Code Components Affected:** | ASME Section III Subsection NE Class MC applies to the Containment Vessel (CV) pressure vessel (CNS-MV-01) shell in the CNS. |
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| **Applicable Code Edition and Addenda:** | ASME B&PV Code, Section III, 2001 Edition through the 2002 Addenda |
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| **Applicable Code Requirements:** | NCA-3131 Welding During Construction<br>For Divisions 1 and 2, it is required that all shop and field welding during Code construction be done only by a Certificate Holder holding a certificate appropriate to the scope of welding to be performed. A Certificate Holder may engage individuals by contract for their services as welders or welding operators at the site location shown on the Certificate, provided conditions of (a) through (g) below are met. This is an acceptable method of complying with Section IX requirements concerning responsibility for welding.<br>(a) The work to be done by such welders and welding operators is within the scope of the Certificate.<br>(b) The use of such welders and welding operators is contained in the Quality Assurance Program of the Certificate Holder. The Quality Assurance Program (NCA-3462, NCA-3562, NCA-3662, or NCA-3762) shall include a requirement for direct supervision and direct technical control of the welders and welding operators by the Certificate Holder during such welding operations, and this program shall be acceptable to the Certificate Holder's Authorized Inspection Agency (NCA-5121) performing the inspections.<br>(c) The welding procedures have been properly qualified by the |

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| | Certificate Holder, and Code responsibility for such procedures is retained by the Certificate Holder.<br>(d) The welders and welding operators are qualified by the Certificate Holder to perform such procedures.<br>(e) The Certificate Holder shall have contractual control of the welding operation, including authority to assign or remove welders and welding operators at his discretion.<br>(f) The Certificate Holder shall be responsible for Code compliance of the completed item or installation including Code Symbol stamping and providing the completed appropriate Data Report Form.<br>(g) Exceptions to the requirements of this paragraph for furnace brazing operations are specified in NCA-3561(c), NCA-3661(b), and NCA-3761(b).<br><br>NE-4321 Welding Qualifications, Records, and Identifying Stamps – Required Qualifications<br>(a) Each Certificate Holder is responsible for the welding done by his organization, and he shall establish the procedure and conduct the tests required by this Article and by Section IX in order to qualify both the welding procedures and the performance of welders and welding operators who apply these procedures.<br>(b) Procedures, welders, and welding operators used to join permanent or temporary attachments to pressure parts and to make permanent or temporary tack welds used in such welding shall also meet the qualification requirements of this Article.<br>(c) When making procedure test plates for butt welds, consideration shall be given to the effect of angular, lateral, and end restraint on the weldment. This applies particularly to material and weld metal of 80.0 ksi (552 MPa) tensile strength or higher and heavy sections of both low and high tensile strength material. The addition of restraint during welding may result in cracking difficulties that otherwise might not occur.<br><br>NE-4411 Identification, Storage, and Handling of Welding Materials<br>Each Certificate Holder is responsible for control of the welding electrodes and other material which is used in the fabrication and installation of components (NE-4120). Suitable identification, storage, and handling of electrodes, flux, and other welding material shall be maintained. Precautions shall be taken to minimize absorption of moisture by electrodes and flux.<br><br>NE-4435 Welding of Nonstructural and Temporary Attachments and |

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| | Their Removal<br>(a) Nonstructural attachments (NE-1132.1) welded to the pressure retaining portion of the containment vessel need not comply with NE-2000 and may be welded with continuous or intermittent fillet or partial penetration welds, provided the requirements of (1) through (4) below are met:<br>(1) the welding procedure and the welders have been qualified in accordance with NE-4321;<br>(2) the material is identified and is compatible with the material to which it is attached;<br>(3) the welding material is identified and compatible with the materials joined;<br>(4) the welds are postweld heat treated when required by NE-4620.<br>(b) Removal of temporary attachments shall be accomplished as follows:<br>(1) The temporary attachment is completely removed in accordance with the procedures of NE-4211.<br>(2) As an alternative to (a)(4) above, postweld heat treatment may be deferred until after removal of the attachment.<br><br>NE-4610 Welding Preheat Requirements<br>In summary, NE-4610 requires materials to be preheated prior to welding if required by the qualified Welding Procedure Specification (WPS).<br><br>NE-4620 Postweld Heat Treatment<br>In summary, NE-4620 requires all welds to be postweld heat treated, unless exempted by NE-4622.7. Specific to the application, preheat of 200° F is required to exempt postweld heat treatment (PWHT). |
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| **Reason for Request:** | The Vogtle Unit 3 CV is an ASME Section III, Class MC pressure vessel designed and constructed in accordance with ASME Section III 2001 Edition, 2002 Addenda. Design and construction of the CV is complete as indicated by application of the N-Certificate Holder's Certification Mark.<br>Subsequent to completion of design and construction of the CV, and contrary to the requirements in NCA-3131, NE-4411, NE-4435(a)(1) (which invokes NE-4321), NE-4435(a)(4) (which invokes NE-4620) and NE-4610, a contractor that is not an N-Certificate Holder nor properly sub-contracted by the original CV N-Certificate Holder per Section III, welded pieces of Unistrut to the inner diameter (ID) surface of the CV. |

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| | Six pieces of 12 gauge (0.105" nominal thickness) Unistrut, were welded to the CV ID across three locations. These three locations are similar and are in accessible areas that are not high-stress regions. Two four (4) inch long by 1/4" to 3/8" fillet welds were utilized to attach each piece of Unistrut. Since the contractor performing the welding was not an N-Certificate Holder, nor were they properly subcontracted by the CV N-Certificate Holder, the following ASME Section III requirements for welding were not met:<br>• According to NCA-3131, welding performed during Code construction must be done only by the N-Certificate Holder holding a certificate appropriate to the scope of welding performed.<br>• According to NE-4411, the N-Certificate Holder is responsible for maintaining control of the welding electrodes and material, utilizing suitable identification, storage, and handling of electrodes, flux, and other welding material.<br>• According to NE-4435(a)(1), the WPS used and the welders performing the work must be qualified in accordance with NE-4321.<br>• According to NE-4435(a)(4), the welds are postweld heat treated when required by NE-4620.<br>• According to NE-4610, materials are preheated prior to welding if required by Table NE-4622.7(b)-1 to exempt postweld heat treatment and/or required by the qualified WPS. |
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| **Proposed Alternative and Basis for Use:** | **Proposed Alternative:**<br><br>As an alternative to the requirements in ASME B&PV Section III Code paragraphs NCA-3131, NE-4411, NE-4435(a)(1) (which invokes NE-4321), NE-4435(a)(4) (which invokes NE-4620) and NE-4610, Southern Nuclear Operating Company (SNC) requests authorization to enact a plan of remediation developed by CB&I, the CV N-Certificate Holder. This remediation will be performed by the CV N-Certificate Holder in accordance with their ASME Section III program as follows:<br>• Mechanical methods will be used to cut the Unistrut from the welds<br>• The remnant weld material will be ground flush with the CV shell surface, with trace amounts of the material remaining in place for the life of the plant<br>• Ultrasonic Digital Thickness Measurements of the CV will be taken to confirm thickness prior to, and after grinding the weld flush |

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| | • Surface exams of the CV will be conducted to identify any discontinuities<br>• Supplemental vacuum box testing of remediated areas will be conducted to verify that no leak paths have been introduced to the CV shell.<br>Documentation of remediation activities will be on an N-10A Data Report in accordance with Code Case N-802 and this alternative request.<br><br>**Basis for Use:**<br><br>This proposed alternative to authorize and enact the remediation plan described above provides an acceptable level of quality and safety in accordance with 10 CFR 50.55a. This section outlines the basis of use for the proposed alternative.<br><br><u>NCA-3131</u><br>To remediate the Unistrut welding performed by the subcontractor that is not an N-Certificate Holder, the proposed remediation plan that was developed and will be conducted by the CV N-Certificate Holder in accordance with their Section III Quality Assurance Program will remove the subject welded attachments and grind the material flush with the CV shell surface. The remediation plan will also utilize examinations and supplemental testing to verify that no surface indications are present as a result of the welding performed, and no leak path has been introduced to the CV shell.<br><br><u>NE-4411</u><br>The weld material used was procured under Stone & Webster's ASME Section III Quality Assurance Program and maintained under this program until it was issued through a chain of custody to the contractor and checked out by the welders performing the Unistrut welding. The CV N-Certificate Holder has reviewed the certified material test reports (CMTR)s for the weld metal and confirmed that the material is compatible with the CV plate material. Further discussion of the material compatibility is included in a later section.<br><br><u>NE-4435(a)(1) / NE-4321</u><br>ASME Section III, paragraph NE-4435(a)(1), states that nonstructural attachments welded to the pressure retaining portion of the CV need not comply with NE-2000 and may be welded with continuous or intermittent fillet or partial penetration welds, provided in part that welding procedures and welders have been qualified in accordance with NE-4321. CB&I |

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| | performed two Procedure Qualification Records (PQR)s utilizing the WPS used by the contractor who performed the Unistrut welding, to qualify the welding performed. More details concerning the PQRs are included in a following section. The proposed remediation plan that was developed and will be conducted by the CV N-Certificate Holder in accordance with their Section III Quality Assurance Program will remove the subject welded attachments that were welded using procedures and welders that were not qualified in accordance with NE-4321, and grind the material flush with the CV shell surface. The remediation plan will also utilize examinations and supplemental testing to verify that no surface indications or through-wall leakage paths are present as a result of the welding performed. Additionally, the CV N-Certificate Holder has reviewed the CMTRs for the weld metal used by the unqualified welders and confirmed that the material used is compatible with the CV shell.<br><br>NE-4435(a)(4) / NE-4620<br>Based on the CV base material thickness of 1-3/4" and the fillet weld size of 1/4" to 3/8", the material would be exempt from the PWHT by NE-4620 and NE-4622.7 provided that a preheat of 200° F is achieved. The WPS used for the unqualified welding calls for a preheat of 150° F. While this temperature is not the full 200° F required by Code for the PWHT exemption, it does reduce the temperature differential present during the welding process and the potential for adverse effects as opposed to no preheat at all. As further detailed in a following section, CB&I performed two PQRs utilizing the WPS used by the contractor who performed the Unistrut welding. One PQR included a test plate with preheat of 150° F applied, and the other included a test plate with no preheat. The difference between the average Heat Affected Zone (HAZ) impact test results for the sample with preheat and the one without were less than 3 ft-lb. Therefore, it is reasonable to conclude that if the difference between no preheat and the 150° F preheat in the WPS resulted in a negligible change to the impact values, then the difference between 150° F preheat and the 200° F required by Code for PWHT exemption as discussed above would also have a negligible effect on the weld properties.<br>Based on the size of the Unistrut attachment fillet welds, the potential resulting residual stresses will be highly localized. Any remaining residual stress that may be present after the removal of the welds will be a strain-controlled secondary stress, which will not overstress the shell under pressure loading because of its self-limiting characteristic. Therefore, residual stresses in the affected areas are ineffectual and do not warrant a localized PWHT.<br><br>NE-4610<br>Materials are preheated prior to welding if required by Table NE- |

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| | 4622.7(b)-1 to exempt PWHT and/or required by the qualified WPS. For the specific CV plates in question, a preheat of 200° F is required to exempt PWHT. The achieved preheat of 150° F does not allow for the exemption of PWHT.<br>As noted, the 150° F preheat temperature is not the full 200° F required by Code for the PWHT exemption, however it does reduce the temperature differential present during the welding process and the potential for adverse effects as opposed to no preheat at all. Consideration was also given to the limitations of interpass temperature for quenched and tempered material in accordance with NE-4613, in order to avoid detrimental effects on the mechanical properties. The CV N-Certificate Holder's WPS limits interpass temperature to 500° F, while the WPS used for the unqualified welds calls for a maximum interpass temperature of 450° F.<br>As noted in the preceding section, the PQRs performed by CB&I demonstrate that the difference between the preheat in the WPS and the preheat required by Code would have a negligible impact on the fracture toughness of the CV shell plates.<br>The proposed remediation plan includes a surface examination to confirm the absence of surface defects that could have been introduced by inadequate preheat or interpass temperature control. The remediation plan also includes supplemental vacuum box testing to verify that no leak path has been introduced to the CV shell.<br><br><u>Fracture Toughness in the Heat Affected Zone (HAZ)</u><br>The fracture toughness requirement in NE-2300 for the subject weld areas is met.<br>Per ASME Section III Table NE-2332.1-2, the required Charpy V-notch test ($C_V$) energy values for pressure retaining material other than bolting with specified minimum yield strength over 55 ksi to 75 ksi and thickness over 1½" to 2½" inclusive, the average of three specimens is 40 ft-lb, and the lowest one of three is 35 ft-lb. For the specific CV plates, the Code-required average fracture toughness is ≥40 ft-lb at the lowest service metal temperature of -18.5° F.<br>An average fracture toughness of 240.33 ft-lb at -59.8° F was achieved for the SA-738 Grade B CV shell plates where the Unistrut channels were welded. This results in an average fracture toughness that is greater than five times the minimum Code-required value and it was achieved at a significantly lower temperature than required by the Code. Production test plate impact tests were performed using the N-Certificate Holder's qualified WPS for the heat affected zones of the welds made to confirm that the welding did not adversely impact the fracture toughness of the base metal. For the production test plate impact testing, two sections of the 1-3/4" production plate material were welded together. The CB&I |

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| | production test plates were welded with shielded metal arc welding (SMAW), utilizing a 1/8" E9018M electrode and a qualified maximum heat input of 68.4 kJ/in. The test plates exhibited average toughness values of 237 ft-lb at -29° F, exceeding the Code requirement of 40 ft-lb at -28.5° F (10° F lower than the Lowest Service Metal Temperature per Note 2 of Table NE-4622.7(b)-1 based on SA-738 material and the applicable plate thickness and weld size). The average fracture toughness value for the E9018M weld filler material that was used to make the production test plates is 104 ft-lb at -29° F, also exceeding the Code requirement of 40 ft-lb at -18.5° F (the Lowest Service Metal Temperature).<br><br>In contrast to these production test plate welds, the Unistrut attachment welds are 4" long, 1/4" to 3/8" fillet welds made on 1-3/4" CV shell plates with a 3/32" E7018 electrode. The weld filler material used to attach the Unistrut has an average fracture toughness value of 133 ft-lb at -20° F, exceeding the Code requirement of 40 ft-lb at -18.5° F (the Lowest Service Metal Temperature). The HAZ in the CV material created by the Unistrut welding is localized on the interior surface of the CV and is not significantly different from other attachment welds on the vessel. It is reasonable to conclude that the heat input used to make the Unistrut attachment welds and the size of the heat affected zone of the Unistrut attachment welds are bounded by the heat input and size of the heat affected zone of the production test plate weld.<br><br>Therefore, if the production test plate welding did not adversely impact the fracture toughness of the base metal, it is reasonable to conclude that the Unistrut attachment welds also did not adversely impact the fracture toughness of the CV shell plate base metal.<br><br><u>CB&I Procedure Qualification Testing of Contractor Welding Procedure Specification (WPS)</u><br><br>CB&I, the N-Certificate Holder for the CV, performed two PQRs in accordance with the requirements in ASME Section III and Section IX, utilizing test plates and variables from the applicable contractor WPS. The PQRs are included as attachments to the alternative letter. SA-738 Grade B and SA-516 Grade 60/70 1-1/8" thick plates were welded with SMAW, utilizing the 3/32" E7018 electrode from the same heat and lot used by the contractor to perform the qualification testing. SA-516 was used, as this material has the same P Number (1) and Group Number (1) as the Unistrut material.<br><br>One test plate was welded with no preheat, and another was welded with a minimum preheat of 150° F. Charpy V-Notch Impact Testing was performed to verify the weldments have sufficient toughness values commensurate with ASME Section III NE Code allowables in the weld metal and HAZ. The test plate with no preheat demonstrated a resulting |

average impact value of 83.32 ft-lb at -30° F in the weld metal, and 122.54 ft-lb at -30° F in the HAZ. The test plate with preheat averaged 102.26 ft-lb at -30° F in the weld metal and 124.97 ft-lb at -30° F in the HAZ. The maximum heat input for both test plates was approximately 39 – 44 kJ/in. The average test values achieved are well above the Code required value of 40 ft-lb at -18.5° F (the Lowest Service Metal Temperature). Note 2 of Table NE-4622.7(b)-1 does not apply in this case based on the applicable plate thickness and weld size of the test plate. Therefore, it is reasonable to conclude that the WPS used by the contractor did not adversely affect fracture toughness values of the CV shell plates, and the residual weld metal will meet the ASME Section III requirements for fracture toughness after remediation has been performed.

Compatibility of Welding Material

ASME Section III, paragraph NE-4435(a), states that nonstructural attachments welded to the pressure retaining portion of the CV need not comply with NE-2000 and may be welded with continuous or intermittent fillet or partial penetration welds, provided in part that the welding material used is identified and compatible with the materials joined. As previously noted, the CMTR provided to SNC for the weld filler metal used for the unqualified welding was reviewed by the CV N-Certificate Holder. The table below compares the chemical composition of the 3/32" EXCALIBUR® 7018 MR™ filler metal used to weld the Unistrut pieces to the CV and the CV shell material composition. As shown in the table, the deposited weld metal chemical composition either falls within the range or is below the maximum allowed for SA-738 Grade B. Therefore, the chemical composition of the remnant weld material that will remain on the CV is compatible with the SA-738 Grade B CV shell plate material.

| Material | C (%) | Si (%) | Mn (%) | P (%) | S (%) | Cu (%) | Ni (%) | Cr (%) | Mo (%) | V (%) | Nb (%) |
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| SA 738 Grade B | 0.20 | 0.15-0.55 | 0.90-1.50 | 0.025 | 0.025 | 0.35 | 0.60 | 0.30 | 0.30 | 0.07 | 0.04 |
| Excalibur 7018 MR | 0.08 | 0.22 | 1.11 | 0.01 | 0.007 | 0.03 | 0.02 | 0.03 | 0.23 | <0.01 | NR |

The reported yield strength of the weld filler metal is 67 ksi, which is above the 60 ksi minimum for SA-738 Grade B, and the reported 84 ksi ultimate tensile strength nearly matches the 85 ksi minimum required for SA-738 Grade B.

Unistrut material was purchased commercial grade, therefore, CMTRs are not available for the material that could remain present in the remnant weld material on the CV shell. The CV N-Certificate Holder has reviewed the catalog information for the A1011 SS Grade 33 Unistrut that was

used. The information following is a comparison between the CV shell base metal and the Unistrut.

P-number and Group Number:

- Metals with same P-number have similar materials. In this case P-1 means they are both carbon steel.
- A1011 SS Grade 33 is listed as a P1 Group 1 material in ASME Section IX (QW-422) and is compatible with P1 Group 3 material, including SA-738 B.

Chemistry

- Carbon (C) and more so Carbon Equivalency (CE) affects the hardness and welding process.
- The Unistrut and the base metal have similar CE (see below).
- CE = C + Mn/6 + (Cr + Mo + V)/5 + (Ni + Cu)/15

Strength

Since the Unistrut material will be remixed and undergoes a level of dilution during the welding process, the amount of Unistrut material remaining in the base metal will be minimal. As such, the base metal is not expected to get weaker with the dilution from the Unistrut material.

| | SA-738 B | A1011 SS Grade 33 |
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| **P Number** | 1 | 1 |
| **Group Number** | 3 | 1 |
| **C %** | 0.2 | 0.25 |
| **CE %** | 0.48% (per CBI Spec) | 0.47% |
| **Sy (at room temp)** | 60 ksi | 33 ksi |

Welding between P-1 Group-3 and P-1 Group-1 has been performed on other temporary attachments to the CV.

Therefore, the mechanical properties of the remnant weld material that will remain on the CV are compatible with the CV shell plate material.

Remediation Plan Basis

After a review of the options, SNC selected the remediation plan proposed by CB&I, the N-Certificate Holder, as it was deemed to be the least intrusive to the CV, consistent with Code requirements for similar temporary attachments and does not impact the capability of the CV to

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| | fulfill its design function. The plan matches existing Code language for removal of temporary attachments. This plan, along with the welding qualification performed by CB&I on the WPS used to attach the Unistrut, provide reasonable assurance that residual weld material and the HAZ are not negatively affecting the design properties, including fracture toughness, of the CV.<br>The proposed remediation is focused on restoration by removal of the Unistrut channels in accordance with NE-4435(b)(1) and acceptability of the final containment vessel boundary. Subsequent examinations and testing will verify the absence of defects that could be present due to a lack of having a qualified welder perform the work and the remnant of residual weld material that will be in place for the life of the plant. The following examinations and testing will be performed by the CV N-Certificate Holder in accordance with their ASME Section III program:<br>• Ultrasonic digital thickness measurements of the CV to confirm thickness prior to, and after grinding weld flush<br>• Surface exams of the CV to identify any discontinuities<br>• Supplemental vacuum box testing of remediated areas<br>Supplemental vacuum box testing of remediated areas will be conducted by the CV N-Certificate Holder as part of the remediation plan. This test will verify that no leak path has been created in the disturbed surfaces of the CV.<br>CB&I will remove the Unistrut channels by implementing the same Section III processes used to remove temporary attachments to the CV shell. During Section III construction, CB&I installed and removed over ten thousand temporary welded attachments to the CV ranging in size from 3/16" to 1/2" in accordance with the provisions in NE-4435. NE-4435(b) provides direction for removing temporary attachments and does not require volumetric examinations to be performed after their removal. Therefore, the removal of the Unistrut channels that range in size from 1/4" to 3/8" in accordance with NE-4435(b) would not be subject to volumetric examination requirements.<br>CB&I ran two test plates (PQR# 14162 and 14163) which utilized representative variables from the contractor WPS used to attach the Unistrut to the CV shell. During destructive testing, the HAZ was determined to vary in size from 1.1 mm to 3.75 mm. Given the in-plant weld joint material thicknesses (12 Gauge A1011 SS Grade 33 Unistrut to 1 3/4" SA-738 Grade B Plate), it is reasonable to conclude that the lower bounding test plate HAZ size (1.1 mm to 1.5 mm) is representative of the Unistrut attachment fillet weld HAZ's.<br>During remediation, the surface will be conditioned via mechanical means (grinding/buffing), to confirm adequate final Non-Destructive Examination (NDE). This is expected to remove minimal amounts of additional material. |

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| | With this understanding, Liquid Penetrant Testing (PT) and Magnetic Particle Testing (MT) surface examinations will be performed on the remediated areas. The MT exam will utilize a DC yoke Half Wave DC (HWDC) to assist in detection of near subsurface discontinuities within the remnant weld metal and HAZ.<br>The Unit 3 CV has successfully passed an SIT per NE-6000. There is no explicit Code requirement to reperform pressure test after removal of temporary attachments in NE-4435(b). The integrity of the minimal area of the CV affected by the Unistrut welding is adequately and conservatively demonstrated by the above discussed engineering, metallurgical and welding evaluations. The surface examinations along with the proposed vacuum box testing provide reasonable assurance that no through-wall leakage paths resulted from the subject welding and as a result, that the SIT results remain valid. For many pressure boundary components, stresses arising from the SIT are the highest levels that are expected for the life of the components. Each SIT contributes to the cumulative fatigue damage that the CV pressure boundary is required to endure. An additional SIT is not appropriate to address the welding of the Unistrut to the CV as it will introduce an additional fatigue cycle with no beneficial effects.<br><br><u>Conclusion</u><br>The proposed alternative and plan of remediation recommended by CB&I, the CV N-Certificate Holder, are supported by the combined evaluations of SNC and CB&I, and provide assurance that the CV structural integrity is maintained such that the safety design function of the CV is not compromised. Therefore, this proposed alternative represents an acceptable level of safety and quality and should be granted pursuant to 10 CFR 50.55a(z)(1). |
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| **Duration of Proposed Alternative:** | Life of the plant |
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| **References:** | ASME Boiler & Pressure Vessel Code, Section III, 2001 Edition through 2002 Addenda – Rules for Construction of Nuclear Facility Components<br><br>ASME Boiler & Pressure Vessel Code, Section IX, 2019 Edition – Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators<br><br>CB&I Procedure Qualification Record 14162 |

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| | CB&I Procedure Qualification Record 14163 |
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| **Status:** | Awaiting NRC authorization |