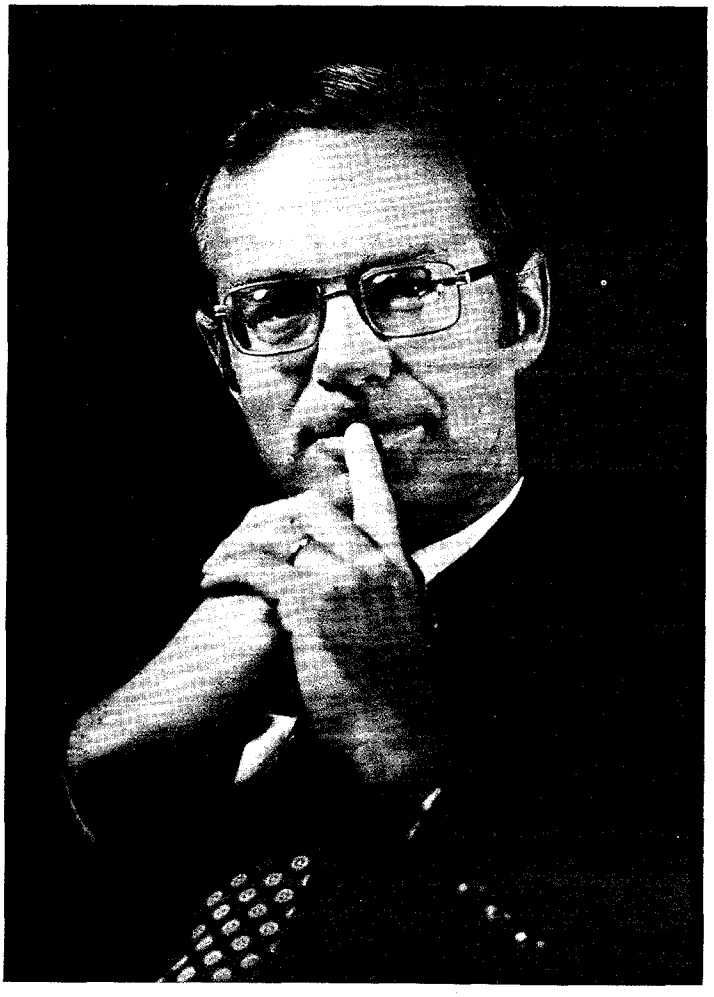
EDITORIAL

Don Kerr on Nuclear Safeguards



For nuclear energy to remain an indispensible part of the United States energy supply, three major problems must be overcome both technically and institutionally: assured safety, acceptable waste disposal, and effective safeguards. The Los Alamos Scientific Laboratory is making significant contributions to all three, but improved nuclear safeguards may be the most pressing requirement today.

Since the beginning of the atomic era, the thrust of United States nuclear policy has been twofold: to build a strong national defense by developing nuclear weapons and naval propulsion systems and to support the private sector's development of a safe and efficient energy resource. As these efforts have expanded, so have the risks incurred by our accumulation of weapons-usable nuclear materials. The proliferation of nuclear weapons states has become a major national security problem. Similarly, the potential for diversion of nuclear materials from the nuclear fuel cycle by a subnational group has added to the growing arsenal of mass terrorism techniques.

Recent guerrilla actions to capture and hold diplomatic hostages in Tehran and Bogota call attention to the need for all major governments, regardless of ideology, to join in common action to protect institutions and communications from the spread of terrorism. In the nuclear age, the threat of terror may be greater than the threat of war between the superpowers. As the world runs short of fossil fuels or the cost to acquire them becomes too high, our reliance on nuclear energy is bound to increase. Among the industrialized countries, France, Japan, West Germany, and the United Kingdom have chosen nuclear energy; Brazil, Argentina, and other developing countries are likely to make the same choice. In the future, unless the tyranny of political terrorists is brought under control, a few may be able to seize, not an embassy, but a nuclear power plant or some other nuclear facility and hold hostage not ambassadors, but entire communities and even nations. Far less difficult actions could produce the same tragic results. The capture of a few kilograms of fissile material and the threat to detonate an improvised nuclear explosive, or the seizure of a few barrels of radioactive wastes and the threat to disperse them in rivers and harbors near large cities could render whole populations defenseless. The challenge to protect nuclear materials from illegal possession is enormous and urgent. It can be met only by a combination of technological and institutional developments.

International and national safeguards and security measures to limit the risks of the nuclear era have evolved over several decades. They must continue to evolve. In fact, recent studies (the International Nuclear Fuel Cycle Evaluation and the Non-Proliferation Alternative System Assessment Program) affirm the need for continuing improvements.

The goal of these studies was to determine whether we could avoid nuclear proliferation problems associated with current LWR and LMFBR fuel cycles by developing alternative fuel cycles that do not produce nuclear materials in forms suitable for use in a nuclear weapon. The studies concluded that proliferation-proof, diversion-proof fuel cycles are unattainable and that the urgent need of some countries for nuclear power will result in the continued growth of the uranium-based nuclear power industry. In fact, some countries see a need not only for nuclear power facilities, but for their own reprocessing plants and centrifuge enrichment plants in order to assure an adequate, economical supply of nuclear fuel for power production. From a safeguards point of view, reprocessing plants that recover weapons-usable uranium and plutonium from burnt or spent reactor fuel and centrifuge plants that enrich uranium are the most vulnerable elements in the nuclear fuel cycle. Not only do they produce weapons-grade uranium and plutonium in large quantities, but the safeguards technologies necessary to account for the materials on a timely basis are in the development stages prior to test and evaluation. The 1980 General Accounting Office report on problems of nuclear fuel reprocessing concludes that "new technology is needed if the United States is to further its own goals of preventing the spread of nuclear weapons and influence other countries to adopt strengthened safeguards at reprocessing facilities."

As the Department of Energy's lead laboratory for research and development in special nuclear material control and accountability, LASL has made major contributions to these and other safeguards technology problems. We have developed nondestructive assay instrumentation for timely measurement of sensitive nuclear materials in all stages of processing. We have also designed near-real-time material control and accountability systems based on the use of these measurement techniques and are now demonstrating such a system at our Plutonium Processing Facility. Further we have developed the systems methodology necessary to design similar systems for new facilities and to evaluate their detection sensitivities. These integrated systems are necessary to deter and detect diversion of sensitive nuclear material by a knowledgeable insider. With regard to materials accountability for reprocessing, the appropriate measurement instruments are under development at LASL. Based on projected measurement capabilities our design analyses suggest that adequate safeguards accountability systems can be implemented in reprocessing facilities. However, the final assurance can come only after instrument development is complete and measurement systems are tested and evaluated at an operating plant. Whether or not commercial reprocessing is carried out in this country, I believe that in order to fulfill our commitment to international safeguards, we must continue to develop, test, and evaluate the materials control and accountability technology needed to safeguard all types of nuclear facilities including reprocessing plants.

Los Alamos also has the principal responsibility for transferring this developing technology to industry, the Nuclear Regulatory Commission, International Atomic Energy Agency, and other countries. In this role, the Laboratory sponsors an extensive program of special training courses and participates directly in the design of new facilities and the addition of new safeguards to existing facilities.

To meet national goals for the prompt recovery of lost or stolen materials, Los Alamos also plays a lead role in defining and organizing DOE's nuclear emergency search team (NEST). The Laboratory's unique capabilities in weapon-related fields are applied to development and operational deployment of search, hazard-assessment, and render-safe equipment and procedures that may be needed to deal with improvised nuclear devices and nuclear terrorism. Nondestructive assay techniques contribute significantly to these NEST capabilities. The weapons development program continues to integrate protective measures into the design of nuclear weapons to deny malefactors the ability to achieve a nuclear yield without resorting to extraordinary measures.

For the future, Los Alamos is developing cost-effective methods to integrate material control and accountability with physical protection. The Laboratory is also taking initiatives to

- develop the NEST technology and organization for extension to nuclear sabotage and reactor accidents.
- develop special international safeguards technology for application to gas-centrifuge plants, advanced isotope separation plants, the fast-breeder fuel cycle, and high-throughput, spent-fuel reprocessing plants.
- develop safeguards systems for away-from-reactor spent-fuel storage.

However, technology only augments the institutional controls on nuclear materials and weapons technology. Institutional developments must proceed in parallel with technology if we are to achieve the level of deterrence we require. To that end, three proposals are under consideration: an international plutonium storage supported by about 85% of the nations participating in the INFCE, international or multinational nuclear fuel cycle facilities, and nuclear power parks that close the fuel cycle within their borders. These institutional initiatives promise to address some of the vulnerabilities of the current nuclear economy. Advanced technology must be developed to make them even more effective in order that nuclear energy may be retained as an alternative for the future.