

NUCLEAR WEAPONS MATERIALS GONE MISSING: WHAT DOES HISTORY TEACH?

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Editor

This four-part book examines past cases of nuclear materials gone missing around the world, painting a dire picture of the likelihood of being able to account for, guard, detect, and prevent fissile materials from going missing in the future. The lessons drawn from these cases challenge commonly held assumptions about the ability and the will that exist to prevent or respond to material unaccounted for (MUF) incidents. The book includes works by a dozen leading nuclear and security experts.

Part 1 introduces the reader to nuclear MUF, explains why it is a concern, and discusses efforts in the United States to detect and prevent it. In this section, Charles Ferguson of the Federation of American Scientists, followed by Thomas Cochran and Matthew McKinzie, both of the Natural Resources Defense Council, show that—though widely assumed to be a model of nuclear security—the United States actually has lost nearly six metric tons of plutonium, highly enriched uranium (HEU), and uranium-233, enough to make hundreds of nuclear bombs. Although most of this material was lost in the early days of the Cold War during a mad rush to make nuclear weapons and accounting procedures have improved since then, the U.S. experience suggests that other nuclear powers like Russia and India could also have created large amounts of MUF.

In Part 2, Victor Gilinsky, former member of the U.S. Nuclear Regulatory Commission, and Leonard Weiss, former chief of staff of the Senate Governmental Affairs Committee, examine cases that demonstrate that, although the U.S. Government was aware of cases of nuclear materials diversion for weapons purposes, the political will did not always exist to

do anything about them. Instead, the United States looked the other way, thereby encouraging Israel and Pakistan to become nuclear weapons states. In the first half of this section, Gilinsky examines the apparent theft of some 100 kilograms of uranium from the plant of a U.S. Navy contractor in the 1960s that was then used to help fuel Israel's nuclear weapons program. In addition, he examines what the U.S. Government actually knew about the theft, and why it did nothing about it. In the second section, Weiss examines the Atoms for Peace program, negotiations over the creation of the International Atomic Energy Agency (IAEA), and the implications of the United States not paying enough attention to nonproliferation—all of which helped encourage Pakistan to initiate a nuclear weapons program.

In Part 3, Alan Kuperman and David Sokolow of the University of Texas, along with Edwin Lyman of the Union of Concerned Scientists, detail four cases of fissile material gone missing from civilian nuclear facilities in the United Kingdom (UK), France, Japan, and Iran. They use these examples to introduce the reader to and to assess the effectiveness of IAEA safeguards standards and practices in regards to the security threats arising from missing fissile material. Finally, they highlight the technical and political challenges that inhibit the IAEA's work and offer policy recommendations to ameliorate these challenges. Ryan Snyder of Princeton University's Program on Science and Global Security then offers a critique of the trio's work—focusing on the technical, statistical, and human challenges that make it difficult to detect when, or even if, a diversion of fissile material has occurred.

Part 4 focuses on the status of fissile material stocks in South Africa—the only country that has acquired nuclear weapons, declared its stocks, dismantled its arsenal, and allowed international verification of it. In the first chapter, Jodi Lieberman, a veteran of the arms control efforts inside and outside of the U.S. Government, details the history of the South African program and the challenges facing the IAEA and the U.S. intelligence community in verifying South African disarmament after 2 decades of obfuscation and denial. She also draws attention to questions that remain unresolved, namely whether all the enriched uranium and production facilities built in South Africa can really be accounted for due to technical and accounting problems before and during disarmament. The author also offers lessons for future efforts in verifying disarmament. In the final chapter, Olli Heinonen, former IAEA Deputy Director for Safeguards, gives a brief history of IAEA efforts to verify South African disarmament and the challenges it faced in doing so. However, he offers a rosier assessment of the process, highlighting lessons from the case, including the necessity of proper accounting procedures, the need for long-term monitoring of the country's nuclear program, and the importance of cooperation and transparency from the country's government.

This volume raises several important questions about nuclear materials security, namely how much MUF exists? Nearly six tons of nuclear weapons materials went missing from the United States during the Cold War—enough for at least 800 low-tech, multi-kiloton bombs. Russian losses are believed to be at least as large, while much less is known, beyond a very general idea, about how much is missing from the other nuclear weapons states. Civilian plutonium production in the United States, UK, France, Japan, and India remains a concern as well. Missing civilian plutonium from the UK and Japan alone can be measured in the making of a number of bombs. These losses are significant because of the possibility of diversion for military purposes to make nuclear bombs—whether by the producing state, another state, or a nonstate entity. Indeed, some of the missing U.S. highly enriched uranium may have been stolen to help fuel Israel's nuclear program.

A related concern is how much fissile material has been produced. Even in a small nuclear weapons program like South Africa's, IAEA inspectors, former South African program participants, and foreign intelligence officials alike had trouble accounting for how much HEU was produced throughout the program's duration. This case, and those from the United States,

Japan, and UK, also raise questions about whether the IAEA, national intelligence agencies, or program overseers could detect a large diversion of MUF in a timely fashion. If they could, how would they perform with smaller amounts of missing materials? Finally, what lessons or concerns do these cases offer in regard to the ability to verify nuclear disarmament or the reduction in nuclear materials stockpiles?

The cases described in this volume offer a mixed bag of answers at best. In the U.S. case, some conditions have improved in part because the United States has improved its accounting practices since the end of the Cold War. The country has also, along with Russia, stopped producing HEU and weapons-usable plutonium, capping the amount of sensitive nuclear materials produced in the world's two largest fabricators of these materials. Despite these improvements, it took decades to account for losses of special nuclear material, whether by production practices or diversion, from the U.S. nuclear weapons program. In the South African case, there remains doubt among analysts and IAEA officials as to the degree of success in verifying the dismantlement of the country's small and relatively primitive nuclear weapons program. There are still outstanding differences between the amount of material South Africa declared and what the IAEA was able to verify.

Another lesson involves enforcement. What, if anything, has been done when nuclear security agreements have been violated or when there have been discoveries of large amounts of MUF? Have the United States and other world powers chosen to act or simply looked the other way when diversion occurred? Worryingly, as these cases show, they have normally done the latter.

While most of the cases in this book paint a depressing picture of efforts to account for and protect sensitive nuclear materials, it is the first work dedicated to this topic. That is the good news. Further analysis can and should be conducted based on the work found within. The key lesson to draw from this volume concerns limits. We may never be able to account precisely for the materials that have gone missing, but we can act to prevent more losses in the future. Just how much the international community will do to limit the unnecessary production and stockpiling of fissile materials that led to such losses remains to be seen.

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