



*A Basic Overview of*  
**NUCLEAR SAFETY**  
**AT THE**  
**DEPARTMENT OF ENERGY**

*Outreach & Awareness Series*



*Office of Health, Safety and Security (HSS)*  
*U.S. Department of Energy*

September 2010

# *A Basic Overview of* **Nuclear Safety at the Department of Energy**

## **OVERVIEW**

The U.S. Department of Energy (DOE) is committed to conducting its nuclear operations in a manner that protects the public, the environment, and its workers. DOE ensures safe operations by (1) designing its nuclear facilities per rigorous safety standards that require detailed documented safety analyses and multiple layers of protection against the release of hazardous materials; (2) operating its facilities with highly qualified and trained personnel using well-defined procedures; and (3) maintaining its facilities' safety systems in accordance with well-defined programs. Furthermore, a rigorous quality assurance program is invoked to ensure that all aspects of facility safety from design calculations, equipment procurement and facility construction, to operations and maintenance are properly conducted.

This pamphlet is developed as part of the Office of Health, Safety and Security's (HSS) outreach and awareness campaign to proactively advance safe execution of the DOE mission. It is intended to provide an abbreviated summary of regulatory requirements and processes for ensuring nuclear safety at DOE, which serve as the Department's overarching regulatory framework for nuclear safety. The safety of workers and safe execution of the DOE mission are DOE line management's responsibility. However, its ultimate success depends greatly on the collective and informed collaboration of many stakeholders, including DOE Headquarters; Field Offices; safety, environment, health, and security professionals; Federal and contractor organizations; and workers.

HSS stands ready to provide programmatic consultation, scientific subject matter expertise, and technical assistance related to a wide range of nuclear safety issues and topics. Please do not hesitate to contact us with any questions or need for assistance.

# Table of Contents

Types of Nuclear Operations, Facilities, and Hazards..... 1

Nuclear Safety Policies and Requirements..... 2

Nuclear Facility Management and Operation..... 4

Oversight and Enforcement ..... 5

DOE/NNSA Sites with Nuclear Facilities ..... 7

Appendix A – List of Nuclear Safety Directives, Orders,  
Guidance, and Technical Standards..... 8

Appendix B – Summary of Nuclear Safety Regulatory  
Roles and Responsibilities ..... 9

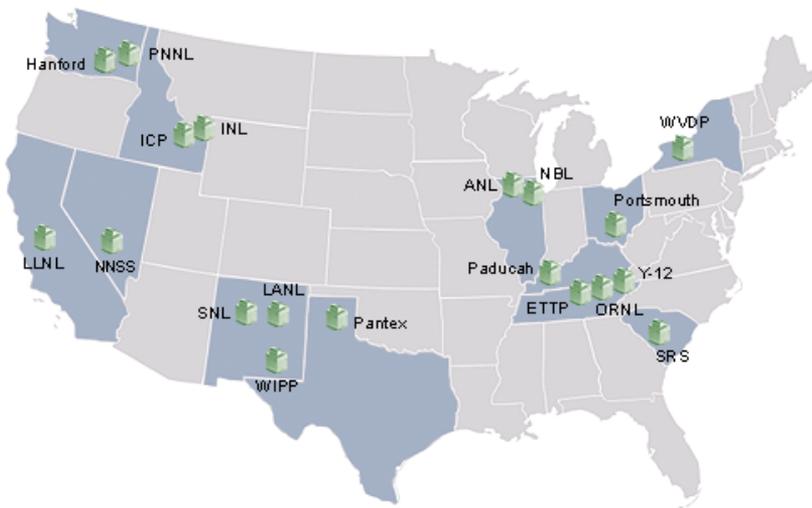
Available Resources for Further Information ..... 11

Points of Contact ..... 11



## Types of Nuclear Operations, Facilities, and Hazards

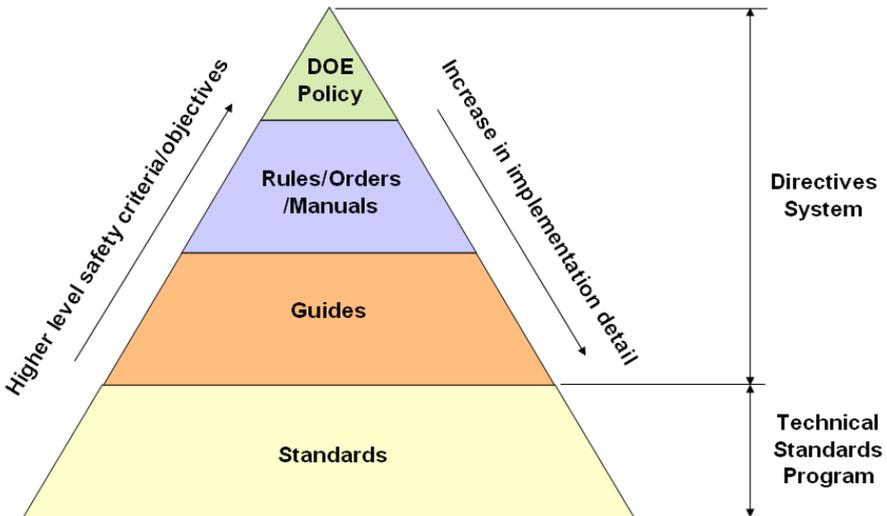
DOE conducts three basic types of nuclear operations: Nuclear Weapons Stockpile Maintenance; Research; and Environmental Cleanup. The operations are performed in a variety of facilities including nuclear reactors; weapons disassembly, maintenance, and testing facilities; hot cells; nuclear material storage facilities; processing facilities; and waste disposal facilities. These facilities are located at national laboratories, cleanup, and manufacturing sites throughout the United States.



These facilities are categorized by the level of hazard they present to the public and workers, which is primarily a function of the amount and type of nuclear materials present at each facility. Hazard Category 1 is the most hazardous (i.e., facilities that have nuclear materials in a quantity or form which if released could have a significant impact on the public) and Hazard Category 3 is the least hazardous (which can only have a safety impact on DOE workers). DOE also has “below Hazard Category 3” facilities called radiological facilities that contain very low levels of nuclear materials.

# Nuclear Safety Policies and Requirements

In accordance with its enabling legislation and other legislative acts, DOE is responsible for the safe operation of its facilities. To ensure this, DOE establishes and implements Safety Policies, Requirements (embedded in Rules<sup>1</sup>, Orders, and Manuals), Implementation Guidance, and Standards.



## Policies

Policies define the objectives and principles by which DOE operates.



<sup>1</sup> Rules are published in the Federal Register. DOE Orders, etc., are published in and processed per DOE's Directives Program.

## Requirements

Requirements establish criteria that DOE and its contractors must meet in all activities and operations.

## Guides

Guides identify acceptable methods for implementing DOE requirements.

## Technical Standards

DOE Standards describe specific methods and techniques for meeting DOE requirements. DOE has established a Technical Standards Program for encouraging and supporting the use of non-government standards (e.g., from different standards bodies, such as the American National Standards Institute). The Technical Standards Program also provides support for DOE development of Standards to support its nuclear safety and other activities. For example, DOE Standard 1189, *Integration of Safety into the Design Process*, establishes a uniform approach for including safety considerations in the design of nuclear facilities.

*See Appendix A for a list of key Nuclear Safety Policies, Regulations, Guidance, and Technical Standards.*



## Nuclear Facility Management and Operation

Almost all DOE nuclear facilities operate under a Government Owned Contractor Operated (GOCO) framework<sup>2</sup>. Although some variations to this framework exist, DOE Program Offices establish broad mission and safety expectations (typically by identifying DOE requirements) into contracts for major contractor organizations that will operate a majority of the facilities at a DOE site.

DOE contractors who manage and operate a nuclear facility are responsible for developing and maintaining safety basis documents and operating procedures. DOE line management reviews and approves the facility safety basis and performs a readiness review prior to the nuclear facility operation. DOE has established the three Under Secretaries as Central Technical Authorities (CTAs) to ensure nuclear safety requirements are included in contracts and any exemptions receive appropriate evaluation. Headquarters Technical Staff support the CTAs. Two of the CTAs have established technical expert organizations to support them, i.e., the Office of the Chief of Nuclear Safety and the Office of the Chief of Defense Nuclear Safety.

The Office of Health, Safety and Security has also established a policy and assistance organization to support the Program Offices<sup>3</sup>. Program Offices that operate nuclear facilities include the Office of Nuclear Energy, the Office of Science, and the Office of Environmental Management; as well as the National Nuclear Security Administration.

---

<sup>2</sup> A few facilities operate under a Government Owned Government Operated (GOGO) framework.

<sup>3</sup> Unlike the commercial nuclear industry, DOE is not regulated by an external agency. DOE establishes and enforces its own safety requirements for the design and operation of its nuclear facilities. However, DOE is subject to external oversight.

# Oversight and Enforcement

## Internal Oversight

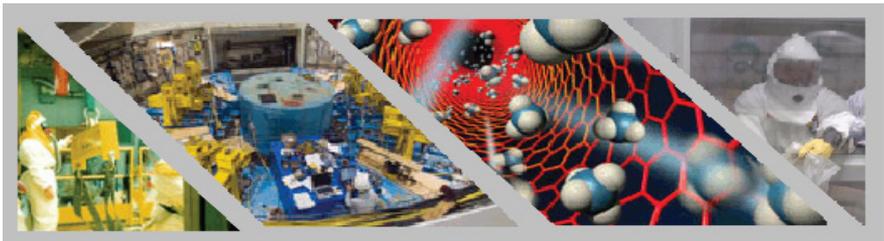
The most fundamental layer of assurance for nuclear facility safety lies with the contractor, who must establish a quality assurance program that will include processes for verifying effective implementation of nuclear safety activities and for performing independent assessments.

The next layer of oversight is by the Site and Program Offices. Site Office (also called the field element) Oversight will include daily reviews of facility operations by Facility Representatives, reviews of contractor's programs for ensuring safety system operability by Safety System Oversight personnel assigned to each safety system, and periodic assessment of programs (e.g., quality assurance and radiological protection programs) by Site Office personnel. The Program Office will periodically assess the Site Office's nuclear safety oversight effectiveness. The set of contractor, Site and Program Office Oversight is called line management oversight.

The Office of Independent Oversight within HSS provides oversight of all levels of line management oversight.

Oversight frequency and level of detail will be reduced as one moves up the oversight pyramid (and by Independent Oversight). However, all oversight can include some "vertical slice" detailed reviews to measure effectiveness of safety requirement implementation in a specific area.

In all cases, the extent of oversight is graded by the level of hazard.

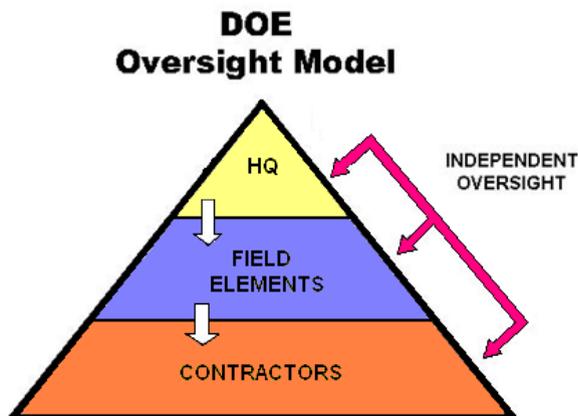


## External Oversight

The Atomic Energy Act established the Defense Nuclear Facilities Safety Board (DNFSB) to provide nuclear safety oversight over the nuclear weapons complex. The DNFSB consists of five Board members who are supported by Headquarters-based technical staff and site-based Site Representatives. The DNFSB reviews all DOE nuclear facility designs, construction, and operation activities. The DNFSB may issue letters requesting information on DOE actions to address the Board's nuclear safety concerns and the Board may issue Recommendations for nuclear safety improvements to address broader or more significant issues.

## Enforcement

The 1988 Price-Anderson Amendments Act (PAAA) provides insurance for managing and operating contractors, subcontractors, and suppliers who conduct nuclear activities for DOE. PAAA established enforcement regulations to ensure that the contractors are appropriately implementing nuclear safety requirements. DOE's Office of Enforcement has established the detailed enforcement requirements and processes for implementing these enforcement regulations. These include requirements for self reporting of violations, independent assessment of the violations and their significance, and issuing of enforcement actions, including fines. The Office of Enforcement's ultimate goal is to improve nuclear safety for workers and the public.



## **DOE/NNSA Sites with Nuclear Facilities**

---

---

Argonne National Laboratory (ANL)  
Hanford Site  
Idaho Cleanup Project (ICP)  
Idaho National Laboratory (INL)  
Los Alamos National Laboratory (LANL)  
Lawrence Livermore National Laboratory (LLNL)  
Nevada National Security Site (NNSS)  
New Brunswick Laboratory (NBL)  
Oak Ridge National Laboratory (ORNL)  
Pacific Northwest National Laboratory (PNNL)  
Paducah Gaseous Diffusion Plant (PGDP)  
Pantex Plant  
Portsmouth Gaseous Diffusion Plant (PORTS)  
Sandia National Laboratory (SNL)  
Savannah River Site (SRS)  
Waste Isolation Pilot Plant (WIPP)  
West Valley Demonstration Project (WVDP)  
Y-12 Site

# Appendix A – List of Nuclear Safety Directives, Orders, Guidance, and Technical Standards

## **Policies:**

DOE P 226.1A	Department of Energy Oversight Policy
DOE P 410.1A	Promulgating Nuclear Safety Requirements
DOE P 426.1	Federal Technical Capability Policy for Defense Nuclear Facilities
DOE P 441.1	DOE Radiological Health and Safety Policy

## **Requirements:**

10 CFR 820	Procedural Rules for DOE Nuclear Activities
10 CFR 830	Nuclear Safety Management
10 CFR 835	Occupational Radiation Protection
DOE Order 414.1C	Quality Assurance
DOE Order 420.1B	Facility Safety
DOE Order 425.1C	Startup and Restart of Nuclear Facilities
DOE Order 433.1B	Maintenance Management Program for DOE Nuclear Facilities
DOE Manual 450.4-1	Integrated Safety Management System Manual

## **Guidance:**

DOE Guide 414.1-1B	Management and Independent Assessments Guide
DOE Guide 414.1-2A	Quality Assurance Management System Guide
DOE Guide 421.1-2	Implementation Guide for Use in Developing Documented Safety Analyses to Meet Subpart B of 10 CFR 830
DOE Guide 423.1-1	Implementation Guide for Use in Developing Technical Safety Requirements
DOE Guide 430.1-4	Decommissioning Implementation Guide
DOE Guide 460.1-1	Packaging and Transportation Safety

## **Technical Standards:**

DOE-STD-1027-92	Hazard Categorization and Accident Analysis Techniques for Compliance with DOE Order 5480.23, Nuclear Safety Analysis Reports
DOE-STD-1189-2008	Integration of Safety into the Design Process
DOE-STD-3009-94	Preparation Guide for U.S. DOE Nonreactor Nuclear Facility Documented Safety Analysis
DOE-STD-1066-99	Fire Protection Design Criteria
DOE-STD-1104-2009	Review and Approval of Nuclear Facility Safety Basis and Safety Design Basis Documents

*For a complete list of Nuclear Safety Policies, Requirements, Guides, and Technical Standards please visit the DOE Directives home page at: [www.directives.doe.gov](http://www.directives.doe.gov).*

## **Appendix B – Summary of Nuclear Safety Regulatory Roles and Responsibilities**

### **Office of Health, Safety and Security:**

#### Office of Nuclear Safety Policy and Assistance

- Develops Nuclear Safety Policies, Requirements, and Implementing Guidance.
- Manages the Technical Standards Program to promote DOE involvement in the development and use of non-government consensus standards and support development of DOE-specific technical standards where needed.
- Provides technical assistance to Program and Field Offices in implementing Requirements.

#### Office of Oversight and Office of Enforcement

- Provides Independent Oversight and Enforcement to ensure compliance with Nuclear Safety Requirements.

#### National Training Center

- Provides nuclear safety training for both DOE Federal and contractor personnel.

### **Central Technical Authorities:**

- Ensure the consistent and effective application of nuclear safety requirements and guidance.
- Two of the CTAs are the Under Secretaries for Energy and Science, while the third CTA is the Administrator for the National Nuclear Security Administration.

#### Chief Defense Nuclear Safety and Chief Nuclear Safety

- Evaluate nuclear safety issues and provide expert advice to the Under Secretaries and Administrator.

## Appendix B (continued)

### Program Secretarial Offices:

- Ensure work is accomplished in a safe and environmentally sound manner at DOE-owned or DOE-leased sites and facilities.

### Field Offices

- Oversee day-to-day safe operation of their Sites' facilities by the contractors.

### Management and Operating Contractors:

Implement nuclear safety requirements and safely operate facilities.



## **Available Resources for Further Information**

---

### **Internal**

Department of Energy:

[www.energy.gov](http://www.energy.gov)

National Nuclear Security Administration:

[www.nnsa.energy.gov](http://www.nnsa.energy.gov)

Office of Nuclear Energy:

[www.ne.doe.gov](http://www.ne.doe.gov)

Office of Science:

[www.sc.doe.gov](http://www.sc.doe.gov)

Office of Environmental Management:

[www.em.doe.gov](http://www.em.doe.gov)

Office of Health, Safety and Security:

[www.hss.energy.gov](http://www.hss.energy.gov)

DOE Directives:

[www.directives.doe.gov](http://www.directives.doe.gov)

DOE Technical Standards:

[www.hss.energy.gov/nuclearsafety/ns/techstds](http://www.hss.energy.gov/nuclearsafety/ns/techstds)

### **External**

Defense Nuclear Facilities Safety Board:

[www.dnfsb.gov](http://www.dnfsb.gov)

## **Points of Contact**

---

### **Andrew Lawrence**

Director, Office of Nuclear Safety, Quality Assurance  
and Environment, HS-20

Office of Health, Safety and Security

Phone: (202) 586-6740

[andrew.lawrence@hq.doe.gov](mailto:andrew.lawrence@hq.doe.gov)

### **James O'Brien**

Director, Office of Nuclear Safety Policy and Assistance, HS-21

Office of Health, Safety and Security

Phone: (301) 903-1408

[james.o'brien@hq.doe.gov](mailto:james.o'brien@hq.doe.gov)

### **Christopher Chaves**

Office of Nuclear Safety Policy and Assistance, HS-21

Office of Health, Safety and Security

Phone: (301) 903-5999

[christopher.chaves@hq.doe.gov](mailto:christopher.chaves@hq.doe.gov)