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# Challenges as Opportunities: Regulatory Activities in the Face of Industrial Change

by

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Good morning. I am pleased to participate in this plenary session of the ANS 1998 winter meeting. While the theme of this session is "Challenges and Opportunities for Nuclear Science and Technology," I find it helpful to think of challenges as opportunities. The recent focus on the mitigation of global warming, culminating in the Kyoto Protocol, has given renewed emphasis to the need for emissions-free electrical generation. This naturally leads to a consideration of the role of nuclear power, since it is an emissions-free electrical generation source. In fact, there has been a push to provide nuclear generation with a "level playing field," as various emissions trading schemes emerge, both nationally and internationally.

These considerations would appear to portend a brighter future for nuclear power and the use of nuclear technology worldwide. This suggests a need and an opportunity for the optimization and continued use of existing nuclear generating facilities, and the construction and use of new reactor technology. However, all of this is occurring against the backdrop of several continuing challenges: the economic deregulation of electric utilities, the continued non-resolution of the disposition of spent fuel and high-level waste, and public perception of the safety of nuclear technology, including nuclear power–which may be improving here, but which is rooted in less positive governmental attitudes toward it in some countries abroad.

## Economic Deregulation of Electric Utilities

The Energy Policy Act of 1992 included provisions that enabled wholesale competition in electricity generation. In 1996, the Federal Energy Regulatory Commission (FERC) issued two rules promoting wholesale competition through open access transmission. The final rules are known as FERC Orders 888 and 889. Rule 888 requires that a public utility will provide transmission services to its wholesale competitors on the same terms as it provides those

services to itself. Rule 889 supports wholesale competition by requiring that the availability and cost of transmission be public, current, and posted on the Internet via a common database.

This movement transitioned quickly from the wholesale to the retail environment. At the Federal level, several bills were introduced in the 104th and 105th Congresses. Although no proposed Federal legislation has yet become law, many States already have moved to deregulate the retail electricity generation market. The States of California, New Hampshire, Pennsylvania and Rhode Island have been leaders in enacting rate deregulation and restructuring legislation. Most recently, Connecticut, Illinois, Massachusetts and Virginia have enacted such legislation. In the most recent election (November 4, 1998), voters in California and Massachusetts defeated ballot propositions aimed at repealing state laws on electricity deregulation.

This evolving environment presents several challenges from a nuclear regulatory perspective. They are:

- The need for a continued, more sophisticated focus on safety in nuclear operations in a manner which allows nuclear generators to operate successfully in a more competitive market. This requires the consistent use of maturing risk assessment methodologies, including probabilistic risk assessment (PRA).

- Electrical grid reliability

- The need to respond to new business/ownership arrangements

    - License Transfers
    - Decommissioning Funding Assurance

- License renewal

- I now will speak to each of these challenges in turn.

<u>The Use of Risk Assessment in Nuclear Operations and Nuclear Regulatory Activities</u>

The use of risk assessment in a nuclear activity is a systematic method for addressing these questions: What can go wrong? How likely is it? What are the consequences?
A typical probabilistic risk assessment (PRA) at a commercial nuclear power plant considers the probability and effects of individual component failures, and of human performance, on the ability of that facility to avoid damage to the reactor core in the event of an accident. The results of such analyses provide useful insights into individual plant vulnerabilities, and can define the importance of one system relative to another. One output of such an analysis is what we refer to as “core damage frequency,” (that is, the probability of an initiating event followed by a series of safety system failures which would lead to core damage on a per reactor-year basis). The analysis becomes very useful in assessing the effects of proposed changes to the facility; that is, changes in core damage frequency <u>due</u> to a proposed change provide an indication of the risk significance <u>of</u> the proposed change.

This form of analysis allows the NRC to focus greater attention on the issues of greatest safety significance, while reducing unnecessary regulatory burden for our licensees. Insights into risks presented by proposed changes to licenses of operating facilities have allowed us to approve

extensions to allowed outage times for safety-related equipment. These extensions allow for more effective maintenance planning, reduced outage scopes, and fewer unnecessary plant transients necessitated by the inoperability of equipment that is of low overall risk significance. At pilot facilities, risk information has been used to make fundamental changes in the way the plants are operated and maintained. For instance, at the South Texas Project, a graded system of Quality Assurance has redirected licensee attention toward components and activities that present the greatest risk. At Surry, Arkansas Nuclear One, and Vermont Yankee, the NRC has nearly completed risk-informed in-service inspection program reviews, which will allow these facilities to conserve effort and realize reductions in radiation exposure in their inspections of safety-related systems and components.

The NRC also has turned its attention to the application of risk information to overall performance assessment, inspection, and enforcement at commercial nuclear power facilities. In a recent and ongoing effort, the NRC, with the active cooperation of its stakeholders, is developing a new plant assessment process. The new process is built on "cornerstones of safety." Which represent central elements of reactor safety, such as minimizing transients, preventing accidents, ensuring the capability to mitigate accidents, ensuring an adequate level of radiological protection to both nuclear workers and the public, and ensuring that adequate radiological safeguards are in place. Risk information can then be used in determining what is important to inspect in a nuclear plant, and what can be monitored through the use of performance indicators.

Based both on objective performance data and specific inspection findings, the new performance assessment will be more objective, and more focused, than our existing assessment processes. It will produce more predictable regulatory responses to observed performance weaknesses. I am encouraged by the level of support these efforts have received from the nuclear power industry, and from public interest groups.

For completeness, I will note that when the subject of risk-informed regulation shifts from the power reactor area to fuel fabrication, waste disposal, and other non-reactor fields, implementation becomes more difficult. In the power reactor arena, there are a relatively small number of licensees (less than one hundred); and fundamentally, 2 types of power reactor technology–boiling water reactors and pressurized water reactors–supported, in the US, by 4 major vendors. Non-reactor materials users number approximately 20,000 NRC and NRC Agreement State licensees and comprise approximately 40 different activities, devices and systems ranging from devices which employ low-activity sealed sources to large fuel-cycle facilities or a geologic repository for high level waste disposal. The power reactor industry has one basic product–electricity–and is supported and organized by owners' groups and industry organizations, such as NEI. Nuclear materials licensees provide everything from radiography services to fuel assemblies for power reactors, which limits the potential for overall unification. This level of diversity complicates considerably the NRC effort to risk-inform nuclear materials regulation.

Nonetheless, the Commission directed the NRC Office of Nuclear Material Safety and Safeguards (NMSS) to examine the extent to which risk-informed and less prescriptive regulation can be applied to non-reactor nuclear activities in a manner similar to that employed with the power reactor industry. relating the sophistication of the analytical method for determining risk to the risk presented by specific nuclear materials activities will be important in establishing a more risk-informed regulatory process. a broader range of licensee and

regulator circumstances, such as the impact of NRC actions on its Agreement States, will have to be considered.

There have been some examples of the successful application and use of risk information outside the power reactor arena. For example, the NRC has encouraged the use of Integrated Safety Analyses (ISAs) in fuel cycle facilities. Such analyses involve the identification of safety hazards at a given facility, analysis of the how those hazards may result in accidents, and classification of the components relied upon to prevent or mitigate the accidents. While much more qualitative than the PRAs performed for operating reactors, these methodologies represent structured and worthwhile tools in the effort to identify and address risk.

Electrical Grid Reliability

In recent years, NRC probabilistic risk assessments have made it clear that a "Station Blackout" at a nuclear power station is a major contributor to core damage frequency. The term "Station Blackout" is used, in the nuclear power industry, to refer to an event in which a loss of offsite power is coupled with the inability of the onsite emergency diesel generators to provide vital power to plant safety equipment. While the estimated frequency of these events is very low, because of the potential consequences, the possibility of a Station Blackout is an area of NRC focus.

The analysis of power reactor experience in this area shows that nuclear generating stations are robust in design and operational standards, allowing them to help stabilize the electrical grid. However, analysis also makes clear that nuclear generating stations are vulnerable to grid disturbances, and especially to loss-of-offsite-power events. Grid reliability governance must take account of these factors. Standards of performance, operational criteria, and training of personnel all must be addressed, especially as Independent System Operators (ISOs) are established in response to deregulation. The NRC has established a grid reliability action plan to address concerns regarding the impact of utility deregulation on the reliability of the electrical grid in supplying offsite power to nuclear power plants. As part of the plan, the NRC has been working with other agencies with jurisdiction over grid reliability to address our concerns.

The DOE has created a working advisory committee on the reliability of the U.S. electric system. Just last month, this task force submitted a final report to the Secretary of Energy. The report recommended that Federal legislation be considered to clarify the authority and responsibility for setting reliability standards, and that the FERC should review the policy, standards, governance, and organization of reliability entities. The report also identified the need to take planning and operating actions that support the unique power requirements of critical facilities such as nuclear power plants. The task force has issued two position papers–one related to technical transmission issues, and the other addressing [the roles and responsibilities of] Independent System Operators. Grid reliability was discussed at a recent Senate Energy Committee hearing on electricity pricing abnormalities. The NRC will continue its coordination with the DOE and other agencies, and will continue to monitor closely the impact of electric utility restructuring and evolving legislative initiatives on grid reliability.

Responding to New Business and Ownership Arrangements

On August 19, 1997, the Commission issued a final policy statement on electric utility restructuring and deregulation. The policy statement indicates that the NRC will continue to conduct its financial qualifications, decommissioning funding, and antitrust reviews; will identify

all direct and indirect owners of nuclear power plants; will establish and maintain working relationships with rate regulators (including the FERC and the State PUCs); and will reevaluate the adequacy of our regulations in this area. NRC staff guidance has been developed for antitrust reviews, licensee financial qualification reviews, and decommissioning plan reviews.

License Transfers

We also have seen an increase in license transfer applications, primarily as a result of corporate restructuring actions in anticipation of electric utility industry deregulation. To ensure that license transfers are conducted effectively and promptly, the NRC has issued a proposed rule (which will become final in December 1998) that would provide uniform rules of practice for handling hearing requests associated with license transfer applications. The adjudicatory process will be streamlined by allowing more informal hearings for license transfers.

Corresponding guidance documents have been developed for NRC staff review of license transfer applications, including the establishment of technical and financial qualifications of purchasers, and the evaluations of foreign ownership and control limitations.

Decommissioning Funding Assurance

Under the Atomic Energy Act, the NRC has general authority to regulate the decommissioning of the nuclear facilities and materials that it licenses. NRC decommissioning regulations have required power reactor licensees either to set aside funds periodically in external trust fund accounts or to provide third-party guarantees for estimated decommissioning costs.

As such, by the time a licensee permanently ceases operations at the end of its licensed term, the total amount of funds estimated as needed to complete decommissioning is expected to be available. In the emerging environment of electric utility restructuring, the NRC has had to reevaluate certain aspects of these provisions for decommissioning funding assurance, including the NRC definition of "electric utility," the potential impact of new ownership arrangements, and the problem of above-market or "stranded" costs.

On September 22, 1998, the NRC amended its regulations on decommissioning funding for nuclear power plants to reflect the conditions expected from rate deregulation. The amended rule, which will take effect later this month, modifies the NRC decommissioning regulations in four areas.

- It identifies which licensees may use the external sinking fund method of financial assurance for decommissioning exclusively, and identifies additional financial assurance mechanisms that may be used for decommissioning.

- It permits nuclear power plant licensees to take credit on earnings for prepaid decommissioning trust funds.

- To keep the NRC informed of licensees' decommissioning fund status, it requires licensees to report periodically to the NRC on the status of their

decommissioning funds and on any changes to their external trust agreements.

- It adds a definition of "Federal Licensee" to further clarify the issue of which licensees may use statements of intent.

License Renewal

Some nuclear power companies have decided that, in addition to optimizing the operation of existing plants, extending the license terms of these plants from 40 years by an additional 20 years makes good business sense. The NRC currently is reviewing license renewal applications from Baltimore Gas & Electric Company and Duke Energy for their Calvert Cliffs and Oconee nuclear plants, respectively. We expect more. The Commission has issued a policy statement laying out its expectations for a focused review of these and other license renewal applications, built upon our license renewal regulations: 10 CFR Part 54 (for technical issues) and 10 CFR Part 51 (for environmental reviews). Case-specific orders for both of the existing applications have been issued by the Commission-laying out an adjudicatory schedule aimed at completing the license renewal process in 30-36 months.

**Spent Fuel and High-Level Waste**

The Nuclear Waste Policy Act of 1982 and the Nuclear Waste Policy Amendments Act of 1987 specify a detailed national program for deep disposal of spent fuel and HLW in a geologic repository. Under these statutes, the Department of Energy (DOE) was given responsibility for characterizing a repository site, developing a design, and for constructing, operating, and eventually sealing, a repository. The Amendments Act directed the DOE to investigate only one potential location for this repository–at Yucca Mountain, Nevada.

In 1992, the Energy Policy Act directed the Environmental Protection Agency (EPA) to develop environmental standards specifically for the proposed repository at Yucca Mountain, that are to be based on, and consistent with, recommendations of the National Academy of Sciences. Under existing law, the NRC is obligated to implement the environmental standards for Yucca Mountain, to consult with the DOE prior to licensing, to comment on the adequacy of the DOE site characterization activities, and, if warranted, to issue a license to the DOE to construct and operate the repository.

To implement the site-specific health and safety standards mandated by the Congress, the NRC is developing its own implementing regulations, which will specify the licensing criteria for the proposed repository at Yucca Mountain. The primary responsibility for safety and demonstration of compliance with environmental standards rests with the DOE. The NRC task, prior to issuing a license, will be to determine that reasonable assurance exists for compliance with applicable standards and regulations.

The DOE has completed a 5-mile exploratory tunnel into Yucca Mountain. DOE scientists now are using the exploratory studies facility to assess the viability of the site as a permanent repository. We understand that the DOE viability assessment is to be submitted to the President and the Congress later this year.

As a part of its pre-licensing role, and to prepare for the evaluation of the repository license application, the NRC intends to review the technical basis of the DOE viability assessment. The

focus of this review, as well as of the NRC HLW regulatory program as a whole, is the NRC attempt to understand (and, eventually, to resolve) those key technical issues most important to performance of a high-level waste repository. As we work toward this objective, the NRC will continue to provide early feedback to the DOE on potentially significant site, design, or assessment issues as they are identified during site characterization. In addition, we will complete the development of regulations for geologic disposal at Yucca Mountain, and continue to maintain our capability for regulating the transportation and storage of spent nuclear fuel.

## The Future

Looking to the future, in May 1997, the NRC certified the General Electric Advanced Boiling Water Reactor (ABWR) design and the ABB-Combustion Engineering System 80+ design. Both the ABWR (a 1,350-megawatt boiling water reactor) and System 80+ (a 1,400-megawatt pressurized water reactor) are evolutionary designs that incorporate features to prevent and mitigate the effects of severe accidents. These certifications marked the final step in a 10-year effort that encompassed the development and promulgation of 10 CFR Part 52 (a regulation forming the basis for a streamlined licensing process for new reactors), the implementation of the design certification process, and, overall, the most rigorous technical and safety reviews ever performed for a nuclear plant design. The goals of this process included standardization, enhanced safety and reliability features, and a more stable and predictable licensing process.

In September of this year, the Final Design Approval (FDA) for the AP600 design (a 600-megawatt pressurized water reactor) was presented to Westinghouse Electric Company. The issuance of this FDA marks the completion of a 9-year technical review phase, and signifies the NRC readiness for initiation of the design certification rulemaking phase. This safety review was particularly challenging for the NRC staff because the AP600 uses many design features that are not found in current operating reactor designs. It is one of the first designs submitted for NRC review to rely primarily on passive systems, using basic forces such as gravity, natural circulation, and stored energy for plant safety and accident mitigation. Even given the advantages of these next-generation designs, the timing and likelihood of renewed demand for nuclear construction in the U.S. remains unclear. The design certification process, however, has been effective in providing enhancements to safety in design, drawing from experience in a manner that will increase the efficiency of the licensing process, and has positioned the NRC for change.

## Conclusion

As the twenty-first century rapidly approaches, the nuclear industry, especially the nuclear power industry, faces a complex spectrum of challenges and opportunities. The ability to address these challenges will determine the likelihood of the challenges being–or becoming–opportunities. This also undergirds the continuation of public confidence in the safe use of these technologies.

Thank you for your attention, and please accept my best wishes for a productive meeting.