

**GAO**

Testimony

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# COMBATING NUCLEAR TERRORISM

## Preliminary Observations on Preparedness to Recover from Possible Attacks Using Radiological or Nuclear Materials

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Natural Resources and Environment



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Accountability \* Integrity \* Reliability

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Highlights of [GAO-09-996T](#), a testimony to Subcommittee on Emerging Threats, Cybersecurity, and Science and Technology, Committee on Homeland Security, House of Representatives

## Why GAO Did This Study

A terrorist's use of a radiological dispersal device (RDD) or improvised nuclear device (IND) to release radioactive materials into the environment could have devastating consequences. The timely cleanup of contaminated areas, however, could speed the restoration of normal operations, thus reducing the adverse consequences from an incident.

This testimony examines (1) the extent to which federal agencies are planning to fulfill their responsibilities to assist cities and their states in cleaning up areas contaminated with radioactive materials from RDD and IND incidents; (2) what is known about the federal government's capability to effectively cleanup areas contaminated with radioactive materials from RDD and IND incidents, and (3) suggestions from government emergency management officials on ways to improve federal preparedness to provide assistance to recover from RDD and IND incidents. We also discuss recovery activities in the United Kingdom. This testimony is based on our ongoing review of recovery preparedness issues for which we examined applicable federal laws and guidance; interviewed officials from the Department of Homeland Security (DHS), Federal Emergency Management Agency (FEMA), Department of Energy (DOE), and Environmental Protection Agency (EPA); and surveyed emergency management officials from 13 large cities and their states, as well as FEMA and EPA regional office officials.

View [GAO-09-996T](#) or key components. For more information, contact Gene Aloise at (202) 512-3841 or [aloise@gao.gov](mailto:aloise@gao.gov).

# COMBATING NUCLEAR TERRORISM

## Preliminary Observations on Preparedness to Recover from Possible Attacks Using Radiological or Nuclear Materials

### What GAO Found

DHS, through FEMA, is responsible for developing a comprehensive emergency management system to respond to and recover from natural disasters and terrorists attacks, including RDD and IND attacks. The response phase would involve evacuations and providing medical treatment to those who were injured; the recovery phase would include cleaning up the radioactive contamination from an attack in order to permit people to return to their homes and businesses. To date, much federal attention has been given to developing a response framework, with less attention to recovery. Our survey found that almost all cities and states would be so overwhelmed by an RDD or IND incident that they would rely on the federal government to conduct almost all analysis and cleanup activities that are essential first steps towards recovery. However, we found that the federal government has not sufficiently planned to undertake these activities. For example, FEMA has not issued a national disaster recovery strategy or plans for RDD and IND incidents as required by law. Existing federal guidance provides only limited direction for federal agencies to develop their own recovery plans and conduct exercises to test preparedness. Out of over 70 RDD and IND exercises conducted in the last 5 years, only three have included interagency recovery discussions following a response exercise.

Although DOE and EPA have experience in the cleanup of small-scale radiation-contaminated areas, their lack of knowledge and capability to apply approaches to address the magnitude of an RDD or an IND incident could increase recovery costs and delay completion. According to an expert at Idaho National Laboratory, experience has shown that not selecting the appropriate decontamination technologies can generate waste types that are more difficult to remove than the original material and can create more debris requiring disposal—leading to increased costs. Limitations in laboratory capacity to rapidly test thousands of material samples during cleanup, and uncertainty regarding where to dispose of radioactive debris could also slow the recovery process. At least two-thirds of the city, state, and federal respondents expressed concern about federal capability to provide the necessary analysis and cleanup actions to promote recovery after these incidents.

Nearly all survey respondents had suggestions to improve federal recovery preparedness for RDD and IND incidents. For example, almost all the cities and states identified the need for a national disaster recovery strategy to address gaps and overlaps in federal guidance. All but three cities wanted additional guidance, for example, on monitoring radioactivity levels, cleanup standards, and management of radioactive waste. Most cities wanted more interaction with federal agencies and joint exercising to test recovery preparedness. Finally, our review of the United Kingdom's preparedness to recover from radiological terrorism showed that that country has already taken actions similar to those suggested by our survey respondents, such as issuing national recovery guidance, conducting a full-scale recovery exercise, and publishing a national handbook for radiation incidents.

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Madam Chairwoman and Members of the Subcommittee:

I am pleased to be here today to discuss preliminary observations from our ongoing work reviewing the federal government's preparedness to assist localities in recovering from a terrorist attack involving either a radiological dispersal device (RDD)—frequently referred to as a dirty bomb—or an improvised nuclear device (IND). Responding to such an attack would involve evacuations, providing medical treatment to those who were injured, and protecting property; recovery would include cleaning up the radioactive contamination from an attack in order to permit people to return to their homes and businesses.<sup>1</sup> A terrorist's use of an RDD or IND to release radioactive materials into the environment could have devastating consequences. However, quickly analyzing and cleaning up contaminated areas after a deliberate release of radioactive materials could speed the recovery from such an attack by restoring normal operations of critical infrastructure, services, businesses, and public activities, and thus reducing the many adverse consequences from an attack. According to a recent report of the National Science and Technology Council, which coordinates science and technology policy within the Executive Office of the President, the ability of government to quickly and decisively respond to and recover from an RDD or IND incident is key to national resiliency.<sup>2</sup> Importantly, the Council noted that being prepared to recover from these incidents may even provide an element of deterrence if the adversary perceives less potential for long-lasting harm.

The consequences of a terrorist attack using an RDD or IND would not only include loss of life but also enormous psychological and economic impacts. An RDD would disperse radioactive materials into the environment through a conventional explosive or through other means. Depending on the type of RDD, the area contaminated could be as small as part of a building or city block or as large as several square miles. An IND would create a nuclear explosion producing extreme heat, powerful shockwaves, and intense radiation that would be immediately lethal to

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<sup>1</sup>For the purpose of this testimony, analysis activities include efforts to sample and analyze affected areas to determine the type and location of contamination, and cleanup activities include efforts to contain radioactive materials, decontaminate affected areas, and manage the radioactive waste.

<sup>2</sup>National Science and Technology Council, *Roadmap for Nuclear Defense Research and Development: Fiscal Years 2010-2014* (Washington, D.C.: July 2008).

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individuals within miles of the explosion, as well as radioactive fallout over thousands of square miles. Thus, the consequences of RDD and IND incidents would vary in magnitude, with an RDD expected to cause few deaths but produce significant economic and psychological impacts, and an IND causing thousands of deaths and more extensive destruction. An RDD is thought to be a more likely terrorist weapon than an IND given the prevalent commercial use of radioactive source material—for example, in some medical and industrial equipment—and the relatively uncomplicated way in which this material could be dispersed. In contrast, detonating an IND would require a terrorist group to obtain nuclear weapons material—which is generally heavily secured—and have highly sophisticated expertise and equipment to fabricate this material into a weapon.

If an RDD or IND incident occurred, a number of federal, state, and local government departments and agencies would be involved in the analysis and cleanup of areas contaminated with radioactive material as part of the recovery process.<sup>3</sup> Generally, state and local governments have primary responsibility for recovering from disasters, but the federal government may provide assistance when an incident exceeds state and local resources or when an incident is managed by federal agencies under their own authorities. The Department of Homeland Security (DHS) is the principal federal agency for domestic incident management. The primary mission of its Federal Emergency Management Agency (FEMA) is to develop a comprehensive emergency management system of preparedness, protection, response, recovery, and mitigation. For an RDD or IND incident, DHS would be the lead agency in coordinating federal assistance to state and local governments. For these incidents, DHS would rely on other federal agencies that have more experience with the analysis and cleanup of areas contaminated with radioactive materials. For example, in certain circumstances, the Department of Energy (DOE) would have primary responsibilities for the initial analysis of areas contaminated with radioactive materials, and the Environmental Protection Agency (EPA) would have primary responsibility for cleaning

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<sup>3</sup>The Robert T. Stafford Disaster Relief and Emergency Assistance Act primarily establishes the programs and processes for the federal government to provide major disaster and emergency assistance to state and local governments, as well as to tribal nations, individuals, and qualified nonprofit organizations. Pub. L. No. 100-107, 102 Stat. 4689 (1988) (codified as amended at 42 U.S.C. § 5121 et. seq.).

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up the radiation-contaminated areas.<sup>4</sup> The Department of Defense (DOD) would act in support of the primary federal agencies. Federal agencies, including EPA, DOE, the Nuclear Regulatory Commission, as well as state regulatory agencies have set various cleanup standards for decontaminating affected areas.

The risk of terrorists using an RDD or IND is, in large part, determined by their ability to gain access to the materials needed to construct these devices. Over the past few years, we have issued a number of reports on the security of nuclear and radiological materials, and facilities that house them. Overall, our work has shown that despite investing billions of dollars in new technology to upgrade security procedures, gaps continue to exist in our nation's ability to prevent terrorists from accessing or smuggling dangerous quantities of radioactive material into the country. For example, in 2007, we testified before Congress that our own investigators were able to set up phony businesses and obtain a legitimate NRC license that would have permitted us to obtain dangerous quantities of radioactive material.<sup>5</sup> Our investigators were able to obtain this NRC license just months after NRC had completed a lengthy process to strengthen its licensing procedures. In 2008, we reported that NRC, in developing its security requirements for research reactors, had not fully considered the risks associated with terrorists attacking these facilities—many of which are located on college campuses.<sup>6</sup> Such an attack could involve terrorists sabotaging a reactor in order to disperse radioactive material over neighboring communities—similar to an RDD. We have also

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<sup>4</sup>The Federal Radiological Monitoring and Assessment Center (FRMAC) is a DOE-led interagency asset that is available on request to respond to an RDD or IND incident. The FRMAC is responsible for coordinating all environmental radiological monitoring, sampling, and assessment activities for the response. DOE leads the FRMAC for the initial response phase and EPA assumes leadership for the cleanup phase.

<sup>5</sup>GAO, *Nuclear Security: Actions Taken by NRC to Strengthen Its Licensing Process for Sealed Radioactive Sources Are Not Effective*, [GAO-07-1038T](#) (Washington, D.C.: July 12, 2007).

<sup>6</sup>GAO, *Nuclear Security: Action May be Needed to Reassess the Security of NRC-Licensed Research Reactors*, [GAO-08-403](#) (Washington, D.C.: Jan. 31, 2008).

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reported on DHS's and FEMA's preparedness for, response to, and recovery from disasters in 2007, 2008, and 2009.<sup>7</sup>

Our testimony today presents preliminary observations from our ongoing effort to examine (1) the extent to which federal agencies are planning to fulfill their responsibilities to assist cities and their states in cleaning up areas contaminated with radioactive material from RDD and IND incidents; (2) what is known about the federal government's capability to effectively cleanup areas contaminated with radioactive material from RDD and IND incidents; and (3) suggestions from government emergency management officials on ways to improve federal preparedness to assist state and local governments in recovering from RDD and IND incidents. In addition, we are providing information on our review of actions taken in the United Kingdom to prepare for recovering from RDD and IND incidents. We expect to issue our final report on this topic in November 2009.

To address these objectives, we examined pertinent federal law, presidential directives, and other executive guidance; interviewed cognizant officials from DHS, DOE, EPA, FEMA, NRC, and national laboratories; and conducted a survey of emergency management officials in 13 cities considered to be at high- or medium-risk of such attacks, officials in these cities' states, and similar officials in all federal FEMA and EPA regional offices.<sup>8</sup> We also reviewed information on the number and type of RDD and IND response and recovery exercises that have been conducted in the last 5 years. Finally, we visited the United Kingdom to review its preparedness to recover from RDD and IND incidents at the suggestion of EPA officials and because it has addressed a fairly recent radiological release incident in a large urban area.

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<sup>7</sup>GAO, *Observations on DHS and FEMA Efforts to Prepare for and Respond to Major and Catastrophic Disasters and Address Related Recommendations and Legislation*, [GAO-07-1143T](#) (Washington, D.C.: July 31, 2007); *Actions Taken to Implement the Post-Katrina Emergency Management Reform Act of 2006*, [GAO-09-59R](#) (Washington, D.C.: Nov. 21, 2008); and *National Preparedness: FEMA Has Made Progress, but Needs to Complete and Integrate Planning, Exercise, and Assessment Efforts*, [GAO-09-369](#) (Washington, D.C.: Apr. 30, 2009).

<sup>8</sup>The high- and medium-risk cities are Boston, Chicago, Dallas, Denver, Detroit, Houston, Los Angeles, Miami, New York, Philadelphia, San Francisco, Seattle, and St. Louis. While Washington, D.C., is considered a high-risk city, we excluded it from our survey because it is unlike other cities in its reliance on the federal government and the federal agencies that would take over analysis and cleanup activities.

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## Background

In the aftermath of September 11, 2001, there is heightened concern that terrorists may try to smuggle nuclear or radiological materials into the United States. These materials could be used to produce either an IND or an RDD. An IND is a crude nuclear bomb made with highly enriched uranium or plutonium. Nonproliferation experts estimate that a successful IND could have a yield in the 10 to 20 kiloton range (the equivalent to 10,000 to 20,000 tons of TNT). An IND with a 20-kiloton yield would have the same force as the equivalent of the yield of the bomb that destroyed Nagasaki; it could devastate the heart of a medium-sized U.S. city and result in thousands of casualties and radiation contamination over a wide area.

Security experts have also raised concerns that terrorists could obtain radioactive material used in medicine, research, agriculture, and industry to construct an RDD, or dirty bomb. This radioactive material is encapsulated, or sealed in metal, such as stainless steel, titanium, or platinum, to prevent its dispersal and is commonly called a sealed radioactive source. These sealed sources are used throughout the United States and other countries in equipment designed to, among other things, diagnose and treat illnesses, preserve food, detect flaws in pipeline welds, and determine the moisture content of soil. Depending on their use, sealed sources contain different types of radioactive material, such as strontium-90, cobalt-60, cesium-137, plutonium-238, and plutonium-239. If these sealed sources fell into the hands of terrorists, they could use them to produce a simple, but potentially dangerous weapon, by packaging explosives, such as dynamite, with the radioactive material, which would be dispersed when the bomb went off. Depending on its type, amount, and form (powder or solid), the dispersed radioactive material could cause radiation sickness in people nearby and produce serious economic costs and the psychological and social disruption associated with the evacuation and subsequent cleanup of the contaminated area. While no terrorists have detonated a dirty bomb in a city, Chechen separatists placed a canister containing cesium-137 in a Moscow park in the mid-1990s. Although the device was not detonated and no radioactive material was dispersed, the incident demonstrated that terrorists have the capability and willingness to use radiological materials as weapons of terrorism.

Another form of nuclear terrorism occurred with the release of radioactive materials in London. In November 2006, Alexander Litvinenko, a former officer of the Russian Federal Security Service, was poisoned with a gram

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of polonium-210—about the size of a grain of salt.<sup>9</sup> His poisoning was detected only after he was hospitalized for a few weeks and tested for symptoms of radiation exposure because of hair loss. Following the poisoning, forensic investigators identified, with the help of the victim, 47 sites across London where he had been during the few days between his poisoning and death. Of these locations, about 20 showed signs of this radioactive material. Investigators identified over 900 people who might have been exposed to the polonium, including some who may have been exposed while aboard airplanes. After a thorough examination, a few of these individuals turned out to have significant exposure levels. The decontamination activities at these sites, including a hotel room, spanned 19 days, involved a number of methods and technologies, and cost in excess of \$200,000.

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## Cities and States Would Likely Request Federal Assistance for Cleanup of Radiation-Contaminated Areas after RDD and IND Incidents, but Limited Federal Planning Exists for Recovering from Such Incidents

While state and local government responders would be expected to respond first to a terrorist incident within their jurisdiction, they would also expect that the federal government would be prepared to provide the necessary assistance for them to expedite the recovery from such an incident. Emergency management officials from 13 cities and the majority of their respective states indicated in our survey that they would rely on the federal government to conduct and fund all or almost all analysis and cleanup activities associated with recovering from an RDD or IND incident of the magnitude described in the National Planning Scenarios.<sup>10</sup> However, when asked which federal agencies they would turn to for this assistance, city and state respondents replied inconsistently and frequently listed several federal agencies for the same activity. In our view, these responses indicate that there is confusion among city and state officials regarding federal responsibilities for these activities in the event of a terrorist incident. This confusion, if not addressed, could hamper the timely recovery from an RDD or IND incident. Emergency management officials from all the cities and most of their respective states told us they would rely on the federal government because their technical and financial resources would be overwhelmed by a large RDD incident—and certainly

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<sup>9</sup>Investigators believe that this pure polonium was probably produced in a Russian research reactor.

<sup>10</sup>The National Preparedness Guidelines (Sept. 2007) developed 15 national planning scenarios, including scenarios for RDD and IND incidents. The scenarios form the basis for coordinated federal planning, training, exercises, and grant investments to prepare for emergencies of all types.

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by an IND incident. Most of these officials believe they could adequately address a smaller RDD incident, such as one that is confined to a city block or inside a building. Despite this anticipated reliance on the federal government, we obtained mixed responses as to whether these RDD and IND recovery activities should be primarily a federal responsibility. Fewer than half of the respondents from the cities (6 of 13), but most of those from states (8 of 10) indicated that it should be primarily a federal responsibility. The others stressed the need for shared responsibilities with the federal government.

Despite the anticipated reliance by city and state governments on the federal government for analysis and cleanup activities following an RDD or IND incident, FEMA has not developed a national disaster recovery strategy or related plans to guide involvement of federal agencies in these recovery activities, as directed by federal law and executive guidance.<sup>11</sup> To date, much federal attention has been given to developing a response framework, with less attention to recovery. The new FEMA coordinator for the development of a national disaster recovery strategy told us that while the previous administration had drafted a “white paper” addressing this strategy, the new administration has decided to rethink the entire approach.<sup>12</sup> She also told us that FEMA recognizes its responsibility to prepare a national disaster recovery strategy but she could not provide a time frame for its completion. However, she stated that when a recovery strategy is issued it should provide guidance to revise state, local, and other federal agency operational plans to fulfill their respective responsibilities. Moreover, the FEMA official in charge of planning told us that the agency has put on hold issuing component plans that describe how federal capabilities would be integrated to support state and local planning for response to and recovery from RDD and IND incidents.

Some existing federal guidance documents addressing the assets and responsibilities of federal agencies for both response and to a lesser extent

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<sup>11</sup>The Post-Katrina Emergency Management Reform Act requires FEMA to report back to the Congress within 270 days of enactment of this 2006 legislation describing the details of a national disaster recovery strategy. Pub. L. No. 109-295, § 682, 120 Stat. 1355, 1445-46 (2006). In addition, the National Security Council, *National Strategy for Homeland Security* (Washington, D.C., Oct. 2007), states that the federal government will prepare a framework for recovery.

<sup>12</sup>In our November 21, 2008 report ([GAO-09-59R](#)), we found that FEMA had drafted a national disaster recovery strategy but that it was under review at the time with no timeframe for completion.

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recovery-related activities have been issued as annexes to the National Response Framework and in other documents.<sup>13</sup> For example, there is a nuclear and radiological incident annex, which describes the policies, situations, concept of operations, and responsibilities of the federal departments and agencies for the immediate response and short-term recovery from incidents involving the release of radiological materials. There are also emergency support function annexes that provide a structure for coordinating federal interagency support in response to domestic incidents.

In addition, two other sources of guidance have been issued that, according to FEMA officials, represent stop-gap measures until it can issue more integrated planning guidance. In 2008, FEMA issued updated guidance for protection and recovery following RDD and IND incidents.<sup>14</sup> This guidance was to provide some direction to federal, state, and local emergency response officials in developing operational plans and response protocols for protection of emergency workers after such an incident. In regard to recovery, this document recommended a process to involve the affected public, state and local officials, and other important stakeholders in the identification of acceptable cleanup criteria, given the specifics of the incident. The other document, issued by the Homeland Security Council, pertains to responding to an IND in the first few days prior to the arrival of other necessary federal resources. This document was prepared because the prior FEMA guidance did not sufficiently prepare state and local emergency response authorities for managing the catastrophic consequences of a nuclear detonation.<sup>15</sup> Moreover, DOE, EPA and DOD are developing more detailed operational guidance on their own based on the existing federal guidance. For example, DOE has supported research on operational guidelines for implementation of protective

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<sup>13</sup>DHS, *National Response Framework* (Washington, D.C., Jan. 2008). This document provides a guide for how the nation should conduct all-hazards response, including the roles and responsibilities of agencies involved in response efforts. It does not address long-term recovery issues, including cleaning up areas contaminated with radioactive materials.

<sup>14</sup>DHS, *Planning Guidance for Protection and Recovery Following Radiological Dispersal Device (RDD) and Improvised Nuclear Device (IND) Incidents*, 73 Fed. Reg. 45,029 (Aug. 1, 2008).

<sup>15</sup>Homeland Security Council, *Planning Guidance for Response to a Nuclear Detonation* (Washington, D.C.: Jan. 16, 2009).

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actions described in the FEMA guidance,<sup>16</sup> EPA has drafted guidance for the optimization process following RDD and IND incidents,<sup>17</sup> and DOD has established operational plans for consequence management following terrorist incidents, including RDD and IND attacks.<sup>18</sup>

Federal agencies and local jurisdictions have been using the available guidance as a basis for planning RDD and IND exercises to test the adequacy of their plans and skills in a real-time, realistic environment to evaluate their level of preparedness. We identified more than 70 RDD and IND response exercises planned and carried out by federal, state and local agencies since mid-2003. However, officials with FEMA's National Exercise Directorate told us that only three of the RDD response exercises had a recovery component. According to these officials, recovery discussions following an RDD or IND response exercise have typically not occurred because of the time needed to fully address the response objectives of the exercise, which are seen as a higher priority. The most recent response exercise, based in Albany, New York, and planned by DOE, set aside 2 days for federal, state, and local agencies to discuss operational recovery issues. One unresolved operational issue discussed during this exercise pertained to the transition of the leadership of the Federal Radiological Monitoring and Assessment Center (FRMAC) from the initial analysis of the contaminated area, led by DOE, to the later cleanup phase, led by EPA. For example, there are remaining questions regarding the level and quality of the monitoring data necessary for EPA to accept the leadership of FRMAC. While we were told that this transitional issue has been discussed in exercises dating back to the development of the Federal Radiological Emergency Response Plan in 1984, it has only recently been discussed in RDD or IND response exercises. Another unresolved operational recovery issue pertains to the distribution of responsibilities for the ownership, removal, and disposal of radioactive debris from an RDD or IND incident. Both of these operational issues are

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<sup>16</sup>C.Yu, et al. *Preliminary Report on Operational Guidelines Developed for Use in Emergency Preparedness and Response to a Radiological Dispersal Device Incident*, DOE/HS-0001 (Washington, D.C.: DOE, Office of Health Safety, and Security, February 2009). This document does not represent official policy, methods, or agency guidance.

<sup>17</sup>EPA, *EPA Guidance on the Optimization Process Following a Radiological Dispersal Device or Improvised Nuclear Device Incident* (Washington, D.C.: September 2009 Draft).

<sup>18</sup>We provided testimony on this DOD initiative in GAO, *Homeland Defense: Preliminary Observations on Defense Chemical, Biological, Radiological, Nuclear, and High-Explosive Consequence Management Plans and Preparedness*, [GAO-09-927T](#) (Washington, D.C.: July 28, 2009).

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to be examined again in the first full-scale RDD recovery exercise, planned and led by EPA, to take place April 2010.

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## Insufficient Knowledge and Capability to Use Available Approaches for Cleanup of Radiation-Contaminated Areas Could Impede Efforts to Recover from RDD and IND Incidents

Although some federal agencies, such as DOE and EPA, have substantial experience using various cleanup methods and technologies to address radiation-contaminated areas, little is known about how these approaches might be applied in an RDD or IND incident. For example, DOE has invested hundreds of millions of dollars in research, development, and testing of methods and technologies for cleaning up and decommissioning contaminated structures and soils—legacies of the Cold War. In addition, since the passage of the Comprehensive Environmental Response, Compensation, and Liability Act in 1980, which established the Superfund program, EPA has undertaken significant efforts to study, develop, and use technologies that can address radioactive contamination. DOD has also played a major role in studying potential applications for innovative technologies for its Superfund sites.

Not much is known, however, about the application to RDD and IND incidents of available cleanup methods and technologies because such an incident has never occurred in this country, although research is currently underway to gain a better understanding of potential applications. According to decontamination experts at Lawrence Livermore National Laboratory, current research has focused on predicting the effects of radiation release in urban settings through simulation, small scale testing, and theory. In addition, researchers at EPA's National Homeland Security Research Center informed us that while there are standard methods and technologies for cleaning up radiation-contaminated areas, more research is needed to develop standard national guidance for their application in urban environments. The lack of guidance for identifying cost-effective cleanup methods and technologies in the event of an RDD or IND incident might mean that the cleanup approach taken could unnecessarily increase the cost of recovery. According to a decontamination expert at Idaho National Laboratory, for example, experience has shown that not selecting the appropriate decontamination technologies can generate waste types that are more difficult to remove than the original material and can create more debris requiring disposal—leading to increased costs. Moreover, he told us that without guidance and discussion early in the response phase, a contractor might use an approach for no other reason than it was used before in an unrelated situation. In addition, the Lawrence Livermore National Laboratory decontamination experts told us that decontamination costs can increase dramatically depending on the selection of an initial approach and the length of time before remediation

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actions are taken. For example, they said that the conventional use of high pressure water hosing to decontaminate a building is effective under normal conditions but could be the wrong cleanup approach for an RDD using cesium-137 because the force of the water would actually cause this radioactive isotope to penetrate even further into porous surfaces. A senior EPA official with the Office of Radiation and Indoor Air told us that studies are currently underway to determine the efficacy of pressure washing for removing contamination from porous urban surfaces.

In addition to the lack of knowledge about the application of cleanup methods and technologies for wide-area urban contamination from an RDD or IND incident, there are also limitations in federal capabilities to handle in a timely manner the magnitude of tasks and challenges that would be associated with these incidents. For example, we found that limitations in federal capabilities to complete some analysis and cleanup activities might slow the recovery from an RDD or IND incident, including: (1) characterizing the full extent of areas contaminated with radioactive materials; (2) completing laboratory validation of contaminated areas and levels of cleanup after applying decontamination approaches; and (3) removing and disposing of radioactive debris and waste. Respondents representing most of the cities (9 of 13) and states (7 of 10), and respondents from most FEMA regional offices (6 of 9) and almost all EPA regional offices (9 of 10) expressed concerns about the capabilities of federal agencies to provide the assistance needed to complete the necessary analysis and cleanup activities in the event of an RDD or IND incident.

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## City, State, and Federal Emergency Management Officials Have Several Suggestions to Improve Federal Recovery Preparedness for RDD and IND Incidents

Respondents from nearly all the cities and states we surveyed expressed the need for a national disaster recovery strategy to address gaps and overlaps in current federal guidance. According to one city official, “recovery is what it is all about.” In developing such a recovery strategy, respondents from the cities, like those from their states, want the federal government to consult with them in the initial formulation of a recovery strategy through working and focus groups, perhaps organized on a regional basis. Respondents representing most cities (10 of 13) and states (7 of 10) also provided specifics on the type of planning guidance necessary, including integration and clarification of responsibilities among federal, state, and local governments. For example, respondents from some of the cities sought better guidance on monitoring radioactivity levels, acceptable cleanup standards, and management of radioactive waste. Most respondents from cities expressed the need for greater planning interactions with the federal government and more exercises to test recovery plans. One city respondent cited the need for recovery exercises on a regional basis so the cities within the region might better exchange lessons learned. Respondents from most cities (11 of 13) and their states (7 of 10) said that they planned to conduct RDD and IND recovery exercises in the future. Finally, emergency management officials representing almost all cities and states in our survey offered some opinions on the need for intelligence information on RDD and IND threats. They said that sharing information with law enforcement agencies is necessary for appropriate planning for an RDD or IND incident—which they generally consider as low-level threats—but only half of the respondents indicated that they were getting sufficient intelligence information. Emergency management officials from FEMA and EPA regional offices generally concurred with these observations and suggestions of the city and state respondents.

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## The United Kingdom’s Handling of the 2006 Polonium Incident and Subsequent Actions to Better Prepare for an RDD or IND Incident

While it was more limited in scope than what is usually envisioned as an RDD incident, the aftermath of the 2006 polonium poisoning incident in London had many of the characteristics of an RDD including testing hundreds of people who may have been exposed to radiation and a cleanup of numerous radiation-contaminated areas. All this activity resulted from an amount of radioactive material the size of a grain of salt—many times smaller than the amount of radioactive material found in certain common medical devices that could be used in an RDD. Because of its experience in dealing with the cleanup from the 2006 polonium incident and other actions the United Kingdom has taken to prepare for an RDD or IND attack, we visited that country to examine its recovery preparedness programs. United Kingdom officials told us that the attention to recovery

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in their country is rooted in decades of experience with the conflict in Northern Ireland, dealing with widespread contamination from the Chernobyl nuclear power plant accident, and a national history of resilience—that is, the ability to manage and recover from hardship. We found that actions the United Kingdom reported taking to prepare for recovery from RDD and IND incidents are similar to many of the suggestions for improvement in federal preparedness that we obtained through our survey of city, state, and federal regional office emergency management officials in the United States. For example, we found that the United Kingdom reported taking the following actions:

- Enacted civil protection legislation in 2004, with subsequent non-statutory emergency response and recovery guidance to complement this emergency preparedness legislation. The emergency response and recovery guidance describes the generic framework for multi-agency response and recovery for all levels of government. The guidance emphasizes that response and recovery are not discrete activities and do not occur sequentially, rather recovery should be an integral part of response from the very beginning, as actions taken at all times can influence longer-term outcomes of the communities.
- Developed on-line, updatable national recovery guidance in 2007. This guidance reinforces and updates the early emergency response and recovery guidance by establishing, among other things, a recovery planning process during the response phase so that the potential impacts of early advice and actions are explored and understood for the future recovery of the affected areas.
- Issued a national handbook for radiation incidents in 2008. This handbook provides scientific information, including checklists for planning in advance of an incident, fact sheets on decontamination approaches, and advice on how to select and combine management of these approaches.
- Conducted a full-scale RDD recovery exercise in 2008. This exercise, involving several hundred participants, provided a unique opportunity to examine and test the recovery planning process within the urgency of a compressed time frame. The lessons learned from this exercise were incorporated into the United Kingdom's recovery strategy.
- Issued updated nuclear recovery plan guidance in 2009. This guidance provides direction on recovery from events involving a radiological release from a civil or defense nuclear reactor, as well as the malicious use of radiological or nuclear materials. Among other things, it requires that all

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high-risk cities in the United Kingdom prepare recovery plans for such incidents.

In addition to these initiatives, in 2005, the United Kingdom established a special Government Decontamination Service. This organization was created out of recognition that it would not be cost-effective for each entity—national, regional, and local government—to maintain the level of expertise needed for cleaning up chemical, biological, radiological, and nuclear materials, given that such events are rare.<sup>19</sup>

Finally, according to United Kingdom officials, the 2006 polonium incident in London showed the value of recovery planning. In particular, through this incident United Kingdom officials gained an appreciation for the need to have an established cleanup plan, including a process for determining cleanup levels, sufficient laboratory capacity to analyze a large quantity of samples for radiation, and procedures for handling the radioactive waste. Furthermore, they found that implementing cleanup plans in the polonium poisoning incident and testing plans in the November 2008 recovery exercise have helped the United Kingdom to better prepare for a larger RDD or IND incident.

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Madam Chairwoman, this completes my prepared statement. I would be happy to respond to any questions that you or other Members of the Subcommittee may have at this time.

For further information about this testimony, please contact me at (202) 512-3841 or [aloisee@gao.gov](mailto:aloisee@gao.gov). Individuals who made important contributions to this testimony were Ned Woodward (Assistant Director), Nancy Crothers, James Espinoza, Tracey King, Thomas Laetz, Tim Persons, Jay Smale, and Keo Vongvanith.

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<sup>19</sup>The Government Decontamination Service is similar in size and responsibilities to EPA's National Decontamination Team, which became fully operational in August 2007.

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