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BENEFITS OF SAFETY-FOCUSED REGULATION

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Good Morning, Ladies and Gentlemen. I'm very happy to have this opportunity to discuss a regulator's view of the road ahead for nuclear technology as we enter a new millennium. The accelerating pace of industrialization and the expansion of market economies throughout the world continue to create opportunities and challenges for all areas of endeavor, including the generation of electric power by nuclear energy. Change is here, and everywhere; change is here to stay.

Although I am speaking to you as a member of the Nuclear Regulatory Commission, I will be offering my individual views today.

[*Figure 1*] Economic deregulation is a reality in the United States and in many places abroad. 16 of the 31 states in the United States of America with operating nuclear power plants have already decided to deregulate electricity supply. Sustained performance improvements at nuclear power plants, license renewals, sales of existing plants, and mergers are making headlines. And yes, there are regulatory changes. The question, therefore, is not whether to change or not to change, but how to make change serve this country, and serve other countries also.

[*Figure 2*] "Rio revuelto, ganancia de pescadores" (translation: in a murky, turbulent river, fishermen profit).

In a Wall Street Journal article of June 18, 1997, two key problems facing nuclear power plants were raised in the context of forced early shutdowns: the safety and the cost competitiveness of nuclear power plants. Those were the times of Millstone and design-bases compliance, and of the doomsday predictions of the effects of de-regulation and stranded costs. Two dozen early shutdowns of plants with "marginal safety" and/or cost were forecast by many; up to 50% of the fleet by some. The Wall Street article stated: "more conservatively, NRC Commissioner Nils Diaz estimates only one dozen early shutdowns." There have been 6.

In another Wall Street Journal article, this one on October 28, 1999, a different perspective is presented. [Figure 3] The first sentence, however, recalled the same old theme. ***“Put aside for a moment all conventional wisdom about the poor economics and high risks of nuclear power.”*** The article then attempts to describe the present merger-buyout financial picture. Yet, I see other, more significant changes: the decommissioning gloom of 1997 is being replaced by the license renewal boom, and the compliance orientation has been replaced by safety-focused regulation. Most stranded costs are not stranded anymore. Moody’s Investors Services changed its estimates of nuclear stranded costs from \$130 billion 3 years ago to \$10 billion presently. The amortization rate has been expedited, offering the prospect for many power plants’ costs to approach production costs in the next few years. And, independent of financial considerations, the Nuclear Regulatory Commission has been changing its regulatory regime, improving predictability and accountability for all stakeholders.

I submit that two independent yet related variables -- safety and cost competitiveness -- determine the viability, indeed the survivability, of nuclear power and nuclear technologies. They are both integral quantities and embody most of the determinant issues. Safety and cost competitiveness [Figure 4] are both dynamic variables and easily tailored for use in decision-making. They have been, and could be, at odds with each other but should not be. In fact, it is imperative that they work together and not against each other. How this is done is an industry prerogative.

I suggest that in the United States of America, the marketplace and regulatory reform are coupling nuclear safety and cost in the right manner. Safety is the priority that enables cost competitiveness while safety-conscious cost considerations strengthen safety. This coupling is obvious when looking at averaged safety and cost performance indicators, and it is dramatic for “top performers.” There is no doubt that the safest nuclear power plants in this country are generating electricity at very competitive production costs, lower than coal and approaching hydroelectric power. The United States Nuclear Regulatory Commission is no longer portrayed as being a dominant restraint on marketplace forces. The industry is now able to focus more sharply on real safety, licensing and regulatory requirements. It was the industry that first enabled the NRC’s shift by lowering the number and significance of events and improving overall performance. The result is a regulatory agency that is far less event-driven and far more risk-informed, and an industry whose operating priority is safety.

[Figure 5] Safety and cost are also determinants of the credibility of the industry, a factor that cannot be overstated. Safety and cost should work in a synergistic relationship since for the industry -- still clouded in a mantle of adverse publicity and fear -- having credible benefits to society, including both safety and cost, is a must. And, for regulators, having credible processes to ensure adequate protection of public health and safety and the environment is fundamental.

[Figure 6] A reality check reveals that there can be no credible regulator without a credible industry, nor can there be a credible industry without a credible regulator.

Do these changes mean that a “level playing field” is around the corner? No. Nuclear power and other industrial users of radiation are not going to get a level playing field any time soon. Public

perception of risk and of economics, influenced by the conflicting opinions presented by the media and by local, state, and federal entities, and the feedback effects among the influential parties, will keep the field uneven. Therefore, let me state the obvious: nuclear power and industrial users of radiation have to be better, much better. “Better” means keeping a very sharp focus on safety, on minimizing radiological events, and on meeting the safety-focused regulatory requirements. Effective and demanding self-regulation is a key element of being “better.” I assume, for the industry, “better” also means to be economically competitive. The public will not settle for less.

Before I discuss the NRC’s regulatory shift, I would like to show you a graph that depicts a cause and effect relation between safety and cost for some years back. [Figure 7] This slide shows the U.S. nuclear power plants O&M (no fuel) cost. Notice the effects of TMI and Chernobyl, the effects of costly lessons learned, some not so good lessons. Notice the industry recovery afterwards. Notice the 1996 “Millstone effect,” when compliance equaled safety: notice the spike! A good portion of the cost increase was the result of a regulatory regime not safety-focused. And by the way, the American people paid. The present NRC initiative toward more effective, efficient, safety-focused regulation was started in the summer of ‘97 and fully launched in the summer of ‘98. In the interim, the cost of a lengthy regulatory shutdown became unacceptable in a cost competitive marketplace; Millstone and D.C. Cook probably are the last exceptions. Safety is a pre-requisite to economic performance.

Nuclear safety improvements that are necessary for adequate protection should be required without considering cost and the NRC will continue to do so. The NRC’s ongoing regulatory changes are based on a more thorough and objective determination of what are real safety issues. I remember my first Millstone Commission Meeting when we were briefed on the 5,778-odd licensee issues to be resolved; of those, about 190 were “important” issues for NRC. I asked how many of them were safety issues. Silence ensued; neither NRC nor the licensee could then answer. Only afterwards was a real safety focus brought to the forefront of the Millstone recovery. Of course, Millstone had some serious administrative problems that clouded the entire issue and needed major cures. In retrospect, though few safety issues surfaced, safety had not permeated the Millstone organization, and they paid the price. Ultimately, I believe standards that are unnecessarily tight will have negative economic impacts, while standards that are not sufficiently exacting will have negative safety impacts -- eventually leading to negative economic impacts.

The Regulatory Shift

It is my strongly held belief that improving the quality of life of the American people is the foundation, the balance and the measure of success for our regulatory agency. Democracy and the marketplace are two key elements working for a level playing field. For me as a regulator, I see as an obligation and as an opportunity the use of our regulatory mandate to enhance the quality of life of the people we serve. The NRC must be forceful and credible in changing its

regulations, carefully choosing its way in the rapid current (rio revuelto) so there is no question that safety is paramount; that, in fact, safety is improving. The NRC must be vigilant and rely on the strength of the safety fabric it is weaving.

[Figure 8] The NRC “change process” is calibrated by four objectives or, as we call them, outcomes:

- Maintain and/or improve safety
- Improve regulatory efficiency and effectiveness
- Reduce unnecessary burden
- Increase public confidence

The enabling factors for these outcomes are objectivity and due process, accountability and definition, working from a solid technical and legal basis. To accommodate the combined requirements of these objectives will be very difficult without the systematic use of the tool we call risk-informed regulation. In fact, there is no doubt that a significant driver of the regulatory shift has been the promise and the capability to risk-inform the regulatory framework so licensees can make risk-informed decisions.

Risk-informed regulation is a set of deterministic criteria, operating experience, defense-in-depth, engineering judgments and probabilistic risk assessments that qualitatively and quantitatively increases the knowledge base and is conducive to safety-focused decisionmaking. Risk-informed regulation is not a panacea. It will not replace what most people do now, but it is efficient and effective in focusing on safety. Operators will continue to operate, mechanics and electricians will continue to maintain, engineers will engineer, but there is going to be a new edge, a new dimension that provides decisionmaking capabilities. And if your implementation matches a risk-informed regulatory regime, then the NRC will have the information it needs, licensees will know what is required and what to do about it, and the public will be informed.

[Figure 9] Now I am going to quickly review areas where improvements have been made, emphasizing the philosophical shift in the regulatory framework. I should point out that this regulatory shift is being accomplished through open, participatory processes.

10 CFR 50.59

The fundamental process under which an operating reactor license holder can make changes to its facility was suffocated by the “zero factor.” Any change or variation not clearly improving safety fell prey to the compliance mentality of 1996, i.e., zero increase in risk was the “law of the land.” The term “Unreviewed Safety Question” reigned supreme: darned if you do and darned if you don’t.

[Figure 10] Almost 2 years ago, I raised the “zero factor” issue in mathematical terms, zero = $10^{-\infty}$. Zero risk is not of this world, nor is infinity. I am pleased to tell you that the Commission eliminated the “zero factor,” and that the Commission allowed for minimal changes that do not

truly affect safety. A new, functional rule has been constructed and is ready to be implemented. I believe this rule increases safety by focusing resources on what is important to safety.

Maintenance Rule

10 CFR 50.65 was promulgated in 1991 as a risk-informed, performance-based rule. In practice, it was neither. The NRC and licensees were not prepared for such a rule, and in fact, the scope of the rule itself was and is contrary to the essential premise of risk-informed regulation and risk-informed maintenance. A truly risk-informed rule must be based on determining what are risk-significant structures, systems and components (SSCs) and on how to make the decisions affecting them accordingly. In 1999, while not changing the main scope of the rule, a new paragraph 50.65(a)(4) was finalized, permitting the configuration assessment to be limited to an optional scope determined by a risk-informed evaluation process. The reason I am mentioning this last point is because of the importance of the maintenance rule and the importance that the quality of PRAs will soon have in meeting the upcoming guidance. It is in the PRA quality where the basis for scope reduction will lie, where the additional confidence on safety-focused decisionmaking will be found and where the benefits of quantitative determinations will be based. Low safety significance SSCs or combinations thereof will be accounted for in a state-of-the-art PRA and will, therefore, not be challenged in regulatory space. I have one recommendation to make to the industry: if you have not done it yet, complete a functional, quality PRA and train your people in how to use it. One small regulatory or preventable shutdown will pay for this type of PRA many times over.

Reactor Oversight

In addition to establishing the body of safety regulations for this industry, the NRC needs an effective method to verify that the regulations are fulfilling their functions. The fundamental way we do this is through our oversight process, which, in effect, buttresses adequate protection.

To be consistent with the performance improvements at nuclear power plants, the NRC is changing its oversight process to a more risk-informed method of assessing plant performance. These changes will result in streamlined inspection, assessment, and enforcement by focusing inspections on activities where the potential risks are greater and by using objective measurements of plant performance whenever possible. They should also add clarity and predictability to NRC performance assessments, as well as permit more efficient use of NRC resources.

The existing assessment processes were analyzed in relation to their impact on the NRC's mission to provide adequate protection of public health and safety. The NRC task force on inspection and assessment, working closely with the agency's public and industrial stakeholders, identified seven "cornerstones" that provide the foundation for safe performance at nuclear power plants. Information to support assessments of licensee performance in each of the cornerstones will be derived from plant performance indicators and NRC inspections. The baseline inspection program will review areas that are not covered by performance indicators, will verify the accuracy of the licensee's performance indicators, and will also provide a

comprehensive review of the licensee's ability to find and correct problems. The major objective of these assessments is to determine where the NRC should focus its attention and resources.

Two points of fact

- While the performance indicators attract all the attention, the beef is in the data gathering and processing. There lies the strength of the assessment process because it has to be open, it is periodic, and it will be assessed by multiple stakeholders. The fact that deficiencies will go to the Corrective Action Program and be tracked, without pity, provides the backbone for this major shift.
- This process is new, will be in force in April 2000 and is unforgiving. The Commission has committed to take action, whenever warranted, and we will.

Enforcement

In parallel with the changes to the inspection and assessment process, the NRC's enforcement policy continues to be revised to respond to violations in a safety-focused, predictable, and consistent manner. Enforcement has been properly restructured to be an outcome, when warranted, of the inspection and assessment processes. This is in contrast to the previous situation, in which enforcement very often drove inspection and assessment, regardless of the safety significance of the issues being addressed. Indeed, as I stated in one of my votes on this process in the Spring of 1998, "informed enforcement is one of several regulatory tools, not a driving force of assessment activities."

Risk-Informing Part 50

In November of 1997, I stated that the often patched regulatory fabric of the NRC was no longer "patchable." I proposed that the entire Part 50 be made risk-informed. Skeptical at first, both the NRC and the industry have become convinced. The work on risk informing Part 50 is accelerating and holds rich promise for a more efficient and safer way to regulate.

I should point out that there is one field of nuclear endeavor that is ripe for work: regulatory technology. [Figure 11] I define regulatory technology as the science and practices that combine scientific, engineering and technological knowledge with regulatory requirements, as well as socio-political constraints, to effect changes in regulation and technology for the benefit of society. Truly a challenging global technology and one that should not be the exclusive domain of the regulator.

In summary, the United States Nuclear Regulatory Commission (NRC) has recognized that the use of risk insights can be a catalyst for reconciling the beneficial and radiological protection aspects of the peaceful application of nuclear technology. It is safety-focused and a valuable decisionmaking tool. The NRC has been employing risk information in developing rules and policies for regulating nuclear power plants, and is continuing to widen the application of risk-informed techniques. Building on this experience, the NRC is also expanding the use of risk

information in its regulation of nuclear materials, including medical uses of radioisotopes, high level waste, licensing of domestic uses of special nuclear material, clearance of radioactively contaminated materials, and the regulatory controls for generally licensed devices. There are regulations in various stages of development to risk inform these areas. I urge those of you from abroad to consider these initiatives and how they could fit the national interests of your countries.

And speaking about global opportunities and challenges, there is a pervasive opinion that safety and economic deficiencies in a few nuclear programs could force the demise of all other nuclear programs. This truism is known all over the world as “a nuclear accident anywhere is a nuclear accident everywhere.” This is true but is not a complete picture. I believe that the world-wide quality of nuclear technology is, and will be, its greatest asset. There is strength in quality and in numbers, and this is particularly true for nuclear power. [Figure 12] So I leave you with these thoughts:

“a nuclear safety improvement anywhere is a nuclear safety improvement everywhere”

“a nuclear regulatory improvement anywhere is a nuclear regulatory improvement everywhere”

En rio revuelto, ganancia de pescadores.

[Figure 13] A recent USA Today article discussed how a 20th Century visionary, President Ronald Reagan, changed the way people thought about business, how he “celebrated the vitality and magic of the marketplace” and how he urged people in government to think like entrepreneurs, “seeing possibilities where others see only problems.” I urge you to think of the possibilities to benefit from safety-focused regulations and from risk-informed decisionmaking as they interact with the marketplace.

It has been my privilege to address you this morning and I wish you well.