

**Regulatory Analysis and Backfit Considerations**  
**for 2011 Final Amendment**  
**10 CFR 50.55a, “Codes and Standards”**

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**U.S. Nuclear Regulatory Commission**  
Office of Nuclear Reactor Regulation



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## **Regulatory Analysis for Final Amendment 10 CFR 50.55a, “Codes and Standards”**

### **1. Purpose of Rulemaking and Structure of This Analysis**

#### **1.1 Purpose of the Final Rulemaking**

The NRC is amending Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a to incorporate by reference:

1. The 2005 Addenda through 2008 Addenda of Section III, Division 1 of the American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code);
2. The 2005 Addenda through 2008 Addenda of Section XI, Division 1, of the ASME Code;
3. The 2005 Addenda and 2006 Addenda of the *Code for Operation and Maintenance of Nuclear Power Plants* (ASME OM Code);
4. ASME Code Case N-722-1, “Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials Section XI, Division 1; and
5. ASME Code Case N-770-1, “Alternative Examination Requirements and Acceptance Standards for Class 1 PWR [pressurized-water reactor] Piping and Vessel Nozzle Butt Welds Fabricated with UNS N06082 or UNS W86182 Weld Filler Material With or Without Application of Listed Mitigation Activities, Section XI, Division 1,” with conditions.

The amendment also removes certain obsolete requirements specified in the NRC’s regulations. This action is in accordance with the NRC’s policy to periodically update the regulations to incorporate new editions and addenda of the ASME Codes by reference, and is intended to maintain the safety of nuclear reactors and make NRC activities more effective and efficient.

. The regulations were last updated by a final rule dated September 10, 2008 (73 FR 52730), and a correction dated October 2, 2008 (73 FR 57235), which incorporated by reference the 2004 Edition of Section III, Division 1, and Section XI, Division 1, of the ASME Code and the 2004 Edition of the ASME OM Code.

#### **1.2 Structure of Regulatory Analysis**

This analysis will not consider regulatory alternatives to incorporating by reference the Code editions because this action complies with the Commission’s Staff Requirements Memorandum (SRM) of April 13, 2000, directing the staff to follow the NRC’s longstanding policy of updating § 50.55a to incorporate by reference newer editions and addenda to the ASME Code and OM Code. ASME Codes are national voluntary consensus standards and, as such, are required by the National Technology Transfer and Advancement Act of 1995, Pub. L. 104-113, to be used by government agencies unless the use of such a standard is inconsistent with applicable law or

otherwise impractical. As such, the remainder of this regulatory analysis will focus only on the regulatory alternatives associated with the required use of ASME Code Cases N-770-1 and N-722-1.

## **2. Identification and Analysis of Alternative Approaches**

This section presents an analysis of the alternatives that the NRC considered with regard to referencing ASME Code Cases N-770-1 and N-722-1. Four regulatory alternatives to address the problem of primary water stress corrosion cracking (PWSCC) in butt welds and reactor coolant pressure boundary visual inspections are considered below.

### **2.1 Option 1: No Action**

Under Option 1, the no-action alternative, the NRC would not amend the current regulations to require the use of Code Case N-770-1. This would leave in place the current ASME inspection requirements for butt welds. The inspection requirements currently contained in the ASME Code, Section XI, were not written to address degradation of Alloy 82/182 butt welds by primary water stress corrosion cracking (PWSCC), and the safety consequences of inadequate inspections can be significant. The NRC's determination that existing inspections of certain Class 1 butt welds are inadequate is based upon operating experience and analysis. The absence of an effective inspection regime could, over time, result in unacceptable circumferential cracking or the degradation of reactor coolant system (RCS) components by corrosion from leaks in these welds. These degradation mechanisms increase the probability of a loss of coolant accident. The current ASME Code requirements for inspection of Alloy 82/182 butt welds are not frequent enough to ensure that ASME Code-allowable limits will continue to be met in the event that PWSCC initiates. This conclusion is based on crack growth rates developed by the Electric Power Research Institute/Materials Reliability Program and on the ASME Code maximum flaw depth allowable limit of 75 percent through-wall. The growth rate of PWSCC in these welds is rapid enough that PWSCC could lead to leakage or rupture before the degradation would be detected by the inspections in the ASME Code, Section XI, currently required by § 50.55a or by the 2005 Addenda through the 2008 Addenda of Section XI. In addition, none of these requirements address inspection of these welds after they are modified to mitigate the welds against degradation by PWSCC.

In the most recent update to § 50.55a, the NRC added new requirements for all licensees of PWRs to augment their ISI program by implementing ASME Code Case N-722, subject to the conditions specified in § 50.55a(g)(6)(ii)(E)(2) through (g)(6)(ii)(E)(4). Under the no-action alternative, licensees would continue implementation of the visual examination of pressure retaining welds fabricated with Alloy 600/82/182 materials in accordance with Code Case N-722 and the conditions of § 50.55a(g)(6)(ii)(E)(2) through (g)(6)(ii)(E)(4). This would require licensees to continue to submit relief requests for flange seal leak-off lines which are not normally exposed to a corrosive environment and are inaccessible for visual examination. ASME Code Case N-722-1, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials Section XI, Division 1," was published in Supplement 8 of the 2007 Edition of the ASME Boiler and Pressure Vessel Code Nuclear Code Case book. This revision of the code case contains one additional note which indicates that visual examination of Alloy 600/82/182 materials in flange seal leak-off lines is not required

## **2.2. Option 2: Issue an NRC Bulletin**

Under Option 2, NRC would issue an NRC Bulletin to address inspection of Alloy 82/182 butt welds for PWSCC and visual examination of Alloy 600/82/182 materials in flange seal leak-off lines. Since 2002, the NRC has issued three bulletins on PWSCC of RCS components and on corrosion of RCS components that could result from leakage from PWSCC. Although these bulletins were highly effective for addressing specific issues, they were not intended to address the range of potential locations susceptible to PWSCC. Furthermore, bulletins are generally issued to collect information and are not an effective regulatory tool for long-term inspection programs. Short term actions to address PWSCC in butt welds were taken by industry as discussed below.

## **2.3. Option 3: Endorse an Industry Program**

Under Option 3, the NRC would endorse an industry program to address inspection of Alloy 82/182 butt welds for PWSCC. The industry took action to address PWSCC in butt welds when it issued MRP-139, "Primary System Piping Butt Weld Inspection and Evaluation Guideline," in 2005. MRP-139 provides schedule guidance to licensees for completing initial and subsequent inspections of primary system piping butt welds originally fabricated with Alloy 82/182. The NRC concluded that the industry's MRP-139 inspections provided an adequate approach to ensuring integrity in the near-term.

Under this option, these actions are not required, but are voluntary. Given the significance of this issue (i.e., reactor coolant pressure boundary integrity), to ensure that all stakeholders understand the NRC's regulatory and technical requirements, and provide the legal basis for compliance with the inspection requirements, the NRC concludes that the regulatory framework needs to be revised to incorporate inspection requirements to address this issue. Hence, for the long term, the NRC concluded (as discussed below) that the § 50.55a requirements need to be revised to ensure that allowable limits would not be exceeded, leakage would not occur, and potential flaws would be detected before they challenged the structural or leakage integrity of piping welds.

## **2.4. Option 4: Amend § 50.55a to Require Use of Code Cases N-770 and N-722-1**

Under Option 4, the NRC would amend § 50.55a to require the use of ASME Code Cases N-770 and N-722-1 as described in the proposed rule. Specifically, the final amendment would add new § 50.55a(g)(6)(ii)(F), "Inspection Requirements for Class 1 Pressurized Water Reactor Piping and Vessel Nozzle Butt Welds," that would require licensees to implement ASME Code Case N-770, with conditions, and revise paragraphs (g)(6)(ii)(E)(1) through (g)(6)(ii)(E)(3) to update the requirement to implement Code Case N-722-1.

ASME Code Case N-770 provides inspection frequencies and methods for Alloy 82/182 butt welds that are unmitigated as well as butt welds that have been mitigated for PWSCC by any of several mitigation methods. However, the code case is not mandatory for industry to follow. Incorporating by reference (with conditions) ASME Code Case N-770 into § 50.55a makes the code case requirements mandatory and resolves the deficiencies in the ASME Code, Section XI, inspection requirements for Alloy 82/182 butt welds by providing inspection requirements

that ensure that ASME Code-allowable limits will not be exceeded and PWSCC will not lead to leaks or ruptures of piping welds. The NRC identified numerous conditions that were proposed on the use Code Case N-770 regarding categorization of welds, inservice inspection of mitigated welds, definitions, deferral of initial examinations, weld residual stress analysis, notification to the NRC staff, and an error and an inconsistency in Appendix I.

ASME Code Case N-722-1, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials Section XI, Division 1," was published in Supplement 8 of the 2007 Edition of the ASME Boiler and Pressure Vessel Code Nuclear Code Case book. This revision of the code case contains one additional note which indicates that visual examination of Alloy 600/82/182 materials in flange seal leak-off lines is not required. Under this option, licensees would no longer need to submit relief requests for flange seal leak-off lines which are not normally exposed to a corrosive environment and are inaccessible for visual examination.

## **2.5 Option 5: Amend § 50.55a to Require Use of Code Cases N-770-1 and N-722-1**

Under Option 5, the NRC would amend § 50.55a to require the use of ASME Code Cases N-770-1 and N-722-1. Specifically, the final amendment would add new § 50.55a(g)(6)(ii)(F), "Inspection Requirements for Class 1 Pressurized Water Reactor Piping and Vessel Nozzle Butt Welds," that would require licensees to implement ASME Code Case N-770-1, with conditions, and revise paragraphs (g)(6)(ii)(E)(1) through (g)(6)(ii)(E)(3) to update the requirement to implement Code Case N-722-1.

ASME Code Case N-770-1 was approved by ASME on January 30, 2009, and was published in Supplement 8 of the 2007 Edition of the ASME Boiler and Pressure Vessel Code Nuclear Code Cases book. ASME Code Case N-770-1 provides inspection frequencies and methods for Alloy 82/182 butt welds that are unmitigated as well as butt welds that have been mitigated for PWSCC by any of several mitigation methods. This revision of the code case addressed many of the conditions the NRC had proposed to mandate on the implementation of Code Case N-770 in Option 4. However, the Code Case is not mandatory for industry to follow. Incorporating by reference (with conditions) ASME Code Case N-770-1 into § 50.55a makes the code case requirements mandatory and resolves the deficiencies in the ASME Code, Section XI, inspection requirements for Alloy 82/182 butt welds by providing inspection requirements that ensure that ASME Code-allowable limits will not be exceeded and PWSCC will not lead to leaks or ruptures of piping welds.

ASME Code Case N-722-1, "Additional Examinations for PWR Pressure Retaining Welds in Class 1 Components Fabricated With Alloy 600/82/182 Materials Section XI, Division 1," was published in Supplement 8 of the 2007 Edition of the ASME Boiler and Pressure Vessel Code Nuclear Code Case book. This revision of the code case contains one additional note which indicates that visual examination of Alloy 600/82/182 materials in flange seal leak-off lines is not required. Under this option, licensees would no longer need to submit relief requests for flange seal leak-off lines which are not normally exposed to a corrosive environment and are inaccessible for visual examination.

The NRC is implementing this option (requiring use of ASME Code Cases N-770-1 and N-722-1) because the inspections currently required by the ASME Code, Section XI, were not written

to address degradation of Alloy 82/182 butt welds by primary water stress corrosion cracking (PWSCC), and the safety consequences of inadequate inspections can be significant. The NRC's determination that existing inspections of certain Class 1 butt welds are inadequate is based upon operating experience and analysis as discussed above in Option 1. Mandating the use of ASME Code Case N-770-1 instead of N-770 proposed in Option 4 allows the NRC to reduce the number of conditions required to implement the code case and therefore reduces the complexity of the final rulemaking. In addition, by requiring the use of ASME Code Case N-722-1, licensees would no longer need to submit relief requests for flange seal leak-off lines which are not normally exposed to a corrosive environment and are inaccessible for visual examination.

### **3. Regulatory Impact - Qualitative/Quantitative Costs and Benefits**

This regulatory examines the costs and benefits associated with incorporating ASME Code Cases N-770-1 and N-722-1 by reference into § 50.55a. First, however, this regulatory analysis discusses disaggregation.

#### **3.1 Disaggregation**

According to Section 4.3.2, "Criteria for the Treatment of Individual Requirements" of the Regulatory Analysis Guidelines of the Nuclear Regulatory Commission, NUREG/BR-0058, Revision 4 (hereafter referred to as Guidelines), in evaluating a regulatory initiative, the NRC usually performs a regulatory analysis for the entire rule to determine whether or not it is cost justified. However, aggregating or bundling different requirements in a single analysis could potentially mask the inclusion of an unnecessary individual requirement. In the case of a rule that provides a voluntary alternative to current requirements, the net benefit from the relaxation of one requirement could potentially support a second unnecessary requirement that is not cost justified. Therefore, under the Guidelines, when analyzing and making decisions about regulatory initiatives that are composed of individual requirements, the NRC must determine if it is appropriate to include each individual requirement (disaggregation).

The Guidelines further state that a special case involves the NRC's periodic review and endorsement of consensus standards, such as new versions of the ASME Code because they tend to be noncontroversial and have already undergone extensive external review and been endorsed by industry. In addition, endorsement of the ASME Code has been longstanding NRC policy. Licensees participate in the development of the ASME Code and know when receiving their operating licenses that updating the ASME Code is part of the regulatory process. Finally, endorsement of the ASME Code is consistent with the National Technology Transfer and Advancement Act, inasmuch as the NRC has determined that there are sound regulatory reasons for establishing regulatory requirements for design, maintenance, inservice inspection and inservice testing by rulemaking.

Evaluating the benefits and costs of each individual provision in a regulatory analysis would be a monumental task and the value gained by performing such an exercise would be limited. These NRC endorsements can typically involve hundreds, if not thousands, of individual provisions. Thus, although regulatory actions endorsing these consensus standards must be addressed in a regulatory analysis, it is not necessary for the regulatory analysis to address the individual provisions of the consensus standards. Therefore, disaggregation will not be

discussed further.

### **3.2 Costs and Benefits for Incorporating by Reference ASME Code Cases N-770-1 and N-722-1**

Requiring the use of ASME Code Case N-770-1 (with conditions) through the addition of new § 50.55a(g)(6)(ii)(F), "Inspection Requirements for Class 1 Pressurized Water Reactor Piping and Vessel Nozzle Butt Welds," would impact licensees. The following estimate of the impacts of codifying the inspection requirements of ASME Code Case N-770-1 do not take into account the fact that the inspections performed under Code Case N-770-1 are similar to the inspections industry is already performing under the MRP-139 initiative.

The NRC has conservatively estimated the cost and radiological dose exposure that a licensee would incur if it were required to perform the inspections detailed in Code Case N-770-1. The NRC estimates a cost of inspection of approximately \$100,000 per plant over a 10-year interval. Given there are 69 PWR units the corresponding industry total costs are \$ 51.3 million (using a 7 percent discount rate) and \$72.0 million (for a 3 percent discount rate). The inspection costs are an overestimate because many licensees do not have all the welds assumed typical for each vendor type and a higher fraction of these welds was assumed to be inspected each interval than required by the code case. The NRC estimates the radiological dose of inspections of approximately 3 rems per plant over a 10-year interval and a one-time exposure for mitigating welds of approximately 30 rems per plant. The NRC estimates bound the values contained in the ASME Regulatory Analysis Summary developed with the code case.

The NRC estimates that the benefit of incorporating ASME Code Case N-722-1 into § 50.55a would be that 25 relief requests (or approximately ½ of the PWR industry) would no longer be submitted, at a savings of \$12,000 per relief request. Instead, these same PWR licensees would need to update their 10-year inservice inspection plan for each of the 25 PWR units to reflect use of this relief provision from N-722-1. This relatively simple plan update would be at a cost of approximately \$800/plant.

## **4. Backfitting Considerations**

### **Introduction**

The NRC's Backfit Rule in § 50.109 states that the NRC shall require the backfitting of a facility only when it finds the action to be justified under specific standards stated in the rule. Section 50.109(a)(1) defines backfitting as the modification of, or addition to, systems, structures, components, or design of a facility; the design approval or manufacturing license for a facility; or the procedures or organization required to design, construct or operate a facility. Any of these modifications or additions may result from a new or amended provision in the NRC rules or the imposition of a regulatory position interpreting the NRC rules that is either new or different from a previously applicable NRC position after issuance of the construction permit or the operating license or the design approval.

The NRC has also adopted analogous "issue finality" provisions in 10 CFR Part 52. Changes to design certification rules are governed by 10 CFR 52.63 and 52.59. Changes to combined

licenses are governed by 10 CFR 52.98. Finality of issues in NRC approvals referenced in combined license applications is governed by 10 CFR 52.83.

Section 50.55a requires nuclear power plant licensees to:

- Construct ASME BPV Code Class 1, 2, and 3 components in accordance with the rules provided in Section III, Division 1, of the ASME Code (Section III”).
- Inspect Class 1, 2, 3, Class MC, and Class CC components in accordance with the rules provided in Section XI, Division 1, of the ASME Code (“Section XI”).
- Test Class 1, 2, and 3 pumps, valves, and dynamic restraints (snubbers) in accordance with the rules provided in the ASME OM Code.

This rule incorporates by reference the 2005 Addenda through 2008 Addenda of Section III, Division 1, and the 2005 Addenda through 2008 Addenda of Section XI, Division 1, of the ASME Code, the 2005 Addenda and 2006 Addenda of the ASME OM Code, and ASME Code Cases N-770-1 and N-722-1.

#### **4.1 Overall Backfitting Considerations: ASME BPV and OM Codes**

ASME BPV and OM codes are national consensus standards developed by participants with broad and varied interests, in which all interested parties (including the NRC and utilities) participate. A consensus process involving a wide range of stakeholders is consistent with the National Technology Transfer and Advancement Act, inasmuch as the NRC has determined that there are sound regulatory reasons for establishing regulatory requirements for design, maintenance, ISI and IST by rulemaking. The process also facilitates early stakeholder consideration of backfitting issues. Thus, the NRC believes that separate NRC consideration of backfitting in the context of the general incorporation by reference of updated editions and addenda is unnecessary.

#### **4.2 Section III of the ASME BPV Code**

Incorporation by reference of more recent editions and addenda of Section III of the ASME BPV Code does not affect a plant that has received a construction permit or an operating license or a design that has been approved, because the edition and addenda to be used in constructing a plant are, under § 50.55a, determined on the basis of the date of the construction permit, and are not changed thereafter, except voluntarily by the licensee. The incorporation by reference of more recent editions and addenda of Section III ordinarily applies only to applicants after the effective date of the final rule incorporating these new editions and addenda. Thus, incorporation by reference of a more recent edition and addenda of Section III does not constitute "backfitting" as defined in § 50.109(a)(1).

This final 10 CFR 50.55a rulemaking does not impose the newly-approved editions and addenda of Section III of the ASME Code on existing design certification rules in 10 CFR Part 52, Appendices A through D. Thus, incorporation by reference of a more recent edition and addenda of Section III is not inconsistent with any of the issue finality provisions in Part 52 applicable to design certifications, as discussed in more detail below. The final § 50.55a rule applies to design certifications which are currently being reviewed by the NRC, as well as to future applicants for design certification. Applicants for design certifications are not protected by

10 CFR 52.63, the issue finality provision applicable to design certifications. Thus, the imposition of Section III requirements (governing design) on current design certification applicants is not inconsistent with the issue finality provision in Part 52 applicable to design certifications. The final rule will apply to future design certification applicants. Future design certification applicants are not protected by § 52.63. This finality provision was not intended to apply to every NRC action which substantially changes the expectations of future applicants under 10 CFR Part 52.

The final § 50.55a rule applies to combined licenses, but there are no combined licenses issued as of the date of this rulemaking. Therefore, there are no finality issues with respect to any existing combined licenses. The final § 50.55a rule applies to combined license applications which are currently being reviewed by the NRC, except that if the application references a certified design, then the requirements of the rule do not directly apply to the referenced design (*i.e.*, by virtue of the design certification being referenced in the combined license application). Applicants for combined licenses are not protected by 10 CFR 52.98, the issue finality provision applicable to combined licenses. Thus, the imposition of Section III requirements (governing design) on current design certification applicants is not inconsistent with the issue finality provision in Part 52 applicable to design certifications. If the combined license application references a final design certification rule, then that portion of the facility's design if governed by the referenced design certification; that design certification is not subject to the requirements of the final § 50.55a rule. Thus, the issue finality provisions of 52.98 are not violated in this circumstance. The final rule will apply to future combined license applicants. Future combined license applicants are not protected by § 52.63. This finality provision was not intended to apply to every NRC action which substantially changes the expectations of future applicants under 10 CFR Part 52.

#### **4.3 Section XI and OM Code – Current Holders of Operating Licenses**

Incorporation by reference of more recent editions and addenda of Section XI of the ASME Code and the ASME OM Code affect the ISI and IST programs of operating reactors. However, the Backfit Rule generally does not apply to incorporation by reference of later editions and addenda of the ASME Code (Section XI) and OM Code. As mentioned above, the NRC's longstanding regulatory practice has been to incorporate later versions of the ASME Codes into § 50.55a. Under § 50.55a licensees must revise their ISI and IST programs every 120 months to the latest edition and addenda of Section XI of the ASME Code and the ASME OM Code incorporated by reference into § 50.55a 12 months prior to the start of a new 120-month ISI and IST interval. Thus, when the NRC endorses a later version of the Code, it is implementing this longstanding regulatory practice and requirement.

Other circumstances where the NRC does not apply the Backfit Rule to the endorsement of a later Code editions and addenda are as follows.

1. When the NRC takes exception to a later ASME Code or OM Code provision but merely retains the current existing requirement, prohibits the use of the later Code provision, limits the use of the later Code provision, or supplements the provisions in a later Code, the Backfit Rule does not apply because the NRC is not imposing new requirements. However, the NRC explains any such exceptions to the Code in the Statement of Considerations and regulatory analysis for the rule.

2. When an NRC exception relaxes an existing ASME Code or OM Code provision but does not prohibit a licensee from using the existing Code provision, the Backfit Rule does not apply because the NRC is not imposing new requirements.

3. Modifications and limitations imposed during previous routine updates of § 50.55a have established a precedent for determining which modifications or limitations are backfits or require a backfit analysis (e.g., final rule dated September 10, 2008 [73 FR 52731], and a correction dated October 2, 2008 [73 FR 57235]). The application of the backfit requirements to modifications and limitations in the current rule are consistent with the application of backfit requirements to modifications and limitations in previous rules.

There are some circumstances in which the endorsement of a later ASME BPV Code or OM Code introduces a backfit. In these cases, the NRC would perform a backfit analysis or documented evaluation in accordance with § 50.109. These include the following:

1. When the NRC endorses a later provision of the ASME Code or OM Code that takes a substantially different direction from the existing requirements, the action is treated as a backfit, see, e.g., 61 FR 41303 (August 8, 1996).

2. When the NRC requires implementation of later ASME Code or OM Code provision on an expedited basis, the action is treated as a backfit. This applies when implementation is required sooner than it would be required if the NRC simply endorsed the Code without any expedited language, see, e.g., 64 FR 51370 (September 22, 1999).

3. When the NRC takes an exception to a ASME Code or OM Code provision and imposes a requirement that is substantially different from the existing requirement as well as substantially different than the later Code, see, e.g., 67 FR 60529 (September 26, 2002).

#### **5. Backfitting Discussion for Changes that Go Beyond Those Necessary to Incorporate by Reference the New ASME BPV and OM Code Addenda, and ASME Code Cases – Currently Operating Reactors**

This section discusses the backfitting considerations for all changes to § 50.55a that go beyond those necessary to incorporate by reference the ASME BPV and OM Code Addenda, and ASME Code Cases which are the subject of this final rule (identified above in section 4). The backfitting discussion for each of these changes to § 50.55a is set forth below.

1. Clarify § 50.55a(a)(3) to indicate that an alternative to the requirements of §§ 50.55a(c), (d), (e), (f), (g), and (h) must be submitted to, and authorized by, the NRC prior to implementing the alternatives. This change does not alter the original intent of this requirement and, therefore, does not impose a new requirement. This change is not a backfit.

2. Remove § 50.55a(b)(2)(i), “Limitations on specific editions and addenda,” § 50.55a(b)(2)(iv), “Pressure retaining welds in ASME Code Class 2 piping,” and § 50.55a(b)(2)(v), regarding the evaluation procedures and acceptance criteria for austenitic piping. These changes delete existing conditions in § 50.55a that no longer apply since licensees no longer use the

associated Code editions and addenda to which the conditions apply. Therefore, these changes are not backfits.

3. Remove § 50.55a(b)(2)(iii) “Steam generator tubing;” revise § 50.55a(b)(2)(xv), “Appendix VIII specimen set and qualification requirements,” and; revise § 50.55a(b)(2)(xviii)(B) and (b)(2)(xviii)(C), “Certification of NDE Personnel,” and revise § 50.55a(b)(2)(xxiv), “Incorporation of the Performance Demonstration Initiative and Addition of Ultrasonic Examination Criteria.” These changes revise existing conditions in § 50.55a that are now addressed in the new Code addenda referenced in this final rulemaking, and consequently the condition applies to older Code editions and addenda. The requirements remain unchanged and, therefore, these changes are not backfits.

4. Amend § 50.55a(b)(2)(xix), “Substitution of alternative methods,” so the conditions for the substitution of alternative examination methods in that paragraph would not apply when using the 2005 Addenda through the 2008 Addenda. The condition states that paragraphs IWA-4520(b)(2) and IWA-4521 of the 2007 Edition of Section XI, Division 1, of the ASME Code, with the 2008 Addenda are not approved for use. This condition does not impact licensees since use of the subject provisions is not currently allowed. Therefore, the amendment is not a backfit.

5. Revise § 50.55a(b)(2)(xxvii), “Removal of Insulation,” to make an editorial change to point to the correct requirements (now re-located) in the ASME Code. This change is not a backfit.

6. Add a new condition as § 50.55a(b)(2)(xxviii), “Analysis of Flaws.” This change adds a new condition on the use of ASME Nonmandatory Appendix A, “Analysis of Flaws,” related to the fatigue crack growth rate calculation for subsurface flaws defined in paragraph A 4300(b)(1) when the ratio of the minimum cyclic stress to the maximum cyclic stress (R) is less than zero. This condition does not impact licensees since the use of the subject provisions is not currently allowed by § 50.55a. Therefore, the addition of this new condition is not a backfit.

7. Add a new condition as § 50.55a(b)(2)(xxv), “Evaluation of Unanticipated Operating Events.” This change adds a new condition on the use of ASME Nonmandatory Appendix E. Appendix E provides acceptance criteria and guidance for evaluating the effects of out-of-limit conditions on structural integrity of the reactor vessel beltline region. The NRC is conditioning the use of Appendix E to specify that Section E-1200 is not acceptable for use because Table E-1 (the acceptance criteria in E-1200) is predicated on the postulation of a 1-inch deep flaw. This condition does not impact licensees since the use of the subject provisions is not currently allowed by § 50.55a. Therefore, the addition of this new condition is not a backfit.

8. Add a new condition as § 50.55a(b)(2)(xxix), “Nonmandatory Appendix R.” This change adds a new condition on the use of ASME Nonmandatory Appendix R “Risk-Informed Inspection Requirements of Piping.” The condition requires licensees to submit an alternative in accordance with § 50.55a(a)(3)(i) and obtain NRC authorization of the proposed alternative prior to implementing Appendix R, RI-ISI programs. This condition does not impact licensees since the use of the subject provisions is not currently allowed by § 50.55a. Therefore, the addition of this new condition is not a backfit.

9. Revise conditions in § 50.55a(b)(3)(v), § 50.55a(g)(2), § 50.55a(g)(3)(i), § 50.55a(g)(3)(ii), the introductory text of § 50.55a(g)(4), § 50.55a(g)(4)(i), and § 50.55a(g)(4)(ii). The changes require that licensees use the provisions for examination and testing snubbers in Subsection ISTD of the ASME OM Code when using the 2006 Addenda and later editions and addenda of Section XI, since the previous provisions for ISI of snubbers (in Article IWF-5000) are now deleted in the 2006 Addenda of Section XI. Snubber inspection requirements have not changed; only the flexibility is reduced since the IWF-5000 requirements were removed from Section XI. These conditions do not result in a change in requirements and are, therefore, not backfits.

10. Revise the condition in § 50.55a(b)(3)(vi), “Exercise interval for manual valves.” The amendment revises the existing requirement for exercising manual valves in § 50.55a(b)(3)(vi) to limit its application to the 1999 through 2005 Addenda of the ASME OM Code. The existing requirement in § 50.55a(b)(3)(vi) does not apply to the 2006 Addenda of the ASME OM Code since the new referenced Code was revised in the 2006 Addenda of the ASME OM Code to address the underlying issue to which the condition applied. These conditions do not result in a change in requirements and are, therefore, not backfits.

11. Clarify § 50.55a(f)(5)(iv), § 50.55a(g)(5)(iii), and § 50.55a(g)(5)(iv). The amendments modify the wording of these requirements to clarify that licensees are required to submit ISI and IST requests for relief based on impracticality within 12 months of the end of the ISI and IST intervals for which relief is being sought. The amendments also clarify the subject requirements to more clearly articulate the requirements for licensee action when compliance with certain code requirements is determined to be impractical. These revisions clarify the current requirements, are considered to be consistent with the meaning and intent of the current requirements, and therefore are not considered to result in a change in requirements. As such, these changes are not backfits.

12. Revise § 50.55a(g)(4)(ii). The existing regulations in § 50.55a(g)(4)(ii) give licensees the option of not performing surface examinations of high-pressure safety injection systems as specified in Section XI, Table IWB-2500-1, “Examination Category B-J,” Item Numbers B9.20, B9.21 and B9.22. Later editions and addenda of Section XI have been modified and the surface examination requirement no longer exists in Table IWB-2500-1, and some of the Item Numbers have either changed or been deleted. Therefore, the condition is revised to provide the proper references. This is an editorial change to revise the condition to reflect the fact that the Code requirements have been deleted. This change is not a backfit.

13. Revise paragraph § 50.55a(g)(6)(ii)(E) “Reactor coolant pressure boundary visual inspections.” The NRC is revising the reference from Code Case N-722 to N-722-1 and to clarify footnote 1 to § 50.55a(g)(6)(ii)(E). Revising the reference from Code Case N-722 to Code Case N-722-1 is a relief to licensees since it removes unnecessary inspections. The wording in the second sentence of footnote 1 to § 50.55a(g)(6)(ii)(E) has generated confusion, and caused some licensees to believe that they need to submit additional relief requests. The second sentence in the footnote is intended to specify what portion of welds has to be inspected during a plant interval that remains after January 1, 2009. The intent was to require licensees to distribute the population such that the portion of welds to be inspected in the remaining portion of the interval is based on the portion of the interval remaining as of January 1, 2009. The

revision clarifies this intent. These conditions do not result in a change in requirements, and are therefore not backfits.

14. Language Changes. This final rule makes several revisions to the regulatory language of § 50.55a including changing: 1) “limitations and modifications” to “conditions;” 2) “provisions” to “conditions;” and 3) “but” to “subject to the following conditions.” In all cases, these changes are meant to clarify the § 50.55a requirements and are not intended to change either the meaning or intent of any of the requirements. These changes are not backfits.

15. Add a new § 50.55a(g)(6)(ii)(F), “Examination requirements for class 1 piping and nozzle dissimilar-metal butt welds.” A new § 50.55a(g)(6)(ii)(F) is added to require licensees to implement ASME Code Case N-770-1, with conditions. Code Case N-770-1 contains baseline and inservice inspection requirements for unmitigated butt welds fabricated with Alloy 82/182 material, and preservice and inservice inspection requirements for mitigated butt welds. The NRC is adding § 50.55a(g)(6)(ii)(F) to require licensees to implement ASME Code Case N-770-1, with conditions, in lieu of the inspections currently required by the ASME Code, Section XI. The action mandating that ASME Code Case N-770-1 be implemented with conditions constitutes a backfit. The NRC has concluded that imposition of ASME Code Case N-770-1 constitutes an adequate protection backfit for the reasons set forth below.

The NRC’s determination that currently required inspections of Alloy 82/182 Class 1 butt welds are inadequate is based upon the degradation of nickel-based Alloy 82/182 butt welds at V. C. Summer, Wolf Creek, and other domestic and foreign plants. The discovery of degradation of similar nickel-based materials in reactor pressure vessel head penetration nozzles at Davis-Besse and the discovery of leaks and cracking of nickel-based materials at other plants, such as Oconee and Arkansas Nuclear One Unit 1, reinforces the need for an effective inspection program of unmitigated as well as mitigated Alloy 82/182 butt welds.

The absence of an effective inspection regime could, over time, result in unacceptable circumferential cracking or the degradation of reactor coolant system components by corrosion from leaks in these welds. These degradation mechanisms increase the probability of a loss of coolant accident. The inspections in the ASME Code, Section XI, are inadequate because Table IWB 2500–1, Examination Categories B–F and B–J of Section XI were not written to address degradation of Alloy 82/182 butt welds by PWSCC. The ASME Code, Section XI, requirements for inspection of Alloy 82/182 butt welds are not frequent enough to ensure that ASME Code-allowable limits will continue to be met in the event that PWSCC initiates. This conclusion is based on crack growth rates developed by the Electric Power Research Institute/Materials Reliability Program and on the ASME Code maximum flaw depth allowable limit of 75 percent through-wall. The growth rate of PWSCC in these welds is rapid enough that PWSCC could lead to leakage or rupture before the degradation would be detected by the inspections of the ASME Code, Section XI, currently required by § 50.55a or by the 2005 through the 2008 Addenda of Section XI. In addition, none of these requirements address inspection of these welds after they are modified to mitigate the welds against degradation by PWSCC.

The general design criteria (GDC) for nuclear power plants (Appendix A to 10 CFR Part 50) or, as appropriate, similar requirements in the licensing basis for a reactor facility, provide bases and requirements for NRC assessment of the potential for, and consequences of, degradation

of the reactor coolant pressure boundary (RCPB). The applicable GDCs include GDC 14 (Reactor Coolant Pressure Boundary), GDC 31 (Fracture Prevention of Reactor Coolant Pressure Boundary), and GDC 32 (Inspection of Reactor Coolant Pressure Boundary). GDC 14 specifies that the RCPB be designed, fabricated, erected, and tested so as to have an extremely low probability of abnormal leakage, of rapidly propagating failure, and of gross rupture. GDC 31 specifies that the probability of rapidly propagating fracture of the RCPB be minimized. GDC 32 specifies that components which are part of the RCPB have the capability of being periodically inspected to assess their structural and leaktight integrity.

The NRC has concluded that ASME Code Case N-770-1 must be mandated to ensure that the requirements of GDC are satisfied. Imposition of ASME Code Case N-770-1, with conditions, will ensure that the requirements of GDC are met because that ASME Code-allowable limits would not be exceeded, leakage would likely not occur, and potential flaws would be detected before they challenged the structural or leakage integrity of piping welds. The NRC is concluding that the regulatory framework for providing adequate protection of public health and safety be accomplished by the incorporation of Code Case N-770-1 into § 50.55a, with conditions.

It is appropriate and necessary for the protection of public health and safety to establish a clear regulatory framework to ensure the integrity of butt welds susceptible to PWSCC. As the requirements of the ASME Code, Section XI, are not sufficient to provide reasonable assurance of adequate protection of public health and safety, the NRC concludes that the final rule requiring implementation of ASME Code Case N-770-1, with conditions as outlined above, constitutes an adequate protection backfit as defined under § 50.109(a)(4)(ii).

## 6. Section XI and OM Code – Combined Licenses under Part 52

Section XI of the ASME Code and the ASME OM Code affect the ISI and IST programs, which are activities implemented by holders of operating licenses, and combined licenses during operation (*i.e.*, after the Commission has made a finding under 10 CFR 52.103(g)). There are no combined licenses issued as of the date of this rulemaking. Therefore, there can be no combined licenses for which the Commission has made a finding under 10 CFR 52.103(g), and consequently there are no issue finality issues with respect to existing combined licenses. The final rule will apply to future combined license applicants during operation. Future combined license applicants are not protected by § 52.98. This finality provision was not intended to apply to every NRC action which substantially changes the expectations of future applicants under 10 CFR Part 52.

## 7 Conclusion

The NRC finds that it is beneficial to incorporate by reference into § 50.55a the 2005 Addenda through 2008 Addenda of Section III, Division 1, of the ASME Code subject to the identified conditions; the 2005 Addenda through 2008 Addenda of Section XI, Division 1, of the ASME Code, subject to the identified conditions; the 2005 Addenda and 2006 Addenda of the ASME OM Code subject to the identified conditions; Code Case N-722-1; and Code Case N-770-1 subject to the identified conditions.

## **8. Implementation**

The final rule becomes effective, consistent with the previous § 50.55a Code updates, 30 days after it is published in the *Federal Register*. Section 50.55a(g)(6)(ii)(F) requires licensees of existing pressurized water reactors to implement the Code Case N-770-1 requirements by the first refueling outage that occurs 60 days after the effective date of the final rule.