ASME Nuclear Codes & Standards – Version: Feb. 2005

Risk Management Strategic Plan
by
BNCS Risk Management Task Group

1. Mission

Factor risk, as well as performance, into all ASME Nuclear Codes and Standards, as appropriate, to further ensure, on a worldwide basis, that they protect public health and safety and meet the needs of users.

2. Goal

To determine the need and provide risk-informed, performance-based ASME Nuclear Codes and Standards for the benefit of users.

3. Summary of Proposed Initiatives

The following short and long term initiatives summarize the specific actions identified in sections 5 through 8 of this Plan:

Short Term (2005-2006)

3.1 Integrate Risk-Informed IST Code initiatives relative to existing Code Cases into proposed Subsection ISTE of ASME OM Code.

3.2 Ensure that ASME Risk-Informed Code Cases and Codes & Standards are properly integrated with Risk-Informed Regulation Initiatives.

3.3 Develop new Addendum to the Probabilistic Risk Assessment (PRA) Standard to clarify items defined from recent use of the Standard for plant-specific PRA review.

3.4 Integrate application of PRA Standard into other ASME Risk-Informed Codes and Standards, as appropriate.

3.5 Work with Nuclear Risk Management Coordinating Committee to coordinate risk management development activities by SDOs, regulators, and industry, where appropriate.

3.6 Support ASME Research effort to Develop Reliability-Based Load and Resistance Factor Design (LRFD) Methods for Piping in ASME Section III.

3.7 Adapt the provisions of the Risk-Informed Safety Classification Code Case for Repair/Replacement Activities (Case N-660) for consideration of a new classification Case (Case N-720) for Section III design.

3.8 Investigate use of LRFD and risk-informed methods for concrete components for nuclear service for Joint ACI-ASME III design.

3.9 Complete risk-informed initiatives on minimum exam coverage, pressure testing & leakage, and heat exchanger exams.

3.10 Using experience from risk-informed ISI applications and trial risk-informed repair/replacement applications, develop alternative piping risk-informed classification and exam requirements, revise Code Case N-660 to address service water systems, and revise Code Case N-660 for all plant systems to support 10 CFR 50.69 initiative.

3.11 Develop an Appendix that risk-informs the requirements of NQA-1
3.12 Investigate approaches for the development of a Life-Cycle Risk-Informed Nuclear Code and make decision regarding Nuclear System Code development.
3.13 Develop an O&M Standard on treatment of LSSC pumps and valves excluded from OM Code requirements through 10CFR50.69.
3.14 Identify actions necessary to respond to Commission paper COMNJD-03-0002 on PRA quality

Long Term (2007-Beyond)
3.15 Integrate risk-informed, performance-based approaches into new ASME Nuclear Codes & Standards to support next generation reactors.
3.16 Implement and complete scope additions to the PRA Standard.
3.17 Develop risk-informed safety classification Code Case(s) for use across all ASME Nuclear Codes & Standards.

4. Background

The consideration of risk has always been part of ASME's development of Codes and Standards. Traditional engineering methods, such as use of design factors, were incorporated into Codes and Standards to manage this risk. With the emergence of PRA technology, ASME has the opportunity to better focus its guidance on the most important risks. The mission of this Risk Management Strategic Plan is to assist BNCS in infusing PRA methods and perspectives into Codes and Standards development and implementation so that these Codes and Standards continue to effectively and efficiently provide for public health and safety.

For over a decade the nuclear industry has had initiatives in the utilization of risk for various regulatory requirements that reduce unnecessary burden while maintaining a high level of safety. Every plant has a PRA, primarily due to the industry response to NRC Generic Letter 88-20, and in meeting the requirements of the NRC Maintenance Rule, 10 CFR 50.65.

Over the last decade the ASME has developed risk-informed component applications for inservice testing (IST), inservice inspection (ISI), and repair/replacement activities in the form of Code Cases and a Non-Mandatory Appendix. Also, the ASME has developed the PRA Standard for commercial nuclear power plants. These products are summarized in Section 9 of this plan.

5. Matrix of ASME Nuclear Codes & Standards Risk Management Developments

Table 1 has been developed and will be maintained to guide the development of risk management initiatives within the ASME BNCS. The table summarizes current and potential risk applications within the BNCS committees. In addition, the applications are related to the need for enhancement or development of PRA Standards.

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Table 1. Potential Applications within BNCS Committees / Relation to PRA Standards Development

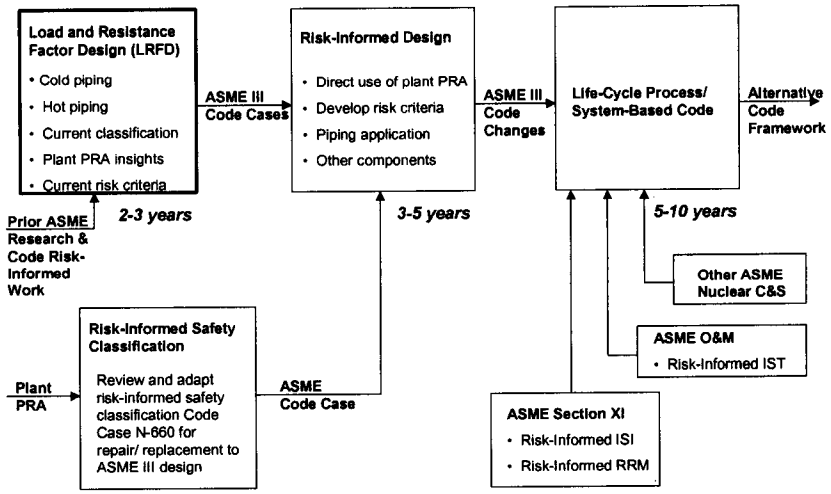
Nuclear Committee	Current Product	Can Use Existing PRA Standards?	Another PRA Standard Required?
Operation & Maintenance (O&M) – for pump & valve IST	Code Cases/ New ISTE	Yes, pumps & valves are modeled	No
O&M – for Snubber IST	Code Case	Yes, for supporting information; Snubbers are not explicitly modeled	May benefit from enhancement
Section XI – for piping ISI	Code Cases/ Non-Mandatory Appendix	Yes, for supporting information; Piping is not explicitly modeled	May benefit from enhancement
Section XI – for other component ISI	Code Cases	Yes, for supporting information; SSCs are not explicitly modeled	May benefit from enhancement
Section XI – for pressure-retaining item repair/replacement	Code Cases	Yes, for supporting information; SSCs are not explicitly modeled	May benefit from enhancement
Section III – Div 1 for risk-informed piping design	Under Development	Yes, for supporting information for existing reactor designs; Piping is not explicitly modeled	PRA standard may need to be expanded to address new generation reactor designs
Section III – Div 1 for other components	Under Review	Same as above	Same as above
Section III – Div 2 for concrete / metal structures	Under Review	Maybe to a limited degree; ANS Seismic and External Events Standard may have significant input	Existing standards may have to be modified
Section III – Div 3 for nuclear casks	None	Not likely	New standards would need to be developed
Nuclear Quality Assurance	Under Development	Yes with some possible modification	No. NQA should develop requirements compatible with risk categorization
Qualification of Mechanical Equipment – Valve Qualification	Previous Work on Hold	Yes with some possible modification	No
Nuclear Air & Gas Treatment Equipment	None	Yes, most SSCs are implicitly modeled; However passive components are not	May benefit from enhancement
Cranes For Nuclear Facilities	None	Not likely but impact of crane failures could be possibly evaluated	A new standard may be required to address crane structures / mechanical systems

		ANS Seismic and External Events Std may have significant input	
Nuclear Risk Management	PRA Standard/ Review of Potential New Standards	Not Applicable	New PRA Standards (or expanded scope) may need to be developed for the following needs: - Reliability data base to support PRAs - Treatment of items not modeled - Global risk-informed safety classification - Address needs of high temperature reactor designs - Independent Decision-Making Panel

6. Nuclear Systems Code

Current ASME nuclear codes and standards rely primarily on deterministic and mechanistic approaches to design of components, including piping systems. The design code is a separate volume from the code for ISI and both are separate from the code for IST. A decision needs to be made as to whether and to what extent an ASME Nuclear Systems Code should be developed, which would include a planned evolution that integrates the various nuclear codes and standards and adopts a risk-informed approach across a facility life-cycle – encompassing design, construction, operation, maintenance, and closure. Figure 1 offers a conceptual development.

Figure 1. Potential Evolution to Nuclear Systems Code



7. Plan for 2005 and 2006

Begin new initiatives and enhance the current series of ASME Risk-Informed products for both operating and new nuclear power plants as shown in Table 2.

Table 2. Short Term BNCS Risk Management Enhancement Actions and Status

Nuclear Committee	Enhancement Action	Status
Board Operations	Risk Management Task Group work with regulator & industry to insure that ASME risk-informed Codes & Standards are properly integrated in risk-informed regulation initiatives	ASME letters issued and discussed with NRC and industry; ASME comment letter issued and discussed with NRC in finalization of 10 CFR 50.69; ASME briefed ACRS 02-19-04; Final Rule 10 CFR 50.69 placed in Federal Register Nov. 22, 2004; Currently interfacing with NRC on ASME Code Case N-660 being used in pilot plant applications for 10 CFR 50.69.
	Work with ANS and NRC to form Nuclear Risk Management Coordinating Committee (NRMCC) to coordinate risk management development activities by SDOs, regulators, and industry.	Inaugural meeting held 02-20-04 at ASME Washington, DC; Proposed charter and strategic plan for NRMCC developed; Joint ASME / ANS letter sent to NRC on PRA quality expectations; Efforts underway to (1) develop single ASME/ANS PRA requirements standard (level 1 internal/external events & fire at-power and shutdown); (2) form joint project team and consensus committee of ASME CNRM augmented by a few ANS Risk-Informed Standards Committee members reporting to ASME BNCS; A similar effort is underway for Level 2 and 3 PRA with ANS leading; Meeting held with ANS on risk-informed safety classification; Task team identifying needs to support risk management for new reactors, reviewing NRC plan on this item.
	Form Task Group to recommend approaches for development of life-cycle process / systems-based Code (SBC) using risk insights	Workshop conducted 8-29-04 on Probabilistic and System-Based Methods for Design during ASME B&PV Meeting; Needs identified for risk-informed safety classification for design and risk-informed ISI for high temperature gas-cooled reactors; ASME BNCS SBC Task Group report issued for BNCS review for future action; Discussions held with U.S. Dept. of Energy (DOE) on Feb. 11, 2005 to support investigation of SBC for use in ASME Nuclear Codes & Standards.

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Operation & Maintenance of Nuclear Power Plants	Integrate RI-IST Code initiatives relative to existing Code Cases into proposed Subsection ISTE of ASME OM Code and	Pre-ballot review comments received and addressed. SG-ISTE review during July meetings resulted in substantive changes. Third pre-ballot review issued in December, 2004 to O&M Committee and BNCS.
	Investigate the development of a standard describing acceptable treatment requirements for low safety significant pumps and valves excluded from OM Code requirements through 10CFR50.69.	Scope and need statement for treatment requirements for low safety significant pumps and valves approved by Committee. Project Manager selected and Project Team being formed.
	Revise RI-IST snubber Code Case OMN-10 to address pressure boundary	Revision of OMN-10 underway
Section XI Subcommittee	Evaluate extending the provisions of Case N-660 to also cover Section XI pressure testing and leakage	At Working Group on Implementation of Risk-Based Examination (IRBE)
	Develop Code Case addressing minimum exam coverage using risk insights	Code Case N-711 balloted by ASME XI; Negatives addressed by WG (IRBE) and SG (WCS). Meeting with NRC to confirm resolution of comments held Feb. 10, 2005. Plan to discuss at Feb.28 – Mar.4, 2005 Boiler Code meetings, and present to Section XI at March 2005 meeting.
	Develop Code Case on heat exchanger exams using risk insights	Under development within WG on Optimization and WG on Risk
	Develop Code Case providing alternative piping risk-informed classification and exams using experience from risk-informed ISI applications	Proposed Code Case N-716 voted by SG Water-Cooled Systems as well as broad review; Negatives and comments addressed by WG IRBE and re-affirmed. Meeting with NRC to confirm resolution of comments held Feb. 10, 2005. Plan to discuss at Feb. 28 – Mar.4 Boiler Code meetings, and present to Section XI at March 2005 meeting.
	Revise Code Case N-660 to address service water systems using trial application experience	Proposed Code Case N-660A approved by WG IRBE. Meeting with NRC to confirm resolution of comments held Feb. 10, 2005. This effort may no longer be pursued so that efforts can focus on continuing N-660B.
	Revise Code Case N-660 to address all plant systems using trial applications experience to support 10 CFR 50.69 initiative	Revised Code Case N-660B balloted by WG IRBE using 10 CFR 50.69 pilot plants; Comments being addressed including meeting with NRC on Feb. 10, 2005. Plan to vote or ballot for 2nd consideration at Feb. 28, 2005 ASME XI WG meeting.
	Develop risk-informed ISI procedures to support high temperature gas-cooled reactors (HTGR)	Efforts underway within ASME Section XI, Division 2; Special presentation by Dr. Karl Fleming on use of PRA in HTGR designs planned for Feb. 28, 2005 Code meeting.

	Begin research effort to develop Code Case(s) using Reliability-Based Load and Resistance Factor Design (LRFD) for piping	Interim Report completed from initial research effort supported by NRC and Institute of Universality of Japan; Work to be presented at Feb. 28 Boiler Code meeting; Investigating participation of ASME Section VIII-Div. 2 to address LRFD for use in vessel applications; Discussions held with DOE on Feb. 11, 2005 to support extension of LRFD efforts to new nuclear, hydrogen, and other energy sectors.
Section III – Div 1 Subcommittee	Coordinate with CNRM and Section XI on adapting Code Case N-660 for Risk-Informed Safety Classification for Design	WG Probabilistic Methods in Design (PMD) balloted draft Code Case N-720 for risk-informed safety classification for design; Numerous comments being addressed and Technical Bases paper to be prepared; Discussion of key technical comments held with NRC on Feb. 10, 2005; Further discussion planned for March 1, 2005 ASME III WG meeting and with ASME CNRM and NRMCC.
	Other Subgroup Design Actions	WG PMD is developing an attributes matrix comparing technical and administrative requirements of Class 1, 2, 3 and B31.1 piping; WG Component Supports has initiated an item to incorporate LRFD version of AISC N-690 into Subsection NF
	Investigate use of LRFD and risk-informed methods for concrete components	Technical presentation given at Joint ACI-ASME Committee meeting 9-30-03; Task Group formed to investigate methods
Section III – Div 2	Consider using a non-PRA risk standard for Nuclear Cask applications	
Section III – Div 3	Develop an Appendix that risk-informs the requirements of NQA-1	Work is in progress
Nuclear Quality Assurance	Consider use of probabilistic methods in valve qualification standards	Research proposal prepared; Currently on-hold
Qualification of Mechanical Equipment	Investigate use of risk-informed methods in testing of mechanical equipment	
Nuclear Air & Gas Treatment Equipment	Consider using a non-PRA risk standard for nuclear cranes applications	
Cranes For Nuclear Facilities	Maintain PRA Standard (fold in or reference fire, external events, internal flooding, containment); Need to discuss low power and shutdown PRA	Proposal for integrated standard under review.
Nuclear Risk Management	Develop requirements and guidance for treating items not modeled in the PRA.	Task assigned to Subcommittee on Applications for developmentTask Initiated
	Consider reliability data base for PRA	Research proposal approved by BNCS; Will be developed through CSTI
	Work with other committees and SDOs to begin development of new risk-informed safety classification standard	See Section III Div 1 Subcommittee Item 2 for actions; Developing more formal liaison between CNRM and Section III WG..
	Develop guidance on Independent Decision-Making Panels	Task assigned to Subcommittee on Applications for development

	Incorporate experience in first use of the ASME PRA Standard	Develop new Addendum to clarify items defined from recent use of the Standard for plant-specific PRA review; Addendum b balloted by CNRM and reviewed by BNCS December 2005.
	Identify actions necessary to respond to Commission paper COMNJD-03-0002 on PRA qualityIdentify actions necessary to respond to Commission paper COMNJD-03-0002 on PRA quality	Task assigned to Subcommittee on ApplicationsTask assigned to Subcommittee on Applications
	Develop risk-informed framework to support design, construction and operation of new nuclear power plants	Discussions held with DOE on Feb. 11, 2005 to support efforts for PRA quality, application, and implementation needs.

8. Plan for 2007 and Beyond

Enhance ASME Risk-Informed Codes & Standards products, particularly to support next generation reactor needs. Develop new risk-informed safety classification process for use on all ASME Nuclear Codes & Standards. Begin efforts to move ASME Nuclear Codes & Standards toward a life-cycle process / system-based Code using risk insights, if decision made in 2005-2006 to begin this initiative. Table 3 summarizes the long term development needs.

Table 3. BNCS Long Term Risk Management Enhancement Actions

Nuclear Committee	Enhancement Action
Board Operations with All Committees	Implement recommendations of CBO Task Group to develop a life-cycle process / systems-based Code using risk insights, as required
Operations & Maintenance of Nuclear Power Plants	Revise OM Code for IST to support next generation reactor needs
	Revise Standard on treatment of LSSC Pumps and Valves to support next generation reactor needs.
Section XI Subcommittee	Review and revise, as appropriate, all risk-informed Code Cases and Non-Mandatory Appendices related to ISI, pressure testing, and repair/replacement activities to support next generation reactor needs
Section III – Div 1	Complete Code Case(s) on LRFD for piping, including merger of LRFD with new risk-informed safety classification process using plant PRA
	Begin research & Code Case development for use of LRFD for other components, including support of new generation reactor needs
Section III – Div 2	Begin development of use of LRFD / risk-informed methods for concrete components
Section III – Div 3	To be defined later
Nuclear Quality Assurance	Complete development of GQA Standard providing treatment in accordance with new risk-informed safety classification, including support of new generation reactor needs
Qualification of Mechanical Equipment	Develop standard for use of probabilistic methods in valve qualification requirements, including support of new generation reactor needs (To be defined later)
Nuclear Air & Gas Treatment Equipment	Develop standard for use of risk-informed methods in testing of mechanical equipment, including support of new generation reactor needs (To be defined later)
Cranes For Nuclear Facilities	To be defined later

Nuclear Risk Management	Develop PRA Standard suitable to support next generation reactor design needs
	Consider extension of PRA Standard to full Level 2 and Level 3 to support risk-informed regulation developments, including plant siting
	Develop new risk-informed safety classification standard in collaboration with other committees and SDOs

9. Products Completed

The following references summarize ASME Nuclear Codes and Standards products associated with this ASME BNCS Risk Management Strategic Plan that have been developed, approved, and issued to date.

ASME Section XI, Division 1 Products

[1] American Society of Mechanical Engineers, Code Case N-560, *Alternative Examination Requirements for Class 1, Category B-J Welds*, Section XI, Division 1, New York (1996).

[2] American Society of Mechanical Engineers, Code Case N-560-1, *Alternative Examination Requirements for Class 1, Category B-J Welds*, Section XI, Division 1, New York (TBD).

[3] American Society of Mechanical Engineers, Code Case N-560-2, *Alternative Examination Requirements for Class 1, Category B-J Welds*, Section XI, Division 1, New York (2000).

[4] American Society of Mechanical Engineers, Code Case N-577, *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method A, Section XI, Division 1,* New York, NY (1997).

[5] American Society of Mechanical Engineers, Code Case N-577-1, *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method A, Section XI, Division 1,* New York, NY (2000).

[6] American Society of Mechanical Engineers, Code Case N-578, *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1,* New York, NY (1997).

[7] American Society of Mechanical Engineers, Code Case N-578-1, *Risk-Informed Requirements for Class 1, 2, and 3 Piping, Method B, Section XI, Division 1,* New York, NY (2000).

[8] American Society of Mechanical Engineers, Code Case N-660, *Risk-Informed Safety Classification for Use in Risk-Informed Repair/Replacement Activities, Section XI, Division 1,* New York, NY (2002).

[9] American Society of Mechanical Engineers, Code Case N-662, *Alternative Repair/Replacement Requirements for Items Classified in Accordance With Risk-Informed Processes, Section XI, Division 1,* New York, NY (2002).

[10] American Society of Mechanical Engineers, Nonmandatory Appendix R, *Risk-Informed Requirements for Piping, Section XI, Division 1,* New York, NY (2004)

ASME Operations and Maintenance Committee Products

[1] American Society of Mechanical Engineers, Code Case OMN-1, Alternate Rules for Preservice and Inservice Testing of Certain Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants OM Code-1995, Subsection ISTC (2001).

[2] American Society of Mechanical Engineers, Code Case OMN-3, *Requirements for Safety Significance Categorization of Components Using Risk Insights for Inservice Testing of LWR Power Plants,* New York, NY (1998).

[3] American Society of Mechanical Engineers, Code Case OMN-4, *Requirements for Risk Insights for Inservice Testing of Check Valves at LWR Power Plants*, New York, NY (1998).

[4] American Society of Mechanical Engineers, Code Case OMN-7, *Requirements for Risk Insights for Inservice Testing of Pumps at LWR Power Plants*, New York, NY (1999).

[5] American Society of Mechanical Engineers, Code Case OMN-10, *Requirements for Safety Significance Categorization of Snubbers Using Risk Insights and Testing Strategies for Inservice Testing of LWR Power Plants,* New York (2001).

[6] American Society of Mechanical Engineers, Code Case OMN-11, *Risk-Informed Testing for Motor-Operated Valves*, New York (2001).

[7] American Society of Mechanical Engineers, Code Case OMN-12, *Alternate Requirements for Inservice Testing Using Risk Insights for Pneumatically and Hydraulically Operated Valve Assemblies in Light-Water Reactor Power Plants*, New York (2001).

ASME Committee on Nuclear Risk Management Products

[1] American Society of Mechanical Engineers, ASME RA-S-2002, *Standard For Probabilistic Risk Assessment For Nuclear Power Plant Applications,* New York, NY (2002).

[2] American Society of Mechanical Engineers, *"Addendum a" to ASME RA-SA-2002, Standard for Probabilistic Risk Assessment for Nuclear Power Plant Applications*, ASME RA-SA-2003, New York, NY (2003).