ATTACHMENT 2

REGULATORY ANALYSIS FOR PROPOSED AMENDMENT TO 10 CFR 50.55a, "CODES AND STANDARDS"

1. OBJECTIVE OF THE REGULATORY ACTION

The U.S. Nuclear Regulatory Commission (NRC) is proposing to amend its regulations to incorporate by reference a later edition and addenda of the American Society of Mechanical Engineers (ASME) *Boiler and Pressure Vessel Code* (BPV Code) and the ASME *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code) to provide updated rules for construction, inservice inspection (ISI), and inservice testing (IST) of components of light-water cooled nuclear power plants. The proposed rule identifies the latest edition and addenda of the ASME BPV Code and OM Code that the NRC has approved for use, subject to certain limitations and modifications. The ASME BPV Code and OM Code are national consensus standards developed by participants with broad and varied interests, in which all interested parties (including the NRC and utilities) participate.

Section 50.55a requires that nuclear power plant owners (1) construct Class 1, 2, and 3 components in accordance with the provisions in Section III, Division 1, "Requirements for Construction of Nuclear Power Plant Components," of the ASME BPV Code; (2) inspect Class 1, 2, 3, metal containment (MC) and concrete containment (CC) components in accordance with the provisions in Section XI, Division 1, "Requirements for Inservice Inspection of Nuclear Power Plant Components," of the ASME BPV Code; and (3) test Class 1, 2, and 3 pumps and valves in accordance with the provisions in the ASME OM Code. At this time, the 1998 Edition with the 2000 Addenda is the latest edition and addenda of the ASME BPV Code and OM Code incorporated by reference in § 50.55a.

This proposed rule would amend § 50.55a to incorporate by reference the 2001 Edition and the 2002 and 2003 Addenda of (1) Section III, Division 1, of the ASME BPV Code subject to modifications and limitations; (2) Section XI, Division 1, of the ASME BPV Code subject to modifications; and (3) the ASME OM Code with no new modifications or limitations.

Incorporation by reference of more recent editions and addenda of Section III, Division 1, of the ASME BPV Code do not effect 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, by rule, 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, Division 1, of the ASME BPV Code is required by the National Technology Transfer and Advancement Act of 1995, Pub. L. 104-113 (agencies are required to use technical standards that are developed or adopted by voluntary consensus standards bodies unless the use of such a standard is inconsistent with applicable law or is otherwise impractical). This draft regulatory analysis identifies any portions of Section III, Division 1, of the ASME BPV Code that are not being adopted, and discusses the need for and impacts of conditions (modifications and limitations) placed on the use of the Code.

The incorporation by reference of more recent editions and addenda of Section XI, Division 1, of the ASME BPV Code, and the ASME OM Code is treated differently than the incorporation by reference of Section III, Division 1, of the ASME BPV Code because §§ 50.55a(f) and (g) require that licensees update their IST and ISI programs every 120 months to a more recent edition and addenda. The automatic update of IST programs under § 50.55a(f) and ISI programs under § 50.55a(g) exists in tandem with the endorsement of more recent editions and addenda of the ASME Code in § 50.55a under Pub. L. 104-113 as an integrated regulatory structure. Therefore, in addition to identifying portions of Section XI, Division 1, of the ASME BPV Code or the ASME OM Code that are not being adopted and discussing the need for and impacts of the conditions placed on the use of the Code, this draft regulatory analysis addresses the expected benefits and costs associated with implementation of the 2001 Edition and the 2002 and 2003 Addenda of Section XI and the ASME OM Code.

2. REGULATORY IMPACT - QUALITATIVE/QUANTITATIVE COSTS AND BENEFITS

The 2001 Edition and the 2002 and 2003 Addenda of Section XI, Division 1, of ASME BPV Code and the ASME OM Code provide new and revised provisions for the ISI of reactor coolant system (RCS) boundary components and containments, and testing of pumps and valves in nuclear power plants. The new and revised provisions in the 2001 Edition and the 2002 and 2003 Addenda of Section XI of the ASME BPV Code and ASME OM Code clarify, relax, reorganize, or supplement existing provisions; codify industry practices that up to now, have not been addressed in the Code; or provide new ISI examination and analytical methods.

The assurance of the integrity of the reactor coolant system (RCS) boundary and the containment is one of the cornerstones of the NRC regulatory approach. ISI programs are relied upon to provide additional assurance, through application of the defense-in-depth philosophy, of the integrity of these barriers and to compensate for uncertainties. ISI requirements that assure the integrity of the RCS boundary and containment relate to defense-in-depth considerations that do not lend themselves to cost/benefit analyses. Furthermore, experience has shown that RCS components degrade as they age, and ISI programs are relied upon to manage the effects of aging on components. Cost/benefit analyses are not well suited to assess the appropriateness of new requirements that address aging on components because of the many uncertainties associated with the effects of aging.

The costs and benefits associated with licensees updating their ISI and IST programs to a new edition and addenda of the ASME Code every 120 months are difficult to quantify because neither the NRC staff nor ASME performs detailed quantified cost and benefit analyses of the individual changes to the ASME Code. The burden associated with revising ISI and IST programs and procedures every 120 months versus the cost savings associated with implementing new, more cost-effective methods for ISI and IST in newer editions and addenda of the ASME Code has not been determined. However, the staff notes that considerations of increased safety versus cost are implicit in the ASME consensus process. Although the Code revisions may not be rigorously analyzed for costs versus benefits, the costs and benefits are implicitly weighed in the course of their development.

The NRC's longstanding policy has been to update § 50.55a to keep current the ASME Code editions and addenda incorporated by reference. Section 50.55a requires licensees to revise their ISI and IST programs every 120 months to the latest edition and addenda of Section XI of the ASME BPV Code and the ASME OM Code incorporated by reference in § 50.55a that are in effect 12 months prior to the start of a new 120-month ISI and IST interval. Thus, when the

NRC endorses a more recent version of the Code, it is implementing this longstanding policy and requirement.

In conclusion, the assessment used to justify this regulatory action is primarily based on judgment rather than specific cost estimates. However, the following are estimates of the cost savings associated with revising § 50.55a to incorporate by reference the 2001 Edition and the 2002 and 2003 Addenda of Section XI of the ASME BPV Code and OM Code.

Elimination of Relief Valve Pressure Test

Paragraph IWA-4132(e) of Section XI of the ASME BPV Code (2001 Edition) eliminated the requirement to pressure test relief valves rotated from stock provided that the rotation is only for testing the removed relief valve. This reduces recordkeeping because records associated with relief valve pressure test procedures and pressure test are no longer required. It is estimated that 20 relief valves are tested during a refueling outage, there are 6 refueling outages in each 10 year ISI interval, and it takes 0.5 person-hours to complete the recordkeeping for each relief valve pressure test. The annual decrease in industry recordkeeping burden is estimated to be 624 person-hours (20 tests/outage X 6 outages/interval X 104 units X 0.5 person-hours/pressure test ÷ 10 years). The annual decrease in industry cost is $49,920 (624 person-hours X $80/hour).

The elimination of the relief valve pressure test also reduce the number of pressure tests. It is estimated that it costs $1000 per relief valve pressure test. The annual decrease in industry cost is $1,248,000 (20 tests/outage X 6 outages/interval X 104 units X $1000 ÷ 10 years).

The total annual decrease in industry cost is $1,297,920 ($49,920 + $1,248,000).

Elimination of Containment Pressure Test

Paragraph IWL-5210 of Section XI of the ASME BPV Code (2002 Addenda) eliminated the requirement to perform a containment pressure test following repair/replacement of containment post-tensioning tendons and components. This reduces recordkeeping because elimination of the containment pressure test also eliminates records required for the tests. It is estimated that a total of 2 containment pressure tests are eliminated in a 10 year period (total for industry), and it takes 100 person-hours to complete the recordkeeping for each containment pressure test. The annual decrease in industry recordkeeping burden is estimated to be 20 person-hours (2 pressure tests X 100 person-hours/pressure test ÷ 10 years). The annual decrease in industry cost is $1600 (20 person-hours X $80/hour).

The elimination of the containment pressure test also reduces testing and equipment down time. It is estimated that it costs $250,000 to conduct a containment pressure test. The annual decrease in industry cost is $50,000 (2 tests X $250,000 ÷ 10 years).

The total annual decrease in industry cost is $51,600 ($1600 + $50,000).

Elimination of Insulation Removal Requirement

Paragraph IWA-5242 of Section XI of the ASME BPV Code (2003 Addenda) eliminated the requirement to remove insulation from bolted connections in borated systems when performing a system leakage test provided that the bolting is resistant to boric acid corrosion. This revision reduces recordkeeping because records for the installation/removal of insulation and the installation/removal of scaffolding to support the removal/installation of insulation are no longer required when bolting resistant to boric acid corrosion is installed in a borated system. It is estimated that this revision will eliminate the need to remove/install insulation and scaffolding for 10 bolted connections for each pressurized water reactor each 10-year ISI interval, and that it this would reduce recordkeeping by 10 person-hours. The annual decrease in industry recordkeeping burden is estimated to be 69 person-hours (69 units X 1 person-hours ÷ 10 years). The annual decrease in industry cost is $5,520 (69 person-hours X $80/hour).

The elimination of the requirement to remove insulation also reduces maintenance costs and occupational exposure. It is estimated that it costs $10,000 to install/remove insulation and scaffolding for each bolted connection. The annual decrease in industry cost is $690,000 (10 bolted connections X $10,000 X 69 units ÷ 10 years). It is estimated that the occupational exposure to install/remove insulation and scaffolding for each bolted connection is 0.250 person-rem. The annual decrease in industry cost due to the decrease in occupational exposure is $34,500 (10 bolted connections X 0.250 person-rem X $2000 person-rem converted X 69 units ÷ 10 years). (The NRC currently uses a conversion factor of $2000 per person-rem to reflect the monetary worth of radiation exposure.)

The total annual decrease in industry cost is $730,020 ($5,520 + $690,000 + $34,500).

Pressure Testing of Mechanical Joints

The requirements to pressure test Class 1, 2, and 3 mechanical joints undergoing repair and replacement activities were deleted in the 1999 Addenda of Section XI. Therefore, pressure testing of mechanical joints is not required by Section XI when performing IWA-4000 repair and replacement activities when using the 1999 and 2000 Addenda of Section XI. The NRC is proposing to reinstate the pressure and testing requirements when using the 2001 Edition through 2003 Addenda because there is no justification for eliminating the requirements for pressure testing Class 1, 2, and 3 mechanical joints. This proposed modification (§50.55a(b)(2)(xxvi)) will increase test requirements which will increase costs. It is estimated that reinstatement of this pressure test will result in each licensee performing two additional tests every year at $5,000 per test to conduct a pressure test of a mechanical joint. The annual increase in industry cost is $1,040,000 (2 tests X $5,000 X 104 units).

Total

The total estimated change in industry annual costs is $1,039,540 ($1,040,000 - $1,297,920 - $51,600 - $730,020). Annual cost estimates are multiplied by a factor of 7.02 to determine a present value assuming a 7-percent discount rate over a 120-month interval. The present value of this cost decrease is $7,297,571 (7.02 X $1,039,540).

3. **PORTIONS OF THE ASME CODE THAT ARE NOT BEING ADOPTED**

Piping Design Criteria For Reversing Dynamic Loads

The proposed amendment would add modifications and limitations, § 50.55a(b)(1)(vi)(A) through (F), that prohibit or supplement as discussed below the use of certain piping design criteria for reversing dynamic loads in the 2001 Edition and the 2002 and 2003 Addenda of Section III of the ASME BPV Code. These provisions involve the alternative method for evaluating reversing dynamic loads. Reversing dynamic loads are defined as those loads which cycle about a mean value and include building filtered loads, seismic (earthquake) loads, and reflected wave loads.

The alternative method for evaluating reversing dynamic loads was revised in the 1994 Addenda of Section III. The new provisions in the 1994 Addenda were based, in part, on industry evaluations of the data from tests performed under sponsorship of the Electric Power Research Institute (EPRI) and NRC. After reviewing changes in the 1994 Addenda, the NRC determined that the alternative method was unacceptable because evaluation of the test data did not support the changes. An ASME special working group was established to reevaluate the bases for the alternative method for evaluating reversing dynamic loads that was revised in the 1994 Addenda. An NRC sponsored research program was also initiated to evaluate the technical issues regarding the adequacy of the new provisions in the 1994 Addenda. These technical issues are summarized in NUREG/CR-5361, "Seismic Analysis of Piping," dated June 1998. The technical issues summarized in NUREG/CR-5361 were subsequently evaluated by ASME committees, and Section III of the ASME BPV Code has been revised to resolve the technical issues in NUREG/CR-5361. However, in the NRC's view, several technical issues in NUREG/CR-5361 have not been satisfactorily resolved. These technical issues are discussed below.

10 CFR 50.55a(b)(1)(vi)(A) - Reflected Waves Caused by Flow Transients

NB-3200, NB-3600, NC-3600, and ND-3600 of the 2001 Edition and the 2002 and 2003 Addenda allow the alternative method for evaluating reversing dynamic loads to be applied to calculations for piping subject to loads generated by reflected waves caused by flow transients (sudden closure of a valve is an example of a condition that could create a flow transient). Members on ASME committees used data from tests performed under the sponsorship of EPRI and NRC that focused on seismic loading conditions to demonstrate that use of the alternative method for evaluating reversing dynamic loads for piping subject to loads provided acceptable design margins. As discussed in NUREG/CR-5361, the limited amount of test data does not support a finding the design margin is adequate for these types of loadings. Therefore, the NRC is proposing to disallow the use of the alternative method for evaluating reversing dynamic loads for piping subject to loads generated by reflected waves caused by flow transients in NB-3200, NB-3600, NC-3600, and ND-3600.

10 CFR 50.55a(b)(1)(vi)(B) - Inelastic Analysis for Evaluating Reversing Dynamic Loads

NB-3228.6 of the 2001 Edition and the 2002 and 2003 Addenda provides alternative provisions for performing an inelastic analysis for evaluating reversing dynamic loads. The NRC is proposing to disallow the use of NB-3228.6. As discussed in NUREG/CR-5361, the NRC's and industry's review of the limited amount of test data does not support a finding that the design margin is adequate. In addition, it would require validation of the nonlinear material modeling (constitutive relationships) in order to justify selection of the material models because of the high sensitivity of the dynamic analysis to these material models.

10 CFR 50.55a(b)(1)(vi)(C) - Level A and B Service Limit Loadings

NC-3653.2(d) and ND-3653.2(d) of the 2001 Edition and the 2002 and 2003 Addenda provide a separate equation for evaluating reversing dynamic loads from other design basis loadings for Level A and B service limits. The NRC is proposing to disallow the use of NC-3653.2(d) and ND-3653.2(d) because it has not been demonstrated that these provisions provide an adequate design margin and why treatment of reversing dynamic loads separate from other design basis loads is acceptable. The NRC is proposing the use of NC-3653.1 and NC-3653.2 instead of NC-3653.2(d), and ND-3653.1 and ND-3653.2 instead of ND-3653.2(d). Analysis using NC-3653.1 or ND-3653.1 must include pressure and reversing dynamic loads that are not required to be combined with nonreversing dynamic loads, and the allowable B_2‘ stress indices defined in NC-3655(b)(3) may be used in these analyses. The anchor motions associated with reversing dynamic loads must be included as an anchor displacement in the definition of M_C when applying NC-3653.2 or ND-3653.2.

10 CFR 50.55a(b)(1)(vi)(D) - Appendix N Linear Elastic Response Spectrum Analysis

NB-3656(b)(3), NC-3655(b)(3), and ND-3655(b)(3) of the 2001 Edition and the 2002 and 2003 Addenda provide a definition of the moment, $M_{E,}$ to be used in the evaluation of reversing dynamic loads. The moment definition states that reversing dynamic loads must be computed from a linear elastic response spectrum analysis as defined in Appendix N of Section III. Linear elastic response spectrum analysis requirements are also addressed in the licensing basis for each nuclear power plant. Appendix N linear elastic response spectrum analysis provisions may be less conservative than licensing basis linear elastic response spectrum analysis provisions. The NRC is proposing to disallow the use of Appendix N in applications when Appendix N linear elastic response spectrum analysis provisions are less conservative than licensing basis linear elastic response spectrum analysis provisions. A licensee would be required to compare the Appendix N linear elastic response spectrum analysis provisions to its licensing basis linear elastic response spectrum analysis provisions, and use the provisions that provide the most conservative calculation of M_E. In addition, establishing a Code requirement to use Appendix N to develop reversing dynamic loads for new plant applications may restrict an applicant's use of other suitable methods for developing reversing dynamic loads.

10 CFR 50.55a(b)(1)(vi)(E) - Stress Indices for Tees and Elbows

NB-3656(b)(3), NC-3655(b)(3), and ND-3655(b)(3) of the 2001 Edition and the 2002 and 2003 Addenda specify the maximum allowable B_2‘ stress indices for tees and elbows when using the alternative method for evaluating dynamic reversing loads. The allowable B_2‘ stress indices specified in ND-3655(b)(3) are not consistent with the allowable B_2‘ stress indices specified in NB-3656(b)(3) and NC-3655(b)(3). The allowable B_2‘ stress indices of 3/4 up to B_2 for tees and elbows as specified in NB-3656(b)(3) and NC-3655(b)(3) are acceptable. The NRC is proposing to disallow the use of the B_2‘ stress indices specified in ND-3655(b)(3), and to require that the allowable B_2‘ stress indices specified in NB-3656(b)(3) and NC-3655(b)(3) be used instead of the allowable B_2‘ stress indices specified in ND-3655(b)(3). The NRC is proposing to disallow the use of the B_2' stress indices specified in ND-3655(b)(3) for tees and elbows because the safety margins associated with this application have not been established.

10 CFR 50.55a(b)(1)(vi)(F) - Anchor Motions

The proposed amendment would allow the use of an allowable stress limit of $6S_M$ in the evaluation of the range of resultant moment only when it is demonstrated that the global piping system response to the anchor movement does not create significant inelastic strain concentrations when using the provisions in NB-3656(b)(4), NC-3655(b)(4), and ND-3655(b)(4). The proposed amendment would not require a demonstration that the anchor movement does not create significant inelastic strain concentrations if an allowable stress limit of $3S_M$ is used instead of $6S_M$ in the evaluation of the range of resultant moment. NB-3656(b)(4), NC-3655(b)(4), and ND-3655(b)(4) of the 2001 Edition and the 2002 and 2003 Addenda provide provisions for evaluating anchor motions when using the alternative method for evaluating reversing dynamic loads. The allowable bending stress limit of $6S_M$ in NB-3656(b)(4), NC-3655(b)(4), and ND-3655(b)(4) is used in conjunction with the elastic analysis of the piping system. However, significant inelastic strains in the piping system could occur at the $6S_M$ stress limit. The elastic analysis of the piping system will ensure that the inelastic piping strains will remain within acceptable limits as long as the global piping system behaves elastic. However, if a significant strain concentration exists in the piping system, the maximum strain may be much greater than would be predicted by an elastic analysis. These larger strains could result in failure of the piping. The use of an allowable stress limit of $3S_M$ instead of $6S_M$ is acceptable because the adequacy of the $3S_M$ stress limit has been satisfactorily demonstrated by operating experience for thermal loads.

These proposed modifications and limitations would revise or supplement calculations that are used for the design of piping in nuclear power plants. Although the alternative method for evaluating reversing dynamic loads was revised in the 1994 Addenda, the NRC has not approved the use of the alternative method for evaluating reversing dynamic loads in the 1994 through 2000 Addenda of Section III. Use of the alternative method for evaluating reversing dynamic loads in the 2001 Edition and the 2002 and 2003 Addenda of Section III is being approved by the NRC subject to proposed modifications and limitations. Use of the alternative method for evaluating reversing dynamic loads is less restrictive than other existing design piping design methods approved for use in the 1994 through 2000 Edition and Addenda, and therefore, will result in a cost savings when constructing new piping systems.

IWL-4110(b)(3) Corrosion Protective Medium

IWL-4110 of Section XI defines the scope of the repair and replacement activities associated with concrete containments. IWL-4110(b) specifies those items that are exempt from repair and replacement activity requirements. A new provision, IWL-4110(b)(3), was added in the 2002 Addenda exempting the removal, replacement, or addition of concrete containment post-tensioning system CPM from repair and replacement requirements. It is not clear if the removal, replacement, or addition of concrete containment post-tensioning system CPM was intended to be considered by IWL-4000 to be a repair and replacement activity in editions and addenda of Section XI prior to the 2002 Addenda. However, prior to the 2002 Addenda, IWL-4000 specifies that the CPM must be restored following a concrete containment post-tensioning system repair and replacement activity.

The proposed modification, § 50.55a(b)(2)(viii)(G), would supplement the requirements for restoring corrosion protection medium (CPM) following the performance of IWL-4000 repair and replacement activities on concrete containment post-tensioning systems. CPM is applied to containment post-tension system components to prevent corrosion. The function of the containment post-tension system is to retain pressure and CPM is relied upon to maintain the integrity of the containment post-tension system. Therefore, the restoration of concrete containment post-tensioning system CPM is important to ensure that the containment integrity and load capacity satisfy design basis requirements under accident conditions. For example, the acceptable concentration of water soluble chlorides, nitrates and sulfides of the replacement CPM must be verified. The amount of CPM to be installed and the method used to apply the CPM must be specified. Therefore, the NRC is supplementing IWL-4000 repair and replacement requirements in the 2002 and 2003 Addenda, to clarify that CPM must be restored following concrete containment post-tensioning system repair and replacement activities in accordance with the quality assurance program requirements specified in IWA-1400.

There is no impact associated with this proposed modification. This modification is a clarification of existing requirements.

IWA-2220 Surface Examinations

The proposed modification, § 50.55a(b)(2)(xxii), would prohibit the use of a new provision in IWA-2220. The provisions of Code Case N-615, "Ultrasonic Examination as a Surface Examination Method for Category B-F and B-J piping Welds," were incorporated into IWA-2220 in the 2001 Edition of Section XI of the ASME BPV Code. Code Case N-615 and IWA-2220 (2001 Edition and the 2002 and 2003 Addenda) allow a surface examination to be conducted using an ultrasonic (UT) examination method. The UT examination is conducted from the inside surface of certain piping welds. Other allowable surface examination methods (magnetic particle or liquid penetrant) are conducted from the outside surface of certain piping welds. The purpose of the these surface examinations is to identify flaws in the outer surface of the weld. The NRC disallowed the use of Code Case N-615 and is proposing to prohibit the use of the same type of UT examination specified in IWA-2220 because there are no provisions in Section XI that address how to ensure proper consideration of flaws in the outer surface of a piping weld when conducting a UT examination from the inside surface of the piping weld. Provisions for a demonstrated, and standardized repeatable UT methodology for this type of UT examination needs to be added to Section XI in order to ensure consistent implementation among all licensees.

There is no impact associated with this proposed modification. This modification would prohibit the use of the later Code provision and retain current existing requirements in the 1998 Edition with the 2000 Addenda of Section XI.

IWA-4461.4.2 Evaluation of Thermally Cut Surfaces

The proposed modification, 50.55a(b)(2)(xxiii), would supplement the use of the new provisions in IWA-4461.4.2 that allow the elimination of mechanical processing of a thermally cut surface. Sub-section IWA-4461.4.2 was added in the 2001 Edition to allow the elimination of mechanical processing of a thermally cut surface when, due to field conditions, mechanical processing is deemed impractical. Thermal cutting is a process for removing metal from a weld or base metal. Thermal cutting includes processes such as oxy-acetylene cutting, plasma-arc cutting, laser-beam cutting, and air-carbon arc gouging. These processes can leave cracks, stress risers, very rough surfaces, or heavy oxidation on the cut surface that can seriously degrade the material toughness or corrosion resistance of the material or leave large residual stresses in the material. If the thermally disturbed surface is not mechanically processed, such as, grinding, machining, or filing, or properly evaluated, these defects could be incorporated into the final weld, possibly compromising the integrity and quality of the weld.

The provisions in IWA-4461.4.2 allow the elimination of mechanical processing of thermally cut surfaces provided that the tests and inspections and the analysis specified in IWA-4461.4.2(a)(1) through (5) are considered by an evaluation. It is unclear to the NRC if Code provisions that state that specific items that must be considered by evaluation are intended to be mandatory or optional requirements. The NRC believes that the provisions specified in IWA-4461.4.2(a)(1) through (5) specify the appropriate tests and inspections and analysis for eliminating the mechanical processing of thermally cut surfaces provided that all these actions are performed. These actions are necessary to ensure proper evaluation of cracks, stress risers, oxidation, or other contamination of cut surfaces that could exist in the final weld which would seriously degrade the material toughness or corrosion resistance of the material. Therefore, the NRC is proposing that all the tests and inspections and the analysis specified in IWA-4461.4.2(a)(1) through (5) must be performed whenever a thermally cut surface is not mechanically processed.

Discussion with ASME members indicate that it is the intent of the Section XI to require that all the tests and inspections and the analysis specified in IWA-4461.4.2(a)(1) through (5) must be performed whenever a thermally cut surface is not mechanically processed. Therefore, there is no impact associated this modification.

Appendix VIII and the Supplements to Appendix VIII and Article I-3000

The proposed limitation, § 50.55a(b)(2)(xxiv), would prohibit the use of Appendix VIII and the supplements to Appendix VIII, and Article I-3000 in the 2002 and 2003 Addenda of Section XI of the ASME BPV Code. The elements of the Performance Demonstration Initiative (PDI) program was added to Appendix VIII and its supplements in the 2002 Addenda of Section XI of the ASME BPV Code. The PDI is an organization formed for the purpose of developing efficient, cost-effective, and technically sound ultrasonic (UT) performance demonstration methods to meet Appendix VIII requirements. The PDI program has evolved as programs were developed for each Appendix VIII supplement. Article I-3000, Examination Coverage, was also added in the 2002 Addenda to provide UT examination coverage criteria for certain welds.

The final rule dated September 22, 1999 (64 FR 51370), requires licensees to implement Appendix VIII and its supplements. The essential elements of the PDI program were added to the final rule as § 50.55a(b)(2)(xv). Section 50.55a(b)(2)(xv) also provides UT examination coverage criteria. Licensees are currently implementing Appendix VIII and its supplements in accordance with § 50.55a(b)(2)(xv). Although the NRC, ASME, and PDI have made considerable progress in the development of UT qualification and inspection requirements, the addition of the PDI program and UT examination coverage criteria into Section XI are not complete at this time. As a result, conflicts exist between the modifications in § 50.55a(b)(2)(xv), and the provisions in Appendix VIII and its supplements and Article I-3000 in the 2002 and 2003 Addenda of Section XI of the ASME BPV Code. Therefore, Appendix VIII and its supplements can not be implemented in accordance with § 50.55a(b)(2)(xv) when using the 2002 and 2003 Addenda. Consequently, the NRC plans to prohibit the use of Appendix VIII and its supplements and Article I-3000 beyond the 2001 Edition until the addition of the PDI program and the addition of UT examination coverage criteria into Section XI are complete.

There is no impact associated with this proposed modification. This modification would prohibit the use of the later Code provision and retain current existing requirements in § 50.55a(b)(2)(xv).

IWA-4340 Mitigation of Flaws

The proposed modification, § 50.55a(b)(2)(xxv), would prohibit the use of the provisions in IWA-4340 when using the 2001 Edition and the 2002 and 2003 Addenda of Section XI of the ASME BPV Code. IWA-4340 was added in the 2000 Addenda to provide requirements for the mitigation of defects by "modification". Paragraph IWA-4340 allows a defect to remain in a component provided that the defect can be eliminated from the pressure boundary by "modification".

The scope of the activity envisioned or permitted by this subsubarticle is not clear. The subsubarticle does not provide limitations on the applicability of its provisions to specific to ASME Classes or components. As written, this provision could be used in applications with widely varying safety significance and levels of difficulty in implementation, ranging from the elimination of a defect in a Class 1 item or component, such as a penetration of the lower head of the reactor vessel to the encapsulation of a defect on a straight section of Class 3 moderate energy piping. IWA-4340 has no prohibition on the number of times it can be used to mitigate the same defect. Therefore, if the flaw propagated “beyond the limits of the modification” implemented under the provisions of IWA-4340, a licensee could, for example, encapsulate the previous modification with another larger modification. This could result in unusual and unforeseeable design configurations.

IWA-4520(b)(2) exempts piping, pump and valve welding or brazing that does not penetrate the pressure boundary from any pressure test. Since the modification to mitigate the defect will become the new pressure boundary and the modification may be attached to the pressure boundary by welds that do not penetrate the pressure boundary, pressure testing may not be required. The NRC does not accept the elimination of pressure testing requirements for a modification that will function as a pressure boundary.

Since this subsubarticle does not provide specificity for the types of modifications or limitations on the applicability of its provisions to specific ASME Classes or items, the NRC is unable to determine whether the “modifications” under the provisions of this paragraph would maintain safety and ensure the protection of public health and safety.

IWA-4340(c) requires that each licensee define the successive examinations to be performed after the completion of the "modification". As currently stated, the purpose of the successive examinations is to monitor the flaw to detect propagation of the flaw beyond the limits of the modification and, when practicable, to validate the projected growth. The terminology “beyond the limits of the modification” needs to be more specifically defined. For example, it is not clear by these words if a flaw would be permitted to propagate outside the physical boundary of the “modification” if it had not reached the level of a defect. The NRC also does not agree with the inclusion of the “when practicable” limitation in IWA-4340(c). The flaw propagation must be validated to accurately predict when, or if, the flaw will become unacceptable. IWA-4340(c), as written, does not require that a licensee’s examination program predict propagation of the flaw such that the licensee would be able to identify, in advance, a flaw that is expected to propagate outside the area physically modified such that corrective action could be taken. In IWA-4340, each licensee would be responsible for determining the method of examinations to be performed and the frequency at which the examinations would be performed. In addition, each licensee would be permitted to define the acceptance criteria for these examinations. The NRC notes that the ASME Code currently contains rules for successive examination of flaws left in service as addressed in IWB-2420, and that more stringent examination requirements for defects left in service may be needed. However, since IWA-4340(c) has not defined an examination process which would require examinations at a frequency, based on flaw propagation rate, that would require a licensee to identify in advance when a flaw is projected to propagate outside the physical configuration of the "modification", and the acceptance limits specified as "beyond the limits of the modification" are somewhat ambiguous, the NRC is unable to determine whether the examinations and acceptance criteria prepared by each licensee under the provisions of this paragraph would maintain safety and ensure the protection of public health and safety. Furthermore, the provisions of IWA-4340(c) could result in inconsistent examination requirements and acceptance criteria being applied at different facilities for the same type of mitigating action.

Although the use of IWA-4340 is permitted when using the 1998 Edition with the 2000 Addenda of Section XI, this modification would prohibit the use of IWA-4340 when using the 2001 Edition and the 2002 and 2003 Addenda of Section XI. Licensees using the 2001 Edition with the 2002 and 2003 Addenda of Section XI would be required to obtain written permission from the NRC to isolate a flaw by modification or perform a design change in accordance with 10 CFR 50.59. However, flaws seldom occur that can be isolated by modification. Therefore, the impact of this modification in negligible.

<u>IWA-4540 Pressure Testing Mechanical Joints</u>

The proposed modification, 10 CFR 50.55a(b)(2)(xxvi), would supplement the test provisions in IWA-4540 of the 2001 Edition and the 2002 and 2003 Addenda of Section XI of the ASME BPV Code to require that Class 1, 2, and 3 mechanical joints be pressure tested in accordance with IWA-4540(c) of the 1998 Edition of Section XI. The requirements to pressure test Class 1, 2, and 3 mechanical joints undergoing repair and replacement activities were deleted in the 1999 Addenda of Section XI. Therefore, pressure testing of mechanical joints is no longer required by Section XI when performing IWA-4000 repair and replacement activities. The NRC is proposing to reinstate the pressure and testing requirements in IWA-4540(c) of the 1998 Edition when using the 2001 Edition through 2003 Addenda because there is no justification for eliminating the requirements for pressure testing Class 1, 2, and 3 mechanical joints. The NRC believes that pressure testing of mechanical joints affected by repair and replacement activities is necessary to ensure and verify structural and leakage integrity of the pressure boundary. However, the NRC is requesting that comments on the proposed rule provide additional information that can be used to justify the elimination of the pressure tests requirements in IWA-4540(c) of the 1998 Edition of Section XI. The NRC will review any additional information that is provided and in the final rule, reevaluate if it is necessary to reinstate the pressure testing requirements for Class 1, 2, and 3 mechanical joints when using the 2001 Edition and the 2002 and 2003 Addenda of Section XI.

This proposed modification will increase test requirements which will increase costs.

IWA-5242 Removal of Insulation

The proposed modification, § 50.55a(b)(2)(xxvii), would supplement the use of a new provision in IWA-5242(a) to require that insulation be removed when conducting visual examinations on bolting susceptible to stress corrosion cracking. The provisions of Code Case N-616, “Alternative Requirements for VT-2 Visual Examination of Classes 1, 2, and 3 Insulated Pressure Retaining Bolted Connections Section XI, Division 1," were added to IWA-5242 in the 2003 Addenda of Section XI of the ASME BPV Code. Code Case N-616 and IWA-5242(a) (2003 Addenda) allow periodic VT-2 examinations be performed without having to remove insulation from corrosive resistant bolting that has a chromium content greater than or equal to 10 percent installed in borated systems.

The purpose of the provisions in IWA-5242 is to periodically examine bolted connections for evidence of boric acid leakage. The NRC conditionally accepted the use of Code Case N-616 and proposes to apply the same conditions to IWA-5242(a) when 17-4 PH stainless steel or 410 stainless steel studs or bolts installed in borated systems were aged at a temperature below 1100°F or with a hardness above R_c 30; and when the preload for A-286 stainless steel studs or bolts installed in borated systems is 100 ksi or higher. The 17-4 PH stainless steels and the 410 stainless steels installed in borated systems are susceptible to stress corrosion cracking when aged at a temperature below 1100°F or have a hardness above R_c 30. A-286 stainless steel studs or bolts are also susceptible to stress corrosion cracking when preloaded to 100 ksi or higher. Thus, the insulation must be removed when visually examining these bolting materials.

There is no impact associated with this proposed modification. This modification would prohibit the use of the later Code provision and retain current existing requirements in the 1998 Edition with the 2000 Addenda of Section XI.

IWA-4226.1 Reconciliation of Quality Assurance Requirements

The proposed modification, § 50.55a(b)(2)(xxviii), would supplement a new provision in IWA-4226.1 to require that repair/replacement components be manufactured, procured, and controlled as safety-related under a quality assurance program meeting the requirements of Appendix B to 10 CFR Part 50. The purpose of IWA-4226.1 (2003 Addenda) and Code Case N-554-2, “Alternative Requirements for Reconciliation of Replacement Items and Addition of New Systems, Section XI, Division 1," is to provide requirements for reconciling design requirements when using later editions of a construction code or Section III. However, IWA-4226.1 and Code Case N-554-2 do not require reconciliation of the quality assurance requirements for certification, Code symbol stamping, data reports, and authorized Inspection. For example, a component manufactured in a commercial shop that does not have a quality assurance program could be used in a safety-related application without having to reconcile quality assurance requirements. The NRC conditionally accepted the use of Code Case N-554-2, by requiring that repair/replacement components be manufactured, procured, and controlled as safety-related under a quality assurance program meeting the requirements of Appendix B to 10 CFR Part 50. The proposed modification in (b)(2)(xviii) would impose the same quality assurance requirements on IWA-4226.1.

There is no impact associated with this proposed modification. This modification would prohibit the use of the later Code provision and retain current existing requirements in the 1998 Edition with the 2000 Addenda of Section XI.

4. REGULATORY OPTIONS

A regulatory analysis normally identifies several regulatory options with respect to how to accomplish the desired rulemaking and best meet the agency's performance goals of maintaining safety, increasing public confidence, reducing unnecessary regulatory burden, and making NRC activities and decisions more effective, efficient, and realistic. However, regulatory options are not addressed in this draft regulatory analysis because the Commission's staff requirements memorandum dated April 13, 2000, directed the staff to follow the NRC's longstanding policy of updating § 50.55a to incorporate by reference newer editions and addenda to the ASME BPV Code and OM Code. If, in the future, the staff determines that it is not appropriate to conduct routine § 50.55a updates, the staff will submit a rulemaking plan with regulatory options to the Commission for its consideration.

5. CONCLUSION

The NRC staff finds that it is beneficial to incorporate by reference in § 50.55a the 2001 Edition and the 2002 and 2003 Addenda of (1) Section III, Division 1, of the ASME BPV Code for the construction of Class 1, Class 2, and Class 3 components subject to modifications and limitations; (2) Section XI, Division 1, of the ASME BPV Code for inspection of Class 1, Class 2, Class 3, Class MC, and Class CC components subject to modifications and limitations; and (3) the ASME OM Code for testing of Class 1, Class 2, and Class 3 pumps and valves with no new modifications.

The staff believes that effective ISI programs based on a broad technical consensus standard maintain safety by providing confidence that the integrity of the RCS pressure boundary and containment are maintained, and that the effects of component aging are adequately managed. The assurance of the integrity of the RCS pressure boundary and the containment is one of the cornerstones of the NRC regulatory system. ISI programs are relied upon to provide additional assurance, through application of the defense-in-depth philosophy, of the integrity of these barriers and to compensate for uncertainties. Further, experience has shown that RCS pressure boundary components degrade as they age, and ISI programs are relied upon to manage the effects of aging. ISI requirements that assure the integrity of the RCS pressure boundary and containment relate to defense-in-depth considerations that do not lend themselves to cost/benefit analyses.

In general, new and revised provisions in Section XI of the ASME BPV Code and ASME OM Code clarify, reorganize, relax or supplement existing provisions; codify industry practices that are not addressed in earlier editions and addenda; or provide more efficient ISI and IST methods. Therefore, timely endorsement of new ASME Code editions and addenda in 10 CFR 50.55a would reduce the number of licensee requests to continue to use alternatives to previous Code requirements (or for relief from previous impractical Code requirements) during mandatory ISI and IST program 120-month updates. Further, implementing a new edition of the ASME Code can result in cost savings that offset the costs associated with updating ISI and IST programs because new ASME Code editions and addenda would permit the use of more cost-effective methods for ISI and IST. However, the costs and benefits associated with licensees updating their ISI and IST programs to a new edition and addenda of the ASME Code every 120 months are difficult to quantify because neither the NRC staff nor ASME performs detailed quantified cost and benefit analyses of the individual changes to the ASME Code. The burden associated with revising ISI and IST programs and procedures every 120 months versus the cost savings associated with implementing new, more cost-effective methods for ISI and IST in newer editions and addenda of the ASME Code has not been determined. However, the staff notes that considerations of increased safety versus cost are implicit in the ASME consensus process. Although the Code revisions may not be rigorously analyzed for costs versus benefits, the costs and benefits are implicitly weighed in the course of their development. In addition, ASME has responded to recent NRC initiatives by developing risk-informed ISI and IST provisions that focus resources on safety significant systems and components and reduce unnecessary burden.

Timely NRC endorsement of new ASME Code editions and addenda would increase public confidence as a result of the use of the most up-to-date technologies and methods for the ISI and IST of nuclear power plant components.

In some instances, timely endorsement of new ASME Code editions and addenda would make NRC activities more effective and efficient. For example, licensees' requests to use alternatives to the Code requirements would be eliminated in cases where the new edition and addenda that the licensee is updating to have been revised to eliminate the need for the request. However, in other instances, licensees occasionally request NRC approval to use specific provisions in a new edition and addenda of Section XI of the ASME BPV Code or ASME OM Code which result in additional requests to the NRC. For example, licensees that are midway through the 120-month ISI or IST interval submit requests to the NRC for approval to use a recently-approved ISI or IST method in a new edition or addenda of the ASME Code without updating to the full edition or addenda.

6. IMPACT ON SMALL ENTITIES

In accordance with the Regulatory Flexibility Act of 1980, 5 U.S.C. 605(b), the Commission has certified that this rule will not have a significant economic impact on a substantial number of small entities. This final rule affects only the licensing and operation of nuclear power plants. The companies that own these plants do not fall within the scope of the definition of small entities set forth in the Regulatory Flexibility Act or the size standards established by the NRC (10 CFR 2.810).