

United States Nuclear Regulatory Commission
Office of Public Affairs
Washington, DC 20555
Phone 301-415-8200 Fax 301-415-2234
Internet: opa@nrc.gov
www.nrc.gov/OPA/

No. S-96-05

NUCLEAR REGULATION: THE CHALLENGES OF CHANGE

BY

DR. SHIRLEY ANN JACKSON, CHAIRMAN
U.S. NUCLEAR REGULATORY COMMISSION

BEFORE THE

JAPAN ATOMIC INDUSTRIAL FORUM
NAGOYA, JAPAN
APRIL 17, 1996

INTRODUCTION

Kon Nichi Wa Mi Na San

Good afternoon. It is a privilege to have this opportunity to address the annual meeting of the Japan Atomic Industrial Forum (JAIF). I would like to use this occasion to discuss the challenges which nuclear regulators face as a result of a variety of changes. The future of nuclear regulation, and indeed of nuclear power as an energy source, will depend upon our ability to meet these challenges effectively.

In the United States, change is being driven by sometimes conflicting pressures in four areas: (1) economic constraints and the restructuring of the electricity industry; (2) the changing role of government, in response to evolving public concerns; (3) the maturing of the nuclear power industry; and (4) technological innovations. All four factors have major implications for nuclear regulation.

The United States is not unique in this respect. To varying degrees, other countries are facing similar challenges. Although the precise character of the response to these challenges may differ between countries, the objectives are largely the same everywhere: (1) improvement in the already high levels of safety

in the peaceful uses of nuclear energy; (2) improved nuclear power plant operating performance (which has the incidental effect of improving economic performance); and (3) better public understanding of the basis for the regulators' confidence that, with proper regulation, nuclear energy can play a part in the economic and social development of nations.

The common thread running through these issues is change. Governments, like individuals, sometimes feel most comfortable clinging to the status quo, even as circumstances shift around them. In the nuclear area, this is a luxury we cannot afford. Ignoring change can compromise public health and safety. If a nuclear plant is badly designed, or poorly operated, remedial action must be taken. Safety upgrades, power reductions, or even shutdown and decommissioning must be considered -- even in the face of power shortages, human and financial resource constraints, and political obstacles.

At the same time, change for the sake of change is by no means desirable. Allowing change to drive decision-making in a haphazard and premature manner could be as dangerous as an overly rigid refusal to contemplate doing things differently. Unnecessary alterations in designs, or modifications or backfits ordered in haste, without a proper understanding of their long-range impact, can erode safety rather than increase it.

In the end, the only acceptable approach is "managing" change, which means focusing our efforts on best defining and implementing long-term, well thought-out approaches. This will tax our human and infrastructural resources. It will require both vision and political will. However, I am convinced that "managed change" will have the best chance of maintaining nuclear power as a viable energy alternative, supported by a public which believes that its essential health and safety concerns are taken into account.

DIMENSIONS OF CHANGE

Economic Change

First, let me address the economic dimensions of change.

The U.S. electric utility industry is currently facing challenges that will inevitably change its business practices in fundamental ways. At present, the industry is restructuring in an effort to become more competitive, to lower electric rates to consumers, and to respond to Federal and state regulatory initiatives. The implications of these challenges to U.S. utilities and to the NRC are not yet clear.

Safety performance, reliability, and availability of U.S. power reactors during the 1990's have been good and generally continue to improve slowly. This is demonstrated by the key operational safety indicators monitored by the NRC. Improved management of operational safety has been accompanied by decreases in average plant operation and maintenance costs, and increased plant availability.

Paradoxically, this excellent record of nuclear power may also contain a degree of risk: that complacency might subtly erode the vigilance that a true safety culture requires. Further, there is the danger that increased competitiveness in the electricity industry may create pressures to minimize expenditures to the point that safety is compromised.

In all the countries I have visited during my first year as Chairman, I have seen that securing reliable sources of energy dominates national agendas. Some nations, which have significant nuclear energy programs, face public skepticism or increased competition from alternate sources of energy, often compounded by new policies directing the privatization of the nuclear sector. In countries just beginning nuclear programs, or contemplating a nuclear power option, high start-up costs and extensive infrastructural demands are weighed against the costs of imported fossil fuels, or their associated environmental effects. In states with aging nuclear power facilities, the decision to continue operating them is sometimes a function of social need, which may outweigh strict cost accounting.

In this complex situation, the regulator must keep abreast of how rate deregulation, competition, and economic, political and social constraints affect nuclear reactor operators, because they can impact safety. In the U.S. I have to ensure that nuclear electric generators continue to maintain high safety standards, with sufficient resources devoted to nuclear operations, and with decommissioning funding assured. I have asked the NRC staff to analyze this changing business environment carefully to determine the adequacy of our current regulatory requirements. To this end, the NRC staff has proposed that the Commission initiate a rulemaking to provide adequate assurance of decommissioning funds for those power reactor licensees which are no longer economically regulated.

Changing Role of Governments

Many Americans have come to believe that Government is too large, with too pervasive an impact on industry and the public. Moreover, continuing budget constraints affect all U.S. government agencies, including the NRC. Part of our task at the

NRC is to assure that, regardless of the constraints or where the lines are drawn, adequate protection of public health and safety is not compromised.

Smaller budgets do not necessarily mean decreased responsibilities. For example, in the newly independent states of the former Soviet Union, governments with slender and uncertain budgets have had to take on the demanding responsibilities of regulating, as well as operating, existing nuclear power plants. They often lack trained personnel, adequate facilities, and even design information, and they have limited funds to devote to this complex process.

In the U.S., despite budget cutbacks, the NRC may have to assume new missions. An advisory committee, formed in 1994 by the U.S. Department of Energy (DOE), has made recommendations on external regulation of DOE facilities. DOE is currently studying the advisory committee's findings, and this month expects to issue its decisions. If full DOE oversight is assigned to the NRC, it would add significantly to our current regulatory responsibilities, would require agency restructuring, and significant additional resources. Such a step also would require Congressional approval.

Changes in a Maturing Industry

In those countries which began their civilian nuclear programs in the 1950's and 1960's, the industry has operated long enough to have accumulated aging facilities and substantial quantities of nuclear wastes. For countries just now beginning nuclear power programs, planning at the outset for aging, plant life extension, and even disposal of waste may seem remote and possible to defer. However, addressing these issues at the outset of a program is fundamentally important.

For example, without careful advance planning in design, modifications needed to operate and eventually extend the operating life of a plant may be very difficult and very costly. In the U.S., we also have learned that planning for decommissioning a nuclear plant is as important as designing, constructing and operating it safely. In the U.S., as elsewhere, the short-term and long-term disposition of radioactive wastes has become a national problem. Without timely attention to the safe management of these wastes, it is unlikely that nuclear power will garner the public support needed for further development.

Aging Reactors

Aging affects all plant structures to varying degrees and can affect operations and safety, if not properly managed. The regulatory authority of each country must examine the standards and operating procedures imposed on critical components to assure itself and the public that adequate safety margins will be maintained as nuclear power plants age. Two specific aging problems of great importance worldwide are reactor pressure vessel embrittlement and steam generator tube degradation. Some U.S. reactor pressure vessels may approach pressurized thermal shock screening criteria before the end of their license terms. If so, licensees will have to perform detailed analyses to demonstrate that the plants can be operated safely. If the analyses do not support continued safe operation, the embrittlement of the reactor pressure vessel must be mitigated in some way, such as by thermal annealing, or these reactors will have to be shutdown.

Steam generator tube degradation represents the potential failure of one of the principal fission product barriers in a pressurized water reactor. The NRC is considering a generic approach for dealing with steam generator tube degradation that will reduce plant-specific regulatory decisions, while ensuring defense-in-depth through a balance of protection, inspection, and mitigation. In the end, however, many plants may have to replace the steam generators; and, indeed, a number have done so.

The NRC believes that, as operating plants age, an important step in ensuring that licensees continue to focus on safety-important plant equipment is our risk-informed, performance-based Maintenance Rule, which will become effective in July. Under this rule, licensees will be required to establish maintenance programs based on a risk-ranking of structures, systems and components for their specific plants, and performance monitoring based on pre-established goals. Through inspection, the NRC will monitor performance against the licensee's program.

Life Extension

The NRC recognizes that, if age-related issues are addressed properly, there is no reason that U.S. electric utilities, and our nation, should be deprived of the electricity that older plants can generate. Therefore, we have worked to create an effective regulatory environment in which plants capable of extended safe operation may continue to operate beyond forty years. In the U.S. regulatory scheme, this means renewing a nuclear plant operating license. The NRC has recently developed a regulatory process to handle license renewal in 10 CFR Part 54. Reports from industry groups to discuss generic license renewal

programs have been received, but no license renewal application has yet been filed.

Waste Storage and Disposal

One of the most important and highly publicized issues facing the nuclear industry worldwide is nuclear waste storage and disposal. Without satisfactory resolution of this issue, the future role of nuclear energy in the overall U.S. energy mix will be severely constrained. This is both a technical and a public policy issue. The continuing delays in achieving a demonstrably workable facility for permanent disposal of nuclear wastes has had a major influence on public attitudes toward nuclear power in the United States.

Based on what we know today, the NRC believes that a deep geologic repository is a technically feasible solution to the problem of permanently disposing of spent fuel and other high-level radioactive waste in the U.S. The NRC will have to determine whether spent fuel and other high-level nuclear waste can be disposed of safely in a geologic repository constructed and operated by the U.S. Department of Energy (DOE). To make that determination, the NRC will have to maintain, in the face of budget constraints, the technical capability and resources for performing the necessary analyses and determinations. The NRC also could be called upon to license an interim centralized storage facility. We are initiating an examination of our existing licensing capabilities and staff resources relative to that possibility.

In the Low-Level Radioactive Waste Policy Act of 1980 and its 1985 amendments, the responsibility for identifying sites and developing disposal facilities in the U.S. was given to the States. This authorized them to enter into compacts for the establishment and operation of regional disposal facilities for low-level waste. The NRC or, as appropriate, the 29 Agreement States which have signed agreements with the NRC to regulate the use of radioactive material within their borders are responsible for licensing these facilities. It currently appears that most, if not all, low-level waste disposal facilities will be licensed by Agreement States. Nevertheless, the NRC also must maintain some level of licensing capability should we be called upon to license directly a low-level radioactive waste disposal facility.

Technological Change

The term "technological change" should be interpreted in the broadest possible manner -- to include, for example, new reactor designs, as well as improvements in the methodologies used to

calculate the risks associated with operating existing plants. These technical innovations provide important tools for industry and regulator alike.

New Reactor Designs

Although it does not appear likely at this time, the possibility remains that utilities and other electric power generators will consider a standard nuclear power plant as a source for new generating capacity. The NRC has issued final design approvals for two standard reactor designs and is in the process of certifying these designs by rulemaking. We expect that the certification of the two standard reactor designs -- the General Electric Advanced Boiling Water Reactor and the ABB/Combustion Engineering System 80+ -- will be completed in 1996. The NRC is also reviewing the Westinghouse AP-600 standard design application for a novel light water reactor design employing passive safety features and greater use of modular construction. While General Electric announced that it was ending its Simplified Boiling Water Reactor program, Westinghouse has confirmed its continued participation in the DOE's first-of-a-kind-engineering Advanced Light Water Reactor effort.

New Methodologies

In regulating the mature nuclear power industry in the U.S., I favor the use of risk insights, such as Probabilistic Risk Assessments (PRAs), in a "risk-informed, performance-based" approach. This tends to relieve regulatory burden by focusing on those aspects of nuclear operations that have the greatest safety significance, while maintaining the principle of defense-in-depth. It also may reveal vulnerabilities which could result in new requirements. On balance, however, a risk-informed, performance-based approach allows a sharpening of focus and a targeting of resources in the most efficient, effective ways.

The NRC has some regulatory initiatives employing this approach - including amendments to the containment leakage testing rule, the maintenance rule, and a proposed reliability data rule. To foster consistency in the use of PRA in NRC decision-making, the NRC last year issued a PRA policy statement and related implementation plan. The NRC staff has been tasked to develop a basic structure for a risk-informed, performance-based regulatory framework, including standards development, a standard review plan, and regulatory guidance documents.

Let me turn to reactor pressure vessel embrittlement. Over the past 30 years, researchers have made significant progress in understanding the variables that affect such embrittlement.

However, we have not yet made sufficient progress in directly measuring embrittlement changes in operating reactor vessels and relating those changes to microscopic models which give a stronger predictive capability, and allow an assessment of post-annealing properties. To improve this situation, we should pursue the use of advanced NDE techniques to measure embrittlement of irradiated reactor vessels directly, not restricted by a limited number of test specimens. Although the development of new NDE methods for measuring radiation embrittlement is a formidable task, such methods would be clearly beneficial as a supplement to current practices.

MANAGING CHANGE

Strategic Assessment and Rebaselining

To position us to effectively meet the challenges we face and to intelligently guide our activities and decision-making in the future, last year, I initiated a strategic assessment and rebaselining at the NRC for domestic and international activities. The first phase is identifying key strategic issues to be addressed by the Commission. This will lead to a new NRC strategic plan and five-year plan. The subsequent rebaselining will reflect our prioritized programmatic needs, their required resource levels, and any agency-wide changes needed.

Transparency and Public Trust

The challenges facing the nuclear power industry worldwide can be posed as a series of questions. How best can we assure safety and public confidence during periods of economic constraints and industry restructuring? What role should downsized and budget-restricted government have in ensuring domestic and international safety? What is the most appropriate and effective way of regulating a maturing industry? And finally, what technological advances can be harnessed for maximum effect in ensuring public health and safety?

The beginning of an answer for each of these questions is transparency, because it generates public trust, demonstrates how decisions to allocate scarce resources are made and implemented, ensures effective cross-fertilization of experience and information, and promotes the use of new ideas and technology.

Public trust in nuclear energy, and by extension in those who regulate it, is inherently fragile. It is nurtured and strengthened only when government officials and the industry they regulate are utterly candid and honest -- painful as that

sometimes may be. There is a kind of pact that exists between the public and those who operate and regulate technologies such as nuclear power; and the rock-bottom foundation of that pact is candor. If we are not candid with the public when we discuss our shortcomings, we cannot expect to be believed when we describe our successes. Overall, the story of commercial nuclear power and its regulation has been admirable, in the United States and abroad, but public acceptance has lagged behind, and to some extent that is attributable to the fact that transparency has not always been the guiding principle.

This necessitates the transaction of our business in the most public way possible. I have been reminded of that recently by the publication of articles in the U.S. media on the Northeast Utilities' Millstone plant and its noncompliance with its Final Safety Analysis Report (FSAR). Millstone operators allegedly were routinely performing full core off-loads, during refueling outages, were ignoring the mandated 250-hour cool-down period for these offloads, and allegedly were placing the primary cooling system at risk. Evidence suggests that these activities had been taking place for over twenty years, without NRC intervention. In response to the situation, and in an effort at honest self-appraisal, I requested an in-depth lessons-learned assessment from the NRC staff -- incorporating suggested improvements of oversight processes including: (1) clarification of relative responsibility and accountability of those with direct plant oversight; (2) strengthened guidance for making and documenting changes to a nuclear power plant; (3) strengthened training of inspectors; and (4) improvement of our responsiveness to the public. These assessments will help us to improve our performance as regulators. Has it been painful? Of course. But I do not doubt that out of these pains will come gains for the NRC, the nuclear industry and the American public.

Coordinating Resources

The development of nuclear power is and always has been an international undertaking, with extensive technology transfer between nations. Countries have differed in the way they have developed and applied the operational and regulatory safety culture by which the risks and consequences of radiological accidents are kept within acceptable bounds. I have tried today to point out the similarity of the challenges that currently face many nations with nuclear power programs. Given those common challenges, it is time that we share not just technology, but also our collective wisdom in coping with today's environment. We need to explore how better to communicate our experiences and leverage our resources to manage the challenges we face.

The nuclear industry has long seen the benefit of sharing information in the design, development, and construction of nuclear power plants and of cooperating in reactor research. The major vendors have invested in increased efficiencies, such as building reactor pressure vessels in one country, constructing instrumentation and control systems in another, and bringing them together in a single project in a third country. Likewise, they have banded together in domestic and international operators' groups to share information and experiences to build a common basis for the safe operation of their facilities.

I believe the world's nuclear regulators should follow suit, and consider establishing a better mechanism for coordinating their own efforts. This could be done through a more regular forum for the exchange of views and information on topics of mutual interest. I know that significant exchanges already take place on an ad hoc basis and sometimes in the context of meetings at the IAEA in Vienna or the NEA in Paris. However, these efforts do not always reflect the needs or priorities of regulators. We do not need a multilateral nuclear regulatory organization with a secretariat and headquarters. Nuclear safety must remain the responsibility of the nations in which the technology is utilized. However, a more formal organization of nuclear regulators on the international level might identify common themes and approaches and provide greater support for safety.

Another means of combining enhanced safety with a recognition of fiscal constraints is to build on the internationally applied concepts of collaboration and peer review, comparing perspectives on problems and the means of resolving them. A striking example of the success of this policy has occurred in the area of reactor research, where many countries already share the results of their reactor research, building upon the unique areas of expertise each possesses.

Specifically, I suggest that we consider an international reactor safety research program, focused on aging and risk assessment methodologies, in which we integrate our safety research activities. In certain areas of mutual interest, coordinated international safety research has already occurred, with excellent results. My proposal is meant to be a more structured and focused safety research program than generally exists internationally at this time.

Another effective mechanism for sharing information is through the international Convention on Nuclear Safety (CNS), negotiated over a three-year period by representatives from over 65 states. This instrument will help assure a safer global environment because of the guiding principles that participants are obliged

to follow which require each contracting party to establish an independent regulatory body. There are also reporting and peer review processes implemented by the Convention. The Convention on Nuclear Safety is currently before the U.S. Congress for ratification.

CONCLUSION

I hope my remarks have given you some insight into why I believe our mutual goal should be the effective "management of change" in four major areas. These changes and the challenges they present, viewed as an interrelated series of opportunities which both the international and the U.S. nuclear industries and regulators are facing, require from us greater efforts to coordinate and pool our information and resources, and to maintain a climate of candor at all times.

There is today, in nations around the world with civilian nuclear programs, a wealth of experience of all kinds -- technical knowledge, operating experience, and an understanding of what government regulation can and should accomplish. Much of that experience is in this room today. By ensuring that this experience is shared widely, we have the ability to benefit the people of our own nations and the world community as well. Great as this challenge is, it is an even greater opportunity.

Domo Arigato.