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THE ENVIRONMENT AND THE PUBLIC

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Good morning, ladies and gentlemen. I am grateful for the opportunity to speak to you today about some issues of importance to all of us. Richard Dean and his colleagues have done extraordinary work in choosing subject matter and in gathering people from around the world for this ANS Meeting. I look forward to the sessions and to hearing what others of you have to say on these and other issues. As some of you know, yesterday I got an earful of what others have to say on a certain issue.

Indeed, when I received the invitation to speak to you, I welcomed the opportunity to find out what *I* think! Having to work up a speech, just like facing a hanging, wonderfully focuses one's thoughts. And having to give an account of myself in public *could* turn out to be like a hanging, because I never know whether what I say will be the last words I'm ever permitted to speak!

But putting fears aside, we all know the value of putting one's thoughts on paper. Writing is never merely recording things already thought. It is discovering, correcting, questioning, comprehending. Every regulator owes such effort to the public -- and by "public" I mean also the regulated industry. In a few minutes, I will return to this theme of communication with the public. It is related to ANS President Dave Rossin's wise choice of "public participation in decision making" as the theme for his special session tomorrow.

The Environment

Let me speak first to the great theme of your Meeting this summer, namely, "Nuclear Technology and the Environment". Ordinarily, because I am an NRC Commissioner, I would have to stand off from the debate over how the nation's energy needs must be met. Because my responsibilities are regulatory, not developmental, I would have to speak as an interested observer on the question, and I would restrict myself to saying that I try to exercise my regulatory responsibilities so that the

complexity and uncertainty of the regulatory process would not, by themselves, deprive the nation of the nuclear option.

However, when dealing with environmental issues, I have the freedom of more scope. Indeed, I, and the agency, have a statutory *obligation* to make a judgment about the relative value of nuclear power to the environment. For example, in the context which perhaps matters the most to the immediate future of the nuclear industry in the United States, the agency's staff is proposing to make a firm judgment. I read to you from NUREG-1437, the "Draft Generic Environmental Impact Statement for License Renewal of Nuclear Plants", which was issued for public comment in August of 1991:

... [T]he staff concludes that, for the nation as a whole, license renewal is preferable from both an environmental and economic perspective to either new fossil-fueled or new nuclear baseload capacity. [V.1, p. 9-41.]

The staff is confident about the environmental benefits of nuclear power despite the continuing debate over whether emissions of greenhouse gases are causing global warming. Let me take just a few moments to comment on this debate, because we should try to be clear about what the environmental benefits of nuclear power are.

We know pretty reliably that surface temperatures *and* so-called "greenhouse gases" have increased over the past 100 to 150 years, but we don't know yet whether this correlation is long-term enough to be a *causal* relation. Perhaps the recent warming is simply part of a continuing recovery from what some researchers have called the "Little Ice Age" which took place between the 1400s and the 1800s. And the heating up which is taking place during the recovery may be coming to an end. For instance, I have seen a graph which shows that, in some places, the annual marginal increases in surface temperatures have been *dropping* throughout this century. This would suggest that we might be headed for global *cooling*, and according to some, the long-term trend for the past 40 million years, especially the last 15 million, *has* been toward cooling.

Clearly, we need to know more, and major efforts are afoot to determine more precisely and accurately such things as the history both of surface temperatures and of the proportions of greenhouse gases in the atmosphere. And, of course, more than just climate history must be examined. For example, we don't know yet where all the billions of tons of carbon dioxide we produce each year go. According to some accounts, only about a third of it remains in the atmosphere, and much of the rest remains unaccounted for.

Till we know more, it's probably not wise to go around claiming that nuclear power will help halt global warming. The U.S. Council for Energy Awareness shows laudable restraint in its full page magazine ads when it makes no claims about whether global warming is occurring. Instead, the ads simply note the very important truth that nuclear power plants generate no greenhouse gases. According to one report, 35% of the CO₂ generated in this country is generated by coal-fired power plants. Similar figures could be cited for SO₂ and the oxides of Nitrogen. These and similar facts are what the staff focuses on in its generic environmental review for license renewal, and they are

the kinds of facts which some other nations, Indonesia for one, have cited as reasons for moving forward with nuclear power and in the interim planting billions of trees. (By the way, using scrubbers to clean SO₂ out of the emissions of coal-fired plants increases by about 4% their emissions of CO₂, because the scrubbers use energy and the chemical reaction which removes the SO₂ also generates CO₂. There is a lesson here: We encourage students in technical subjects to work as if every problem has a solution, but we should also encourage them to work as if every *solution* also has a *problem*.)

Of course, it is perfectly legitimate to regard global warming as a real possibility. It is therefore perfectly legitimate to credit nuclear power plants for not adding to our concerns about warming, and the staff does credit nuclear plants this way. Combine this credit with the continuing decline in the total collective dose released per unit of electricity generated by nuclear power, a decline reported by the United Nations Scientific Committee on the Effects of Atomic Radiation, and you have an environmentally attractive technology in nuclear power.

The Public

I promised you a few minutes ago that I would say more about the theme of communication with the public, and now is a good time to do so, because I've just been talking about what kinds of claims advertising can make about global warming. No one from the NRC can claim to be all-wise about talking to the public -- and here I mean by "public", people other than those in the industry. However, we try, and we do have a good record with the Federal Courts and with Congress. And so, out of my modest fund of wisdom acquired as a teacher, research administrator, advisor of government, and Commissioner, all in the nuclear field, let me offer for your kind consideration three points. Some of you have probably heard me make some of these same points in other contexts, but let me bring them all together now and focus them in a different way.

My first point is that the public has some remarkably disheartening views about risk, but that there are also grounds for hope. I am making a very broad generalization here, to which there are, of course, exceptions, but permit me to ignore the exceptions today, in order to frame more clearly the difficulties we face.

As for the disheartening, consider this: We lead longer, healthier, and potentially more fulfilling lives now largely because of mathematics, science, and technology, and yet I don't know of any time in history in which the public has been more concerned about risk from technology.

Too, the public's approach to risk often seems ill-informed and inconsistent. Take information: For just one example, would you expect to persuade someone of the advantages of nuclear power in regard to global warming if that person didn't know that greenhouse gases may contribute to global warming? Of course you wouldn't, but according to the lead article in this month's *Scientific American*, and I quote, "only a relatively small proportion of people associate energy use and carbon dioxide emissions with global warming."

Take now consistency: It is well known that people will underestimate the risk of deaths which happen frequently, such as deaths in car accidents, and they will overestimate the risk of deaths which happen very rarely, such as deaths stemming from nuclear power plant accidents involving radioactivity. I admit that this disproportion is not without its own rather natural coherence: No matter what the risk numbers might say, people seem on the whole to be less concerned about risks which seem to them to be observable and controllable. However, no matter how natural this approach might seem, by focusing on the lower risks, it threatens to sacrifice lives to the higher risks.

Nonetheless, there are grounds for hope. For example, the growing use of nuclear medicine suggests that people can and do make distinctions about the sources of radiological risk, that they understand that there are tradeoffs between radiological and non-radiological risks, and that they are capable of weighing one kind of risk against another. Environmental concerns and the need for energy have led others to modify their opposition to nuclear power.

But our hopes for what most of us in this room like to think of as rational approaches to risk will not be realized unless we do our part to put good information and analyses before the public. In a republic such as ours, the public, generally working through its elected legislators and officials, makes the ultimate decisions on what risks to take. And while good information and analysis won't guarantee what you and I might regard as wise decisions, they surely will make such decisions more likely.

And so I arrive naturally at my second point on communication with the public: Government should do its best to find out what the public wants to know, or needs to know, and to provide the public with that information. Of course, all of you have a role here, not just those of you who work for governments, but permit me today to focus on the role of government, especially the Federal government.

I will go further and assert that to communicate well with the public means focusing on risks, and it means comparing them. Comparison is required, because, despite the seemingly absolute numbers we use to measure risks, the numbers have little meaning by themselves. Risk is like height: You cannot say whether I'm short or tall except by comparison with others. Similarly, risks are not big or little except by comparison.

I would go a step further and assert that the risk numbers we should try to compare and communicate should be couched in terms of effects on health. This is, of course, the approach which the Commission takes in its qualitative Safety Goals, a point which may tend to be obscured in all the recent emphasis we at the NRC have put on core damage frequency and conditional probability of containment failure. This emphasis is necessary in the implementation of the Safety Goals, but we should not forget that the Goals themselves are stated in a way which makes them independent of particular design elements. Moreover, the Goals are stated comparatively, in terms of risks some of which the NRC does not even regulate.

I am pleased to see that a similar approach may yet be taken to the government's standard for the national high-level waste repository. As you may know, the EPA has been focussing on a standard

stated in terms of the probability of release of radioactivity from the repository. Such a standard is like the NRC's standard for conditional probability of containment failure. However, I have long felt that a standard stated in terms of risk to individuals -- the way our Safety Goal Quantitative Objectives are stated -- provides a better standard for determining the design and evaluation of such a repository, because such a standard would communicate better to the public what the impact of the facility was going to be.

I realize, of course, that there are uncertainties in any calculation of the risk a given facility poses to the public, but I believe that it would be better for us to calculate those risks in a public way, and in terms which lay persons are likely to understand, than to leave it to citizens to more or less guess what impact a given probability of release, measured in unfamiliar units, might have on them.

I was glad to see that, in the Energy Policy Act of 1992, the Congress commissioned a study from the National Academy of Sciences on, among other questions, whether a health-based standard based on doses to individuals from releases to the environment will provide a good standard by which to measure how much protection of health and safety the repository will provide. The Academy will complete its work probably some time next summer, and the EPA and the NRC will be required to carry out their work in a manner consistent with the findings and recommendations of the Academy. Stay tuned.

I can hear you asking now: Can anyone realistically expect the government to take a consistent, comparative, approach to risk? After all, look at the government's handling of safety: There are many agencies, thus making a consistent, comparative, approach unlikely administratively. As if in proof of this last claim, there are many different valuations of human life, varying, according to one account, from 164 million dollars a life saved through control of routine radiation at nuclear power plants, to 100 thousand dollars per life saved through air bags in new cars. Add to this variation the many different approaches to making decisions once the risks are known. Even the same agency will weigh risks at one time on the basis of net social benefit, at another time on the basis of the impact on the most sensitive part of the population, and at yet another time on the basis of whether risk reduction is technologically feasible.

To illustrate, just take the NRC alone: Even with its Safety Goals, the NRC appears to have established its radiation protection standards, reactor site criteria, ill-fated BRC criteria, and low-level waste disposal criteria apparently without reference to each other (although, as some of you have heard me argue, these various standards remarkably enough imply pretty much the same risk goal).

So, the answer to all this governmental disarray must be a superagency regulating nuclear technology, drugs, consumer products, the design and operation of airplanes, and every other technology which has implications for safety. Right?

Wrong. And this brings me naturally to my third and last point: Don't expect the law to bring us out of this quagmire by creating a superagency, or by some other radical approach. It is true that a superagency might more easily take a comparative risk approach, and Congress might pass a NRCA

(pronounced "nerka"), or National Risk Comparison Act, which, taking its cue from NEPA's requirement for an EIS for each major federal action, would require an RCS, or Risk Comparison Statement, for each federal act which imposes more stringent safety standards -- a kind of Congressionally-mandated backfit analysis, if you will, but with the all-important addition of a requirement to ask whether the money might be better spent on another risk, and perhaps a mechanism to see that it gets spent there. You can see I've really gotten smitten by all this governmentese.

But such solutions too may have their problems. For example, a superagency might not give each separate technology the attention it deserves. Therefore, I urge that we consider what we can do within the existing framework to advance the cause of informing the public and making sound risk decisions.

For example, do we need new laws in order to site much-needed low-level waste facilities in this country? As of now, I don't think we do. Both France and Spain have sited well-constructed and professionally operated low-level waste facilities of advanced design, and they have done so without laws equivalent to our Low-Level Radioactive Waste Policy Amendments Act of 1985, and thus without any of the legislated milestones, incentives, surcharges, or other inducements and penalties that are set forth in our Act. I am not implying that the Low-Level Radioactive Waste Policy Amendments Act of 1985 is deficient or unwarranted. Indeed, it is a sound piece of legislation which, if followed, should clearly have led to adequate waste disposal facilities for radioactive waste generators around 1996. Part of my point, though, is that the Supreme Court's decision to strike the "take-title" provision from the Act should not deter a state or compact from trying to site and operate a low-level radioactive waste disposal facility. It can be done.

How did the French and the Spanish achieve this? I hesitate to make comparisons among quite different cultural, social, and political conditions, but I will note that early, timely, and effective communication with the public was critical to the successful siting of the facilities. At the Centre de l'Aube facility in France, a citizens' advisory committee was established early in the process of constructing the facility. The committee was provided with monthly updates on the status of the project, and the committee's views were solicited before major safety and environmental decisions. The El Cabril facility in Spain did not have a citizens' advisory group, probably because of the site's rather remote location, but the officials of the facility are particularly proud that roughly 5,000 people visit it each year. Officials at both facilities place a high premium on having open communications with the public and on being a good neighbor. This is further evidenced by the aesthetically-pleasing appearance of both facilities. The designers of both facilities took added measures to assure that their facilities could not reasonably be referred to as "radioactive waste dumps."

In the closely related area of decommissioning and site decontamination standards, the NRC, at my suggestion, is making a concerted effort to involve all interested parts of the public early on, *before* the NRC staff develops a draft proposed rule. To aid in getting this input, the staff has held a series of workshops at several locations throughout the country. I attended the discussions in San Francisco as an observer and was encouraged by what I saw. Thorough discussions of this sort bring

to light facts and options which would otherwise not be seen clearly, and they do so without the paraphernalia of adjudication or the intricacies and ambiguities of modern legislation. These facts and opinions, brought to light in free and open discussion, can in turn prove to be the breeding ground for unexpected agreement, or at least for a lessening of the suspicions of bad faith which sometimes accompany discussions of abstract principles. Though some of the positions I heard expressed seem extreme, I am hopeful that they will with time evolve, and that a widely, though I'm sure not universally, acceptable resolution will be found for the issue of how much decontamination should be required during decommissioning.

I hope I am not overly optimistic. I know that my approach to safety decisions is not welcomed in all places. For example, the Washington, D.C., *Legal Times* reported recently that Ralph Nader was opposing the then rumored nomination of Judge Stephen Breyer to the United States Supreme Court. In Nader's opinion, the Judge was "soft on ... health and safety rights", and "reflected an excessively mercantile value to life." Why did Nader think this? Because, he said, the Judge had written a book recently in which he had argued that "many environmental and other regulations waste billions of dollars seeking to control relatively minor risks and that far more lives could be saved for the same or less cost by basing regulations on scientific cost-benefit analyses, rather than on political reactions to popular scares." Just what *was* it Mr. Nader was objecting to: Saving money? Saving lives?

It is a good sign when a prominent candidate for a Democratic President's nomination to the Supreme Court argues for comparing risks and weighing costs and benefits. So I have hope that, in facing the challenge of protecting the environment and health from the undesirable side effects of our economic activity, the public can be assisted by our expertise in deciding what it cares about most. I see nothing easy about the balancing of even a limited number of factors. For instance, to return to the subject of emissions from coal-fired power plants, these emissions bring us respiratory problems and perhaps acid rain and global warming, but these same emissions also bring us low short-term energy costs, more abundant biological plant life, and more red sunsets. And yet these factors are only a few of the multitude which must be balanced.

Everyone in the position of making or assisting environmental and safety decisions must do his or her best to advance the understanding of the risks we face. I have made here today a few modest suggestions for how we might best go about this. I am sure that there is much more which could usefully be said, and that others here today may be better able to say it. I therefore end here and await eagerly the sessions ahead of us.