REGULATORY ANALYSIS FOR PROPOSED AMENDMENT

1. Statement of the Problem and Objective

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 nuclear power plant components of light-water cooled nuclear power plants. The proposed rule identifies the latest edition and addenda of the ASME BPV and OM Codes that have been approved for use by the NRC subject to certain limitations and modifications.

The regulations in 10 CFR 50.55a require that nuclear power plant Owners: (1) Construct Class 1, 2, and 3 components in accordance with the provisions provided 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 provided 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 provided in the ASME OM Code.

The regulations in 10 CFR 50.55a also require that licensees revise their ISI and IST programs every 120 months to the edition and addenda of the ASME Code incorporated by reference into 10 CFR 50.55a and that is in effect 12 months prior to the start of the new 120-month interval; permit licensees to voluntarily update their construction, ISI, and IST programs at any time to the most recent edition and addenda of the ASME BPV and/or OM Codes incorporated by reference in 10 CFR 50.55a with the approval of the NRC; and specify the edition and addenda of Section III of the ASME BPV Code that must be applied to the construction of reactor coolant pressure boundary components and Quality Group B and C components.

The NRC proposes to amend its regulations in 10 CFR 50.55a to incorporate by reference the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of Division 1 rules of Section III of the ASME BPV Code; the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of Division 1 rules of Section IX of the ASME BPV Code; and the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of the ASME OM Code for construction, ISI, and IST of components in nuclear power plants. The NRC is proposing that: (1) Section III of the ASME BPV Code is acceptable for use with no new proposed limitations or modifications; (2) Section XI of the ASME BPV Code is acceptable for use subject to proposed limitations and modifications; and (3) The ASME OM Code is acceptable for use subject to one proposed modification.

2. Identification and Preliminary Analysis of Alternative Approaches

Alternative 1- Elimination of 120-Month Update Requirement

Alternative 1 proposes to eliminate the requirement to update ISI and IST programs every 120 months and establish the 1995 Edition with the 1996 Addenda (as currently incorporated by reference in 10 CFR 50.55a) of the ASME BPV Code, Section XI, and ASME OM Code as the baseline Code for ISI and IST requirements. The ASME BPV Code has been revised on a continuing basis over the years to provide improved requirements for inspecting pressure boundary components and testing pumps and valves in nuclear power plants. Certain IST provisions for pumps and valves originally contained in Section XI of the ASME BPV Code are now replaced in Section XI by references to ASME OM standards on which the ASME OM Code is based. Although some Code revisions have strengthened requirements and others have relaxed requirements, over a long period of time, the evolution of the ASME Code generally results in a net improvement in the measures for inspecting piping and components and testing pumps and valves. The overall level of safety achieved by adherence to a baseline edition or addenda of the ASME Code incorporated by reference in the regulations may be sufficient and adequate, and that unnecessary burden might be placed upon licensees by the required updating of their ISI and IST programs. The NRC would continue to review the periodic revisions to the ASME Code to determine whether any new ISI or IST provisions meet the backfit requirements of 10 CFR 50.109 to mandate their implementation by nuclear power plant licensees.

For future nuclear power plants, Alternative 1 would continue the regulatory requirement that components conform to ISI and IST requirements stated in the latest edition and addenda of the ASME Code incorporated by reference in the regulations 1 year before issuance of the operating license. Future licensees would meet these ISI and IST requirements, according to the limitations and modifications specified in the regulations, to the extent practical within the design, geometry, and materials of construction of the components. As with existing licensees, Alternative 1 would eliminate the requirement for future licensees to update their ISI and IST programs periodically.

Alternative 1 does not propose to alter the regulatory requirements for implementation of Section III of the ASME BPV Code for the design and construction of nuclear power plant components. The NRC regulations would continue to require future applicants for a construction permit to implement the latest edition and addenda of Section III of the ASME BPV Code incorporated by reference in the regulations when the construction permit is issued.

In addition to resource expenditures, eliminating the requirement for licensees to update their ISI and IST programs every 120 months might affect license amendments, inspections, enforcement actions, and Code effectiveness related to ISI and IST programs. For example, the current requirements of 10 CFR 50.55a determine the ASME Code edition and addenda in effect during each 120-month interval for a given plant. When a licensee implements a subsequent edition or addenda of the ASME Code, the licensee's commitment may be documented in a periodic update of the licensee's Final Safety Analysis Report. However, if a licensee seeks to adopt something less than the entire Code, as approved by the NRC, a relief request to use the proposed alternative would be necessary. With respect to inspection activity, elimination of the 120-month update requirement could result in NRC inspectors having to

evaluate a wider range of Code editions and addenda, and portions thereof. Also, eliminating the 120-month update requirement might affect the staff's process for preparing regulatory guides that endorse ASME Code cases, or current initiatives by the NRC staff and industry on risk-informed ISI and IST programs. Over the long term, the elimination of the periodic update requirement might affect the technical quality of the ASME Code as a result of reduced interest in future editions of the Code by the NRC and industry organizations with the establishment of a baseline Code edition.

In SECY-00-0011, "Evaluation of the Requirement for Licensees to Update Their ISI and IST Programs every 120 Months," dated January 14, 2000, the staff reported to the Commission on the results of its evaluation of the regulatory requirement for nuclear power plant licensees to update their ISI and IST programs every 120 months, presenting options for Commission consideration. The staff recommended establishment of the ISI/IST program baseline requirements as the 1995 Edition with the 1996 Addenda of the ASME Code as described above, which was then (and is currently) incorporated by reference in 10 CFR 50.55a. In a staff requirements memorandum dated April 13, 2000, the Commission disapproved the staff's recommendation and approved maintaining the current requirement that licensees update their ISI and IST programs every 120 months to the latest edition and addenda of the ASME Code incorporated by reference in NRC regulations. Therefore, Alternative 1 will no longer be addressed in this regulatory analysis.

Alternative 2 - No Action

The requirements in 10 CFR 50.55a currently incorporate by reference editions and addenda of the ASME BPV Code up to and including the 1995 Edition with the 1996 Addenda, and the 1995 Edition with the 1996 Addenda of the ASME OM Code. Alternative 2 proposes no action at this time. The requirements in 10 CFR 50.55a would not be revised to incorporate by reference the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of the ASME BPV and OM Codes. The NRC would evaluate in the future the need to revise 10 CFR 50.55a to incorporate by reference editions and addenda of the ASME BPV and OM Codes later than the 1995 Edition with the 1996 Addenda. The NRC staff review of the changes in the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda finds that there are substantial changes to the Code requirements that licensees desire to use (see Estimation and Evaluation of the Values and Impact for Alternative 3 in the following sections). Therefore, the NRC staff concludes that it would not be beneficial to industry to take no action at this time.

Alternative 3 - Revise 10 CFR 50.55a to Incorporate by Reference a Later ASME Code Edition and Addenda

Alternative 3 proposes to amend the regulations in 10 CFR 50.55a to incorporate by reference the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of Division 1 rules of Section III of the ASME BPV Code with no new proposed limitations or modifications; the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of Division 1 rules of Section IX of the ASME BPV Code subject to proposed limitations and modifications; and the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of the ASME OM Code subject to one proposed modification.

3. Estimation and Evaluation of the Values and Impacts

Estimates of the values and impacts associated with revising 10 CFR 50.55a to incorporate by reference the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of the ASME BPV and OM Codes as discussed in Alternative 3 are as follows. Annual cost estimates have been multiplied by a factor of 7.02 to determine a present value assuming a 7 percent discount rate over a 120-month interval.

(i) The 1998 Edition of Section XI of the ASME BPV Code revised the requirements in Table IWB-2412-1, Table IWC-2412-1, and Table IWD-2412-1 to increase the maximum examinations that can be credited during the first inspection from 34 to 50 percent. Increasing the maximum examinations that can be credited during the first inspection period would improve the efficiency of the ISI inspections and tests conducted during the first inspection period, and therefore, the cost of the inspections would decrease. It is estimated that it would take approximately 2000 hours to conduct the inspections scheduled for the first inspection period, and the cost of these inspections would decrease from $2000 to $1900 an hour for a total savings of $100 an hour due to the improved efficiency. It is estimated that increasing the maximum examinations credited during the first inspection from 34 to 50 percent under Alternative 3 would decrease industry's cost approximately $20,600,000 each 120-month interval ($100/hour x 2000 hours x 103 units). The present value is $14,461,200 ($20,600,000/10 (annual cost) x 7.02).

(ii) The 1998 Edition of Section XI of the ASME BPV Code deleted the requirement in IWE-2200(g) to perform a visual examination of paint and coatings reapplied to containment surfaces. The visual examination of paint and coatings reapplied to containment surfaces is now performed by other programs, and personnel who perform these inspections are no longer required to be qualified in accordance with Section XI requirements. Therefore, the deletion of the requirement in IWE-2200(g) to perform a visual examination of paint and coatings reapplied to containment surfaces will result in a cost savings because it will reduce the number of personnel that are required to maintain qualifications in accordance with the examination provisions in Section XI. It is estimated that licensees would be able to reduce the number of Section XI qualified examiners by 3 people over the 120-month interval. It costs approximately $1000 per year for 1 person to maintain the Section XI visual examination qualifications. It is estimated that the deletion on the visual examination of paint and coating reapplied to containment surfaces under Alternative 3 would decrease industry's cost approximately $231,750 each 120-month interval ($75/hour x 3 people x 10 years x 103 units). The present value is $162,689 ($231,750/10 (annual cost) x 7.02).

(iii) The requirement in IWE-2420(c) of Section XI to reexamine areas containing flaws, areas of degradation, or repairs during 3 consecutive inspection periods was revised in the 1998 Edition. The 1998 Edition states that when reexaminations reveal that the flaws or areas of degradation are essentially unchanged for the next inspection period, these areas no longer require reexamination. The requirement to reexamine repairs during 3 consecutive inspection periods was deleted. The revision to IWE-2420(c) will reduce the number of reexaminations that are conducted each inspection period, and it is estimated that approximately 5 fewer reexaminations would be conducted each inspection period. It is estimated that it takes approximately 1 hour to conduct each

reexamination, and that there are 3 inspection periods every 120-month interval. It is estimated that revising the reexamination requirements for flaws, areas of degradation, or repairs under Alternative 3 would reduce industry's cost approximately $115,875 each 120-month interval ($75/hour x 5 hours x 3 inspection periods x 103 units). The present value is $81,344 ($115,875/10 (annual cost) x 7.02).

(iv) The provisions of Table IWE-2500-1, Examination Category E-A, Items E1.10 and E1.11, were relaxed in the in the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of Section XI of the ASME BPV Code to no longer require a torque test of each containment bolted connection. It is estimated that there are approximately 50 bolted containment connections in each unit and that it takes approximately 24 hours to perform a torque test on each bolted connection. It is estimated that the deletion of the torque tests of containment bolted connections under Alternative 3 would reduce industry's cost approximately $9,270,000 each 120-month interval ($75/hour x 24 hours x 50 bolted connections x 103 units). The present value is $6,507,540 ($9,270,000/10 (annual cost) x 7.02). The elimination of the torque test would also reduce occupational exposure. The NRC current estimates for exposure are approximately 20 millirem for performing a torque test on each containment bolted connection. It is estimated that there are 50 containment bolted connections in each unit, therefore, the occupational exposure for the industry is estimated to be reduced by 1 person-rem per unit per 120-month interval ((20 millirem x 50 units). The industry's occupational dose cost savings per 120-month interval per unit under Alternative 3 would be on the order of $206,000 (1 person-rem x $2,000 x 103 units). The present value is $144,612 ($206,000/10 (annual cost) x 7.02).

(v) The 1998 Edition of Section XI of the ASME BPV Code deleted the requirement to visually examine containment seals and gaskets that was previously in Table IWE-2500-1, Category E-D, Items E5.10 and E5.20. It is estimated that it takes 1 person approximately 12 hours each 120-month interval to examine containment seals and gaskets, and that the deletion of this requirement under Alternative 3 would reduce industry's costs approximately $92,700 each 120-month interval ($75/hour x 12 hours x 103 units). The present value is $65,075 ($92,700/10 (annual cost) x 7.02). The elimination of the examination of containment seals and gaskets would also reduce occupational exposure to the personnel who examine the drywall head seals in Mark I and Mark II containments. The NRC current estimates for exposure are approximately 100 millirem for examining drywall head seals in Mark I and Mark II containments. There are 24 units with a Mark I containment design and 7 units with a Mark II design. The occupational exposure is estimated to be reduced in Alternative 3 by 3.1 person-rem during each 120-month interval (100 millirem x 31units). The industry's occupational dose cost savings per 120-month interval would be on the order of $6,200 (3.1 person-rem x $2,000). The present value is $4,352 ($6,200/10 (annual cost) x 7.02).

(vi) The NRC-proposed limitation in 10 CFR 50.55a(b)(2)(xii)(A) would not allow welds in high-energy fluid system piping that are located inside a containment penetration assembly or encapsulated by a guard pipe to be exempted from examination as permitted by IWC-1223 of the 1997 Addenda, the 1998 Edition and the 1999 Addenda and the 2000 Addenda. The provisions of the Code that exempts welds located inside a containment penetration assembly or encapsulated by a guard pipe from Subsection IWC examination requirements were incorporated into IWC-1223 in the 1994 Addenda. It is estimated that there are approximately 2 containment penetration

assemblies in each unit that contain high-energy fluid piping with welds that would now be required to be examined, and that it would take approximately 20 hours to examine a weld in each containment penetration during a 120-month interval. It is estimated that the NRC-proposed modification in 10 CFR 50.55a(b)(2)(xii)(A) in Alternative 3 would increase industry's cost approximately $309,000 each 120-month interval ($75/hour x 2 containment penetration assemblies x 20 hours x 103 units). The present value is $216,918 ($309,000/10 (annual cost) x 7.02).

(vii) The proposed limitation in 10 CFR 50.55a(b)(2)(xx) would require that the pressure and temperature hold time requirements of IWA-5213(a) of the 1995 Edition be applied in lieu of the revised provisions of the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda when performing system leakage tests. The 1995 Addenda incorporates the provisions of Code Case N-498-2, "Alternative Requirements for 10-Year Hydrostatic Testing for Class 1, 2, and 3 Systems," which deleted the provisions requiring system pressure and temperature conditions to be maintained for 4 hours on insulated systems or components, or 10 minutes on noninsulated systems or components, prior to conducting system leakage tests. It is estimated that system leakage tests are conducted on approximately 20 insulated systems per unit during each refueling outage and that there are 6 refueling outages each 120-month interval. It is estimated that it takes 3 people to conduct a system leakage test during the 4-hour hold time, for a total of 12 additional hours (3 people x 4 hours) to conduct each system leakage test. It is estimated that the proposed modification to 10 CFR 50.55a(b)(2)(xx) in Alternative 3 would increase industry's cost approximately $11,124,000 each 120-month interval ($75/hour x 12 hours x 20 systems x 6 refueling outages x 103 units). The present value is $7,809,048 ($11,124,000/10 (annual cost) x 7.02).

(viii) The 1999 Addenda of Section XI of the ASME BPV Code decreased the rate of search unit movement from 6 to 3 inches/second when conducting ultrasonic (UT) examinations on piping systems in accordance with Mandatory Appendix III-2420. Decreasing the rate of search unit movement will improve the accuracy of UT examinations; increase the amount of time required to conduct UT examinations; and increase the cost of the UT examinations. It is estimated that it costs approximately $1,500,000 each 120-month interval to conduct UT examinations of piping required by Section XI, and that this cost will increase by approximately 10 percent due to the decrease in the rate of search unit movement from 6 to 3 inches/second. It is estimated that decreasing the rate of search unit movement in Alternative 3 would increase industry's cost approximately $15,450,000 each 120-month interval ($1,500,000 x .10 (10%) x 103 units). The present value is $10,845,900 ($15,450,000/10 (annual cost) x 7.02).

(ix) The NRC-proposed modification in 10 CFR 50.55a(b)(2)(xxi)(B) would require licensees to use the requirements of Table IWB-2500-1, Examination Category B-G-2, Item B7.80, of the 1995 Edition in lieu of the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda. The 1995 Addenda incorporates the provisions of Code Case N-547, "Alternative Examination Requirements for Pressure Retaining Bolting of Control Rod Drive Housings." Code Case N-547 deletes the examination of control rod drive (CRD) bolting whenever the CRD housing is disassembled. It is estimated that it takes 1 person 1 hour each outage to conduct the examination of the CRD bolting and that there are 6 refueling outages in each 120 month interval. It is estimated that the NRC-proposed modification in 10 CFR 50.55a(b)(2)(xxi)(B) in Alternative 3 would increase industry's cost

approximately $ 46,350 each 120-month interval ($75/hour x 1 hour x 6 refueling outages x 103 units). The present value is $32,538 ($46,350/10 (annual cost) x 7.02).

(x) The NRC-proposed modification in 10 CFR 50.55a(b)(3)(vi) would permit an exercise interval of 2 years for manual valves within the scope of the ASME OM Code. The 1998 Edition of the ASME OM Code (and previous Code editions and addenda) specified an exercise interval of 3 months for manual valves within the scope of the Code. It is estimated that there are approximately 4 manual valves in each unit, that the exercise frequency will be extended from 3 months to 2 years and that it takes approximately 1 hour to exercise each manual valve. It is estimated that the number of exercises for each manual valve will decrease from 40 exercises during a 120-month interval (4 exercise/year x 10 years) to 5 exercises during a 120-month interval (1 exercise/2 years x 10 years) when implementing the 1999 Addenda of the ASME OM Code. It is estimated that the NRC-proposed modification in 10 CFR 50.55a(b)(2)(xxi)(B) in Alternative 3 would decrease industry's cost approximately $1,081,500 each 120-month interval ($75/hour x 35 exercises x 4 manual valves/unit x 103 units). The present value is $759,213 ($1,081,500/10 (annual cost) x 7.02).

(xi) The 1998 Edition of the ASME OM Code, ISTC-5223, added a provision to allow testing of two check valves in series as a unit, provided certain conditions are met. It is estimated that this revision would reduce costs for approximately 25 units that contain systems that do not permit individual testing of two check valves in series. It is estimated that modifications to systems that would permit individual testing of two check valves in series would cost approximately $100,000 per unit. The revision to the ASME Code to allow testing of two check valves in series as a unit in Alternative 3 would decrease industry's cost approximately $2,500,000 during each 120-month interval ($100,000 x 25 units). The present value is $1,755,000 ($2,500,000/10 (annual cost) x 7.02).

4. Presentation of Results

Table 1 - Alternative 3 Cost Estimates for 120-Month Interval When Updating to the 1997 Addenda, 1998 Edition, 1999 Addenda and 2000 Addenda

Requirement	Cost Reduction	Cost Increase
(i) Increase the Maximum Examinations Credited During the First Inspection from 34 to 50 percent (Tables IWB-2412-1, IWC-2412-1, and IWD-2412-1)	$14,461,200	
(ii) Deletion of IWE-2200(g) Paint and Coating Exams	$162,689	
(iii) Revision of Flaws, Areas of Degradation and Repairs Reexamination Requirements in IWE-2420	$81,344	
(iv) Deletion of Table IWE-2500-1 Bolted Connection Torque Tests	$6,507,540	
(iv) Reduction of Occupational Exposure due to Deletion of Table IWE-2500-1 Bolted Connections Torque Tests	$144,612	

Requirement	Cost Reduction	Cost Increase
(v) Deletion of Table IWE-2500-1 Containment Seal and Gasket Examinations	$65,075	
(v) Reduction of Occupational Exposure due to Deletion of Table IWE-2500-1 Containment Seal and Gasket Examinations	$4,352	
(vi) Reinstatement of Examination of Welds in High-Energy Piping		$216,918
(vii) Reinstatement of IWA-5213(a) Hold Times		$7,809,048
(viii) Decreased Rate of Search Unit Movement When Conducting UT Examinations		$10,845,900
(ix) Reinstatement of Table IWE-2500-1 CRD Bolting Examination		$32,538
(x) Extension of Manual Valve Exercise Frequency	$759,231	
(xi) Testing 2 Check Valves in Series	$1,755,000	
Subtotal	$23,941,043	$18,905,274
Total	$5,035,769	

5. Decision Rationale for Selection of the Proposed Action

The values and impacts associated with revising 10 CFR 50.55a to incorporate by reference the 1997 Addenda, the 1998 Edition, the 1999 Addenda, and the 2000 Addenda of the ASME BPV and OM Codes as discussed in Alternative 3 indicate a cost savings of $5,035,769 (Table 1), and would meet the NRC goal of maintaining safety by continuing to provide NRC review and endorsement of the latest editions and addenda of the ASME BPV and OM Codes. It would reduce unnecessary regulatory burden and improve NRC efficiency and effectiveness by eliminating the need for licensees to submit plant-specific relief requests, and for the NRC to review those submittals when implementing improved technology or techniques in the later edition and addenda of the Code. The NRC endorsement of technological advances and improved testing and inspection techniques in the ASME Code will increase public confidence.

Revising 10 CFR 50.55a to incorporate by reference the 1997 Addenda, the 1998 Edition, and the 1999 Addenda and 2000 Addenda of the ASME BPV and OM Codes as discussed in Alternative 3 is preferred over the no-action approach in Alternative 2 because it supports the NRC performance goals of maintaining safety, reducing unnecessary burden, increasing public confidence, and improves efficiency and effectiveness.

6. Implementation

The regulations in 10 CFR 50.55a require that licensees revise their ISI and IST programs every 120 months to the edition and addenda of the ASME Code incorporated by reference in

10 CFR 50.55a and that is in effect 12 months prior to the start of the new 120-month interval; permit licensees to voluntarily update their construction, ISI, and IST programs at any time to the most recent edition and addenda of the ASME BPV and/or OM Codes incorporated by reference in 10 CFR 50.55a with the approval of the NRC; and specify the edition and addenda of Section III of the ASME BPV Code that must be applied to the construction of reactor coolant pressure boundary components.

The new regulations in the prosed rule would become effective 60 days after the Final Rule is published in the *Federal Register*.