NUCLEAR ENERGY SECURITY ISSUES IN THE POST-SEPTEMBER 11 WORLD:
Physical Security, Safety, Reliability of Supply

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I. Introduction

It is a great honor to address this meeting of the Spanish Nuclear Society. Thank you for allowing me to join you.

I would like to say at the outset how deeply I appreciate all the words of condolence that have been offered regarding the terrorist attacks of September 11. I will carry your words of kindness back to my country, and I know they will be received gratefully. Likewise, I appreciate the expressions of solidarity with the ongoing multinational military effort to combat terrorism.

Just last year, King Juan Carlos I and Queen Sofia visited Washington. The date was February 23 -- the anniversary of the day, now 20 years ago, when the King courageously and selflessly rescued Spanish democracy. As I am sure you know, he won the enduring gratitude and admiration not only of his own countrymen and women, but of people all over the world who cherish liberty.

On the eve of the King's arrival in Washington, ETA terrorists ruthlessly murdered a member of the Basque regional parliament in the presence of his own son. They also murdered one of his escorts. Speaking in Washington the next day, the King denounced the crime, and he uttered a profound warning. He said "terrorism is a scourge that affects each and every one of us and, to fight against it, democratic societies must join efforts and necessarily strengthen the indispensable international cooperation." At the time, most people in my country probably did not fully appreciate just how urgent that message was. We surely do today.

The King also commented that the terrorists, in murdering an elected parliament member, were really attacking the democratic process that chose him. Again, his remarks were prophetic. The September 11 terrorists, in ruthlessly attacking ordinary men and women, were really waging war on freedom itself, on the whole idea of a democratic, egalitarian, open society.

There was something else that King Juan Carlos said in Washington that many of us found deeply moving, and that is worth recalling today. He said that Spain has special ties to the Mediterranean region, because "the Arab and Jewish cultures contributed to shaping the essence of the Spanish nation just as much as the Latin language and the Christian religion." That spirit of pluralism -- of respect and honor, without distinction, for diverse religions and cultures -- also

bears on the present struggle against terror. The battle should not be framed as a clash of cultures or religions, but rather as a struggle between human decency and barbarism.

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I had originally intended to spend most of my time today talking about the security of electricity supply and the role of nuclear energy in helping to ensure it, and about the safety of nuclear power plants. Recent events have brought a new focus on questions of physical security, and have also underscored how inseparable these topics are. (In your country, where *seguridad* means both "safety" and "security," the Spanish language itself makes this point.) So today I would like to discuss all three of these issues -- physical security, safety, and security of supply -- and their implications for the future of nuclear energy. Let me begin with the topic that has dominated my attention in recent weeks, physical security.

II. Security as Physical Protection

In the aftermath of the attacks of September 11, many immediately asked about the consequences if a large airliner, fully loaded with jet fuel, had crashed into a nuclear power plant. We had to say candidly that we were not sure. We know that reactor containments are extremely robust, that nuclear plants benefit from redundant safety equipment, that operators are trained to respond to unusual events, and that carefully designed emergency plans are in place. Nuclear power plants are certainly far more capable to respond to an aircraft attack than other civilian infrastructure. We had never previously had reasons to perform a detailed engineering analysis of the consequences of a deliberate attack by a large airliner, but we are commencing these analyses today.

Immediately after the airliner attacks on the World Trade Center, we directed our licensees to go to the highest level of security. For obvious reasons, we have not spelled out the specifics of what that entails, other than to say that it generally includes such things as increased patrols, augmented security forces and capabilities, heightened coordination with law enforcement and military authorities, and limitations on access to nuclear sites. Although we are not aware at this time of a specific credible threat directed at nuclear power plants, our licensees have remained at the highest security level. And the NRC has continued to provide guidance and information so as to enable our licensees to augment their defensive capacities.

To strengthen our preparedness, the NRC has been working closely with the Federal Bureau of Investigation, the Federal Emergency Management Agency, the military, the Department of Energy, and nuclear regulators in Mexico and Canada. A notice has been issued by the Federal Aviation Administration to advise pilots to avoid flying over or in the vicinity of the nuclear plants. I have written the governors of 40 states so as to assure that any state defensive assets (National Guard or state police) are properly integrated into the licensees' defensive strategies.

The attack of September 11 has served as a wake up call in our country with regard to the seriousness of the terrorism threat and of the need to develop policies to address it. I have directed the NRC staff to commence a top-to-bottom review of our safeguards and security requirements and policies. This will include not only the regulations and guidance directed at licensees, but also an examination of the NRC's processes, communication capabilities, coordination with other agencies, and security. I recognize that the evolution of policy will require an examination of issues that extend beyond the NRC and our licensees -- principally including the boundary of the responsibility that is to be borne by the private sector and the responsibility that must be assumed by the Government. We look forward to working with the new Homeland Security Council created by President Bush in resolving such matters.

Shortly after September 11, the NRC issued a detailed public statement describing its response to the terrorist attacks. We reported candidly what we knew, and what we do not know, about the likely consequences of an attack on a nuclear power plant, a dry storage cask for spent fuel, a shipping cask, and a uranium fuel cycle facility. All of us on the Commission were united in the view that this was a time neither for undue alarmism nor for undue complacency, but rather for being straightforward and direct with the public.

I believe that the public can accept and indeed respect Government officials who admit the limits of their knowledge. What they cannot accept, and will not forgive, is the comforting reassurance that turns out later to have been empty. So our policy is one of transparency, and as our analyses progress, we will keep the public advised - - consistent, of course, with the need to ensure that we do not publish information useful to would-be terrorists.

Let me turn now to the second aspect of security.

III. Security as Safe Operation

The focus on issues of physical security and terrorism comes at a time when justified confidence in the safety of nuclear power plant operations is at an all-time high. To use just one measure, we have seen the average number of automatic scrams decline by a factor of about 3 over the past decade. Likewise, we have seen significant reductions in safety system failures, safety system actuations, and collective radiation exposure to employees.

Operational performance has improved in parallel with the gains in safety performance. In 1980, the overall capacity factor of our nuclear plants was 58 percent; in 1990 it was 68 percent and last year it was over 87 percent. As a result, although the number of licensed power reactors has declined, from 111 in 1990 to 104 today, the actual power produced has continued to increase, to a record 754 billion kilowatt hours last year. The contribution of nuclear power to total energy generation in the United States remains steady at about 20 percent, about two-thirds of the level in Spain.

In my view, it is not an accident that economic performance and safety performance have

improved together: the achievement of both objectives stems from the same fundamental commitment to excellence. These statistics are a reflection of improvements in training and maintenance, and -- crucially important, and very difficult to impose by regulation -- more rigorous attention to detail. Primary credit is owing, of course, to the nuclear industry, individually and collectively.

The nuclear industry in the United States came to the recognition many years ago that every licensee had a pressing interest in the safe operation of every other licensee. Through the Institute of Nuclear Power Operations and otherwise, the industry moved very forcefully to ensure that no utility would fall short, and in so doing, impair public trust in the nuclear option as a whole. This was extremely far-sighted. The industry recognized that public acceptance of nuclear energy was critical, and that this was not something that token actions and advertising slogans could accomplish. Rather, it would require years of consistent, patient work to make the safety and reliability of nuclear energy a demonstrable reality. Today, the American public has increasing confidence in the safety of nuclear power, and justly so. The industry's efforts are a good illustration of the dictum of Cervantes that "*la diligencia es madre de la buena ventura*."

I believe that the Nuclear Regulatory Commission also played its part. In recent years, beginning well before I came to the agency, the NRC has engaged in a comprehensive rethinking of its entire regulatory philosophy: in essence, making the transition from a purely prescriptive, deterministic approach to one that is risk-informed and performance-based. Reduced to simplest terms, this means more emphasis on telling licensees what we expect them to achieve, in terms of risk minimization, and less emphasis on dictating the means by which they achieve these objectives. If licensees can accomplish the desired results more efficiently and economically through innovative procedures, so much the better.

I must hasten to add that this effort has not meant that we have jettisoned the elaborate structure of regulation that has developed over the years. The strategy, at this juncture, is not to move to a regulatory environment that is entirely risk based. Rather, we seek to use risk insights as one means of determining those aspects of the regulatory program that deserve augmentation and those that should be eliminated or reduced. In this way, we seek to use risk as a tool to define the appropriate modifications to the existing structure of regulation.

The clearest example to date of the application of the risk-informed approach is the new reactor oversight process. Our intention is to ensure that, in assessing operating plants, we focus on the areas of greatest risk, while at the same time making the process as objective and transparent as possible. A review of the first full year of the new system reveals a need for further reform, but there is nonetheless a broad consensus that the new oversight process represents a significant improvement over what it replaced. That consensus includes even groups normally critical of the NRC and the industry.

The process of making our requirements more risk-informed is still in its initial stages. We have included risk consideration in the rules governing maintenance (50.65) and changes,

tests and experiments (50.59). We are using risk considerations in the modification of technical specifications. And we have singled out specific regulations for possible revision, including the combustible gas rule (50.44) and the standards for emergency core cooling systems (50.46). This past summer, we granted an exemption to the first plant to apply risk insights to the categorization of components for special treatment. We are in the process of developing a rule that would permit any licensee to use this approach.

Today we are seeing the fruits of the industry's successes and the NRC's reforms. Only a few years ago, some were predicting that nuclear power would vanish altogether from the energy mix in the United States, as plants reached the end of their 40-year license terms and were retired. The NRC was preparing for the anticipated surge of decommissioning applications. Today, by contrast, it appears that in virtually every case, an application for an extension of the license term will be filed. And, as I will discuss shortly, construction of new nuclear plants is again a subject of discussion for the first time in many years.

All these initiatives require resources: not just money, but also technically qualified individuals. Money can be appropriated overnight, if the will is there; but technical expertise in the nuclear area is not obtained so easily or quickly. In the United States, the number of students pursuing careers in nuclear engineering declined sharply after the expansion of nuclear power abruptly ceased in the United States some 20 years ago. We are seeing the results today: for example, in an NRC professional staff in which for every employee under 30 years old there are four over 60. We have lost a wealth of technical expertise to retirement within the last few years, and today, some 17 percent of our engineers are eligible to retire. And serious as the staffing situation is now, it may be significantly worse in the coming decade, unless there is an upturn in the meantime in the number of new nuclear engineering students.

The Commission is taking actions so as to enable it to maintain and even enhance its technical competence through a variety of programs to strengthen the capacity to recruit and retain top-notch individuals. I recognize, however, that the regulated community and the industry depend on the same supply of students and, increasingly, that supply of students is international. I mention this because we have a world-wide manpower problem that we must address comprehensively.

Let me turn now to security as reliability of supply.

IV. Security as Reliability of Supply

Earlier this year, the State of California experienced a severe shortage of electricity. In May, the state was forced to institute rolling blackouts. To meet the crisis, California was forced to buy power on the spot market at extremely high rates -- several times the prices of just a few months before. At the same time, state officials were making strenuous efforts to persuade consumers to conserve energy use. These efforts, helped along by sharply higher electric bills and an unusually mild summer, were quite successful: so much so that California found itself

paying for expensive power that in the end it did not need.

These events prompted many in the United States -- even those long skeptical about nuclear power, on economic grounds or otherwise -- to ask whether the current energy mix in our country requires reexamination. We are seeing growing concern in this area. The United States has been too much the grasshopper, too little the ant: focusing on short-term expedients, trusting that nothing will happen to disrupt existing sources of supply, and neglecting the longer view. This concern is only heightened by the uncertain international situation. We have seen ample proof in our lifetimes that energy security is a crucial component to national security.

In May of this year, the White House released the details of a comprehensive national energy plan, developed under the leadership of Vice President Cheney. Prominent in it is a "new look" at nuclear power. The plan calls on the NRC to expedite the process of licensing new nuclear capacity. Just two months later, three generating companies informed the NRC that they were evaluating existing nuclear sites with a view to possibly adding nuclear units.

I do not wish to create the impression that a renaissance of nuclear energy in the United States is going to take place overnight, if indeed it takes place at all. Even with the strong support of the President and Vice President, the present situation, in which no new orders for plants have been placed for over two decades, will not easily be changed. Whereas in many countries energy decisions are made centrally with a view to national needs, the United States, with consideration of the prerogatives of the 50 states, operates differently.

Some issues *are* handled at the national level: nuclear safety, for example. The NRC has sole responsibility for setting nuclear power plant safety standards, and states are barred from regulating in this area. But the threshold question of *whether* a nuclear power plant will be built in the first place is not one for the federal government. Rather, that issue is up to individual generating companies in the 50 states, and, in many states, to state public utility commissions. This has tended to mean a focus on the short term, and the cheapest short-term energy alternative available. In recent years this has been natural gas.

Let me provide some background. Three decades ago, when the enthusiasm for building nuclear plants in the U.S. was at its height, public utility commissions generally deferred to utilities' decisions on generating capacity. But in part because of unexpected overruns in the cost of building some nuclear plants, these commissions began to take a much more aggressive role. Responding to public demand, their orientation shifted in the direction of securing the lowest electricity rates for consumers in the short term.

Moreover, the public temper, especially in the wake of the Three Mile Island accident in 1979, led many utilities to fear the political as well as economic risks of investing in nuclear power. And not without reason. In one case, a fully completed nuclear plant became enmeshed in a political tug-of-war between federal and state authorities and ultimately was scrapped, with the result that the entire investment was a waste, to the tune of $5 billion. I mention all this

history simply to suggest why generating companies in the United States might have been so wary for so long of any new investment in nuclear construction.

As I said, I think that this attitude is beginning to change. And while any judgment of this kind is necessarily subjective, I believe that the American public is inclined to see energy choices less through an ideological lens, and more in a pragmatic and practical way. That means recognizing that each energy option has advantages as well as drawbacks, and that it is wise to have a balanced energy portfolio. For the field of energy supply, diversity of sources equals security. Here as elsewhere, security does not necessarily come cheaply; but the absence of security carries its own price, which may be even higher.

Moreover, the enormous improvement of performance of nuclear plants over the past decade has changed the economic calculus. In the last year, the average production cost of nuclear plants was less than those of any other source of electricity. The great interest in license renewal is simply a reflection that nuclear plants provide the lowest cost power on the grid, without the risks of price volatility associated with fossil fuels.

The NRC is an exclusively regulatory body, with no promotional responsibilities. We cannot advise utilities to apply for plant license renewals, or to build new nuclear power plants. What we *can* do, however, is make sure that a timely and efficient process is in place for those generating companies that elect to make such decisions. We have striven to do that. With regard to plant license renewals, we have allocated sufficient staff to process many applications simultaneously. We have already approved three license extensions; seven more are pending; and we anticipate that some twenty more applications will be received within the next four years. As I mentioned earlier, we expect that virtually the entire fleet of 103 powerplants in the U.S. will eventually seek license renewal.

With regard to possible applications for new nuclear plants, the NRC has used the years in which the industry's growth has been dormant to learn from the past and improve its processes. In the past, every construction permit application was essentially unique, and every design and every site required individual scrutiny: a very time-consuming process. As a result, the agency has put in place a new set of regulations (Part 52) to create an alternative approach. It allows manufacturers to obtain approval for standardized designs, which, once approved, could be used repeatedly without duplicative reviews. This concept is coupled with that of an "early site review," under which utilities can obtain advance approval of a potential site for a nuclear power plant before making a definite commitment to build a plant at any particular time. Once an early site approval has been secured, however, the utility can then apply for a license incorporating that approved site and an already approved standardized reactor design and begin construction under greatly simplified and streamlined legal procedures. Part 52 provides opportunity for issuance of a combined construction permit and operating license, eliminating the gauntlet of two administrative legal proceedings through which the existing plants were licensed.

One of the important virtues of the revised procedures is that they allow early resolution

of issues. This allows the elimination of needless economic risk by enabling the principal legal and technical questions to be resolved before billions of dollars in construction costs have been incurred. This obviously serves the applicants, but also serves the interveners because it assures that decisions can be made early and without any influence from the fact that substantial investments have already been made.

Applicants have already taken advantage of the new provisions. The NRC has certified three plant designs, submitted by Combustion Engineering, General Electric, and Westinghouse. Although to date, no utility has availed itself of the opportunity to obtain early site approval, we have been told that it is likely that such applications will be submitted by next year. Finally, as has been reported in the trade press, Exelon *may* apply, perhaps in 2003, for a combined license for the pebble bed modular gas-cooled reactor.

The NRC has also recently completed a thoroughgoing evaluation of its readiness to handle applications for new construction: not only in terms of staffing, but also in terms of regulatory impediments. Even while conducting that assessment, the NRC has already created organizational units within each of its program offices - - reactors, materials, and research - - so that the agency can "hit the ground running" if and when an application comes. The challenge will be substantial, particularly if the application is for a design that departs significantly from the light-water cooled paradigm for which our existing regulations are tailored. I should also note that both Houses of Congress *added* funds to the NRC's budget request for this fiscal year, earmarking them for consideration of new construction. It is far more typical for budget requests to be cut than to be met in full - - and to have Congress add money on it own initiative is something very unusual indeed. Plainly this is a sign that Congress as well as the Administration sees wisdom in revitalizing the nuclear option in the United States.

I cannot suggest that the path to a revival of nuclear energy in my country is sure or smooth. Concern over the disposition of spent fuel and nuclear waste is by no means limited to the opponents of nuclear power. Literally for decades, the public has received assurances that the problems of long-term waste disposal are technically soluble, through geologic repositories. That is certainly the view of most experts, including the U.S. National Academy of Sciences. But the passage of so much time, with so little tangible result, has understandably fostered skepticism. For the time being, the growing volume of spent fuel has been accommodated in expanded pools and in dry casks, and there is no technical reason I know of why this should not be an acceptable solution for decades to come. Yet in the long run, it is obvious that the issues relating to the back end of the fuel cycle must be solved.

There is, I know, considerable interest in the status of the proposed geologic depository at Yucca Mountain. By law, the NRC must license any such facility, and under our system, that means that the other Commissioners and I will be acting in a quasi-judicial role. I therefore must be circumspect in my comments. I would simply note that progress has been made in putting in place the regulatory framework for a decision. The Environmental Protection Agency has issued its standards for the site and the NRC has recently promulgated its own conforming standards.

Wholly apart from the specific merits of this particular proposal, I believe we can expect vigorous debate, in the public and the Congress, about the preferred approach to the back end of the fuel cycle. I am hopeful that this debate will contribute to the development of a greater national consensus.

V. Conclusion

I would sum up this overview of these three areas of nuclear *seguridad* in this way. First, as to physical security, it is frankly too early to say how fully this problem is under control. But there is no question that we appreciate its urgency, and are acting accordingly.

As to nuclear safety on a day-to-day basis, there is reason for satisfaction, in that all measurable trends are positive. But the excellent safety record we have seen will continue only so long as all of us, in industry and government, exercise vigilance. There is no room for complacency, now or in the future, and we must not let our increased concern with physical security cause a diminution in our attention to operational safety.

Finally, as to the security of energy supplies, I would draw an analogy to another kind of energy, one with a place in the conjoined history of our two countries. The nuclear option in the United States could be compared to a long-becalmed sailing ship. It did not founder, as some hoped it would; neither has it yet shown its full potential, as others hoped. Today we are seeing a breeze rippling the waters; the sails have begun to puff out. Whether that breeze will strengthen into a wind or die back down we cannot yet know. We do know, however, that this is a time for preparations, making sure that sails, rigging, and crew are fully ready for whatever is demanded of them.

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I began by talking about the recent terrorist attacks on the United States, and it is there that I would like to end as well. This is a time at which my country has much to learn from Spain. You have had long experience in dealing with terrorism: ruthless terrorism, that takes cynical advantage of the vulnerabilities inherent in any free society. You also have knowledge, won at a bitter price, of how to combat these forces and defend against them without sacrificing democratic values in the process -- the very democratic values that are the terrorists' target.

As my country, and the civilized world as a whole, confront the post-September 11 realities, there are grounds for renewed hope, even while there are so many to be mourned. For people around the world have been shocked into a new awareness of their interconnectedness in many respects. One central area, as King Juan Carlos emphasized in Washington, is our common need to confront issues of security and terrorism as a global rather than a nation-by-nation issue. On a more personal level, these horrifying events have also brought a reminder of the bond that represents the most fundamental kinship among the vast majority of people, regardless of nationality or religion. That is the kinship of common human decency: the shared

sense of right and wrong that in the end represents the best hope that our children and grandchildren will inherit a world happier and more secure than that of today.

Thank you.