

WHAT DOES NUCLEAR WASTE HAVE TO DO WITH ME?

Purpose:

This lesson helps students establish the relevance of the topic of nuclear waste to their everyday lives and activities.

Concepts:

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 waste has the characteristic of being radioactive, and, therefore, requires special handling, storage, and disposal.
5. A national problem has been created by the accumulation of radioactive wastes and a safe and environmentally acceptable method of permanent disposal is needed.
6. Development of a high-level waste management program involves complex societal and technical challenges.

Duration of Lesson:

One 50-minute class period

(Allow an additional class period if optional energy review is used.)

Objectives:

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

1. identify everyday uses of electricity and tradeoffs of various energy sources used to generate electricity; and
2. discuss the relevance of nuclear waste to his/her life.

Skills:

Analyzing, comparing, discussing

Vocabulary:

Byproduct, controversial, energy source, fossil fuel, nuclear energy, nuclear powerplant, nuclear waste, radioactive waste, repository, waste management

Materials:

Discussion Questions

Reading Lesson

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

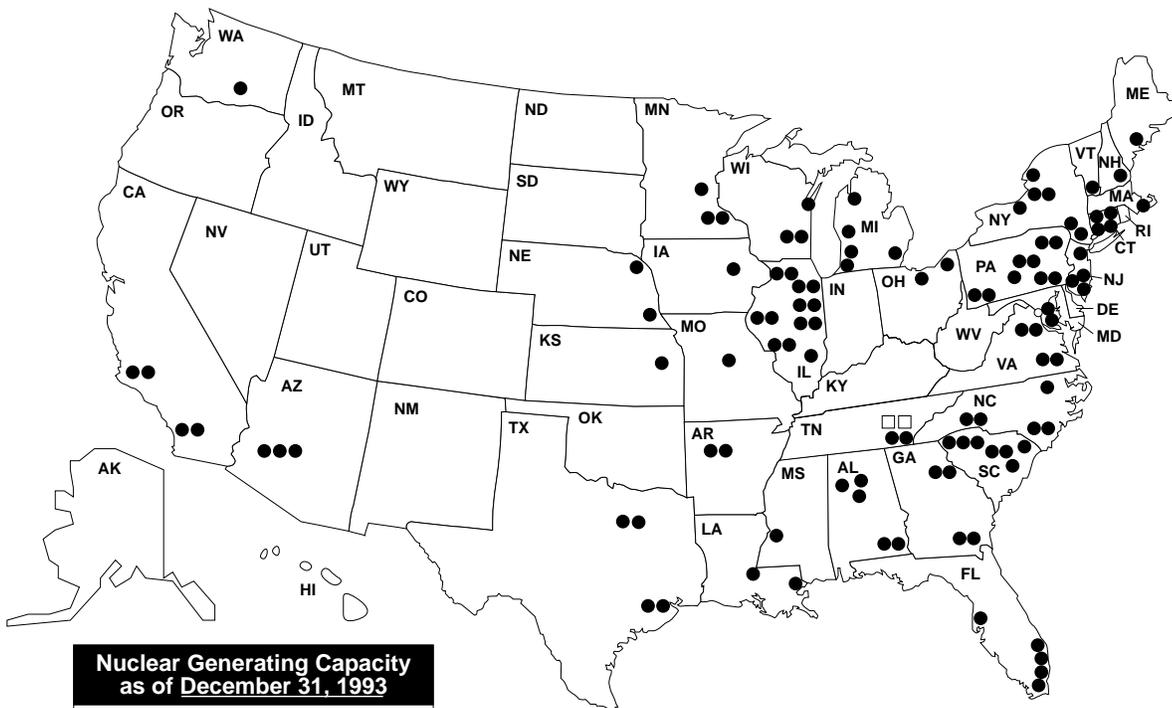
Activity Sheet

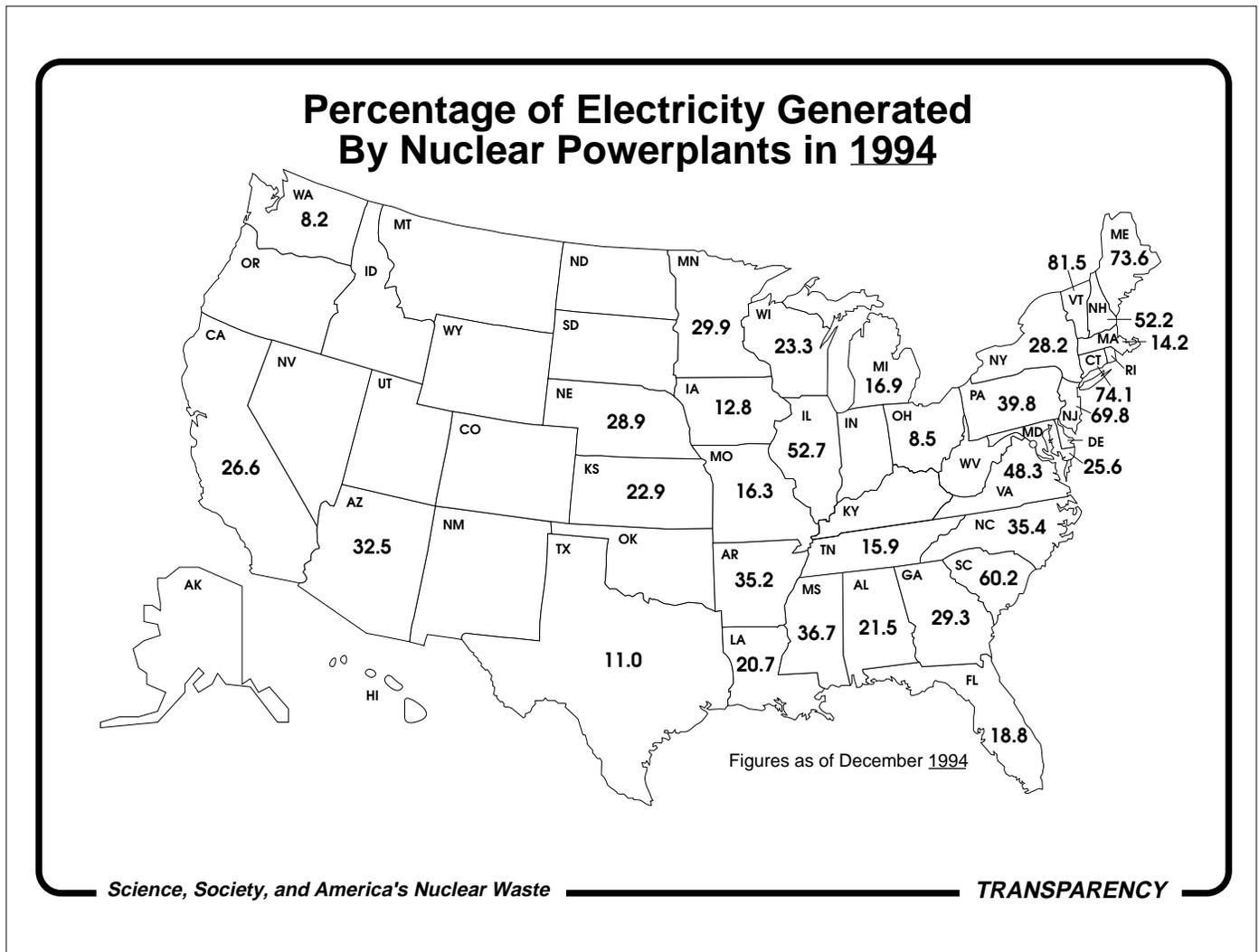
Electricity from Nuclear Energy, p. 107

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 Source*, p. 81

Background Notes

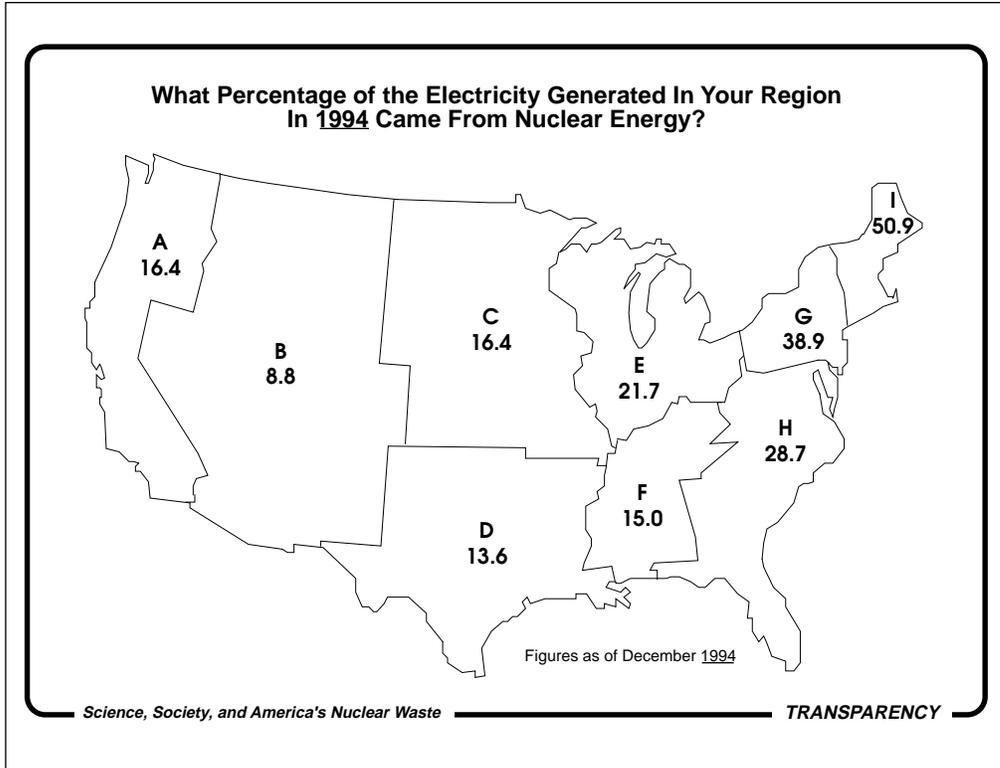
Updating Electricity Generation Statistics, p. 7*Generation of Electricity*, p. 9**Locations of Nuclear Powerplants**



Suggested Procedure:

1. **Energy and Electricity Review:** The attached optional review of energy and electricity has been provided for groups who will find a brief review helpful. If this reading lesson is not required, you may wish to proceed directly to #2. Concepts, objectives, vocabulary, etc. have not been prepared for this review.
2. The question of what to do with the accumulation of nuclear waste in the United States is a complex topic. Many aspects of this topic are controversial and scientific in nature. Students may feel that it has little or no relevance for them.

You may wish to introduce the topic of nuclear waste by first establishing the relevance of the topic for students. One method of putting the subject of waste on a personal level and engaging students' interest is to have the classroom completely littered with classroom trash when students arrive for the first lesson in this course of study. Direct students to take their seats without any effort at cleanup other than to push aside anything that is an obstacle to finding and taking their seats. After students have been seated amongst the trash for a few minutes, ask if they feel that the condition of the classroom is a problem. If there is agreement that a problem exists, ask students what they feel should be done about it, and who is responsible for doing it.



Key to Regions listed on outline map entitled WHAT PERCENTAGE OF THE ELECTRICITY GENERATED IN YOUR REGION IN 1994 CAME FROM NUCLEAR ENERGY?

- A = WA, OR, CA
- B = AZ, CO, ID, MT, NV, NM, UT, WY
- C = IA, KS, MN, MO, NE, ND, SD
- D = AR, LA, OK, TX
- E = IL, IN, MI, OH, WI
- F = AL, KY, MS, TN
- G = NJ, NY, PA
- H = DE, DC, FL, GA, MD, NC, SC, VA, WV
- I = CT, ME, MA, NH, RI, VT

After this brief exercise is concluded; ask them to identify other types of trash—specifically types related to energy. One way of encouraging students to think about energy-related wastes and their own contribution to the production of these wastes is to turn the classroom light switch off and then on again. Ask students to list the wastes that have probably been the products of producing the electricity that turned on the classroom lights. Relate the cleanup of wastes produced during energy production, especially spent fuel from nuclear reactors, to the "you make a mess, you clean it up" concept. Have students consider who is responsible for the cleanup and permanent disposal of the Nation's accumulating high-level nuclear waste: the present generation who created it or future generations who may be more advanced technologically?

Then begin a discussion of the following questions about energy and electricity use and generation. The transparencies about locations of nuclear powerplants and electricity are included to aid in your discussion of questions f, g, and h.

- a. What are your activities for a typical school day (getting ready, traveling to school, during school, after school, and in the evening)?
- b. Which involve the use of energy? Electricity?
- c. How does the availability of electricity affect the manufacture of goods you and your family use? Food? Clothing? Transportation vehicles? Electronic goods? Other goods?
- d. How does availability of electricity affect your family's income? How does it affect your education? Part-time jobs of other students or yourself?
- e. What energy source or sources are used to generate the electricity you use?

- f. What sources are used to generate electricity throughout the United States?
(1994 figures: coal – 56%; nuclear – 22%; natural gas – 10%; hydropower – 8%; petroleum – 3%; solar, geothermal, wood, wind, and waste – <1%.)
- g. What role does nuclear energy play in producing our Nation's electricity?
- h. What role does it have in producing electricity in your State or region?
- i. Every energy source used to generate electricity has both benefits and problems. What are some benefits and problems associated with the major sources? Consider such factors as reliability of supply (including the effect on national security), air pollution, waste byproducts, cost, limited reserves, alternate uses of fossil fuels, and production hazards, etc. (Some examples are listed below, but this list is not meant to be exhaustive.)

<u>Energy Source</u>	<u>Benefit</u>	<u>Problem</u>
coal	a) domestic reserves b) relatively economical	a) hazardous to mine b) air pollution c) <u>limited supply</u>
uranium (nuclear)	a) concentrated energy source b) domestic reserves	a) hazardous to mine b) radioactive waste
water (hydroelectric) construction	a) renewable b) economical	a) building dams affects rivers and floods land b) few sites available for new dam c) supply affected by weather
oil	a) can be used when other sources not available	a) limited supply b) foreign dependence c) air pollution d) expensive e) alternate uses (transportation, petrochemicals etc.)
wind & solar	a) renewable b) environmentally desirable in most aspects	a) useful only when wind blows and sun shines b) more research needed to make it practical <u>and economical</u>
natural gas	a) domestic reserves b) clean burning	a) nonrenewable b) limited reserves
geothermal	a) renewable	a) geographically limited

tidal a) renewable a) geographically limited

3. Students should complete the review activity entitled *Electricity from Nuclear Energy* for this lesson in class.
4. You may wish to require students to clip newspaper and magazine articles regarding management of nuclear/hazardous waste and maintain a scrapbook throughout the course of study. Requiring that students document the source and date of their clippings may encourage them to read newspapers, periodicals, etc. on a routine basis. These student newsclip scrapbooks may be useful for enrichment activities appearing in Unit 3 regarding the Nuclear Waste Policy Act and Amendments.

Teacher Evaluation of Learner Performance:

Student participation in class discussion and completion of the activity entitled *Electricity from Nuclear Energy* will indicate understanding.

Enrichment:

Worldwide Waste Management, videotape - 20 minutes **(available free of charge by calling the OCRWM National Information Center at 1-800-225-6972; within Washington, DC, 488-6720)**

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Regional Electricity Generation, p. 127