



DOE Shipments and Response Resources

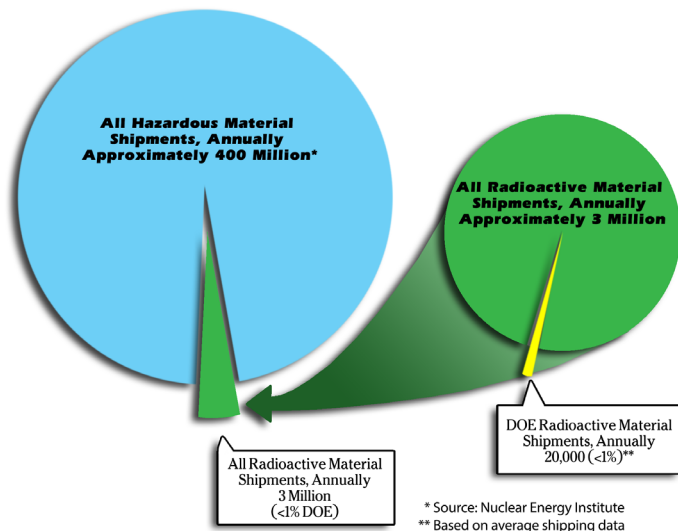
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OVERVIEW

During the late 1970's, the Department of Energy (DOE) emphasized energy development and regulation. In recent history, the Department has shifted its emphasis and focus as the needs of the nation have changed. In the 1980's, nuclear weapons research, development, and production took a priority. Since the end of the Cold War, the Department has focused on environmental cleanup of the nuclear weapons complex, nonproliferation, and stewardship of the nuclear stockpile. As a result, the transportation of radioactive material, radioactive waste, and other hazardous material has become a substantial part of many DOE programs.

Types of radioactive material shipped by DOE include:

- Material and isotopes for medical and research uses
- Weapons and weapons-related material
- Low and high-level radioactive waste
- Transuranic waste
- Special nuclear material¹
- Navy and research reactor spent nuclear fuel
- New (unirradiated or unused) nuclear fuel



¹ "Special nuclear material" (SNM) is defined by the Nuclear Regulatory Commission as plutonium, uranium-233, or uranium enriched in the isotopes uranium-233 or uranium-235.



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Rail Transport

Rail transportation is used for all types of radioactive material/waste shipments. The most significant difference between rail and truck is the size of the package. Trains can carry very large and heavy packages—those too heavy for trucks. In addition, trains are often used to carry large volumes of low-level radioactive waste.



Air Transport

Shipments made by air consist primarily of medical and research isotopes. These materials are very lightweight and must be delivered quickly, because of their short half-lives. Transportation of radioactive material by air is very tightly regulated. The pilot of the aircraft must sign a manifest acknowledging the presence of the material on the plane. Radioactive material on aircraft must be in packages that are able to withstand the conditions of air transport, such as pressure changes, and must be stored in designated locations.



Water Transport

Transport of radioactive material by water exists in two broad classifications: ocean and river. Ocean transport of radioactive material includes both low-level radioactive ores and high-level items, such as foreign research reactor spent nuclear fuel. Vessels carrying radioactive material into the United States must conform with very stringent Coast Guard regulations regarding entry into U.S. waters. River vessels carry material similar to that shipped by truck or train. Access to suitable port facilities, and the resulting need to transfer the material from barge to truck or train, limits the transport of radioactive material by water.



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How TRANSCOM Works

The TRANSCOM system uses satellites, transponders, computers, and networks to gather and exchange data related to a shipment being monitored. A transponder on the transport vehicle transfers position and message information to satellites. Satellites are linked to a ground station where data is collected.



The collected data is transferred automatically to the TRANSCOM control center (TCC) operated by DOE. Computers at the TCC process the raw data into maps and tables that are made available to authorized users via the Internet.

Carrier/Driver Requirements

Carriers must possess a DOT safety rating of satisfactory, must have been approved for DOE by the Motor Carrier Evaluation Program (MCEP), and have a contract or tender currently on file. Drivers must present evidence of radioactive material transportation training and must possess a valid Commercial Drivers License. DOE reserves the right to reject carrier equipment that is, or appears to be, in disrepair. Carriers must show evidence of sufficient insurance coverage along with proof of hazardous material transport registration with the U.S. DOT.

Vehicle Inspections

The Commercial Vehicle Safety Alliance (CVSA), under a cooperative agreement with DOE, developed an inspection standard for shipments of spent nuclear fuel and other high-level radioactive material shipments. The goal was to develop a standard which would ensure the protection and safety of people and the environment by setting and enforcing rigid inspection standards and safeguards for the transportation of radioactive material.





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TRANSPORTATION PROTOCOLS

Transportation Routing

DOE hazardous material shipments will generally follow the U.S. DOT hazardous and/or radioactive material routing requirements, using preferred road routes or preferred alternatives. All surface routes are chosen based on the intent of the road routing regulations, which are to minimize the time in transit for hazardous shipments. DOE pre-identifies its routes for high visibility and Highway Route Controlled Quantity (HRCQ) shipments. For these shipments, DOE also provides a seven day advance notice to each effected state's governor's designated point of contact.

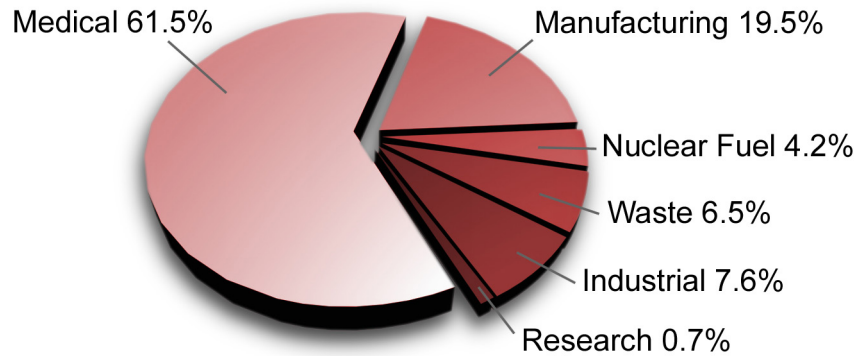


The map above shows the major routes that are used to transport radioactive waste to DOE disposal locations. Routing through each state has been determined with direction from the effected states and appropriate Governors' Associations.



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The pie chart above illustrates the types of radioactive material shipments being transported over U.S. highways by the U.S. Department of Energy and other shippers. According to a Department of Transportation database that tracks accident information², between January 2014 and December 2023 there were 182,228 transportation-related incidents (air, highway, and rail) involving hazardous material. Of these incidents, only 46 (0.025%) involved radioactive material. Of the 46 incidents involving radioactive material, 27 were by air, 17 by highway, and 4 by rail. This information shows that the number of transportation incidents involving radioactive material is minimal compared to the total number of shipments.

Public Interaction

Public reaction to incidents involving the transportation of radioactive material is often more extreme than to incidents involving other types of hazardous material. A lack of technical knowledge on the part of the public and the media may lead to a public response that is based on mistaken perceptions.

Fear of the unknown is a factor that may cause overreaction to any event involving radioactive material. Many hold the mistaken belief that any incident involving radioactive material is more dangerous than one involving another class of hazardous material.

² Data and summary statistics obtained from the Hazardous Materials Incident Report Form 5800.1. 10 Year Incident Summary Reports may be viewed at: <https://www.phmsa.dot.gov/hazmat-program-management-data-and-statistics/data-operations/incident-statistics>



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Event Scene Sources of Information

The IC is the best and primary source of information at the incident scene. Other than the IC, the best sources for information at the scene of an incident involving radioactive material are on-scene personnel. It is best to obtain quotable information from “believable” sources. According to risk communication studies³, “believable” sources include the following agencies in the order given:

1. Emergency medical personnel
2. Fire department
3. State police department
4. Local police department
5. State environmental or health agency

Social Media

The use of social media such as Facebook, YouTube, Instagram, TikTok, and X have become a powerful tool to reach members of the general public with timely information during an emergency. Because members of the general public often lack technical knowledge, social media can be especially useful in providing direct internet links to credible sources of technical information. Organizations should recognize the usefulness of social media and have a strategy in place to implement these types of communication activities during an incident.

RESPONSE AGENCIES AND RESOURCES

Once all initial response actions have taken place, additional support may be needed to complete resolution of the incident scene. There are numerous local, state, and federal agencies that can provide support during a transportation incident involving radioactive material. These agencies become involved in an emergency response effort when requested to do so by state, tribal, or local government officials. Local response departments should always contact federal response agencies through their appropriate state agency. The following information summarizes local, state and federal response and informational resources available to PIO's and emergency response organizations.

³Jenkins-Smith, Hank, and Carol Silva. How entrenched is public Opposition to Nuclear Materials Transport Programs?: The Case of the Cs-137 Transportation Program. University of New Mexico Institute for Public Policy.



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Federal Agencies

Federal agencies can be divided into two categories—those that can provide assistance and those that are reporting agencies only. Federal agencies typically become involved when requested to do so by state, tribal, or local government. You should be aware that in some jurisdictions the responsibility and/or authority for requesting federal assistance might be vested in a state or local agency.

Federal agencies providing direct assistance include:

National Response Center (NRC)

The primary function of the National Response Center is to serve as the sole national point of contact for reporting all oil, chemical, radiological, biological, and etiological discharges into the environment anywhere in the United States and its territories. In addition to gathering and distributing spill data for federal on-scene coordinators and serving as the communications and operations center for the National Response Team, the NRC maintains agreements with a variety of federal entities (including DOE) to make additional notifications regarding incidents meeting established criteria. The 24-hour emergency response phone number for the National Response Center is (800) 424-8802.

Nuclear Regulatory Commission (NRC)⁴

The U.S. Nuclear Regulatory Commission is an independent agency established by Congress to ensure adequate protection of the public health and safety, the common defense and security, and the environment in the use of nuclear material in the United States. The NRC's scope of responsibility includes regulation of commercial nuclear power reactors; non-power research, test, and training reactors; nuclear fuel cycle facilities; medical, academic, and industrial uses of nuclear material; and, the transport, storage, and disposal of nuclear material and waste. The NRC has a response team that can be dispatched to a fixed facility incident from one of its four Regional Offices.

The 24-hour emergency response contact number for the Nuclear Regulatory Commission is (301) 816-5100.

⁴ Both the Nuclear Regulatory Commission and the National Response Center are commonly referred to as the "NRC." When making the determination to contact one of these agencies, be specific about which agency you are referring to.



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U.S. Department of Energy's National Nuclear Security Administration (NNSA)

The Department of Energy's semi-autonomous National Nuclear Security Administration (NNSA) has the Nuclear Emergency Support Team (NEST) that is structured as a multi-mission nuclear emergency response capability that leverages the Department of Energy's world-class scientists and technical experts to contend with the Nation's most pressing radiological and nuclear challenges.

NEST is the umbrella designation that encompasses all DOE/NNSA radiological and nuclear emergency response functions, some of which date back more than 60 years. These include all field-deployed and remote technical support to the Nation's countering weapons of mass destruction (WMD) operations, including Preventive Nuclear and Radiological Detection (PNRD) and threat-based nuclear search; public health and safety missions, including radiological consequence management; and responses to U.S. nuclear weapon accidents and incidents. Additionally, NEST maintains operational capabilities that enable nuclear forensic analysis of nuclear material used in an improvised nuclear device or interdicted outside of regulatory control. NEST's motto – "Scientifically Informed, Operationally Focused" – reflects the technical underpinning of its diverse operational missions.

NEST conducts operations in close coordination with federal mission partners, including the Federal Bureau of Investigation (FBI), Department of Defense (DoD), and Department of Homeland Security (DHS), as well as state, local, tribal, and territorial governments during crises. As part of its long-term strategy, NEST continues to enhance regional capabilities to conduct time-critical actions to protect the public, key infrastructure, and the environment from nuclear and radiological dangers. Additionally, NEST ensures that cutting-edge technology and scientific innovation are continuously incorporated into its operations.

NEST's radiological emergency response assets are listed on the following pages.



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DOE Forensics Operations (DFO)

The DOE Forensics Operations (DFO) team is composed of technical experts from across the National Laboratory complex who are trained and equipped to perform nuclear forensics analysis following a nuclear detonation in support of the interagency effort to identify the perpetrator of the attack. DFO supports ground collection and processing of post-detonation debris to provide the highest quality samples for forensic analysis.

Federal Radiological Monitoring and Assessment Center (FRMAC)

FRMAC coordinates the federal radiological monitoring, assessment, and evaluation of data when a radiological emergency has occurred. Established as needed, it is fully operational within 24-36 hours after assistance is requested. The FRMAC gathers radiological information such as plume and deposition predictions, air and ground concentrations, exposure rates and dose projections, assurance of data quality, current meteorological conditions and weather forecasts, and provides the results of the data collection, sample analysis, evaluations, assessments, and interpretations to the coordinating federal agency and state officials. Monitoring continues until all of the surrounding areas where radioactivity was released are fully evaluated.

Joint Technical Operations Team (JTOT)

The Joint Technical Operations Team provides rapidly deployable technical and operational support to the FBI and DoD to counter WMD threats, including nuclear and radiological devices. Established in 1997, JTOT ensures that the full breadth of NNSA's scientific knowledge of nuclear weapons and devices is brought to bear during the response to a nuclear threat, including technical support from the National Laboratories. JTOT personnel are on-call 365 days per year / 24 hours per day to respond to nuclear incidents.

JTOT personnel are closely involved in the execution of the "Capability Forward" initiative. Under this program, FBI counter-WMD teams in American cities are trained and equipped to take decisive action to defeat WMD threat devices, accelerating life-saving responses to nuclear and radiological attacks.



National Atmospheric Release Advisory Center (NARAC)

When an emergency occurs, NARAC predicts the probable spread of nuclear, chemical, biological, or hazardous material contamination into the atmosphere to help officials and federal agencies react quickly. It also assesses natural disasters such as volcanic ash clouds, earthquake-induced hazardous spills, man-made disasters such as the Kuwaiti oil fires, and toxic chemical releases. For NARAC-supported sites, critical information can be delivered as quickly as 5 to 10 minutes after accident information is received. For non-supported sites, it usually takes less than 1 hour.

National Search Team (NST)

The National Search Team (NST) is composed of scientists, engineers, and technical support personnel from the DOE National Laboratories. Equipped with specialized training and advanced instrumentation, NST personnel stand ready to search for nuclear threat devices based on a variety of signatures and intelligence in concert with federal mission partners. These capabilities are highlighted in the 2018 National Strategy for Countering Weapons of Mass Destruction Terrorism, which notes the U.S. Government’s ability to deploy “highly mobile, responsive counter-WMD teams that can search for dangerous material over wide areas based on a variety of threat intelligence.” Once a nuclear or radiological threat device is interdicted, the specialized knowledge and equipment of NEST’s Joint Technical Operations Team is used to characterize and render the device safe.

Nuclear Forensics - Material Analysis Program (NF-MAP)

The primary mission of the Nuclear Forensics-Material Analysis Program (NF-MAP) is to receive and characterize pre-detonation nuclear material samples to support attribution of an attempted or actual nuclear event. NF-MAP supports both law enforcement efforts to hold perpetrators accountable for illicit uses of nuclear material, as well as national decision-making surrounding a nuclear security event. Nuclear forensics results for law enforcement investigations must meet current standards for admissibility of evidence at trial. The DOE/NNSA national laboratories capable of determining nuclear material characteristics at the highest level

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of quality to meet these standards are designated as NF-MAP laboratories. The NF-MAP laboratories are supported by analyses performed at National Nuclear Materials Archive laboratories, which identify, collect, preserve, and analyze forensically valuable nuclear material specimens.

Radiation Emergency Assistance Center/Training Site (REAC/TS)

REAC/TS has assisted in more than 1,200 incidents involving radiation from local, national, and international incidents. Its physicians, registered nurses, EMT-paramedics, health physicists, radiobiologists, and coordinators are on call 24-hours a day for consultations or direct medical care to people at the REAC/TS facility or the accident site. This highly trained and qualified team is prepared to conduct medical and radiological triage, decontamination procedures, DTPA chelation therapy, Prussian Blue therapy, diagnostic and prognostic assessments of radiation injuries, and dose estimates that include cytogenetic analysis, bioassay, and in-vivo counting.

Radiological Assistance Program (RAP)

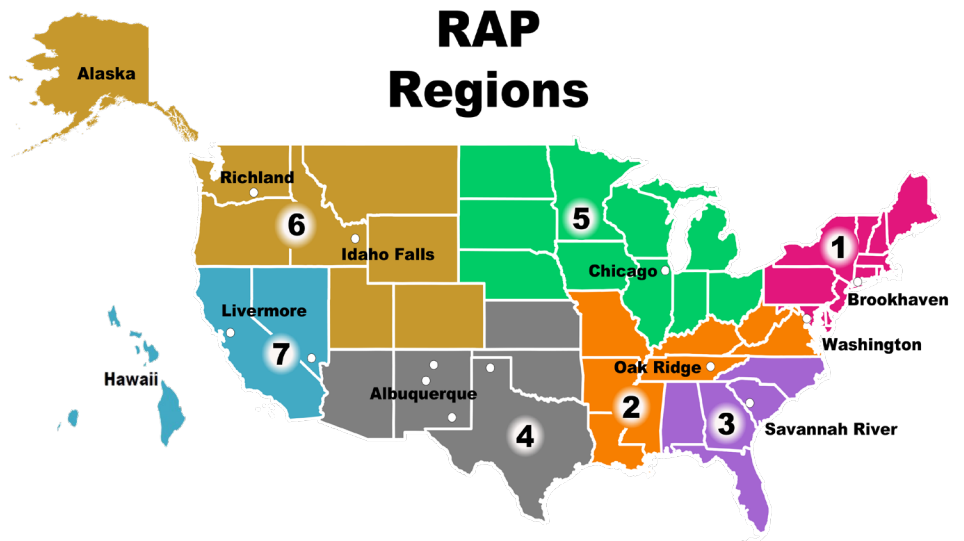
RAP is capable of providing assistance in all types of radiological incidents. It provides trained personnel, equipment, monitoring, and assessment assistance to DOE program elements, other federal agencies, state, tribal, and local governments. It is usually the first responding NNSA resource in assessing a radiological emergency, and advises on what further steps should be taken to minimize hazards. RAP teams arrive at the scene within four to six hours after notification of an emergency to conduct the initial radiological assessment of an effected area and determine, along with the state and coordinating federal agency, what actions to take and if additional resources are needed.



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Region	Regional Response Center	Location	24-Hour Number
0	National Capitol Region	Washington DC	(202) 586-8100
1	Brookhaven Area Office	Upton, L.I., NY	(631) 344-2200
2	Oak Ridge Operations Office	Oak Ridge, TN	(865) 576-1005
3	Savannah River Operations Office	Aiken, SC	(803) 725-3333
4	NNSA Service Center	Albuquerque, NM	(505) 845-4667
5	Chicago Operations Office	Argonne, IL	(630) 252-4800
6	Idaho Operations Office	Idaho Falls, ID	(208) 526-1515
6	Richland Operations Office	Richland, WA	(509) 373-3800
7	Livermore Site Office	Livermore, CA	(925) 422-7595





OTHER TECHNICAL RESOURCES

In addition to local, state, and federal agencies, there are numerous published technical references that the responder can use to collect hazard and response information from during an event. A brief listing of some of these reference documents include:

- ASTM E 2601, Standard Practice for Radiological Emergency Response
- Centers for Disease Control and Prevention, Population Monitoring in Radiation Emergencies: A Guide for State and Local Public Health Planners
- National Urban Security Technology Laboratory Radiological Dispersal Device (RDD) Response Guidance: Planning for the First 100 Minutes
- National Council on Radiation Protection and Measurements Reports No. 161-I and 161-II, Management of Persons Contaminated with Radionuclides
- U.S. Environmental Protection Agency, PAG Manual: Protective Action Guides and Planning Guidance for Radiological Incidents
- The Waste Information Management System (WIMS) provides a user-friendly online system to gather, organize, and present waste forecast data from DOE sites. This system provides a method for identification of waste forecast volumes, material classes, disposition pathways, and potential choke points and barriers to final disposition. To create an account visit www.emwims.org.

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Check Your Understanding

1. Which of the following is an example of radioactive material shipped by the DOE?
 - a. Material and isotopes for medical and research uses
 - b. Weapons and weapon-related material
 - c. Special nuclear material
 - d. All of the above
2. The majority of DOE's radioactive material/waste shipments are made by which of the following transportation modes?
 - a. Air
 - b. Highway
 - c. Rail
 - d. Water
3. As an enhanced safety measure, DOE monitors some of its shipments using the _____ system.
4. During a pre-shipment CVSA enhanced inspection, if the vehicle, drivers, and cargo do not pass the inspection, the vehicle is:
 - a. Not allowed to travel faster than 35 m.p.h.
 - b. Given a fine
 - c. Not allowed to leave the point of origin
 - d. All of the above are correct
5. Which agency is most believable as far as the public is concerned?
 - a. State police
 - b. Emergency medical personnel
 - c. State EPA
 - d. Federal PIO

ANSWERS

1. d
2. b
3. TRANSCOM
4. c
5. b
6. Radiological Assistance Program
7. True

6. The DOE _____ teams provide on-scene or telephone assistance including technical advice concerning radiological material and equipment.
7. Anyone may call their DOE Regional Response Center to get information, advice, or assistance. True/False.