Nuclear Security in an Uncertain World
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Overview

Although public awareness of their importance is low, nuclear issues continue to be of vital concern to public policy and international security. The University of California Institute on Global Conflict and Cooperation's Public Policy and Nuclear Threats Program will address the uncertainties faced in analyzing nuclear issues in its January 2005 conference, "Nuclear Security in an Uncertain World."

Abstracts

Session I: Nuclear Uncertainty in the United States: Civilian Programs, Waste Management, and the National Labs

The Future of Nuclear Power: Yucca Mountain as an Indicator
Paul P. Craig

Without energy, human society as we know it will collapse. This is a huge problem for two reasons: world petroleum production is about at its peak; and carbon dioxide emissions from fossil fuels are changing the global climate in ways that will place enormous stress on human society. From the end of World War II, nuclear power has offered the promise of energy to meet society's needs. With a few exceptions nuclear power is stagnant. Debate in the nations with most of the world installed nuclear capacity (about 400 reactors) is not over building new ones, but over life-extension of reactors built 20–30 years ago. What's going on? Is there no hope for nuclear power?

My take is that the world nuclear industry has fallen victim to massive and possibly irreversible errors of overconfidence and arrogance. The trust the world's physicists acquired at the end of World War II has been dissipated. The debate over nuclear power has become massively polarized and almost theological, with no resolution in sight. Yucca Mountain, Nevada, the U.S. Government's intended disposal site for all U.S. high-level civilian and military nuclear waste, is a microcosm of the problem of building the many thousands of reactors that will be required if nuclear power is to make a significant contribution to displacing fossil fuels.

Session II: Nuclear Terrorism: The Uncertainty of the Unthinkable

Aftermath: Scenarios and International Cooperation
Harold Smith

A nuclear detonation in the kiloton range will produce a variety of signatures regarding the source of the weapon that will become available over time in various locations and with varying degrees of uncertainty. Estimates of the yield, using seismic techniques can be made in hours at large distances from Ground Zero. Access to the radioactive cloud should provide indications of the type of fissile material and the sophistication of the design within days. Actual typing of the design, assuming that actual designs (a stolen weapon, for example) were available to the forensics team, would take weeks, but it is within the range of possibility. How this information will be used (and/or misused) will depend to a considerable extent on the degree of collaboration that is permitted and encouraged among the forensics experts of many nations—particularly the nuclear powers. It may well be that the greater the perception that cooperation among nations is real the greater may be the reluctance of terrorists to resort to nuclear weapons to accomplish their goals.

Session III: The Nuclear Weapons Complex: Managing and Modernizing the Stockpile Under Uncertainty

New Proposals for Nuclear Weapons Designs: Technical Aspects
Tom Butler

Much confusion and debate from both technical and political perspectives persists concerning new proposals for nuclear weapons. This presentation will first discuss what kinds of earth penetrating weapons have been proposed and then explain how elementary geometry and energetic considerations demonstrate that the proposed weapons may, in fact, substantially increase the power to hold some deeply buried facilities under threat. However, the same considerations suggest that such weapons will have greatly increased local fallout as compared to a surface explosion of the same yield. In addition, as the depth of the target increases, the nuclear yield required to maintain the threat increases dramatically.

The inescapable physics of earth penetrating weapons raises the question as to whether such weapons will function as effective deterrents or simply drive bunkers deeper underground or beneath densely-populated urban sites.

Reevaluating Nuclear Safety and Security in a Post-9/11 Era
Lisa Brown and Paul Booker

With the end of the Cold War and the increased focus on terrorism and rogue states following 9/11, the safety and security needs for a credible deterrent have evolved. While considering the reduction in stockpile numbers called for in the Nuclear Posture Review, nuclear safety and security methodologies

must be modified as the characteristics of tomorrow's flexible deterrent are formulated. Assuming that the U.S. nuclear stockpile will continue to exist in some form, necessary stockpile changes must be evaluated in light of the heightened perception of terrorism after 9/11.

During the Cold War nuclear weapons were optimized to provide the maximum yield for a given size and weight. In today's world it is imperative to shift away from that mind set and begin optimizing the stockpile for safety and security. New technical solutions must be implemented to protect U.S. special nuclear material and reduce the burden of physical security on the Nuclear Weapons Complex and the Department of Defense. Modern drivers necessitate integration of weapon infrastructure and adoption of technological solutions to provide a lifecycle approach in creating an affordable safe and secure nuclear force appropriate for the post-9/11 threat environment.

Why Stockpile Stewardship Is a Threat to U.S. National Security
Jonathan Hagood

Many elements of the Nuclear Weapons Complex and its stockpile stewardship and life extension programs have potentially adverse consequences for the responsiveness of the U.S. nuclear weapons infrastructure. This presentation identifies four important discourses surrounding the current state of the complex that will have a profound effect upon the future of nuclear weapons design, production, and use. First, "The Myth of the Manhattan Project" describes the founding myth of the national labs and its potential effect upon how the U.S. conceives of and resolves future scientific and technological crises. Second, "In-sourcing in a Global Economy" illustrates the anomalous position of an intra-national industry at a time of global flows of capital, technologies, and material production. Third, "Virtual Testing and the Generation Gap"' critiques the reliance upon virtual weapons testing and the dwindling number of veterans of underground nuclear tests. Finally, "Beating Your Head against a Plywood Wall" raises concerns about legislative restrictions on scientific and technological research.