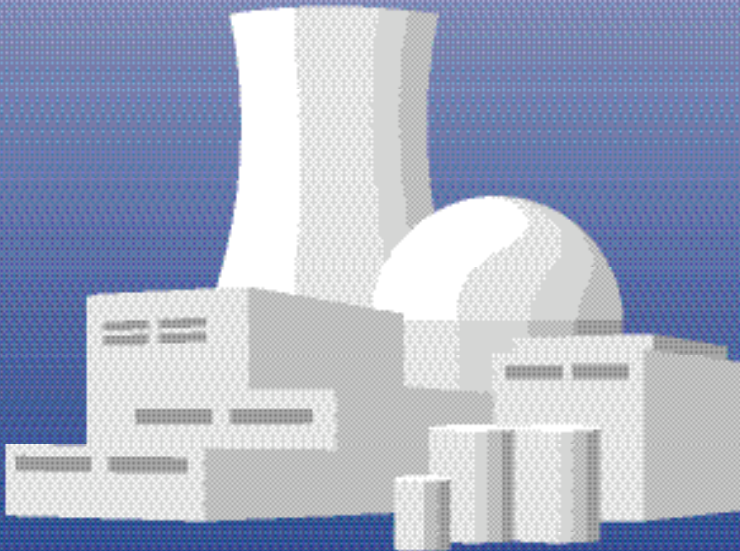


# ACRS

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## *2005–08 Action Plan*

*Advisory Committee on Reactor Safeguards  
U.S. Nuclear Regulatory Commission*





The Advisory Committee on Reactor Safeguards (ACRS) was established as a statutory committee of the Atomic Energy Commission (AEC) by a 1957 amendment to the *Atomic Energy Act* of 1954. The functions of the Committee are described in Sections 29 and 182b of the Act. The Energy Reorganization Act of 1974 transferred the AEC's licensing functions to the U.S. Nuclear Regulatory Commission (NRC), and the Committee has continued serving the same advisory role to the NRC.

The ACRS reports directly to the Commission, providing independent reviews of, and advice on, the safety of proposed or existing NRC-licensed reactor facilities and the adequacy of proposed safety standards. The ACRS reviews power reactor and fuel cycle facility license applications for which the NRC is responsible, as well as the safety-significant NRC regulations and guidance related to these facilities. On its own initiative, the ACRS may review certain generic matters or safety-significant nuclear facility items. The Committee also advises the Commission on safety-significant policy issues, and performs other duties as the Commission may request. Upon request from the U.S. Department of Energy (DOE), the ACRS provides advice on U.S. Naval reactor designs and hazards associated with the DOE's nuclear activities and facilities. In addition, upon request, the ACRS provides technical advice to the Defense Nuclear Facilities Safety Board.

ACRS operations are governed by the *Federal Advisory Committee Act* (FACA), which is implemented through NRC regulations at Title 10, Part 7, of the Code of Federal Regulations (10 CFR Part 7). ACRS operational practices encourage the public, industry, state and local governments, and other stakeholders to become involved in Committee activities.

# THE ADVISORY COMMITTEE ON REACTOR SAFEGUARDS 2005–2008 ACTION PLAN, PRIORITIES, AND ACTIVITIES

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This plan provides guidance and direction for the Advisory Committee on Reactor Safeguards (ACRS) for the years 2005–2008 to focus the Committee on the issues that are most important to the U.S. Nuclear Regulatory Commission (NRC) in carrying out its mission to protect public health and safety, promote the common defense and security, and protect the environment. It also defines the mission, goals, objectives, and priorities of the ACRS, consistent with the NRC's Strategic Plan. In addition, this plan provides ACRS as well as the criteria that the ACRS uses to select issues for review.

## SCOPE OF ACRS ACTIVITIES

The Committee reports to and advises the Commission on technical matters related to nuclear reactor safety and safeguards. The bases of ACRS reviews include Title 10 of the *Code of Federal Regulations* (10 CFR), Parts 20, 21, 26, 50, 51, 52, 54, 55, 70, 72, 73, 76, and 100, as well as other applicable legislation and regulations. Current regulatory activities that are within the scope of ACRS responsibilities include license renewal, application of risk-informed and performance-based regulations, reactor operations, rulemaking, codes and standards, generic safety issues, research, power uprates, advanced reactor design reviews, facility application reviews, and other regulatory issues as requested by the Commission. To fulfill its responsibilities, the ACRS provides a forum for the discussion of technical safety issues by all affected parties, including the NRC staff; the interested public; the U.S. Department of Energy (DOE); the NRC's Advisory Committee on Nuclear Waste (ACNW); other Federal agencies; state, tribal, and local governments; and private, international, and other organizations, as appropriate.

## ACRS MISSION

The mission of the ACRS is to provide the Commission with independent and timely technical advice on issues of public safety related to nuclear reactors and reactor safeguards. In so doing, the ACRS supports the NRC in conducting an efficient regulatory program that enables the Nation to safely use nuclear power for civilian purposes.

## ACRS VISION

The ACRS envisages safety regulation of nuclear power plants on the basis of a coherent set of requirements that are securely founded on science, engineering, and quantitative risk assessment.

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## ACRS OPERATING PRINCIPLES

The ACRS ensures that the priorities of the Commission and its Executive Director for Operations (EDO) are understood and adequately considered in setting the Committee's agenda. It makes its letters and reports clear and concise. The ACRS continues to believe that early involvement is, on balance, the best approach for resolving complex issues, and that it allows the ACRS to provide input when it is most effective and efficient. The ACRS also believes that the Committee is most effective when it involves itself in the resolution of broad technical issues. The Committee will continue to maintain its independence as it reviews issues.

## OUTCOMES AND COMMITMENTS

The Committee aspires to achieve the following outcomes:

1. Provide useful advice in adequate time for consideration by the Commission in making regulatory decisions.
2. Alert the Commission to potential challenges that may be averted by taking interim action.
3. Forewarn the Commission regarding emerging issues that may require action at a later time.
4. Ensure that the Committee's advice reflects state-of-the-art technology; is practical; and allows for incorporation into the NRC's technical approaches, regulations, and guidance.
5. Ensure that the Committee's advice reflects an understanding of inherent risks, and considers first the need for adequate protection and defense-in-depth, and secondly, the need to balance risk, cost, and benefit in all of the NRC's decisions.
6. Provide advice that is valued by the Commission, the NRC staff, the DOE, and the public.
7. Earn the public's trust by providing frank, open advice, and by offering a forum for public participation in the regulatory process.
8. Assist in resolving conflicts between the NRC and other stakeholders by encouraging communication and providing a neutral forum for interaction.

To accomplish its mission, the Committee will carry out the following commitments:

1. Focus on nuclear safety.
2. Be responsive to the Commission's needs for technical advice to support Commission decisions.

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3. Maintain technical excellence.
  4. Focus on risk by asking what is the risk, what are the important contributors to risk, and what are the uncertainties associated with the risk.
  5. Foster an atmosphere of mutual problem solving with the NRC staff.
  6. Remain unbiased, be responsive to change, and consider various options and contingencies.
  7. Identify, in advance, those issues that could impact the NRC's ability to achieve its mission.
  8. Keep abreast of international trends and developments that could affect the NRC's regulatory practices or approaches, and factor international experience into the Committee's advice, where appropriate.
  9. Provide timely public notification of ACRS meetings in order to provide opportunities for stakeholder participation.

## GOALS AND OBJECTIVES

In keeping with its mission, the ACRS has developed the following goals and objectives, which are consistent with the performance goals in the NRC's Strategic Plan and reflect current regulatory needs:

**Goal 1**                    **Provide useful advice to support the Commission in responding to the evolution of and challenges to the safe use of nuclear power.**

*Objective 1*              *Advise the Commission in a timely fashion on issues of a technical nature that may impact public health and safety and protection of the environment in the following areas:*

- *implementation of risk-informed and performance-based safety regulations*
- *the reactor oversight process*
- *safety issues related to age-related degradation*
- *research efforts that provide the technical bases for the NRC's regulatory decisions*
- *safety issues associated with new nuclear designs*
- *changes in the nuclear industry*
- *prioritization and resolution of generic safety issues (GSIs)*
- *rulemaking and regulatory guidance*
- *emerging operational issues*
- *technical issues associated with regulatory safeguards*

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**Goal 2 Support the NRC in ensuring openness by involving the public in the ACRS' process of reviewing nuclear power safety and safeguards issues.**

*Objective 1 Provide opportunities for meaningful public involvement in the regulatory process by implementing the Federal Advisory Committee Act (FACA) and by fostering an open, accessible, and clear, yet independent review process.*

*Objective 2 Assist the NRC in ensuring that agency decision making is a transparent process by noting whether agency documentation reviewed by the Committee is thorough, clear, and readily understandable.*

**Goal 3 Support the effectiveness, efficiency, and timeliness of NRC operations.**

*Objective 1 Advise the NRC on how to increase its reliance on risk insights as a basis for decision making, including using risk assessment methods for the safe use of nuclear power, that (1) implements a risk-informed approach, (2) quantifies and reveals uncertainties, and (3) is consistent across programs, where possible.*

*Objective 2 Propose approaches that provide a better understanding of the inherent risks associated with nuclear power and the relationships between safety, regulations, and cost.*

*Objective 3 Provide technically sound, realistic, and timely approaches for resolving new and emerging issues related to the safe operation of nuclear power plants.*

*Objective 4 Advise the Commission on opportunities for improving agency reviews.*

**Goal 4 Support the NRC's use of good science in resolving key safety issues.**

*Objective 1 Keep abreast of the challenges associated with changing regulatory demands, as well as the new technologies that are being developed and utilized throughout the world.*

*Objective 2 Recommend ways to utilize risk-informed and performance-based approaches to ensure effectiveness and efficiency.*

*Objective 3 Advise the Commission on the effectiveness of the reactor oversight process with respect to the safety of nuclear power plant operations.*

*Objective 4 Advise the Commission of projected needs for additional NRC technical capabilities that could enhance the agency's ability to effectively address safety issues.*

*Objective 5 Promote the use of good science to support staff positions and regulations.*

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**Goal 5                    Improve the effectiveness and efficiency of ACRS operations.**

*Objective 1            Seek opportunities to increase the value of ACRS advice to the Commission and the NRC staff.*

*Objective 2            Maintain innovative and sound business practices that focus on outcomes, and provide effective tools for establishing goals.*

*Objective 3            Improve and modify operational procedures for reporting on program accomplishments and matters of accountability.*

*Objective 4            Enhance the effectiveness of the review process by building upon mutually beneficial relationships with the NRC staff and stakeholders.*

## **PROACTIVE INITIATIVES**

In accordance with its charter, the ACRS takes the initiative to proactively investigate issues that have not yet been presented to the Committee. These issues have emerged as a result of the broad and far-reaching involvement of the Committee members in their respective areas of expertise, both domestically and abroad. The following list of proactive initiatives may be supplemented as new issues arise.

### INTERNATIONAL ACTIVITIES

- *Quadripartite Hosts 2006*

Host the fifth Quadripartite meeting in the United States, as scheduled. The Quadripartite is a consortium of senior advisory committees on nuclear safety, whose membership consists of France, Germany, Japan, and the United States (with Sweden and Switzerland as observers). Meetings are held every 4 years on a rotating basis in the country of the host. The ACRS is scheduled to host the 2006 meeting in the United States.

- *Divergence In Regulatory Approaches*

Consider, as a part of the Committee's normal reviews, development and treatment of similar technical issues in other countries, as appropriate.

Maintain an awareness of reactor safety research being conducted in other countries.

### ADVANCED REACTOR DESIGNS FOR HYDROGEN PRODUCTION

- Identify potential safety issues for DOE advanced reactor activity to generate hydrogen from nuclear heat.
- Identify long-term research issues that would require new analytical tools or infrastructure.

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## PROBABILISTIC RISK ASSESSMENT MODEL UNCERTAINTY

- Identify major model uncertainties in Level 1 and Level 2 probabilistic risk assessments (PRAs).
- Identify methods that have been used or proposed to handle model uncertainty.
- Document examples of model uncertainties that were important in regulatory decisions, as well as the importance of various phenomenological uncertainties associated with PRAs and how they have been addressed, with emphasis on Level 1 and Level 2 PRAs.

## POWER UPDATES

- Review the impact of power updates on the safety of nuclear power plants in light of other ongoing changes (e.g., aging, longer fuel cycles, higher burnup).
- Review the expanding application of techniques, such as probabilistic fracture mechanics, to identify and manage margin in systems and components.

## MATERIALS

- Review the progress being made in the NRC's "Proactive Materials Degradation Assessment" program, in response to incidences of corrosion related failures in operating plants both domestically and abroad.

## **CRITERIA FOR SELECTING PRIORITY ISSUES**

The following criteria are used to identify the priority of issues that the ACRS reviews:

- Does the issue have an immediate impact on nuclear safety?
- Is the issue required by law or regulations?
- Is the issue risk-significant, or does it affect adequate protection of health and safety?
- Are there potential long-term issues requiring continuous attention by the agency?
- Is the issue requested by the Commission?
- Is the issue requested by the EDO?
- Was the issue raised by the public?
- Did the ACRS initiate the review of an issue that may or may not currently be worked on by the NRC staff?
- Can the issue impact the effectiveness or efficiency of the NRC regulatory process?



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## PRIORITY ISSUES

A list of ACRS priority issues is provided below. This list will be augmented, as necessary, to support the changing needs of the agency and to deal with significant emerging technical and safety issues.

### LICENSE RENEWAL

10 CFR 54.25 requires that each license renewal application be referred to the ACRS for a review and report. An ACRS review is essential, given the potential safety implications of extending power operation of a significant number of plants for 20 years beyond their current licensed terms. ACRS involvement is also important because Congressional and industry interests have made license renewal a high-priority item for the Commission. This places significant pressure on the NRC staff to expedite the review process, and to reduce demonstration and documentation requirements. The ACRS has reviewed the improved guidance, and will continue to monitor the implementation of the guidance on individual license renewal applications. ACRS involvement will help in the ongoing development of a standardized license renewal process. The ACRS will play a valuable role by assuming the following responsibilities:

- Participate in the development of revised standardized license renewal processes to ensure that detailed requirements for license renewal applications are sufficient to provide reasonable assurance that plants will operate safely throughout the period of extended operation.
- Identify significant issues and focus attention on the ways that these issues are addressed in individual applications.
- Provide to the Commission independent views on contested interpretations of the rule, such as the issue of credit for existing programs.
- Identify issues, as appropriate, that may be outside the narrow confines of the License Renewal Rule, such as using risk information to further improve the license renewal process.
- Evaluate the impact of concurrent actions, such as power uprates and/or operational issues, on licensing renewal commitments and requirements.

The ACRS has performed thorough reviews of the license renewal applications for 27 nuclear power plants, and has provided timely advice to the Commission. The ACRS has also reviewed and provided comments on the staff's review process. Six of the reviews were completed in calendar year 2003 and 7 reviews are scheduled for completion in 2004. The Committee also provided comments to the staff on the current application review process. The Committee has completed reviews for the following plants:

- |                    |                     |                       |
|--------------------|---------------------|-----------------------|
| • Ginna            | • McGuire 1, 2      | • Turkey Point 3, 4   |
| • Summer           | • Catawba 1, 2      | • Oconee 1, 2, 3      |
| • Robinson         | • North Anna 1, 2   | • Calvert Cliffs 1, 2 |
| • Fort Calhoun     | • Surry 1, 2        | • Dresden 2, 3        |
| • Saint Lucie 1, 2 | • Peach Bottom 3, 4 | • Quad Cities 1, 2    |

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The ACRS will continue to play a significant role in the license renewal area through the following activities:

- Review each license renewal application.
- Review revisions to license renewal guidance documents (e.g., the NRC's Standard Review Plan, Regulatory Guides, Generic Aging Lessons Learned (GALL) Report, and "Industry Guidelines for Implementing the Requirements of the License Renewal Rule" (NEI 95-10) promulgated by the Nuclear Energy Institute), as necessary.
- Review selected industry topical reports.
- Visit plants, as needed and as resources permit, to gather information regarding the changes made to the maintenance programs and inspection practices to support extended plant operations, adequacy of the aging management programs, and other significant activities related to license renewal.
- Hold meetings to provide a forum for public participation.
- Implement an efficient process to ensure timely completion of the ACRS review of license renewal applications and related matters.

### RISK-INFORMED AND PERFORMANCE-BASED REGULATION

The ACRS has been a strong advocate of the Agency's move toward establishing a risk-informed and performance-based regulatory system. On numerous occasions in the past, the ACRS encouraged the use of risk information in the regulatory decision-making process, and provided comments and recommendations regarding the consistent use of probabilistic risk assessment (PRA), the impact of PRA results and insights on the regulatory system, and the coherence of the regulatory process. The ACRS has also played a major role in assisting the NRC staff and providing valuable advice to the Commission for developing a risk-informed and performance-based regulatory approach. The ACRS has made significant contributions in this area, including the following:

- performed a participatory review and assisted the staff in developing several regulatory guides, especially Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Current Licensing Basis," and Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities"
- reviewed proposed final 10 CFR 50.69, "Risk-Informed Categorization and Treatment of Structures, Systems, and Components for Nuclear Power Reactors"
- related to large-break loss-of-coolant accidents (LOCAs) and the elicitation process to determine LOCA frequencies

- commented on the NRC staff's draft plan for implementing the Commission's phased approach to PRA quality
- reviewed the proposed final performance-based, risk-informed revisions to 10 CFR 50.48, which permits licensees to voluntarily adopt a performance-based approach to satisfy existing fire protection requirements
- reviewed proposed final risk-informed revision to 10 CFR 50.44, "Combustible Gas Control in Containment"
- identified impediments to the increased use of risk-informed regulation
- commented on the role of defense-in-depth in a risk-informed regulatory system
- addressed the treatment of uncertainties in the risk-informed decision-making process
- evaluated the importance measures for risk-informing 10 CFR Part 50
- commented on the use of defense-in-depth in risk-informing the activities of the NRC's Office of Nuclear Material Safety and Safeguards (NMSS)
- advised the Commission on the need to better understand the risks associated with low-power and shutdown operations

The ACRS will continue to add value to the development of a risk-informed and performance-based regulatory framework. To do so, the Committee will review and provide timely advice to the Commission on the activities associated with the risk-informed and performance-based regulatory system, including the following:

- proposed rule to risk-inform the requirements addressing large-break LOCAs, including the associated NUREG documenting the NRC staff's expert elicitation to determine LOCA frequencies
- proposed American Nuclear Society (ANS), American Society of Mechanical Engineers (ASME), and National Fire Protection Association (NFPA) standards to be used in support of the Commission's phased approach to PRA quality
- proposed NUREG on acceptability of alternate methods and treatments of uncertainties
- implementation of regulatory guidance documents associated with risk-informed and the need for potential revisions to these documents
- proposed risk-informed performance indicators
- proposed final risk-informed revisions to 10 CFR Part 50, Appendix R, which would allow for the use of operator manual actions to satisfy current fire protection requirements

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## RULES AND REGULATORY GUIDANCE

10 CFR 2.809 states that when a rule involving nuclear safety matters within the purview of the ACRS is under development by the NRC staff, the staff will ensure that the ACRS is given an opportunity to provide advice at appropriate stages and to identify issues to be considered during rulemaking hearings. A memorandum of understanding between the ACRS and the EDO delineates the procedures for ACRS participation in the development of rules and regulatory guidance documents [e.g., Regulatory Guides, Standard Review Plans, and Regulatory Issue Summary Reports (Generic Letters)]. The ACRS has made significant contributions in assisting the staff in formulating and/or revising numerous rules and regulatory guidance documents.

Since its inception, the ACRS has reviewed all safety-significant rules and regulatory guidance documents that are within its purview, including the General Design Criteria. Recently, the ACRS played a major role in assisting the staff in developing or revising several important rules and regulatory guidance documents, including the following:

- proposed amendment to 10 CFR 50.55a, “Codes and Standards,” regarding elimination of the requirement to update inservice inspection and inservice testing programs every 120 months
- proposed rule, regulatory guide, and Standard Review Plan section associated with the use of an alternative source term at operating reactors
- proposed revision to 10 CFR 50.59, “Changes, Tests, and Experiments”
- proposed final revision to 10 CFR 50.65, “Requirements for Monitoring the Effectiveness of Maintenance at Nuclear Power Plants”
- proposed rulemaking for shutdown and fuel storage pool operations at nuclear power plants
- proposed revisions to 10 CFR Parts 50 and 100, and proposed regulatory guide related to reactor siting criteria
- proposed rule and regulatory guide for fracture toughness requirements for light-water reactor (LWR) pressure vessels
- proposed rulemaking for reporting reliability and availability information for risk-significant systems and equipment

The ACRS will continue to review and comment on proposed rules and regulatory guidance documents, as well as revisions to existing rules and guidance documents, including those associated with a risk-informed and performance-based regulatory framework.

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## SAFETY RESEARCH PROGRAM

In a Staff Requirements Memorandum dated September 9, 1997, the Commission requested that the ACRS provide an annual report to the Commission regarding the NRC's Safety Research Program, documenting its views on the need, scope, and balance of the research program; whether the research program provides the needed information to the research user offices; anticipation of research needs; and prioritization and planning of research in the changing regulatory and technological environment. Since receiving the Commission's request in 1997, the ACRS has provided five reports (NUREG-1635, Volumes 1 through 5, "Review and Evaluation of the Nuclear Regulatory Commission Safety Research Program"), which included valuable advice to the Commission and the staff, as follows:

- NUREG-1635, Vol. 1, dated July 1998, only included ACRS comments and recommendations resulting from the Committee's comprehensive review of the NRC's Safety Research Program. It included ACRS comments and recommendations on engineering the reactor safety research program, as well as several specific research activities, including those related to PRA, human factors, fire protection, severe accidents, containment integrity, thermal hydraulics, advanced instrumentation and control, reactor fuels, reactor pressure vessel integrity, and plant aging. The NRC's Office of Nuclear Regulatory Research (RES) was generally responsive to the ACRS' comments and recommendations.
- In NUREG-1635, Vol. 2, dated July 1999, the ACRS provided additional comments and recommendations on significant research activities addressed in NUREG-1635, Vol. 1. This volume emphasized the need to develop PRA models in the areas of severe accidents, human factors, fire protection, low-power and shutdown operations, and instrumentation and control systems. Also, the ACRS addressed the need for maintaining an in-house capability for independent verification of regulatory criteria and resolution of complex technical issues associated with the integrity of reactor vessel and steam generator tubes. The Committee also reiterated the need for a strong research program to support the transition to a risk-informed and performance-based regulatory framework. In general, the RES agreed to consider the ACRS' comments and recommendations.
- In NUREG-1635, Vol. 3, dated March 2000, the ACRS examined the internal and external contexts that together determine the needs for research and the corresponding responses of the agency. The ACRS also discussed how the NRC's research has evolved, and how it may develop in the future. In addition, the Committee presented specific evaluations of research requirements in response to more significant future issues. The Committee's comments and recommendations were very well received by the Commission and the RES.
- In NUREG-1635, Vol.4, dated May 2001, ACRS Provided an assessment of the research programs focusing on the continuing need for various research activities, whether certain research could or should be done by the industry, and whether the NRC could enhance efforts to use information developed through cooperative international research activities instead of performing research in certain areas. The ACRS also attempted to identify long-range NRC research needs. The RES was generally responsive to the ACRS' comments and recommendations.

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- In NUREG-1635, Vol. 5, dated June 2003, the ACRS provided its comments and advice on the RES document entitled “Advanced Reactor Research Infrastructure Assessment,” which identified gaps in technology that need to be filled prior to the potential certification of a number of new reactor designs. The Committee provided specific advice as to the direction of the NRC staff work in the areas of generic regulatory framework, human factors, thermal-hydraulics, neutronic analysis, severe accident progression and source term, fuels, and computer capabilities.
  - In NUREG-1635, Vol. 6, dated March 2004, the Committee provided its observations and recommendations concerning the ongoing and proposed research activities. This report focused on that portion of the NRC research program dealing with the safety of existing nuclear reactors and advanced light water reactor designs. In its review of the NRC research activities, the Committee considered the programmatic justification for the research as well as the technical approach and progress of the work. This review attempted to identify research crucial to the NRC mission. This review also attempted to identify research activities that have made valuable contributions to the agency mission in the past, but now have reached the point where additional research is not needed for efficient and effective safety regulation.

The ACRS plans to continue reviewing the ongoing and proposed research activities as part of its biennial reports, in which the Committee will provide comments and recommendations to the Commission on how well the RES program is addressing the agency’s needs. The ACRS also intends to interact with similar advisory committees of other countries, as appropriate and as resources permit, to remain well informed of the developments in the international research arena, and to bring those developments to the attention of the Commission, as needed.

The ACRS has also agreed to assist RES in evaluating the effectiveness and utility of the NRC research programs. This evaluation is mandated by the Government Performance and Results Act (GPRA) and needs to be in place during fiscal year 2005. The Committee review will focus on assessing the quality of the NRC research programs. The ACRS plans to provide an evaluation of the quality of selected research projects to be used in the annual RES performance report and in supporting RES’ quality improvement activities. The result of this evaluation will be in the form of a letter report to the Director, RES, providing a quantitative metric and a narrative evaluation of a selected number of research projects.

### GENERIC SAFETY ISSUES

The ACRS has had a long-standing role in advising the Commission on the staff’s prioritization and resolution of GSIs. For several years, the ACRS maintained a separate list of the GSIs that the Committee identified during its review of significant operating events and applications for construction permits and operating licenses. Recognizing the additional burden on the staff in keeping track of the GSIs identified by the ACRS and those identified by the staff, the ACRS and the NRC agreed in the early 1980s to combine the ACRS list of the GSIs with the list compiled by the NRC staff.

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The ACRS made significant contributions to the GSI process, including the following:

- played a major role in assisting the staff in developing the methodology for prioritizing GSIs, which is included in NUREG-0933, “A Prioritization of Generic Safety Issues”
- reviewed the adequacy of the priority rankings (HIGH, MEDIUM, LOW, and DROP) for more than 800 GSIs (in most cases where the ACRS disagreed, the staff reassessed the priority rankings and resolved the ACRS concerns)
- reviewed the resolution of essentially all of the unresolved safety issues (USIs) and most of the GSIs (the staff resolved the ACRS concerns and disagreements regarding the adequacy of the resolution through additional and/or improved analyses which, in turn, resulted in a technically sound resolution)
- pushed for the resolution of several GSIs that were prioritized about 15 years ago, but still remained unresolved (subsequently, schedules for resolving these GSIs have been included in the Chairman’s Tasking Memorandum, which is now submitted to Congress every year and, since the ACRS expressed its concern, several of these GSIs have been resolved, and the GSI process has been revised)

The ACRS will continue to add value to the GSI process by reviewing the following aspects:

- support staff activities to resolve GSIs in a timely manner, using good science
- adequacy of the proposed priority rankings and resolution of GSIs
- effectiveness of using Management Directive 6.4 and the associated Handbook to implement the revised GSI resolution process
- validity of the assumptions and analyses used in prioritizing and resolving GSIs
- operational events (to determine whether they warrant reassessment of those GSIs that were previously assigned a “LOW” priority ranking and those that were classified as “RESOLVED”)
- adequacy of the resolution of certain GSIs by the licensees through programs involving individual plant examination (IPE) and individual plant examination of external events (IPEEE)
- adequacy of the resolution of the GSIs identified by the Multiple System Responses Program (MSRP)
- effectiveness of the revised GSI process

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## REACTOR OPERATIONS

The ACRS has made significant contributions in the area of reactor operations by reviewing safety-significant issues associated with operating plants and several other related matters, including the following:

- continuing review of the reactor oversight process (ROP)
- proposed improvements to the inspection and assessment programs, generic communication process, and enforcement policy
- differing professional opinion (DPO) issues associated with steam generator tube integrity
- steam generator tube and reactor pressure vessel integrity and steam generator tube repair limits
- spent fuel pool accident risk
- insights gained from risk-informed pilot applications, including those from pilots for inservice inspection (ISI), extension of allowed outage times, and online maintenance
- strainer blockage in boiling-water reactors (BWRs)
- reliability of emergency ac power at nuclear power plants
- IPE and IPEEE programs
- safeguards issues
- lessons learned from the investigation of significant operating events (e.g., steam generator tube rupture event and reactor trip and loss of offsite power event at Indian Point Unit 2, and reactor trip event at Hatch Nuclear Plant)
- improvement of the review process for extended power uprates through a revised standard review process
- highlights of events that occurred at foreign nuclear plants and their associated safety significance
- power uprate review guidance for licensees and staff
- loss of spent fuel cooling following a loss-of-coolant accident at the Susquehanna Nuclear Plant
- effectiveness review of NRC's Operating Experience Program



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The ACRS will continue to make significant contributions to the safe operation of nuclear plants. To do so, the Committee plans to review several matters in this area, including the following, and provide valuable and timely advice to the Commission:

- use of performance indicators (PIs) in the ROP (to ensure that they provide meaningful insight into aspects of plant operation that are important to safety)
- enhanced NRC training material for inspecting the licensees' corrective action programs (CAPs)
- continuing review of the Significance Determination Processes (SDPs), and its technical adequacy relative to these processes
- significant operating events
- safety management
- materials degradation (cracking, corrosion, etc.), which potentially impact safety and the economics of nuclear power generation.
- human factors and human reliability analysis models
- reliability and modeling of digital instrumentation and control systems for current and future plant designs to increase confidence and reduce uncertainty in quantitative assessments
- issues that led to the shutdown of plants for more than a year, and the associated corrective action programs
- strainer blockage in pressurized-water reactors (PWRs)
- risk-based analysis of reactor operating experience and risk-based technical specifications
- pressurized thermal shock (PTS) screening criteria (reevaluation)
- power uprates and applications for extended power uprates of more than 5 percent (e.g., Vermont Yankee, Hope Creek, and Browns Ferry)
- unanticipated effects of power uprates on BWRs, such as steam dryer degradation
- impact of deregulation on operating plant safety
- impact on safety from changes in nuclear plants (high-burnup fuel, power uprates, plant life extension, and use of "best-estimate" or "more-realistic" analyses), and their potential impact on plant safety
- impact from changes in grid reliability and recovery time on station blackout risk

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In addition, each year, the ACRS will visit one of the NRC's Regional Offices and a plant in that region, and will meet with the licensee and the regional staff to obtain information regarding significant issues that are currently being dealt with. Insights gained from these meetings will be used in the Committee's review of significant regulatory issues, or brought to the attention of the EDO or the Commission.

### TRANSIENT AND ACCIDENT ANALYSIS CODES

Computer codes have become the major tools used to calculate reactor system behavior during transients and accidents. The codes in use have an ancestry that dates back some 30 years, and a corresponding development process that has not been transparent. As such, the codes must be carefully compared to relevant experimental data, and used only within the range of applicability of that data. Given the above, ACRS review of these codes is necessary for the following reasons:

- The move to risk-informed regulation will result in the use of more realistic codes. Use of such codes requires a quantitative evaluation of model uncertainties, and the development of acceptance criteria.
- Code documentation must be acceptable to knowledgeable, impartial observers. Review of codes to date indicates that documentation needs to be improved. In addition, code quality must be adequate to support regulatory decisions.

The ACRS has significant interest in the transient and accident analysis codes. As a result, the Committee has made major contributions in this area by providing formal and informal comments and recommendations, as follows:

- reviewed several thermal-hydraulic codes and severe accident codes used by the NRC and/or its contractors (such as RELAP5, TRACE, SCDAP, MELCOR), as well as industry codes (such as S-RELAP5, TRACG, WGOETHIC, and NOTRUMP)
- identified shortcomings associated with several of these codes
- pointed out the inadequate and incomplete code documentation
- questioned whether the code calculations are sufficiently independent of the nodding for full-scale application
- recommended that the NRC staff should continue to independently verify the validity of industry codes
- urged the staff to develop documents to guide the content of code submittals, and to establish procedures for use by the staff in reviewing the industry codes

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The ACRS is continuing the process of reviewing several codes, including the NRC TRACE code, General Electric Nuclear Energy (GENE) TRACG, and other codes used to support advanced reactor designs, as well as the Standard Review Plan Section and Regulatory Guide that will guide the content of code submittals and include procedures for use by the staff in reviewing industry codes.

### ADVANCED REACTORS

10 CFR 52.53 requires that the ACRS review and report on those portions of standard design certification applications that concern safety. The Committee has reviewed the General Electric Nuclear Energy (GENE) application for its U.S. version of the Advanced Boiling-Water Reactor (ABWR) standard design, the Asea Brown Boveri Combustion Engineering (ABB-CE) application for the System 80+ standard design, the Westinghouse AP600 design, and the Westinghouse AP1000 standard plant design.

The Committee will continue to review the safety aspects of the proposed nuclear power plant (NPP) designs, and will provide independent views on the technical adequacy of the designs.

In addition, the ACRS is involved in the pre-application review of the Advanced CANDU Reactor (ACR) 700 and the General Electric Economic and Simplified Boiling Water Reactor (GE-ESBWR). The Committee will participate in the pre-application reviews of the Gas Turbine-Modular Helium Reactor (GT-MHR), the International Reactor Innovative and Secure (IRIS), and the Simplified Water Reactor (SWR)-1000 designs.

The staff developed and the ACRS reviewed standard RS-002, "Processing Applications for Early Site Permits," which describes the early site permit (ESP) review process and review criteria. This standard can be used for application review, as applicable. ESP applications have been submitted by Exelon Generation Company (Exelon), Entergy Operations (Entergy), and Dominion Generation (Dominion). The ACRS will review these applications and the staff assessments.

Other ACRS activities include the review of the Construction Inspection Program (CIP) and the updates to 10 CFR Part 52 rulemaking.

Approval of new advanced reactor designs that are substantially different from existing light water designs will involve considerably more effort than can be inferred from the AP1000 experience. The evolutionary and passive light water advanced reactor designs are built upon an existing technology base that was familiar to the NRC staff and the ACRS. New designs such as the gas-cooled reactors and the ACR-700 will introduce different technologies. A good example of the difference from the AP1000 is the fuel design. The applicant plans to use existing fuel designs and analytical methods, which have been reviewed and approved by the staff and the ACRS. For non-LWR designs, the staff and the ACRS will have to consider a large body of data and other documentation, which in some cases (pebble-bed fuel) are still under development, to approve the new reactor fuel designs. ACRS interactions with the applicants and the NRC staff will be extensive and time consuming, as all stakeholders educate themselves about the technologies that are proposed, including the analytical and experimental bases for demonstrating their safe operation.

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The ACRS is reviewing a technology-neutral framework document for new plant licensing. The recent efforts to risk-inform the regulations have provided insights into the value of a top-down approach for the development of a regulatory framework for new plant designs. Such an approach could facilitate the implementation of performance-based regulations, as well as ensure a greater degree of coherence among the regulations.

### OTHER REGULATORY ACTIVITIES

The ACRS plans to review (or continue reviewing) several other regulatory activities, including the extended burnup of reactor fuels, use of mixed-oxide (MOX) fuel in commercial light-water reactors, the MOX fuel fabrication facility, and acceptance criteria for high-burnup fuels. The ACRS encouraged the NRC's participation in the experimental studies being performed at the CABRI reactor in France, and plans to follow up on those performed at the NSRR reactor in Japan. In addition, the ACRS will review reactor pressure vessel embrittlement issues, control room habitability, decommissioning activities, fire-protection issues, including credit for manual actions, resolution of associated circuits issues, fire risk requantification, and the NFPA-805 Standard, human factors, application for uranium enrichment facilities, safeguards, and transportation of radioactive materials.

### SPECIAL PROJECTS

The ACRS has performed an independent review of each major nuclear propulsion plant (NPP) design proposed by the Naval Reactors (NR) organization of the DOE and the U.S. Department of Defense (DOD). It is anticipated that additional reviews will be undertaken in the 2007–2008 time frame. This review was initially requested by the NR organization, and was subsequently required by a Presidential Directive issued under Section 91b of the *Atomic Energy Act*.

The ACRS also reviewed the adequacy of the SEAWOLF submarine design in 1994, and completed review of the safety aspects of the VIRGINIA class submarine during 2002. The ACRS has added significant value, as follows:

- The ACRS reviewed the safety aspects of the proposed NPP designs, and provided independent views on the adequacy of these designs. Since these designs are classified, they are not subject to public scrutiny. Consequently, the ACRS' independent evaluation of the adequacy of these designs provided credibility and aided the NR organization in justifying the technical adequacy of the designs in front of the U.S. Congress.
- The ACRS' comments and recommendations on the NR Training Program were very helpful to the NR organization in enhancing the effectiveness of this program.
- During its review of the Moored Training Ship Demonstration Project in 1987, the ACRS recommended that the NR organization apply a PRA methodology and severe accident analysis to the NPP design. Subsequently, the NR organization initiated the practice of performing a PRA, including severe accident analysis, for all succeeding NPP designs.

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At the request of the Commission and the EDO, the ACRS has performed other special technical reviews:

- The ACRS, at the request of the EDO, reviewed a differing professional opinion (DPO) on steam generator tube integrity and provided recommendations to the EDO on resolution of the DPO.
- In response to a Commission request, the ACRS completed a technical review of issues related to spent fuel pool fires and provided recommendations for resolution of the issues.

## **MEASURES OF SUCCESS**

An assessment of the extent to which the goals and objectives of this plan have been achieved (including the ACRS' effectiveness, efficiency, quality, timeliness, and rate of success in contributing to the regulatory process) will be addressed in the annual ACRS Operating Plan and its biennial Self Assessment.

## **ACRS ACTION PLAN UPDATE**

The ACRS will periodically update this plan, as necessary. Revisions to the plan will be founded on ACRS' recognition of the need to update the plan, input from the Commission, changes to the NRC's Strategic Plan, changes in the direction of NRC programs, results from stakeholder surveys and self assessments, external events and factors, and available resources.

## **ACRS CONTACT**

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