

NUCLEAR WASTE Sources, Characteristics, and Locations

Unit Purpose:

This unit helps students establish the relevance of the topic of nuclear waste to their everyday lives and activities. Additionally, the unit provides a detailed examination of the different types of nuclear waste, the geographic distribution of spent fuel and high-level nuclear waste in the United States, and it includes brief, optional review activities on energy and electricity and the nuclear fission process. Particular attention is focused on the sources, characteristics, and locations of spent fuel and high-level nuclear waste, whose management is the concern of the Nuclear Waste Policy Act. The paradoxical relationship between the total volumes and radioactivities of nuclear waste is explored. The fact that various States are projected to increase their spent fuel storage as much as 300% by the year 2000 will further highlight the urgency of this pressing national issue for students.

Unit Concepts:

A national challenge exists because there is an accumulation of nuclear waste.

1. Energy in the form of electricity is essential to our standard of living.
2. Every energy source used to generate electricity has both benefits and problems.
3. The topic of nuclear waste is important to all of us.
4. Nuclear wastes have the characteristic of being radioactive, and, therefore, they require special handling, storage, and disposal.
5. A national challenge exists because there is an accumulation of radioactive wastes and a safe and environmentally acceptable method of permanent disposal is needed.
6. There are four major classifications of nuclear waste: high-level waste, low-level waste, transuranic waste, and mill tailings.
7. Classification of nuclear waste depends on its source and the types and levels of radiation it emits.
8. Each type of nuclear waste is disposed of in a way that will protect the public and environment from hazards associated with radiation.
9. High-level waste in the form of commercial spent fuel is currently stored in 35 States.

Duration of Unit:

Three 50-minute class periods

Unit Objectives:

As a result of participation in this unit of study, the learner will be able to:

1. identify everyday uses of electricity and trade-offs of various energy sources used to generate electricity;

2. discuss the relevance of nuclear waste to his/her life;
3. list and define the four categories of nuclear waste;
4. state how each type of waste is or will be disposed of;
5. write a brief statement explaining the paradoxical relationship between the total volumes and radioactivities of nuclear wastes;
6. complete an outline map of the United States showing where spent fuel and/or high-level nuclear waste is stored and/or will be stored by the year 2000; and
7. discuss where spent fuel and/or high-level nuclear waste is currently stored in the United States.

Unit Skills:

Analyzing, comparing, critical thinking, data transferring, defining, describing, discussing, drawing conclusions, evaluating, explaining, grouping, interpreting (charts, maps, and tables), labeling, listing, mapping, reading, sorting, synthesizing, writing

Unit Vocabulary:

Byproduct, ceramic pellets, commercial, compact, controversial, cubic meter, defense high-level waste, energy source, fission, fission products, fossil fuel, fuel assembly, fuel rods, geographic, high-level waste, low-level waste, mapping, mill tailings, neutron, nuclear chain reaction, nuclear energy, nuclear powerplant, nuclear reactor, nuclear waste, pie chart, radioactive, radioactive waste, radioactivity, repository, spent fuel, transuranic, volume, waste management

Unit Materials:

Reading lessons

Energy and Electricity Review (optional), p. SR-1

Nuclear Waste: What Is It? Where Is It?, p. SR-9

Activity sheets

Electricity from Nuclear Energy, p. 107

Radioactive Wastes: Volumes and Radioactivities, p. 109

Nuclear Waste: What Is It? Where Is It?, p. 111

Geographic Distribution of Commercial Spent Fuel and Commercial and Defense High-Level Nuclear Waste, p. 115

(blank U.S. map and question/answer sheet)

Geographic Distribution of Commercial Spent Fuel and Commercial and Defense High-Level Nuclear Waste, p. 117

Masters for transparencies

Locations of Nuclear Powerplants, p. 73

What Percentage of the Electricity Generated in Your Region in 1994 Came from Nuclear Energy?, p. 75

Percentage of Electricity Generated by Nuclear Powerplants in 1994, p. 77

Energy Equivalents, p. 79

Share of Electrical Generation by Power Source, p. 81

Fission, p. 83

Locations of Spent Nuclear Fuel and High-Level Radioactive Waste Ultimately Destined for Geologic Disposal, pp. 85-105

Background Notes:

Updating Electricity Generation Statistics, p. 7

Generation of Electricity, p. 9

Types of Nuclear Waste, p. 19

Storage of Spent Fuel, p. 21

Below Regulatory Concern (BRC) Materials, p. 25

Enrichment:

What Does Nuclear Waste Have To Do with Me?, p. 119

Regional Electricity Generation, p. 127

Inventories of Spent Fuel, p. 129

Spent Fuel Inventories Number Line, p. 131

1993 Inventories of Spent Fuel by State (blank U.S. map), p. 133

Worldwide Nuclear Waste Management (videotape and activity), p. 135

Low-Level Waste, p. 139

Low-Level Waste Compacts, December 1993, p. 143

Low-Level Waste Number Line, p. 145

Low-Level Waste Received at Disposal Sites - 1993, p. 147