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

1. OBJECTIVE OF THE REGULATORY ACTION

The U.S. Nuclear Regulatory Commission (NRC) is amending 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 final 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, and 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 final rule amends § 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 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 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 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 NRC 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 costs associated with updating ISI and IST programs to the 2001 Edition and the 2002 and 2003 Addenda of Section XI of the ASME BPV Code and ASME 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 reduces 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).

Insulation Removal Requirements

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. 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. However, the modification in

(b)(2)(xxvii) of the final rule requires that insulation be removed when conducting visual examination on bolting susceptible to stress corrosion cracking. This modification offsets the reductions created by IWA-5242 in the 2003 Addenda. It is estimated that this revision combined with the modification 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 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 combined with the modification 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).

50.55a(b)(2)(xxv) - IWA-4340 Mitigation of Flaws

IWA-4340 was added in the 2000 Addenda and provides 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." This modification increases paperwork because licensees using the 2001 Edition with the 2002 and 2003 Addenda of Section XI are required to obtain written permission from the NRC to isolate a defect by modification. It is estimated that 2 requests would be required for each 10 year ISI interval, and that it takes 16 person-hours to complete the paperwork for each request. The annual increase in industry burden is estimated to be 3328 person-hours (2 requests/interval X 104 units X 16 person-hours/request). The total annual increase in industry cost is $266,240 (3328 person-hours X $80/hour).

(b)(2)(xxvi) - Pressure Testing of Mechanical Joints

The requirement to pressure test Class 1, 2, and 3 mechanical joints undergoing repair and replacement activities was 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 reinstating the pressure testing requirement when using the 2001 Edition through 2003 Addenda because there is no justification for eliminating the requirement for pressure testing Class 1, 2, and 3 mechanical joints. This 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 $773,300 ($1,040,000 + $266,240 - $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 $5,428,566 (7.02 X $773,300).

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

50.55a(b)(2)(viii)(G) - Restoration of Corrosion Protective Medium

The modification in (b)(2)(viii)(G) supplements the requirements for restoring corrosion protection medium (CPM) following the performance of IWL-4000 repair and replacement activities on concrete containment post-tensioning systems. 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.

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.

This modification prohibits the use of a new provision in the 2002 Addenda and retains requirements in the 1998 Edition with the 2000 Addenda of Section XI. The impact associated with this modification is minimal because licensees will be required to document CPM activities in the repair/replacement plan. Licensees would not be required to document CPM activities in the repair/replacement plan if this modification was not adopted in the final rule.

50.55a(b)(2)(xxii) - Surface Examination

The modification in (b)(2)(xxii) prohibits 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 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 prohibited the use of Code Case N-615 and is prohibiting the use of the same type of UT examination specified in IWA-2220 because there are no provisions in Section XI that address qualification requirements and performance demonstration criteria and requirements 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.

Appendix I of Section XI requires that all piping examinations be performed in accordance with Appendix VIII qualified procedures and personnel. The final rule dated September 22, 1999 (64 FR 51370), requires that licensees implement Appendix VIII and the supplements to Appendix VIII on an expedited basis. The NRC imposed this requirement on an expedited basis because there were shortcomings in the qualifications of personnel and procedures in ensuring the reliability of nondestructive examination of the reactor vessel and other components of the RCS pressure boundary. The NRC believes that the imposition of performance demonstration in Appendix VIII and its supplements has enhanced the overall level of assurance of the reliability of UT examination techniques in detecting and sizing flaws. Therefore, the NRC is not able to approve the use of new UT provisions in Section XI because qualification requirements and performance demonstration criteria for the new UT provision are not addressed in Appendix VIII.

This modification prohibits the use of a new provision in the 2001 Edition and retains requirements in the 1998 Edition with the 2000 Addenda of Section XI. The impact associated with this modification must be determined on a case-by-case basis. Shielding and insulation must be removed in order to conduct a surface examination. Shielding and insulation do not have to be removed to conduct a UT from the inside surface of the component. However, the system must be opened to gain access to the inside surface when conducting a UT. The system does not have to be opened to conduct a surface examination.

50.55a(b)(2)(xxiii) - Evaluation of Thermally Cut Surfaces

The modification in (b)(2)(xxiii) prohibits the use of the new provision in IWA-4461.4.2 to require that the tests and inspections and the analysis specified in IWA-4461.4.2(a)(1) through (5) be considered by an evaluation. 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. IWA-4461.4.2 allows the elimination of mechanical processing of thermally cut surfaces provided that the adverse effects associated with the elimination of mechanical processing are documented in an evaluation.

The NRC believes that it is impracticable to justify the elimination of mechanical processing of a thermally cut surface in a documented evaluation as specified in IWA-4461.4.2 because it is not possible to evaluate the adverse effects that can occur as a result of thermal cutting without performing appropriate tests, inspections, and analysis. For example, the provisions in IWA-4461.4.2 could be used to eliminate mechanical processing for a carbon arc-gouging cut that removed a hanger in a high radiation area. If the cut is made too close to the load-bearing component, the metal on the load-bearing component could be affected by an errant arc

touching the load-bearing surface or allowing some of the cutting spatter to become attached to the load-bearing surface, leaving an arc strike, a heat-affected zone or a stress riser on the surface. Also, if the cut is made too close to the final surface, a heat-affected zone from the cut could be left in the final load-bearing surface or a very rough, highly oxidized or carburized surface could be left very near the final load-bearing surface. The area around the cut must be inspected to make certain that the cutting has not damaged the surface of the component. Elimination of the inspection in a documented evaluation would not be adequate even for this simple thermal cutting example. Furthermore, the cut must be a safe distance from the surface of the component to eliminate any possibility of leaving a mechanical (a rough, oxidized or carburized surface) or metallurgical (a heat affected zone) stress riser near or in the surface of the component. The exact distance from the cut surface must be determined by qualification testing of the configuration not by a documented evaluation.

This modification prohibits the use of a new provision in the 2001 Edition and retains requirements in the 1998 Edition with the 2000 Addenda of Section XI. The impact associated with this modification must be determined on a case-by-case basis. The costs associated with mechanically processing a thermal cut surface depends on the thermal removal method that is used and the location and material of the cut surface. The costs associated with an evaluation are also difficult to quantify because the extent of the evaluation required by the Code would also depend on many different factors such as the soundness of the cut, material toughness, and corrosion resistance.

50.55a(b)(2)(xxiv) - Appendix VIII and the Supplements to Appendix VIII and Article I-3000

The limitation in (b)(2)(xxiv) prohibits 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 were 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 (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, differences exist between the modifications in (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 (b)(2)(xv) when using the 2002 and 2003 Addenda. Article I-3000 requires that the UT coverage provisions be applied when using UT examination procedures, equipment, and personnel qualified by performance demonstration in accordance with Appendix VIII. The NRC believes that allowing the use of the UT coverage requirements in Article I-3000 would require revising the existing UT coverage requirements in (b)(2)(xv) to

provide licensees the choice of continuing to use the existing UT coverage requirements in (b)(2)(xv) or using the UT coverage requirements in Article I-3000. It is not the NRC's intention to periodically revise (b)(2)(xv) to add new elements of the PDI program as the program evolves. The purpose of the modification in (b)(2)(xv) is to provide a short-term solution that allows licensees to implement an Appendix VIII program. The long-term solution is to add the elements of the PDI program to Section XI or develop a code case that can be used to implement Appendix VIII and remove (b)(2)(xv) from 10 CFR 50.55a. Consequently, the NRC is prohibiting 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.

This modification prohibits the use of the new UT coverage provisions in the 2002 Addenda and retains the UT coverage requirements in § 50.55a(b)(2)(xv). This modification will increase costs because UT coverage requirements in the 2002 Addenda are less comprehensive than the UT coverage requirements in (b)(2)(xv). The cost increase would have to be determined on a case-by-case basis based on the UT performance method that is used and the configuration of the piping.

50.55a(b)(2)(xxv) - IWA-4340 Mitigation of Flaws

IWA-4340 was added in the 2000 Addenda and provides 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 NRC is not approving the use of IWA-4340, 2001 Edition through 2003 Addenda for the following reasons.

Section XI does not specifically address mitigation of defects by "modification" in the editions and addenda prior to the 2000 Addenda. The NRC is also unaware of any ASME Section XI interpretation that specifically addresses mitigation of defects by "modification." Furthermore, the NRC has authorized many alternatives pursuant to § 50.55a(a)(3) that are similar to those in IWA-4340. These alternatives were authorized on a case-by-case basis and addressed pressure testing, flaw growth evaluation, and reexamination requirements. Licensees believed these modifications were not permitted by the ASME Code and, therefore, concluded that authorizations of alternatives were necessary. Although some Section XI code cases address repair of defects on a limited basis, such as the use of weld overlays, new provisions for repairing defects were added in the 2000 Addenda.

In some instances, the NRC has previously approved the use of mitigative methods or alternatives that could fall under the provisions of IWA-4340, but the methods approved by the NRC were significantly more comprehensive than those in IWA-4340. For example, the NRC approved the use of Code Case N-504-2, "Alternative Rule for Repair of Class 1, 2, and 3 Austenitic Stainless Steel Piping," in Regulatory Guide 1.147. The NRC notes that the provisions in Code Case N-504-2 are significantly more comprehensive than the provisions required by IWA-4340. The NRC has also authorized use of weld overlays as corrective action for intergranular stress corrosion cracking in plant-specific submittals. Authorization was based on adequate flaw growth evaluation, examination frequency, and pressure testing provided by licensees in its proposed alternative. However, the NRC has also disapproved the use of mitigative methods that would be allowed under IWA-4340. For example, the NRC disapproved the use of Code Case N-562-1, "Alternative Requirements for Wall Thickness Restoration of

Class 3 Moderate Energy Carbon Steel Piping," in Regulatory Guide 1.193, "ASME Code Cases Not Approved For Use." The NRC disapproved the use of Code Case N-562-1 because the ASME Code and the code case do not provide criteria for determining the rate of the extent of degradation of the repair or surrounding base metal and do not specify examination requirements.

IWA-4520(b)(3) exempts piping, pump and valve welding or brazing that does not penetrate through the pressure boundary from any pressure test. The NRC believes that pressure testing of a new pressure boundary weld is a requirement. However, the NRC is concerned that licensees could interpret the provisions in IWA-4540(b)(3) that pressure tests are not required for certain IWA-4340 modifications such as an encapsulation of a defect that does not yet, but eventually could, breach the pressure boundary, for example. The NRC believes that pressure testing the "modification" is necessary to validate the structural integrity of the "modification."

IWA-4340(c) requires that each licensee define the successive examinations to be performed after the completion of the "modification." The purpose of the successive examinations is to monitor the defect to detect propagation beyond the limits of the "modification" and, when practicable, to validate the projected growth of the defect. The Code is unclear as to whether it permits a defect to propagate outside the physical boundary of the "modification" or requires that a licensee's examination program predict propagation of the defect such that the licensee would be able to identify, in advance, a defect that is expected to propagate outside the area physically modified such that corrective action could be taken. The NRC believes that IWA-4340(c) is unacceptable because it does not specify minimum periodic examinations that are capable of validating the predicted defect growth assumptions. The NRC believes that it is appropriate for the Code to establish minimum periodic examination requirements. Licensees may always do more than Code minimum requirements.

Section XI, Appendix I, Ultrasonic Examination, directs users to the specific examination methods to be followed including the performance demonstration requirements of Appendix VIII for certain components. IWA-4340(a) states that defects shall be characterized using nondestructive examination but has no specific requirements regarding nondestructive examination methods to be used. The NRC believes that IWA-4340(a) should specify the qualification requirements and examination methods by reference to existing rules in the Code where applicable, or where not applicable, the process to be followed to demonstrate the capability of the techniques to be used.

IWA-4340 could be used to mitigate non-planar defects, such as caused by flow accelerated corrosion or microbiological induced corrosion. The ASME has issued certain code cases, such as Code Cases N-561-1, "Alternative Requirements for Wall Thickness Restoration of Class 2 and High Energy Class 3 Carbon Steel Piping," and N-562-1, dealing with wall thickness restoration for non-planar defects. The NRC has found these code cases to be unacceptable because of the absence of criteria concerning the extent and rate of degradation of the repair and reinspection frequencies and because the root cause of the degradation may not be mitigated. For similar reasons, the NRC finds IWA-4340 unacceptable for use to mitigate non-planar defects.

Licensees have proposed to mitigate circumferential defects above the partial penetration weld in control rod drive nozzles by partially removing the defect and replacing the removed material with weldment, thereby "embedding" the defect. The NRC has found such proposals to be

unacceptable because of the possibility of additional cracking in the embedding weld and because of safety concerns posed by severance of the nozzle. The NRC finds IWA-4340 unacceptable because it could be used to mitigate such defects.

As written, if a defect were to propagate beyond the limits of a modification, IWA-4340 could be used more than once to mitigate the defect in this location. The NRC believes this is unacceptable because it would represent a failure of the original evaluation of the projected growth and the ability of the modification to contain or isolate the defective area.

Licensees using the 2001 Edition with the 2002 and 2003 Addenda of Section XI are required to obtain written permission from the NRC to isolate a defect by modification. The modification in 50.55a(b)(2)(xxv) will increase paperwork which will increase costs. The costs associated with the modification are addressed in Section 2 of this regulatory analysis.

50.55a(b)(2)(xxvi) - IWA-4540 Pressure Testing Mechanical Joints

The modification in (b)(2)(xxvi) supplements 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 final rule retains 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. Pressure testing of mechanical joints affected by repair and replacement activities is necessary to ensure the leakage integrity of the pressure boundary.

The NRC believes that it is inappropriate to rely on regulations or programs other than the Code, such as testing requirements in Appendix B of 10 CFR 50, “Quality Assurance Criteria for Nuclear Power Plants and Fuel Reprocessing Plants,” to provide detailed test requirements for mechanical joint repair and replacement activities. With the exception of Section XI, there are no other NRC regulations that provide detailed guidance on pressure testing mechanical joints that are repaired or replaced in accordance with Section XI. The test requirements in Section XI are technically correct and are also consistent with the test requirements in Appendix B of 10 CFR 50.

This modification reinstates a provision that was deleted in the 1999 Addenda. The modification in 50.55a(b)(2)(xxvi) will increase test requirements which will increase costs. The costs associated with the modification are addressed in Section 2 of this regulatory analysis.

50.55a(b)(2)(xxvii) - IWA-5242 Removal of Insulation

The modification in 50.55a(b)(2)(xxvi) supplements 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.

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 precipitation-hardended (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 Rockwell Method C hardness value above 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 Rockwell Method C hardness value above 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.

This modification prohibits the use of a new provision in the 2003 Addenda on bolted material that is susceptible to SCC. This modification offsets reductions in costs created by the revision to IWA-5242 in the 2003 Addenda. The increase in costs associated with the modification in (b)(2)(xxvi) are combined with the decrease in costs for the new code provision in IWA-5242 and are addressed in Section 2 of this regulatory analysis.

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 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

Use of the 2001 Edition and the 2002 and 2003 Addenda of Sections III and XI, Division 1 of the ASME BPV Code and the ASME OM Code will reduce unnecessary regulatory burden. The number of licensee requests to use alternatives to previous Code requirements (or for relief from previous impractical Code requirements) will decrease because the 2001 Edition and the 2002 and 2003 Addenda of Sections III and XI, Division 1 of the ASME BPV Code and the ASME OM Code have been revised to eliminate the need for the request. 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.

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. The cost estimates in Section 2 of this regulatory analysis indicate a reduction of costs when using the 2001 Edition and 2002 and 2003 Addenda of ASME Section XI and the OM Code. 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 analysis 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.

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).