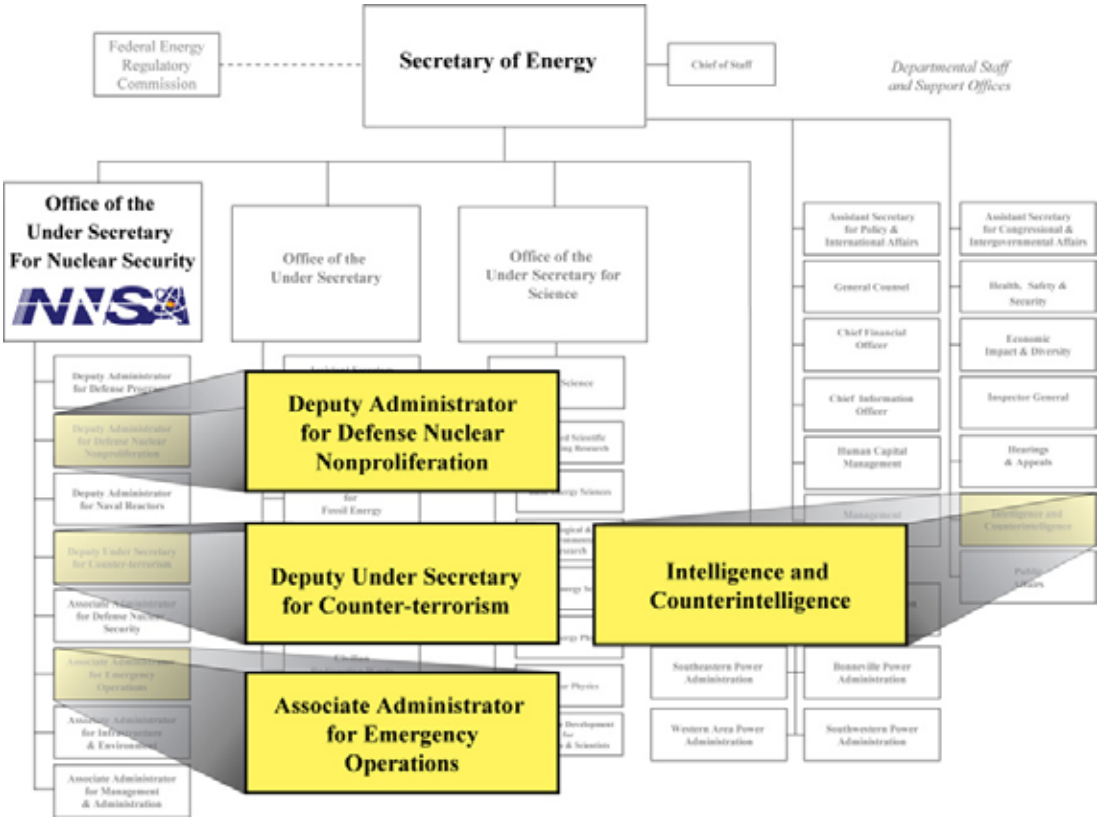
Nonproliferation and Counterterrorism
at the Department of Energy

The Department of Energy (DOE) is the custodian of a wide range of policy, intelligence, and technical capabilities that play a vital role in the USG's nonproliferation and counterterrorism programs. In addition to the vast, world-class technical capabilities throughout the Department's national laboratory system, most of these capabilities reside in the Department's Office of Intelligence and Counterintelligence and in several organizations within the National Nuclear Security Administration (NNSA).



DOE views counterterrorism and nonproliferation as elements of a continuous threat spectrum encompassing nuclear weapons, nuclear energy, proliferation and terrorism. Our understanding of the threat is informed by our unique technological capability. We focus on the materials, technologies and expertise needed for Weapons of Mass Destruction (WMD), whether they are destined for nation-state proliferants or terrorist groups.

With regard to terrorist activities, there are three main threat categories we identify in decreasing order of likelihood, but increasing order of consequence (i.e., deaths, injuries, cleanup costs, etc.). First, terrorists could acquire radioactive materials and build a so-called dirty bomb (i.e., radioactive dispersal devices or RDDs, which do not generate a nuclear yield). Second, terrorists could acquire special nuclear materials (SNM) – plutonium or highly enriched uranium – and build an improvised nuclear device

of a few kilotons of nuclear explosive power; or third, terrorists could acquire a functioning nuclear weapon from one of the nuclear weapons states (which could generate tens to hundreds of kilotons of nuclear yield).

The Department's current nonproliferation and counterterrorism programs cover a wide range of functions fully integrated within the U.S. Government's national security and homeland security policy communities, and undergirded by work of the intelligence community. Most are intended to prevent WMD proliferation or a terrorist attack, but a few also satisfy important national security requirements in a post-detonation environment and also serve to enhance deterrence.

DOE Nonproliferation and Counterterrorism Capabilities	Pre-Detonation	Post-Detonation
Maintain nuclear material information database	✓	✓
Review nuclear and dual-use trade for export control violations	✓	
Develop security relationships with other countries	✓	
Help other countries strengthen their export control systems	✓	
Facilitate peaceful employment for displaced WMD scientists	✓	
Upgrade storage and transportation security for SNM in other countries	✓	
Prevent production of new SNM	✓	
Eliminate stocks of excess SNM	✓	
Convert HEU-fueled research reactors	✓	
Train other countries' inspectors in international safeguards	✓	
Provide training to US / foreign export control, customs, and border security officials	✓	
Provide technical support to IAEA	✓	
Upgrade security for radiological sources	✓	
Dispose of unused radiological sources	✓	
Analyze and help identify WMD proliferation networks	✓	
Develop new detection technologies, techniques and tools	✓	
Install radiation detection monitors at strategic border crossings	✓	
Provide real-time technical assistance to USG interdiction efforts	✓	
Improve emergency response capabilities in foreign countries	✓	
Develop / provide capabilities to monitor / verify arms control agreements	✓	
Search for, locate, dismantle and appropriately dispose of WMD	✓	
Deploy processes to recover from nuclear and radiological terrorism		✓
Conduct forensic analyses		✓
Provide new technologies, tools and techniques to emergency response authorities		✓

The Treaty on the Non-Proliferation of Nuclear Weapons (or simply the Nonproliferation Treaty or NPT) is the cornerstone of the nonproliferation regime, and is complemented by a dense thicket of associated treaties, agreements, laws, regulations, operating procedures, and common practices covering export controls, nuclear tests, and nuclear security and safety, among other issues. The International Atomic Energy Agency

(IAEA), the United Nations organization charged with administering many of these agreements, promotes and facilitates peaceful nuclear uses while applying safeguards on nuclear facilities and materials in non-nuclear weapon states. The United States has always been a major supporter of the IAEA's safeguards activities because they are the principal mechanism for preventing and detecting diversion of civil nuclear materials to nuclear weapons programs. In addition, the Department provides the IAEA with safeguards technologies, personnel, and funding.

The Atomic Energy Act of 1946 (amended in 1954) imposes specific legal requirements on the DOE and the Secretary, primarily in the area of civilian nuclear trade. Since the passage of the Atomic Energy Act and the NPT, the Department of Energy (and its predecessors) played an ever-larger role in the international arena, particularly in the areas of strengthening physical security for U.S. origin nuclear materials exported to other countries and international safeguards, as well as improving foreign countries' export control functions.

The nuclear proliferation problem began to change with the breakup of the Soviet Union in the early 1990s, which spawned widespread fears of "loose nukes," reduced security of fissile materials, especially at bulk handling facilities, and a brain drain of weapons scientists to other countries. The emergence of nuclear smuggling and proliferation networks, coupled with the advent of violent terrorist movements with global reach—evidenced by Al Qaeda's attack on the United States on September 11, 2001, raised the specter of WMD terrorism that could not be deterred or otherwise managed by traditional nonproliferation mechanisms. While the United States maintains a focus on preventing the proliferation of nuclear weapons to new states, U.S. government programs are increasingly focused on actively countering proliferation through such activities as interdiction and WMD terrorism by non-state actors.

The threat reduction programs aimed at securing nuclear materials, technology and expertise in the former Soviet republics, including Russia, intensified after a succession of weak central governments in Moscow in the late 1990s. The combined effects of a sharply deteriorating Russian economy and weakened central authority led to a worsening security situation for the country's nuclear materials, technologies and scientific expertise. Since then, DOE/NNSA has spent roughly $2 billion on upgrading security at hundreds of facilities and buildings in Russia and other former Soviet republics. This was not an act of charity on the part of the U.S., but rather a cost-effective investment in U.S. national security deemed both urgent and critical by bipartisan supporters in both the Legislative and Executive branches of government for approximately a decade now. The current threat of non-state nuclear terrorism adds increased emphasis to the importance of this program, as we seek to ensure that these materials never leave the strengthened security of state control.

Now that the Russian economy seems to have stabilized and much of the originally planned nonproliferation work scope there is nearing completion, our programs are pivoting to meet the evolving threat that we face. The nonproliferation task in Russia is

turning to efforts to create a sustainable security culture in Russia. Moreover, we are building up our "second line of defense" programs that detect and deter illicit nuclear traffic. These back up our material security work in Russia elsewhere, and enable us to meet emerging threats from nations such as North Korea. We are also putting greater emphasis on the threat posed by civil nuclear and radiological material, and have therefore stepped up efforts to convert reactors from highly enriched uranium to low enriched uranium and to return and dispose of fresh and spent fuel. We have also stepped up efforts to secure radiological sources both in the United States and abroad, having secured over 9 million curies of material. In sum, we work with over 100 countries to detect, secure, and dispose of dangerous nuclear material.

Knowledge of the location and status of nuclear material worldwide is essential for an effective strategy to prevent illicit acquisition of such materials by terrorists, non-state actors or rogue nation-states. To address this issue, the Nuclear Materials Information Program (NMIP) was established by Presidential Directive on August 28, 2006, as a national-level program to organize, consolidate, and assess information concerning worldwide nuclear materials holdings and security status. While the Department of Energy has overall program management responsibility, many other agencies also contribute to and participate in the program. Additionally, a key component of the NMIP strategy is engagement with international partners on the importance of improving our collective understanding of the characteristics, security status and location of nuclear materials worldwide. NMIP will improve our understanding of gaps in materials information and establish a process to reconcile materials data to ensure that properly vetted nuclear materials information is available to all appropriate Federal departments and agencies to support their nonproliferation, counter-proliferation, and counterterrorism efforts.

Should all our efforts fail and a terrorist group succeeds in detonating a nuclear weapon or a dirty bomb, we would bring other capabilities to bear on mitigating the attack. Attribution is the fusion of intelligence, law enforcement, and technical data to characterize and identify the source of a nuclear warhead or weapons usable nuclear material either before or after an attack. Attribution is a key component of an overall strategy to deter nuclear terrorism, because states are less likely to provide nuclear weapons to terrorists if they know that we will retaliate under certain conditions (e.g., a witting transfer from a state sponsor to terrorists). Moreover, post-attack attribution would provide critical information to law enforcement agencies and possibly help prevent follow-on attacks.

Nuclear forensics is the technical analysis of a nuclear device or its materials (presumably interdicted prior to detonation), or the debris and signals resulting from a detonation. The elements of a nuclear forensics capability involve (1) collection of technical forensics data from the device or event, (2) lab analysis and reporting, including comparisons of collected data with a materials database, and (3) interpretation and evaluation coupled with appropriate technical peer review.

Nuclear forensics following a nuclear attack would include discovering key information about the detonation, such as its yield, the design and sophistication of the warhead, and therefore about the origin of its fissile materials, and ultimately, who was behind the attack. This type of work would be an interagency effort in which DOE/NNSA plays a key role, because with one exception, all the capabilities the nation draws upon for technical nuclear forensics reside at DOE's national laboratories. To date, forensics capabilities relating to such areas as nuclear weapons device modeling, nuclear materials production, radiochemistry and associated specialized facilities, advanced computations and simulations, and the physics and chemistry of fissile materials, have been sustained in large part by making use of capabilities resident in NNSA's nuclear weapons program.

Key to the overall national strategy to prevent, deter or counter nuclear proliferation or nuclear terrorism is the ability to rapidly and reliably detect, characterize and identify nuclear weapons, weapons-usable nuclear materials , and radiological sources, either before or after an attack. The Office of Emergency Operations in NNSA serves as the Secretary's primary contact for nuclear and radiological emergency management and response activities. These emergency response capabilities reside in a variety of teams, which search for, locate, render safe, dismantle and dispose of a nuclear or radiological device. There are five main assets, all of which are designed for rapid response. The Radiological Assistance Program (RAP) is usually the first NNSA responder for assessing an emergency situation and determining what further steps should be taken to minimize the hazards of a radiological emergency. The Aerial Measuring System (AMS) detects, measures, and tracks radioactive material at the location of an incident to determine radiological contamination levels. The National Atmospheric Release Advisory Capability (NARAC) develops predictive plume plots generated by sophisticated computer models. The Federal Radiological Monitoring and Assessment Center (FRMAC) coordinates Federal radiological monitoring and assessment activities with those of state and local agencies. Finally, the Radiation Emergency Assistance Center/Training Site (REAC/TS) provides treatment and medical consultation for injuries resulting from radiation exposure and contamination. Each of these assets handles certain aspects of the radiological emergency and together provides a comprehensive, integrated response.

Despite these capabilities, we cannot expect that deterrence will always work. Indeed, the willingness of organizations such as Al Qaeda to sacrifice its members to achieve political objectives suggests that previous concepts of deterrence based on retaliation may well not apply. We therefore need to strengthen our capability to interrupt a terrorist attack in the making. This includes both technical means to identify a nuclear weapon, nuclear or radioactive materials, or other key components, and close monitoring of intelligence collected against terrorist organizations interested in conducting nuclear or radiological attacks. A robust nuclear and radioactive material detection system not only protects the country directly, it may also convince attackers that any attempt of this sort is likely to fail.

With regard to long-term development of advanced technology for detecting nuclear materials, DOE draws on the science base established in multifaceted research and development (R&D) programs, particularly in NNSA's Office of Defense Nuclear Nonproliferation. Active efforts are underway in such areas as advanced radiation sensors, identification and detection of alternative signatures for special nuclear materials, and advanced radiation detection materials development. These R&D activities are focused on enabling detection and identification of shielded highly enriched uranium, standoff detection of special nuclear material, and higher confidence in special nuclear material threat identification. Some of these projects are considered "high-risk" technology development efforts. While we continue to develop conventional methods of radiation detection – that is, detection of neutrons and gamma rays from nuclear materials – we are also investing in non-conventional and alternative concepts – for example, muon detection – to ensure that we cover areas that have typically been out of the mainstream. As inventive and ambitious as some of these efforts are, it's worth remembering that all detection capabilities are nevertheless constrained by the laws of physics.

NNSA (and its predecessors) have accumulated over 60 years of experience in responding to nuclear and radiological accidents and incidents. NNSA provides technical support to the Departments of Homeland Security, Justice, State, and Defense for nuclear terrorism events and domestic nuclear weapon accidents and incidents. In this vein, NNSA's nuclear and radiological response teams not only respond to and mitigate nuclear and radiological incidents around the world; they also provide training for foreign counterparts.

Nearly all the technical capabilities needed to fulfill these many nonproliferation and counterterrorism tasks would not be possible without the Department's national laboratory complex, which is a legacy of Cold War requirements, but is too big, too old, and too costly to maintain unchanged. Today, that complex is at a crossroads and faces a set of challenges not seen since its inception in the 1940s. The moratorium on underground nuclear testing and the suspension of new warhead development and weapons production in the early 1990s brought major technical and cultural changes to our laboratories and production plants. The overhead costs required to maintain and secure the deteriorating physical infrastructure continue to rise, even as the Cold War era requirements that gave rise to the complex in the first place continue to decline and change in unexpected directions. We are therefore in the process of transforming the lab complex into a more affordable 21st Century enterprise, which will be both at the forefront of emerging scientific and technological capabilities, and will be responsive to new and emerging national security requirements.

The scientific and technical skill sets associated with developing and maintaining a nuclear weapons program have provided essential and irreplaceable capabilities to our work in nonproliferation and counterterrorism. The Department must retain and exercise the fundamental capabilities to design, certify, manufacture components,

assemble/disassemble, conduct surveillance, and transport nuclear warheads, even as it sustains the scientific and engineering base that is the foundation of our Nation's nuclear deterrent. Irrespective of how one feels about the size of the U.S. nuclear deterrent, the irreducible fact is that we have one now and we will continue to need one for the foreseeable future. Most importantly, the people who work on that deterrent are the very same people that lend their skills to many other areas that are vitally important to the United States – nonproliferation, counterterrorism, nuclear forensics, and a host of other technical capabilities that require special expertise.

The next Administration will face a number of challenges and will be presented with a number of opportunities. In order to combat the very real threat posed by nations or terrorist groups, we recommend that the next Administration support the current nonproliferation and counterterrorism strategy by continuing to support DOE's and NNSA's comprehensive set of programs, as they provide a vital underpinning for the USG's nonproliferation and counterterrorism efforts. DOE and NNSA, along with the national laboratory system, provide invaluable expertise in policy, intelligence, and technical capabilities. The next Administration should continue to focus on securing, detecting and eliminating dangerous material, as this is the critical first step in mitigating the threat of WMD and terrorism.