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Department of Energy (DOE)  
Office of Science (SC)  
Transportation Overview

**Jon W. Neuhoff, Director  
New Brunswick Laboratory**

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**About the Office of Science**

The Office of Science (SC) with a budget of approximately \$5 Billion...

- Single largest supporter of basic research in the **physical sciences** in the U.S. (> 40% of the total funding)
- Principal Federal funding agency for the Nation's research programs in **high energy physics, nuclear physics, and fusion energy sciences**
- Manages fundamental research programs in **basic energy sciences, biological and environmental sciences, and computational science**
- Federal Government's largest single funder of **materials and chemical sciences**
- Supports unique and vital parts of U.S. research in **climate change, geophysics, genomics, life sciences, and science education**
- About a third of SC funding goes to support research at more than 300 colleges and universities nationwide

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## Programs in the Office of Science

**ADVANCED SCIENTIFIC COMPUTING RESEARCH**  
*Deliver Computing for the Frontiers of Science*

- > Computer science and software research
- > Extending science through computation and collaboration
- > Supercomputing technologies for science
- > Computational and network infrastructure and tools

**HIGH ENERGY PHYSICS**  
*Explore the Fundamental Interactions of Energy, Matter, Time, and Space*

- > Explore unification of the forces and particles of nature
- > Understand the cosmos and the destiny of the universe
- > Develop the tools for scientific revolutions to come

**BASIC ENERGY SCIENCES**  
*Advance the Basic Sciences for Energy Independence*

- > Materials sciences and engineering research
- > Chemical sciences, geosciences, and physical biosciences research
- > Nanoscale science, engineering, and technology research
- > Scientific user facilities to understand materials and perform nanoscale science

**NUCLEAR PHYSICS**  
*Explore Nuclear Matter – from Quarks to Stars*

- > Studies of hot, dense nuclear matter
- > The quark structure of matter
- > Nuclear structure/astrophysics, fundamental symmetries, and neutrinos

**BIOLOGICAL AND ENVIRONMENTAL RESEARCH**  
*Harness the Power of Our Living World*

- > Bioenergy research
- > Genomics and low dose radiation research
- > Climate change research
- > Environmental remediation sciences
- > Medical sciences

**WORKFORCE DEVELOPMENT FOR TEACHERS AND SCIENTISTS**  
*Train the Next Generation of Scientists and Engineers to Maintain U.S. Scientific and Technological Leadership*

- > Student internships at national laboratories
- > Fellowships for distinguished science, technology, engineering, and mathematics educators
- > The DOE National Science Bowl® for high school and middle school students

**FUSION ENERGY SCIENCES**  
*Bring the Power of the Stars to Earth*

- > Harnessing fusion energy through basic research in plasma and fusion sciences
- > ITER, the international burning plasma experiment

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## Office of Science National Laboratories

★ Headquarters | Washington, DC  
● Office of Science National Laboratories  
● Office of Science Site Offices  
● Office of Science Integrated Support Offices  
● Government Owned Government Operated

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## SC University-Based Research

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## Overview of SC Transportation Activities

- The DOE Office of Science has the responsibility to oversee a wide variety of radioactive and hazardous material shipments
- Primary goal is to continue maintaining our excellent safety record for shipments in commerce (protect the public and environment)
- This is done through:
  - Transportation activities conducted in compliance with all regulations
  - Extensive coordination with other DOE Programs and external regulators
  - Proactive stakeholder involvement
  - Robust internal oversight of transportation activities




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## Overview of SC Transportation Activities

35% Radioactive Shipments (high volume/low number)

65% Hazardous Shipments



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## Types of Radioactive and Hazardous Materials/ Associated with Research and Development

- **Sealed Sources:** range from small calibration check sources to neutron/gamma irradiation sources
  - Small calibration check sources more common
  - Typically shipped Type A, special form
- **Samples:** SC user facilities (at labs listed below) host thousands of visiting researchers from universities and private companies
  - Most radioactive samples are small DOT exempt, limited quantity, or low specific activity quantities
  - Argonne National Laboratory
  - Brookhaven National Laboratory
  - Lawrence Berkeley National Laboratory
  - Oak Ridge National Laboratory
  - Pacific Northwest National Laboratory



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## Types of Radioactive and Hazardous Materials/ Waste Associated with Research and Development

- Waste: SC waste is produced from demolition of old facilities (rubble), soil remediation, and nuclear material disposition
  - Low level waste/non-placarded shipments
  - FY 2009 – 2,500 cubic meters shipped for off-site treatment or disposal
  - Projected FY 2010 – 9,000 cubic meters of low-level waste shipments due to surge in ARRA projects at SC sites involving demolition/remediation




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## Types of Radioactive and Hazardous Materials/ Waste Associated with Research and Development

- Type A Shipments: infrequent and usually associated with separation science or nuclear research at:
  - Argonne National Laboratory
  - Oak Ridge National Laboratory
  - Pacific Northwest National Laboratory




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## Types of Radioactive and Hazardous Materials/Waste Associated with Research and Development



- Type B Shipments are the least common shipments and are currently limited to spent nuclear fuel transfers and nuclear material deinventory/consolidation efforts from Argonne National Laboratory and Oak Ridge National Laboratory
  - Transuranic waste shipments to WIPP and Idaho National Laboratory
  - Nuclear material consolidation efforts to NNSA sites



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## High Energy Physics and Nuclear Physics

- Isotope Production and Applications Subprogram
  - Production of radioactive and stable isotopes that are in short supply for research and applications (e.g., energy, medical)
  - Goal is to make critical isotopes more readily available to meet domestic U.S. needs
  - Supports isotope production at a suite of university, National Laboratory and commercial accelerator/reactor facilities throughout the Nation to promote a reliable supply of domestic isotopes
  - Steward of:
    - Isotope Production Facility (IPF) at Los Alamos National Laboratory LANSCE
    - Linear Isotope Producer Facility (BLIP) at Brookhaven National Laboratory
    - Hot cell facilities for processing isotopes at Brookhaven National Laboratory, Los Alamos National Laboratory and Oak Ridge National Laboratory

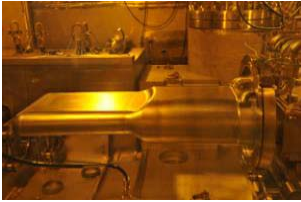


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## High Energy Physics and Nuclear Physics

➤ Accelerator Components

- Targets are rarely shipped due to long experiment times and storage to allow the radioactive dose to decrease prior to shipment for disposal
  
- Periodic shipments of excess depleted uranium calorimeters and shielding from accelerator facilities:
  - Argonne National Laboratory
  - Brookhaven National Laboratory
  - Lawrence Berkeley National Laboratory
  - SLAC National Accelerator Laboratory
  - Thomas Jefferson National Accelerator Facility


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## High Energy Physics and Nuclear Physics

- Periodic accelerator facility upgrades produce activated metals and concrete waste
  - Low Specific Activity (LSA) shipments with relatively short-lived radionuclides
  
- Neutron sources usually used for startup and calibration are shipped for re-use as Type A special form to Los Alamos National Laboratory for disposal at WIPP







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## Basic Energy Sciences

- Light Source Samples: Generally exempt quantities or Low Specific Activity (LSA) irradiated samples
- New Brunswick Laboratory Certified Reference Materials: Uranium, thorium, and plutonium certified reference materials, as well as intercomparison test samples, are shipped domestically and internationally as exempt, limited quantity, or Type A
- Nuclear Chemistry: Fundamental nuclear research and separation sciences utilizes a wide array of radiological materials ranging from exempt quantities to Type B fissile:
  - Argonne National Laboratory
  - Brookhaven National Laboratory
  - Oak Ridge National Laboratory
  - Pacific Northwest National Laboratory


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## Basic Energy Sciences


- The Spallation Neutron Source (SNS) is an accelerator-based neutron source in Oak Ridge, Tennessee
- This one-of-a-kind facility provides the most intense pulsed neutron beams in the world for scientific research and industrial development
- Materials shipped include :
  - Research samples, which are primarily shipped by international air
  - Radioactive waste (~ 10/yr)
  - Hazardous waste (~3/yr)



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## Multi-DOE Programs

- Although other programs and agencies fund research and development at Office of Science laboratories, the Office of Science is responsible for shipments
  - Site Office Oversight
  - Transportation Safety/Security Plans
  - Program Reviews
- Multi-program labs include: Argonne National Laboratory, Brookhaven National Laboratory, Lawrence Berkeley National Laboratory, Pacific Northwest National Laboratory and Oak Ridge National Laboratory
- Office of Science laboratories have similar types of wastes as any other DOE multi-program site


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## SC High Interest Shipments

- Nuclear Energy reactor fuel research at Argonne National Laboratory, Oak Ridge National Laboratory and Pacific Northwest National Laboratory
  - Requires Type A and Type B shipments
  - Waste streams are consolidated at Idaho National Laboratory and Savannah River Site as spent fuel or at WIPP as transuranic waste.





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## SC High Interest Shipments

- High Flux Isotope Reactor (HFIR) Spent Fuel Shipments
  - Since 1995, approximately 100 HFIR shipments have been conducted from Oak Ridge National Laboratory to the Savannah River Site , with as many as 14 being conducted in one calendar year
  - The Type B shipping package is a DOE-owned cask (GE-2000) specifically adapted for HFIR elements
  - Approval has been received for 12 shipments this fiscal year and probably 8 shipments next fiscal year based on Savannah River Site storage considerations

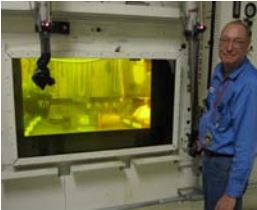


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## SC High Interest Shipments

- Argonne National Laboratory shipment of material derived from sodium bonded fuel research will be shipped to Idaho National Laboratory for treatment
  - A Type B specifically adapted NAC-LWT cask will be used
  - One shipment will take place in the Fall of 2010



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## SC High Interest Shipments

Shipment of GE-2000 and NAC-LWT Casks:

- ✓ Shipment schedule and routing are considered restricted information for security reasons
- ✓ Commercial Vehicle Safety Alliance safety inspections are conducted prior to each shipment
- ✓ These shipments are escorted by state troopers and monitored by TRANSCOM





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## SC ARRA Funded Projects

- Lawrence Berkeley National Laboratory's Bevatron accelerator decontamination and decommissioning is currently under way
  - Demolition expected through 2011
  - Very low activity waste/non-placarded
  - Shipped to the Nevada Test Site
  - Approximately 8 trucks per day




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### SC ARRA Funded Projects

- FY2010 removal of New Brunswick Laboratory's legacy ventilation system for a fire protection upgrade project



- Will generate 4 B-25 low level waste containers and 4 85-gallon transuranic waste containers
- Low level waste will be shipped to the Nevada Test Site
- Transuranic waste will be transferred by Argonne National Laboratory to Idaho National Laboratory or WIPP for disposal

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### EM ARRA Funded Projects at SC Sites

- Oak Ridge National Laboratory will have numerous decontamination and decommissioning projects in the main campus area of the Laboratory in 2010-2011, with the majority of the waste shipments being disposed of at an onsite disposal cell
  - A smaller number of shipments will go to either the Nevada Test Site or Energy Solutions (Utah)
- Brookhaven National Laboratory's major campaign to ship Brookhaven Graphite Research Reactor radioactive graphite to the Nevada Test Site





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## EM ARRA Funded Projects at SC Sites






- SLAC National Accelerator Laboratory low specific activity activated components from an accelerator facility shutdown transferred to the Nevada Test Site and Energy Solutions (Utah)
- Argonne National Laboratory decontamination and decommissioning of former nuclear facilities
  - Rubble shipped to Nevada Test Site or Energy Solutions (Utah)
  - Most debris non-DOT radioactive waste (below DOT Class 7)

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## EM ARRA Funded Projects at SC Sites

- Argonne National Laboratory remote-handled transuranic waste shipments to WIPP
- Argonne National Laboratory contact-handled transuranic campaign to Idaho National Laboratory



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## Stakeholder Involvement

- Coordination with EM-45, Office of Packaging and Transportation.
  - Transportation Security Plans
  - Routing
  - Reviews
  - Stakeholder Outreach Plans
- SC tailors involvement with site location and stakeholder interests
  - For example, Brookhaven National Laboratory has special arrangements with New York City and other local bodies (Port Authority, Suffolk County, etc.) for shipping through New York City
- Even though most SC shipments are low activity and therefore don't require notification to stakeholders, SC still provides information through the National Environmental Policy Act process and Site Environmental Reports for waste management activities through sites

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## SC Transportation Safety/Oversight

- DOE Transportation Safety & Operations Compliance Assurance Program
  - Coordination with EM-45, Office of Packaging & Transportation
  - Teams consist of Federal employees and contractors from SC, EM and NNSA
  - Evaluate all areas of site transportation and packaging
- Coordination with EM and NNSA
  - National Transportation Stakeholders Forum (NTSF)
  - Packaging Management Council (PMC)
  - Secure Transportation and Packaging Steering Committee (STPSC)
  - Directives development and coordination
  - Transportation safety issues coordination
- Independent oversight from external organizations such as DOE-HSS and DOT
- Safe Transport – shipments in commerce in compliance with DOT using Motor Carrier Evaluation Program listed carriers

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# Questions?



**ENERGY**  
LEADING BASIC RESEARCH  
FOR A SUSTAINABLE FUTURE

**ENVIRONMENT**  
UNDERSTANDING CLIMATE CHANGE AND  
IMPROVING THE ENVIRONMENT

**INNOVATION**  
BUILDING RESEARCH INFRASTRUCTURE AND  
PARTNERSHIPS THAT FOSTER INNOVATION

**DISCOVERY**  
UNRAVELING NATURE'S  
DEEPEST MYSTERIES

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