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"Nuclear Issues in Eastern Europe"

I am pleased to be here this evening to discuss how nuclear issues are evolving in Eastern Europe. Having returned this past fall from a two-week tour of eight countries, including several in Eastern Europe and the former Soviet Union, I am delighted to share with you my views and observations of this important part of the globe. This topic is a particularly timely, in light of the growing concerns about nuclear safety and energy security in that region.

Let me start by explaining the scope of the Nuclear Regulatory Commission's international activities. The NRC carries out its international activities within the overall foreign policy context set by the Department of State. This includes U.S. participation in the programs of the International Atomic Energy Agency (IAEA) and the Organization for Economic Cooperation and Development/Nuclear Energy Agency (OECD/NEA). In support of operational safety, NRC accesses foreign data and other resources and evaluates their technical significance. The lessons learned from this information can then be used to help improve the safety of NRC-licensed facilities and materials. It also helps enhance nuclear safety practices worldwide. In the nonproliferation area, NRC controls the export of nuclear commodities, including reactors, and consults on nuclear-related export actions of other agencies. We also help in U.S. efforts to improve international safeguards and physical security measures.

Before presenting my thoughts on the safety of nuclear power within the Eastern European community, I believe that I need to first give you a bit of an idea of nuclear power plant design.

Nuclear fuel is the heat source which makes steam to drive the turbine, which turns the generator, thus making electricity. When a uranium atom is "hit" by a neutron, it fissions into two pieces. When the uranium atom fissions, heat is released. It also releases several additional neutrons which can "hit" other uranium atoms causing a chain reaction. By controlling the number of neutrons free to hit other uranium atoms, the reactor's power is controlled.

Western reactors operate using water as their "moderator." Water-moderated reactors operate using the principle of "negative reactivity" feedback. Simply put, this means that when reactor power increases and more heat is generated, the chain reaction of the fission process naturally slows down and the power increase is reversed (thus the "negative" feedback concept).

The Russian RBMK design uses graphite as a moderator. Graphite-moderated reactors are characterized by "positive reactivity" feedback, especially when operating at low power. Under these conditions, when reactor power increases and more heat is generated, the fission process is enhanced, and power increases even further (thus the "positive" feedback concept). Without actions by the operators an over-power condition can quickly develop. This is what happened at Chernobyl.

Even with all of the safety inherent in their design physics, water-moderated reactor designs include numerous backup systems. For example, if a leak develops and the water used as coolant escapes, emergency core cooling systems throw in new water to help to dissipate the heat. These systems, with backup upon backup upon backup, ensure that water is always available to cool the reactor core. Other features include high pressure, intermediate pressure, and low pressure pumps; at least three redundant supplies of water available; and finally, the entire reactor complex is enclosed within a containment structure.

These containments are designed to withstand the pressures that could be expected to occur if there were an untoward event at the plant. They stand as a significant barrier in assuring the protection of the public. They are typically built of reinforced concrete which includes steel tendons. The RBMK design does not include a pressure resistant containment. Instead, the power plant is protected from the elements by a steel framed building, covered with sheet metal and a tar-paper roof. It is designed to keep rain and snow out and keep heat in for the workers. It is not designed to be a protective barrier between the reactor core and the public.

As we witness the changing events in this region, I believe we must view nuclear issues in the overall context of three things: nuclear safety, nuclear non-proliferation, and the broader issue of nuclear arms control. Let me emphasize that the opinions and conclusions which I am about to present represent my personal views, and are not necessarily those of the U.S. Government.

In September 1991, I attended a special meeting in Paris organized by the OECD/NEA for the heads of the nuclear regulatory organizations of seven major OECD countries. This group, the so--called "senior regulators," concluded that the highest priority of NEA should be ensuring the establishment of effective governmental nuclear regulatory authorities in the Eastern European countries. In addition, they agreed that a common evaluation of the safety of nuclear power plants in Eastern Europe was urgently needed.

2

To support these priorities, the NEA group proposed that a high-level steering committee be established to do two things: first, it would seek to improve the safety of Eastern European nuclear power plants; and second, it would address the more general issues related to overall energy supply and economic impacts in those countries. This steering committee has been constituted and consists of representatives from the OECD countries, as well as concerned international organizations such as the NEA, IAEA, the International Energy Agency (IEA),World Bank, European Bank for Reconstruction and Development, and the World Association of Nuclear Operators (WANO).

During the senior regulators' meeting and later at the IAEA General Conference in Vienna, I tried to emphasize the point that taking a stronger role in Eastern Europe means much more than coordinating technical assistance. The program should be like a modern IMF program -- a little immediate humanitarian assistance, plus short and long term aid conditioned on fundamental reforms.

Assistance to these countries must be coupled with a commitment on their part to realistic policies in pricing energy, establishing autonomous power production operations, actively pursuing alternative energy sources, and implementing strong independent regulatory structures.

For example, Bulgaria has been plagued with an inability to retain its skilled plant operators, shift supervisors and key management personnel. This is the result of the low pay structure dictated by the central government. There is a problem when a cab driver in a city earns more than a nuclear plant operator. The organization running the nuclear power plants has neither the autonomy nor the authority to increase salaries or to provide other incentives necessary to retain these key people. To date, decisions have been made to shut down some of their nuclear plants rather than stretch available personnel too thin. This is both Prudent and proper.

3

In response to our pressure, Bulgaria did give the operators a one-time pay bonus. Nevertheless, a one-time pay raise is not a compensation policy in the face of stiff inflation. Safety risks could increase unless the government authorities make fundamental changes and give the plants the freedom to take those steps necessary to retain key people. In the absence of such changes, a major program of safety assistance to Bulgaria would, in my view, be ineffective. Furthermore, providing assistance without such conditions could be viewed as sanctioning the current unacceptable situation.

Similarly, in the CIS, electricity prices have been consistently set by the governments far below the cost of power generation. The net result is absence of adequate financial resources for plant maintenance, improvements, and safety enhancements and, even worse, no incentive for energy conservation. Construction practices are substandard, and there is still no strong and independent regulatory organization with sufficient authority to ensure safety. The effectiveness of safety assistance for the USSR under such conditions is questionable; in fact, the net effect of international safety assistance, however well intentioned, could be to sanction nuclear operations which are arguably unsafe.

Efforts are currently underway to develop a binding international convention, under the aegis of the IAEA, whose goal would be to achieve a tough minimum level of safety for all nuclear installations throughout the world. The convention would specify acceptable qualitative safety standards to be met by all such facilities. Its objectives would be achieved primarily through the self-inspection and enforcement programs of the individual nations. However, international peer pressure, bilateral agreements, membership in international organizations, and operating in a forum open to public scrutiny would provide assurance to all concerned parties of compliance with the convention. This would be analogous to the approach used in implementing the Helsinki Convention.

In addition to specifying safety norms, I also believe that an international nuclear safety convention should call for all associated parties to provide the following:

(1) Financing and investment in nuclear facilities adequate to assure operational safety. This would be reflected, in part, through realistic electricity pricing.

(2) Assured autonomy for nuclear power producing organizations. This would enable them to attract and retain adequate numbers of skilled personnel.

(3) An independent regulatory agency. These regulators should have enough expertise and authority to ensure appropriate safety standards are developed for and implemented in facility operations.

With regard to some of the specific safety observations I made on my trip, the nuclear power plant at Kozloduy in Bulgaria had made marked improvements in housekeeping activities and general plant operations. This was encouraging since a highly critical June 1991 IAEA report had advised the Bulgarian government that it would be imprudent to continue operation of Units 1 - 4 in their condition at that time. I understood that after that report, there had been a major commitment to cleanup of the plant, with personnel working 16-hour days. The former plant manager, who had left Kozloduy to enter politics in Sofia, had returned to lead the improvement effort and was having a significant impact. Finally, assistance from the European Community and the World Association of Nuclear Operators was starting to pay dividends. However, while the operational practices and the material condition of the Kozloduy plant were not as bad as had been earlier reported, the situation remains unstable and has deteriorated in a number of areas over the last few years. This is particularly true with regard to the numbers and morale of skilled plant operators and key personnel.

In Russia, it appeared that the larger and newer VVER-lOOOs (the 4th generation Soviet version of our light water reactors) can be operated safely. This is in no small part due to the fact that they employ a number of advanced safety systems, common in Western plants, such as containments and emergency core-cooling. Those plants where construction has been suspended could be finished and operated effectively with adequate financial support. On the other hand, the Chernobyl-type RBMKs, with, among other shortcomings, serious problems in their electrical, fire protection, and instrumentation systems, are very worrisome. I express this concern even in light of the safety improvements that have been made since the Chernobyl accident. It is my opinion that, in the interest of safety, the CIS should concentrate on finishing the larger VVERs, as well as non-nuclear power plants, and shut down the RBMRs as quickly as possible. As a side note, this strategy could well be attractive to financial institutions outside Russia willing to invest in the VVER-1000 plants. I believe the U.S. and other Western countries should not provide further safety assistance other than immediate, everyday help, to the RBMK reactors. It simply will not be effective in view of their substantial fundamental design and fire safety problems. Again, it could be viewed as sanctioning the continued operation of unacceptable plants.

Because of the recent upheavals in the former USSR, the organizations that operate nuclear power plants and regulate their safety are going through major reorganizations. Historically, safety regulation was weak in the USSR. Autonomous

republics with authority for both plant operations and for safety regulation are now being established. It remains to be seen what the impact of these developments will be. There, no doubt, needs to be a legal solution to dealing with the republics, with clear-cut laws defining nuclear energy responsibilities.

Throughout my journey, it was clear that the fundamentals for safe nuclear programs are missing in the former Soviet Union and Eastern Europe - such things as electricity priced at full cost of production would not only help generate cash, but also reduce electricity demand and encourage conservation. First, I firmly believe, whether discussing domestic or foreign nuclear power, that programs without solid and predictable cash flows are a considerable concern. Maintenance, repairs, and capital reinvestments are essential ingredients for nuclear safety and adequate cash is the foundation for these improvements. Second, in Russia there appears to be no autonomy for nuclear operating units. While excellent knowledge existed at the national level in Moscow, it was not reflected at the sites. The disintegration of the central Soviet state gives rise to serious questions concerning command and control, and the maintenance of technical competence. The substantial ambiguity regarding responsibility for nuclear safety must be addressed and resolved at the individual Russian plant sites. Third, I found that there was no sensible national energy plans. If countries are going to have a nuclear power program, they must be willing to make a full financial commitment, and they must have a good regulatory system in place. Nuclear power requires technical sophistication and the resources to operate them safely.

Finally, let me turn to the topic of safeguards and security. The dissolution of the Soviet Union raises several important issues in the nuclear area. I have already discussed the operational safety elements (or lack thereof) in the Soviet nuclear power program. The next and probably the most obvious area of concern, is the control and dismantling of Soviet nuclear weapons. Following that, there is the issue of ensuring that nuclear weapons and materials are adequately safeguarded. These three areas - nuclear safety, control of nuclear weapons, and nuclear proliferation - while appearing to be separate and distinct issues, are really closely connected and should be viewed holistically. The USG is working closely with Russia and other CIS states on the safety, security, and dismantlement of former Soviet nuclear weapons.

As Secretary Baker indicated to the Senate Foreign Relations Committee on February 5, we have reason to think we are making good progress in this area.

In the nuclear materials area, the Soviets have already flooded the legitimate market for fuel with cheap uranium causing havoc, not only to our own domestic industry, but throughout the world. All nuclear programs are reassessing their fuel needs to determine what makes most sense economically in today's market.

There has been much discussion about the possibility of unemployed Soviet nuclear scientists selling their expertise to rogue nations aspiring to join the "nuclear club." One of the key questions, then, is how to hold together Soviet scientists and engineers long enough to solve the technical problems associated with dismantling and destroying their nuclear weapons. We, along with the Russians and Germans, have announced the formation of a science center -- through which we will work to engage scientists and nuclear experts of the former Soviet Union in

productive work within the FSU in order to prevent proliferation of nuclear expertise. We are confident that our approach will address these very important matters. Another equally pressing matter is how to ensure that the nuclear power plant operators employed by the old central government do not leave due to inadequate pay.

After the Chernobyl accident, the NRC and our Soviet counterparts signed a memorandum of understanding establishing the Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCCCNRS). This committee focuses on a number of nuclear safety issues ranging from technical approaches to regulatory practices. To date, the program has been very active and has led to some significant safety improvements.

In the context of our formal exchange, the NRC recently received a request from the Russians about how we discharge national and international safeguards responsibilities. Let me depart for a moment to explain the term safeguards. In a regulatory context, safeguards denotes measures that are taken to deter, prevent, or respond to the unauthorized possession or use of significant quantities of special nuclear material through theft or diversion, and to protect against radiological sabotage of nuclear facilities. In general, safeguards for licensed nuclear fuel facilities and research (otherwise known as nonpower) reactors emphasize protection against theft or diversion of special nuclear materials, whereas safeguards for power reactors stress protection against radiological sabotage.

To our knowledge, Russia does not have a state system for accounting and controlling nuclear material which is technically valid, legally binding, and enforceable. Whatever system that is currently in place is reportedly of low accuracy. Unlike the United States, where we keep our commercial and weapons programs completely separate, the Soviets commingle materials from their weapon and their commercial nuclear activities. Unlike us, they also recycle spent fuel. If the base amounts and locations of such special nuclear material are not known, the possibilities of diversion will inevitably increase as more and more material is recovered from the dismantled weapons. Given this, I believe it is in our best interest to assist Soviet officials in developing sound and effective material control and accounting procedures and providing safeguards assistance in both power reactors and nuclear weapons areas.

To this end, we could assist in the actual design and implementation of a state system for accounting and control, training nuclear safeguards inspectors, procurement of materials measurement and containment/surveillance instrumentation, and introduction of computerized nuclear material accounting systems.

Following this, we need to work with the Department of State and others in discouraging what I will call "the prestige acquisition" of nuclear reactors in countries that have neither the expertise nor the need for them. Any of the new independent states could become a supplier of nuclear weapons to the developing world. Given this possibility, we should request that any Soviet republic seeking independence first sign the Nuclear Non-Proliferation Treaty.

I believe there are a number of other measures which are worth considering and might help prevent the drain of expertise developed from the Soviet nuclear, chemical and biological weapons programs. The private sector has many means to attract scientists who have been accustomed to a relatively high standard of living. American business, for example, could offer incentives to prevent specialists from being lured to countries striving to join the nuclear club. Research grants in areas like environmental cleanup and restoration could be established. Job banks including academic and research positions, as well as jobs in nuclear and related fields, would provide employment opportunities; and tax considerations to ensure adequate financing would provide the necessary financial incentives.

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