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Despite the sobering nature of nuclear weapons, this is an optimistic book. It points to problems and it suggests solutions. It never gives into pessimism or fatalism. At the same time, it offers no grounds for complacency. We say in the Preface that the world is "teetering on the edge of a new and more perilous nuclear era." It is not just that the developing situation is not favorable to nuclear nonproliferation. New dangers that did not exist in the Cold War heighten the risk posed by more nuclear weapons in more hands. These new dangers include international terrorism, well organized nuclear black markets, and the rise of cyber warfare, which will make the management of any future nuclear crisis even more difficult. Think of the Cuban Missile Crisis over laid by third-party disinformation.

The essence of the argument of this book is that linking immediate actions and a long-term vision will produce synergies that will encourage progress toward a world without nuclear weapons. We speak in our

Preface of pursuing measures to provide greater safety to all the world's people "with the intensity the times require." That result is what we are after when we advocate the elimination of nuclear weapons – building the intensity the times require.

Since it is quite reasonable to ask whether the goal of eliminating nuclear weapons is realistic, I would like to say a few words that are inspired by the chapters in the book that did with deterrence and verification. This is my own take, responding to many conversations on these subjects since our summary report of the Hoover-NTI conference was published.

The U.S.-Soviet model of nuclear deterrence during the Cold War was probably unique. We shouldn't think that deterrence in a world with multiple nuclear powers will work the same way. And we shouldn't want to find out. Messrs. Shultz, Kissinger, Perry and Nunn said, in both their *Wall Street Journal* articles, that reliance on nuclear weapons for deterrence is "increasingly hazardous and decreasingly effective." Of course, so long as other nations have nuclear weapons the United States will have to be in the business of nuclear deterrence. Deterring the use of

nuclear weapons by other nations is about the only rational basis for nuclear weapons these days.

But, if other countries verifiably renounce nuclear weapons, then the rationale for nuclear deterrence based on deployed nuclear weapons, as is presently the case, disappears altogether. The United States – and others – will be safer in a world without nuclear weapons. Hardly anyone disputes that – they just stay it can't be done.

This brings us to the question of whether we can reliably verify the absence of nuclear weapons. Well, we have years of successful experience in verifying numbers of operationally deployed nuclear warheads, that is, those associated with deployed missiles and bombers. We can monitor the numbers and locations of the principal means of delivering warheads – bombers and missiles – and that gives us some handle over nondeployed warheads. But there can be no doubt about it, iron-clad assurances that all non-deployed warheads everywhere in the world have been eliminated will be difficult to come by. Much more study is needed in this, and other areas discussed in this book. But to say that nondeployed warheads are hard to find is not the same as saying that warning of an

impending activation of concealed weapons cannot be detected. Pre-emption or some other action would be available as an option. And it is not the same as saying that nuclear deterrence by other means would disappear if nuclear weapons were eliminated. Last Fall, the present U.S. Secretaries of Defense and Energy issued a report in which they suggested that a "responsive nuclear infrastructure" would make it possible, over time, to rely less on nondeployed nuclear warheads. A responsive nuclear infrastructure means functioning nuclear laboratories and some capacity to produce nuclear weapons, if needed, in a timely way. This may be what nuclear deterrence will look like in the future. For the purists, it is not ideal. But it is a big improvement over what we have today.

Won't the world have to change pretty dramatically to make possible the safe elimination of nuclear weapons? Yes, of course, and the adoption and implementation of the essential first steps that Dr. Drell discussed, like a test ban, stopping the production of fissile materials for weapons, and also deep cuts in U.S. and Russian nuclear weapons would begin that process of change. So would internationalizing the nuclear fuel cycle.

And there will have to be a lot of diplomacy involved – it will have to be an "Age of Diplomacy" as Secretary Shultz calls it. We will have to work harder at resolving regional conflicts. We will have to work out stable relations with Russia and China, and do all this in close collaboration with our allies.

One of the things that emerged as we at Hoover thought about the problem is that we cannot confine the process of working toward a world without nuclear weapons to the narrow task of eliminating nuclear weapons. Success in moving in that direction, however, should make it easier to build the broad infrastructure for international cooperation. Part of that infrastructure should be the internationalizing of the nuclear fuel cycle. Here I would like to turn to the subject of another chapter in our book.

The "nuclear fuel cycle" refers to facilities that enrich uranium for use as fuel in nuclear power plants – the so called front end of the fuel cycle. It also refers to extracting plutonium from spent fuel – the back end of the cycle. If a nation has the capacity to do these two things, it has the capacity to build a nuclear bomb.

The idea of a "nuclear renaissance" has captured the imagination of the nuclear power industry, with good cause. Orders for new nuclear power plants have increased at a rapid rate because of increasing demands for energy and because nuclear fuel is carbon-free. It does not contribute to global warming.

An expansion of the share of nuclear power in the world's energy generation mix will bring with it a demand for more enriched uranium and possibly for more plutonium separation capabilities. Since most nations are very sensitive about energy security they may seek energy independence by building their own fuel cycle capabilities, especially uranium enrichment plants. This would make little economic sense but economics is sometimes trumped by national security. Of course, some of these countries may want the complete fuel cycle quite simply to have an option to build nuclear bombs.

So far, the main response of the international community to the concerns of consumer countries has been to provide assurances of reliable supplies of nuclear fuel. For example, it has been proposed that the International Atomic Energy Agency should be given access to a supply

of low enriched uranium that could be sold to consumer countries if commercial supplies of uranium fuel are not available. This has become known as the fuel bank, and it is a promising idea.

But for those countries that insist on the right to ownership of a uranium enrichment facility the answer may lie in multinationally-owned facilities. And that may be the best economic answer too, partly because of economies of scale. Three plants are being planned for construction in the United States that are owned in part by non-U.S. entities:

- Urenco, a British-German-Dutch consortium
- Areva, a French energy company
- GE Hitachi, a U.S.-Japanese joint venture with participation by Cameco, a Canadian firm.

A fourth plant, the U.S. Enrichment Corporation, is purely U.S.-owned. Because capital costs are so high for constructing nuclear facilities the infusion of capital from external sources – consumer countries, for example – would almost certainly be welcomed by most of these companies. We may be able to create a "bottom up", commercially-driven

internationalization of the fuel cycle if we play our cards right. And so, multinational companies may be another answer to the problem of a level playing field.

Next year will be a critical time for nonproliferation because there will be a major international review of how the nonproliferation treaty is working early in 2010. Both ideas we have been talking about – a world without nuclear weapons and equal access to the benefits of nuclear power – will figure in this review. These issues correspond to Articles VI and IV of the Treaty. The United States will have to take the lead in this. And just as in other measures related to nuclear proliferation, the linkage between the vision and the actions will be critical to solving the nuclear fuel cycle.

I think that what we are trying to do in this book is captured brilliantly in the last paragraph of the *Wall Street Journal* article of January 15, 2008 and I will end on this note:

In some respects, the goal of a world free of nuclear weapons is like the top of a very tall mountain. From the vantage point of our troubled world today, we can't even see the top of the mountain, and it is tempting and

easy to say we can't get there from here. But the risks from continuing to go down the mountain or standing pat are too real to ignore. We must chart a course to higher ground where the mountaintop becomes more visible.