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SUBJECT: CHAIRMAN JACKSON'S TRIP REPORT ON VISIT TO THE REPUBLIC OF KOREA
AND JAPAN

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May 31, 1996

MEMORANDUM TO: The File

FROM: Shirley Ann Jackson *Shirley Ann Jackson*

SUBJECT: TRIP REPORT ON VISIT TO THE REPUBLIC OF KOREA
AND JAPAN

SUMMARY:

On April 10 - 27 I travelled to the Republic of Korea (ROK) and Japan to speak at two international conferences, meet with government and industry officials, and visit nuclear facilities. I was accompanied by Ms. Janice Dunn Lee, my Special Assistant for International Policy, Mr. Regis R. Boyle, my Technical Assistant for Nuclear Materials and Waste, Mr. Carlton R. Stoiber, Director, Office of International Programs (OIP), and for selected portions of the trip, Mr. James M. Taylor, Executive Director for Operations, Ms. Donna Chaney, Senior International Policy Officer, OIP, and Mr. Kevin Burke, Senior International Relations Officer, OIP.

From the standpoint of nuclear technology, it is clear to me that the two countries I visited have dynamic, and expanding nuclear power programs in contrast to the U.S., where the growth of nuclear power has been suspended. These countries are also devoting much in the way of resources (manpower and money) and creative energy (highly educated workforce) to their programs.

While in the ROK, I was the keynote speaker at Korea Atomic Industrial Forum and spoke of nuclear regulation in the U.S., policy direction, and future prospects.

The ROK has a very aggressive program which includes a mixture of U.S., French, Canadian, and now their own indigenous standard design built on the ABB-CE System 80+. There are 11 reactors operating, 5 in construction, and more at the planning stage. I had impressive site visits to Ulchin and the Daeduk Science Center. At Ulchin, I was informed of their achievement of high capacity factors for the two operating reactors. This combined with a good safety record might also contain a certain degree of risk. I warned that confidence could lead to operational complacency.

While in the ROK, I co-chaired with Dr. KunMo Chung, Minister of Science of Technology the closing session of the Joint Standing Committee on Nuclear and Other Energy Technologies (JSCNOET). In addition, I met on several separate occasions with Dr. Chung who

May 31, 1996

discussed the globalization of ROK vis-a-vis nuclear issues, including strong ROK interests in supplier and safety aspects of the KEDO project, an expanded role for the ROK in IAEA Board of Governors, and possible burning of MOX fuel in Korean reactors.

In Japan, I delivered a keynote address at the Japan Atomic Industrial Forum which covered nuclear regulation and the challenges of change. I noted that U.S. regulatory policy is being affected by four factors: (1) changes in market forces and competitive pressure; (2) the changing role of government; (3) the maturing of the nuclear industry; and (4) technological changes. I was amazed to find how various aspects of these four points of change resonated with different individuals and organizations throughout government and industry.

Japan has a highly developed program based on the drive for energy independence. I visited the Kashiwazaki Kariwa Nuclear Power Plant, JAERI and PNC facilities at Tokai, the new reprocessing site at Rokashomura, and the Monju Fast Breeder Reactor. I had lengthy discussions with many Japanese nuclear officials about the Monju accident and follow-on actions.

My trip leads me to believe that Japan and Korea with their advancing programs, will take a lead in developing new markets in the Pacific Rim. The country that sets standards and rules in new technologies will also have the competitive edge. This has not gone without notice in Japan and the ROK.

It is a sobering thought for me that the U.S. has lost the lead in certain areas. While I was impressed with Japan's progress in areas such as materials testing and non-destructive examination, I am concerned about the reduced state of research in the U.S. nuclear programs in these areas, which are of ever increasing importance as U.S. nuclear facilities age.

In each of the countries I have visited, I have seen that securing reliable sources of energy dominates national agendas. However, approaches in energy planning are the key source of difference between the U.S. and others. While energy planning and development are highly centralized activities performed by the government in both Japan and Korea, in the U.S., energy planning is primarily left to the private sector. Furthermore, while we have governmental bodies responsible for the development and regulation of nuclear energy, we are organized differently. The U.S. also takes a fundamentally different approach to closing the back end of the fuel cycle. The U.S. does not reprocess civilian spent nuclear fuel; other countries do.

There are several areas of particular concern that are described briefly below. I plan to raise these issues with senior Administration officials in the upcoming weeks.

May 31, 1996

- U.S. interests in Asia are being affected by China's rise as a more assertive and influential regional power, continuing trade confrontations with Japan, the volatile standoff on the Korean peninsula, and the growth of Southeast Asian solidarity.
- There has been a noted absence of high level Administration participation at meetings and conferences in the civilian nuclear arena, particularly in the Far East. The focus has been on trade issues.
- The tremendous advancements in science and technology in the nuclear arena in the Far East are occurring with relatively less U.S. involvement than in the past
- The nuclear infrastructures of both Japan and Korea are strong and solid, and there is a parallelism between energy security and national security needs.
- There has been a call for regional organization on nuclear issues. Prime Minister Hashimoto, upon conclusion of the Moscow Nuclear Safety Summit, called for an "Asian" nuclear safety conference in Tokyo this fall, with non-Asian participation only in "observer" status.
- Nuclear safety and non-proliferation should be considered as mutually reinforcing and key national goals. I believe there is a need for bringing the same policy perspective on the linkage between nuclear safety and national security we have taken with respect to the FSU to Asian nuclear development.

A detailed report (prepared by my staff) and relevant cables and documents are attached which summarize individual meetings which took place during this period.

Attachments:

1. Summary of Meetings
2. April 12, 1996 Speech to the KAIF
3. Summary Record of JSCNOET Meeting
4. Reporting Cable on ROK visit
5. April 17, 1996 Speech to the JAIF
6. May 15, 1996 letter to Dr. Chidambaram
7. STA Investigation Report of Monju
8. May 15, 1996 Remarks at Asian/Pacific American Heritage Month Celebration

Summary of Meetings and Site Visits

REPUBLIC OF KOREA (ROK)

Meeting of Korea Atomic Industrial Forum / Korean Nuclear Society, April 12, 1996

Chairman Jackson gave a keynote address at the morning plenary session of the conference. Her remarks were about nuclear regulation in the U.S., policy direction, and future prospects for the U.S. nuclear industry. She stressed the numerous areas regulatory policy is evolving in response to technological, governmental, and other developments. Her remarks also included specific views about the challenges and changes facing the U.S. nuclear industry and how the NRC is responding. A copy of Chairman Jackson's speech is at Attachment 2.

Closing Plenary Session of the 17th ROK - USA Joint Standing Committee on Nuclear and Other Energy Technology (JSCNOET), April 12, 1996

Since the 17th annual JSCNOET meeting coincided with the scheduled visit of Chairman Jackson, she was asked to co-chair with Dr. KunMo Chung, Minister of Science and Technology, the closing plenary session. Topics discussed included nuclear non-proliferation, export controls, nuclear exchanges with China and the former Soviet Union, and strengthening IAEA safeguards. In addition, the principles addressed technical matters related to nuclear safety, radioisotope production, and advanced fuel cycle research. A more detailed summary record of meeting is at attachment 3.

Visit to Ulchin Nuclear Power Plant, April 13, 1996

Chairman Jackson and accompanying party (including A. Burkart, Department of State, and Warren Stern, Arms Control Disarmament Agency), visited the Ulchin site, home of the first South Korean built standard reactor, a design adapted from the ABB/CE System 80+. Ulchin is also the site of two operating Framatome reactors. Chairman Jackson visited Unit 3, which is 65 percent complete with generator, turbine, and reactor installed. Unit 3 is expected to be commissioned in 1988. She also toured the Unit 1 control room, remote shutdown facility, and turbine hall.

Chairman Jackson had extensive discussions with utility and plant personnel on the performance of Units 1 and 2 and the construction experience with Units 3 and 4. Plant personnel informed that Unit 2 obtained a record high of 98 percent capacity in 1995. Ulchin managers explained that these high plant capacity factors are a combination of team work, and good operations, and maintenance practices. Chairman Jackson talked about the generally excellent safety, reliability, and

availability record of nuclear power in recent years, and suggested that paradoxically, this record might also contain a degree of risk: that complacency might subtly erode the vigilance that a true safety culture requires. When asked by the Ulchin reactor operators for advice on maintaining high performance, the Chairman cautioned about the dangers of developing operational complacency and advised them to "never, never rest".

Site Visit to DAEDUK Science Center April 15, 1996

Chairman Jackson and accompanying party including Science Counselor Kenneth Crosher, travelled to Taejon and the DAEDUK Science Center for discussions with the Korea Institute of Nuclear Safety (KINS), the Korea Atomic Energy Research Institute (KAERI), and the Korea Nuclear Fuel Company (KNFC). She also toured the 30 MWT Hanaro multi-purpose research reactor, KAERI's "DUPIC" mockup facility, the Irradiated Materials Examination Facility (IMEF), and KNFC's light water reactor fuel fabrication facility. A detailed report of the visit and discussions with facility personnel is contained in reporting cable at Attachment 4.

Highlights of the meeting with KINS staff included a comprehensive briefing by Dr. Young-Soo Eun, Vice President of KINS, about the evolution of the regulatory system. Dr. Eun described three periods beginning with Phase 1 (1971 -78) as the "turnkey" period where a Korean licensing system was not yet formulated, and consequently vendor laws and regulations were applied. Phase 2 (1981 - 1987) saw the expansion of Korean nuclear power plant construction, with the establishment of a nuclear safety center and development of domestic regulatory criteria. Phase 3 (1988 - present) sees the prime contractors as domestic Korean firms and foreign companies as subcontractors. This period focusses on standardization, and a recognition of the need to separate nuclear promotion and regulation. KINS was established in 1990 and currently has a staff of 311 employees.

KINS informed that the current laws do not yet mandate public hearings. Dr. Eun stated that he believed that public hearings can be held on a voluntary basis without the need for specific regulatory requirements to do so. Public concerns currently are being addressed by KEPCO, the utility. Chairman Jackson warned that one should not overestimate the reaction of the public. In addition, KINS does not have enforcement power. While KINS provides technical analyses, the ability to shut down a facility currently lies with the Ministry of Science and Technology (MOST).

There are two resident inspectors at each site, with KINS providing technical support. KINS performs quality assurance

inspections. When asked about the difficulties of licensing and regulating different types of reactors, KINS replied that they use French codes for the Framatome reactors, and ASME codes for the U.S. plants. The ROK is trying to meld the different aspects of regulation together. KINS acknowledged that the biggest challenge the ROK faces is the rapid industrialization that is happening, and building solid infrastructures to sustain the growth. Nuclear power has been an integral part of the development and also the exception with respect to adequate manpower and resources. [REDACTED]

[REDACTED] While tightly coupled with social advancement, the Koreans believe that safety should come first. EX. 4+5

On the subject of the KEDO project, KINS had strong views regarding the need to be involved, particularly in the safety and design aspects. KINS noted that there is no safety regulatory body in North Korea. Nuclear safety, however, is embodied in the ROK program. In addition, Ulchin Units 3 and 4 are models for the KEDO LWR project, and KINS is the only regulatory organization that has experience with these types of reactors. KINS asked for NRC support to get them more involved in the project's licensing aspects, general consultation, training, and inspections.

Chairman Jackson asked about KINS ability to handle the additional challenges posed by the KEDO project. KINS positive response centers primarily on their development of a safety culture in the ROK which is supported by an excellent operational record, and recognized and endorsed by MOST. Chairman Jackson praised their "can do" spirit and advised them to plan in a realistic way by taking an assessment of their strengths and vulnerabilities.

KINS officials expressed support for Chairman Jackson's proposal for an International Nuclear Regulators Forum, and is willing to expand coordinated research efforts on severe accidents and aging either on a bilateral or multilateral bases.

While at the new KINS headquarters building, Chairman Jackson was briefed on radiological emergency planning and preparedness. She saw their state of the art computerized technical advisory system for radiological emergency. This impressive system provides information on a real time basis to assess plant safety and off-site radiological consequences.

JAPAN

Meeting of the Japan Atomic Industrial Forum (JAIF), April 17 - 18, 1996

Chairman Jackson was invited to deliver a keynote address at the 29th annual JAIF in Nagoya, Japan. Her speech focussed on nuclear regulation and the challenges of change. She noted that U.S. regulatory policy is being affected by four factors: (1) changes to the market forces and competitive pressures; (2) the changing role of government in response to evolving public concerns; (3) the maturing of the nuclear industry which is focussing on issues such as aging, decommissioning, and waste storage and disposal; and (4) technological changes affecting human and plant performance. A copy of the Chairman Jackson's remarks is at attachment 5.

Following her remarks, Chairman Jackson participated in a one and a half hour press conference which focussed on a wide range of issues including proposals for the international nuclear regulators forum and more focussed international nuclear safety research, probabilistic risk assessments (PRA) in the U.S., aging and embrittlement, reaction to Monju, industry restructuring, the Moscow Nuclear Safety Summit, and NRC role as an "independent" commission and its relationship to DOE.

On the margins of the conference, Chairman Jackson met separately with the following individuals:

- Dr. Yannick D'Escatha, Administrator General of the French Atomic Energy Administration (CEA)

The meeting focussed on a wide range of mutual interest topics including use of mixed oxide fuels in France where D'Escatha informed that 15 applications were pending for MOX use. He inquired about plutonium disposition options under consideration, and the likelihood of MOX utilization in the U.S. The subject of fast breeder reactors was raised with D'Escatha providing a status report of the Super Phoenix fast breeder reactor in France, and [REDACTED]

[REDACTED] Chairman Jackson spoke about external regulation of DOE facilities, the high level waste program, and her upcoming visit to China where she planned to visit Qinshan and Daya Bay. (The trip has since been postponed at the request of the Chinese.) [REDACTED]

[REDACTED] The discussion turned to Russia and the desire on both sides for a successful Moscow Nuclear Safety Summit.

Ey
4.5

- Remy Carle, Chairman of the World Association of Nuclear Operators (WANO)

Chairman Jackson and Mr. Carle discussed their respective views on nuclear power programs in China, India, S. Korea, Pakistan, Argentina, Japan, Russia, and Eastern Europe. Chairman Jackson noted WANO's unique role and special access which allows for improving nuclear plant operations and reliability worldwide. She appreciated and agreed with his remarks at the KAIF, particularly his comment that safety does not mean availability. Carle discussed various WANO programs including voluntary peer reviews, operating experience exchange, performance indicators, and performance at the various WANO regional centers. He noted that the Tokyo office operated differently from other regional centers, with less peer reviews. [REDACTED] EX. 4 + 5

- Dr. Rajogopala Chidambaram, Chairman of India Atomic Energy Commission

Chairman Jackson inquired about the status of the three nuclear related safety projects to be acquired through the Rupee Fund. Chidambaram informed that use of the Rupee Fund was a long and complicated process in India. It could take up to two years for approval and given the small amounts of money, it was not worth the effort. Chidambaram indicated that he could fund the projects out of his own budget, but was also looking for larger technology transfers items from the U.S. He was mainly interested in developing an agreement with the Department of Energy and indicated he has been in touch periodically with Secretary O'Leary. Chairman Jackson suggested that the way to reach this larger goal would be to take a step-by-step approach, starting with the nuclear safety projects. He should respect and support the agreement between AECB and NRC and approve funding (either his own or the Rupee Fund) so the safety related projects can move forward. Chidambaram noted that he would be visiting the U.S. in August and would try and stop by Washington to continue discussions. (Meanwhile Chairman Jackson has followed up with a letter to Chidambaram on his offer. The letter is at Attachment 6.)

Site Visit to the Monju Fast Breeder Reactor, April 19, 1996

Chairman Jackson and her delegation, accompanied by Charles Robertson, U.S. Consulate Osaka-Kobe, visited the Power Reactor and Nuclear Fuel Development Corporation's (PNC) Monju reactor. Monju is the site of the recent accident involving a broken thermocouple which caused sodium to leak, and because the utility was less than candid in reporting the accident, the event has led to intense scrutiny of both PNC and the regulatory authorities. Japan is undergoing a soul-searching process of self-assessment,

and there is deep concern at many levels for the implications the accident may have for the future of the Japanese program.

Chairman Jackson was escorted by Mr. Ohishi, President of PNC, to the location of the thermocouple break where she witnessed the areas contaminated by the sodium leakage. PNC acknowledged that the public disclosure aspects of the accident were mishandled. Since JOYO, the first experimental fast breeder, operated safely for 18 years, there has been a definite erosion of public confidence. While the cause of the leak was still under investigation, flow induced vibration is anticipated to be the main problem. There are currently 190 employees at the Monju site. While the investigation and followup is consumed by the transparency issue, there is recognition about the need to improve operating procedures. Chairman Jackson noted that the issue of transparency is important, but one should not lose sight of the technical design issues. Procedures are also important; however, through all the discussions, it was difficult to derive what PNC's planned approach is for resolution.

Meeting with Tsutomu Inoue, President, Nuclear Power Engineering Cooperation (NUPEC), April 22, 1996

NUPEC officials discussed work underway in the areas of seismic testing, plant aging, and severe accident research, and seismic probabilistic safety assessments (PSA). Chairman Jackson discussed aging and PRA in the U.S. and noted that NRC pioneered use of the PRA some time ago but it has only been utilized more recently. The NRC decided that PRA has a role in regulation and staff is developing a standard review plan. While more work is needed in the development of a data base, PRA does track naturally with issues related to aging. Chairman Jackson further noted that we need to be concerned about aging in a seismic context, particularly fragility of structures. She discussed annealing to preserve the integrity of the pressure vessel, and mentioned the two DOE test cases. She inquired about NUPEC interest in international collaboration on issues such as aging and PRA, and received a positive response.

Mr. Inoue noted that currently each utility in Japan is responsible for conducting PSAs on a voluntary basis. MITI, however, will take up PSA as a part of future regulatory requirements. Mr. Inoue suggested that NRC might be interested in work underway between NUPEC, CEA in France, and GRS in Germany. Chairman Jackson responded that PRA needs to be considered in the context of worldwide safety. If structured as an international project, it should be viewed as safety work.

Meeting with Director General Ezaki, Ministry of International Trade and Industry (MITI) Agency of Natural Resources and Energy, April 22, 1996

The meeting began about the Moscow Nuclear Safety Summit, and the announcement by Prime Minister Hashimoto for a regional Asian nuclear conference in Tokyo this fall. The call for a conference reflects Asia's advancing nuclear development and the need to put safety first. It is also related to concerns about nuclear safety with respect to the KEDO project. DG Ezaki mentioned that other G-7 nations could participate in the conference as observers. Chairman Jackson noted that she was pleased to see regional cooperation, but stressed that nuclear safety is a worldwide interest. Chornobyl showed that an accident has more than just regional consequences. She discussed her proposal for an international nuclear regulators forum which would involve all countries with major nuclear programs. She indicated that it would be announced and discussed more fully at the Senior Regulators Meeting in Paris in September 1996.

DG Ezaki discussed the investigation concerning Monju and the implications on Japan's future program. While the accident was not serious from a radiological perspective, there is growing distrust on the part of the people. He recognized that both technical and communications issues must be dealt with.

Japan's fuel supply system is quite fragile with 60 -70 percent dependence on oil from the Middle East. In order to increase nuclear production from 35% to 40% in the year 2010, Japan needs to build twenty more plants to realize this goal. The Monju accident complicates this path, but there is a need to clarify safety and energy security issues. In the final analysis, DG Ezaki does not believe the Monju accident will impact the fuel cycle program. He noted that MOX fuels can be utilized in light water reactors, not just breeders.

The discussion turned to the modular construction aspects of the ABWR which Japan is pleased about. Ezaki noted that the ABWR could also burn MOX fuels. Even though the Advanced Thermal Reactor (ATR) was canceled for economic reasons, there continues to be research on thermal research reactors.

The renewal of the NRC bilateral safety agreement with MITI is working its way through the Japanese bureaucracy, but unfortunately, was not ready for signing during the Chairman's visit. Chairman Jackson noted that she would be returning to Japan in October 1996 to speak at the Pacific Basin Conference, and perhaps a signing could be arranged at that time. Meanwhile, both sides agreed that cooperation would continue.

Meeting with Mr. Hirose, Managing Director, Japan Power Engineering and Inspection Corporation (JAPEIC), April 22, 1996

Mr. Hirose gave an overview of the JAPEIC organization which is 25 years old, employees a staff of 230 researchers and engineers, has a statutory basis, and has three R&D centers. JAPEIC performs inspections at nuclear power plants, and does nuclear safety R&D work. Chairman Jackson and JAPEIC officials discussed issues related to plant aging, inspection techniques, plant life extension, and materials aging detection technology. Chairman Jackson was notably impressed with JAPEIC's progress in areas such as materials testing and non-destructive examination.

Meeting with Director General Miyabashi, Nuclear Safety Bureau, April 23, 1996

Chairman Jackson was accompanied by U.S. Embassy Minister Counselor Gerry Whitman and EST Officer Stephen Tanski. The discussion focussed on the Monju accident, public anxiety and concern for safety. DG Miyabashi explained that there are now technical uncertainties associated with the fast breeder reactor. He informed that STA as the regulatory body is responsible for developing a framework to assure safety of nuclear facilities. STA currently cannot specify the level of safety for Monju.

When Chairman Jackson asked what impact safety concerns for the fast breeder reactor could have on plans for a complete fuel cycle, DG Miyabashi noted that a closed fuel cycle is inevitable for Japan. Furthermore, Japan must reuse LWR fuel, and views reprocessing more desirable than storage.

The discussion turned to safety standards and licensing procedures for fast breeder and light water reactors. DG Miyabashi noted that there is a difference in standards. Japan has developed rough standards for the fast breeder by way of test facilities, but they don't want the standards to be unique so they are working closely with the French towards a more international set of norms.

When asked about cooperation with China, Miyabashi indicated that Japan is ready to provide assistance within a regional framework to maintain safety at a reasonable level. He noted, however, that China has to maintain their own safety stance. With regard to the KEDO project, Japan has much interest from both a safety and financial perspective. [REDACTED]

EX. 42
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Meeting with Chairman Yasumasa Togo, Commissioners Sumita and Naito, Science and Technology Agency (STA), Nuclear Safety Commission, April 23, 1996

The conversation focussed on Monju and continued speculation about impacts to the Japanese program, aspects of the investigation including an investigation by special experts initiated by STA, and follow-up activities. Chairman Togo provided a report at Attachment 7 which discusses the investigation. Chairman Togo informed that on the safety issue, a study is underway to determine the differences between LWRs and R&D facilities. In addition, new initiatives are underway including a wider scope of evaluation of the accident, and installation of confirmation mechanisms.

There was discussion of the challenges facing the nuclear industry. Chairman Togo noted that by the year 2000, all facilities must have an accident management plan. In addition, design standards need to be completed on seismicity, and periodic safety reviews should be done every twenty years.

Chairman Jackson spoke about the challenges facing the U.S. industry, including industry restructuring, the shrinking size of government and budgets which forces us to prioritize, regulatory effectiveness, use of PRAs, age related degradation, and reactor pressure vessel embrittlement. She also mentioned external regulation, new proposals for more focussed international research possibly in plant aging and PRA, the international nuclear regulators forum, and strategic assessment and rebaselining initiative underway at NRC.

Meeting with Dr. Masaji Yoshikawa, President, Japan Atomic Energy Research Institute (JAERI), April 23, 1996

The meeting focussed on common interest issues such as the on-going work related at the ROSA facility, PSAs, high temperature test reactor research, and Monju. JAERI operates the ROSA project, a very large scale model for validating computer codes used in modeling safety phenomena for the Westinghouse AP-600 design. The NRC is doing extensive work at ROSA, a facility which has no analogue in the U.S.. This is another example of Japan's extensive investment in atomic energy. In the area of PSA, Dr. Yoshikawa informed that two primary activities are underway. These are core damage influence (effects of internal events) and seismic influence (hazard evaluation, building endurance, and frequency of core damage). The recent Kobe earthquake has been evaluated with the conclusion that no substantial change was needed in the regulations.

When asked about research in fragility, JAERI responded that it is under consideration, but no research has been conducted yet.

On high temperature test reactor research, Dr. Yoshikawa noted that work is going on between Japan, Germany, Russia, China, with interest on the part of the IAEA.

On Monju, JAERI is doing research on the shape of the thermocouple device which failed. They plan to submit a report to STA.

Chairman Jackson responded to questions about nuclear safety research in the U.S., including severe accidents, thermal hydraulics, and high level waste. JAERI officials raised the issue of more leniency on NRC's part regarding publication of research efforts on the ROSA project. Chairman Jackson understood the issue from a researchers' perspective, but also from the industry's viewpoint, and indicated that this matter would require further consideration.

Meeting with Mr. Ohishi, President, Power Reactor and Nuclear Fuel Development Corporation (PNC), April 23, 1996

The meeting at PNC headquarters focussed on a variety of topics including Monju and future plans for the breeder program, fuel cycle issues covering plutonium use and waste disposal, high burnup fuels, PSAs, transparency and public trust, and human aspects of nuclear power operations. PNC informed that their programs are ultimately designed to be transferred to the private sector for commercialization.

With regard to high burnup fuels, particularly for MOX, PNC officials indicated that they did not use it in the experimental JOYO reactor, but did plan to use it at Monju. The current rate of 60,000 MWt would increase to 80,000 and then to 100,000 in the year 2005. For LWRs, 55,000 MWt is considered high burnup, however PNC is not currently involved in LWRs or LWR fuels. PNC offered that there are no special characteristics of MOX high burnup fuel.

Chairman Jackson was asked by Mr. Ohishi for her assessment of Monju. She began by noting that it is hard to comment after only such a short visit. She understood what Monju means in the fuel cycle for Japan and appreciated the opportunity to see the site first hand. When asked for advice on handling the sodium leak accident, Chairman Jackson drew from the recent NRC experience with the Northeast Utilities Millstone plant and its noncompliance with its FSAR. She suggested that, in addition to transparency and public accountability, the Japanese should not lose sight of the technical deficiencies. They might apply the following approach: (1) a thorough root cause analysis should be performed; (2) there should be a clarification of relative responsibility and accountability of those with direct plant oversight; (3) appropriate guidance for plant operators should be

developed; (4) operator training should be strengthened; and (5) responsiveness to and openness with the public should be improved. Millstone taught us that one cannot forget the public, in "public health and safety".

When Chairman Jackson was asked for her personal views about plutonium use, she responded that she adheres to the policy of the U.S. government to neither engage in reprocessing nor encourage or discourage it in other nations. Furthermore, she believes it important for the U.S. to be a reliable nuclear trade partner in Japan. She recognizes the importance it plays in energy independence for Japan.

Site Visit to Rokkashomura, April 24, 1996

Chairman Jackson and her delegation visited the Institute for Environmental Sciences where three principal studies are under development: (1) radioecology, involving the distribution of radioactive nuclides in the local environment to study the safety margin to the environment and biological effects of radiation; (2) closed ecology experiment facilities to study the material circulation mechanism in the environment; and (3) radiobiology study to look at the effect of low dose ionizing radiation and biological responses to radiation.

The Chairman was given a tour of Japan Nuclear Fuels Limited (JNFL) uranium enrichment plant which uses centrifuge technology, an overlook of the low-level radioactive waste disposal facility, a construction site tour of the reprocessing plant, and the high-level waste disposal facility tour.

Site Visit to Kashiwazaki-Kariwa, April 25, 1996

The Chairman was accompanied the entire day by Tokyo Electric Power Corporation (TEPCO) General Manager for Nuclear Power Program Operations, Mr. Tomono, and Deputy General Manager Mr. Omoto. The Kashiwazaki-Kariwa site has five operating BWR reactors and two advanced BWR's under construction. Situated on a lovely site on the Sea of Japan, the plant is spotless and well operated. The site is designed so that two thirds of the property will eventually be left for environmental usage.

Chairman Jackson visited Unit 6 which is beginning its startup testing and Unit 7 which is completing construction. There are approximately 8,000 people on site. Evidence is everywhere of the meticulous planning that the Japanese invest in their nuclear construction projects. Not only is the project ahead of schedule, but it is designed in concert with nature.

In discussions with Mr. Tomono, he expressed disappointment with the U.S. pulling out of the advanced reactor programs. What use

to be a partnership project between Japan and the U.S., the Japanese are now alone in the LWR business.

Kashiwazaki-Kariwa has high capacity factors, an excellent safety record, along with timely construction schedules. TEPCO has seen the evolution of LWRs from the start with the culmination now of the ABWR, which has resulted in better, more efficient, and safer plants. Mr. Tomono indicated that the most difficult part of the process in building a nuclear power plant is siting which sometimes can take up to 27 years.

Chairman Jackson talked about her experiences on utility boards and discussed changes which would impact the U.S. nuclear program. She also discussed the certification process underway at the NRC which would help streamline the process. Both sides acknowledged that NRC certification might help reduce anti-nuclear sentiment in Japan.

**Site Visit to JAERI Tokai Establishment and PNC Tokai Works,
April 26, 1996**

In the morning, Chairman Jackson and accompanying delegation visited JAERI's TOKAI Research Establishment for a detailed technical briefing and a tour of the ROSA research facility, and the Waste Testing Facility (WASTEF). JAERI officials discussed high burnup fuel tests, human factors studies, volume reduction of transuranic wastes, work on seismic PSAs, and noted that the high temperature test reactor would go critical in 1997. JAERI officials also noted with regret, that the research expertise in the U.S. was dwindling.

In the afternoon, the Chairman visited PNC's Tokai Works for technical briefings and a tour of the reprocessing plant, the Krypton Recovery Facility, and the Geological Isolation Basic Research Facility.

In further discussions with PNC, they indicated that it was becoming more difficult to get DOE to cooperate in areas other than waste management and safeguards. They inquired about aging research and how it was being conducted in the U.S.

Chairman Jackson discussed on-going work between NRC and EPA on radiological criteria for decommissioning. There are a number of U.S. plants who will be required to do a decommissioning plan. These include Fort St. Vrain, Yankee Rowe, and Trojan. While plant life in Japan is 30 years, there is the expectation that licenses will be extended.

When asked by PNC what Asian nations should do about reactor safety, Chairman Jackson responded that: (1) it is important to have a strong overarching regulatory body that has real

authority; (2) stay on the peaceful side of nuclear uses; (3) standardize wherever possible; (4) develop a safety culture for the operators; (5) develop and strengthen ability to do safety assessments in order to understand where vulnerabilities lay; (6) emphasize training; and (7) participate in worldwide nuclear safety cooperation.



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"NUCLEAR REGULATION IN THE UNITED STATES: POLICY DIRECTIONS AND FUTURE PROSPECTS"

BY

DR. SHIRLEY ANN JACKSON, CHAIRMAN
U.S. NUCLEAR REGULATORY COMMISSION

BEFORE THE

KOREA ATOMIC INDUSTRIAL FORUM/KOREAN NUCLEAR SOCIETY
SEOUL, REPUBLIC OF KOREA
APRIL 12, 1996

INTRODUCTION

An Yung Ha Shim Nika.

Good morning. I very much appreciate the invitation to address this annual meeting of the Korea Atomic Industrial Forum (KAIF)/Korean Nuclear Society (KNS). I am delighted to have this opportunity to discuss with you the direction and future prospects of nuclear regulatory policy in the United States.

Nuclear regulatory policy is evolving in response to technological, governmental, and other developments. While not all nations with nuclear programs face the same issues at the same time, there is enough overlap from one nation to another that it may be useful to describe the challenges facing the NRC today, the ways in which we are seeking to address them, and the directions in which nuclear regulatory policy is moving. The challenges that we are dealing with at the NRC today may well be those which other nations will be confronting shortly -- if they are not doing so already.

In addressing the question of my vision for the NRC, I am sometimes asked whether it is possible to have a vision for the agency, given that no new nuclear plants are being built in the U.S. and none are on the immediate horizon. The answer, of

course, is that the original licensing of nuclear power plants is only a part of the job of the NRC -- an important part, to be sure, because safety must be built into nuclear plants from the beginning -- but nevertheless just one part. The task of the nuclear regulator is to ensure not only that plants are designed and constructed safely, but also that they are operated safely throughout an operating life measured in decades; that they are properly maintained as they age; and when the time comes to retire them from service, they are decommissioned safely.

In the United States today, numerous challenges face the nuclear power industry and its regulators. These include: (1) economic constraints and the restructuring of the electricity industry in accordance with market forces and competitive pressures; (2) the evolving role of government in American political life; (3) the special requirements posed by a maturing industry; and (4) technological developments. I would like to discuss each of these.

DOMESTIC CHALLENGES AND RESPONSES

Economic Constraints

The U.S. electric utility industry faces substantial challenges that will inevitably change its business practices. At present, the industry is restructuring in an effort to remain competitive, to lower electric rates to consumers, and to respond to Federal and state regulatory initiatives. One concern is that economic pressures might cause electric utilities to cut costs at the expense of maintenance and safety upgrades. In fact, during the 1990's, safety performance, reliability, and availability for U.S. power reactors have been good and generally continue to improve, albeit slowly. This is demonstrated by the key operational safety indicators monitored by the NRC. Improved management of operational safety has been accompanied by decreases in average plant operation and maintenance costs and increased plant availability. But the industry could find it challenging to maintain a proper focus on safety if good performance were to be taken for granted. We all know that creating and maintaining a true safety culture means resisting the temptation to become complacent in response to sustained success.

Therefore, as the business environment changes, the NRC must ensure that nuclear electric generators continue to maintain high safety standards, with sufficient resources devoted to nuclear operations and with decommissioning funding secure. To help ensure this, I have asked the NRC staff to analyze this changing business environment carefully to determine whether our current regulatory requirements are satisfactory. The staff has proposed that the Commission initiate a rulemaking to provide adequate

assurance of decommissioning funds for those power reactor licensees which are no longer economically regulated.

Role of Government

For some time, there has been public debate in the United States over the proper role of government, with many Americans believing that the government has become too large, expensive, and intrusive. Public concerns about the size and cost of government have resulted in reduced funding for all government agencies, including the NRC. Like many other agencies, we are having to carry out our responsibility to assure adequate protection of public health and safety with diminished resources. This tighter fiscal environment requires us to prioritize our programs and make some difficult choices about where the increasingly scarce funds should be spent.

At the same time, the NRC may be asked to assume new duties. An advisory committee was formed in 1994 by the U.S. Department of Energy (DOE) to examine and make recommendations on external regulation of DOE facilities, including national laboratories and weapons plants. DOE is currently studying the advisory committee's recommendation, and this month expects to issue its findings. If full responsibility is assigned to the NRC, it would add significantly to the NRC's current nuclear regulatory responsibilities, requiring agency restructuring, and significant additional resources. Such a step also would require Congressional approval.

Regulating a Maturing Industry

Aging

One of the most obvious manifestations of the maturity of the nuclear power industry is that plants have been in operation long enough for reactor aging to become a major issue both for the NRC and the regulated industry. Aging affects all plant structures, systems, and components to varying degrees, and it can affect operations and safety, if not appropriately managed. The NRC believes that a "risk-informed, performance-based" approach is an important step in ensuring that licensees continue to focus on safety-important plant equipment. The Maintenance Rule, which will become effective in July, incorporates this approach. Licensees will be required to establish maintenance programs based on a risk-ranking of structures, systems, and components for their specific plants and performance monitoring based on preestablished goals. Through inspection, the NRC will monitor performance against the licensee's program.

We must examine the standards and operating procedures imposed on critical components to assure ourselves and the public that an adequate safety margin will be maintained. Two specific aging

problems of great importance are reactor pressure vessel embrittlement and steam generator tube degradation. Some U.S. reactor pressure vessels may approach pressurized thermal shock (PTS) screening criteria before the end of their licensed terms. If so, licensees will have to perform plant specific analysis, mitigate the embrittlement, or shut down their reactors. Steam generator tube degradation is another area of concern. The Commission is considering a generic regulatory approach for dealing with steam generator tube degradation with a view to reducing plant-specific regulatory decisions, while ensuring defense in depth through a balance of protection, inspection, and mitigative measures. In the end, however, many plants may have to replace their steam generators; and, indeed, a number have done so already. Both of these issues can cause aging plants to be shut down before the end of their 40-year license terms, as was the case with Yankee Atomic Electric Company's Yankee Rowe and Portland General Electric Company's Trojan facilities.

Waste storage and disposal

The continued operation of many nuclear plants over a period of decades has meant a steadily mounting quantity of nuclear wastes to be stored and disposed of. The need to address and resolve this problem remains critically important, in the U.S. and elsewhere, including the Republic of Korea.

The NRC believes, based on what we know today, that a deep geologic repository is a technically feasible solution to the problem of permanently disposing of spent fuel and other high-level radioactive waste in the United States. The responsibility for constructing and operating such a facility rests with the U.S. Department of Energy; licensing it is the responsibility of the NRC.

The delays in developing permanent storage and disposal facilities, coupled with diminished space in spent fuel pools, has caused many utilities to turn to dry cask storage. NRC rules provide for generic approvals of dry cask designs, which allow a nuclear utility to purchase and use approved casks without the need for site-specific licensing action. Several such designs have already been approved, and the NRC's approach has been sustained by the U.S. courts.

The attractiveness of such casks as an interim solution to the waste storage problem, coupled with uncertainties in the repository program, has led to interest in the development of a centralized interim storage facility for the United States. Legislation to that effect has been proposed in the U.S. Congress. The NRC believes that any such legislation should provide for an integrated high-level waste management plan, with three components: interim on-site storage; centralized interim off-site storage; and deep geologic disposal of high-level

nuclear waste, primarily spent fuel. We are examining the NRC's existing licensing capabilities and staff resources, should we be called upon to license an interim centralized storage facility. It is important that statutory clarity on the direction of the U.S. high-level waste program be established as soon as possible, so that the NRC and the utilities can plan prudently.

While on the subject of nuclear wastes, let me touch briefly on low-level radioactive waste disposal, which remains a significant issue. In the Low-Level Radioactive Waste Policy Act of 1980 and its 1985 amendments, the responsibility for identifying sites and developing disposal facilities in the U.S. was given to the States. This authorized them to enter into compacts for the establishment and operation of regional disposal facilities for low-level waste. The NRC or, as appropriate, the 29 "Agreement States" (states which have signed agreements with the NRC to regulate the use of radioactive material within their borders) are responsible for licensing these facilities. It currently appears that most, if not all, low-level waste disposal facilities will be licensed by Agreement States. Nevertheless, the NRC must also maintain some level of licensing capability in case we are called upon to license a low-level radioactive waste disposal facility.

Technological Changes

Although in the United States, new nuclear electric generating capacity does not appear likely at this time, the possibility remains that U.S. electric power generators will consider a standard nuclear power plant as a source for new generating capacity. The NRC has issued final design approvals for two standard reactor designs and is in the process of certifying these designs by rulemaking. We expect that the certification of the two standard reactor designs -- the General Electric Advanced Boiling Water Reactor and the Combustion Engineering System 80+ will be completed in 1996. The NRC is also reviewing the Westinghouse AP-600 standard design application, a light water reactor design which employs passive safety features and greater use of modular construction. While General Electric has announced that it was ending its simplified boiling-water reactor program, Westinghouse has confirmed its continued participation in the Department of Energy's Advanced Light Water Reactor effort.

INTERNATIONAL CHALLENGES

It is important that the nations of the world share their collective technological, operational, and governmental experience, to help keep the risks of accidents to acceptable levels in all countries. The NRC regards this part of our role as extremely important. Much of our focus in the past five years

has been on the new governments formed in the aftermath of the breakup of the Soviet Union. Not only have these nations inherited Soviet-built reactors, they also may have limited experience with the concept of independent regulatory bodies, capable of shutting down plants when safety concerns warrant that step. World wide, the NRC has provided assistance to a number of nations -- some with existing nuclear programs, and others, particularly in Asia, which are studying their feasibility -- in establishing and strengthening regulatory bodies.

A major challenge in the international arena is safeguarding fissile materials. Every country with a nuclear program must have the means to prevent theft or misuse of dangerous materials through effective safeguards, including materials protection, control and accountability (MPC&A) programs implemented through a strong and effective regulatory system. Various agencies of the U.S. government are working closely with their counterpart organizations in Central and Eastern Europe to guard against such diversions, by assisting in the development of effective regulatory and safeguards programs.

A long-standing NRC international cooperative activity is regulatory research -- an area likely to assume even greater significance in the future. The NRC has over 60 research agreements with organizations in more than 20 foreign countries, including Korea. This cooperative approach not only makes good economic sense -- through the pooling of increasingly scarce resources -- but recognizes that no country or agency has a monopoly on good ideas. A diversity of perspectives and viewpoints on complex technical issues can only improve our understanding of how best to assure protection of public health and safety.

One specific area in which international cooperation is already bearing fruit is in the thermal annealing of reactor pressure vessels, which involves significant engineering issues and financial risk to nuclear power companies. Although thermal annealing of a reactor pressure vessel has not yet been attempted at a commercial nuclear power plant in the U.S., the Russians have had considerable success with their annealing procedures, and part of our cooperative safety program with Russia includes annealing technology. The NRC has created a regulatory framework to assess reactor pressure vessel integrity following annealing, and the Department of Energy is planning to conduct two annealing demonstrations using two different heating techniques, including the Russian technique which utilizes electrical heat. We will carefully observe and evaluate these tests to strengthen our regulatory process in this area. The Palisades Nuclear Plant in Michigan is considering annealing its pressure vessel, and its decision will test our regulatory framework and its technical bases.

RESPONDING TO THE CHALLENGES: THE U.S. PICTURE

I have described today some of the challenges I see facing nuclear regulators in the U.S. and internationally. I now would like to discuss some of the ways I envision that these challenges can be addressed -- in the U.S., by the NRC, and internationally by the world community.

Review of Regulations

The NRC has been engaged in a reexamination of its regulations for a few years, with emphasis added by a government-wide initiative of the Clinton Administration -- the National Performance Review. The objective of this effort for the NRC can be summed up in the phrase "regulatory effectiveness." To achieve this goal, the NRC is currently looking not only at whether a particular regulation or set of regulations is necessary, but also considering the ease of its implementation, its consistency with other applicable statutes and regulations, its fairness, its cost-effectiveness, and its place within the overall regulatory program.

Also with regard to our regulations, I have requested that the NRC staff examine closely those regulations for which we have granted numerous exemptions. It seems to me that when exemptions from a particular regulation are routinely requested, one must at least ask whether the regulation needs amendment, or whether licensee performance needs improvement. We already have amended our regulation pertaining to containment leakage testing and plan to consider amending the other regulations as well.

Strategic Assessment and Rebaselining

To position us to effectively meet the challenges we face and to intelligently guide our activities and decision-making in the future, last year, I initiated a strategic assessment and rebaselining at the NRC for domestic and international activities. The first phase of the initiative, the "strategic assessment," involves reviewing, categorizing and examining the sources of the mandates that make up our regulatory mission -- statutes, Executive Branch directives, and Commission decisions. This phase is identifying key strategic issues to be addressed by the Commission. This will lead to a new NRC strategic plan and five-year plan. The subsequent rebaselining will reflect our programmatic needs, their required resource levels and any agency-wide changes needed.

Probabilistic Risk Analysis (PRA)

In regulating a mature nuclear industry in the U.S., "risk-informed, performance-based regulation" uses Probabilistic Risk Analysis (PRA) as a tool. This technique allows the NRC to focus

on the most safety-significant aspects of reactor operations and other licensee activities while maintaining the principles of defense in depth. Properly applied, it tends to relieve unnecessary regulatory burdens by focusing on those things that have the greatest safety significance. At the same time, however, it may also reveal vulnerabilities which could result in new requirements. In either case, a risk-informed, performance-based approach allows a sharpening of focus and a targeting of attention and resources in a way that should help the regulator, the industries we regulate, and the public.

To foster consistency in the use of PRA in NRC decision-making, the Commission in 1995 issued a PRA policy statement and related implementation plan. The NRC staff has been given the task of developing a basic structure for a risk-informed, performance-based regulatory framework, including standards development, a Standard Review Plan, and changes in the regulatory guidance documents.

Technical Specifications

Another area of focus involves technical specifications. Technical specifications are specific operational, testing, design and administrative constraints under which each nuclear power plant is required to operate. In this area, the NRC has implemented an improvement program designed to eliminate unnecessary license constraints and to improve understanding of the bases of the technical specifications, thereby substantially reducing the regulatory burden on licensees. Improved standard technical specifications are available for adoption by licensees. As of October 1, 1995 more than half of the operating units had converted or intended to convert to the improved standard technical specifications.

Embrittlement of Reactor Pressure Vessels and Nondestructive Testing

Let me turn to the embrittlement issue. From my perspective, we have not made adequate progress in measuring embrittlement changes in operating reactor vessels and relating those changes to microscopic models which give a stronger predictive capability, and allow an assessment of post-annealing properties.

The surveillance programs used by licensees for determining changes in toughness properties in the vessel materials of operating reactors have a number of shortcomings, especially for older plants. These programs use a simple, but indirect, conservative method that does not utilize improvements in fracture toughness technology. The results tend to have significant variability, making more difficult the assessment of plant-specific reactor vessel integrity.

To address this problem, we should pursue the use of advanced nondestructive examination techniques for measuring the embrittlement of irradiated reactor vessels. Several possible approaches have been proposed for such measurements, including magnetic, ultrasonic, and hardness measurement techniques. Additional research is required. This is an area with considerable promise, and significant potential safety benefits.

LOOKING TO THE FUTURE: THE INTERNATIONAL PERSPECTIVE

The United States is not alone in facing the problem of how to accomplish the health and safety objectives of government within the constraints of a limited budget. One obvious solution, for the numerous governments in this situation, is to pool their bodies of knowledge toward the common goal of enhanced nuclear safety in all countries. Already, a striking example of this is occurring in nuclear safety research, where many countries share their results. I believe that we should go further. Toward that end, I have proposed two international initiatives which would avoid duplication of effort, but meet the common challenges which we are encountering, and help to compensate for the pressures on our various safety research budgets.

First, I believe the world's nuclear regulators should consider establishing a better mechanism for coordinating their own efforts, through a structured forum for the exchange of information and views on topics of mutual interest. I know that significant exchanges already take place on an ad hoc basis, as well as in the context of meetings at the IAEA in Vienna or the NEA in Paris. However, these efforts do not always reflect the needs of regulators or their priorities. We do not need a multilateral nuclear regulatory organization with a secretariat and headquarters, but a more formal organization of nuclear regulators on the international level might help to identify common themes and approaches and provide greater support for safety.

My second proposal is that the international community consider new programs of cooperative research in areas where we face common challenges such as aging and risk assessment methodologies. In certain areas of mutual interest, coordinated international research activity has already occurred, with excellent results. If existing international bodies can provide the necessary structure for such a program, this would be excellent; if not, the creation of other mechanisms should be considered.

CONCLUSION

I have attempted to describe this morning some of the many challenges the nuclear power industry and nuclear regulators currently face, in the United States and around the world. Despite their number and complexity, I believe that there is reason for considerable satisfaction. The same maturing process that has brought issues such as reactor aging to the forefront of our concerns has also provided us with a base of operating experience, helping to ensure the safety of reactors in the U.S. and abroad. In the safeguards area, although the problems are substantial, there is increasing cooperation of the world community in coping with these problems.

Nuclear energy and nuclear knowledge have long since ceased to be the preserve of just a few nations. Today the world's nuclear community has the benefit of the knowledge, the expertise, and the fresh insights of capable men and women around the world -- including those here this morning. As we approach a new century and a new millennium, we recognize increasingly our global interdependence. We must continue to work together to ensure a unified commitment to nuclear safety throughout the world.

Thank you for your attention.



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NUCLEAR REGULATION: THE CHALLENGES OF CHANGE

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BEFORE THE

JAPAN ATOMIC INDUSTRIAL FORUM
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INTRODUCTION

Kon Nichi Wa Mi Na San

Good afternoon. It is a privilege to have this opportunity to address the annual meeting of the Japan Atomic Industrial Forum (JAIF). I would like to use this occasion to discuss the challenges which nuclear regulators face as a result of a variety of changes. The future of nuclear regulation, and indeed of nuclear power as an energy source, will depend upon our ability to meet these challenges effectively.

In the United States, change is being driven by sometimes conflicting pressures in four areas: (1) economic constraints and the restructuring of the electricity industry; (2) the changing role of government, in response to evolving public concerns; (3) the maturing of the nuclear power industry; and (4) technological innovations. All four factors have major implications for nuclear regulation.

The United States is not unique in this respect. To varying degrees, other countries are facing similar challenges. Although the precise character of the response to these challenges may differ between countries, the objectives are largely the same everywhere: (1) improvement in the already high levels of safety in the peaceful uses of nuclear energy; (2) improved nuclear power plant operating performance (which has the incidental effect of improving economic performance); and (3) better public

understanding of the basis for the regulators' confidence that, with proper regulation, nuclear energy can play a part in the economic and social development of nations.

The common thread running through these issues is change. Governments, like individuals, sometimes feel most comfortable clinging to the status quo, even as circumstances shift around them. In the nuclear area, this is a luxury we cannot afford. Ignoring change can compromise public health and safety. If a nuclear plant is badly designed, or poorly operated, remedial action must be taken. Safety upgrades, power reductions, or even shutdown and decommissioning must be considered -- even in the face of power shortages, human and financial resource constraints, and political obstacles.

At the same time, change for the sake of change is by no means desirable. Allowing change to drive decision-making in a haphazard and premature manner could be as dangerous as an overly rigid refusal to contemplate doing things differently. Unnecessary alterations in designs, or modifications or backfits ordered in haste, without a proper understanding of their long-range impact, can erode safety rather than increase it.

In the end, the only acceptable approach is "managing" change, which means focusing our efforts on best defining and implementing long-term, well thought-out approaches. This will tax our human and infrastructural resources. It will require both vision and political will. However, I am convinced that "managed change" will have the best chance of maintaining nuclear power as a viable energy alternative, supported by a public which believes that its essential health and safety concerns are taken into account.

DIMENSIONS OF CHANGE

Economic Change

First, let me address the economic dimensions of change.

The U.S. electric utility industry is currently facing challenges that will inevitably change its business practices in fundamental ways. At present, the industry is restructuring in an effort to become more competitive, to lower electric rates to consumers, and to respond to Federal and state regulatory initiatives. The implications of these challenges to U.S. utilities and to the NRC are not yet clear.

Safety performance, reliability, and availability of U.S. power reactors during the 1990's have been good and generally continue

to improve slowly. This is demonstrated by the key operational safety indicators monitored by the NRC. Improved management of operational safety has been accompanied by decreases in average plant operation and maintenance costs, and increased plant availability.

Paradoxically, this excellent record of nuclear power may also contain a degree of risk: that complacency might subtly erode the vigilance that a true safety culture requires. Further, there is the danger that increased competitiveness in the electricity industry may create pressures to minimize expenditures to the point that safety is compromised.

In all the countries I have visited during my first year as Chairman, I have seen that securing reliable sources of energy dominates national agendas. Some nations, which have significant nuclear energy programs, face public skepticism or increased competition from alternate sources of energy, often compounded by new policies directing the privatization of the nuclear sector. In countries just beginning nuclear programs, or contemplating a nuclear power option, high start-up costs and extensive infrastructural demands are weighed against the costs of imported fossil fuels, or their associated environmental effects. In states with aging nuclear power facilities, the decision to continue operating them is sometimes a function of social need, which may outweigh strict cost accounting.

In this complex situation, the regulator must keep abreast of how rate deregulation, competition, and economic, political and social constraints affect nuclear reactor operators, because they can impact safety. In the U.S. I have to ensure that nuclear electric generators continue to maintain high safety standards, with sufficient resources devoted to nuclear operations, and with decommissioning funding assured. I have asked the NRC staff to analyze this changing business environment carefully to determine the adequacy of our current regulatory requirements. To this end, the NRC staff has proposed that the Commission initiate a rulemaking to provide adequate assurance of decommissioning funds for those power reactor licensees which are no longer economically regulated.

Changing Role of Governments

Many Americans have come to believe that Government is too large, with too pervasive an impact on industry and the public. Moreover, continuing budget constraints affect all U.S. government agencies, including the NRC. Part of our task at the NRC is to assure that, regardless of the constraints or where the lines are drawn, adequate protection of public health and safety is not compromised.

Smaller budgets do not necessarily mean decreased responsibilities. For example, in the newly independent states of the former Soviet Union, governments with slender and uncertain budgets have had to take on the demanding responsibilities of regulating, as well as operating, existing nuclear power plants. They often lack trained personnel, adequate facilities, and even design information, and they have limited funds to devote to this complex process.

In the U.S., despite budget cutbacks, the NRC may have to assume new missions. An advisory committee, formed in 1994 by the U.S. Department of Energy (DOE), has made recommendations on external regulation of DOE facilities. DOE is currently studying the advisory committee's findings, and this month expects to issue its decisions. If full DOE oversight is assigned to the NRC, it would add significantly to our current regulatory responsibilities, would require agency restructuring, and significant additional resources. Such a step also would require Congressional approval.

Changes in a Maturing Industry

In those countries which began their civilian nuclear programs in the 1950's and 1960's, the industry has operated long enough to have accumulated aging facilities and substantial quantities of nuclear wastes. For countries just now beginning nuclear power programs, planning at the outset for aging, plant life extension, and even disposal of waste may seem remote and possible to defer. However, addressing these issues at the outset of a program is fundamentally important.

For example, without careful advance planning in design, modifications needed to operate and eventually extend the operating life of a plant may be very difficult and very costly.

In the U.S., we also have learned that planning for decommissioning a nuclear plant is as important as designing, constructing and operating it safely. In the U.S., as elsewhere, the short-term and long-term disposition of radioactive wastes has become a national problem. Without timely attention to the safe management of these wastes, it is unlikely that nuclear power will garner the public support needed for further development.

Aging Reactors

Aging affects all plant structures to varying degrees and can affect operations and safety, if not properly managed. The regulatory authority of each country must examine the standards and operating procedures imposed on critical components to assure

itself and the public that adequate safety margins will be maintained as nuclear power plants age. Two specific aging problems of great importance worldwide are reactor pressure vessel embrittlement and steam generator tube degradation. Some U.S. reactor pressure vessels may approach pressurized thermal shock screening criteria before the end of their license terms. If so, licensees will have to perform detailed analyses to demonstrate that the plants can be operated safely. If the analyses do not support continued safe operation, the embrittlement of the reactor pressure vessel must be mitigated in some way, such as by thermal annealing, or these reactors will have to be shutdown.

Steam generator tube degradation represents the potential failure of one of the principal fission product barriers in a pressurized water reactor. The NRC is considering a generic approach for dealing with steam generator tube degradation that will reduce plant-specific regulatory decisions, while ensuring defense-in-depth through a balance of protection, inspection, and mitigation. In the end, however, many plants may have to replace the steam generators; and, indeed, a number have done so.

The NRC believes that, as operating plants age, an important step in ensuring that licensees continue to focus on safety-important plant equipment is our risk-informed, performance-based Maintenance Rule, which will become effective in July. Under this rule, licensees will be required to establish maintenance programs based on a risk-ranking of structures, systems and components for their specific plants, and performance monitoring based on pre-established goals. Through inspection, the NRC will monitor performance against the licensee's program.

Life Extension

The NRC recognizes that, if age-related issues are addressed properly, there is no reason that U.S. electric utilities, and our nation, should be deprived of the electricity that older plants can generate. Therefore, we have worked to create an effective regulatory environment in which plants capable of extended safe operation may continue to operate beyond forty years. In the U.S. regulatory scheme, this means renewing a nuclear plant operating license. The NRC has recently developed a regulatory process to handle license renewal in 10 CFR Part 54. Reports from industry groups to discuss generic license renewal programs have been received, but no license renewal application has yet been filed.

Waste Storage and Disposal

One of the most important and highly publicized issues facing the nuclear industry worldwide is nuclear waste storage and disposal. Without satisfactory resolution of this issue, the future role of nuclear energy in the overall U.S. energy mix will be severely constrained. This is both a technical and a public policy issue. The continuing delays in achieving a demonstrably workable facility for permanent disposal of nuclear wastes has had a major influence on public attitudes toward nuclear power in the United States.

Based on what we know today, the NRC believes that a deep geologic repository is a technically feasible solution to the problem of permanently disposing of spent fuel and other high-level radioactive waste in the U.S. The NRC will have to determine whether spent fuel and other high-level nuclear waste can be disposed of safely in a geologic repository constructed and operated by the U.S. Department of Energy (DOE). To make that determination, the NRC will have to maintain, in the face of budget constraints, the technical capability and resources for performing the necessary analyses and determinations. The NRC also could be called upon to license an interim centralized storage facility. We are initiating an examination of our existing licensing capabilities and staff resources relative to that possibility.

In the Low-Level Radioactive Waste Policy Act of 1980 and its 1985 amendments, the responsibility for identifying sites and developing disposal facilities in the U.S. was given to the States. This authorized them to enter into compacts for the establishment and operation of regional disposal facilities for low-level waste. The NRC or, as appropriate, the 29 Agreement States which have signed agreements with the NRC to regulate the use of radioactive material within their borders are responsible for licensing these facilities. It currently appears that most, if not all, low-level waste disposal facilities will be licensed by Agreement States. Nevertheless, the NRC also must maintain some level of licensing capability should we be called upon to license directly a low-level radioactive waste disposal facility.

Technological Change

The term "technological change" should be interpreted in the broadest possible manner -- to include, for example, new reactor designs, as well as improvements in the methodologies used to calculate the risks associated with operating existing plants. These technical innovations provide important tools for industry and regulator alike.

New Reactor Designs

Although it does not appear likely at this time, the possibility remains that utilities and other electric power generators will consider a standard nuclear power plant as a source for new generating capacity. The NRC has issued final design approvals for two standard reactor designs and is in the process of certifying these designs by rulemaking. We expect that the certification of the two standard reactor designs -- the General Electric Advanced Boiling Water Reactor and the ABB/Combustion Engineering System 80+ -- will be completed in 1996. The NRC is also reviewing the Westinghouse AP-600 standard design application for a novel light water reactor design employing passive safety features and greater use of modular construction. While General Electric announced that it was ending its Simplified Boiling Water Reactor program, Westinghouse has confirmed its continued participation in the DOE's first-of-a-kind-engineering Advanced Light Water Reactor effort.

New Methodologies

In regulating the mature nuclear power industry in the U.S., I favor the use of risk insights, such as Probabilistic Risk Assessments (PRAs), in a "risk-informed, performance-based" approach. This tends to relieve regulatory burden by focusing on those aspects of nuclear operations that have the greatest safety significance, while maintaining the principle of defense-in-depth. It also may reveal vulnerabilities which could result in new requirements. On balance, however, a risk-informed, performance-based approach allows a sharpening of focus and a targeting of resources in the most efficient, effective ways.

The NRC has some regulatory initiatives employing this approach - including amendments to the containment leakage testing rule, the maintenance rule, and a proposed reliability data rule. To foster consistency in the use of PRA in NRC decision-making, the NRC last year issued a PRA policy statement and related implementation plan. The NRC staff has been tasked to develop a basic structure for a risk-informed, performance-based regulatory framework, including standards development, a standard review plan, and regulatory guidance documents.

Let me turn to reactor pressure vessel embrittlement. Over the past 30 years, researchers have made significant progress in understanding the variables that affect such embrittlement. However, we have not yet made sufficient progress in directly measuring embrittlement changes in operating reactor vessels and relating those changes to microscopic models which give a stronger predictive capability, and allow an assessment of post-annealing properties. To improve this situation, we should

pursue the use of advanced NDE techniques to measure embrittlement of irradiated reactor vessels directly, not restricted by a limited number of test specimens. Although the development of new NDE methods for measuring radiation embrittlement is a formidable task, such methods would be clearly beneficial as a supplement to current practices.

MANAGING CHANGE

Strategic Assessment and Rebaselining

To position us to effectively meet the challenges we face and to intelligently guide our activities and decision-making in the future, last year, I initiated a strategic assessment and rebaselining at the NRC for domestic and international activities. The first phase is identifying key strategic issues to be addressed by the Commission. This will lead to a new NRC strategic plan and five-year plan. The subsequent rebaselining will reflect our prioritized programmatic needs, their required resource levels, and any agency-wide changes needed.

Transparency and Public Trust

The challenges facing the nuclear power industry worldwide can be posed as a series of questions. How best can we assure safety and public confidence during periods of economic constraints and industry restructuring? What role should downsized and budget-restricted government have in ensuring domestic and international safety? What is the most appropriate and effective way of regulating a maturing industry? And finally, what technological advances can be harnessed for maximum effect in ensuring public health and safety?

The beginning of an answer for each of these questions is transparency, because it generates public trust, demonstrates how decisions to allocate scarce resources are made and implemented, ensures effective cross-fertilization of experience and information, and promotes the use of new ideas and technology.

Public trust in nuclear energy, and by extension in those who regulate it, is inherently fragile. It is nurtured and strengthened only when government officials and the industry they regulate are utterly candid and honest -- painful as that sometimes may be. There is a kind of pact that exists between the public and those who operate and regulate technologies such as nuclear power; and the rock-bottom foundation of that pact is candor. If we are not candid with the public when we discuss our shortcomings, we cannot expect to be believed when we describe our successes. Overall, the story of commercial nuclear power

and its regulation has been admirable, in the United States and abroad, but public acceptance has lagged behind, and to some extent that is attributable to the fact that transparency has not always been the guiding principle.

This necessitates the transaction of our business in the most public way possible. I have been reminded of that recently by the publication of articles in the U.S. media on the Northeast Utilities' Millstone plant and its noncompliance with its Final Safety Analysis Report (FSAR). Millstone operators allegedly were routinely performing full core off-loads, during refueling outages, were ignoring the mandated 250-hour cool-down period for these offloads, and allegedly were placing the primary cooling system at risk. Evidence suggests that these activities had been taking place for over twenty years, without NRC intervention. In response to the situation, and in an effort at honest self-appraisal, I requested an in-depth lessons-learned assessment from the NRC staff -- incorporating suggested improvements of oversight processes including: (1) clarification of relative responsibility and accountability of those with direct plant oversight; (2) strengthened guidance for making and documenting changes to a nuclear power plant; (3) strengthened training of inspectors; and (4) improvement of our responsiveness to the public. These assessments will help us to improve our performance as regulators. Has it been painful? Of course. But I do not doubt that out of these pains will come gains for the NRC, the nuclear industry and the American public.

Coordinating Resources

The development of nuclear power is and always has been an international undertaking, with extensive technology transfer between nations. Countries have differed in the way they have developed and applied the operational and regulatory safety culture by which the risks and consequences of radiological accidents are kept within acceptable bounds. I have tried today to point out the similarity of the challenges that currently face many nations with nuclear power programs. Given those common challenges, it is time that we share not just technology, but also our collective wisdom in coping with today's environment. We need to explore how better to communicate our experiences and leverage our resources to manage the challenges we face. The nuclear industry has long seen the benefit of sharing information in the design, development, and construction of nuclear power plants and of cooperating in reactor research. The major vendors have invested in increased efficiencies, such as building reactor pressure vessels in one country, constructing instrumentation and control systems in another, and bringing them together in a single project in a third country. Likewise, they have banded together in domestic and international operators'

groups to share information and experiences to build a common basis for the safe operation of their facilities.

I believe the world's nuclear regulators should follow suit, and consider establishing a better mechanism for coordinating their own efforts. This could be done through a more regular forum for the exchange of views and information on topics of mutual interest. I know that significant exchanges already take place on an ad hoc basis and sometimes in the context of meetings at the IAEA in Vienna or the NEA in Paris. However, these efforts do not always reflect the needs or priorities of regulators. We do not need a multilateral nuclear regulatory organization with a secretariat and headquarters. Nuclear safety must remain the responsibility of the nations in which the technology is utilized. However, a more formal organization of nuclear regulators on the international level might identify common themes and approaches and provide greater support for safety.

Another means of combining enhanced safety with a recognition of fiscal constraints is to build on the internationally applied concepts of collaboration and peer review, comparing perspectives on problems and the means of resolving them. A striking example of the success of this policy has occurred in the area of research, where many countries already share the results of their reactor research, building upon the unique areas of expertise each possesses.

Specifically, I suggest that we consider an international reactor safety research program, focused on aging and risk assessment methodologies, in which we integrate our safety research activities. In certain areas of mutual interest, coordinated international safety research has already occurred, with excellent results. My proposal is meant to be a more structured and focused safety research program than generally exists internationally at this time.

Another effective mechanism for sharing information is through the international Convention on Nuclear Safety (CNS), negotiated over a three-year period by representatives from over 65 states. This instrument will help assure a safer global environment because of the guiding principles that participants are obliged to follow which require each contracting party to establish an independent regulatory body. There are also reporting and peer review processes implemented by the Convention. The Convention on Nuclear Safety is currently before the U.S. Congress for ratification.

CONCLUSION

I hope my remarks have given you some insight into why I believe our mutual goal should be the effective "management of change" in four major areas. These changes and the challenges they present, viewed as an interrelated series of opportunities which both the international and the U.S. nuclear industries and regulators are facing, require from us greater efforts to coordinate and pool our information and resources, and to maintain a climate of candor at all times.

There is today, in nations around the world with civilian nuclear programs, a wealth of experience of all kinds -- technical knowledge, operating experience, and an understanding of what government regulation can and should accomplish. Much of that experience is in this room today. By ensuring that this experience is shared widely, we have the ability to benefit the people of our own nations and the world community as well. Great as this challenge is, it is an even greater opportunity.

Domo Arigato.



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

May 15, 1996

Release

Dr. Rajagopala Chidambaram
Chairman, Atomic Energy Commission
Anushakti Bhavan
Chhatrapati Shivaji Maharaj Marg
Bombay 400 039
India

Dear Dr. Chidambaram:

I would like to follow up on our conversation on April 18 at the Japan Atomic Industrial Forum annual meeting in Nagoya. I appreciated very much the opportunity to share thoughts on the future direction of our nuclear safety dialogue.

You mentioned in Nagoya that you did not favor using the U.S./India rupee fund to support the three nuclear safety cooperation projects that NRC had worked out with the Atomic Energy Regulatory Board, but that India would prefer using its own resources for this purpose. Since NRC has no funds allocated to this purpose, we thought that the availability of this source would enable us to proceed expeditiously on these projects of mutual benefit. We are still very much interested in implementing the projects and, if you are able to provide funding, we would like to proceed. Please let me know how we can move to closure on this mutual work.

Finally, I look forward to seeing you in the United States, perhaps when you travel to Seattle for the professional conference you mentioned during our conversation. I would be happy to host discussions with you in Washington, as well as arrange site visits to NRC-licensed facilities you may wish to see.

Again, I appreciate our exchange of views in Japan, and look forward to hearing from you soon.

Sincerely,

Shirley Ann Jackson

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**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
Office of Public Affairs
Washington, D.C. 20555

No. S-96-03

"NEW ENERGY IN THE PACIFIC RIM"
BY
DR. SHIRLEY ANN JACKSON, CHAIRMAN
U.S. NUCLEAR REGULATORY COMMISSION
AT THE
ASIAN/PACIFIC AMERICAN HERITAGE MONTH
OBSERVANCE
NRC AUDITORIUM
WEDNESDAY, MAY 15, 1996

INTRODUCTION

Good morning.

I am pleased to join you today at this special observance of Asian/Pacific American Heritage Month. These programs remind all Americans of the diversity of cultures, traditions, and peoples that are the sources of our modern national identity. In celebrating the contribution made by Americans of Asian and Pacific descent, we are well aware of the rich diversity within that broad category -- diversity of culture, language, and history.

This year's celebration is particularly meaningful to me, because I recently returned from a 17-day journey to the Far East, and was deeply impressed by what I saw, technically and otherwise. From the standpoint of nuclear technology, it is clear to me that the two countries I visited -- Japan and the Republic of Korea -- in contrast to the United States, where the growth of nuclear power has for many years been suspended -- have dynamic, and expanding nuclear power programs. They are also devoting much in the way of resources and creative energy to them.

I would like to share with you some of the highlights of my trip and my observations of the Japanese and South Korean nuclear power development programs, because I think that their advances in the field of nuclear technology will prove to be significant in the years ahead. We at NRC know how much our agency has benefited from the technical expertise and creative thinking of individual personnel of Asian and Pacific origin. We have now arrived, I believe, at a point at which the world can learn from the advances made by national nuclear power programs of countries of the Pacific Rim.

REPUBLIC OF KOREA

The first stop on my two and one half week trip was the Republic of Korea. South Korea has a very aggressive nuclear power program, with eleven reactors in operation, five in construction, two on order, and still more at the planning stage. The program contains a mixture of reactor designs, including U.S., French, Canadian, and now their own indigenous standard design.

I was invited to deliver a keynote address at the 11th Annual Conference of the Korea Atomic Industrial Forum (KAIF)/Korean Nuclear Society. I spoke about nuclear regulation in the United States, our policy direction, and future prospects for the U.S. nuclear industry. I stressed that there are numerous areas in which regulatory policy is evolving in response to technological, governmental, and other developments. My remarks included specific views about the challenges and changes facing the U.S. nuclear industry and how the Nuclear Regulatory Commission is responding.

I was graciously welcomed by a wide range of South Korean officials and received a broad and detailed overview of their nuclear program. Their regulatory program closely follows our own.

During my week in Korea I met several times with the Minister of Science and Technology, Dr. Kun Mo Chung, as well as key members of the South Korean nuclear power and safety community. I also visited the Ulchin Nuclear Power Station, and the Daeduk Science Center. The first South Korean built standard reactor design is at Ulchin, a design which was adapted from the ABB/CE System 80, incorporating certain more advanced safety features of the ABB/CE System 80+. Unit 3, to be commissioned in 1998, is about 65 percent complete with generator, turbine, and reactor installed. Unit 4 is about 44 percent complete with commissioning expected in 1999.

While at Ulchin, I had extensive discussions with utility and plant personnel on the performance of Units 1 and 2 and the construction experience with Units 3 and 4. I learned that Unit 2 attained a record high of 98 percent capacity factor in 1995. Our hosts explained that these high plant capacity factors are a combination of team work, and good operations and maintenance practices. Further, they stated that their safety record is good, and can be attributed in part to design improvements incorporated over the years. This reinforces my belief that a safe plant is both reliable and economic.

Describing to my hosts the generally excellent safety, reliability, and availability record of nuclear power in recent years, I suggested to them that paradoxically, this record might also contain a degree of risk: that complacency might subtly erode the vigilance that a true safety culture requires. When asked by the Ulchin reactor operators for advice on maintaining high performance, I cautioned about the dangers of developing operational complacency and advised them to "never, never rest."

I also toured the inside of the Ulchin Unit 3 containment building and visited the Unit 1 control room and turbine hall. The impressive control room had state-of-the-art zero system alarms. The construction site was orderly, clean, and non-distracting.

I visited the new headquarters building of the Korea Institute of Nuclear Safety (KINS), the technical arm of the Ministry of Science and Technology which performs many of the regulatory functions such as safety reviews, technical analyses, inspections, and standards development. I was briefed on radiological emergency planning and preparedness in Korea. I also saw their state-of-the-art computerized technical advisory system for radiological emergency. This system provides information on a real time basis to assess plant safety and off-site radiological consequences. Their capability in this area is perhaps a model for the U.S.

In addition to my meetings and site visits, I co-chaired the closing session of the U.S. - ROK Joint Standing Committee on Nuclear and Other Energy Technologies (JSCNOET). My co-chair was Korea's Minister of Science and Technology. The U.S. delegation to JSCNOET is composed of representatives from the Departments of Energy and State, the Arms Control and Disarmament Agency, and the NRC. The JSCNOET meets annually to discuss nuclear non-proliferation, export controls, nuclear exchanges with China and the former Soviet Union, and strengthening of IAEA safeguards. In addition to these policy issues, the group discusses technical matters such as nuclear safety, radioisotope production, and advanced fuel cycle research.

A key item of the JSCNOET agenda is a joint US-South Korea-Canada program to explore the direct use of spent PWR fuel in CANDU reactors. The program, known as DUPIC, explores ways of reusing spent PWR fuel to fuel CANDU reactors. This has the dual purpose of extending uranium resources and improving waste management. DUPIC is a form of co-processing in which, unlike reprocessing, there is no chemical separation of uranium and plutonium. This makes fissile material diversion more difficult, so the project offers some safeguardability. Spent PWR fuel is repackaged by cutting open the spent fuel rod and crushing the fuel pellets into powder. New pellets are formed, sintered, loaded into a new fuel cladding, and fabricated as a CANDU fuel assembly. The process is expected to reduce the spent fuel volumes by one half, and will save South Korea one third of its uranium fuel needs. The current phase of the experimental DUPIC program will be ongoing until the year 2000. I had the opportunity to visit the DUPIC mock-up facility at the Daeduk Science Center.

South Korean nuclear officials also expressed an interest in a larger and more acknowledged role in the Korean Peninsula Energy Development Organization (KEDO) Project for the supply of the two 1000 megawatt PWRs to North Korea. Many of you will recall that this project has been the subject of sensitive negotiations largely between the United States and North Korea. The KEDO project will provide light water nuclear power reactors in exchange for North Korean dismantlement of their nuclear weapons development program. South Korean officials emphasized the overriding need to consider the safety aspects of the proposed project. Their concerns are similar to those which the NRC has articulated to U.S. Administration officials; namely, that nuclear safety is a fundamental element which must be factored into project planning from the very beginning. Representatives of KINS indicated that they stand ready to provide full advice and assistance in the KEDO project.

On fuel cycle issues, the Koreans view these somewhat differently from the U.S. position. They dominated the discussions in my various meetings. As you know, since 1979 it has been U.S. policy not to reprocess spent fuel, because of concerns over non-proliferation and terrorism, and we have urged other countries to adopt the same approach. In 1991, the South Korean government made a formal commitment not to develop reprocessing or enrichment facilities. This unilateral declaration formed a cornerstone of the North Korea-South Korea non-nuclear declaration. This policy recognized the destabilizing effect within the Korean Peninsula of unirradiated nuclear material directly usable for nuclear weapons. The U.S. strongly endorses this exercise of self-restraint on South Korea's part. At the same time, however, the U.S. recognizes South Korea's desire to extend its uranium resources and better manage its nuclear wastes and, as an advancing nuclear country, to engage in fuel cycle research.

Although South Korean approaches to the nuclear fuel cycle have been somewhat constrained in recognition of non-proliferation and national security concerns, it is clear that the South Koreans are seeking more flexibility, including the possibility of burning mixed oxide (MOX) fuel. My South Korean hosts were keen to discuss a wide range of fuel cycle issues related to nuclear waste disposal including vitrification, spent fuel storage, and disposition of weapons materials from the dismantlement effort, including the burning of MOX fuel in commercial light water reactors.

In summary, South Korea has, without doubt, become a major player on the world nuclear scene. It is for this reason that Korea seeks broader recognition in the international nuclear community. To this end, the ROK is seeking a permanent, designated seat on the IAEA Board of Governors. In parallel, South Korea is also expanding its roles in the United Nations and the Nuclear Energy Agency, while also forging dialogues with Vietnam and Australia. Korea's clear policy goal is to become a global key policy-maker and supplier.

JAPAN

Now, let me turn to Japan.

As most of you know, Japan has a highly developed nuclear power program. Japan has based its nuclear power program of almost 40 years on the desire for energy independence, rather than on economic and environmental considerations alone. This position has resulted in a mix of light water reactors for nuclear power production and a plutonium-based fuel cycle with breeder reactors. The basic Japanese philosophy for achieving and maintaining nuclear safety is through self-effort. This philosophy is evident throughout their nation's industrial life, and has been crucial in enabling them to become one of the economic giants in the world.

I visited Kashiwazaki Kariwa, a large reactor site in Japan, with five operating BWR reactors and two advanced BWR's under construction. Situated on a lovely site on the Sea of Japan, the plant is spotless and well operated. The site is designed so that two thirds of the property will eventually be left for environmental usage. I visited Unit 6 which is beginning its startup

testing and Unit 7 which is completing construction. Everywhere, I saw evidence of the meticulous planning that the Japanese invest in their nuclear construction projects. Not only is the project ahead of schedule, but it is designed in concert with nature.

I also visited several Japanese Atomic Energy Research Institute (JAERI) and Power Reactor and Nuclear Fuel Development Corporation (PNC) facilities at Tokai. JAERI operates the ROSA project, a very large scale model for validating computer codes used in modeling safety phenomena for the Westinghouse AP-600 design. The NRC is doing extensive joint research at ROSA, a facility which has no analogue in the U.S. This is yet another example of Japan's extensive investment in atomic energy.

The Japanese program was highly stimulating. I was impressed by their progress in areas such as materials testing and non-destructive examination. At the same time, I have to confess that it was sobering for me to compare their efforts with the currently reduced state of nuclear research in the U.S. program. Some of my hosts noted with regret that some particular fields related to nuclear research do not seem to be attracting the level of expert attention and capability they received in previous years in the U.S.

I spent a day visiting the Monju fast breeder reactor site which was designed to be the prototype for the future. The Monju fast breeder reactor is being developed by the Power Reactor and Nuclear Fuel Corporation (PNC). Monju is the site of the recent accident involving a broken thermocouple which caused a sodium leak. Because PNC was less than candid in reporting the accident, the event has led to intense scrutiny of both the company and the regulatory authorities. There has also been a soul-searching process of self-assessment by PNC. My host, the President of the PNC, was most gracious in arranging for me to visit the location of the thermocouple break and observe the areas contaminated by the sodium leakage. It was interesting and curious at the same time to note that, while the accident was significant, it posed no threat comparable to that of the 1991 Mihama reactor steam generator tube ruptures. However, Japanese public opinion was deeply affected by this accident, and there is now deep concern at many levels of the Japanese nuclear community about the implications the Monju event may have for the future of the Japanese nuclear program.

In addition to the site visits, I met with agency heads in the variety of Japanese government organizations supervising, promoting or regulating atomic energy. The Ministry of Trade and Industry (MITI) regulates the utilities with assistance and guidance from the Science and Technology Agency (STA). MITI has legal authority to issue fines and even shut down an operating plant if necessary. However, at the same time, it also promotes nuclear power. This dual role could reduce the Ministry's public credibility as an arm's-length regulator, if not carefully managed.

When I delivered a Keynote address at the 29th Annual Japan Atomic Industrial Forum (JAIF) in Nagoya, I spoke at some length about the issue of transparency and public trust. The message I tried to convey was that public trust in nuclear energy, and by extension in those who regulate it, is inherently fragile. It is nurtured and strengthened only when government officials and

the industry they regulate are utterly candid and honest -- painful as that sometimes may be. This is because there is a kind of pact that exists between the public and those who operate and regulate technologies such as nuclear power; and the rock-bottom foundation of that pact is candor. If we are not candid with the public in discussing our shortcomings, we cannot expect to be believed when we describe our successes.

When asked by Japanese nuclear officials for advice on handling the sodium leak accident, I drew on our recent experience with the Northeast Utilities' Millstone plant and its noncompliance with its FSAR. I suggested that, in addition to transparency and public accountability, the Japanese should not lose sight of the technical deficiencies. I suggested the following overall approach: (1) a thorough root cause analysis should be performed; (2) there should be a clarification of relative responsibility and accountability of those with direct plant oversight; (3) appropriate guidance for plant operators should be developed; (4) operator training should be strengthened; and (5) responsiveness to and openness with the public should be improved.

THE PACIFIC RIM

The future of nuclear power in any part of the world is, in large part, a question of economic development: how the demand for secure, predictable, and affordable energy will be met. Today, Asia's Pacific Rim is the fastest growing market for electricity in the world. The combined energy needs of Pacific Rim countries will help determine the scope of world electricity production for decades to come, fueling an estimated worldwide increase of electricity consumption over the next 30 years of almost 100 percent. This demand for power threatens to far outstrip current available sources of supply. Oil supply difficulties in the 1970's led the oil-importing nations like Japan and South Korea to develop well-planned nuclear power programs to ensure the long-term availability of electricity. Furthermore, a mounting awareness of the technological challenges of burning coal and other fossil fuels in an environmentally benign way are leading many to look for other fuels for electricity. In this search for the optimum energy mix, many other Asian countries are looking to nuclear power as a viable option to address the electricity shortage.

My trip leads me to believe that Japan and South Korea, with their advancing nuclear programs, will take a lead in developing new markets for their nuclear technology in the Far East, and perhaps elsewhere. Further, the country that sets standards and rules in new technologies will also have the competitive edge. This has not gone without notice in Japan and South Korea. Asia, too, is the fastest growing market for U.S. exports, giving the U.S. a large and expanding economic stake in the region.

SIMILARITIES AND DIFFERENCES

During my visits, I spoke on nuclear regulation and the challenges of change. U.S. regulatory policy is being affected by four factors: (1) changes in market forces and competitive pressures; (2) the changing role of government,

in response to evolving public concerns; (3) the maturing of the nuclear industry which is focussing on issues such as aging, decommissioning, and waste storage and disposal; and (4) technological changes affecting human and plant performance.

The United States is not unique in this respect. In fact, I was amazed to find how various aspects of these four points of change resonated with different individuals and organizations throughout government and industry.

Although the precise character of the response to these challenges may differ between countries, the objectives are largely the same everywhere: (1) improvement in the already high levels of safety in the peaceful uses of nuclear energy; (2) improved nuclear power plant operating performance (which improves economic performance); and (3) better public understanding of the basis for the regulators' confidence that, with proper regulation, nuclear energy can play a part in the economic and social development of nations.

In fact, in each of the countries I have visited during my first year as NRC Chairman, I have seen that securing reliable sources of energy dominates national agendas. However, approaches to energy planning and development are perhaps the key source of difference between the U.S. and other countries. For example, while energy planning and development are highly centralized activities performed by the government in both Japan and South Korea, in the U.S., energy planning is primarily left to the private sector. And while different nations all have governmental bodies responsible for the development and regulation of nuclear energy, they have far different policy perspectives and quite different organizational arrangements. I found that there is no absolute correlation between an independent safety organization like NRC, which performs rulemaking, licensing, research, and inspection activities, and those solely responsible for nuclear safety in Japan and South Korea. At a glance, it appears that NRC embodies much more than the strict technical safety aspects of nuclear power operations. Understanding other countries' nuclear programs requires understanding their fundamental national political and economic goals, and how energy planning and development are organized accordingly.

CONCLUSION

Overall, I felt that my visits to both Korea and Japan were sincerely welcomed and appreciated by all the individuals and organizations with which I interacted. I will be encouraging the U.S. Administration to adopt a more active, high-level focus and dialogue with these nations in important science and technology areas.

To sum up, I see the key factors contributing to the success of the nuclear programs in Japan and South Korea as the following: (1) long-term national commitment to nuclear power; (2) large investments in research and development; (3) creation and support of academic programs to provide trained personnel; and (4) aggressive international cooperation and information exchange. Both countries have benefited greatly from technology transfers, primarily from the U.S., and both have learned well. They continue to be

active partners with NRC in nuclear safety exchanges, involving cooperative research, information on regulatory programs, and exchange programs involving personnel and training.

Although I have visited Japan in the past, this was a working visit, and I regret that there was not nearly enough opportunity to see as much of the landscape or the cultural attractions of Korea and Japan as I would have liked. What I did see, however, was deeply impressive -- shrines, temples, castles, and formal gardens of beauty and power. I look forward to return visits and to seeing much more.

In conclusion, I would be remiss if I did not mention one other factor that is responsible for the success of nuclear programs in Asia, and it is perhaps the most important of all: the human factor. A tradition of emphasizing education, personal discipline and responsibility and a strong work ethic are the bedrock on which the vigorous industrial economies of Asia have been built during the past half century. These are values which immigrants from those lands brought with them when they came to America. These are the traditions undergirding your work here at the NRC. Not only the NRC, but also American society as a whole, continues to be profoundly enriched by Asian and Pacific Americans and the values they embody.

Thank you.