U.S. DEPARTMENT OF ENERGY

National Nuclear Security Administration

Prevent, Counter, and Respond—NNSA's Plan to Reduce Global Nuclear Threats

FY 2025-FY 2029

Report to Congress
September 2024

National Nuclear Security Administration
United States Department of Energy
Washington, DC 20585

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Message from the Administrator

The Department of Energy's National Nuclear Security Administration (DOE/NNSA) is pleased to submit *Prevent, Counter, and Respond—NNSA's Plan to Reduce Global Nuclear Threats (FY 2025–FY 2029).* This report outlines how DOE/NNSA applies the unique, cross-cutting capabilities of our resilient and responsive Nuclear Security Enterprise to provide comprehensive nuclear security solutions that protect the American people, our Allies, and our partners in a dynamic world.

In the 2022 *National Security Strategy*, the United States committed to addressing the "existential threat posed by the proliferation of nuclear weapons" by working closely with our partners and Allies "especially during times of conflict when escalation risks are greater." The United States will support and strengthen nonproliferation regimes, ensure export control regimes are equipped to tackle "destabilizing emerging technologies," and align efforts with our partners towards "countries of concern." We will seek "pragmatic engagement with competitors" on strategic stability and risk reduction and address the enduring threat of weapons of mass destruction terrorism.

This is an unprecedented moment in history. Russia continues its destabilizing behavior, including stationing tactical nuclear weapons in Belarus, "de-ratifying" the Comprehensive Nuclear-Test-Ban Treaty, and deepening ties to Iran and North Korea. China is rapidly modernizing and expanding its nuclear arsenal. The climate emergency and energy security challenges are more urgent than ever, and ongoing conflict in the Middle East reaffirms the need for the United States to be prepared to respond to rapidly evolving crises.

NNSA Administrator Jill Hruby delivering remarks at the CTBT: Science and Technology Conference 2023

As articulated in the *NNSA Strategic Vision*, through our innovative, collaborative, and results-driven approach, DOE/NNSA works to forge sustainable solutions that enable global security and stability, maintains the nuclear deterrent, provides nuclear propulsion, and leverages transformative technologies to address emerging challenges. DOE/NNSA uses an integrated strategy to prevent, counter, and respond to nuclear threats. Drawing on the strong technical and policy expertise of its workforce, DOE/NNSA is accelerating efforts to strengthen nonproliferation and enhance nuclear and radiological security worldwide, expanding on existing partnerships with more than 100 agencies and 100 countries worldwide.

These combined efforts to mitigate global nuclear threats are paramount to strengthening U.S. national security and supporting efforts to address climate change. As the United States and countries around the world, including many "nuclear newcomers," look to nuclear energy to provide clean baseload power, DOE/NNSA remains committed to promoting the safe, secure, and peaceful expansion of nuclear energy while adhering to and setting the highest nonproliferation and nuclear safeguards and security standards. In a volatile international environment, DOE/NNSA continually engages with the international community on best practices, strengthens existing partnerships, and works to establish new ones.

DOE/NNSA works in close collaboration with its national laboratories, plants, and sites, as well as with other Federal agencies to anticipate tomorrow's nuclear and national security challenges and deliver timely, innovative solutions. In an era of rapidly evolving global threats and a changing technological landscape, DOE/NNSA focuses on investing in a world-class workforce, adaptive and resilient infrastructure, and cutting-edge technological solutions to address current and future challenges. DOE/NNSA's most important asset is its people, and we place the highest priority on recruiting and retaining a workforce that reflects the diversity, strengths, and the innovative spirit of the American people.

This report is provided to:

- **The Honorable Jack Reed**
  Chairman, Senate Committee on Armed Services
- **The Honorable Roger Wicker**
  Ranking Member, Senate Committee on Armed Services
- **The Honorable Angus King**
  Chairman, Subcommittee on Strategic Forces
  Senate Committee on Armed Services
- **The Honorable Deb Fischer**
  Ranking Member, Subcommittee on Strategic Forces
  Senate Committee on Armed Services
- **The Honorable Mike Rogers**
  Chairman, House Committee on Armed Services
- **The Honorable Adam Smith**
  Ranking Member, House Committee on Armed Services
- **The Honorable Doug Lamborn**
  Chairman, Subcommittee on Strategic Forces
  House Committee on Armed Services
- **The Honorable Seth Moulton**
  Ranking Member, Subcommittee on Strategic Forces
  House Committee on Armed Services
- **The Honorable Patty Murray**
  Chair, Senate Committee on Appropriations
- **The Honorable Susan Collins**
  Vice Chair, Senate Committee on Appropriations
- **The Honorable Patty Murray**
  Chair, Subcommittee on Energy and Water Development
  Senate Committee on Appropriations
- **The Honorable John Kennedy**
  Ranking Member, Subcommittee on Energy and Water Development
  Senate Committee on Appropriations
- **The Honorable Tom Cole**
  Chairman, House Committee on Appropriations

- **The Honorable Rosa DeLauro**
  Ranking Member, House Committee on Appropriations
- **The Honorable Chuck Fleischmann**
  Chairman, Subcommittee on Energy and Water Development, and Related Agencies
  House Committee on Appropriations
- **The Honorable Marcy Kaptur**
  Ranking Member, Subcommittee on Energy and Water Development, and Related Agencies
  House Committee on Appropriations

Please direct any questions or requests for additional information to Ms. Jessica Lee, Associate Administrator for Congressional and Intergovernmental Affairs, at (202) 586-4418.

Sincerely,

Jill Hruby
Under Secretary for Nuclear Security
Administrator, NNSA

1.0 Threat Environment and Policy Context

As required by Section 2575 of Title 50 of United States Code (50 U.S.C. § 2575), *Prevent, Counter, and Respond—NNSA's Plan to Reduce Global Nuclear Threats (FY 2025–FY 2029)* provides a summary update of the Department of Energy's National Nuclear Security Administration's (DOE/NNSA) five-year management plan for activities associated with the defense nuclear nonproliferation programs of the Administration to prevent and counter the proliferation of materials, technology, equipment, and expertise related to nuclear and radiological weapons in order to minimize and address the risk of nuclear terrorism and the proliferation of such weapons.

The Biden Administration's nonproliferation priorities are detailed in various strategic documents, including the 2022 *National Security Strategy*, which states that "nuclear, chemical, and biological weapons proliferation is a vitally important and enduring global challenge, requiring sustained collaboration to prevent the spread of weapons of mass destruction and fissile material, their means of delivery, and enabling technologies." DOE/NNSA answers that call to action by harnessing its technical and policy expertise to reduce nuclear and radiological threats, including developing options to address emerging military technologies and challenges posed by Russia, China, North Korea, and Iran. By enabling the advancement of nuclear energy and advanced reactor designs while minimizing potential proliferation risks, DOE/NNSA will both contribute to the Administration's goals to achieve net-zero carbon emissions by 2050 and support the American nuclear industry.

DOE/NNSA nuclear threat reduction activities strengthen U.S. national security by:

- ***Preventing*** adversaries from acquiring nuclear weapons or weapons-usable materials, technology, and expertise;
- ***Countering*** efforts to acquire such weapons or materials; and
- ***Responding*** to nuclear or radiological incidents and accidents domestically and abroad.

This report describes DOE/NNSA nuclear and radiological threat reduction activities within the prevent, counter, and respond strategic framework, highlighting the work of DOE/NNSA programs against 10 key objectives. By adopting a proactive, analytic posture that identifies, characterizes, and prepares for emerging trends and risks, DOE/NNSA will be as prepared as possible to respond to unanticipated events.

1.1 Threat Environment

The current threat environment includes potential adversaries' expansion of their nuclear stockpiles; states' pursuit of nascent nuclear weapons programs; the potential for malicious non-state actors to obtain nuclear and radiological materials; the erosion of nonproliferation norms; and the destabilizing forces of regional conflicts. DOE/NNSA faces the sustained need to counter those threats while balancing urgent priorities to address the climate crisis, engage both the promise and threat of emerging technologies, and support U.S. industry's role in the peaceful expansion of nuclear power.

In addition to the technical expertise and analysis of NNSA's Nuclear Security Enterprise, DOE/NNSA relies on several sources to characterize the threat environment, including the Intelligence Community's 2023 Annual Threat Assessment (ATA) and periodic "Global Trends" reports, the 2022 Nuclear Posture Review (NPR), assessments and military power reports from the Defense Intelligence Agency, annual Department of State (DOS) reports on arms control compliance, International Atomic Energy Agency (IAEA) reports, and civil nuclear assessment reports from the International Energy Agency. The following are examples that inform DOE/NNSA's strategy development.

Expanding Nuclear Stockpiles

"The expansion of nuclear weapons stockpiles and their delivery systems, coupled with increasing regional conflicts involving nuclear weapons states, pose a significant challenge to global efforts to prevent the spread and use of nuclear weapons." (ATA)

"Russia will continue to modernize its nuclear weapons capabilities and maintains the largest and most diverse nuclear weapons stockpile." (ATA)

"China remains intent on orienting its nuclear posture for strategic rivalry with the United States because its leaders have concluded their current capabilities are insufficient." (ATA)

"The expansion of nuclear weapons stockpiles and their delivery systems, coupled with increasing regional conflicts involving nuclear weapons states, pose a significant challenge to global efforts to prevent the spread and use of nuclear weapons. Arms control efforts through 2035 will change in scope and complexity as the number of strategic technologies and the countries that have them grow." (ATA)

Pursuit of Weapons Programs

"[North Korean leader] Kim remains strongly committed to expanding the country's nuclear weapons arsenal, which serves as the centerpiece of his national security structure." (ATA)

Erosion of Norms

In January 2024, DOS found Russia in violation of several of its New START Treaty (NST) obligations for the second year in a row: failing "to comply with its obligations to facilitate U.S. inspection activities on Russian territory and to convene sessions of the Bilateral Consultative Commission (BCC)." DOS stated that in addition to these violations, in the wake of its "legally invalid purported suspension of the New START Treaty starting in February 2023," Russia also "failed to comply with its obligations to provide Treaty-required notifications and data updates, and its obligations related to the exchange of telemetric information." (2023 Report to Congress on Implementation of the NST). Fully consistent with international law, in March and June 2023, DOS adopted "proportionate and reversible" U.S. countermeasures in response to Russia's violations of its NST obligations. DOS noted, "Because the purported suspension is invalid, Russia remains bound by its NST obligations, and its failure to implement those obligations violates the NST." (2024 Adherence to and Compliance with Arms Control, Nonproliferation, and Disarmament Agreements and Commitments Report)

"Since 2020. . .Tehran has stated that it is no longer constrained by any [Joint Comprehensive Plan of Action] JCPOA limits, and Iran has greatly expanded its nuclear program, reduced IAEA monitoring, and undertaken activities that better position it to produce a nuclear device, if it chooses to do so." (ATA)

Non-state Actors

"This comprehensive new strategy advances several of President Biden's most enduring national security priorities: protecting our nation and the international community from the existential threats posed by WMD terrorism and preventing non-state actors from using chemical, biological, radiological, and nuclear weapons." (National Security Memorandum (NSM)-19 Fact Sheet)

"Nuclear terrorism continues to pose a threat to the United States and our Allies and partners. Terrorists remain interested in using [weapons of mass destruction] WMD in attacks against U.S. interests and possibly the U.S. homeland. Dual-use knowledge, goods, and technology applicable to WMD continue to proliferate." (NPR)

Regional Conflicts

"Russia's aggression against Ukraine could create or deepen proliferation incentives." (NPR)

"Moscow's military forces will face a multi-year recovery after suffering extensive equipment and personnel losses during the Ukraine conflict. Moscow will be more reliant on nuclear and counterspace capabilities for strategic deterrence as it works to rebuild its ground force." (ATA)

"Pakistan's long history of supporting anti-India militant groups and India's increased willingness, under the leadership of Prime Minister Narendra Modi, to respond with military force to perceived or real Pakistani provocations raise the risk of escalation during a crisis. There remains the potential for an event to trigger a rapid escalation." (ATA)

"Pyongyang has sought to demonstrate the danger posed by its military through missile launches and rhetoric threatening nuclear retaliation." (ATA)

Emerging Priorities

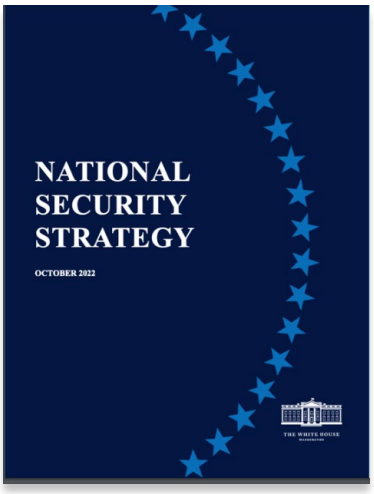
"New technologies—particularly in the fields of [artificial intelligence] AI and biotechnology—are being developed and are proliferating at a rate that makes it challenging for companies and governments to shape norms regarding civil liberties, privacy, and ethics. The convergence of these emerging technologies is likely to create breakthroughs, which could lead to the rapid development of asymmetric threats—such as advanced [unmanned aerial vehicles] UAVs—to U.S. interests and probably will help shape U.S. economic prosperity." (ATA)

"The risks to U.S. national security interests are increasing as the physical effects of climate and environmental change intersect with geopolitical tension and vulnerabilities of some global systems. Climate-related disasters in low-income countries will deepen economic challenges, raise the risk of inter-communal conflict over scarce resources, and increase the need for humanitarian and financial assistance." (ATA)

1.2.1 Policy Context

DOE/NNSA draws its mission, mandate, and authorities from the *Atomic Energy Act of 1954,* as amended, (42 U.S.C. §§ 2011 *et seq*.), the *National Nuclear Security Administration Act,* as amended (50 U.S.C. §§ 2401 *et seq*.), and the *Atomic Energy Defense Act*, as amended (50 U.S.C. §§ 2501 *et seq.*). In executing its programs, NNSA is guided by Administration- and Department-level policy documents, as well as relevant laws and international agreements.

National Security Strategy



President Biden's 2022 *National Security Strategy* reinforces the point that "nuclear, chemical, and biological weapons proliferation is a vitally important and enduring global challenge, requiring sustained collaboration to prevent the spread of weapons of mass destruction and fissile material, their means of delivery, and enabling technologies."

The Strategy emphasizes the importance of U.S. leadership in addressing this "existential threat" and calls for the United States to:

- Lead bilateral and multilateral arms control efforts and strengthen existing regimes, frameworks, and institutions, including the Nuclear Non-Proliferation Treaty, Comprehensive Test Ban Treaty Organization, IAEA, and other United Nations bodies, to extend the more than seven-decade record of nuclear non-use;
- "Continue to lead the world in coordinated efforts to lock down nuclear and radiological materials and prevent terrorist acquisition";
- "Ensure multilateral export control regimes are equipped to address destabilizing emerging technologies and to align export policies in likeminded states toward countries of concern;"
- "Out-compete" China and "constrain" Russia while increasing international cooperation on shared global priorities such as climate and energy security, food insecurity, governance of emerging technologies, and securing cyberspace; and
- Have "nuclear deterrence remain a top priority for the Nation," undergirding U.S. defense priorities by "deterring strategic attacks, assuring allies and partners, and allowing us to achieve our objectives if deterrence fails."

Nuclear Posture Review

Nested within the *2022 National Defense Strategy*, the 2022 NPR informs DOE/NNSA's nuclear threat reduction missions. Guidance within the NPR calls for steps to preserve and strengthen the nuclear arms control and nonproliferation regime in four areas: nuclear arms control and risk reduction, nuclear nonproliferation, multilateral arms control and disarmament, and nuclear counterterrorism.

National Security Memorandum-19

In March 2023, the Administration provided new policy guidance with the release of NSM-19, "Counter Weapons of Mass Destruction Terrorism and Advance Nuclear and Radioactive Material Security." NSM-19 focuses on three lines of effort: countering weapons of mass destruction (WMD) terrorism, advancing nuclear material security, and advancing radioactive material security.

NNSA Strategic Vision

At the organizational level, the *NNSA Strategic Vision* provides guidance through its four enduring mission priorities:

- Designing and delivering the Nation's nuclear stockpile;
- Forging solutions that enable global security and stability;
- Harnessing the atom to power a global naval fleet; and
- Leveraging transformative technologies to address emerging challenges.

In addition, the *NNSA Strategic Vision* articulates three mission enablers that are the foundation for achieving its mission priorities:

- World-class science, technology, and engineering;
- Adaptive workforce and resilient infrastructure; and
- Integrated enterprise management and operations.

Relevant Laws, Policy Directives, and International Instruments

DOE/NNSA's nuclear and radiological threat reduction activities operate within the context of many laws, Presidential Policy Directives (PPD), and international agreements and other international instruments. The most significant of these include:

Laws and Regulations

- *American Medical Isotopes Production Act of 2012*, Pub. L. 112-239, Div. C., Title XXXI, Subt. F.
- *Atomic Energy Act of 1954, as amended*.
- *Atomic Energy Defense Act, as amended*.
- Code of Federal Regulations (44 CFR 351 – Radiological Emergency Planning and Preparedness)
- *The Export Control Reform Act of 2018,* Pub. L. 115-232, Div. A, Title XVII, Subt. B.
- *Henry J. Hyde United States-India Peaceful Atomic Energy Cooperation Act of 2006*, Pub. L. 109-401, Title I.
- National Defense Authorization Acts (Various).
- *National Nuclear Security Administration Act, as amended*, Pub. L. 106-65, Div. C., Title XXXII.
- *Nuclear Non-Proliferation Act of 1978*, as amended, Pub. L. 95-242.

Presidential Policy

- NSM-19: Counter Weapons of Mass Destruction Terrorism and Advance Nuclear and Radioactive Material Security
- PPD-8: National Preparedness
- NSPM-35: National Technical Nuclear Forensics
- NSPM-36: Guidelines for United States Government Interagency Response to Terrorist Threats or Incidents in the United States and Overseas
- NSPD-48: Nuclear Materials Information Program
- PPD-33: Detection of Nuclear Proliferation
- PPD-35: United States Nuclear Weapons Command and Control, Safety, and Security
- PPD-40: National Continuity Policy
- PPD-42: Preventing and Countering Weapons of Mass Destruction Proliferation, Terrorism, and Use
- Executive Order 12981: Administration of Export Controls

International Agreements and Other International Instruments

- Treaty on the Non-Proliferation of Nuclear Weapons
- United Nations Security Council Resolution 1540
- Agreement between the United States of America and the International Atomic Energy Agency for the Application of Safeguards in the United States (INFCIRC/288)
- Convention on the Physical Protection of Nuclear Material and its 2005 Amendment
- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency
- Convention on Early Notification of a Nuclear Accident
- International Convention for the Suppression of Acts of Nuclear Terrorism

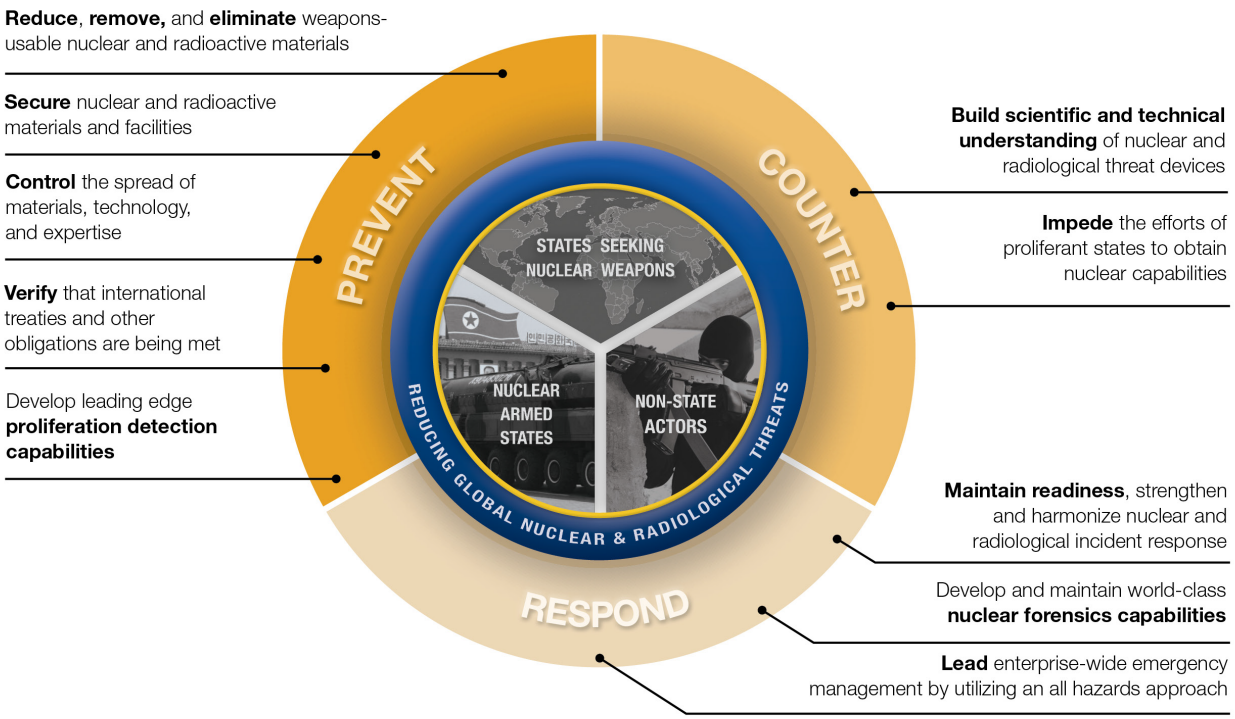
- Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management
- Agreement between the Government of the United States of America and the Government of the United Kingdom of Great Britain and Northern Ireland for Cooperation on the uses of Atomic Energy for Mutual Defense Purposes
- U.S.-France Agreement for Cooperation on Uses of Atomic Energy for Mutual Defense Purposes
- Agreement between the Government of the United States of America, the Government of Australia, and the Government of the United Kingdom of Great Britain and Northern Ireland for the Exchange of Naval Nuclear Propulsion Information
- Agreement between the Government of the United States of America and the Government of the Russian Federation Concerning the Management and Disposition of Plutonium Designated as No Longer Required for Defense Purposes and Related Cooperation, as amended
- Agreement Between the Government of the United States of America and the Government of the Russian Federation on Cooperation in Nuclear- and Energy-Related Scientific Research and Development

2.0 Fiscal Year 2023–2024 Activities

To achieve its mission and address the policy mandate to reduce global nuclear and radiological threats posed by nuclear armed states, states seeking nuclear weapons, and malicious non-state actors, DOE/NNSA conceptualizes its approach using a strategic implementation framework (Figure 1) focused on three objectives:

1. ***Prevent*** proliferant states from developing nuclear weapons or acquiring weapons-usable nuclear materials, equipment, technology, and expertise, and prevent non-state actors from acquiring nuclear and radioactive materials that can be used for malicious purposes.
2. ***Counter*** the efforts of both proliferant states and non-state actors to acquire, develop, disseminate, deliver, or use the materials, expertise, or components of a nuclear or radiological device.
3. ***Respond*** to the full spectrum of nuclear and radiological emergencies at home or abroad, including deliberate attacks and accidents, to minimize the damage from such events.

FIGURE 1: PREVENT, COUNTER, AND RESPOND STRATEGIC IMPLEMENTATION FRAMEWORK



This report describes DOE/NNSA's nuclear and radiological threat reduction activities within the prevent, counter, and respond strategic framework, highlighting 10 key priorities:

Prevent:

- Reduce, remove, and eliminate weapons-usable nuclear and radioactive materials
- Secure nuclear and radioactive materials and facilities
- Control the spread of materials, technology, and expertise
- Verify that international treaty and other obligations are being met
- Develop cutting-edge proliferation detection capabilities

Counter:

- Build scientific and technical understanding of nuclear and radiological threat devices
- Support efforts to impede proliferant states and non-state actors' ability to obtain nuclear capabilities

Respond:

- Maintain readiness, strengthen and harmonize nuclear and radiological incident response
- Develop and maintain world-class nuclear forensic capabilities
- Lead enterprise-wide emergency management by utilizing an all-hazards approach

2.1 Recent Accomplishments

DOE/NNSA relies on the world-class science, technology, policy expertise, and infrastructure of the Department and its national laboratories, plants, and sites to provide innovative solutions to successfully execute its nuclear threat reduction activities. Supplementing this continuous innovation, DOE/NNSA fosters strong interagency and international partnerships to extend the global reach and effectiveness of its nonproliferation and nuclear security activities, delivering sustainable and impactful solutions against current and emerging threats in the United States and in more than 100 countries worldwide.

***To Prevent* proliferant states from developing nuclear weapons or acquiring weapons-usable nuclear materials, equipment, technology, and expertise, and prevent non-state actors from acquiring nuclear and radioactive materials that can be used for malicious purposes, DOE/NNSA:**

- Completed conversion of all major global producers of molybdenum-99 (Mo-99), a medical isotope used widely in diagnostic scans, from highly enriched uranium (HEU) to high-assay low-enriched uranium (HALEU) targets.
- Removed more than 49 kilograms (kg) of HEU from partner countries in Asia, Europe, and North America to the United States for downblending and disposition.
- Dispositioned 111.6 kg of DOE/NNSA surplus plutonium at the Waste Isolation Pilot Plant (WIPP).
- Expanded the Nuclear Power Plant Initiative on sabotage mitigation to an additional five new partners in locations where nuclear power plants are critical to energy security.
- Supported nuclear security upgrades at nine nuclear facilities and regulatory capacity enhancements in four nuclear newcomer countries.
- Eliminated 82 domestic and 19 international high activity radioactive devices and recovered over 2,600 sources domestically and 16 sources internationally in fiscal year (FY) 2023.

To Counter **the efforts of both proliferant states and non-state actors to acquire, develop, disseminate, deliver, or use the materials, expertise, or components of a nuclear or radiological device, DOE/NNSA:**

- Enhanced the security during the transportation of radiological sources by installing the first units of Transportation Security, Tracking and Reporting systems on three domestic transportation conveyances and deploying to two international partner countries.
- Enhanced the ability to detect nuclear smuggling by completing four Green Border Security Initiative projects at high-risk border areas and providing radiation detection systems at official points of entry.
- Provided radiation detection tools for interdiction of small maritime vessels in the Indian Ocean and the Arabian Sea.
- Successfully conducted the first field trial of wide-area environmental sampling as a proof-of-concept of a verification tool for use by the IAEA.
- Supported more than 120 requests for technical analysis from the U.S. enforcement community to assist in commodity identification and proliferation risk analysis of U.S. exports.
- Developed the low-yield nuclear monitoring testbed for future radioactive tracer and chemical high-explosive experiments to improve understanding of signatures associated with evasively conducted low-yield underground nuclear tests.
- Manufactured and installed 17 advanced test articles supporting a nonproliferation testbed modernization strategy and advancing DOE/NNSA and broader U.S. Government sensing and characterization technology development.

To Respond **to the full spectrum of nuclear and radiological emergencies at home or abroad, including deliberate attacks and accidents, and minimize the damage from such events, DOE/NNSA:**

- Strengthened law enforcement agencies' interdiction capabilities by providing 51 counter nuclear smuggling systems.
- Initiated a standardized Nuclear Emergency Support Team (NEST) training program to ensure readiness of NEST and its global response force partners to detect, secure, and defeat radiological and nuclear threats.
- Responded to 19 unplanned emergency response operations and 79 planned emergency response operations and participated in 127 exercises with Federal, state, local, tribal, and territorial response partners, protecting U.S. public health and safety.
- Strengthened coordination and reporting between intelligence and emergency management missions by commencing operations on an Emergency Operations Desk within the Intelligence Operations Center.

In addition, in support of Administration priorities, DOE/NNSA:

- Launched the latest Global Positioning System (GPS) satellite with Nuclear Detonation Detection's Global Burst Detector III-6 payload and conducted early on-orbit testing of the payload for meeting operational requirements for the U.S. Nuclear Detonation Detection System.
- Built and delivered to the U.S. Space Force a suite of test assets that emulate the connections between the next-generation space-based payloads and their future GPS satellite host.

- Supported sanctions against Russia by providing expertise to the U.S. export enforcement community that resulted in the identification of entities involved in Russian sanction evasion.
- Took unprecedented actions through the Ukraine Task Force to address nuclear risks stemming from the conflict in Ukraine, advancing U.S. capabilities across multiple disciplines, including in remote sensing, crisis management, capacity building, resilience, and strategic messaging.
- Supported radiological security in Ukraine by providing equipment, training, and technical assistance to partners to secure and monitor 36 facilities housing high-activity radioactive sources and removing five disused sources from medical facilities to secure storage facilities in Ukraine.
- Bolstered the resilience of nuclear power plants in Ukraine by providing physical protection and cyber security upgrades and provided equipment to the National Guard of Ukraine to strengthen its capability to protect nuclear power plants still under Ukrainian control.

2.2.1 Technologies Transferred

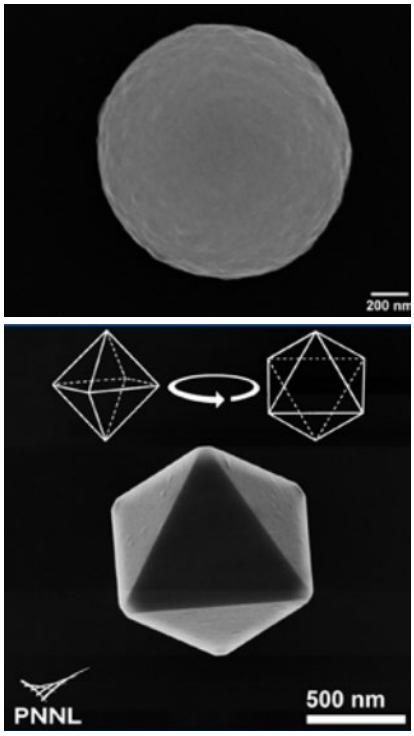
The following unclassified examples highlight technologies and capabilities that were developed, tested, and transferred by DOE/NNSA to end users and partners in FY 2023.

DOE/NNSA successfully transferred and deployed several key proliferation detection technologies to mission partners and industry in FY 2023.

- A new space-based nuclear detonation detection sensor suite (Global Burst Detector III-06) was deployed for operations on a GPS satellite from Cape Canaveral Space Force Station, Florida. The payload contains radiofrequency, optical, and X-ray sensors to detect nuclear explosions in the atmosphere and space as part of the constellation of space-based sensors of the U.S. Nuclear Detonation Detection System for global nuclear monitoring.
- The joint DOE/NNSA-Air Force Technical Applications Center (AFTAC) TRAILBLAZER initiative supported the transition of multiple DOE/NNSA National Laboratory technologies for operational deployment at AFTAC. These included new computational tools for geophysical (seismic) network performance modeling, improved data management and analysis, and new yield estimation and scenario models.
- A radiation detection material, bismuth-loaded plastic formulation (Bi-PVT) technology was transferred from Lawrence Livermore National Laboratory to commercial partners at Eljen Technologies for purchase and subsequent testing by DOE/NNSA. This new heavy metal loaded scintillator material was initially funded by the Department of Homeland Security (DHS) Countering Weapons of Mass Destruction Office via a Sandia National Laboratories/Lawrence

Livermore National Laboratory effort called "Metal-Loaded and Quench-Resistant Plastic Scintillators," followed on by funding from DOE/NNSA. The new formulation offers the possibility of drop-in replacement plastic panels for use in radiation portal monitors that can provide improved sensitivity over existing detectors as well as previously unavailable spectroscopic information.

- DOE/NNSA transferred new technology to the Department of Defense (DoD) in support of the nuclear forensics mission, including a low-cost system using photovoltaic arrays to measure nuclear explosion reaction times and a water surface burst fallout model for incorporation into operational computational modelling codes.



Above: Scanning electron micrograph of a mixed uranium-plutonium oxide particle displaying spherical morphology and approximate diameter of 1.09 µm. Below: Microscopy image of a uranium oxide particle produced by the PNNL hydrothermal method.

DOE/NNSA has transferred more than 82 technologies to the IAEA since 2008. In FY 2023, transfers included:

- Ultra-Wideband Data Link Technology enables real-time, wireless transfer of surveillance images from IAEA cameras through reinforced concrete walls in nuclear facilities. This technique reduces the need for expensive cable installation and improves security of IAEA safeguards data transfer.
- Time Trends Statistical Tools provide guidance to IAEA evaluators on whether analyzed material from environmental swipe samples in nuclear facilities is like, or different from, previous results. This enables the IAEA to objectively and defensibly communicate uncertainty in conclusions drawn about a country's declaration.
- Unattended Cylinder Verification Station Software enables control, data acquisition, and analysis of the Unattended Cylinder Verification Station, a first-of-a-kind, automated system to provide an independent measurement of the uranium enrichment, uranium-235 mass, and total weight of uranium hexafluoride (UF6) cylinders in enrichment facilities.
- Gaussian Mixture Model Software improves measurement of uranium-235 content in fresh fuel assemblies, including those with complex compositions, for IAEA verification at fuel fabrication facilities and reactor plants.
- Uranium Reference Samples printed on wafers using a new, automated inkjet technology, aids calibration of complex instruments (Large Geometry Secondary Ion Mass Spectrometers) used to analyze environmental swipe samples taken by IAEA inspectors at nuclear facilities.

2.2.2 Activities Conducted or Planned with DOE/NNSA Partners

DOE/NNSA executes its nonproliferation missions in partnership with numerous U.S. Government agencies. Partnerships with DoD, DHS, DOS, the Department of Commerce (DOC), and the Department of Justice; the Intelligence Community; and the Nuclear Regulatory Commission (NRC), as well as DOE's

Offices of Nuclear Energy (DOE-NE) and Environmental Management (DOE-EM) enable DOE/NNSA to address broad U.S. Government priorities and maximize efficiency of effort.

To ensure the efficacy of U.S. Government efforts to prevent proliferant states from developing nuclear weapons or acquiring weapons-usable nuclear materials, equipment, technology, and expertise, and prevent non-state actors from acquiring nuclear and radioactive materials that can be used for malicious purposes, DOE/NNSA:

- Partnered with the DoD Chemical, Biological, Radiological, Nuclear, and high yield Explosive Commands' Nuclear Disablement team and the Defense Threat Reduction Agency's (DTRA) Global Nuclear Security team to achieve international operations, transportation, and logistics, and enable real-world Mobile Packaging exercises and maintain mission preparedness.
- Entered a cost-sharing agreement with DTRA to enable the removal of all weapons-useable HEU from the Japan Materials Testing Reactor Critical Assembly.
- Maintained partnership with DOE-EM to execute the Surplus Plutonium Disposition (SPD) mission. Surplus plutonium designated for disposition includes both DOE-EM and DOE/NNSA material, which will undergo the same dilution and packaging process for permanent disposition at WIPP, avoiding the need for duplicate processing capabilities. The SPD program leverages existing DOE-EM facilities and capabilities at both WIPP and the Savannah River Site.
- Coordinated with DOS, DoD, NRC, and DOE-EM to ensure that material currently under Voluntary Offer Agreement safeguards remains under IAEA verification as it undergoes dilution and disposition at WIPP. This interagency effort demonstrates U.S. commitment to the international nuclear safeguards regime, while minimizing operation impacts to the SPD program.
- Partnered with DOS and the IAEA to execute the Wide Area Environmental Sampling (WAES) Lost River Modeling Validation Exercise at the Idaho National Laboratory. WAES is a potentially powerful safeguards verification tool for the IAEA that could support conclusions regarding the absence of undeclared nuclear activities by collecting environmental samples over a wide area. During the future years nuclear security program (FYNSP), DOE/NNSA will continue to partner with DoD and DOS to evaluate the technical and policy options for deployment of WAES as a tool for international nuclear safeguards.
- Partnered with experts from the IAEA, the national laboratories, and the NRC to host an Advanced Reactor International Safeguards Engagement Program, entitled "Pilot Safeguards and Security by Design," that enabled U.S. advanced and small modular reactor vendors to learn about the importance and benefits of safeguards.

In support of the U.S. Government's ability to *Counter* the efforts of both proliferant states and non-state actors to acquire, develop, disseminate, deliver, or use the materials, expertise, or components of a nuclear or radiological device, DOE/NNSA:

- Collaborated with DoD to achieve the removal of high-activity radioactive sources from partner states via military transport.
- Studied the space-based detection of various weapon outputs and weapon effects, and the U.S. Air Force Institute of Technology to model the propagation of those signals in atmospheric and space environments.
- Partnered with DoD and DOS to support the IAEA Network of Analytical Laboratories (NWAL). In FY 2023, initiatives sponsored by DOE/NNSA led to qualification of the Savannah River National

Laboratory and Pacific Northwest National Laboratory as two of the only three laboratories worldwide authorized to supply microparticulate reference materials containing uranium to the IAEA. During the FYNSP, DOE/NNSA will continue to partner with DoD, DOS, and the National Institute of Standards to strengthen NWAL.

- Partnered with DOS to conduct a counter-North Korea tabletop exercise for more than 30 leadership-level participants from Southeast Asia to evaluate national plans and processes for countering North Korea's sanctions evasion and acquisition of sensitive goods and technologies.
- Signed an annex and workplan with DTRA in support of the April 2023 Memorandum of Agreement signed by the NNSA Administrator and the Under Secretary of Defense for Acquisition and Sustainment to ensure efficiency and avoid duplication of efforts in joint programs to reduce the risk of nuclear smuggling around the world.
- Partnered with DTRA to initiate the Certification and Authentication Group Exercise: a red teaming exercise for DOE/NNSA and DTRA participants to work together to use both current and developmental inspection capabilities on unfamiliar inspection equipment.

DOE/NNSA partnerships (small sample shown here) maximize the impact and effectiveness of threat reduction activities.

To maximize capabilities to *Respond* to the full spectrum of nuclear and radiological emergencies at home or abroad, including deliberate attacks and accidents, to minimize the damage from such events, DOE/NNSA:

Advanced radiological/nuclear emergency preparedness and response domestically and internationally by collaborating with domestic and international partners to conduct 65 virtual

and in-person training events on topics including crisis communication, nuclear incident response, medical response, and the security of major public events.

- Maintained cooperation with international partners and organizations, including Ukraine, the Republic of Korea, Israel, Taiwan, Japan, Canada, North Atlantic Treaty Organization (NATO), and the IAEA, to advance U.S. nuclear threat reduction and emergency preparedness objectives.
- Collaborated with the Federal Bureau of Investigation (FBI) to conduct a series of "Silent Thunder" exercises to provide Federal, state, and local officials a no-fault, site-specific tabletop exercise to demonstrate crisis and consequence management capabilities in response to a simulated WMD terrorism incident.
- Maintained a long-standing collaboration with DoD to support the U.S. Nuclear Detonation Detection System for global nuclear monitoring by supplying nuclear explosion monitoring sensor suites; supporting pre-launch activities and on-orbit testing; and developing ground station software.
- Sustained key partnerships with DoD and its Combatant Commands, the Intelligence Community, the FBI, and DHS, and other interagency partners, to execute joint planning, training, and exercises; enable crisis response, standards and guidance development, and develop international threat reduction and emergency preparedness capacity development.
- Co-chaired the Continuity Advisory Group, an interagency organization managed by the Federal Emergency Management Agency, to lead continuity community and strengthen partnerships with other agencies across the emergency management mission space.

In addition, in support of Administration priorities, DOE/NNSA:

- Collaborated with NRC and DOC to prepare to submit the U.S. High Performance Research Reactor Base Fuel Qualification Report to the NRC to use uranium-molybdenum HALEU fuel to convert several NRC-regulated research reactors.
- Began processing scrap HALEU to support DOE-NE's HALEU Availability Program. Over the FYNSP, DOE/NNSA will provide approximately 6 metric tons of HALEU in metal and oxide forms to DOE-NE.
- Partnered with the DOE-NE and DOS to support the safe and secure expansion on nuclear energy.
- Partnered with the National Aeronautics and Space Administration to launch a LEONIDAS experiment to the International Space Station to demonstrate the efficacy of fielding technology components in space.
- Worked closely with interagency colleagues to combat misinformation campaigns aimed at inhibiting the Australia-United Kingdom-United States (AUKUS) enhanced trilateral security partnership.

2.2.3 Foreign Contributions and Cost-Sharing Agreements (FY 2023)

DOE is authorized to accept international[1] contributions for any program within the Office of Defense Nuclear Nonproliferation (DNN). During FY 2023, DNN's Office of Global Material Security (GMS) received a total of $11,253,352.46 (U.S. dollar (USD) equivalent) from four international contributors.

Foreign Government Contributions Received

FY	Program for Cooperation	Partner	Contributions (whole dollars)
2023	GMS	United Kingdom	$1,206,418.14
2023	GMS	Finland	$106,240.00
2023	GMS	Canada	$11,184.00
2023	GMS	United Kingdom	$1,210,214.21
2023	GMS	Canada	$2,678,992.47
2023	GMS	Canada	$3,622,002.57
2023	GMS	Norway	$476,644.42
2023	GMS	United Kingdom	$426,505.13
2023	GMS	United Kingdom	$1,515,151.52
Total FY 2023			**$11,253,352.46**

[1] Pursuant to 50 USC 2569(e)

Amount and Use of Foreign Contributions

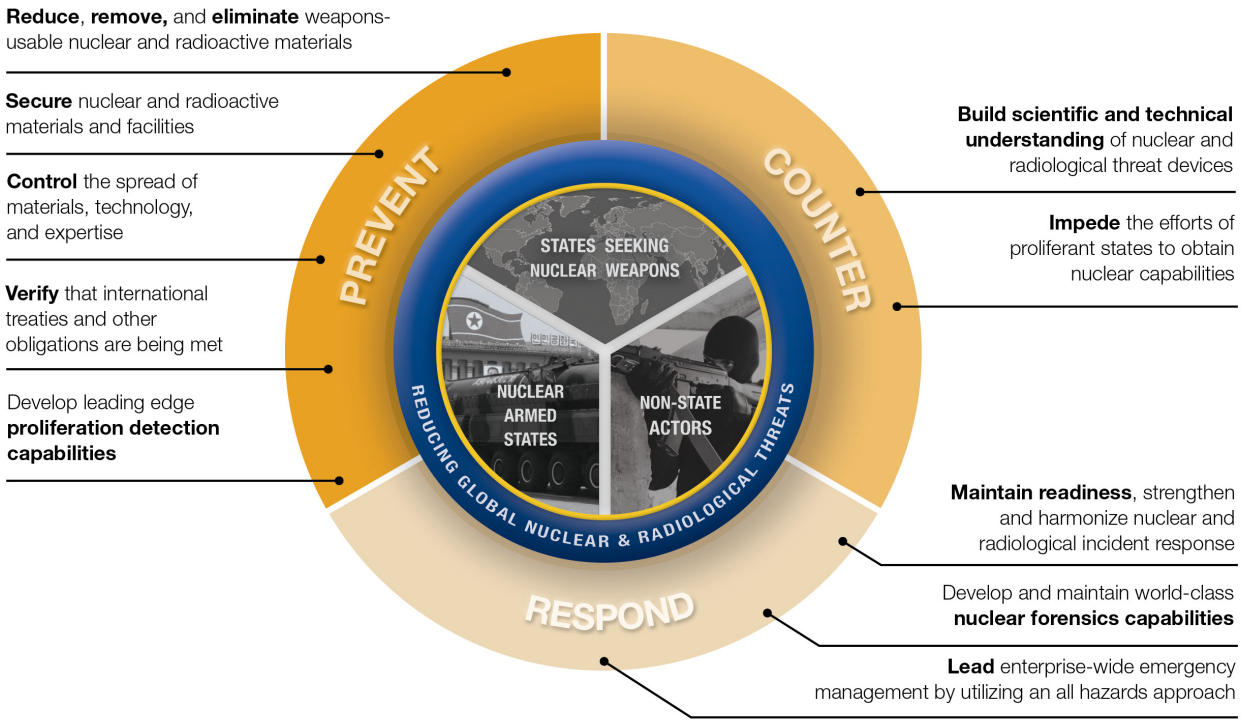
During FY 2023, DNN used the entire $11,253,352.46 (USD equivalent) received from those four international contributors for designated projects.

International Contributor	Amount/Date Received	Use
Global Material Security		
United Kingdom	$1,206,418.14 12/30/2022	Funds were used toward counter smuggling and radiological response support for critical efforts in Ukraine to support Ukraine's State Border Guard Service (SBGS), National Police, and State Emergency Services.
Finland	$106,240.00 01/03/2023	Funds were used toward strengthening the capabilities of the SBGS of Ukraine; specifically, assisting in detecting and deterring the smuggling of nuclear and radiological materials at the borders of Ukraine.
Canada	$11,184.00 02/07/2023	Funds were used to support the 25th Annual Meeting of the International Technical Working Group on Nuclear Forensics.
United Kingdom	$1,210,214.21 02/10/2023	Funds were used to provide equipment and support for the National Guard of Ukraine.
Canada	$2,678,992.47 03/15/2023	Funds were used to support the Kazakhstan Green Border Security Initiative.
Canada	$3,622,002.57 03/17/2023	Funds were used to support the Uzbekistan Green Border Security Initiative.
Norway	$476,644.42 03/22/2023	Funds were used for the efforts to provide State Emergency Services of Ukraine with radiation detection equipment and dosimeters.
United Kingdom	$426,505.13 03/31/2023	Funds were used to host a workshop in India on promoting the use of E-beam technology as an alternative to radioactive source-based technologies.
United Kingdom	$1,515,151.52 05/08/2023	Funds contributed to a counter nuclear smuggling project with Ukraine National Police and Ukraine State Emergency Service focused on training and equipping law enforcement and emergency response officers across Ukraine with basic radiation detection equipment, to include pagers, backpacks, and radioactive isotope identifier devices. In addition, these funds supported the installation of radiation portal monitors at the Port of Tripoli and the Port of Tyre in Lebanon.

3.0 Future Years Nuclear Security Program Planning (Fiscal Year 2025-2029)

3.1 Program Plans

Under its five-year nuclear security plan, and as described in its FY 2025 Congressional Budget Request, DOE/NNSA will continue to focus on the three critical objectives of prevent, counter, and respond to reduce nuclear and radiological threats.



To prevent **proliferant states from developing nuclear weapons or acquiring weapons-usable nuclear materials, equipment, technology, and expertise, and prevent non-state actors from acquiring nuclear and radioactive materials that can be used for malicious purposes, DOE/NNSA will:**

- Convert and/or verify the shutdown of an additional HEU fuel reliant research reactor and isotope production facility.
- Remove and/or confirm the disposition of 10 kg of weapons useable material from a partner country.
- Continue the dilute and dispose strategy to disposition plutonium from the State of South Carolina and continue the 34 metric ton dilute and dispose mission.
- Reduce the risk of sabotage at facilities in key locations and engage with partners on nuclear security topics, including insider threat mitigation, cyber security, transportation security, nuclear material control and accounting, physical security, and emergent technologies.

- Promote and facilitate the adoption of viable alternative technologies that do not use high-activity radioactive sources with a focus on replacement of cesium and cobalt devices.
- Enhance capabilities to manage disused sources safely and securely and build international partner capacity to manage disused sources themselves.

***To counter* the efforts of both proliferant states and non-state actors to acquire, develop, disseminate, deliver, or use the materials, expertise, or components of a nuclear or radiological device, DOE/NNSA will:**

- Engage in technical partnerships with industry on Security-by-Design for advanced reactors for future global deployments and expand engagements with nuclear newcomer countries on nuclear security infrastructure development in support of sustainable energy goals.
- Deploy and support sustainable counter nuclear smuggling solutions to detect, disrupt, and investigate the illicit trafficking of nuclear and radioactive material through critical pathways.
- Continue implementation of the Advanced Reactor International Safeguards Engagement program, including working with key stakeholders to incorporate Safeguards-by-Design elements into advanced reactor designs.
- Develop policy and technical solutions for, and support the implementation of, arms control and nonproliferation treaties, agreements, and on-site denuclearization monitoring and verification activities.
- Demonstrate new U.S. capabilities for detecting foreign material and weapons production processes.
- Demonstrate new capabilities for weapons and material security applications, including detecting special nuclear material movement and diversion and nuclear safeguards.
- Sustain and improve U.S. nuclear explosion monitoring capabilities, including delivering the Nation's space-based nuclear detonation detection payloads and related activities that support treaty monitoring and military missions.
- Contribute to space-based monitoring and verification to support the Outer Space Treaty and address emerging challenges in the space environment with new investments in independent space-based verification technologies.
- Implement a comprehensive, scalable, and repeatable framework to assess how Artificial Intelligence (AI) could advance a nuclear capability.
- Perform focused and integrated experimental science to improve predictive simulation capabilities used to assess and mitigate counterterrorism and counterproliferation risks and inform policy and response options.

***To respond* to the full spectrum of nuclear and radiological emergencies at home or abroad, including deliberate attacks and accidents, to minimize the damage from such events, DOE/NNSA will:**

- Advance technical nuclear forensics analysis capabilities that support the U.S. Government response to a nuclear event, with an emphasis on reducing timelines to support attribution and novel approaches to material provenance.
- Enhance capabilities to counter nuclear and radiological threats—including improving tools to locate, characterize, defeat, and conduct forensics.

- Sustain training and maintain equipment for regional and national response capabilities to respond to WMD terrorism threats, including enhanced counter-WMD capability in 14 major U.S. cities.
- Demonstrate the ability to detect, measure, and track radioactive material in an emergency to determine contamination levels through the Aerial Measuring System (AMS), a NEST asset. AMS consists of a fleet of aircraft equipped with specialized radiation detection systems to provide real-time measurements of air and ground radiation contamination.
- Support Federal, state, local, tribal, and territorial partners by deploying significant NEST assets and personnel for a series of large-scale planned responses to major public events (e.g., the 2025 Inauguration, 250th U.S. Independence Day, 2026 and 2027 World Cups, 2028 Olympics).
- Provide security assessments for non-stockpile nuclear threat device designs, including improvised nuclear devices.
- Implement training, develop and validate tools, and maintain expertise for DOE/NNSA, DoD, and FBI counterterrorism, counterproliferation, and contingency planning efforts.
- Enable development, implementation, and demonstration of comprehensive Red Teaming capabilities for a wide range of open-source and industry AI systems.

3.2 Future Years Nuclear Security Program Budget Plan (FY 2025-2029)

The following information is from the Department of Energy FY 2025 Congressional Budget Request, Volume 1: National Nuclear Security Administration.

	FY 2023 Enacted	FY 2024 Enacted	FY 2025 Request	FY 2025 vs FY 2023 $	FY 2025 vs FY 2023 %
Defense Nuclear Nonproliferation Appropriation					
Defense Nuclear Nonproliferation					
Material Management and Minimization*					
Reactor Conversion and Uranium Supply	**203,169**	**166,675**	**145,227**	**-57,942**	**-28.5%**
Nuclear Material Removal and Elimination	**55,000**	**47,100**	**38,825**	**-16,175**	**-29.4%**
Plutonium Disposition	**206,116**	**282,250**	**193,045**	**-13,071**	**-6.3%**
Total, Material Management and Minimization	**464,285**	**496,025**	**377,097**	**-87,188**	**-18.8%**
Global Material Security					
International Nuclear Security	**87,763**	**84,707**	**87,768**	**+5**	**+0.0%**
Radiological Security	**260,000**	**258,033**	**260,000**	**+0**	**+0.0%**
Nuclear Smuggling Detection and Deterrence	**185,000**	**181,308**	**196,096**	**+11,096**	**+6.0%**
Total, Global Material Security	**532,763**	**524,048**	**543,864**	**+11,101**	**+2.1%**
Nonproliferation and Arms Control	**230,656**	**212,358**	**224,980**	**-5,676**	**-2.5%**
Defense Nuclear Nonproliferation R&D					
Proliferation Detection	**299,283**	**290,388**	**317,158**	**+17,875**	**+6.0%**
Nuclear Detonation Detection	**279,205**	**285,603**	**323,058**	**+43,853**	**+15.7%**
Nonproliferation Fuels Development	**20,000**	**20,000**	**0**	**-20,000**	**-100.0%**
Forensics R&D	**44,414**	**44,759**	**37,759**	**-6,655**	**-15.0%**
Nonproliferation Stewardship Program	**125,000**	**125,000**	**124,875**	**-125**	**-0.1%**
Total, Defense Nuclear Nonproliferation R&D	**767,902**	**765,750**	**802,850**	**+34,948**	**+4.6%**
NNSA Bioassurance Program	**20,000**	**0**	**0**	**-20,000**	**-100.0%**
Nonproliferation Construction					
18-D-150 Surplus Plutonium Disposition Project, SRS	**71,764**	**77,211**	**40,000**	**-31,764**	**-44.3%**
Total, Nonproliferation Construction	**71,764**	**77,211**	**40,000**	**-31,764**	**-44.3%**
Total, Defense Nuclear Nonproliferation Programs	**2,087,370**	**2,075,392**	**1,988,791**	**-98,579**	**-4.7%**

	FY 2023 Enacted	FY 2024 Enacted	FY 2025 Request	FY 2025 vs FY 2023 $	FY 2025 vs FY 2023 %
Nuclear Counterterrorism Incident Response Program					
Emergency Management	**29,896**	**19,123**	**23,847**	**-6,049**	**-20.2%**
Counterterrorism and Counterproliferation	**440,074**	**483,898**	**512,342**	**+72,268**	**+16.4%**
Total, Nuclear Counterterrorism Incident Response Program	**469,970**	**503,021**	**536,189**	**+66,219**	**+14.1%**
Legacy Contractor Pensions	**55,708**	**22,587**	**7,128**	**-48,580**	**-87.2%**
Subtotal, Defense Nuclear Nonproliferation Appropriation	**2,613,048**	**2,601,000**	**2,532,108**	**-80,940**	**-3.1%**
Use of Prior Year Balances	**-123,048**	**-20,000**	**-67,000**	**+56,048**	**-45.5%**
Total, Defense Nuclear Nonproliferation Appropriation	**2,490,000**	**2,581,000**	**2,465,108**	**-24,892**	**-1.0%**
Rescission					
Ukraine Supplemental Appropriations Act 2023	35,000				
Additional Ukraine Supplemental Appropriations Act 2023	126,300				

* Material Management and Minimization (M3) proposes a restructure in the FY 2025 budget to better align program activities and support mission-critical goals. This new budget structure will increase transparency by creating clear delineations between the M3 programs. The alignment would be Reactor Conversion and Uranium Supply Program, Nuclear Material Removal and Elimination Program and Plutonium Disposition Program.

Small Business Innovation Research (SBIR)/ Small Business Technology Transfer (STTR):

- FY 2023 Enacted: SBIR: $15,282; STTR: $0
- FY 2024 Annualized CR: SBIR: $15,282; STTR: $0
- FY 2025 Request to OMB: SBIR $15,435; STTR: $0

Defense Nuclear Nonproliferation
Funding by Congressional Control
Outyear Funding ($K)

	FY 2026 Request	FY 2027 Request	FY 2028 Request	FY 2029 Request
Defense Nuclear Nonproliferation Appropriation				
Defense Nuclear Nonproliferation				
Material Management and Minimization				
Reactor Conversion and Uranium Supply	118,130	104,168	107,270	121,011
Nuclear Material Removal and Elimination	39,350	40,700	40,700	41,315
Plutonium Disposition	231,356	260,755	266,589	271,201
Total, Material Management and Minimization	388,836	405,623	414,559	433,527
Global Material Security				
International Nuclear Security	**88,964**	**89,310**	**89,979**	**94,813**
Radiological Security	**263,907**	**271,823**	**273,858**	**289,185**
Nuclear Smuggling Detection and Deterrence	**198,078**	**200,281**	**230,802**	**242,809**
Total, Global Material Security	550,949	561,414	594,639	626,807
Nonproliferation and Arms Control	**222,870**	**224,483**	**239,193**	**243,029**
Defense Nuclear Nonproliferation R&D				
Proliferation Detection	319,476	335,651	341,064	346,978
Nuclear Detonation Detection	330,952	336,076	341,255	348,085
Nonproliferation Fuels Development	0	0	0	0
Forensics R&D	**40,460**	**40,818**	**41,675**	**42,877**
Nonproliferation Stewardship Program	129,683	131,319	134,383	136,397
Total, Defense Nuclear Nonproliferation R&D	820,571	843,864	858,377	874,337
NNSA Bioassurance Program	0	0	0	0
Nonproliferation Construction				
U.S. Construction				
18-D-150 Surplus Plutonium Disposition Project, SRS	50,980	59,354	41,540	13,080
Total, Nonproliferation Construction	50,980	59,354	41,540	13,080
Total, Defense Nuclear Nonproliferation Programs	2,034,206	2,094,738	2,148,308	2,190,780
Nuclear Counterterrorism and Incident Response Program				
Emergency Management	**33,122**	**33,534**	**34,667**	**34,933**
Counterterrorism and Counterproliferation	**513,740**	**515,240**	**516,740**	**532,041**
Total, Nuclear Counterterrorism and Incident Response Program	546,862	548,774	551,407	566,974
Legacy Contractor Pensions and Settlement Payments	20,993	14,128	14,368	14,292
Total, Defense Nuclear Nonproliferation Appropriation	2,602,061	2,657,640	2,714,083	2,772,046

3.2.1 Uncosted/Uncommitted Balances (FY 2023)

When Congress appropriates funding for DOE programs, including for DOE/NNSA's nuclear threat reduction programs, most funding remains available until expended in recognition of the multi-year execution requirements for many DOE programs. No-year funds that have not been obligated or costed by the end of one fiscal year are carried over into the subsequent fiscal year. These carry-over balances occur due to the long-term aspects of DOE/NNSA's nonproliferation efforts, and the balances are managed and tracked as part of DOE's financial management system.

Following Government Accountability Office guidance and recommended practices, DOE establishes threshold carryover balances for uncosted balances across multiple categories of spending (e.g., funding for major contractors, construction projects, and programs). The thresholds provide metrics for review and an analysis framework. On a consistent basis, DOE/NNSA also assesses all uncosted carryover, particularly to identify any funds excess to program and project requirements. These amounts can be used to address emergent issues during the year of execution consistent with reprogramming guidelines, and for formulating future program budget requests.

Per the requirements in the *National Defense Authorization Act for Fiscal Year 2016*, Sec. 3132 (50 U.S.C. § 2575(c)(6)), DOE/NNSA reports to Congress annually on any uncommitted or other uncosted balances that exceed these thresholds. Uncommitted, or "unencumbered," balances include funds that have been obligated but not yet costed or encumbered. Funds are "encumbered" through the award of direct contracts to non-management and operating (M&O) contractors, the award or issuance of subcontracts or purchase orders by M&O contractors to third parties, or certain other encumbering actions by M&O contractors. DNN measures financial performance in terms of the percentage of funds that have been costed or encumbered, rather than just the percentage of funds that have been costed, because a great deal of DNN's work involves multi-year projects, or is performed overseas, and sound management and programmatic necessities generally require work to be fully completed and verified before DNN disburses funds in non-U.S. venues. In many cases, measuring financial performance only in terms of funds costed would not provide an accurate picture of DNN's progress.

Details on the balances for each budget element, explanations for the balances, and a table showing FY 2023 budget execution data (excluding supplemental funds appropriated in the *Ukraine Supplemental Appropriations Act, 2023* (Division B of Public Law 117-180) and the *Additional Ukraine Supplemental Appropriations Act, 2023* (Division M of Public Law 117-328) for all appropriation years are provided below.

Material Management and Minimization

At the end of FY 2023, Office of Material Management and Minimization (M3) costs plus encumbrances totaled $600.8 million (M), or 71.9 percent of total FY 2023 available funds. The uncosted balance total of $455.6M exceeded the recommended DOE threshold of $161.8M by $293.8M. Of the remaining funds, approximately $221M is encumbered, leaving approximately $234M unencumbered. The FY 2023 unencumbered balances support four critical programs within M3: Reactor Conversion and Uranium Supply; Nuclear Material Removal and Elimination; Plutonium Disposition; and Laboratory and Partnership Support.

- The unencumbered balances for the Reactor Conversion and Uranium Supply Program ($32.7M) will support irradiation of experiment tests in the Advanced Test Reactor, fuel fabrication contracts with BWXT, ongoing conversion activities for Japan's Kyoto University Critical Assembly and Kazakhstan's Impulse Graphite Reactor, HALEU analyses and modeling for all conversion

projects, expansion of Proliferation Resistance Optimization to new international and domestic partnerships, and the recovery of scrap HALEU into a usable form.

- The unencumbered balances for the Nuclear Material Removal and Elimination Program ($41.5M) will support optimization and deployment of the Mobile Melt-Consolidate system (a deployable facility that enables in-country disposition of HEU, and will be deployed to Norway); ongoing and future nuclear material removal campaigns from Asia, Europe, and North America; Mobile Uranium Facility and Mobile Plutonium Facility readiness, including a full scale training exercise and equipment modernization; removal of HALEU from a partner country to support DOE's Office of Nuclear Energy; and contractor labor and travel to support future nuclear material removals.
- The unencumbered balances for the Plutonium Disposition Program ($160.1M) will support U.S. Plutonium Disposition at multiple sites to continue program management and integration activities, including Strategic Laboratory Assessment/Robotics and National Environmental Policy Act activities; pit disassembly and processing activities; disposition of legacy Mixed Oxide materials; and downblending and waste characterization activities supporting the dilute and dispose strategy. Of the $160.1M, $95.0M is associated with capital asset acquisition projects funded in a single year but will cost over multiple years. $37.0M will be applied as an FY 2025 prior year offset. U.S. Uranium Disposition ($15.5M) will support HEU downblending activities at the Y-12 National Security Complex; and International Plutonium Disposition ($1.1M) will implement plutonium management strategies with international partners, including technical exchanges with the United Kingdom and Japan.
- The unencumbered balances for the Laboratory and Partnership Support Program ($0.1M) are within the DOE threshold and provide non-proprietary laboratory technical support to U.S. companies working to produce the medical isotope molybdenum-99 without the use of HEU.

Global Material Security

At the end of FY 2023, the Office of Global Material Security (GMS) costs plus encumbrances totaled $983M, or 87 percent of total FY 2023 available funds. The uncosted balance total of $537M exceeded the recommended DOE threshold of $169M by $367M[2]. Of the remaining funds, approximately $384M is encumbered, leaving roughly $154M as unencumbered. The FY 2023 unencumbered balances support three critical programs within GMS. Of the $154M in GMS uncosted, unencumbered balances, $105M was encumbered and costed as of January 2024 for execution of agreed to priority scope with partners on nuclear security, radiological security, and counter nuclear smuggling, including security upgrades, replacement and removal of devices relying on radioactive sources, installation of detection systems, award of a new implementation contract for the detection work, and associated training, workshops, and exercises. The majority of the remaining balance is within a sensitive project within the Office of International Nuclear Security. A number of commitments have and will be made in this project by the end of FY 2024 and a $20M use of prior year balances has proposed in the FY 2025 budget request to reduce unencumbered balances for this project.

[2] Ukraine supplemental funding and international contributions are excluded from GMS numbers in this paragraph.

Nonproliferation and Arms Control

At the end of FY 2023, Office of Nonproliferation and Arms Control (NPAC) costs plus encumbrances totaled $264.7M, or 86.8 percent of total FY 2023 available funds. The uncosted balance total was $88.9M, of which $48.6M, representing 15.9 percent of available FY 2023 funds, was encumbered. The $40.3M in FY 2023 unencumbered balances support four critical programs within NPAC: International Nuclear Safeguards; Nuclear Export Controls; Nuclear Verification; and Nonproliferation Policy.

- The unencumbered balances for International Nuclear Safeguards ($9.1M) were used to conduct multiple safeguards engagements during the first quarter of FY 2024, analyze data from a FY 2023 field experiment, and finalize additional technology transfers to the IAEA.
- The unencumbered balances for Nuclear Export Controls ($8.4M) were used to accelerate the development of training courses in export licensing and industry outreach and to accelerate laboratory participation in export licensing review and adjudication.
- The unencumbered balances for Nuclear Verification ($8.0M) were used to conduct early FY 2024 activities, including completion of annual proficiency testing for Chemical Weapons Convention sample analysis accreditation and verification team training to maintain and enhance readiness for fissile material and nuclear explosion monitoring, disablement, and dismantlement verification capabilities.
- The unencumbered balances for Nonproliferation Policy ($14.8M) will be used to implement statutory requirements and 10 CFR Part 810 licensing reviews. Beginning in FY 2022, Nonproliferation Policy undertook multi-year projects which continued through FY 2023 and planned to extend them through FY 2024 and FY 2025. This funding is largely allocated to the DOE national laboratory staff rather than to procurement/contractual activities that can be immediately costed. These projects include the continued development of the e810 online licensing system and the implementation of Nonproliferation and Climate Change program work to examine the nexus between nonproliferation and climate change as the role of nuclear power expands to meet ambitious decarbonization goals. Drawing on the expertise of the national laboratories, NPAC established this program to help ensure national and international response to climate change and the expansion of nuclear energy and technologies does not jeopardize U.S. nonproliferation policy objectives.

Defense Nuclear Nonproliferation Research and Development

At the end of FY 2023, Office of DNN Research and Development (DNN R&D) costs plus encumbrances totaled $883.0M, or 75.1 percent of total FY 2023 available funds. The increases in unencumbered balances that occurred over the past several years have reversed, and despite an appropriation that is $38.7M higher, the FY 2023 unencumbered balances are $10.5M lower than the previous year. The uncosted balance total of $425.9M exceeded the recommended threshold by $203.5M. The FY 2023 unencumbered balances are allocated to planned and approved work scope primarily at the national laboratories in approved Life Cycle Plans, as follows: long-lead (8–24 month) procurements and supply chain requirements; major field experiments and demonstrations; forward-funding space-based nuclear detonation detection satellite payload interagency integration activities; full, upfront funding of subcontracts; major laboratory equipment purchases; and laboratory salaries.

Emergency Management

As of the end of FY 2023, the Office of Emergency Management had $11.7M uncosted but allocated to the Emergency Operations Center renovation. The Emergency Operations Center renovation will increase

the capabilities and capacity for situational awareness and the coordination of DOE/NNSA response to all-hazard events. The Emergency Operations Center renovation design efforts were initiated in 2024, with completion estimated in early FY 2027 and occupancy by April 2027.

Counterterrorism and Counterproliferation

At the end of FY 2023, Office of Counterterrorism and Counterproliferation (CTCP) costs plus encumbrances totaled $486.6M, or 86.9 percent of total FY 2023 funds available. The uncosted balance total was $128.7M, of which $55.5M, representing 9.9 percent of total available FY 2023 funds, was encumbered. The unencumbered balances are allocated to planned and approved critical CTCP activities and scope requirements, as follows: major nuclear forensics and emergency response capacity-building exercises, training, and events; NEST support for major public events; a long-lead (12-18 month) procurement of specialized, critical equipment for nuclear forensics material analysis; receipt of a large experimental tool delayed by supply chain in FY 2023; Nuclear Forensics Clean Laboratory minor construction project at the Lawrence Livermore National Laboratory (expected to fully cost in the early third quarter of FY 2025); maintenance of critical labor levels and experimental work at the national laboratories; new and existing headquarters support service contract labor and travel requirements; laboratory labor subcontracts; and new contract vehicles to build M&O capacity to support the second phase of the Capability Forward initiative, to enhance the capabilities of the FBI's regional counter-WMD teams.[3]

[3]Ukraine supplemental funding and international contributions are excluded from CTCP numbers in this paragraph.

DNN Programs Appendix Table *End of Fiscal Year 2023 ($ in thousands)* (Excludes Ukraine Funds)	Total Funds Available to Cost	YTD Costed	Total Uncosted Encumbered Obligations	Total Costed + Encumbrances	Costed or Encumbered as % of Costing Authority	Total Uncosted Unencumbered Obligations	Costed or Encumbered as % of Costing Authority	Total Uncosted	DOE Threshold
Defense Nuclear Nonproliferation Programs									
Material Management and Minimization									
Conversion	220,523	112,118	75,670	187,788	85.2%	32,735	14.8%	108,405	32,545
Nuclear Material Removal	102,557	43,278	17,777	61,054	59.5%	41,503	40.5%	59,280	13,580
Material Disposition	445,146	197,748	87,280	285,027	64.0%	160,119	36.0%	247,398	89,524
Laboratory and Partnership Support	66,499	26,492	39,869	66,361	99.8%	138	0.2%	40,008	26,096
Legacy Program	548	21	527	548	100.0%	0	0.0%	527	92
Subtotal, Material Management and Minimization	835,273	379,656	221,122	600,778	71.9%	234,495	28.1%	455,618	161,837
Global Material Security									
International Nuclear Security	265,664	132,831	63,989	196,820	74.1%	68,845	25.9%	132,833	37,346
Radiological Security	497,048	277,596	166,244	443,840	89.3%	53,208	10.7%	219,452	76,961
Nuclear Smuggling Detection and Deterrence	413,578	206,669	172,465	379,134	91.7%	34,444	8.3%	206,909	61,599
Subtotal, Global Material Security	1,176,291	617,096	402,698	1,019,794	86.7%	156,497	13.3%	559,194	175,906
Nonproliferation & Arms Control									
Subtotal, Nonproliferation & Arms Control	305,031	216,087	48,609	264,696	86.8%	40,335	13.2%	88,944	41,708
Defense Nuclear Nonproliferation R&D									
Proliferation Detection	437,858	286,819	52,295	339,114	77.4%	98,743	22.6%	151,038	72,749
Nuclear Detonation Detection	424,548	286,282	27,959	314,242	74.0%	110,307	26.0%	138,266	80,182
Nonproliferation Fuels Development	39,618	21,091	3,217	24,308	61.4%	15,311	38.6%	18,528	8,183
Nonproliferation Stewardship Program	214,162	119,149	36,236	155,385	72.6%	58,777	27.4%	95,013	50,357
Forensics R&D	60,114	37,036	12,938	49,974	83.1%	10,140	16.9%	23,078	10,903
Subtotal, Defense Nuclear Nonproliferation R&D	1,176,300	750,378	132,645	883,022	75.1%	293,278	24.9%	425,922	222,374
NNSA Bioassurance Program									
Subtotal, NNSA Bioassurance Program	20,000	9,168	2,572	11,740	58.7%	8,260	41.3%	10,832	4,750
Nonproliferation Construction									
US Construction	262,225	70,826	9,604	80,430	30.7%	181,795	69.3%	191,399	131,113
Subtotal, Nonproliferation Construction	262,225	70,826	9,604	80,430	30.7%	181,795	69.3%	191,399	131,113
Total, Defense Nuclear Nonproliferation Programs	**3,775,120**	**2,043,211**	**817,249**	**2,860,460**	**75.8%**	**914,660**	**24.2%**	**1,731,909**	**737,688**
Nuclear Counterterrorism and Incident Response Program									
Emergency Management	27,598	15,926	8,862	24,788	89.8%	2,810	10.2%	11,672	4,427
Counterterrorism and Counterproliferation	559,885	431,195	55,453	486,648	86.9%	73,237	13.1%	128,690	91,494
Subtotal, Nuclear Counterterrorism and Incident Res	587,483	447,121	64,316	511,436	87.1%	76,047	12.9%	140,363	95,921
Legacy Contractor Pensions									
Subtotal, Legacy Contractor Pensions	47,370	47,370	-	47,370	100.0%	-	0.0%	-	6,768
Total, Defense Nuclear Nonproliferation Appropriation	**4,409,973**	**2,537,702**	**881,565**	**3,419,267**	**77.5%**	**990,707**	**22.5%**	**1,872,272**	**840,377**

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DOE/NA-0155

A Report to Congress

Prevent, Counter, and Respond—NNSA's Plan to Reduce Global Nuclear Threats FY 2025-FY 2029

September 2024

United States Department of Energy
National Nuclear Security Administration
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Washington, DC 20585