NUCLEAR COOPERATION IN THE PACIFIC BASIN – AN HONORED PAST AND A PROMISING FUTURE

Presented by:

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at

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Good morning ladies and gentlemen, colleagues and friends. It is indeed an honor and a privilege for me to be here today and to welcome all of you to the 14th Pacific Basin Nuclear Conference in Hawaii. Being in Hawaii is particularly special, since Honolulu was the site of the very first Pacific Basin Conference in October, 1976. I note with great pride and pleasure, that I, along with many others, had a role to play in the development of the infrastructure that has led to the commendable cooperation that has taken place among the Pacific Rim countries over the years.

I would like to begin this morning by first sharing with you a few of the more significant moments of the past relating to nuclear cooperation in the Pacific Basin. Then I would like to cover some thoughts on the history and future of the international nuclear enterprise and the challenges we all face going forward.

The American Nuclear Society initially proposed the establishment of the Pacific Basin Nuclear Conference series, or PBNC, as a regional cooperative organ to advance the peaceful uses of nuclear energy in the Pacific Basin region. Since the first conference here in Hawaii in 1976, the conference has been held periodically every two or three years at different locations around the Pacific Basin. Conferences were held in Tokyo in 1978, Acapulco in 1981, Vancouver in 1983 and Seoul in 1985. By then, the Pacific Basin Conferences gained the reputation of providing an important mechanism for sharing information on research and development activities and for facilitating exchanges of scientists and researchers.

The idea for a permanent organization for cooperation in the Pacific Basin was actually conceived and proposed during the 5th conference in Seoul in 1985, and I might add with much foresight and encouragement from Prof. KunMo Chung of Korea and Mr. Manning Muntzing of the United States, both of whom I'm sure many of you know. The conferees at the Seoul conference recognized the benefits of regional cooperation to the participating organizations, their respective countries, and the

international nuclear community. They agreed that such regional cooperation should be organized under the auspices of a non-governmental body with minimum red tape and minimum internal structures. The outcome was the formation of the Pacific Basin Nuclear Cooperation Committee (PBNCC) which was officially established at the winter meeting of the American Nuclear Society in San Francisco in November 1985 with the participation of nuclear organizations from Canada, Japan, Korea, Mexico, Taiwan, and the United States.

KunMo Chung and Manning Muntzing were unanimously elected as the Committee's co-chairs, and working groups were set up to address the issues of education and training, nuclear safety, codes and standards, and public acceptance.

As a result of growing fruitful exchanges, during the 6th PBNC in Beijing in 1987, participants of the conference discussed establishing a more structured organization, a Pacific Nuclear Council, which would provide a more formal linkage to the Pacific Basin Conferences. After sorting out the details, which wasn't easy, the Pacific Nuclear Council, or PNC, was officially launched in November 1988, with several of the Pacific Rim societies joining. They included:

American Nuclear Society
Canadian Nuclear Society
Canadian Nuclear Association
Korean Atomic Industrial Forum
Atomic Energy Society of Japan
Japan Atomic Industrial Forum
Sociedad Nuclear Mexicana

It was at this time that I was elected the first chair of the Pacific Nuclear Council, so now you know why there is such a warm place in my heart for the Pacific Nuclear Council and this series of conferences.

In March of 1990, after many negotiating sessions, which resulted in my now counting among my good friends, many colleagues from the nuclear organizations in Beijing and Taipei, both the Chinese Nuclear Society, Beijing, China, and the Nuclear Energy Society, Taipei, China, also officially signed the Pacific Nuclear Council Charter. Thereafter, nuclear organizations from Australia, Russia and Indonesia as well as the Latin American Section of the American Nuclear Society, joined the PNC, with a total count today of 14 member organizations, from countries representing well over one-third of the world's population.

Those who many years ago inspired and worked towards the formation of what is today the Pacific Nuclear Council could not have been more visionary. I am pleased and proud to say that since those early formative days, we have come a long way. This audience, the 14th Pacific Basin Nuclear Conference, can be proud of its heritage and all that has been accomplished over the many years of nuclear cooperation in the Pacific Rim.

But the job is far from finished, and indeed the challenges ahead may even surpass those of the past. Today, essentially every aspect of nuclear science and technology has assumed global dimensions, and cooperation among nations is more vital than ever if the nuclear enterprise is to continue in the future.

The nuclear enterprise of which I speak, is today, without a doubt, an international one. It includes, of course, nuclear power for generating electricity which has expanded from a handful of nations to the present 33 nations, that have 438 operating nuclear plants, generating about 17 % of the worlds electricity. But it also includes a myriad of commercial, medical and scientific uses of radiation and radioisotopes as well, many of which are the subjects of this conference.

Nuclear science and technology has actually been an international endeavor from the outset, drawing on the early scientific work of such notables as Marie Curie and Albert Einstein. International exchanges of scientific information were amazingly frequent prior to World War II with well known participants such as Enrico Fermi and others including Lise Meitner, Frederick and Irene Joliot-Curie, and Otto Hahn.

The internationalization of the atom was temporarily halted by World War II as well as during the immediate post-war period due to the secrecy surrounding the development of nuclear weaponry and the fears engendered by the beginnings of the Cold War. However, the potential peaceful applications of releasing the power of the nucleus captured the imagination of many and produced ideas such as atomic- powered planes and cars, large electric generating stations, tiny reactors wired to clothing to keep a person cool in summer and warm in winter and "home power plants" to provide climate control and electricity in individual homes. Of course, some of those suggestions were fanciful, at least at the time, although an amazingly wide variety of applications have indeed seen the light of day, some that may surprise many people, and I'll return to that in a moment.

In important ways, the origins of a renewed effort to expand the commercial uses of the atom date from President Eisenhower's 1953 "Atoms for Peace" speech at the United Nations, just 50 years ago.

Eisenhower was deeply concerned about the nuclear arms race and wanted to transform the nuclear genie from an agent of destruction to, as he put it, “a great boon”, for the benefit of all mankind. Moreover, his vision was a distinctly international one. "Who can doubt," he said, "if the entire body of the world's scientists and engineers had adequate amounts of fissionable material with which to test and develop their ideas, that this capability would rapidly be transformed into universal, efficient, and economic usage." To this end, he proposed the establishment of an International Atomic Energy Agency which would accept contributions of fissionable materials from the nuclear power states so as to allocate them for peaceful pursuits around the world. That is not exactly how it has turned out, but nevertheless, the IAEA has made a significant contribution to the spread of nuclear science and technology, and indeed for other well-known reasons, is now a household word.

The United States initiated a program of bilateral agreements for cooperation in the sharing of technical knowledge, construction of research reactors and development of power reactors. By 1955, more than 24 such agreements were in place and between 1955 and 1960, more than 130 research reactors were established around the world.

In 1957 the International Atomic Energy Agency that Eisenhower had envisioned in his speech was actually created. Under IAEA's auspices, many countries received assistance in developing their own atomic energy programs and in the uses of radioisotopes and radiation for many scientific, industrial, commercial and medical purposes.

Since then, there has been extensive growth in the applications of the peaceful atom that touch and benefit most of us in our daily lives.

Let me just mention a few of these applications.

There are innumerable industrial applications such as industrial radiography and the use of isotopes to determine the level of liquid in products such as your favorite beer. There are commercial products such as tritium exit signs, smoke detectors, and packages sterilized by radiation to keep items such as cosmetics, contact lenses, and medicines safe for the user. In agriculture, radioisotopes are used as tracers to study plant physiology, and radiation-induced mutations have been used to develop more than 600 varieties of field crops.

Food irradiation is now being used in over 30 countries for a wide range of products including spices, fruits and chickens. In medicine, as we all know, radioisotopes are used for diagnosis, therapy, drug testing, and in medical products such as pacemakers. For almost all of these applications, commerce is international.

Radiation and radioisotopes are used extensively in many fields of basic research, including such esoteric areas as the dating of artifacts and the dating of sediment cores for determining the history of environmental pollution.

In space, reactors and radioisotopes are used to power both space vehicles and equipment. Indeed, deep space exploration would be impossible today without nuclear science and technology.

In this modern era, the quality of life enjoyed in the developed countries is in no small measure due to the availability of nuclear science and technology. In the short period of time that has passed since the scientific discoveries of radiation, the practical applications of the atom have had a profound effect on the world. In view of projected global population growth and the aspiration of the developing nations to achieve lifestyles currently enjoyed by the most advanced nations, we can only expect the need for nuclear science and technology to increase.

Let's now take a look at where we are with nuclear power.

Commercial nuclear power is just over 40 years old, but it would be difficult to deny that it is already a mature industry with worldwide positive trends, particularly evident in the last decade. Operational parameters have improved substantially, the public safety record is superb by any measure or comparison, economics have improved dramatically and international infrastructures (unmatched in any other electric power generation industry) are in place to ensure continued progress, safety and international cooperation.

So, what about the future for nuclear power? I've been asked that question many times and it always reminds me of a famous American baseball player, Yogi Berra, who was known for his interesting observations. In this case, when asked about a future event, Yogi replied, "It's difficult to make predictions …especially about the future."

That being said, any responsible and knowledgeable authority will say that the worldwide demand for electricity is going to continue to increase, at different rates in different regions of course. Meeting the demand will require the contribution of nuclear power given the sources available today and viable in the near future. Beyond that, there are those who argue that not only will it be needed, but in many cases, and for various reasons, nuclear power should be the generation mode of choice.

However, I believe that many factors, beyond logic and statistics, will influence the actual outcome. These factors can be broadly categorized as technical, economic, infrastructural, social and political with many elements falling in more than one category forming a complex matrix of challenges to the future of nuclear power.

Not surprisingly, the "real" (versus perceived) technical issues are perhaps most easily identified and addressed. They obviously involve issues like plant-aging management with respect to existing plants and the need to develop and commercialize plant designs for the future that address a variety of economic, social and political demands. Also included is the need to advance other aspects of the fuel cycle technically. Not so obvious are industry human resources and expertise, more intuitively thought of as social issues. However, technology can play a meaningful role in ensuring these essential resources.

Economic issues are also relatively straightforward *per se*, the bottom line being that nuclear power must be competitive not only in terms of ongoing fuel and operating costs, but in terms of original construction costs, with respect to both time and money. Beyond nuclear plants themselves, costs for the entire fuel cycle, particularly waste management and disposal, must be competitive. In free market economies, investors must be able to gain an assured reasonable return on their investment, while in state-controlled economies the costs must be manageable given other demands for resources and state priorities. In the countries in the Pacific Rim, utility economic models span the whole spectrum between free market and state controlled, resulting in significant economic challenges on both national and international scales.

By definition, liability is an economic issue, and not an insignificant one given the financial impact of a perceived, though highly improbable, accident such as that at Chernobyl with its multinational economic impacts. Finally, critical to economic viability is the overarching need for known and stable regulatory regimes, including health, safety, and environmental as well as commercial.

While these issues are easily defined, cost and efficiency are impacted by technical and liability issues, and stable regulatory environments are clearly influenced by the socio-political environment and infrastructure considerations. Thus we have a pretty complex situation.

Now to the more difficult areas – social and political, which, of necessity, must be considered in combination because they are inextricably intertwined. In the wake of "September 11", and the follow-on environment of international terrorism, security has perhaps emerged at the top of the list of socio-political issues with the related long-time concern of proliferation not far behind, both being heavily impacted by technical and financial considerations as well. Then there is the issue of energy independence, complicated enormously by today's global economy, and the prudent hedging notion of an optimal energy mix, both of which can be viewed across a complex spectrum affecting every nation and region differently.

Not far behind is the concept of "sustainable development" which, not unlike beauty, "is in the eyes of the beholder" and over laden with philosophical, social and politically-controversial baggage. But perhaps most critical to the future of nuclear power is the need for public support and political will, which are almost totally interdependent. Affecting both are perceptions, almost more than realities, of the safety, health and environmental consequences of technology in general, and almost anything "nuclear" in particular.

All of the above lead to the final category: infrastructure. To flourish in the future, nuclear power needs adequate international infrastructures to provide international consensus standards, to enable rapid exchange of technical knowledge and experience, to foster creative economic mechanisms and solutions, to provide transparency with respect to all matters affecting societal risk in the areas of safety, health and environmental integrity and to provide channels of credible scientifically-based information.

Well, all this isn't simple or easy. In principle, the above requirements have been met in many cases, or can be, met. Will they be met in a way that will secure a future for nuclear power?

What is still needed to enable the nuclear enterprise, nuclear power as well as nuclear science and technology, to flourish in the future?

Today, the quality of life enjoyed in the developed countries is in no small measure due to the availability of electricity. Indeed the average citizen uses televisions,

microwave ovens, dishwashers, clothes washers and dryers, stereos, hair dryers, coffee makers, copy and fax machines, cellular phones, DVD players, and a myriad of other relatively standard home and office devices, not to mention medical and emergency equipment, that depend on electricity.

In essence, the world as we know it, with a comfortable lifestyle and economic well-being requires energy, and for many reasons and applications, electricity is the energy source of choice. Will nuclear play a role in providing that electricity?

Beyond nuclear power, the countries of the Pacific Rim have chosen nuclear technology to improve human health, increase the quality and quantity of beneficial consumer products, improve the safety, quality, and quantity of the food supply, our basic transportation systems, fire protection in our homes, and in general, greatly improve our quality of life. Will nuclear science and technology continue to contribute to the health and welfare of humankind?

I, along with others, see a problem – not an unsolvable problem – but one that must be addressed, and addressed expeditiously.

Clearly, as illustrated above, the nuclear community is vast and diverse, but with overriding and compelling common interests creating an interdependency, acknowledged or not, that impacts its very survival. Yet, not only are the various segments of the nuclear community often isolated from each other, but the community itself has managed to isolate itself from society at large - I think, to its possible peril. And this must change!

History can shed some light on the problem. While there was active use of radiation and radioactivity, especially in medicine and research, prior to World War II, our current expanded industry is primarily a post-war venture. With origins in the defense arena, it evolved in an atmosphere of secrecy, and many would say, even arrogance. Unfortunately, this approach has come back to haunt us today in the form of public fear of all things "nuclear". (An interesting anecdote is the example of magnetic resonance imaging, MRI, which was originally called nuclear magnetic resonance, NMR. The name was allegedly changed to get rid of the word “nuclear”).

Actually, it wasn't until the 1950's, after Eisenhower’s UN speech, that the expression "peaceful uses of atomic energy" gained public attention, and the peoples of this world realized the possible applications beyond the familiar: weapons and medicine. By then, the damage caused by isolation had already been done. But, I think it is not too late to reverse the situation if we learn our lesson, and act on what we've learned.

The nuclear community needs to combine forces. That means the entire nuclear community: legal, regulatory, research, commercial, industrial, nuclear power, and the professional organizations – together! It is much to the credit of the PNC, that all of

these segments are indeed brought together in this series of conferences, somewhat unusual in the nuclear arena.

The nuclear community needs to abandon its patronizing attitudes and its petty turf battles, keep its eye on the overriding goal, and most of all put on a human face. We are after all, a part of the society that we serve. And the overriding goal is to ensure the continued availability of the beneficial uses of nuclear science and technology that so richly enhance the economic, social, environmental and physical welfare of our societies around the world.

We in the nuclear community need to develop good leaders who can carry forth the vision of the nuclear enterprise, and, we need good statesmen, who can carry the message of both the successes and the promises of the nuclear enterprise to the citizens of the world. It is clear that there is an increasing desire for society to have a meaningful role in determining their lifestyle. So, in the end, it is they who will decide our fate and the future of nuclear science and technology. Technical people can no longer work in isolation.

And it is not just communication with the public that is needed; it is communication with decision-makers and policy-makers as well. As John Sununu, an engineer, former Governor of New Hampshire and Chief of staff to former president George Bush recently said in a Nuclear News interview "I think it's important for anyone in any profession to realize that they have to be an active part of the policymaking that is related to their profession. If they sit back and don't participate, then it's only the people who generally oppose whatever the goals of that profession are that end up being heard."

The bottom line is that the nuclear community must pay attention to the changing dynamics created by ever-increasing public interest and influence. It follows that there is an increasing need for information and education on the benefits of nuclear technology not just the safeguards in place to protect against its hazards. We need to get out there and speak up. The challenge for all of us is to effectively communicate the fact that beneficial nuclear technologies are being used daily, and safely.

The future of our societies will require a delicate balance – one that maintains the health and safety of the world's citizens and a viable environment, while addressing the world's needs for peace, energy, security, a viable economy and a reasonable lifestyle for all.

The nations of the world are facing challenging times and the peoples of this planet will need to make difficult choices in the 21st century: choices of lifestyle that involve weighing benefits against risks and cost. The atom, largely through international cooperation and exchange, has served to enrich the lives of many, but the risks, as we all well know, are not negligible. Respect for its power is essential if the atom, wherever it travels is to be a welcome visitor. It is incumbent on all of us, each in our own capacity, to share our knowledge with the citizens of the world so that their choices

can be informed ones. And it is up to us to foster the international cooperation necessary to ensure that the atom is used safely and wisely and that its benefits are available for the future generations in the world of tomorrow.

I believe that we are now at a crossroads in the nuclear profession, we can take the route to the dead end of isolation, or we can take the route that lets us all stand tall in our communities and countries and proud of our nuclear technologies that can serve them well in the twenty first century and beyond.

I say, let us move wisely, expeditiously and together, in cooperation, for the good of all of the citizens of the world. May we in the global nuclear community be wise leaders and statesmen. May we recognize the changes around us, rise to the challenges and work together to ensure that the uses of nuclear energy are available for the benefit of humankind and the environment in the future.

Once again, I am honored and delighted to be here among so many long- time friends and to have the opportunity to meet new ones. I congratulate the organizers and sponsors for what promises to be an excellent conference. Finally, I wish you all the best for health, happiness and success, both personally and professionally. May we all have a wonderful time in Honolulu and look forward to continued cooperation and success, not only in the Pacific Basin, but throughout the world. Thank you very much.