Approved January 19, 1984
Date

MINUTES OF THE Senate COMMITTEE ON Energy and Natural Resources.

The meeting was called to order by Senator Charlie L. Angell at
Chairperson

8:00 a.m./~~p.m.~~ on Wednesday, January 18, 1984 in room 123-S of the Capitol.

All members were present except:
Senator Paul Hess

Committee staff present:
Ramon Powers, Research Department
Raney Gilliland, Research Department
Don Hayward, Revisor's Office
LaVonne Mumert, Secretary to the Committee

Conferees appearing before the committee:
Sam Rod, Westinghouse Electric Corporation
Karen Adelson, Westinghouse Electric Corporation

The minutes of the January 17, 1984 meeting were approved.

Copies of Water Purchase Contract No. 83-4 with Douglas County RWD No. 2 from Clinton Lake, Water Purchase Contract No. 83-5 with City of Spring Hill from Hillsdale Lake, Water Purchase Contract No. 83-1 with Johnson County RWD No. 7 from Hillsdale Lake and Supplemental Agreement No. 1 to Water Purchase Contract No. 81-5 with City of Coffeyville from Elk City Lake along with transmittal letters were distributed to the Committee (Attachment 1).

Copies of the following were also distributed to the Committee: an introduction of the two representatives of the State Legislative Energy Briefing Program (Attachment 2); "Safe Transport of Radioactive Material" (Attachment 3); "An Overview of Decommissioning Nuclear Power Plants" (Attachment 4); "Nuclear Power From Fission Reactors" (Attachment 5); and "Low Level Radioactive Waste Disposal: The Problem and The Solution" (Attachment 6).

Sam Rod used a slide presentation to discuss basic energy, how nuclear power plants work and compared electric generating sources. He said Kansas uses a great deal of electricity, with about one-third being consumed by industry, one-third by commercial and business and one-third by residential users. Kansas is heavily dependent on coal and natural gas. Mr. Rod pointed out the problems experienced in Kansas with the coal freezing during the recent spell of extreme cold illustrate the danger of depending on coal and natural gas. He told the Committee that when Wolf Creek comes on line it will be over-capacity, but stressed that this will evaporate very rapidly. Mr. Rod explained the basic element used for nuclear power is a uranium fuel pellet. These weigh one-fourth of an ounce and produce the energy equivalent of three-fourths of a ton of coal or 150 gallons of oil. These pellets are stacked into nuclear fuel rods. The fuel rods are grouped into fuel assemblies which form the reactor core. Mr. Rod explained how the water is pressurized in the core and then goes to a steam generator. This steam turns a turbine which spins an electric generator. Mr. Rod then addressed electric energy issues of health and safety, environmental effects and costs. He discussed regulatory criteria for nuclear plants. Mr. Rod told the Committee a major part of the cost of building a nuclear power plant is the money that has to be borrowed. He advised that the world overall, with the exception of the United States, has increased its commitment to nuclear power. Mr. Rod said from his experience, he believes nuclear power has proven itself to be safe, economical and available.

Ms. Adelson described background radiation. She said that approximately two-thirds of natural radiation comes from sources such as food, air, water, soil, buildings, etc. and the remaining one-third comes from medical radiation. She estimated that a person residing in Kansas probably receives about 135 units of radiation a year. She stressed that tiny amounts of radiation over a long period of time have a different effect than receiving large doses all at once. Ms. Adelson discussed the three types of rays emitted by radioactive material: alpha, which can be stopped by a piece of paper; beta, which can be stopped by a piece of tinfoil; and gamma, which can be stopped by six inches of lead or two feet of concrete. She described low-level waste as slightly contaminated debris. Nine percent of low-level waste is generated by government facilities, 22 percent by industrial operations, 19 percent by hospital clinics and research facilities and the remaining 50 percent by commercial power reactors. Ms. Adelson said the waste is compacted and solidified into a solid chunk of concrete which is placed inside steel drums. The drums are put into lead-lined containers, then shipped to the disposal site. The containers are inspected at the site and are lowered into trenches. She discussed the Low-Level Nuclear Waste Policy Act which takes effect

January 1, 1986. She told the Committee it would take four years, at best, before a disposal site could be operative and expressed concerns that the January 1, 1986 deadline is only two years away. Ms. Adelson said the Wolf Creek facility has at least a five-year storage on site. She pointed out benefits to a state having a disposal site: direct general revenues, stable 30-year employment base, scholarships and research grants and an employment training center. Ms. Adelson then talked about high-level nuclear waste. She said a plant such as Wolf Creek will produce about 10 canisters of high-level waste per year. She described the barriers for the waste -- the waste is in a solid form, there is an engineered confinement and there is the barrier of the geologic formation. She said that rock salt deposits and crystalline formations are being studied and considered for burial of waste.

The Committee viewed a short film showing a series of impact and fire tests done on the canisters used to transport waste.

Mr. Rod and Ms. Adelson answered questions of Committee members.

The Chairman adjourned the meeting at 9:13 a.m. The next meeting of the Committee will be at 8:00 a.m. on January 19, 1984.

Senate Energy + Natural Resources
Jan. 18, 1983

Name	Organization
Jim McBride	United Way
Richard D. Kready	KPL / Gas Service
Sean Rod	Westinghouse Electric Corp.
Karen Adelson	Energy Information Services
John Frye	Westinghouse
Charles Fagan	Westinghouse
Scott McGinley	Centel
Cleon Weathers	Centel
Wm R. Hoover	Centel
Loren E Bell	Centel
Jan Johnson	Budget Division
Dennis Murnane	KCC
Robert M Fillmore	KCC
David W Nicholl	KCC
Whitney B Damron	KNEC
Steve Stephens	NAN
Doug Bendell	Douglas Energy
Joe Kramer KCPL	
Jerry L Coonrod	KG&E
Ron Cachos	KACI
Roy D. Shonkel	KCPL
Louise Ross	KSN TV

STATE OF KANSAS

Attachment 1

John Carlin, Governor

KANSAS WATER OFFICE
Joseph F. Harkins
Director

Suite 200
109 SW Ninth
Topeka, Kansas 66612

913-296-3185

January 3, 1984

The Honorable Charlie L. Angell, Chairman
Senate Committee on Energy and Natural Resources
102 Erie
Plains, KS 67869

The Honorable David J. Heinemann, Chairman
House Committee on Energy and Natural Resources
P. O. Box 1346
Garden City, KS 67846

Re: Water Purchase Contracts for Consideration in 1984 Session

Gentlemen:

The Kansas Water Office will transmit the following contracts (copies enclosed) for consideration by the Kansas Legislature in the 1984 Session:

1. Water Purchase Contract No. 83-4 for sale of 50.00 million gallons per year from Clinton Lake to Douglas County RWD No. 2.

2. Water Purchase Contract No. 83-5 for sale of 20.00 million gallons per year from Hillsdale Lake to City of Spring Hill.

3. Water Purchase Contract No. 83-1 for sale of 110.00 million gallons per year from Hillsdale Lake to Johnson County RWD No. 7. This is an amended contract in the format approved by Kansas Water Authority on August 19, 1983, and replaces the contract submitted to the 1983 Legislature.

4. Supplemental Agreement No. 1 to Water Purchase Contract No. 81-5 for sale of water from Elk City Lake to City of Coffeyville. This supplemental agreement amends the place of use for water purchased under the contract. The principal change allows the City to sell water in Oklahoma to City of South Coffeyville and to Nowata County Rural Water District No. 7. Other changes recognize the water service being provided to several small communities and rural water districts.

Att. 1

Water Purchase Contracts No. 83-4 and 83-5 were approved by the Kansas Water Authority on November 16, 1983, along with Supplemental Agreement No. 1 to Water Purchase Contract No. 81-5. Amended Water Purchase Contract No. 83-1 was approved by the Kansas Water Authority on December 15, 1983.

Additional negotiations are underway with City of Gardner and with White Memorial Camp of United Church of Christ. These negotiations will probably not be completed in time for contracts to be considered in the 1984 Session. However, if the contracts are completed and approved before the 30th day of the Legislative Session, they will be transmitted for consideration.

If you have any questions about these contracts, please let us know.

Sincerely,

John A. Henderson

John A. Henderson, P.E.
Chief, Hydrology and Marketing

JAH:vc

Enclosures

cc: Mr. Ramon Powers, Legislative Research

STATE OF KANSAS

John Carlin, Governor

KANSAS WATER OFFICE
Joseph F. Harkins
Director

Suite 200
109 SW Ninth
Topeka, Kansas 66612

913-296-3185

January 9, 1984

The Honorable Ross O. Doyen
President of the Kansas Senate

The Honorable Mike Hayden
Speaker of the Kansas House of Representatives

The Honorable Jack H. Brier
Secretary of State
State of Kansas

Gentlemen:

In accordance with K.S.A. 1983 Supp. 82a-1307(a), the following contracts are transmitted herewith for consideration by the Kansas Legislature in the 1984 Session:

1. Water Purchase Contract No. 83-4 for sale of 50.00 million gallons per year from Clinton Lake to Douglas County RWD No. 2.

2. Water Purchase Contract No. 83-5 for sale of 20.00 million gallons per year from Hillsdale Lake to City of Spring Hill, Johnson and Miami counties, Kansas.

3. Amended Water Purchase Contract No. 83-1 for sale of 110.00 million gallons per year from Hillsdale Lake to Johnson County RWD No. 7.

4. Supplemental Agreement No. 1 to Water Purchase Contract No. 81-5 for sale of water from Elk City Lake to City of Coffeyville, Montgomery County, Kansas.

The amended Water Purchase Contract No. 83-1 replaces the contract submitted to the 1983 Legislature. The amended contract conforms to the standard format adopted by the Director and approved by the Kansas Water Authority on August 19, 1983.

The Supplemental Agreement to Water Purchase Contract No. 81-5 amends the place of use for water purchased under this contract. This amendment allows the City of Coffeyville to provide water service in Oklahoma to City of South Coffeyville and to Nowata County RWD No. 7. The amendment also recognizes the water service being provided by Coffeyville to several small communities and rural water districts in Kansas.

Water Purchase Contracts 83-4 and 83-5 were approved by the Kansas Water Authority on November 16, 1983, along with Supplemental Agreement No. 1 to Water Purchase Contract No. 81-5. Amended Water Purchase Contract No. 83-1 was approved by the Kansas Water Authority on December 15, 1983.

As provided in K.S.A. 1983 Supp. 82a-1307(a), the Kansas Legislature may disapprove and revoke any of these contracts at any time between the 30th and 90th calendar days of the regular Legislative Session.

If you have any questions about any of these contracts, we will be glad to discuss them with you.

Sincerely,

Joseph F. Harkins
Director

JFH:JAH:dk
Enclosures
cc: The Honorable John Carlin, Governor of Kansas
Mr. H. Philip Martin, Chairman, Kansas Water Authority

S T A T E O F K A N S A S
K A N S A S W A T E R O F F I C E

CONTRACT
Between the State of Kansas
and
Rural Water District No. 2
Douglas County, Kansas

FOR A MUNICIPAL WATER SUPPLY
from
CLINTON RESERVOIR

Water Purchase Contract No. 83-4
November 16, 1983

TABLE OF CONTENTS

INTRODUCTORY PROVISIONS

WATER SERVICE AND PAYMENT PROVISIONS

GENERAL PROVISIONS

KANSAS WATER OFFICE
WATER PURCHASE CONTRACT NO. 83-4

This contract is executed and entered into this 16th day of November, 1983, by and between the State of Kansas (hereinafter referred to as the "State") as represented by the Kansas Water Office, and Rural Water District No. 2 of Douglas County, Kansas, (hereinafter referred to as the "Purchaser").

WITNESSETH: WHEREAS, the Purchaser desires to purchase water for a municipal water supply; and

WHEREAS, the State has signed an Agreement (Contract No. DACW41-77-C-0149) with the United States of America under the provisions of the Water Supply Act of 1958 (Title III, P.L. 85-500), as amended, for water supply storage space in the Reservoir; and

WHEREAS, the State has filed an appropriate water reservation right on May 13, 1974, to divert and store water in the Reservoir; and

WHEREAS, the Director of the Kansas Water Office is authorized by K.S.A. 74-2615, as amended, and by K.S.A. 82a-1305, as amended, to negotiate contracts for the sale of water; and

WHEREAS, the Purchaser filed an appropriate application with the State to negotiate the purchase of raw water from the Reservoir, in compliance with the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., as amended; and

WHEREAS, the Purchaser's immediate and projected water supply needs can be provided from the Reservoir; and

WHEREAS, the withdrawal and use of fifty million (50,000,000) gallons of water annually from the Reservoir by the Purchaser is in the interest of the people of the State of Kansas and will advance

the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated; and

WHEREAS, Purchaser's application to purchase raw water from the Reservoir is approved for a maximum total amount of 50.0 million gallons per year in accordance with Articles 9 and 13 of Chapter 82a of Kansas Statutes Annotated.

NOW, THEREFORE, in consideration of the foregoing, the parties mutually agree as follows:

ARTICLE 1. DEFINITIONS

As used in this contract, unless the context otherwise requires:

(a) "Authority" means the Kansas Water Authority, or its successor.

(b) "Director" means the Director of the Kansas Water Office, his or her successor, or designated representative.

(c) "Point of withdrawal from the reservoir" means the point at which water is taken from the reservoir by pump, siphon, canal, or any other device; or released through the dam by gates, conduits, or any other means.

(d) "Raw water" refers to untreated water at the point of withdrawal from the reservoir.

(e) "Reservoir" means Clinton Lake.

ARTICLE 2. TERM OF THE CONTRACT

The term of this contract shall be for a period of forty (40) years beginning on the date of execution of this contract. The Purchaser may commence using water at any time after the execution of this contract by providing notice as provided in Article 12.

ARTICLE 3. LEGISLATIVE DISAPPROVAL AND REVOCATION

This contract, any amendment hereto, or renewal thereof is subject to disapproval and revocation by the Kansas Legislature as provided in K.S.A. 82a-1307, and amendments thereto.

ARTICLE 4. UNITED STATES APPROVAL

The Purchaser shall secure the right from the federal government to construct, modify, alter, or maintain installations and facilities when such installations and facilities are on federal lands. The Purchaser shall bear the cost of construction, modification, operation, and maintenance of Purchaser owned installations and facilities.

The Purchaser shall provide the Director with proof of any easement granted by the federal government for rights-of-way across, in, and upon federal government land required for intake, transmission of water, and necessary appurtenances.

ARTICLE 5. COMPLIANCE WITH KANSAS STATUTES

This contract is subject to such statutes as may be applicable, including specifically but not by way of limitation, the State Water Planning Act, K.S.A. 82a-901 et seq., and amendments thereto; the State Water Plan, K.S.A. 82a-927 et seq., and amendments thereto; and the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., and amendments thereto; and the Purchaser agrees to comply with such statutes and any amendments to said statutes which may be enacted subsequent to the execution of this contract.

ARTICLE 6. QUANTITY OF WATER

a. Initial Quantity. During the term of this contract defined in Article 2, subject to the conditions herein stated, the State will permit the Purchaser to withdraw not more than two billion (2,000,000,000) gallons of raw water from water supply storage in

the Reservoir; provided, however, that the State shall not be obligated to furnish more than fifty million (50,000,000) gallons of raw water in any one (1) calendar year. If the Purchaser in any calendar year does not withdraw the entire annual amount obligated under terms of this contract, the unused amount of water shall not add to the Purchaser's entitlement in any subsequent year.

b. Review and Adjustment. The Director shall review the quantity and purposes for which water is used on the sixth anniversary of the execution of this contract and on each annual anniversary for the remaining portion of the term of this contract. The Director may adjust the total amount of water contracted for on the sixth anniversary of the execution of the contract and on each annual anniversary thereafter, if the Purchaser does not begin full payment for the water under contract and another water user is ready, willing and able to contract for such water.

c. Water Appropriation Rights. Any rights under the Kansas Water Appropriation Act, K.S.A. 82a-701 et seq., and amendments thereto, acquired by the Purchaser and having priority dates later than May 13, 1974, shall not be used by the Purchaser in lieu of any quantity of water obligated under terms of this contract. Any water received under authority of such water appropriation rights shall not be counted against the Purchaser's annual water entitlement under this contract even though the Purchaser may have to pay the State as if the water had been received under this contract as provided in Article 9.

The Purchaser may use water withdrawn in accordance with the terms of this contract without obtaining a permit or water right

under the Kansas Water Appropriation Act. Rights of the Purchaser under this contract shall be entitled to the same protection as any other vested property interest including vested water rights, water appropriation rights, and approved applications for permit to appropriate water.

ARTICLE 7. PRICE OF WATER

a. Price. The Purchaser agrees to pay the State at the rate fixed in accordance with K.S.A. 82a-1306, and amendments thereto, for each one thousand (1,000) gallons of raw water used or raw water which must be paid for under terms of this contract throughout the term of this contract; provided, however, that the Purchaser is obligated and agrees to pay the minimum charges in accordance with this Article regardless of the quantity of raw water actually used, except as provided in Article 13. The rate for raw water which must be paid for under terms of this contract shall be $0.1158 for each one thousand (1,000) gallons during calendar year 1983.

b. Minimum Charge. The Purchaser agrees to pay to the State a minimum charge whether or not water is withdrawn during the calendar year. The minimum charge for each calendar year shall be determined as provided in K.S.A. 82a-1306, and amendments thereto. The minimum charge shall be subject to change as may be provided by subsequent amendments to State statutes which affect the terms of this contract. The minimum charge for calendar year 1983 and each succeeding calendar year, unless changed by amendment of State statutes, shall be the sum of the following two components:

(1) 50 percent of the total annual amount of water contracted for

during the term of this contract multiplied by the rate established in accordance with paragraph (a) of this Article or as adjusted in accordance with paragraph (c) of this Article; and (2) 50 percent of the total annual amount of water contracted for purchase multiplied by a rate per annum as interest equal to the average rate of interest earned the past 12 months on the investment of State monies by the Pooled Money Investment Board multiplied by the net amount of monies advanced from State funds for the costs incurred and associated with providing that 50 percent of the total annual amount of water contracted for purchase.

c. Review and Adjustment of Rates. The Director shall review the fixed rate stated in this article on July 15 of each year during the term of this contract and may adjust the rate effective January 1 of the following year to reflect any change in experience by substituting the adjusted rate for the fixed rate then applicable to the contract. Such adjusted rate shall be charged for all water used or water which must be paid for under terms of this contract as provided in Article 9. The Director shall notify the Purchaser by restricted mail by July 31 of each year of the adjusted rate which will become effective on January 1 of the ensuing year and shall notify the Purchaser of the adjusted minimum payment which will be required under the terms and conditions of this contract. Failure to furnish such notification by July 31 shall not relieve the Purchaser of the obligation to pay such adjusted rate.

ARTICLE 8. PURPOSE AND PLACE OF USE

a. Purpose. Water purchased under this contract shall be used for purposes which are in the interest of the people of the State of Kansas and which will advance the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated, and amendments thereto.

b. Place of Use. The place of use for water purchased under this contract shall be within the boundaries of Rural Water District No. 2 of Douglas County, Kansas.

c. Approval of Change in Place of Use. The Purchaser shall inform the Director of any intention to sell any water under this contract to any person or entity located outside the geographical limits described above. Whenever the Purchaser shall propose to enter into a contract to sell water purchased under this contract to any such person or entity outside the described geographical limits, the Purchaser shall, before execution thereof, submit a copy of such contract to the Authority for review. The Purchaser agrees not to execute and enter into any such contract unless approved by the Authority.

ARTICLE 9. BILLING AND PAYMENT SCHEDULE

a. Deferment. The beginning of the payment period shall be deferred until December 1, 1983, but not to exceed three (3) years or until such time as actual use of the water contracted for commences, whichever occurs first, if in order to use the water contracted for, bonds are required to be issued, or the construction of transmission or treatment facilities is required.

b. Payments. The Purchaser shall transmit all payments due hereunder to the Director. Remittance for minimum payments shall be paid to the Director in either one annual payment within thirty

(30) days after date of billing by the State or in equal monthly installments during the calendar year in which the minimum payment is due, whether or not water is withdrawn during the calendar year. Remittance for payments due for water used in excess of the quantity obligated by the minimum payment shall be paid to the Director in full within thirty (30) days after date of billing by the State.

c. Determination of Charges. Charges for water for which payment is required shall be determined by the State. The formulas by which charges are computed shall be prepared by the Director with the approval of the Authority. The Purchaser acknowledges and agrees that said formulas and computations are subject to change, based on subsequent amendments to State statutes which may affect the terms of this contract.

d. Water Subject to Payment. The Purchaser shall pay as specified in this contract for all water received under terms of this contract up to the maximum quantity obligated by this contract. The Purchaser shall be entitled to receive any water allowed under the Kansas Water Appropriation Act; provided, however, if the Purchaser receives fifty million (50,000,000) gallons of water or less in any one year from combined use under this contract and any Purchaser held water rights having priority dates later than May 13, 1974, then the Purchaser shall pay the State regardless of the source of water, subject to the provisions of Article 13(c).

e. Initial Minimum Payment. Except as provided in Article 9a, the initial minimum payment shall become due on the day of execution of this contract as defined in Article 2. Remittance for the initial minimum payment shall be in accordance with Article 9b.

The initial minimum charge shall be prorated by the number of months or portions thereof in service during the calendar year. Payment of the initial minimum charge shall entitle the Purchaser to receive during the remaining portion of the calendar year the prorated portion of one-half (1/2) of the maximum annual quantity of water as set forth in Article 6, without additional charge.

f. Subsequent Minimum Payments. On each succeeding January 1 following the due date of the initial minimum payment, subsequent minimum payments shall become due. Remittance for minimum payments shall be in accordance with Article 9b. Payment of the minimum payment shall entitle the Purchaser to receive during the calendar year, without additional charge, one-half (1/2) of the maximum annual quantity obligated under terms of this contract.

g. Water in Excess of Minimum. At the end of each calendar year throughout the term of this contract or within thirty days after the end of each calendar year, the State shall bill the Purchaser for any water used during the calendar year in excess of one-half (1/2) the total annual quantity of water purchased under contract. The charge for this water shall be at the rate in effect for the year in which the water was used. If the Purchaser shall use a quantity of water in excess of the amount of water used to compute the minimum charge, the Purchaser shall be given credit for the proportionate share of the payment which was made as an interest charge on the net amount of monies advanced from State funds for the costs incurred and associated with providing 50 percent of the total annual amount of water contracted for purchase.

h. Overpayment or Underpayment. If for reason of error in computation, measuring device malfunction, or other causes, there is an overpayment or underpayment to the State by the Purchaser of the charges provided herein, such overpayment or underpayment shall be credited or debited, as the case may be, to the Purchaser's account for the next succeeding payment and the State shall notify the Purchaser thereof in writing. However, all charges made in any year shall be conclusively presumed to be correct six (6) months after the end of such year.

i. Adjustment for Apportionment. In the event the Purchaser is unable in any year due to apportionment under Article 13 herein to withdraw the amount which the Purchaser is entitled to receive after payment of the minimum payment, the amount of such minimum payment in excess of the amount of water actually received by Purchaser shall be credited to reduce the obligation of the Purchaser during the next succeeding calendar year.

j. Overdue Payments. If the Purchaser shall fail to make any of the payments when due, then the overdue payments shall bear interest compounded annually at the rate prescribed in K.S.A. 82a-1317, and amendments thereto, during the term of this contract. This shall not be construed as giving the Purchaser the option of either making payments when due or paying interest, nor shall it be construed as waiving any of the rights of the State that might result from such default by the Purchaser.

ARTICLE 10. POINT OF WITHDRAWAL

The point of withdrawal from the Reservoir shall be in the Southwest Quarter of the Northeast Quarter of the Southwest Quarter (SW 1/4 of the NE 1/4 of the SW 1/4) of Section 8,

Township 13 South, Range 19 East, in Douglas County, Kansas.

ARTICLE 11. METERING OF WATER

The Purchaser shall at its own expense, furnish, install, operate, and maintain at the place of diversion, a commercial measuring device as approved by the Director.

The Purchaser shall test and calibrate as accurately as possible such measuring device or devices whenever requested by the Director, but not more frequently than once every twelve (12) months. A measuring device shall be deemed to be accurate if test results fall within a tolerance of plus or minus two (2) percent throughout the full range of diversion. Certification of measuring devices shall be obtained from a commercial testing company approved by the Director.

The previous readings of any measuring device disclosed by test to be inaccurate shall be corrected for the three (3) months previous to such test or one-half (1/2) the period since the last test, whichever is shorter, in accordance with the percentage of inaccuracy found by such tests.

If any measuring device fails to register for any period, the amount of water furnished during such period shall be determined by the Director after consultation with the Purchaser.

The Purchaser shall read the measuring device on or before the last calendar day of each month, and shall send such reading to the Director within ten (10) days after it has been taken.

The Purchaser shall provide to the State monthly reports of all water withdrawn from any sources under authority of Purchaser held water use permits or water appropriation rights having priority dates after May 13, 1974. Representatives of the State

shall, at all reasonable times, have access to the measuring device for the purpose of verifying all readings.

The State may measure releases by means of a rating curve at the point of withdrawal, or by other suitable means, as an auxiliary measuring device to verify the accuracy of the Purchaser's measuring device or to measure the amount of water furnished when the Purchaser's measuring device fails to register.

ARTICLE 12. WATER WITHDRAWAL SCHEDULE

The Purchaser shall notify the Director, in writing, of the date for the initial withdrawal of water at least forty-five (45) days prior to such withdrawal. At such time the Purchaser shall also notify the Director, in writing, of the amounts, times, and rates of withdrawal of water required during the remainder of the calendar year in which such initial withdrawal is made. The Purchaser agrees to submit a water withdrawal schedule for each succeeding calendar year to the Director on or before November 1 of each year.

Such proposed water withdrawal schedule shall be approved or disapproved by the Director within thirty (30) days of the filing of such schedule and, subject to his or her approval, such schedule may be amended upon written request from the Purchaser. The Director shall not unreasonably disapprove or withhold his or her approval of the water withdrawal schedule.

The Purchaser's approved water withdrawal schedule shall govern the rate of withdrawal, but in no event shall the Purchaser withdraw water in excess of the maximum daily rate of three hundred and fifty thousand (350,000) gallons. Whenever the Purchaser wishes to make a withdrawal of water provided under terms of this contract from the reservoir other than as approved in the annual withdrawal schedule,

the Purchaser shall advise the Director at least two (2) working days prior to the time such water is to be withdrawn from the Reservoir. Such notice may be transmitted to the Director by oral communication, but the notice must be confirmed in writing within fifteen (15) days after the oral communication.

ARTICLE 13. CONTINUITY OF WATER SERVICE

(a) The Director shall make all reasonable efforts to perfect and protect the water reservation right necessary for the satisfaction of the water supply commitment. In the event it becomes necessary for any reason to apportion the water among the persons having contracts therefor, or to temporarily discontinue the furnishing of water to such persons, the Director will give each person an oral notice, followed by a written notice, of such action as far in advance as is reasonably practicable.

(b) Neither the Director nor the Authority shall be responsible or have any legal liability for any insufficiency of water or the apportionment thereof, and the duty of the Director and the Authority to furnish water is specifically subject to the following conditions:

(1) If the total amount of water contracted for withdrawal by all purchasers from the Reservoir in the year is greater than the supply available from the conservation water supply storage in the Reservoir, the Director, with the approval of the Authority, will apportion the available water among all the purchasers having contracts therefor as may best provide for the health, safety, and general welfare of the people of this State as determined by the Authority.

(2) The Director shall evaluate the effect of sediment deposits

in the Reservoir and, if such evaluation indicates that the sediment deposits have reduced the yield from the State's conservation water supply storage space, the Director will apportion available water among the persons having contracts in relation to the annual volume of all water contracted.

(3) If the United States temporarily discontinues or reduces water storage available to the State under its agreement with the United States for the purpose of inspection, investigation, maintenance, repair, or rehabilitation of the Reservoir or for other reasons deemed necessary by the United States, the Director will apportion the available water among the persons having contracts as determined by the State.

(4) If, because of an emergency, the Director deems it necessary for the health, safety, and general welfare of the people of Kansas to reduce or terminate the withdrawal of water from the Reservoir, the Director, with the approval of the Authority, will apportion any available water among the persons having contracts therefor as may best provide for the health, safety, and general welfare of the people of Kansas.

(c) In the event the Director finds it necessary to apportion the available water from the Reservoir among the persons having contracts therefor, and such apportionment results in the Purchaser being unable during the year to receive the amount of water that has been purchased by payment of the minimum charge, the Purchaser shall pay the State only for the amount of water actually made available to the Purchaser during the year.

ARTICLE 14. LIABILITY

Neither the Director nor the Authority shall be liable for any claim arising out of the control, carriage, handling, use, disposal, or distribution of water furnished to the Purchaser beyond the point of withdrawal as described in this contract except as provided in the Kansas Tort Claims Act, K.S.A. 75-6101 et seq., and amendments thereto; and the Purchaser shall hold the State harmless on account of damage or claim of damage of any nature whatsoever arising out of or connected with the control, carriage, handling, use, disposal, or distribution of water beyond the point of withdrawal. Nothing in this Article shall be construed to impair any protection of the rights of the Purchaser as set forth in Article 6.

ARTICLE 15. AMENDMENT OR NULLIFICATION

The contract may be amended or nullified by written agreement of the parties, as provided in K.S.A. 82a-1316, and amendments thereto. The fixed rate as stated in this contract may be subsequently adjusted on January 1 after the execution of the contract and on each January 1 thereafter, pursuant to the terms and conditions of this contract.

ARTICLE 16. ASSIGNMENT OF CONTRACT

No assignment, sale, conveyance, or transfer of all or any part of this contract, or of interest therein, shall be valid unless and until same is approved by the Authority under such reasonable terms and conditions as the Authority may impose.

Whenever the assignment, sale, conveyance, or transfer of all or any part of the water purchase contract involves a change in

either the place of use or the purpose of use, the Authority shall have the option to cancel the water purchase contract or portion thereof and make the water available for purchase by persons who have filed applications in accordance with rules and regulations for administration of the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., and amendments thereto.

ARTICLE 17. RENEWALS

When this contract expires, the Director shall give the Purchaser the opportunity to refuse any new offering of the water before offering the same to any other applicant.

ARTICLE 18. TERMINATION

In the event the Purchaser is unable to obtain, construct, maintain, or operate the necessary water treatment and distribution facilities, the Purchaser may terminate this contract upon giving the State thirty (30) days written notice of its intent to do so, and all rights and liabilities of the Purchaser hereunder shall cease. Provided, however, that nothing in this Article shall be construed to affect the duty of the Purchaser to pay the prorated share of the minimum charge for the year in which the contract is terminated or the actual charge for the quantity of water withdrawn, whichever is greater, before notice of termination is given.

ARTICLE 19. SEVERABILITY

In the event any provision of this agreement or any part of any provision of this agreement are held invalid by a court of competent jurisdiction, such invalidity shall not affect other

terms hereof which can be given effect without the invalid provision or portion of such provision, and to that end the terms of this agreement are intended to be severable.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the day and year first above written.

RURAL WATER DISTRICT NO. 2
DOUGLAS COUNTY, KANSAS

Michael A. Flory
Chairman

ATTEST:

John P. Metsker
Secretary

THE STATE OF KANSAS, BY:

Joseph F. Harkins
Director
Kansas Water Office

WITH THE EXPRESS APPROVAL OF
THE KANSAS WATER AUTHORITY,
BY:

H. Philip Martin
Chairman
Kansas Water Authority

S T A T E O F K A N S A S
K A N S A S W A T E R O F F I C E

CONTRACT
Between the State of Kansas
and
City of Spring Hill
Johnson and Miami Counties, Kansas

FOR A MUNICIPAL AND INDUSTRIAL WATER SUPPLY
from
HILLSDALE RESERVIOR

Water Purchase Contract No. 83-5
November 16, 1983

TABLE OF CONTENTS

INTRODUCTORY PROVISIONS

WATER SERVICE AND PAYMENT PROVISIONS

GENERAL PROVISIONS

KANSAS WATER OFFICE
WATER PURCHASE CONTRACT NO. 83-5

This contract is executed and entered into this 16th day of November, 1983, by and between the State of Kansas (hereinafter referred to as the "State") as represented by the Kansas Water Office, and City of Spring Hill, Johnson and Miami counties, Kansas, (hereinafter referred to as the "Purchaser").

WITNESSETH: WHEREAS, the Purchaser desires to purchase water for a municipal and industrial water supply; and

WHEREAS, the State has signed an Agreement (Contract No. DACW41-74-C-0098) with the United States of America under the provisions of the Water Supply Act of 1958 (Title III, P.L. 85-500), as amended, for water supply storage space in the Reservoir; and

WHEREAS, the State has filed an appropriate water reservation right to divert and store water in the Reservoir; and

WHEREAS, the Director of the Kansas Water Office is authorized by K.S.A. 74-2615, as amended, and by K.S.A. 82a-1305, as amended, to negotiate contracts for the sale of water; and

WHEREAS, the Purchaser filed two appropriate applications with the State to negotiate the purchase of raw water from the Reservoir, in compliance with the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., as amended; and

WHEREAS, the Purchaser's immediate and projected water supply needs can be provided from the Reservoir; and

WHEREAS, the withdrawal and use of twenty million (20,000,000) gallons of water annually from the Reservoir by the Purchaser is in the interest of the people of the State of Kansas and will advance

the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated; and

WHEREAS, Purchaser's applications to purchase raw water from the Reservoir are approved for a maximum total amount of 20.0 million gallons per year in accordance with Articles 9 and 13 of Chapter 82a of Kansas Statutes Annotated.

NOW THEREFORE, in consideration of the foregoing, the parties mutually agree as follows:

ARTICLE 1. DEFINITIONS

As used in this contract, unless the context otherwise requires:

(a) "Authority" means the Kansas Water Authority, or its successor.

(b) "Director" means the Director of the Kansas Water Office, his or her successor, or designated representative.

(c) "Point of withdrawal from the reservoir" means the point at which water is taken from the reservoir by pump, siphon, canal or any other device; or released through the dam by gates, conduits, or any other means.

(d) "Raw water" refers to untreated water at the point of withdrawal from the reservoir.

(e) "Reservoir" means Hillsdale Lake.

ARTICLE 2. TERM OF THE CONTRACT

The term of this contract shall be for a period of forty (40) years beginning on the date of execution of this contract. The Purchaser may commence using water at any time after the execution of this contract by providing notice as provided in Article 12.

ARTICLE 3. LEGISLATIVE DISAPPROVAL AND REVOCATION

This contract, any amendment hereto, or renewal thereof is subject to disapproval and revocation by the Kansas Legislature as provided in K.S.A. 82a-1307, and amendments thereto.

ARTICLE 4. UNITED STATES APPROVAL

The Purchaser shall secure the right from the federal government to construct, modify, alter, or maintain installations and facilities when such installations and facilities are on federal lands. The Purchaser shall bear the cost of construction, modification, operation, and maintenance of Purchaser owned installations and facilities.

The Purchaser shall provide the Director with proof of any easement granted by the federal government for rights-of-way across, in, and upon federal government land required for intake, transmission of water, and necessary appurtenances.

ARTICLE 5. COMPLIANCE WITH KANSAS STATUTES

This contract is subject to such statutes as may be applicable, including specifically but not by way of limitation, the State Water Planning Act, K.S.A. 82a-901 et seq., and amendments thereto; the State Water Plan, K.S.A. 82a-927 et seq., and amendments thereto; and the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., and amendments thereto; and the Purchaser agrees to comply with such statutes and any amendments to said statutes which may be enacted subsequent to the execution of this contract.

ARTICLE 6. QUANTITY OF WATER

a. Initial Quantity. During the term of this contract defined in Article 2, subject to the conditions herein stated, the State will permit the Purchaser to withdraw not more than eight hundred million (800,000,000) gallons of raw water from water supply storage in

the Reservoir; provided, however, that the State shall not be obligated to furnish more than twenty million (20,000,000) gallons of raw water in any one (1) calendar year. If the Purchaser in any calendar year does not withdraw the entire annual amount obligated under terms of this contract, the unused amount of water shall not add to the Purchaser's entitlement in any subsequent year.

b. Review and Adjustment. The Director shall review the quantity and purposes for which water is used on the sixth anniversary of the execution of this contract and on each annual anniversary for the remaining portion of the term of this contract. The Director may adjust the total amount of water contracted for on the sixth anniversary of the execution of the contract and on each annual anniversary thereafter, if the Purchaser does not begin full payment for the water under contract and another water user is ready, willing and able to contract for such water.

c. Water Appropriation Rights. Any rights under the Kansas Water Appropriation Act, K.S.A. 82a-701 et seq., and amendments thereto, acquired by the Purchaser and having priority dates later than May 24, 1974, shall not be used by the Purchaser in lieu of any quantity of water obligated under terms of this contract. Any water received under authority of such water appropriation rights shall not be counted against the Purchaser's annual water entitlement under this contract even though the Purchaser may have to pay the State as if the water had been received under this contract as provided in Article 9.

The Purchaser may use water withdrawn in accordance with the terms of this contract without obtaining a permit or water right

under the Kansas Water Appropriation Act. Rights of the Purchaser under this contract shall be entitled to the same protection as any other vested property interest including vested water rights, water appropriation rights, and approved applications for permit to appropriate water.

ARTICLE 7. PRICE OF WATER

a. Price. The Purchaser agrees to pay the State at the rate fixed in accordance with K.S.A. 82a-1306, and amendments thereto, for each one thousand (1,000) gallons of raw water used or raw water which must be paid for under terms of this contract throughout the term of this contract; provided, however, that the Purchaser is obligated and agrees to pay the minimum charges in accordance with this Article regardless of the quantity of raw water actually used, except as provided in Article 13. The rate for raw water which must be paid for under terms of this contract shall be $0.1177 for each one thousand (1,000) gallons during calendar year 1984.

b. Minimum Charge. The Purchaser agrees to pay to the State a minimum charge whether or not water is withdrawn during the calendar year. The minimum charge for each calendar year shall be determined as provided in K.S.A. 82a-1306, and amendments thereto. The minimum charge shall be subject to change as may be provided by subsequent amendments to State statutes which affect the terms of this contract. The minimum charge for calendar year 1984 and each succeeding calendar year, unless changed by amendment of State statutes, shall be the sum of the following two components:

(1) 50 percent of the total annual amount of water contracted for

during the term of this contract multiplied by the rate established in accordance with paragraph (a) of this Article or as adjusted in accordance with paragraph (c) of this Article; and (2) 50 percent of the total annual amount of water contracted for purchase multiplied by a rate per annum as interest equal to the average rate of interest earned the past 12 months on the investment of State monies by the Pooled Money Investment Board multiplied by the net amount of monies advanced from State funds for the costs incurred and associated with providing that 50 percent of the total annual amount of water contracted for purchase.

c. Review and Adjustment of Rates. The Director shall review the fixed rate stated in this article on July 15 of each year during the term of this contract and may adjust the rate effective January 1 of the following year to reflect any change in experience by substituting the adjusted rate for the fixed rate then applicable to the contract. Such adjusted rate shall be charged for all water used or water which must be paid for under terms of this contract as provided in Article 9. The Director shall notify the Purchaser by restricted mail by July 31 of each year of the adjusted rate which will become effective on January 1 of the ensuing year and shall notify the Purchaser of the adjusted minimum payment which will be required under the terms and conditions of this contract. Failure to furnish such notification by July 31 shall not relieve the Purchaser of the obligation to pay such adjusted rate.

ARTICLE 8. PURPOSE AND PLACE OF USE

a. Purpose. Water purchased under this contract shall be used for purposes which are in the interest of the people of the State of Kansas and which will advance the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated, and amendments thereto.

b. Place of Use. The place of use for water purchased under this contract shall be within or in the immediate vicinity of the City of Spring Hill in Johnson and Miami counties, Kansas.

c. Approval of Change in Place of Use. The Purchaser shall inform the Director of any intention to sell any water under this contract to any person or entity located outside the geographical limits described above. Whenever the Purchaser shall propose to enter into a contract to sell water purchased under this contract to any such person or entity outside the described geographical limits, the Purchaser shall, before execution thereof, submit a copy of such contract to the Authority for review. The Purchaser agrees not to execute and enter into any such contract unless approved by the Authority.

ARTICLE 9. BILLING AND PAYMENT SCHEDULE

a. Deferment. The beginning of the payment period shall be deferred for a period of one year but not to exceed three (3) years or until such time as actual use of the water contracted for commences, whichever occurs first, if in order to use the water contracted for, bonds are required to be issued, or the construction of transmission or treatment facilities is required.

b. Payments. The Purchaser shall transmit all payments due hereunder to the Director. Remittance for minimum payments shall be paid to the Director in either one annual payment within thirty

(30) days after date of billing by the State or in equal monthly installments during the calendar year in which the minimum payment is due, whether or not water is withdrawn during the calendar year. Remittance for payments due for water used in excess of the quantity obligated by the minimum payment shall be paid to the Director in full within thirty (30) days after date of billing by the State.

c. Determination of Charges. Charges for water for which payment is required shall be determined by the State. The formulas by which charges are computed shall be prepared by the Director with the approval of the Authority. The Purchaser acknowledges and agrees that said formulas and computations are subject to change, based on subsequent amendments to State statutes which may affect the terms of this contract.

d. Water Subject to Payment. The Purchaser shall pay as specified in this contract for all water received under terms of this contract up to the maximum quantity obligated by this contract. The Purchaser shall be entitled to receive any water allowed under the Kansas Water Appropriation Act; provided, however, if the Purchaser receives twenty million (20,000,000) gallons of water or less in any one year from combined use under this contract and any Purchaser held water rights having priority dates later than May 24, 1974, then the Purchaser shall pay the State regardless of the source of water, subject to the provisions of Article 13(c).

e. Initial Minimum Payment. Except as provided in Article 9a, the initial minimum payment shall become due on the day of execution of this contract as defined in Article 2. Remittance for the initial minimum payment shall be in accordance with Article 9b.

The initial minimum charge shall be prorated by the number of months or portions thereof in service during the calendar year. Payment of the initial minimum charge shall entitle the Purchaser to receive during the remaining portion of the calendar year the prorated portion of one-half (1/2) of the maximum annual quantity of water as set forth in Article 6, without additional charge.

f. Subsequent Minimum Payments. On each succeeding January 1 following the due date of the initial minimum payment, subsequent minimum payments shall become due. Remittance for minimum payments shall be in accordance with Article 9b. Payment of the minimum payment shall entitle the Purchaser to receive during the calendar year, without additional charge, one-half (1/2) of the maximum annual quantity obligated under terms of this contract.

g. Water in Excess of Minimum. At the end of each calendar year throughout the term of this contract or within thirty days after the end of each calendar year, the State shall bill the Purchaser for any water used during the calendar year in excess of one-half (1/2) the total annual quantity of water purchased under contract. The charge for this water shall be at the rate in effect for the year in which the water was used. If the Purchaser shall use a quantity of water in excess of the amount of water used to compute the minimum charge, the Purchaser shall be given credit for the proportionate share of the payment which was made as an interest charge on the net amount of monies advanced from State funds for the costs incurred and associated with providing 50 percent of the total annual amount of water contracted for purchase.

h. Overpayment or Underpayment. If for reason of error in computation, measuring device malfunction, or other causes, there is an overpayment or underpayment to the State by the Purchaser of the charges provided herein, such overpayment or underpayment shall be credited or debited, as the case may be, to the Purchaser's account for the next succeeding payment and the State shall notify the Purchaser thereof in writing. However, all charges made in any year shall be conclusively presumed to be correct six (6) months after the end of such year.

i. Adjustment for Apportionment. In the event the Purchaser is unable in any year due to apportionment under Article 13 herein to withdraw the amount which the Purchaser is entitled to receive after payment of the minimum payment, the amount of such minimum payment in excess of the amount of water actually received by Purchaser shall be credited to reduce the obligation of the Purchaser during the next succeeding calendar year.

j. Overdue Payments. If the Purchaser shall fail to make any of the payments when due, then the overdue payments shall bear interest compounded annually at the rate prescribed in K.S.A. 82a-1317, and amendments thereto, during the term of this contract. This shall not be construed as giving the Purchaser the option of either making payments when due or paying interest, nor shall it be construed as waiving any of the rights of the State that might result from such default by the Purchaser.

ARTICLE 10. POINT OF WITHDRAWAL

The point of withdrawal from the Reservoir shall be determined by the Purchaser. The Purchaser shall provide the legal description of same to the Director before the Purchaser shall begin to use water

from the Reservoir. The point of withdrawal shall be within Township 16 South, Range 23 East, Miami County, Kansas.

ARTICLE 11. METERING OF WATER

The Purchaser shall at its own expense, furnish, install, operate, and maintain at the place of diversion, a commercial measuring device as approved by the Director.

The Purchaser shall test and calibrate as accurately as possible such measuring device or devices whenever requested by the Director, but not more frequently than once every twelve (12) months. A measuring device shall be deemed to be accurate if test results fall within a tolerance of plus or minus two (2) percent throughout the full range of diversion. Certification of measuring devices shall be obtained from a commercial testing company approved by the Director.

The previous readings of any measuring device disclosed by test to be inaccurate shall be corrected for the three (3) months previous to such test or one-half (1/2) the period since the last test, whichever is shorter, in accordance with the percentage of inaccuracy found by such tests.

If any measuring device fails to register for any period, the amount of water furnished during such period shall be determined by the Director after consultation with the Purchaser.

The Purchaser shall read the measuring device on or before the last calendar day of each month, and shall send such reading to the Director within ten (10) days after it has been taken.

The Purchaser shall provide to the State monthly reports of all water withdrawn from any sources under authority of Purchaser held water use permits or water appropriation rights having priority dates after May 24, 1974. Representatives of the State

shall, at all reasonable times, have access to the measuring device for the purpose of verifying all readings.

The State may measure releases by means of a rating curve at the point of withdrawal, or by other suitable means, as an auxiliary measuring device to verify the accuracy of the Purchaser's measuring device or to measure the amount of water furnished when the Purchaser's measuring device fails to register.

ARTICLE 12. WATER WITHDRAWAL SCHEDULE

The Purchaser shall notify the Director, in writing, of the date for the initial withdrawal of water at least forty-five (45) days prior to such withdrawal. At such time the Purchaser shall also notify the Director, in writing, of the amounts, times, and rates of withdrawal of water required during the remainder of the calendar year in which such initial withdrawal is made. The Purchaser agrees to submit a water withdrawal schedule for each succeeding calendar year to the Director on or before November 1 of each year.

Such proposed water withdrawal schedule shall be approved or disapproved by the Director within thirty (30) days of the filing of such schedule and, subject to his or her approval, such schedule may be amended upon written request from the Purchaser. The Director shall not unreasonably disapprove or withhold his or her approval of the water withdrawal schedule.

The Purchaser's approved water withdrawal schedule shall govern the rate of withdrawal, but in no event shall the Purchaser withdraw water in excess of the maximum daily rate of five hundred thousand (500,000) gallons per day. Whenever the Purchaser wishes to make a withdrawal of water provided under terms of this contract from the reservoir other than as approved in the annual withdrawal schedule,

the Purchaser shall advise the Director at least two (2) working days prior to the time such water is to be withdrawn from the Reservoir. Such notice may be transmitted to the Director by oral communication, but the notice must be confirmed in writing within fifteen (15) days after the oral communication.

ARTICLE 13. CONTINUITY OF WATER SERVICE

(a) The Director shall make all reasonable efforts to perfect and protect the water reservation right necessary for the satisfaction of the water supply commitment. In the event it becomes necessary for any reason to apportion the water among the persons having contracts therefor, or to temporarily discontinue the furnishing of water to such persons, the Director will give each person an oral notice, followed by a written notice, of such action as far in advance as is reasonably practicable.

(b) Neither the Director nor the Authority shall be responsible or have any legal liability for any insufficiency of water or the apportionment thereof, and the duty of the Director and the Authority to furnish water is specifically subject to the following conditions:

(1) If the total amount of water contracted for withdrawal by all purchasers from the Reservoir in the year is greater than the supply available from the conservation water supply storage in the Reservoir, the Director, with the approval of the Authority, will apportion the available water among all the purchasers having contracts therefor as may best provide for the health, safety, and general welfare of the people of this State as determined by the Authority.

(2) The Director shall evaluate the effect of sediment deposits

in the Reservoir and, if such evaluation indicates that the sediment deposits have reduced the yield from the State's conservation water supply storage space, the Director will apportion available water among the persons having contracts in relation to the annual volume of all water contracted.

(3) If the United States temporarily discontinues or reduces water storage available to the State under its agreement with the United States for the purpose of inspection, investigation, maintenance, repair, or rehabilitation of the Reservoir or for other reasons deemed necessary by the United States, the Director will apportion the available water among the persons having contracts as determined by the State.

(4) If, because of an emergency, the Director deems it necessary for the health, safety, and general welfare of the people of Kansas to reduce or terminate the withdrawal of water from the Reservoir, the Director, with the approval of the Authority, will apportion any available water among the persons having contracts therefor as may best provide for the health, safety, and general welfare of the people of Kansas.

(c) In the event the Director finds it necessary to apportion the available water from the Reservoir among the persons having contracts therefor, and such apportionment results in the Purchaser being unable during the year to receive the amount of water that has been purchased by payment of the minimum charge, the Purchaser shall pay the State only for the amount of water actually made available to the Purchaser during the year.

ARTICLE 14. LIABILITY

Neither the Director nor the Authority shall be liable for any claim arising out of the control, carriage, handling, use, disposal, or distribution of water furnished to the Purchaser beyond the point of withdrawal as described in this contract except as provided in the Kansas Tort Claims Act, K.S.A. 75-6101 et seq., and amendments thereto; and the Purchaser shall hold the State harmless on account of damage or claim of damage of any nature whatsoever arising out of or connected with the control, carriage, handling, use, disposal, or distribution of water beyond the point of withdrawal. Nothing in this Article shall be construed to impair any protection of the rights of the Purchaser as set forth in Article 6.

ARTICLE 15. AMENDMENT OR NULLIFICATION

The contract may be amended or nullified by written agreement of the parties, as provided in K.S.A. 82a-1316, and amendments thereto. The fixed rate as stated in this contract may be subsequently adjusted on January 1 after the execution of the contract and on each January 1 thereafter, pursuant to the terms and conditions of this contract.

ARTICLE 16. ASSIGNMENT OF CONTRACT

No assignment, sale, conveyance, or transfer of all or any part of this contract, or of interest therein, shall be valid unless and until same is approved by the Authority under such reasonable terms and conditions as the Authority may impose.

Whenever the assignment, sale, conveyance, or transfer of all or any part of the water purchase contract involves a change in

either the place of use or the purpose of use, the Authority shall have the option to cancel the water purchase contract or portion thereof and make the water available for purchase by persons who have filed applications in accordance with rules and regulations for administration of the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., and amendments thereto.

ARTICLE 17. RENEWALS

When this contract expires, the Director shall give the Purchaser the opportunity to refuse any new offering of the water before offering the same to any other applicant.

ARTICLE 18. TERMINATION

In the event the Purchaser is unable to obtain, construct, maintain, or operate the necessary water treatment and distribution facilities, the Purchaser may terminate this contract upon giving the State thirty (30) days written notice of its intent to do so, and all rights and liabilities of the Purchaser hereunder shall cease. Provided, however, that nothing in this Article shall be construed to affect the duty of the Purchaser to pay the prorated share of the minimum charge for the year in which the contract is terminated or the actual charge for the quantity of water withdrawn, whichever is greater, before notice of termination is given.

ARTICLE 19. SEVERABILITY

In the event any provision of this agreement or any part of any provision of this agreement are held invalid by a court of competent jurisdiction, such invalidity shall not affect other

terms hereof which can be given effect without the invalid provision or portion of such provision, and to that end the terms of this agreement are intended to be severable.

IN WITNESS WHEREOF, the parties hereto have executed this agreement as of the day and year first above written.

CITY OF SPRING HILL, BY:

Marion L. Teeter
Mayor

THE STATE OF KANSAS, BY:

Joseph F. Harkins
Director
Kansas Water Office

ATTEST:

Alice Youngman
City Clerk

WITH THE EXPRESS APPROVAL OF
THE KANSAS WATER AUTHORITY,
BY:

H. Philip Martin
Chairman
Kansas Water Authority

STATE OF KANSAS
KANSAS WATER OFFICE

AMENDED CONTRACT
Between the State of Kansas
and
Rural Water District No. 7
Johnson County, Kansas

FOR A MUNICIPAL AND INDUSTRIAL WATER SUPPLY
from
HILLSDALE RESERVOIR

Water Purchase Contract No. 83-1
March 21, 1983
As Amended December 15, 1983

TABLE OF CONTENTS

INTRODUCTORY PROVISIONS

WATER SERVICE AND PAYMENT PROVISIONS

GENERAL PROVISIONS

ADDITIONAL PROVISIONS

KANSAS WATER OFFICE
WATER PURCHASE CONTRACT NO. 83-1
AS AMENDED

This amended Water Purchase Contract is entered into this 15th day of December, 1983, to amend Water Purchase Contract No. 83-1 executed and entered into on the 21st day of March, 1983, by and between the State of Kansas (hereinafter referred to as the "State") as represented by the Kansas Water Office, and Rural Water District No. 7 of Johnson County, Kansas, (hereinafter referred to as the "Purchaser").

WITNESSETH:

WHEREAS, pursuant to the State Water Plan Storage Act (K.S.A. 82a-1301 et seq.), as amended, there is now in full force and effect between the parties hereto Water Purchase Contract No. 83-1, dated March 21, 1983, approved by the Kansas Water Authority, and not rejected by the 1983 Kansas Legislature; and

WHEREAS, Water Purchase Contract No. 83-1 provides the Purchaser the right to utilize water from state managed conservation storage in Hillsdale Lake, Kansas, for public water supply purposes; and

WHEREAS, the State and the Purchaser desire to amend Water Purchase Contract No. 83-1 to conform to the standard contract format approved by the Kansas Water Authority on August 19, 1983; and

WHEREAS, Water Purchase Contract No. 83-1, Article 16, provides for amendment or nullification of the contract by written agreement of the parties; and

WHEREAS, Kansas Statutes in K.S.A. 82a-1316, as amended, provide for amendment or nullification of the contract by written agreement of the parties made and recorded as provided in K.S.A. 82a-1301 et seq. for original contracts; and

WHEREAS, the State has signed an agreement (Contract No. DACW41-74-C-0098) with the United States of America under the provisions of the Water Supply Act of 1958 (Title III, P.L. 85-500), as amended, for water supply storage space in the Reservoir; and

WHEREAS, the State filed an appropriate water reservation right on May 24, 1974, to divert and store water in the Reservoir; and

WHEREAS, the Director of the Kansas Water Office is authorized by K.S.A. 74-2615, as amended, and by K.S.A. 82a-1305, as amended, to negotiate contracts for the sale of water; and

WHEREAS, the Purchaser filed an appropriate application with the State to negotiate the purchase of raw water from the Reservoir, in compliance with the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., as amended; and

WHEREAS, the Purchaser's immediate and projected water supply needs can be provided from the Reservoir; and

WHEREAS, the withdrawal and use of 110.00 million gallons of water annually from the Reservoir by the Purchaser is in the interest of the people of the State of Kansas and will advance the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated; and

WHEREAS, Purchaser's Application No. 2 to purchase raw water from the Reservoir is approved for a maximum total amount of 110.00

million gallons per year in accordance with Articles 9 and 13 of Chapter 82a of Kansas Statutes Annotated.

NOW, THEREFORE, the parties herein mutually agree that said Water Purchase Contract No. 83-1 dated March 21, 1983, is hereby modified in its entirety by the following:

ARTICLE 1. DEFINITIONS

As used in this contract, unless the context otherwise requires:

(a) "Authority" means the Kansas Water Authority, or its successor.

(b) "Director" means the Director of the Kansas Water Office, his or her successor, or designated representative.

(c) "Point of withdrawal from the reservoir" means the point at which water is taken from the reservoir by pump, siphon, canal or any other device; or released through the dam by gates, conduits, or any other means.

(d) "Raw water" refers to untreated water at the point of withdrawal from the reservoir.

(e) "Reservoir" means Hillsdale Lake.

ARTICLE 2. TERM OF THE CONTRACT

The term of this contract shall be for a period of forty (40) years beginning on March 21, 1983, the date of execution of Water Purchase Contract No. 83-1. The Purchaser may commence using water at any time after the execution of the contract by providing notice as provided in Article 12.

ARTICLE 3. LEGISLATIVE DISAPPROVAL AND REVOCATION

This contract, any amendment hereto, or renewal thereof is subject to disapproval and revocation by the Kansas Legislature as provided in K.S.A. 82a-1307, and amendments thereto.

ARTICLE 4. UNITED STATES APPROVAL

The Purchaser shall secure the right from the federal government to construct, modify, alter, or maintain installations and facilities when such installations and facilities are on federal lands. The Purchaser shall bear the cost of construction, modification, operation, and maintenance of Purchaser owned installations and facilities.

The Purchaser shall provide the Director with proof of any easement granted by the federal government for rights-of-way across, in, and upon federal government land required for intake, transmission of water, and necessary appurtenances.

ARTICLE 5. COMPLIANCE WITH KANSAS STATUTES

This contract is subject to such statutes as may be applicable, including specifically but not by way of limitation, the State Water Planning Act, K.S.A. 82a-901 et seq., and amendments thereto; the State Water Plan, K.S.A. 82a-927 et seq., and amendments thereto; and the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., and amendments thereto; and the Purchaser agrees to comply with such statutes and any amendments to said statutes which may be enacted subsequent to the execution of this contract.

ARTICLE 6. QUANTITY OF WATER

a. Initial Quantity. During the term of this contract defined in Article 2, subject to the conditions herein stated, the State will permit the Purchaser to withdraw not more than four billion, four hundred million (4,400,000,000) gallons of raw water from water supply storage in the Reservoir; provided, however, that the State shall not be obligated to furnish more than one hundred

and ten million (110,000,000) gallons of raw water in any one (1) calendar year. If the Purchaser in any calendar year does not withdraw the entire annual amount obligated under terms of this contract, the unused amount of water shall not add to the Purchaser's entitlement in any subsequent year.

b. Review and Adjustment. The Director shall review the quantity and purposes for which water is used on the sixth anniversary of the execution of this contract and on each annual anniversary for the remaining portion of the term of this contract. The Director may adjust the total amount of water contracted for on the sixth anniversary of the execution of the contract and on each annual anniversary thereafter, if the Purchaser does not begin full payment for the water under contract and another water user is ready, willing and able to contract for such water.

c. Water Appropriation Rights. Any rights under the Kansas Water Appropriation Act, K.S.A. 82a-701 et seq., and amendments thereto, acquired by the Purchaser and having priority dates later than May 24, 1974, shall not be used by the Purchaser in lieu of any quantity of water obligated under terms of this contract. Any water received under authority of such water appropriation rights shall not be counted against the Purchaser's annual water entitlement under this contract even though the Purchaser may have to pay the State as if the water had been received under this contract as provided in Article 9.

The Purchaser may use water withdrawn in accordance with the terms of this contract without obtaining a permit or water right under the Kansas Water Appropriation Act. Rights of the Purchaser

under this contract shall be entitled to the same protection as any other vested property interest including vested water rights, water appropriation rights, and approved applications for permit to appropriate water.

ARTICLE 7. PRICE OF WATER

a. Price. The Purchaser agrees to pay the State at the rate fixed in accordance with K.S.A. 82a-1306, and amendments thereto, for each one thousand (1,000) gallons of raw water used or raw water which must be paid for under terms of this contract throughout the term of this contract; provided, however, that the Purchaser is obligated and agrees to pay the minimum charges in accordance with this Article regardless of the quantity of raw water actually used, except as provided in Article 13. The rate for raw water which must be paid for under terms of this contract shall be $0.1158 for each one thousand (1,000) gallons during calendar year 1983.

b. Minimum Charge. The Purchaser agrees to pay to the State a minimum charge whether or not water is withdrawn during the calendar year. The minimum charge for each calendar year shall be determined as provided in K.S.A. 82a-1306, and amendments thereto. The minimum charge shall be subject to change as may be provided by subsequent amendments to State statutes which affect the terms of this contract. The minimum charge for calendar year 1983 and each succeeding calendar year, unless changed by amendment of State statutes, shall be the sum of the following two components:

(1) 50 percent of the total annual amount of water contracted for during the term of this contract multiplied by the rate established in

accordance with paragraph (a) of this Article or as adjusted in accordance with paragraph (c) of this Article; and (2) 50 percent of the total annual amount of water contracted for purchase multiplied by a rate per annum as interest equal to the average rate of interest earned the past 12 months on the investment of State monies by the Pooled Money Investment Board multiplied by the net amount of monies advanced from State funds for the costs incurred and associated with providing that 50 percent of the total annual amount of water contracted for purchase.

c. Review and Adjustment of Rates. The Director shall review the fixed rate stated in this article on July 15 of each year during the term of this contract and may adjust the rate effective January 1 of the following year to reflect any change in experience by substituting the adjusted rate for the fixed rate then applicable to the contract. Such adjusted rate shall be charged for all water used or water which must be paid for under terms of this contract as provided in Article 9. The Director shall notify the Purchaser by restricted mail by July 31 of each year of the adjusted rate which will become effective on January 1 of the ensuing year and shall notify the Purchaser of the adjusted minimum payment which will be required under the terms and conditions of this contract. Failure to furnish such notification by July 31 shall not relieve the Purchaser of the obligation to pay such adjusted rate.

ARTICLE 8. PURPOSE AND PLACE OF USE

a. Purpose. Water purchased under this contract shall be used for purposes which are in the interest of the people of the State of Kansas and which will advance the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated, and amendments thereto.

b. Place of Use. The place of use for water purchased under this contract shall be within Rural Water District No. 7 of Johnson County, Kansas.

c. Approval of Change in Place of Use. The Purchaser shall inform the Director of any intention to sell any water under this contract to any person or entity located outside the geographical limits described above. Whenever the Purchaser shall propose to enter into a contract to sell water purchased under this contract to any such person or entity outside the described geographical limits, the Purchaser shall, before execution thereof, submit a copy of such contract to the Authority for review. The Purchaser agrees not to execute and enter into any such contract unless approved by the Authority.

ARTICLE 9. BILLING AND PAYMENT SCHEDULE

a. Deferment. The beginning of the payment period shall be deferred until March 21, 1985, a period of two (2) years, unless a longer deferment is approved by the Authority. The deferment period shall not exceed three (3) years or until such time as actual use of the water contracted for commences, whichever occurs first, if in order to use the water contracted for, bonds are required to be issued, or the construction of transmission or treatment facilities is required.

b. Payments. The Purchaser shall transmit all payments due hereunder to the Director. Remittance for minimum payments shall be paid to the Director in either one annual payment within thirty (30) days after date of billing by the State or in equal monthly installments during the calendar year in which the minimum payment is due, whether or not water is withdrawn during the calendar year. Remittance for payments due for water used in excess of the quantity obligated by the minimum payment shall be paid to the Director in full within thirty (30) days after date of billing by the State.

c. Determination of Charges. Charges for water for which payment is required shall be determined by the State. The formulas by which charges are computed shall be prepared by the Director with the approval of the Authority. The Purchaser acknowledges and agrees that said formulas and computations are subject to change, based on subsequent amendments to State statutes which may affect the terms of this contract.

d. Water Subject to Payment. The Purchaser shall pay as specified in this contract for all water received under terms of this contract up to the maximum quantity obligated by this contract. The Purchaser shall be entitled to receive any water allowed under the Kansas Water Appropriation Act; provided, however, if the Purchaser receives one hundred and ten million (110,000,000) gallons of water or less in any one year from combined use under this contract and any Purchaser held water rights having priority dates later than May 24, 1974, then the Purchaser shall pay the State regardless of the source of water, subject to the provisions of Article 13(c).

e. Initial Minimum Payment. Except as provided in Article 9a, the initial minimum payment shall become due on the day of execution of this contract as defined in Article 2. Remittance for the initial minimum payment shall be in accordance with Article 9b. The initial minimum charge shall be prorated by the number of months or portions thereof in service during the calendar year. Payment of the initial minimum charge shall entitle the Purchaser to receive during the remaining portion of the calendar year the prorated portion of one-half (1/2) of the maximum annual quantity of water as set forth in Article 6, without additional charge.

f. Subsequent Minimum Payments. On each succeeding January 1 following the due date of the initial minimum payment, subsequent minimum payments shall become due. Remittance for minimum payments shall be in accordance with Article 9b. Payment of the minimum payment shall entitle the Purchaser to receive during the calendar year, without additional charge, one-half (1/2) of the maximum annual quantity obligated under terms of this contract.

g. Water in Excess of Minimum. At the end of each calendar year throughout the term of this contract or within thirty days after the end of each calendar year, the State shall bill the Purchaser for any water used during the calendar year in excess of one-half (1/2) the total annual quantity of water purchased under contract. The charge for this water shall be at the rate in effect for the year in which the water was used. If the Purchaser shall use a quantity of water in excess of the amount of water

used to compute the minimum charge, the Purchaser shall be given credit for the proportionate share of the payment which was made as an interest charge on the net amount of monies advanced from state funds for the costs incurred and associated with providing 50 percent of the total annual amount of water contracted for purchase.

h. Overpayment or Underpayment. If for reason of error in computation, measuring device malfunction, or other causes, there is an overpayment or underpayment to the State by the Purchaser of the charges provided herein, such overpayment or underpayment shall be credited or debited, as the case may be, to the Purchaser's account for the next succeeding payment and the State shall notify the Purchaser thereof in writing. However, all charges made in any year shall be conclusively presumed to be correct six (6) months after the end of such year.

i. Adjustment for Apportionment. In the event the Purchaser is unable in any year due to apportionment under Article 13 herein to withdraw the amount which the Purchaser is entitled to receive after payment of the minimum payment, the amount of such minimum payment in excess of the amount of water actually received by Purchaser shall be credited to reduce the obligation of the Purchaser during the next succeeding calendar year.

j. Overdue Payments. If the Purchaser shall fail to make any of the payments when due, then the overdue payments shall bear interest compounded annually at the rate prescribed in K.S.A.

82a-1317, and amendments thereto, during the term of this contract. This shall not be construed as giving the Purchaser the option of either making payments when due or paying interest, nor shall it be construed as waiving any of the rights of the State that might result from such default by the Purchaser.

ARTICLE 10. POINT OF WITHDRAWAL

The point of withdrawal from the Reservoir shall be in the Southwest Quarter of the Southeast Quarter of the Northeast Quarter (SW 1/4 of the SE 1/4 of the NE 1/4) of Section 7, Township 16 South, Range 23 East, Miami County, Kansas.

ARTICLE 11. METERING OF WATER

The Purchaser shall at its own expense, furnish, install, operate, and maintain at the place of diversion, a commercial measuring device as approved by the Director.

The Purchaser shall test and calibrate as accurately as possible such measuring device or devices whenever requested by the Director, but not more frequently than once every twelve (12) months. A measuring device shall be deemed to be accurate if test results fall within a tolerance of plus or minus two (2) percent throughout the full range of diversion. Certification of measuring devices shall be obtained from a commercial testing company approved by the Director.

The previous readings of any measuring device disclosed by test to be inaccurate shall be corrected for the three (3) months previous to such test or one-half (1/2) the period since the last test, whichever is shorter, in accordance with the percentage of inaccuracy found by such tests.

If any measuring device fails to register for any period, the amount of water furnished during such period shall be determined by the Director after consultation with the Purchaser.

The Purchaser shall read the measuring device on or before the last calendar day of each month, and shall send such reading to the Director within ten (10) days after it has been taken.

The Purchaser shall provide to the State monthly reports of all water withdrawn from any sources under authority of Purchaser held water use permits or water appropriation rights having priority dates after May 24, 1974. Representatives of the State shall, at all reasonable times, have access to the measuring device for the purpose of verifying all readings.

The State may measure releases by means of a rating curve at the point of withdrawal, or by other suitable means, as an auxiliary measuring device to verify the accuracy of the Purchaser's measuring device or to measure the amount of water furnished when the Purchaser's measuring device fails to register.

ARTICLE 12. WATER WITHDRAWAL SCHEDULE

The Purchaser shall notify the Director, in writing, of the date for the initial withdrawal of water at least forty-five (45) days prior to such withdrawal. At such time the Purchaser shall also notify the Director, in writing, of the amounts, times, and rates of withdrawal of water required during the remainder of the calendar year in which such initial withdrawal is made. The Purchaser agrees to submit a water withdrawal schedule for each succeeding calendar year to the Director on or before November 1 of each year.

Such proposed water withdrawal schedule shall be approved or disapproved by the Director within thirty (30) days of the filing of such schedule and, subject to his or her approval, such schedule may be amended upon written request from the Purchaser. The Director shall not unreasonably disapprove or withhold his or her approval of the water withdrawal schedule.

The Purchaser's approved water withdrawal schedule shall govern the rate of withdrawal, but in no event shall the Purchaser withdraw water in excess of the maximum daily rate of seven hundred and fifty thousand (750,000) gallons. Whenever the Purchaser wishes to make a withdrawal of water provided under terms of this contract from the reservoir other than as approved in the annual withdrawal schedule, the Purchaser shall advise the Director at least two (2) working days prior to the time such water is to be withdrawn from the Reservoir. Such notice may be transmitted to the Director by oral communication, but the notice must be confirmed in writing within fifteen (15) days after the oral communication.

ARTICLE 13. CONTINUITY OF WATER SERVICE

(a) The Director shall make all reasonable efforts to perfect and protect the water reservation right necessary for the satisfaction of the water supply commitment. In the event it becomes necessary for any reason to apportion the water among the persons having contracts therefor, or to temporarily discontinue the furnishing of water to such persons, the Director will give each person an oral notice, followed by a written notice, of such action as far in advance as is reasonably practicable.

(b) Neither the Director nor the Authority shall be responsible or have any legal liability for any insufficiency of water or the apportionment thereof, and the duty of the Director and the Authority to furnish water is specifically subject to the following conditions:

(1) If the total amount of water contracted for withdrawal by all purchasers from the Reservoir in the year is greater than the supply available from the conservation water supply storage in the Reservoir, the Director, with the approval of the Authority, will apportion the available water among all the purchasers having contracts therefor as may best provide for the health, safety, and general welfare of the people of this State as determined by the Authority.

(2) The Director shall evaluate the effect of sediment deposits in the Reservoir and, if such evaluation indicates that the sediment deposits have reduced the yield from the State's conservation water supply storage space, the Director will apportion available water among the persons having contracts in relation to the annual volume of all water contracted.

(3) If the United States temporarily discontinues or reduces water storage available to the State under its agreement with the United States for the purpose of inspection, investigation, maintenance, repair, or rehabilitation of the Reservoir or for other reasons deemed necessary by the United States, the Director will apportion the available water among the persons having contracts as determined by the State.

(4) If, because of an emergency, the Director deems it necessary for the health, safety, and general welfare of the people of Kansas to reduce or terminate the withdrawal of water from the Reservoir, the Director, with the approval of the Authority, will apportion any available water among the persons having contracts therefor as may best provide for the health, safety, and general welfare of the people of Kansas.

(c) In the event the Director finds it necessary to apportion the available water from the Reservoir among the persons having contracts therefor, and such apportionment results in the Purchaser being unable during the year to receive the amount of water that has been purchased by payment of the minimum charge, the Purchaser shall pay the State only for the amount of water actually made available to the Purchaser during the year.

ARTICLE 14. LIABILITY

Neither the Director nor the Authority shall be liable for any claim arising out of the control, carriage, handling, use, disposal, or distribution of water furnished to the Purchaser beyond the point of withdrawal as described in this contract except as provided in the Kansas Tort Claims Act, K.S.A. 75-6101 et seq., and amendments thereto; and the Purchaser shall hold the State harmless on account of damage or claim of damage of any nature whatsoever arising out of or connected with the control, carriage, handling, use, disposal, or distribution of water beyond the point of withdrawal. Nothing in this Article shall be construed to impair any protection of the rights of the Purchaser as set forth in Article 6.

ARTICLE 15. AMENDMENT OR NULLIFICATION

The contract may be amended or nullified by written agreement of the parties, as provided in K.S.A. 82a-1316, and amendments thereto. The fixed rate as stated in this contract may be subsequently adjusted on January 1 after the execution of the contract and on each January 1 thereafter, pursuant to the terms and conditions of this contract.

ARTICLE 16. ASSIGNMENT OF CONTRACT

No assignment, sale, conveyance, or transfer of all or any part of this contract, or of interest therein, shall be valid unless and until same is approved by the Authority under such reasonable terms and conditions as the Authority may impose.

Whenever the assignment, sale, conveyance, or transfer of all or any part of the water purchase contract involves a change in either the place of use or the purpose of use, the Authority shall have the option to cancel the water purchase contract or portion thereof and make the water available for purchase by persons who have filed applications in accordance with rules and regulations for administration of the State Water Plan Storage Act, K.S.A. 82a-1301 et seq., and amendments thereto.

ARTICLE 17. RENEWALS

When this contract expires, the Director shall give the Purchaser the opportunity to refuse any new offering of the water before offering the same to any other applicant.

ARTICLE 18. TERMINATION

In the event the Purchaser is unable to obtain, construct, maintain, or operate the necessary water treatment and distribution facilities, the Purchaser may terminate this contract upon giving the State thirty (30) days written notice of its intent to do so, and all rights and liabilities of the Purchaser hereunder shall cease. Provided, however, that nothing in this Article shall be construed to affect the duty of the Purchaser to pay the prorated share of the minimum charge for the year in which the contract is terminated or the actual charge for the quantity of water withdrawn, whichever is greater, before notice of termination is given.

ARTICLE 19. SEVERABILITY

In the event any provision of this agreement or any part of any provision of this agreement are held invalid by a court of competent jurisdiction, such invalidity shall not affect other terms hereof which can be given effect without the invalid provision or portion of such provision, and to that end the terms of this agreement are intended to be severable.

ARTICLE 20. AGREEMENT WITH MIAMI COUNTY RWD NO. 2

The Purchaser shall provide the Director with proof that Rural Water District No. 2, Miami County, Kansas, assumes the duties of the Purchaser to construct, operate, and maintain the water intake and transmission facilities to conduct the raw water from the point of withdrawal to Rural Water District No. 2's water treatment plant for treatment. In the event the Purchaser does not negotiate a contract with Rural Water District No. 2, Miami County, Kansas, for treatment of raw water, the Purchaser shall notify

the Director and the Authority, and the Purchaser shall have the option to obtain or construct, operate, and maintain other facilities for intake, transmission of water, and necessary appurtenances as set forth in this contract.

IN WITNESS WHEREOF, the parties hereto have executed this amended agreement to continue in effect from the 21st day of March, 1983.

RURAL WATER DISTRICT NO. 7
JOHNSON COUNTY, KANSAS

Glenn Bonar
Chairman

ATTEST:

Wendell Knabe
Secretary

THE STATE OF KANSAS, BY:

Joseph F. Harkins
Director
Kansas Water Office

WITH THE EXPRESS APPROVAL OF
THE KANSAS WATER AUTHORITY, BY:

H. Philip Martin
Chairman
Kansas Water Authority

SUPPLEMENTAL AGREEMENT NO. 1
TO
WATER PURCHASE CONTRACT NO. 81-5
BETWEEN THE STATE OF KANSAS
AND
CITY OF COFFEYVILLE, KANSAS
FOR
MUNICIPAL AND INDUSTRIAL WATER SUPPLY
FROM
ELK CITY RESERVOIR

This Supplemental Agreement is entered into this 16th day of November, 1983, by and between the State of Kansas, as represented by the Kansas Water Office (hereinafter referred to as the "State") with the approval of the Kansas Water Authority, and the City of Coffeyville, Kansas, (hereinafter referred to as the "Purchaser") an incorporated city in Montgomery County, Kansas.

WITNESSETH:

WHEREAS, pursuant to the State Water Plan Storage Act (K.S.A. 82a-1301 et seq.), as amended, there is now in full force and effect between the parties hereto Water Purchase Contract No. 81-5, dated December 16, 1981, approved by the Kansas Water Authority, and not rejected by the 1982 Session of the Kansas Legislature, which provides the Purchaser the right to utilize water from State managed conservation storage in Elk City Lake, Kansas, for municipal and industrial water supply purposes; and

WHEREAS, Purchaser desires to amend the place of use for water purchased through the contract in order to provide water supply service to City of South Coffeyville, Oklahoma, and to Rural Water District No. 7 of Nowata County, Oklahoma; and

WHEREAS, waters from conservation water supply capacity committed to the State may be withdrawn and used within or without the State in accordance with K.S.A. 82a-1305 of the State Water Plan Storage Act; and

WHEREAS, the change in place of use would permit the Purchaser to increase and expand its water supply service to residents of the State of Oklahoma who need and desire reliable, economical water supply service; and

WHEREAS, Article 15 of Water Purchase Contract No. 81-5 provides for amendment or nullification of the contract by written agreement of the parties; and

WHEREAS, Kansas statutes in K.S.A. 82a-1316, as amended, provide for amendment or nullification of the contract by written agreement of the parties made and recorded as provided in K.S.A. 82a-1301 et seq. for original contracts; and

WHEREAS, Purchaser has provided satisfactory evidence that the change in place of use is in the interest of the people of the States of Kansas and Oklahoma; and

WHEREAS, the change in place of use will not require an increase in the quantity of water already under contract to the City of Coffeyville; and

WHEREAS, the change in place of use will not deprive Kansas residents of needed water supply at the present time nor during the term of Water Purchase Contract No. 81-5.

NOW, THEREFORE, the parties herein mutually agree that said Water Purchase Contract No. 81-5 is hereby modified in the following particulars but in no others:

ITEM 1: Contract Article 8, Purpose and Place of Use, shall be replaced in its entirety by the following:

ARTICLE 8. PURPOSE AND PLACE OF USE

a. Purpose. Water purchased under this contract shall be used for purposes which are in the interest of the people of the State of Kansas and which will advance the purposes set forth in Article 9 of Chapter 82a of Kansas Statutes Annotated, and amendments thereto.

b. Place of Use. The place of use for water purchased under this contract shall be within or in the immediate vicinity of the City of Coffeyville, Kansas; the City of Dearing, Kansas; the City of South Coffeyville, Oklahoma; Cherokee Water District, Kansas; Rural Water District No. 7, No. 10, or No. 11 of Montgomery County, Kansas; Rural Water District No. 6 of Labette County, Kansas; Southern Hills Subdivision (L and D Investments, Inc.), Kansas; Rural Water District No. 1 or No. 7 of Nowata County, Oklahoma; or City of Lenapah, Oklahoma. The amount of water sold to users in Oklahoma shall be limited to 174.0 million gallons per year unless a larger quantity is subsequently approved by the Authority.

c. Approval of Change in Place of Use. The Purchaser shall inform the Director of any intention to sell any water under this contract to any person or entity located outside the geographical limits described above. Whenever the Purchaser shall propose to enter into a contract to sell water purchased under this contract to any such person or entity outside the described geographical limits, the Purchaser shall, before execution thereof, submit a copy of such contract to the Authority for review. The Purchaser agrees not to execute and enter into any such contract unless approved by the Authority.

Except as herein modified, the terms and conditions of said Water Purchase Contract No. 81-5 shall remain unchanged and in full force and effect.

This Supplemental Agreement shall be subject to the approval of the Kansas Water Authority and to possible revocation by the Kansas Legislature as provided in Contract Article 3, Legislative Disapproval and Revocation, and in K.S.A. 82a-1307, as amended.

IN WITNESS WHEREOF, the parties hereto have executed this Supplemental Agreement as of the day and year first above written.

Mayor
City of Coffeyville

Joseph F. Harkins
Director
Kansas Water Office

ATTEST:

WITH THE EXPRESS APPROVAL OF
THE KANSAS WATER AUTHORITY, BY:

City Clerk
City of Coffeyville

H. Philip Martin
Chairman
Kansas Water Authority

= Attachme.

STATE LEGISLATIVE ENERGY BRIEFING - Topeka, Kansas January 18, 1984

ENERGY IN PERSPECTIVE - Sam Rod (412) 374-4049

Mr. Rod is an engineer in the Waste Technology Services Division of the Westinghouse Electric Corporation. He is presently working on a hazardous waste cleanup and incineration project in Bloomington, IN. Prior to this, Sam worked in the Nuclear Safety Department, analyzing energy transfer in nuclear reactor cores during normal operation and under simulated accident conditions.

He has also conducted research for the U.S. Department of Transportation on railroad tank car safety and worked at the Naval Research Laboratory and the National Bureau of Standards.

Sam is now pursuing a Doctorate degree in Engineering and Public Policy at Carnegie-Mellon University. He holds a Master's degree in Mechanical Engineering and a Bachelor's degree in Nuclear Engimeering from the University of Maryland.

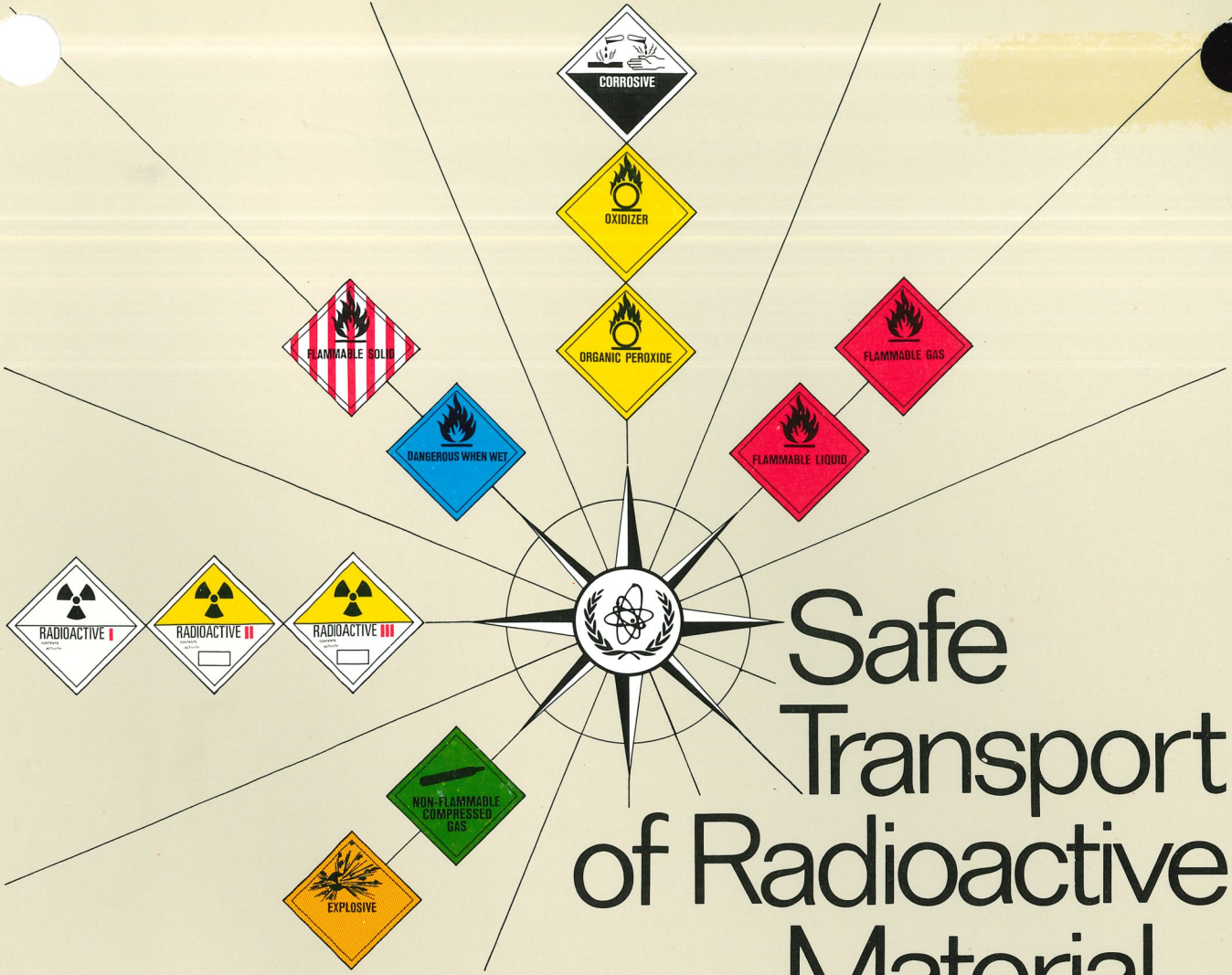
NUCLEAR WASTE & TRANSPORTATION - Karen Adelson (301) 461-5050

Ms. Adelson, an engineer formerly with Westinghouse, was involved with Safety and Licensing, Strategic Resources, and was an engineer in the International Projects Division.

She is a graduate of Sweetbriar and Dartmouth with degrees in Environmental Sciences and Economics, and has recently completed her Master's in Environmental Health Engineering at Johns-Hopkins University.

Karen is now a consultant to Westinghouse, the Committee for Energy Awareness and a number of other energy-related organizations.

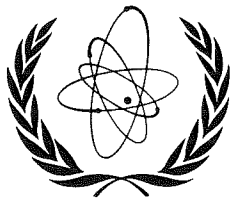
Atch. 2



Safe Transport of Radioactive Material

INTERNATIONAL ATOMIC ENERGY AGENCY

Atch. 3



Safe Transport of Radioactive Material

INTERNATIONAL ATOMIC ENERGY AGENCY
MAY 1982

A-1400 VIENNA
WAGRAMERSTRASSE 5
AUSTRIA

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Associated Press; Atomic Energy of Canada Ltd; Commissariat à l'Energie Atomique, France;
Department of Atomic Energy, Government of India; Forum Atomico Español; IAEA-Pfeifer; New England Nuclear Ltd, Canada;
NUKEM, F.R. Germany; Philippine Atomic Energy Commission; The Radiochemical Centre, Amersham, UK;
Sandia Laboratories, Albuquerque, USA; United Kingdom Atomic Energy Authority.

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MAY 1982

Introduction

Each year billions of tonnes of freight are moved throughout the world by road, rail, air, sea and inland waterways. The UN Statistical Yearbook for 1978, for example, reports that in the United States alone, 1,200,000,000,000 net tonnes per km of freight were carried by rail in 1977. A sizeable* fraction of the cargo moved every year is made up of dangerous goods. In 1979, the harbour of Hamburg, Federal Republic of Germany, alone, for instance, handled 200,000 tonnes of packaged dangerous goods and 550,000 tonnes of dangerous chemicals.

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* According to an estimate of the US Department of Transport 50 per cent of all goods in common carriage contain some degree of hazard.

Drums containing uranium hexafluoride at the harbour of Hamburg, F.R. Germany. ▷

The Transport of Radioactive Materials

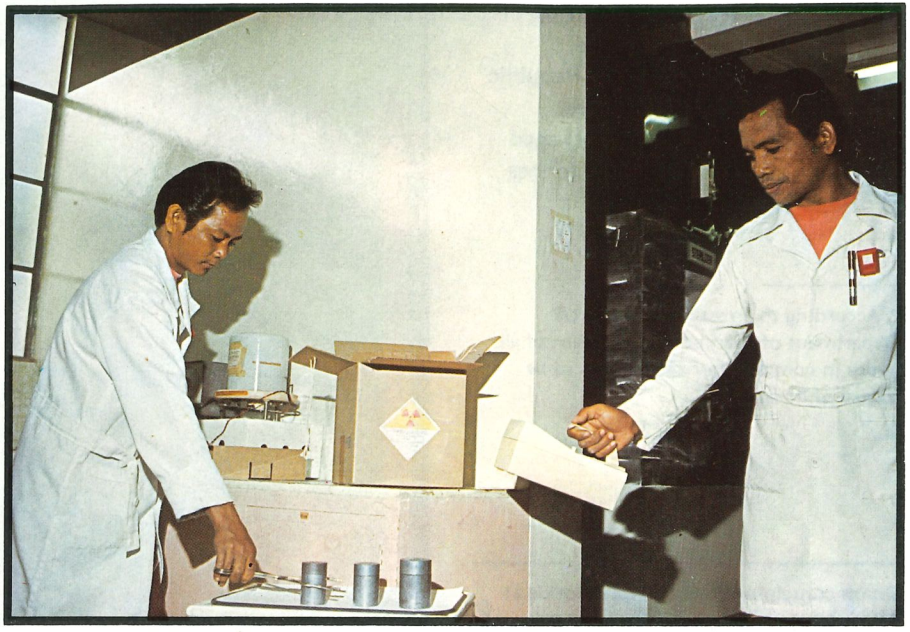
For years, many chemicals and other materials which are potentially harmful to human health and to the natural environment have been moved within countries, and between the continents. To ensure safety, national and international rules have been established both for the packing and the transport of these materials.

The wide range of potential hazards which are ever present on the road, on rail and at sea can be seen from the labels approved by the United Nations for the carriage of dangerous materials. They are an instant warning to everyone who has to handle them.

Accidents occur from time to time and lead to loss of life and pollution of the countryside or the sea coast. These risks are broadly accepted by the public as part of the price of industrial development and of life in today's technological world.

The transport of radioactive material is considered by some people to be very hazardous. During the last 30 years, the transport of such material has become more and more common, has grown to over 8 million shipments per year, yet no accidents with serious consequences to the public have occurred.

Workers in the transport industry and the general public are protected through the application of stringent safety measures and by the



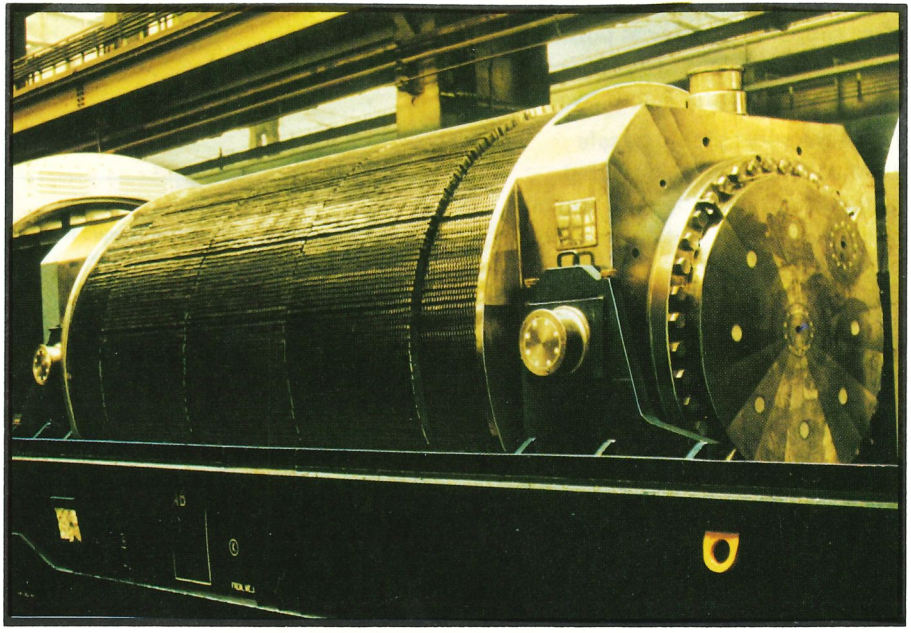
Final check on type A package before radioisotopes are delivered to end users in the Philippines. ▷

estab...ment of an essentially uniform system of international regulatory control. Experience has proven that the risks due to the transport of radioactive materials are less than with other potentially dangerous goods.

The estimated 8 million packages of radioactive material transported in the world each year are still small in comparison with the number of other hazardous goods. In fact, less than a million of those packages contain appreciable amounts of radioactivity.

a) 99% of radioactive materials transported for civilian use are in the form of chemical compounds and radiation sources, which are employed in medical procedures and general research, as well as in a wide variety of techniques in agriculture, hydrology, industry and in commercial products.

b) less than 1% of nuclear material shipments that take place today are to or from nuclear power plants, or elsewhere in the commercial nuclear fuel cycle.



Container sufficient for the transport of
◁ 12 to 32 spent nuclear fuel elements from light water reactors.

Today, radioisotopes have come to play an important role in the technologies that provide us with our various needs. Radioactive materials are being used for a variety of purposes and in a variety of ways in medicine, industry and research studies, in and outside laboratories. Throughout the world radioisotopes are utilized in plant breeding, soil fertility studies, irrigation and crop production, insect and pest control, health, pollution control, and food preservation.

The therapeutic use of radiation sources in treating various forms of cancer and other diseases, such as thyroid problems, is well known.

Radioisotopes also play an essential part in many medical diagnostic procedures. It is estimated that one American in four who is admitted to a hospital these days will receive some diagnostic procedure that involves radioactive "tracers". With imaging devices and computers, radioisotopes are used to assess the condition and functioning of various body organs such as the heart, lung, brain, liver and kidney. Without radioisotopes these assessments would be difficult or impossible. Radioactive materials must often be transported from the centres where they are prepared to the installations where they are to be used, such as hospitals, sometimes in very distant countries. Because of their short half-lives, the transport must take place with as little delay as possible, but of course, safely. The philosophy of regulatory control is thus two-fold:

1) the transport should be safe
2) when safety has been assured, transport should be rapid and unimpeded by restrictions that do not contribute to safety.

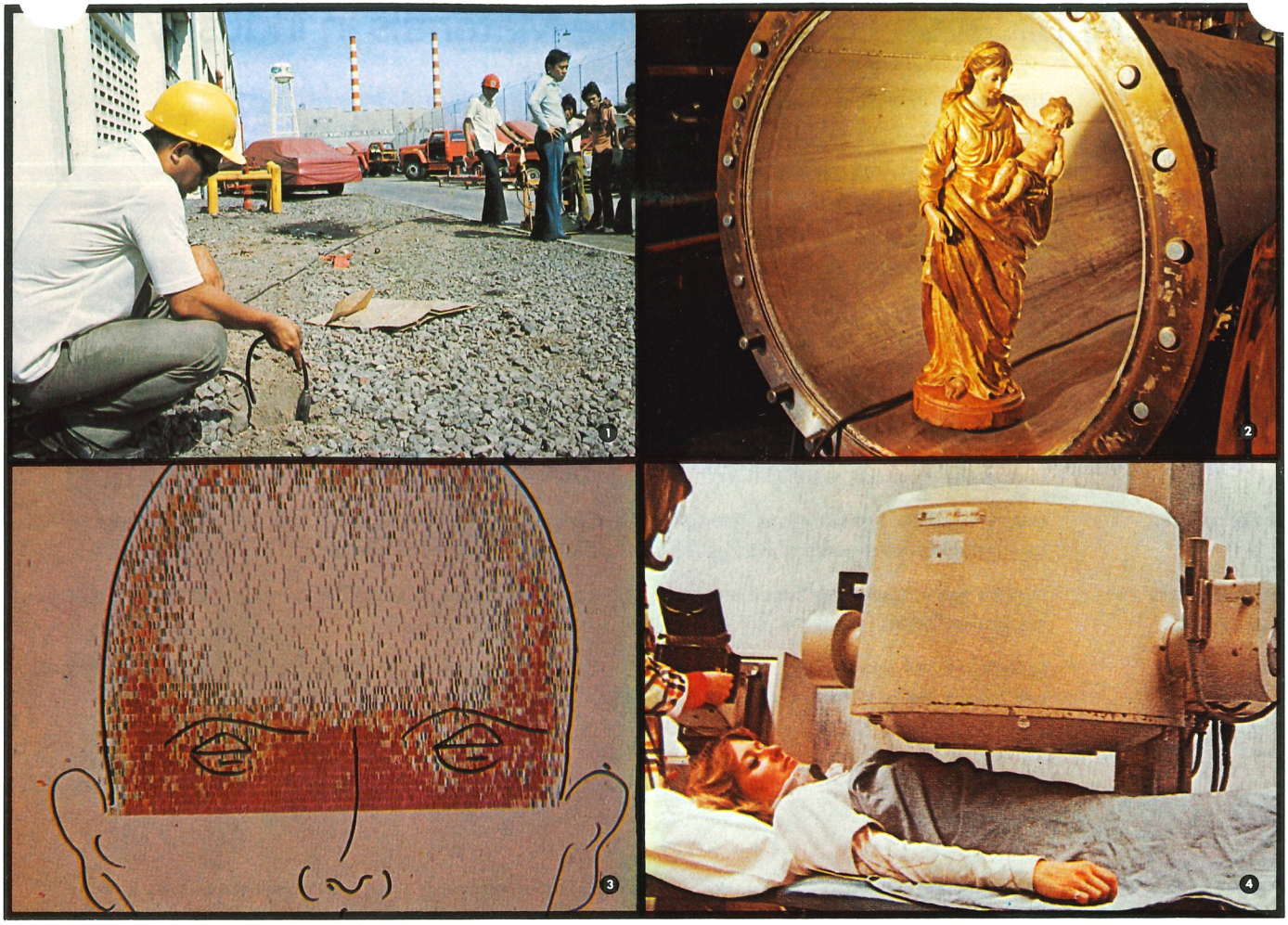
The use of radioisotopes in industry has also witnessed a rapid development and today practically every industry applies radioisotopes and radiation in some form or another.

❶
The application of radioactive tracers in detecting leaks in industrial pipelines.

❷
Radiation is used as a means to detect the age and condition of works of art.

❸
Radionuclide imaging techniques are widely used in nuclear medicine, providing useful diagnostic information: this picture shows brain gammagraphy.

❹
The treatment of cancer has been facilitated by the use of such a machine which uses ionizing radiation. ▷



Typical Applications of Radioactive Materials in Industry

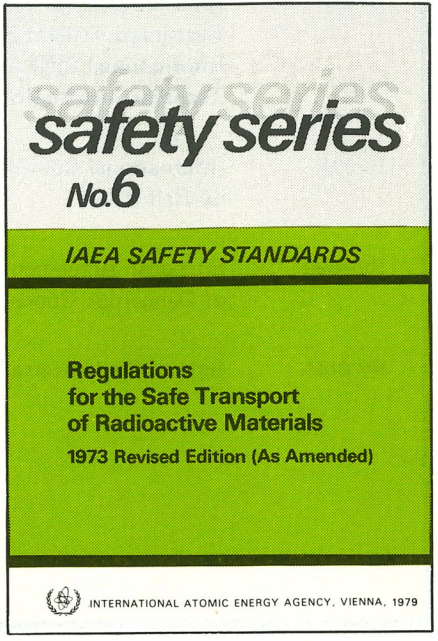
Ventilation	to measure flow rates filtration efficiency
Mixing	fluids, powders, slurries, gases
Flow	to measure velocity in pipes to measure material transport to detect change of phase (i.e. from liquid to gas)
Leakage	to detect cracks or leaks in underground pipes to test gas-filled cables
Wear	to measure the rate of metal wear
Smoke detectors	in wide use in homes, offices, factories and shops. They are extremely sensitive and can detect very small amounts of smoke. It is estimated that 30 million smoke detectors, containing a small amount of radioactive material, were sold in the United States alone for use in private households in 1979.*
Light sources	relatively weak, but very long-lasting light sources based on isotopes that emit beta rays are used for navigational instruments as well as for exit and fire escape signs in aircraft and assembly rooms.
Geochemistry and Geophysics	nuclear techniques have become routine in prospecting for uranium, oil and water, and these techniques are gaining wider use in the exploration for other minerals.
Radiography	to detect flaws, cracks, etc., in metal structures (pipelines, pressure vessels and so forth) and monitor conditions inside jet engines while in operation.

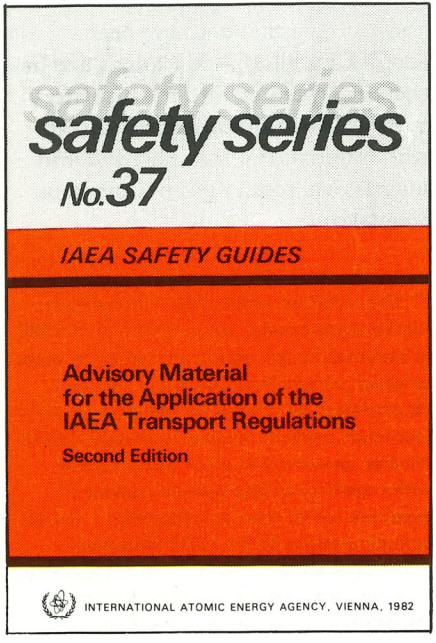
* In the Federal Republic of Germany the millionth ionized smoke detector has been installed by end 1981. All such detectors in use in the Federal Republic of Germany guard an area of 50 million square meters.

IAEA Transport Regulations

The International Atomic Energy Agency was established in 1957 "to seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world". In the late 1950s, following a recommendation of the Committee of Experts on the Transport of Dangerous Goods of the Economic and Social Council of the United Nations (ECOSOC), the Agency undertook to develop safety rules for transportation of those materials on as wide a basis as possible and for all means of transport. Based on existing good practices and the few, simple basic regulations already in effect in the USA* and in a few other countries, the Agency began a synthesis of such rules in 1959, working closely with other international bodies such as the Central Commission for the Navigation of the Rhine, the Central Office of International Railways Transport, the Committee of the Organization for Collaboration of Railways, the European Atomic Energy Community, the Intergovernmental Maritime Consultative Organization, the International Air Transport Association, the International Civil Aviation Organization, the International Labour Organization, the International Standards Organization, the Universal Postal Union, the World Health Organization, and utilizing experts from all over the world.

The first edition of the Agency's recommended Regulations for the Safe Transport of Radioactive Materials was published in 1961.





* The first regulations for the safe transport of radioactive materials in the USA were established in 1947. There is therefore 30 years of experience in this field.

ıe regulations have been reviewed and revised several times since then, in 1964, 1967 and 1973, to take into account the development in technology and shipping practices.

They are now being reviewed again, particularly in the light of the most recent recommendations of the International Commission on Radiological Protection**, to determine whether any further modifications are necessary.

The IAEA regulations have been adopted by the United Nations and have been incorporated into the regulatory texts of the organizations concerned with international transport and into the national regulations of numerous countries.

** The ICRP, an independent non-governmental expert body, was established in 1928 to recommend the maximum radiation doses to which people could be safely exposed. Its members are chosen on the basis of their individual merit in medical radiology, health physics, genetics and other related fields, with regard to an appropriate balance of expertise rather than to nationality. The recommendations of the ICRP have been universally accepted for the last 50 years by both national and international bodies responsible for radiation protection.

The IAEA Regulations have been incorporated in a number of internationally accepted conventions.

By sea:	Intergovernmental Maritime Consultative Organization (IMCO), International Maritime Dangerous Goods Code
By air:	International Air Transport Association (IATA) Restricted Articles Regulations and International Civil Aviation Organization (ICAO) Technical Instructions
By rail:	International Convention Concerning the Carriage of Goods by Rail (CIM)
By road:	European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR)
By post:	Acts of the Universal Postal Union

They have also been adopted by the following states*:

Argentina
Australia
Austria
Bangladesh
Belgium
Bolivia
Brazil
Bulgaria
Canada
Colombia
Cuba
Czechoslovakia
Denmark
Ecuador
Egypt
Finland
France
German Democratic Republic
Germany, Federal Republic of
Greece
Hong Kong
Hungary
Iceland
India
Indonesia
Iraq
Israel
Italy
Japan
Malaysia
Monaco
Mongolia
New Zealand
Norway
Peru
Philippines
Poland
Portugal
Romania
Singapore
South Africa
Spain
Sri Lanka
Sudan
Sweden
Switzerland
Thailand
Turkey
United Kingdom
USA
USSR
Vietnam
Yugoslavia

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* IATA Restricted Articles Regulations 23rd Edition, 1 December 1980
These states include those most actively engaged in transport both for domestic and international purposes.

Objectives of the Safe Transport Regulations

The Regulations were developed to protect both the public and the transport workers, as well as property from both the direct and indirect effects of radiation during the shipment of radioactive materials.

The objectives of the Regulations are to guard against:

- the dispersion and uptake of radioactive material
- the external radiation hazard.

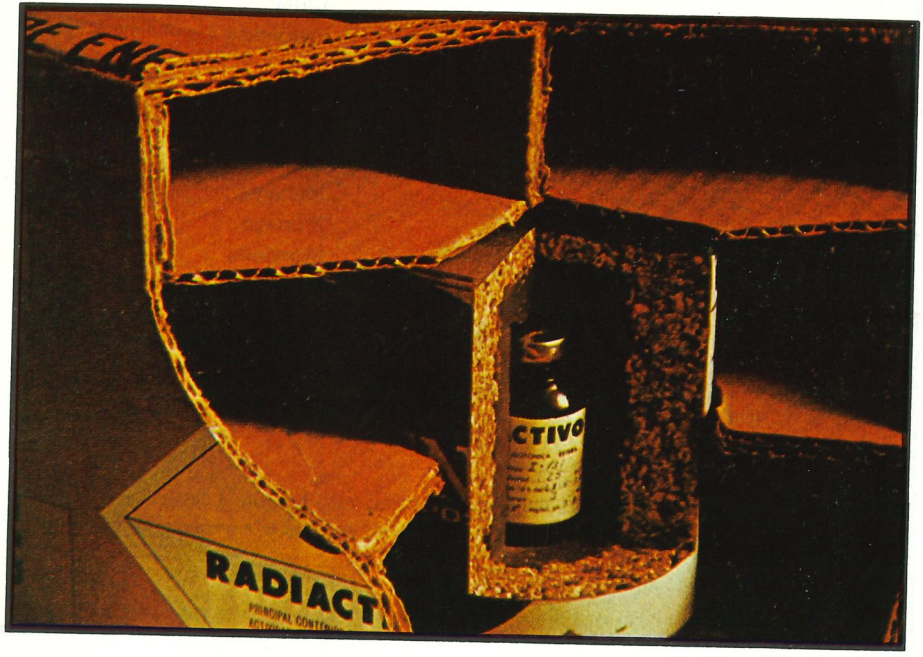
Protection is achieved by a combination of limitations on the contents of a package in terms of the activity and nature of the radioactive material, the package design, and certain simple controls on handling and stowage to be followed during transport.

The objectives are achieved through a system of limits and requirements concerning

1. *containment: to prevent the dispersion and uptake of the material:*
   This concerns the design and strength of the package, and the activity and nature of the contents

2. *control of the external radiation level and warning of contents:*
   These concern the maximum radiation level outside packages, the labeling and marking of packages, and stowage during transport

This section of a package shows how several layers protect the transported radioactive material from being damaged.



3. *prevention of damage by heat:*
   This deals with the maximum surface temperature and instructions on stowage of other cargo to provide for the safe dissipation of heat of packages.

The philosophy underlying this system is that the responsibility for ensuring safety during transport shall belong to the shipper to the greatest possible extent; the contribution required from carriers is minimized. Transport industry workers are expected to treat radioactive consignments with care but no more than that accorded to other dangerous goods.

Consignments may be transported with a minimum of special treatment. Where possible they should be dealt with in the same way as other potentially hazardous goods that are carried by conventional means of transport and handled by workers with no specialized training. For safety's sake reliance is therefore placed principally on package design or built-in safety rather than on operational controls.

Types of Packages

The main function of the packaging is to contain the radioactive material, to prevent it from being dispersed. The Regulations provide for five primary types of package related to the radiotoxicity and the amount of the intended contents.

The various requirements concerning package strength are expressed as performance standards rather than specifications for design, such as wall thicknesses, details of joints and closures and so forth; in other words they prescribe what must be achieved instead of what shall be done.

In addition to the need for containment, it is also necessary to guard against the external hazard because many radioactive materials emit radiation which is only partially absorbed in the walls and containment system of the package. Additional shielding must therefore be included to reduce the radiation levels around the package to acceptable and non-dangerous values. Packages are also classified in three categories, defined in terms of the radiation levels at the surface of the packages and at a distance of one metre from the surface.

Category I

White, in which the maximum radiation level at the surface is 0,5 mrem/h

Category II

Yellow, in which the radiation level at the surface does not exceed 50 mrem/h and the level at one metre does not exceed one mrem/h

Yellow, in which the radiation level at the surface does not exceed 200 mrem/h and the level at one metre does not exceed ten mrem/h.

Each of these categories has its own label; the differences in design are intended to simplify recognition and facilitate control by workers when handling packages.

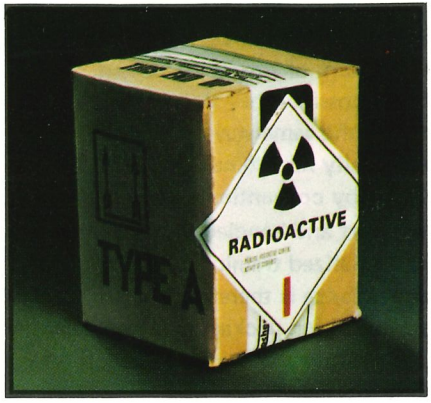
Type A packages

The basic element is the Type A package. Such packages are intended to provide a safe, economical means for transporting relatively small quantities of radioactive materials. These are expected to retain their integrity under the kind of abuse considered "normal" i.e. quite likely to occur during transport: falling from vehicles or being dropped from similar heights, being exposed to rain, being struck by a sharp object which i. penetrate or having other cargo stacked on top.

It is assumed, however, that Type A packages may be damaged in a severe accident and that a fraction of the contents may be released. Limits are therefore prescribed in the Regulations for the maximum amounts of radionuclides that can be transported in Type A packages. These limits ensure that in the event of a release the risks of external radiation or contamination are low.

Typical type A package for the safe transport of perishable medical isotopes.

Light-weight Type A package for radioisotopes.



Type B packages

Larger amounts of radioactive material must be transported in a Type B package. It is required that these be able to withstand the effects of severe accidents. Each design must be approved by the competent authority of the country in which the packaging was designed.

Type B packages for radioisotopes. ▷

Low specific activity and low-level solid radioactive Materials

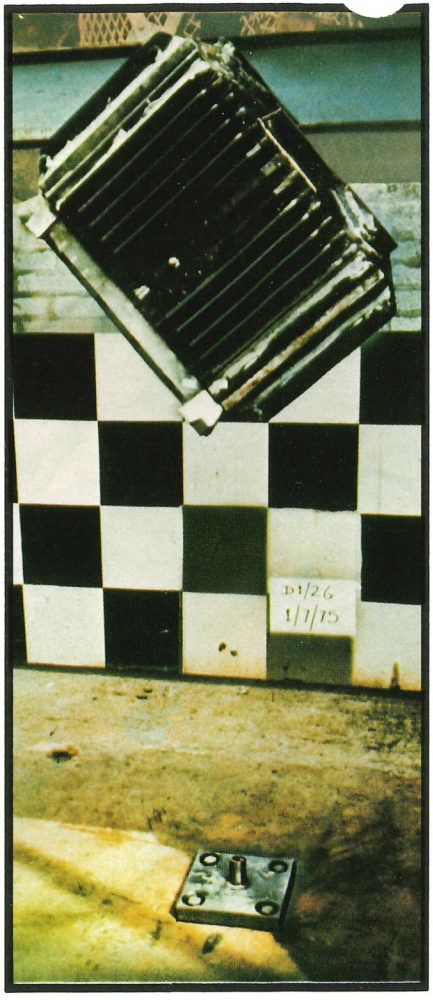
These materials are inherently safe either because the specific activity – that is the amount of radioactivity per unit weight – is very low or because the material is in a form which is not easily dispersed and which has only a low internal radiation hazard. Low specific activity materials, such as radioactive ores for instance, can be transported either in bulk, or in packaging meeting less stringent requirements than those for Type A. Low-level solid radioactive materials, such as processed low-level wastes, can be transported in strong industrial packaging.

Tests

In order to ensure safety, a series of very rigorous tests are prescribed in the IAEA Regulations to prove that the packages meet the relevant requirements. It must be shown that the package design is capable of withstanding these tests without loss of contents or significant increase in external radiation.

The first set of tests are intended to simulate the "normal" conditions of transport which packages may experience: exposure to rain, rough handling and minor mishaps. They apply to Type A and Type B packages.

Water spray test:
The package is subjected to a water spray which is approximately equivalent to a rainfall rate of 5 centimetres per hour, uniformly distributed and for a duration of one hour. Packages have to be subjected to this test before the other tests given below are carried out.



Fuel flask model prepared for IAEA free drop test in Canada. ▷

F₁ ₀p test:
The package is dropped onto a hard target (a concrete block) so as to suffer maximum damage to the safety features to be tested. The height of the drop measured from the lowest point of the package to the upper surface of the target is 1.2 metres for most packages. Heavier packages, i.e. over 1.5 tonnes, are dropped from a lower height. For packages which contain liquid or gaseous contents the drop height is 9 metres.

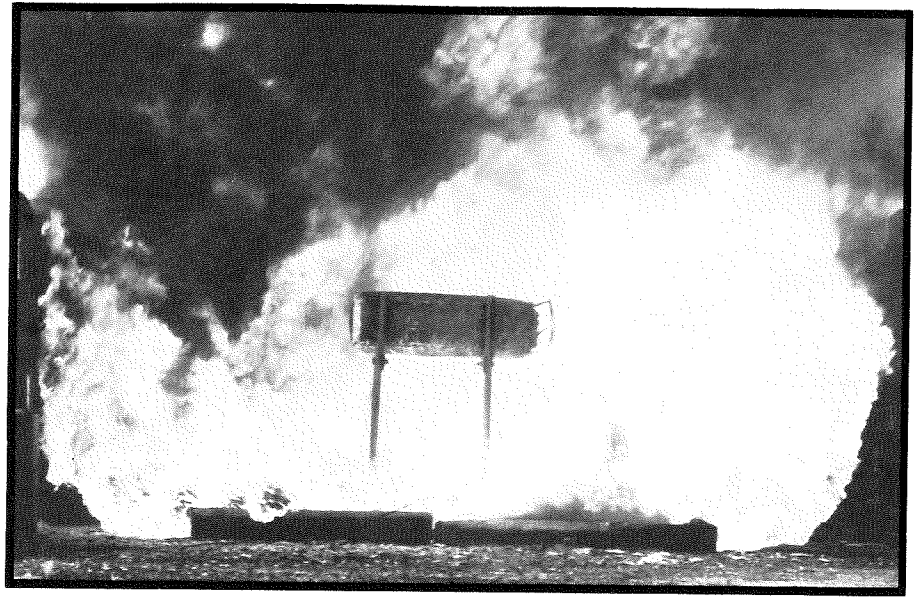
Compression test:
The package is subjected for a period of 24 hours to a compressive load equal to the greater of 5 times weight of the actual package of the equivalent of 1300 kg/m^2 multiplied by the vertically projected area of the package. The load is applied uniformly to what is considered the top of the package.

Penetration test:
The package is placed on a rigid, flat, horizontal surface, and a bar of 3.2. centimetres diameter with a hemi-spherical end and weighing 6 kilo-grams is dropped from a height of one metre (1.7 metres in the case of packages which contain a liquid or a gas), with its longitudinal axis vertical, so that it falls onto the centre of the weakest part of the package.

Type B Tests
The tests for demonstrating the ability to withstand accident conditions in transport are a mechanical test, a thermal test and a water immersion test. The package is subjected to the cumulative effects of the mechanical test and the thermal test in that order, while a separate package is subjected to the water immersion test. Some aspects of the tests are described below.

The thermal test:
In a thermal test the whole package is exposed to a temperature of 800°C for 30 minutes in a fire or a furnace.

Package undergoing a thermal test. It is placed in the middle of an intense fire and remains there for 30 minutes. The temperature, which frequently reaches over 1000°C, is monitored by thermocouples connected to a chart recorder at Harwell, UK.



The mechanical test:
Consists of dropping a package onto two different targets in such a way that the damage it suffers in the drops will lead to the maximum damage in the thermal test. For the first drop the package falls from a height of 9 metres onto a flat, horizontal unyielding surface. For the second drop it falls onto a mild steel bar, 15 centimetres in diameter, from a height of 1 metre. The bar is rigidly mounted, is perpendicular to the target surface and must stick-up at least 20 centimetres above the base.

Water immersion test:
The package is immersed in water with a head equivalent to at least 15 metres for a period of not less than 8 hours.

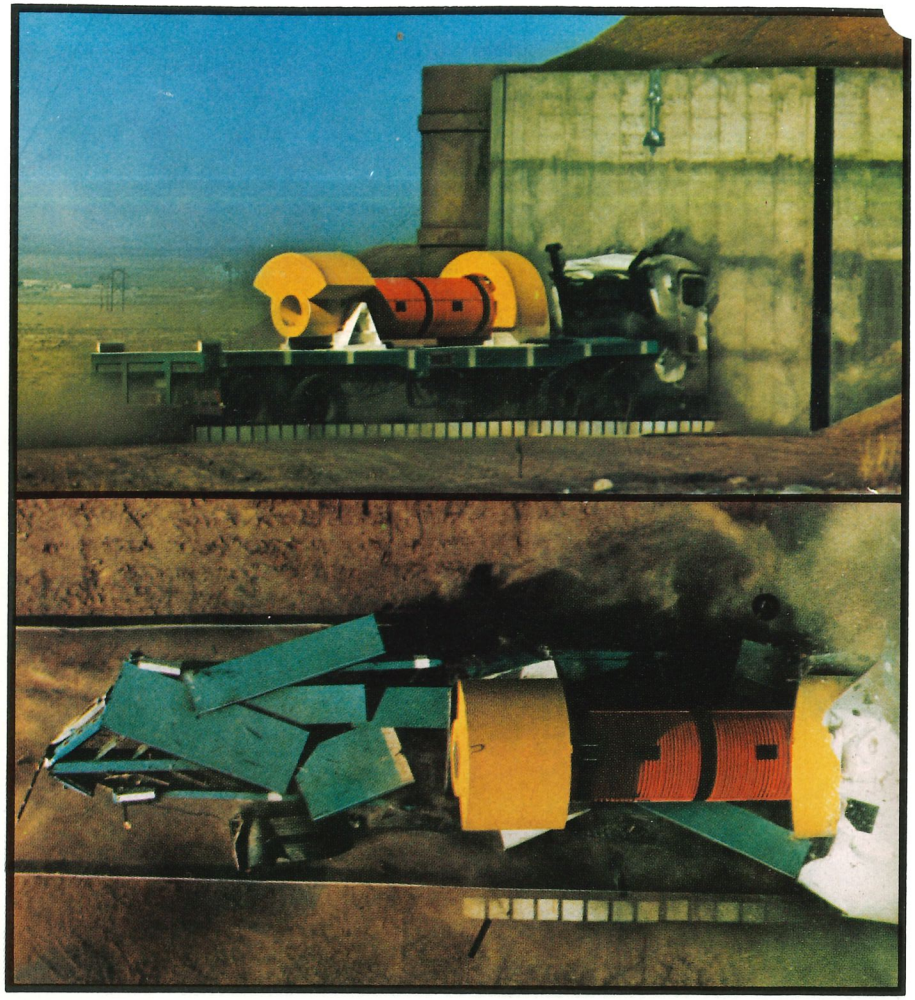
◁ This package has survived a free drop test.

Accidents and Incidents

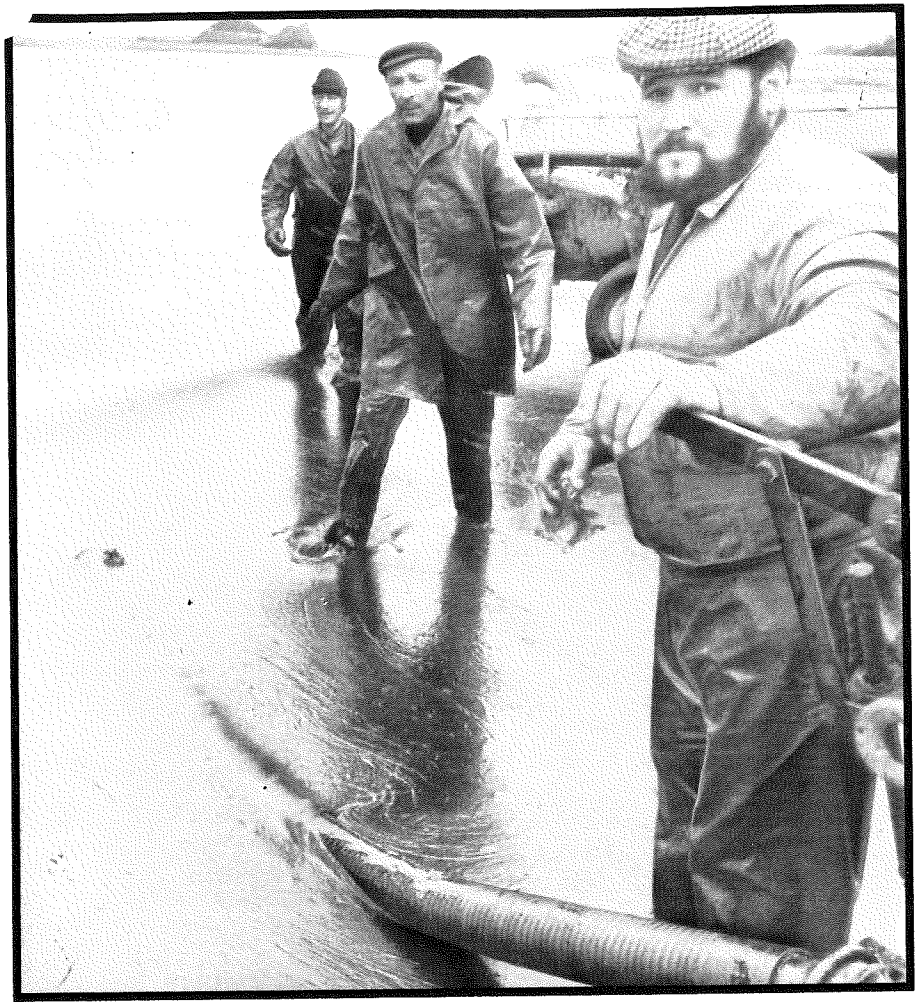
It is a recognized fact that, no matter how much care is taken, accidents do happen, and accidents in the transport of hazardous goods are no exception to this rule.

Petrochemicals are a dangerous cargo – they are flammable and can disperse quickly over a wide area when the container is damaged. Probably the worst demonstration of this occurred at the height of the 1978 summer holiday season when a tank truck filled with propylene went off the road which ran alongside a camping site in Spain and exploded, killing more than 200 holidaymakers.

Transport of explosives also takes its toll. In Texas City, USA in 1947 a shipload of ammonium nitrate blew up and more than 500 people were killed.



This package was not breached in a extraordinary experiment where a lorry crashed at high speed into a wall at the USA Sandia Laboratories. ▷



In Colombia, in 1956 seven truc. carrying dynamite exploded killing over 100 people.

The transportation of oil is also hazardous, not only to people, but to the environment as well: during the ten-year period from 1969 to 1979 there were 19 accidents in which more than 40,000 tons of oil were spilled at sea due to tanker collisions and wrecks. When the Amoco Cadiz ran aground off the coast of France in March 1978, 220 000 tons of oil spilled into the ocean. Though major studies show that now, after some years, the recovery of areas exposed to waves, currents and winds is almost complete, oil still persists in areas protected from the movement of the sea, and there may be long-range effects on the reproduction of marine organisms.

In 1979 a train accident at Mississauga near Toronto, Canada, prompted one of the largest peacetime evacuations in North American history, i.e. about

Brittany farmers in Roscoff, Western France, pumping up oil spilled from the tanker Amoco Cadiz which broke up on reefs at ◁ nearby Portsall.

250, ɔ people were evacuated due to the derailment and rupture of tank cars carrying liquid fuels, petrochemicals and chlorine (a *very poisonous* gas).

The Transportation Technology Centre at Sandia National Laboratories (USA) carried out an analysis of all transportation accidents and incidents with hazardous goods which occurred in the US from 1971 – June 1980. This analysis shows 86,500 entries for all classes of hazardous material. Only 660, less than 1% of the total hazardous material incidents and accidents in this ten-year period, involved radioactive material.

Looking more closely at this figure, 465 of these were incidents* and 195 were accidents**, the majority of

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* Incident: An event reported because of non-conformance with regulations i.e. faulty packaging, missing labels.

** Accident: An unexpected event involving damage to persons, vehicles or packages.

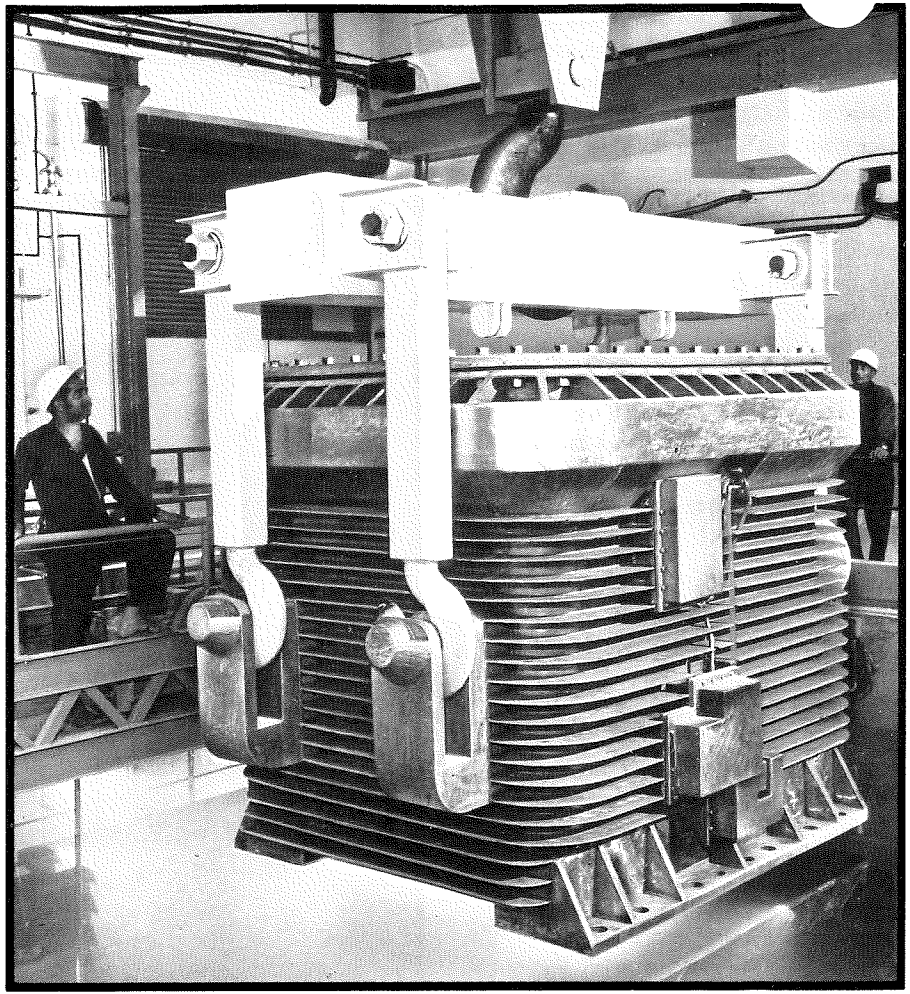
A policeman wears protective mask as he directs traffic during the evacuation of Missisauga, Ontario, after an accident involving a train carrying liquid fuels. ▷

.ese (110) occurred during handling operations – package dropped, run over, etc. and only 85 occurred during transportation. Of these 85 accidents, only 5 involved releases.

In the 10 Type B packages involved in all of the US accidents between 1971–1980 there was no loss of radioactive contents. In fact there has been no recorded release of contents from a properly assembled Type B package anywhere in the world.

In the United Kingdom, the Radiochemical Centre at Amersham has reported that for over 200 000 packages shipped per year, only one package has been involved in a major aircraft crash. The aircraft burned and the package's outer carton was destroyed, but no detectible contamination was found outside the storage compartment.

In Poland, accident experience from 1971 through 1975 showed eight transportation accidents involving radioactive materials. None of these



A 70-tonne shipping cask for the spent fuel of Rajasthan Atomic Power Station, India. ▷

had _ .ificant consequences from the radiological point of view. In only two cases were small areas around the transport units contaminated, and in one case the loading area inside a vehicle was contaminated.

India has reported that of over 70 000 packages of radioactive materials shipped from Trombay, only four packages were involved in accidents. Three were run over by vehicles at the airports during trans-shipment. Although the outer packages and the tin containers were deformed, the vials containing the materials were intact and no contamination was found on the outer surfaces of the damaged packages. The fourth accident involved a gamma irradiation unit. The package was thrown off the truck into a 15-foot-deep stream during an accident to the vehicle. There was no increase in the radiation level on the outer surface of the shielding container and no damage was caused to the internal mechanical parts.

Even the best regulations are of little value unless their provisions are compiled with. This is why the Agency has encouraged the development of effective programmes for quality assurance in the construction, assembly and maintenance of packagings, and for assurance of compliance with the regulatory requirements.

Accidents are bound to occur however meticulous the precautions taken. In view of this the Agency has prepared recommendations on the organizations of emergency services to minimize their consequences and is assisting Member States and international organizations in making provisions for such events.

Physical Protection in Transport

Physical protection provisions are designed to prevent loss, theft or diversion of packages and to enable the packages to withstand the damage resulting from attacks or explosives. Safety is of over-riding importance and the physical protection measures are supplementary to the basic safety requirements.

In general, transport is considered to be the operation most vulnerable to an attempt of unauthorized removal or sabotage.

Protection against theft or unauthorized diversion is a matter of appreciable concern. The responsibility for physical protection of dangerous goods is entirely a matter of national sovereignty, but it is of importance to all other states to know exactly to what extent this or that responsibility is being fulfilled.

The need for close international co-operation has been recognized in the

The meeting in session to conclude negotiations of a Convention on the Physical Protection of Nuclear Material.

nuclear field and there is an international consensus that nations must co-operate in developing measures for the adequate physical protection of nuclear material.

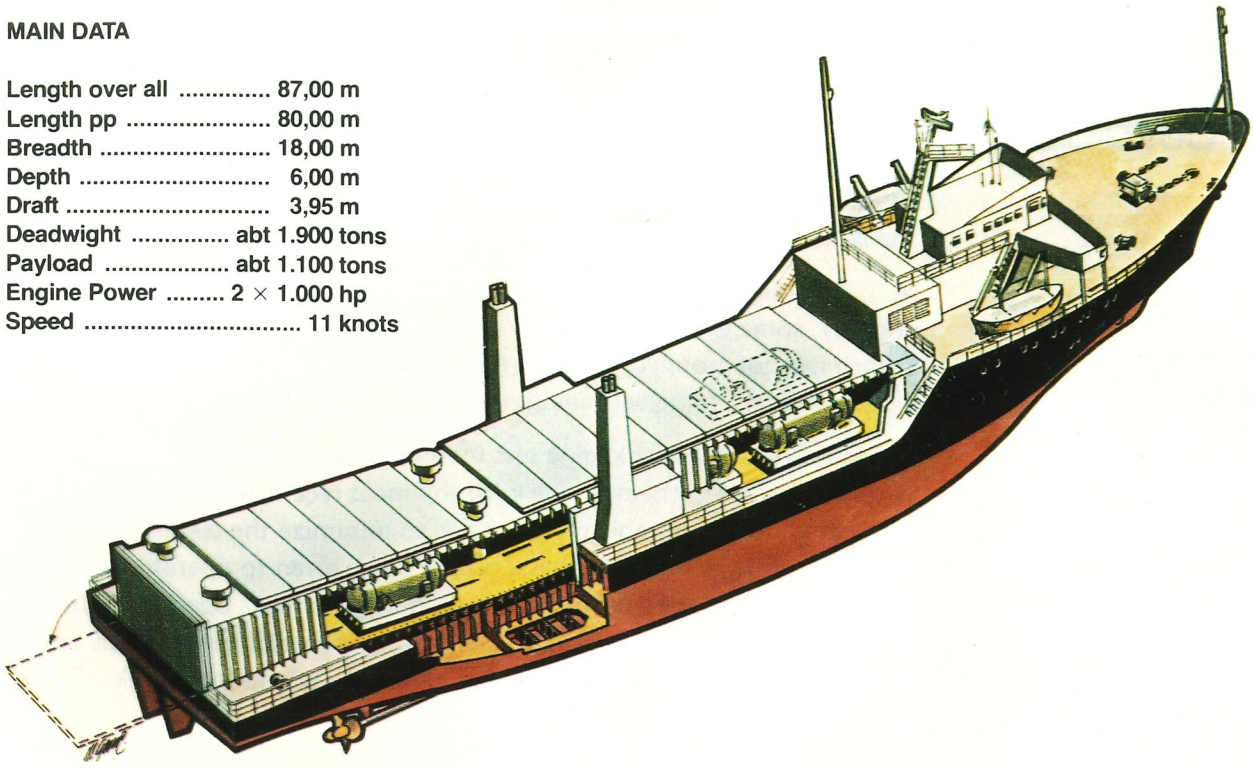
To assist Member States in this respect, the IAEA first published in 1972 "Recommendations for the Physical Protection of Nuclear Material". These recommendations were revised in 1975 and 1977 and they cover, in par . .ar, requirements for physical protection of nuclear material in transit. They also provide a categorization of nuclear material for ensuring appropriate protection and have been incorporated in a number of agreements concluded by Member States with the IAEA.

To achieve effective international co-operation in this field, the negotiation of a Convention on the Physical Protection of Nuclear Material was started in Vienna in October 1977, under the aegis of the Agency. 58 countries as well as the European Atomic Energy Community participated in this work, which was completed on 25 October 1979.

The Convention established standard measures of physical protection to apply to nuclear material during international transport. It requires the contracting parties to provide for punishment of a number of defined serious criminal offences. The States Parties to the Convention will also co-operate in preventive measures and information exchange with regard to acts such as theft, sabotage and extortion involving nuclear material.

MAIN DATA

Length over all	87,00 m
Length pp	80,00 m
Breadth	18,00 m
Depth	6,00 m
Draft	3,95 m
Deadwight	abt 1.900 tons
Payload	abt 1.100 tons
Engine Power	2 × 1.000 hp
Speed	11 knots



A model of a Swedish ship to be specially built for the transport of radioactive material.

Conclusions

1. 35 years of transport of radioactive material have an exemplary safety record. Several million packages of radioactive material are now shipped around the world each year, and contribute to the benefit of mankind in all fields of daily life, with minimum risks.

2. The number of shipments of radioactive material is increasing steadily, some estimates indicate by about 10% a year. A good safety record has not stopped further improvements of the regulations for the safe transport of nuclear materials.

The rules as well as packaging test methods are constantly up-dated and developed to keep them in line with the most recent technical advances. Though packages are constructed so as to minimize the element of human error, increased emphasis is now being given to operational aspects, in particular the training of carrier personnel. Specially built behicles, such as aircraft, rail, cars, trucks, and special carrier ships have already been used by some states for high activity and large bulk shipments.

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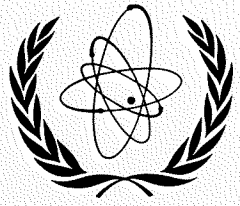

INTERNATIONAL ATOMIC ENERGY AGENCY

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Attachment

An Overview of Decommissioning Nuclear Power Plants

Prepared by

Subcommittee on Decommissioning
of
AIF Committee on Environment

March 1983

Atomic Industrial Forum, Inc.
7101 Wisconsin Avenue
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Attach. 4

PREFACE

This overview of nuclear power plant decommissioning has been prepared by the AIF Subcommittee on Decommissioning. It is intended to provide up-to-date, general information on this subject. Some decommissioning issues have been frequently misunderstood. This is particularly true in the area of costs and availability of funds needed to carry out necessary decommissioning procedures at the end of normal plant service life. In this report, the Subcommittee has attempted to place these issues in a proper perspective and hopes that the information will prove to be useful to those having an interest in the subject.

R. A. Szalay
Vice President

INTRODUCTION

All electric generating facilities must, at the end of their economic service life, be retired from service and decommissioned. The objective of decommissioning a nuclear power plant is to remove the facility from service in a safe manner and to maintain it without hazard to the public and environment. This process may include removal or isolation of radioactive materials so that the site can be released for unrestricted use or use in a controlled manner.

The electric utility industry believes that current decommissioning regulations are adequate [1], that the technology currently exists for proper decommissioning and that the associated costs are within acceptable values. The industry currently is reviewing the Nuclear Regulatory Commission's (NRC) evaluation of a more explicit policy for decommissioning nuclear power reactors and other nuclear facilities.

Over the past several years, information on nuclear power plant decommissioning has appeared to include conflicting and/or inconsistent information with regard to (a) the estimated costs of decommissioning, (b) the available technical alternatives, and (c) the alternatives for funding. This paper will provide information from well-documented sources (see list of references and background reading) to show that a basis is available for making reasonable engineering cost estimates of decommissioning, that basic decommissioning techniques do exist and that there are existing constraints on decommissioning alternatives. This paper also points out the necessity for maintaining flexibility in any overall regulatory policy for decommissioning. Because of its unlikely occurrence, the subject of premature decommissioning due to an accident or other reason is not included in this paper; therefore, the scope is limited to the normal decommissioning situation.

DEFINITION OF TECHNICAL ALTERNATIVES

The following power reactor decommissioning alternatives are considered acceptable by the NRC in its current regulatory policy [2]:

- **Mothballing.** This alternative, also called safe storage, consists of removing the nuclear fuel and placing the facility in a state of protective storage with continuing confinement of radioactive materials so that the risk to the public is minimized and within acceptable radiation protection limits. Appropriate security procedures and environmental radiation monitoring programs are established to ensure no access and that the public health and safety are adequately protected.
- **Entombment.** This alternative consists of removing the nuclear fuel and sealing all highly radioactive components (e.g., the reactor vessel and its internal components) in a protective structure of concrete or other high integrity material. The structure is designed to be sufficiently strong and long-lived to ensure retention of the radioactivity until the structure is eventually dismantled or until any residual radioactivity has decayed to levels that permit unrestricted release or use of the site. Appropriate security procedures and environmental monitoring programs are established to ensure that the public health and safety are adequately protected.
- **Dismantlement.** This alternative involves the removal from the site of all equipment, materials and structures that are radioactive at levels greater than permitted for unrestricted use of the property. Dismantlement can occur immediately following final reactor shutdown and removal of the nuclear fuel or it can be deferred to a later date to allow for some decay of radioactivity. If deferral is chosen, a period of continuing care is required prior to dismantlement. Demolition and removal of non-radioactive structures is at the option of the owner and local government agencies.

In addition to these three alternatives, there are other decommissioning options. For example, a combination of mothballing, entombment and delayed dismantlement are also viable decommissioning approaches.

Converting the plant to a new nuclear or fossil-fuel system, or recommissioning the existing plant, are other options. These alternatives, however, are not forms of decommissioning. They are not being considered by the NRC in its evaluation of decommissioning policy, nor are they examined in this paper.

ANALYSIS OF ALTERNATIVES

- **Mothballing** requires plant operation to be safely suspended and the site structures to be kept under constant maintenance, security watch and radiological surveillance. Annual reports of plant status are made to the NRC. The primary advantage of mothballing is that it requires less initial work, lower initial occupational radiation exposures and lower initial expenditures than other options. However, future dismantlement and surveillance requirements could make it more expensive in the long run. With radiological surveillance, the facility would pose no health or safety concern during the period required for its radioactivity to decay. In addition to the costs associated with maintenance, security and radiological surveillance, another disadvantage of mothballing is the length of time that portions of the site are unavailable for unrestricted use.
- **Entombment** carries many of the same advantages and disadvantages. A key distinction is that less maintenance, radiological surveillance and security than mothballing are required. Entombment produces a higher immediate and lower long-term occupational radiation exposure than mothballing. Some believe that by proper design, the entombed structure could remain on the site indefinitely; however, at the present time, the NRC does not consider entombment to be a viable *long-term* decommissioning option.

- **Dismantlement** pros and cons follow similar lines. However, this alternative would meet the requirements for termination of an NRC license and make the site available for unrestricted use. Additional advantages may include:
  - elimination of the need for continuing security, maintenance and surveillance;
  - earlier availability of the site;
  - aesthetic considerations;
  - availability of a highly knowledgeable facility operations staff to form a decommissioning work force.

On the other hand, immediate dismantlement requires the expenditure of large sums of money in a relatively short time period and requires the highest occupational exposure of all the alternatives. Deferring dismantlement to allow for radioactive decay reduces the occupational radiation exposure, but increases the total cost and, therefore, the revenue requirements.

It is desirable to maintain flexibility in the ability to choose which decommissioning method or combination of methods is most suitable for a particular nuclear power plant. Although decommissioning analyses and cost estimates are important during the early stages of a plant's construction and operation, a final decision on methodology can be made later in plant life. This will permit the utility to take advantage of any improvements in technology that may have occurred during the plant's lifetime.

COST TO DECOMMISSION

Decommissioning cost estimates sometimes appear to be inconsistent when compared on a site-by-site basis. This is usually because of variations in the assumptions used in making the estimates. A thorough understanding of the bases, assumptions, site-specific conditions and costing methods is mandatory to appropriately compare cost estimates of the various alternatives. This section will identify:

- basic elements of the cost estimate;
- summary of published cost estimates;
- basic reasons for the differences among the historical estimates.

The development of a decommissioning cost estimate should be made on a site-specific basis and include the cost elements of labor, materials, equipment and services. The type of nuclear steam supply system, site configuration and geographic location are vital elements to consider in evaluating these cost estimates.

Materials used in decommissioning may include consumable supplies such as cutting gases, explosives, fuel oil, electricity, decontamination chemicals, disposable containers, shipping casks, waste solidification media and those items used for occupational radiation protection. Disposable containers and waste solidification media represent the largest direct material cost components.

Equipment used in decommissioning may include special tooling to segment and remove the reactor vessel (if required), special casks, heavy rigging and hauling equipment and earthmovers. This equipment is often not locally available and must be transported to the site at additional cost. While equipment is, in many cases, not substantially different from that presently used for major reactor repairs and demolition of conventional structures, it has been used successfully in earlier decommissionings of nuclear facilities.

Other cost considerations are waste transportation and low-level waste disposal costs, both of which have increased rapidly in recent years due to higher fuel expenses for truckers and limitations in available commercial burial facilities. Obviously, sites further away from disposal facilities will incur higher waste transportation costs. Plant size, specific features of the design and operating history will determine the quantities and cost of radioactive material removal and disposal. Site location, configuration, and intended disposition also could affect the amount of backfill needed at the site for covering building voids.

Table 1 shows typical cost estimates for large power plants equipped with pressurized water reactors (PWR) and boiling water reactors (BWR).

TABLE 1
Range of Decommissioning Cost Estimates in 1980 Dollars [3]

	Millions of Dollars*					
	PWR			BWR		
	High	Avg.	Low	High	Avg.	Low
Mothballing	11.8	5.7	2.9	19.9	9.3	3.5
Entombment	40.9	14.3	6.5	38.0	23.8	10.9
Dismantling	101.9	54.5	23.7	121.8	64.6	29.4

*Excludes escalation, contingency, maintenance, surveillance, and security costs. The annual costs for mothballing or entombing a nuclear power plant (which include security, maintenance and radiological surveillance) are estimated to range between $168,000 and $315,000 in 1980 dollars.

The reasons for the wide variation (a factor of four) in decommissioning cost estimates include:

- regional differences in labor rates;
- physical plant size and systems configuration;
- disposition of spent fuel (whether charged to plant operation or decommissioning);
- extent of chemical or mechanical decontamination assumed for each decommissioning alternative;
- distance to a licensed radioactive waste burial site;
- variations in the degree of dismantling required (for example, removal to three feet below grade vs. removal of the reactor basemat);
- degree of site restoration required;
- inclusion or omission of decommissioning engineering and planning as a decommissioning cost.

Variations such as these may also account for some of the differences between the BWR and PWR cost estimates.

Inflation and the steep rise in shipping and low-level waste disposal costs recently have increased decom-

missioning costs. For example, the 1976 AIF/NESP study, *An Engineering Evaluation of Nuclear Power Reactor Decommissioning Alternatives* [4] estimated that a 1100 MWe pressurized water reactor could be dismantled at a cost of approximately $27 million in 1975 dollars. This cost, when adjusted for inflation at 7% per year and increased shipping and burial costs, would be approximately $50 million in 1980 dollars.

The increase, large as it may seem, is not unexpected, given similar increases in other construction projects. Use of a detailed cost estimating approach permits accurate prediction of the impact of cost changes on decommissioning costs. Because of changes in the economy, technology and regulatory climate, periodic review of the estimates may be required to ensure continued confidence in the estimates.

FUNDING ALTERNATIVES

The costs of decommissioning, like any other costs of generating electricity, should be reflected in rates to the utility customers served by the generating units.

Selection of the funding methods are based on the following considerations:

- the accounting concept known as "matching", which requires that depreciation of capital equipment be consistent with its rate of use (or consumption) and that this usage (or expense) be matched against revenue generated by the usage;
- the regulatory concept known as "intergenerational customer equity", states that those receiving the benefits should bear the cost;
- the accounting rules of the Uniform System of Accounts of federal and state regulators;
- assurance that funds will be available for expenditure when required;
- cost to the ratepayer; and
- policy of the appropriate ratesetting regulatory agency.

There are two major methods for accumulating the funds to be used in decommissioning — internal and external — and several variations of each. The variations involve different patterns of payments into the funds, and some are more consistent with accounting and regulatory concepts than others.

External funding is a method whereby the portion of customer payments for service that is applicable to decommissioning would either be invested by the utility in securities of other entities or paid to a trustee for investment. Payments to the external fund can vary from a single front-end payment to periodic payments. A single payment at the end of plant life is a theoretical possibility that has not been given serious consideration because of inconsistency with accounting and regulatory concepts.

Internal funding is a method whereby funds are accumulated through periodic bill payments by customers and are available for use by the utility for capital investments. In essence, the funds are invested in the utility itself until needed for decommissioning whereby the actual funds are then acquired by conventional financing.

These payments for decommissioning for both internal and external funding can be recorded in any pattern, but accounting and regulatory concepts suggest certain patterns. For example, the accounting concept of depreciation often assumes that depreciation occurs at a constant rate usually over a period of time, but sometimes it occurs as a function of power production. The same principle applied to decommissioning assumes that a constant amount of decommissioning cost is incurred during each accounting period.

Customer payments for decommissioning include the depreciation provision as well as the impact of this provision on the utility's rate base and income taxes. The pattern and magnitude of customer payments for decommissioning are controlled by the pattern of the depreciation. Of the external methods, a single payment to the fund at the beginning results in the *highest cost to customers.* Of the internal methods, straight-line depreciation results in the lowest total customer payments. While generalized calculations may vary, external methods always produce higher customer payments than internal methods. This results because of (1) increased taxability and (2) the reduction the customer receives from a reduced rate base is greater than the earnings received from outside securities. If the interest collected from the external methods was tax exempt, the cost to ratepayers would be reduced substantially.

While it is not necessarily true that the actual hazard level of a decommissioned nuclear power generating plant is higher than that for a fossil fueled generating plant (or certainly many other industrial facilities), the public certainly perceives it as higher. As a result significant importance is placed on assurance that a nuclear powered generating facility is properly decommissioned. The degree of assurance will depend on the ability to turn either internal or external investments into cash when needed. Those who favor a *high degree of assurance* often favor early collections and external funding, the higher cost of the method notwithstanding. Those who favor *reasonable assurance* support internal funding because of its lower cost.

REGULATORY ASPECTS — FINANCIAL

Since collections from customers are the utility's only source of funds, no matter what the funding alternative, service rate regulators are properly concerned with the financial aspects of decommissioning. Often rate regulators are more concerned with short-term effects than with long-term effects. They tend to favor funding methods and decommissioning alternatives that produce the lowest current consumers payments for service. The actual collection of funds from customers for decommissioning increases annual depreciation provisions. However, depreciation provisions also have a beneficial effect, since the reserve for depreciation is the accumulation of annual amounts and is a deduction in determining the utility's rate base. Because of this

rate base deduction, internal funding is less costly to consumers in the long-term than external methods.

It is generally agreed that the jurisdiction of the NRC over the financial aspects of decommissioning is limited to reactor licensing qualifications, requiring proof that license applicants are financially able to safely remove reactors from operation.

Despite the multiplicity of funding methods and the controversy which often surrounds the issue, it must be remembered that decommissioning funding represents a small portion of the cost of producing electricity, less than 1/2%.

RADIATION PROTECTION CONSIDERATIONS

Radiation protection associated with decommissioning a nuclear power plant has two aspects; protection of workers during the decommissioning procedure, and protection of the public and the environment offsite during and following the decommissioning operation.

Worker protection during decommissioning can be accomplished in the same general manner as successfully utilized in operating and maintaining nuclear power plants and in other industrial operations where radiation is present.

Additionally, special equipment and techniques used in decommissioning are continually being developed and improved. Such new equipment and technology can reduce exposures further during future major decommissioning operations because of increased efficiency allowing procedures to be accomplished in less time, thus shortening the duration of radiation exposure.

Additional health protection measures would include:

- maintaining low-level radioactive contaminants within NRC and Environmental Protection Agency standards, and
- carefully controlling, radiologically surveying and decontaminating material within the plant that is suitable for re-use.

RADIOACTIVE WASTE DISPOSAL

Prior to commencing decommissioning, the highly radioactive nuclear fuel and its associated components are removed to protect workers and the public's health and safety.

Essentially all remaining decommissioning wastes are low-level radioactive wastes suitable for routine disposal in accordance with applicable regulations. The wastes may consist of many materials such as general trash, solidified liquids and contaminated piping.

Low-level waste is packaged in casks, drums or boxes, depending on the nature of the waste, radiologically monitored, marked, and shipped to burial facilities according to the strict standards and procedures established by the NRC, the Department of Transportation, and the states in which the burial grounds are located.

Work is currently under way to develop more effective volume reduction systems which will greatly reduce the volume of waste to be buried. This, in addition to the development of regional waste compact agreements and a *de minimis* level of radioactivity below which materials would constitute no public health hazard and could be considered trash, could reduce the overall cost of decommissioning power reactor facilities.

CONCLUSIONS

Current technology and existing regulations adequately provide for the safe decommissioning of a nuclear power plant within acceptable costs after the nuclear fuel has been removed from the facility. There are several ways to decommission a power reactor and to safely dispose of the residue. Similarly, there are several ways to finance and collect funds for decommissioning. *The decision concerning which technical and financial alternatives to choose must be based on the site-specific characteristics and should be determined on a plant-by-plant basis.* It is important to consider the utility's preference, the rate setting bodies' desires, the cost to the consumer and the need for utility and regulatory flexibility in the development of a regulatory policy for decommissioning.

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Attachment 5

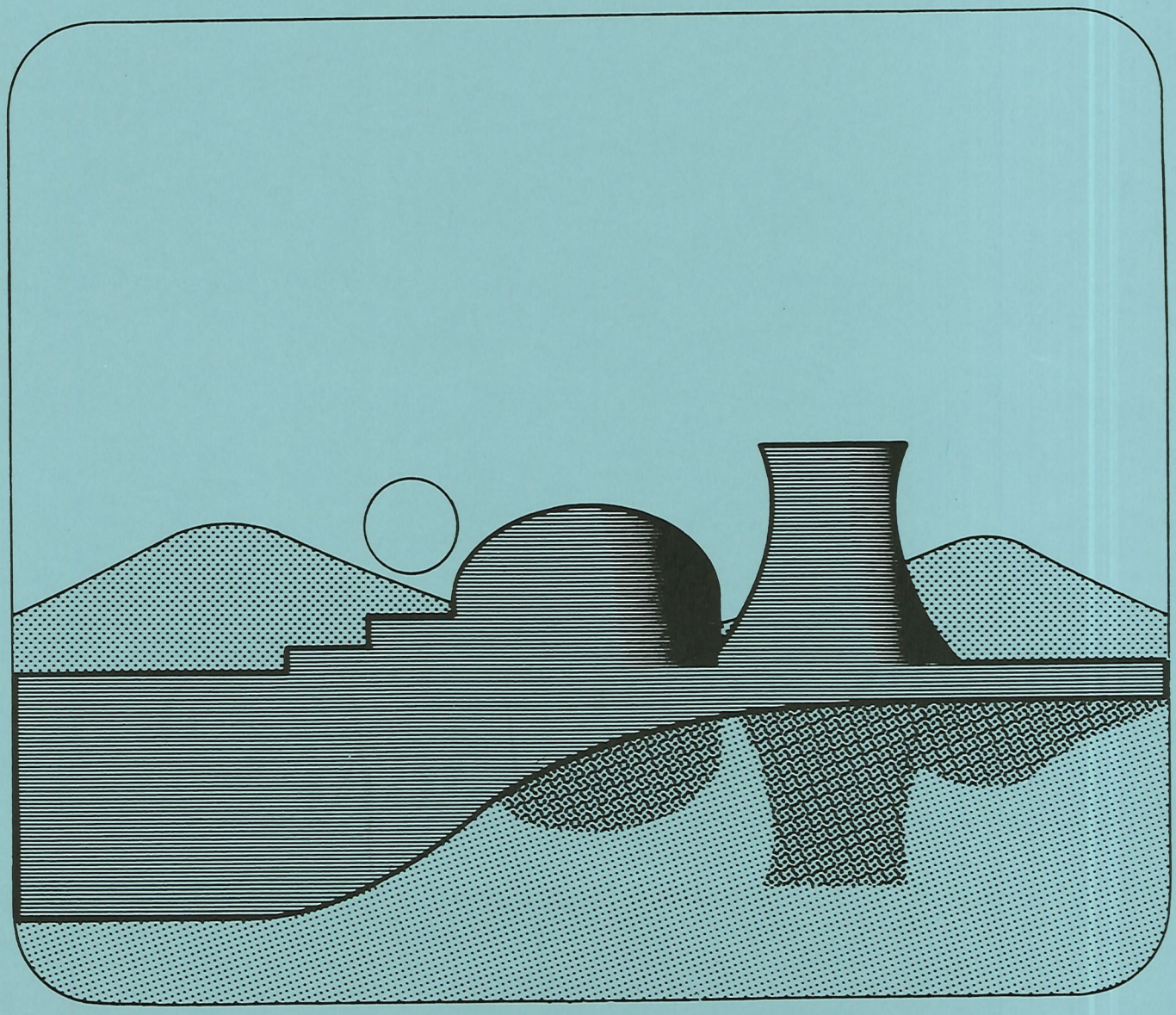
DOE/NE-0029

U.S. Department of Energy
Assistant Secretary for
Nuclear Energy

March 1982

Nuclear Power From Fission Reactors

An Introduction



Atch. 5

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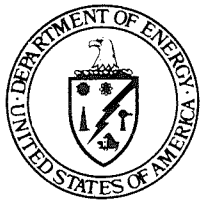
Nuclear Power From Fission Reactors

An Introduction

March 1982

The purpose of this booklet is to provide a basic understanding of nuclear fission energy and different fission reactor concepts.

U.S. Department of Energy
Assistant Secretary for Nuclear Energy
Washington, D.C. 20585



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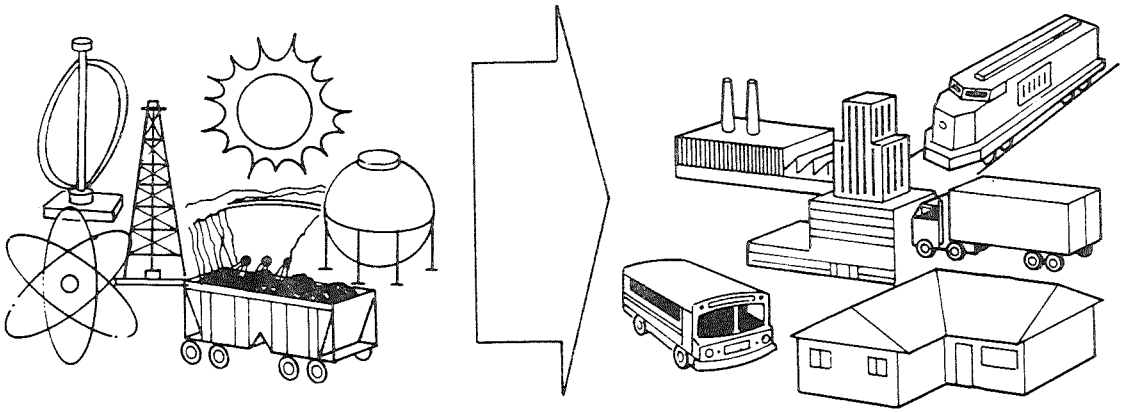
Energy Use and Production

Energy is an important element in nearly every aspect of daily living. It is vital to many of our needs, including heating and cooling, transportation, and electricity for lighting and to run machines.

The energy for these and many other uses is produced in many different ways. We get energy from fuels such as oil, coal, natural gas, and uranium. In addition, we can harness energy from the sun, running water, and the wind. Nuclear power is just one of many ways to produce energy. In order to understand its role, we can ask how it relates to other means of getting energy. In particular, we can look at the way in which we use our fuels today.

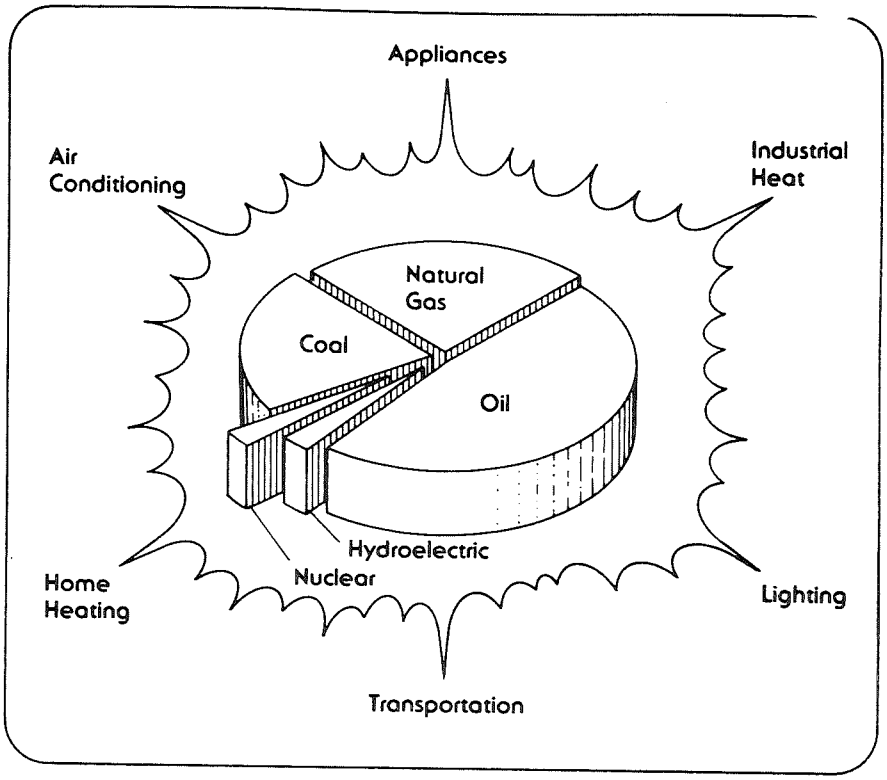


Sources of Energy

Uses of Energy

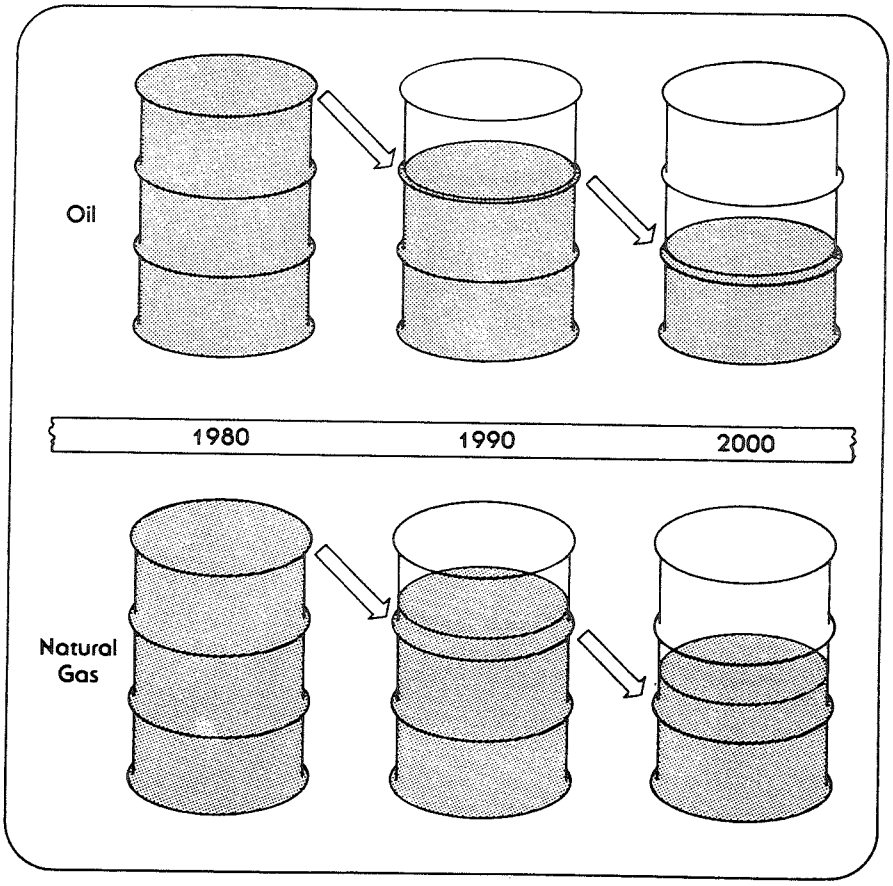
Current Use of Fuels

While there are many ways to produce energy, we do not use them all to the same extent. Some are not fully developed, while others are too expensive or of limited potential. In fact, most of the energy we use today comes from a few major sources--oil, natural gas, coal, uranium, and hydroelectric power. Two of these fuels, oil and gas, supply nearly three-quarters of the energy needs for the U.S.



Oil and Gas Consumption

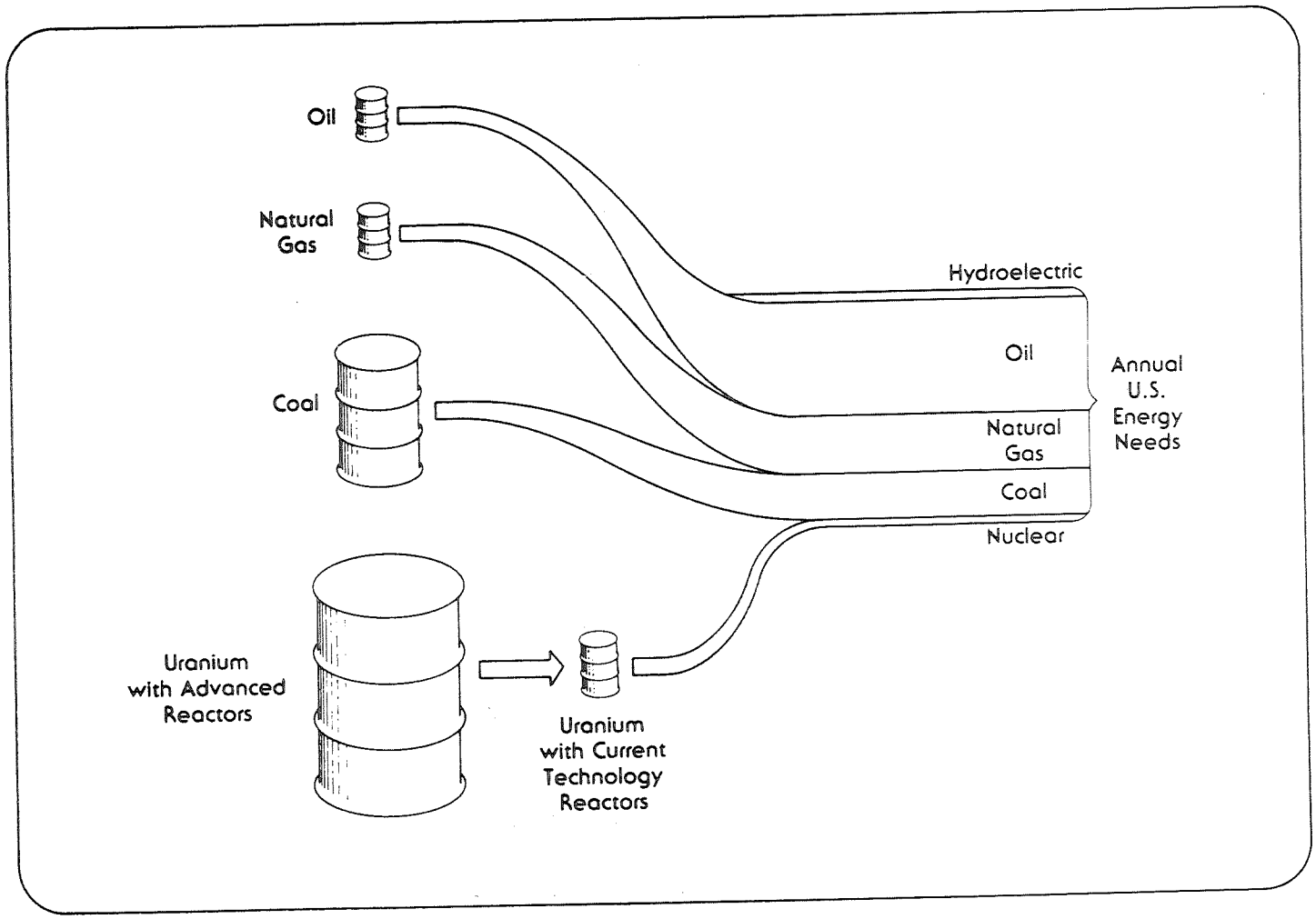
We know that the domestic supplies of oil and gas are limited. In fact, oil and gas deposits are being depleted rapidly. If we continue to use these fuels at the same rate we use them today, we will have consumed nearly one-quarter of all our oil and gas resources within the next ten years. If there are no significant new discoveries within 20 years, these valuable fuels will be half-way gone. Therefore, it is vital that we develop other energy sources that can replace oil and natural gas so that we may have a supply of energy far into the future.



Alternative Sources of Energy

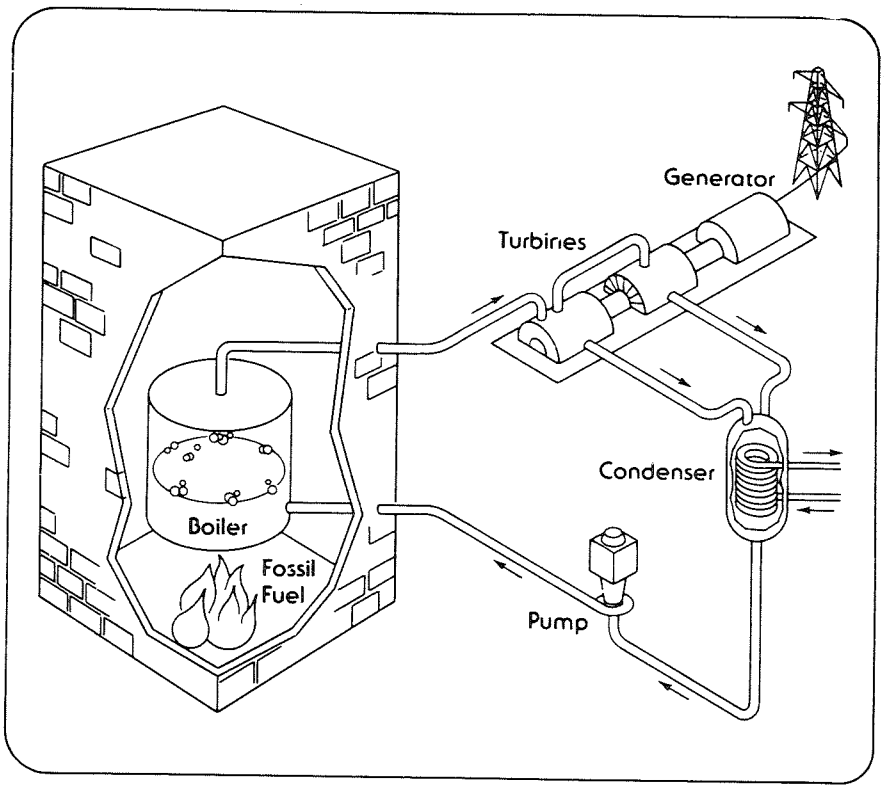
We are fortunate in the U.S. to have fuels besides oil and gas that can provide us energy for many years. As shown below by the size of the barrels, coal is a very large energy resource. The three fossil fuels--coal, oil, and natural gas--provide most of the energy used in the U.S.

Uranium, which is a nuclear fuel rather than a fossil fuel, can also produce energy. If used in today's reactors, uranium could provide as much energy as either oil or natural gas. In addition, if used in advanced reactors known as breeder reactors, the amount of energy obtained from uranium could be multiplied by a factor of 60.



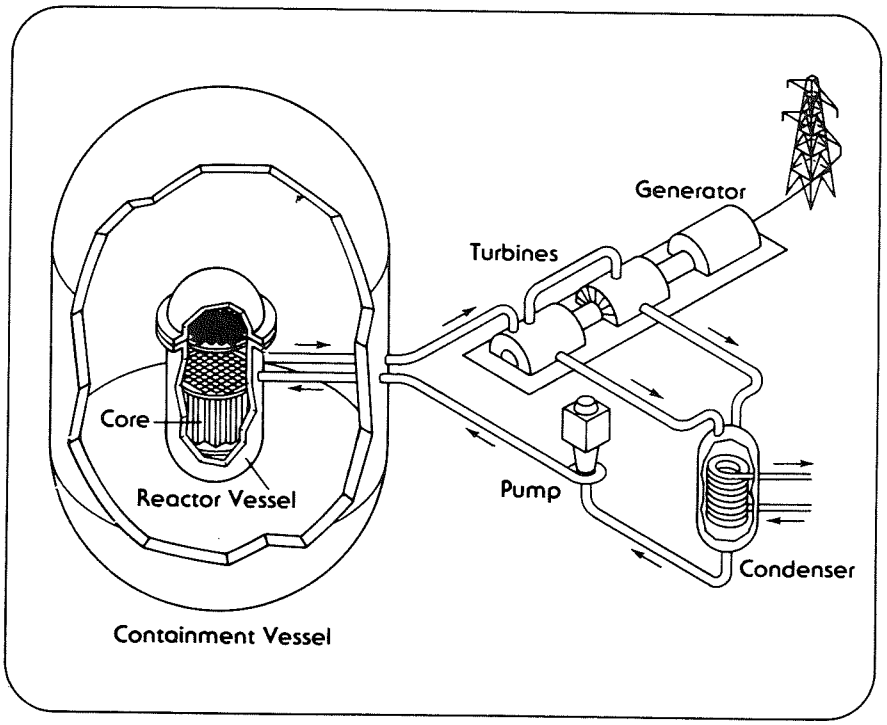
Fossil Fuel Plants

In conventional fossil plants, oil, coal, and natural gas can be burned to produce heat. Regardless of its source, the heat is converted into steam in a boiler. The steam expands as it passes through a turbine. This process drives a generator, which produces electricity. As steam leaves the turbine, it is condensed and returned to the boiler in the form of water.



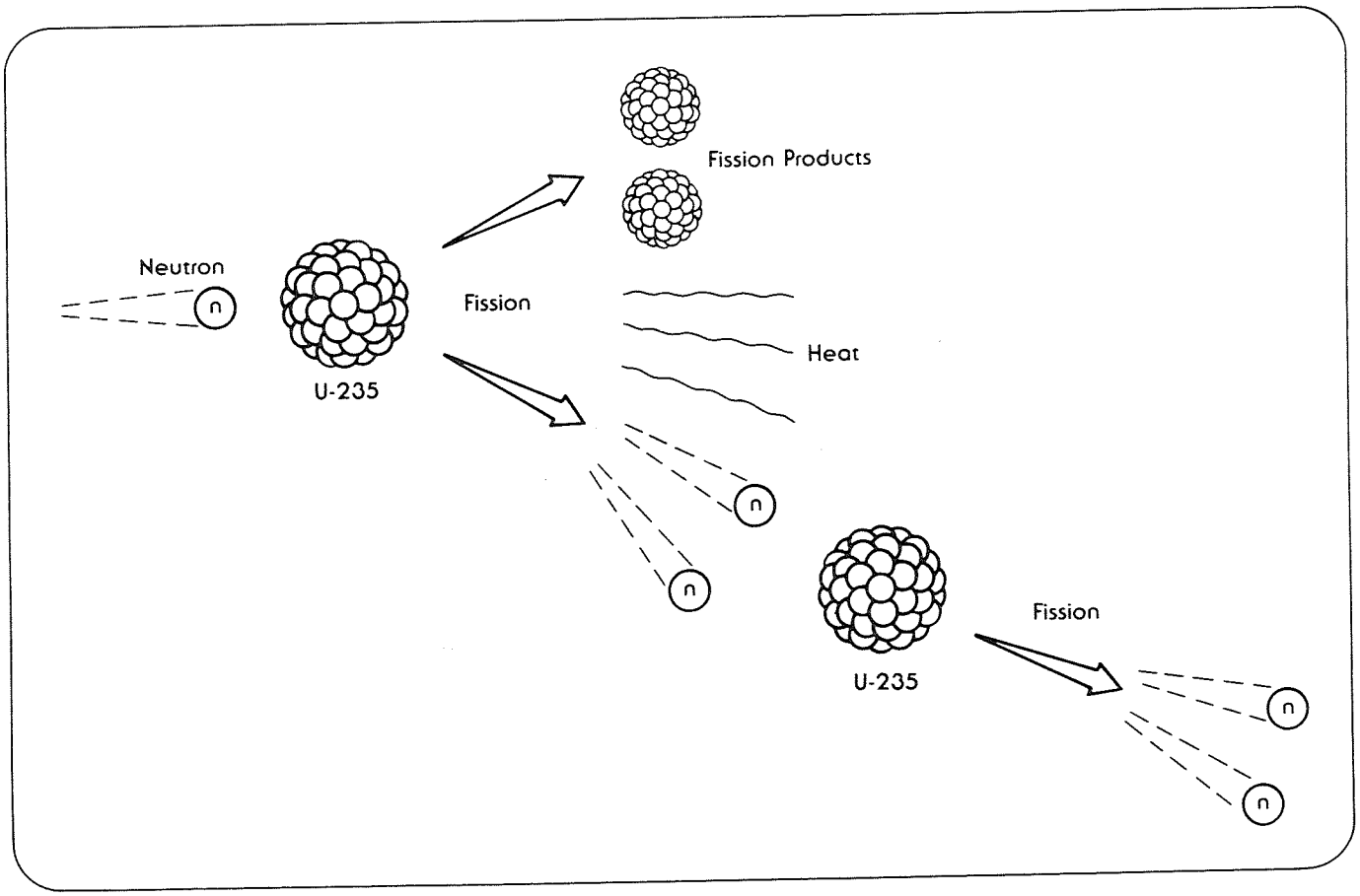
Nuclear Plants

In a nuclear plant, heat is also used to produce steam, which in turn is used to generate electricity. The main difference between a fossil plant and a nuclear plant is the source of heat. The heat in a nuclear plant is produced by a process called nuclear fission, which can occur in special types of nuclear fuel.



Nuclear Fission

The process of fissioning, or splitting, atoms can produce enough heat to generate electricity. Fission occurs readily in only a few elements, such as uranium and plutonium. One particular isotope of uranium, U-235, is commonly used in today's reactors. When a neutron strikes a uranium-235 atom, it is absorbed. This makes the nucleus of the U-235 atom unstable, and causes it to split into two lighter atoms called fission products. At the same time, energy in the form of heat is released along with two or three neutrons. The neutrons can strike other uranium atoms and cause additional fissions. The continuing process of fissioning is known as a chain reaction.

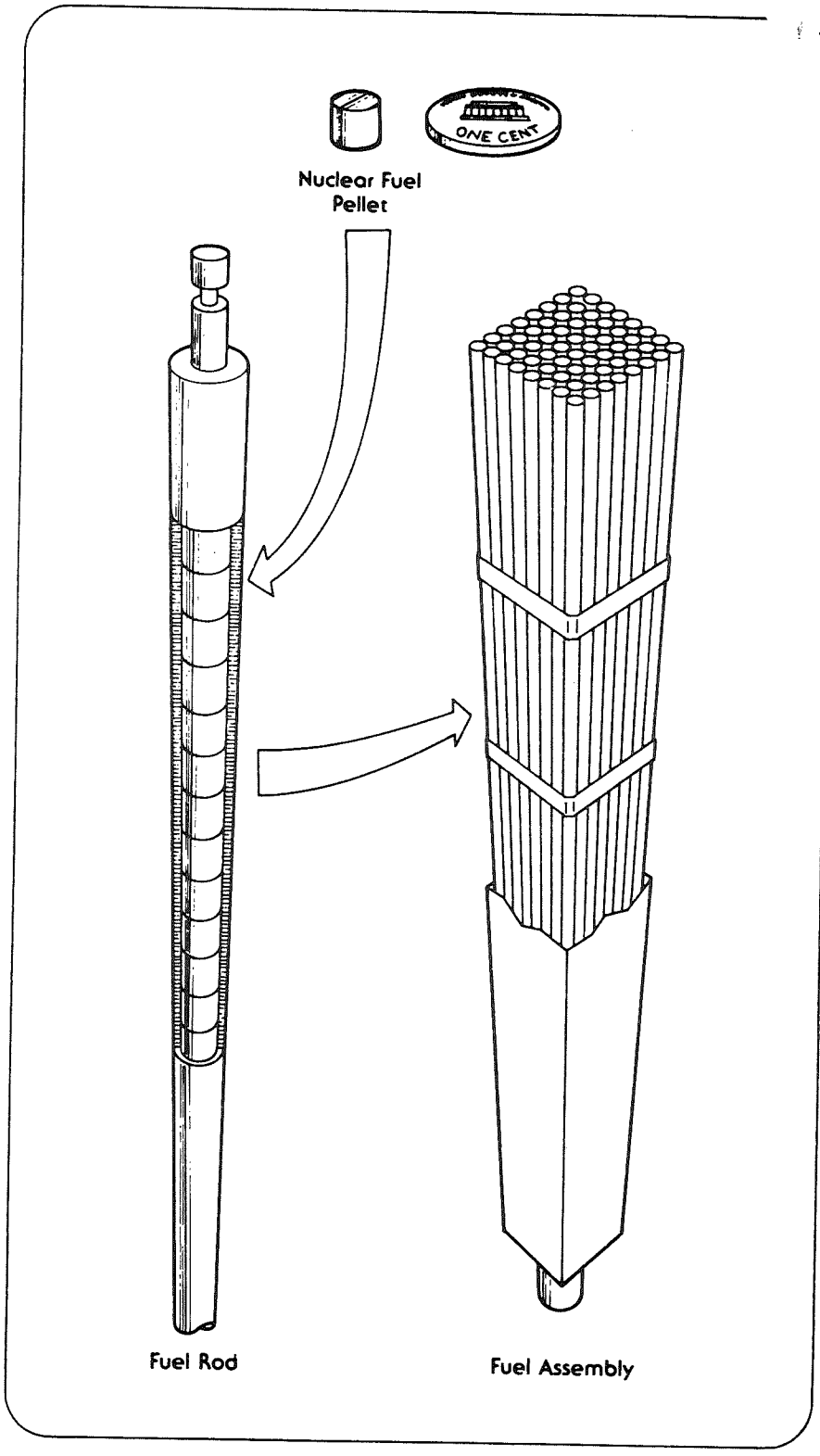


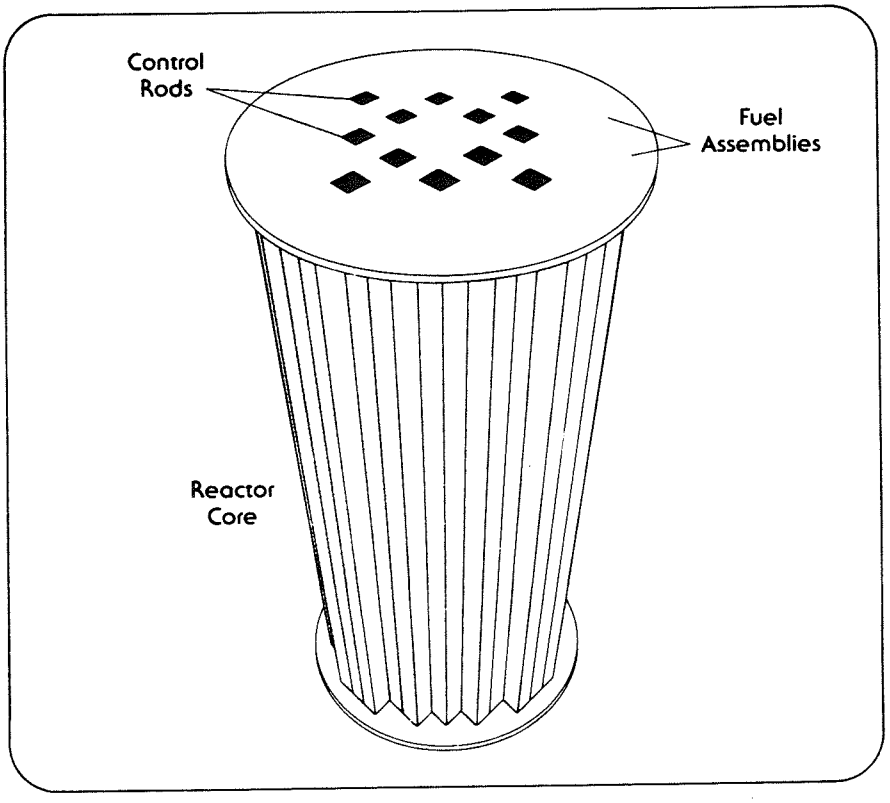
Nu Fuel

Only a few elements fission easily enough to be used as fuel in a nuclear power plant. Of these special materials, uranium is the most common fuel in today's reactors.

Any nuclear fuel, including uranium, must be processed through several steps before it can be used in a reactor. The fuel must first be carefully refined. It is then shaped into small cylinders known as fuel pellets. The pellets are less than 1/2 inch in diameter, but each one can produce as much energy as 120 gallons of oil.

Fuel pellets are stacked and sealed in hollow tubes about 12 feet long. The filled tubes are called fuel pins or rods. The rods are grouped together in bundles known as fuel assemblies. The fuel rods are carefully spaced in the assemblies to allow a liquid coolant to flow between them.

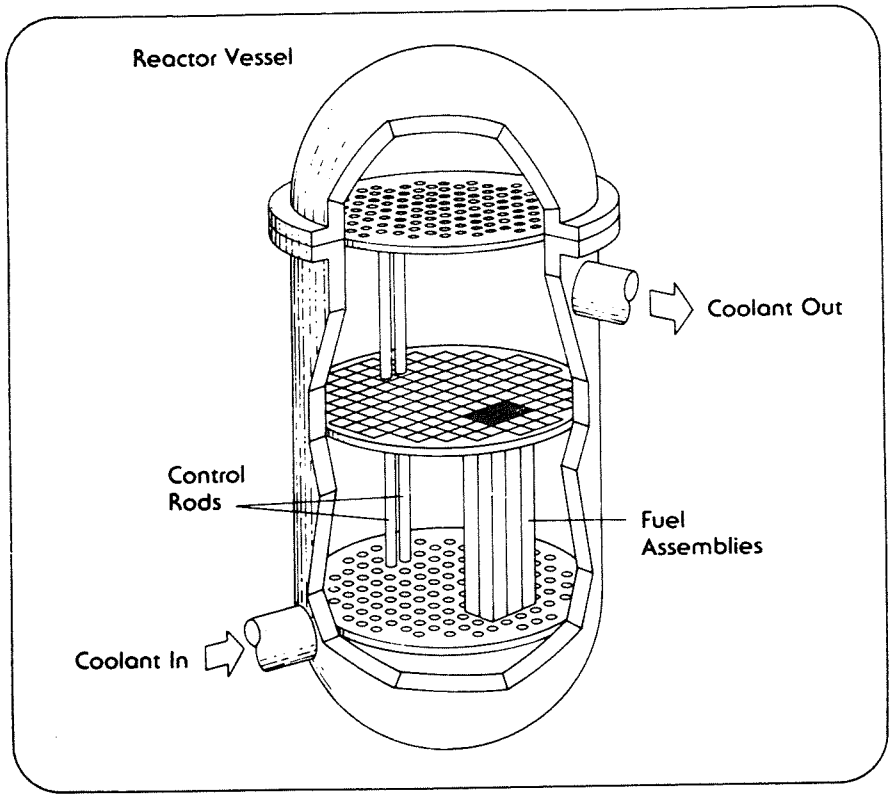




Reactor Core

Approximately 200 nuclear fuel assemblies are grouped together to make up the core of one reactor. Nuclear fuel in the core generates heat in a reactor just as coal or oil generates heat in a boiler.

Interspersed among the fuel assemblies are movable control rods, which are made of material that readily absorbs neutrons. When the control rods are inserted into the core, the nuclear chain reaction in the fuel assemblies is slowed down. This reduces the amount of heat produced by the core. When the control rods are withdrawn from the core, the chain reaction speeds up, and more heat is produced.



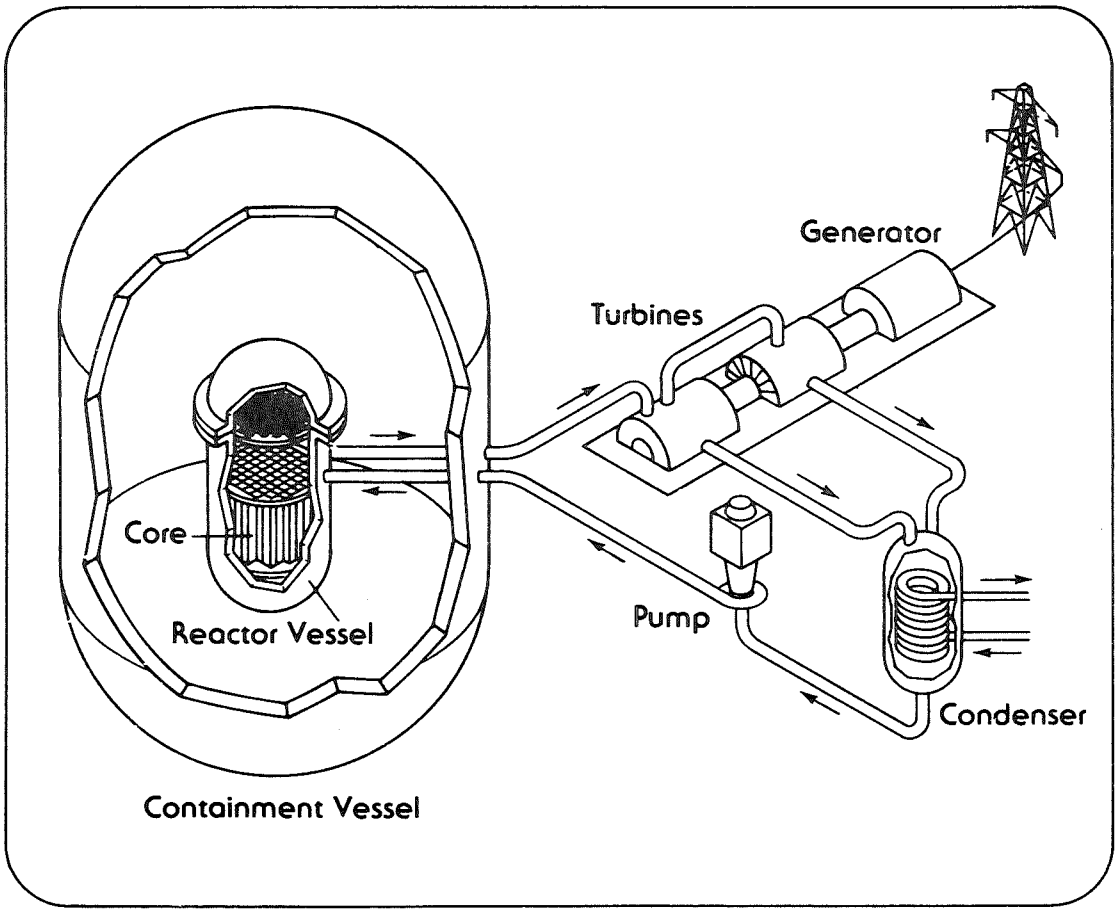
Reactor Vessel

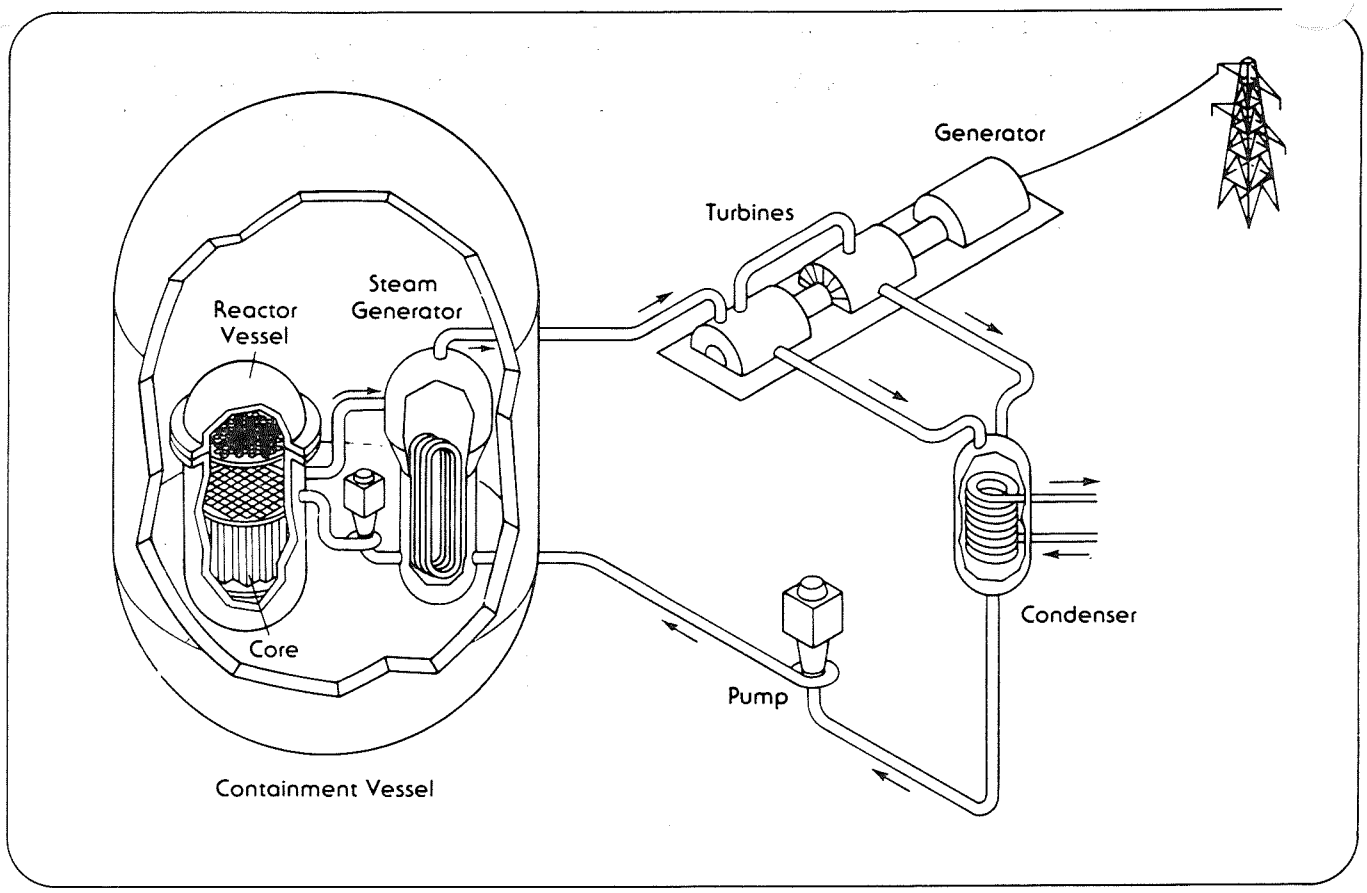
The entire reactor core, which contains fuel assemblies and control rods, is enclosed in a heavy stainless steel vessel. To ensure safety, the entire reactor vessel is housed in a reinforced concrete structure.

A liquid coolant is pumped into the reactor vessel through the core to remove heat. The coolant is then pumped out of the reactor vessel and is used to produce steam. Most of the nuclear power plants in the United States use water as a coolant. These plants are known as Light Water Reactors (LWR's).

Boiling Water Reactors

There are two distinct types of light water reactors in the U.S., and many of each type are built. In both reactors, fuel assemblies in the core are cooled by water, and the heated water is used to generate steam. In the Boiling Water Reactor (BWR), the pressure inside the reactor vessel is carefully controlled so that the water boils as it passes through the core. This reactor generates steam directly by the heat from the core, with no intermediate steps. This is known as a "direct cycle" system.





Pressurized Water Reactors

In the Pressurized Water Reactor (PWR), the pressure is kept high enough to prevent boiling, even though the water is very hot. In the PWR, the heated water from the core is pumped into a steam generator. At this point, the heat is transferred to another coolant system and steam is produced. The water from the core is circulated again and again through the primary loop without ever being converted into steam.

LWR Fuel Cycle

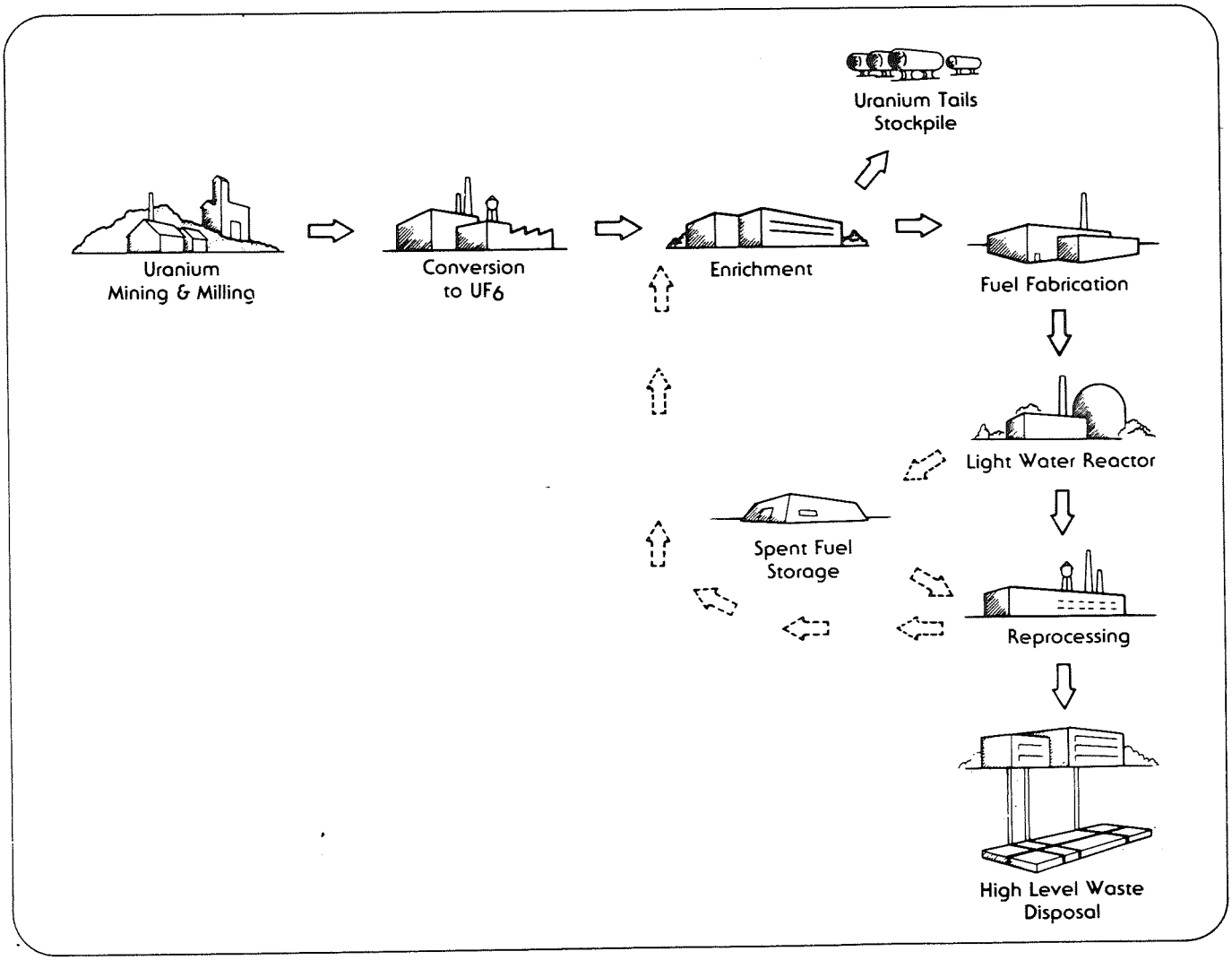
Light water reactors have been built in the U.S. for many years, and the industry that supplies equipment and services is well-established. However, it is not enough to build a reactor that produces heat and electricity. We must also be able to find and prepare nuclear fuel. In addition, we must handle fuel after it is discharged from the reactor. The fuel cycle represents all the elements that must be developed to have a complete nuclear power system.

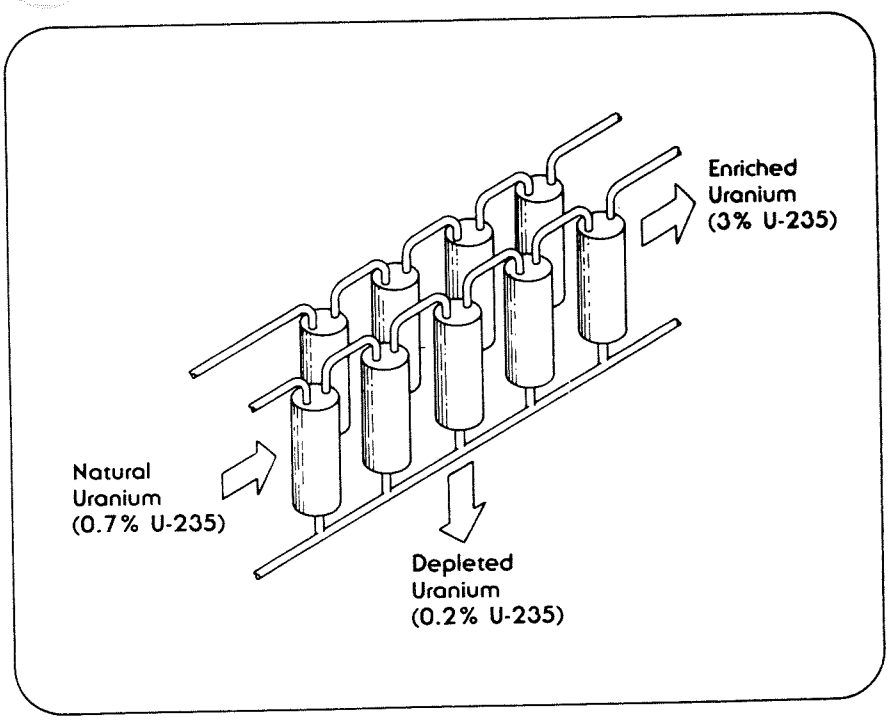
Mining uranium ore is the first step in the fuel cycle for light water reactors. After being mined, uranium is sent to a mill to be crushed and ground. The mill produces "yellowcake," which has a large concentration of the uranium compound U_3O_8.

Yellowcake contains, among other things, several isotopes or varieties of uranium. One such isotope is uranium-235, which is important because it fissions readily in a reactor. Uranium-238 is another isotope found in natural uranium, but it does not fission as easily. Unfortunately, natural uranium is composed primarily of U-238 and has less than 1% U-235. The concentration of uranium-235 can, however, be increased artificially. This is done by first converting the yellowcake to another chemical form and then processing it in an enrichment plant.

After uranium is enriched enough to be used in a reactor, it is fabricated into nuclear fuel elements. The fuel elements are grouped into fuel assemblies and placed in the core of a reactor. The fuel remains in the core and produces power for three to five years before it is removed.

After being discharged from the reactor core, nuclear fuel is cooled in a pool of water near the reactor. After it has cooled long enough to be handled easily, it may be shipped to another location. If it is shipped to a reprocessing plant, valuable fuel would be separated from radioactive waste. The waste material would then be stored safely and the fuel would be available to be used again. If reprocessing plants are not immediately available, it is possible that the spent nuclear fuel would be shipped to an interim storage facility.

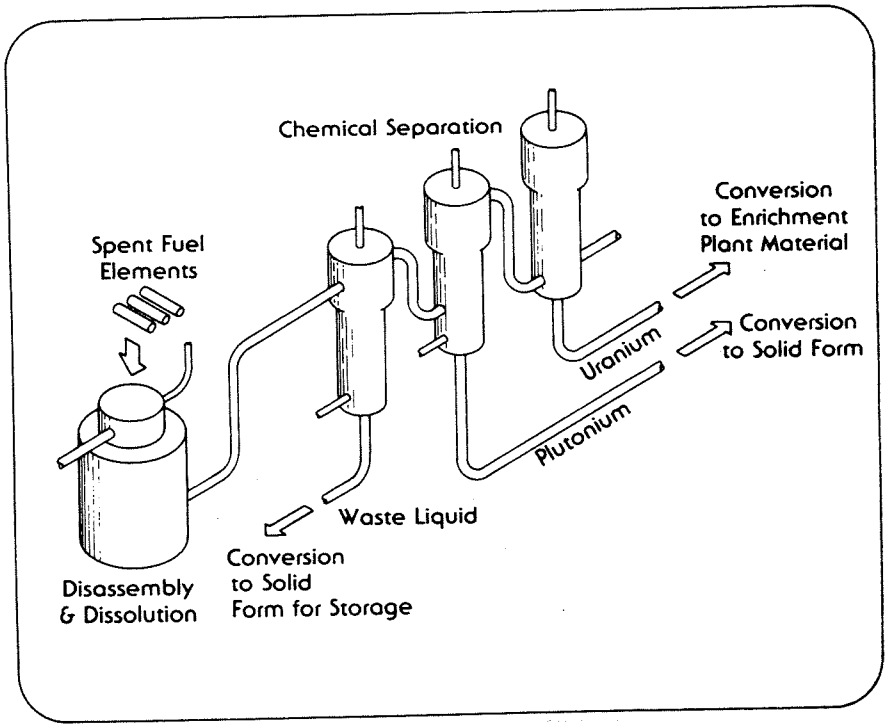




Enrichment

The process of enriching uranium is very sophisticated, but it accomplishes a simple purpose--it increases the concentration of the isotope U-235 in uranium. This is a necessary operation in the LWR fuel cycle, since natural uranium does not contain enough U-235 to run an LWR.

During the process of enrichment, natural uranium is fed into the enrichment plant. Only 0.7% of this uranium is U-235, while 99.3% is another isotope of uranium, U-238. The natural uranium is processed and split into two streams. One contains the concentrated uranium, which is usually about 3% U-235. This is sent to be fabricated for use in light water reactors. The other stream is depleted uranium, or "tails," which contains only 0.2% U-235. Since it is not usable in today's reactors, it is stored.



Reprocessing

Even after fuel is removed from a reactor, it still contains some usable nuclear material, such as uranium or plutonium. The usable fuel can be salvaged, however, only if it is reprocessed. This is a method of chemically separating valuable nuclear materials from radioactive waste material.

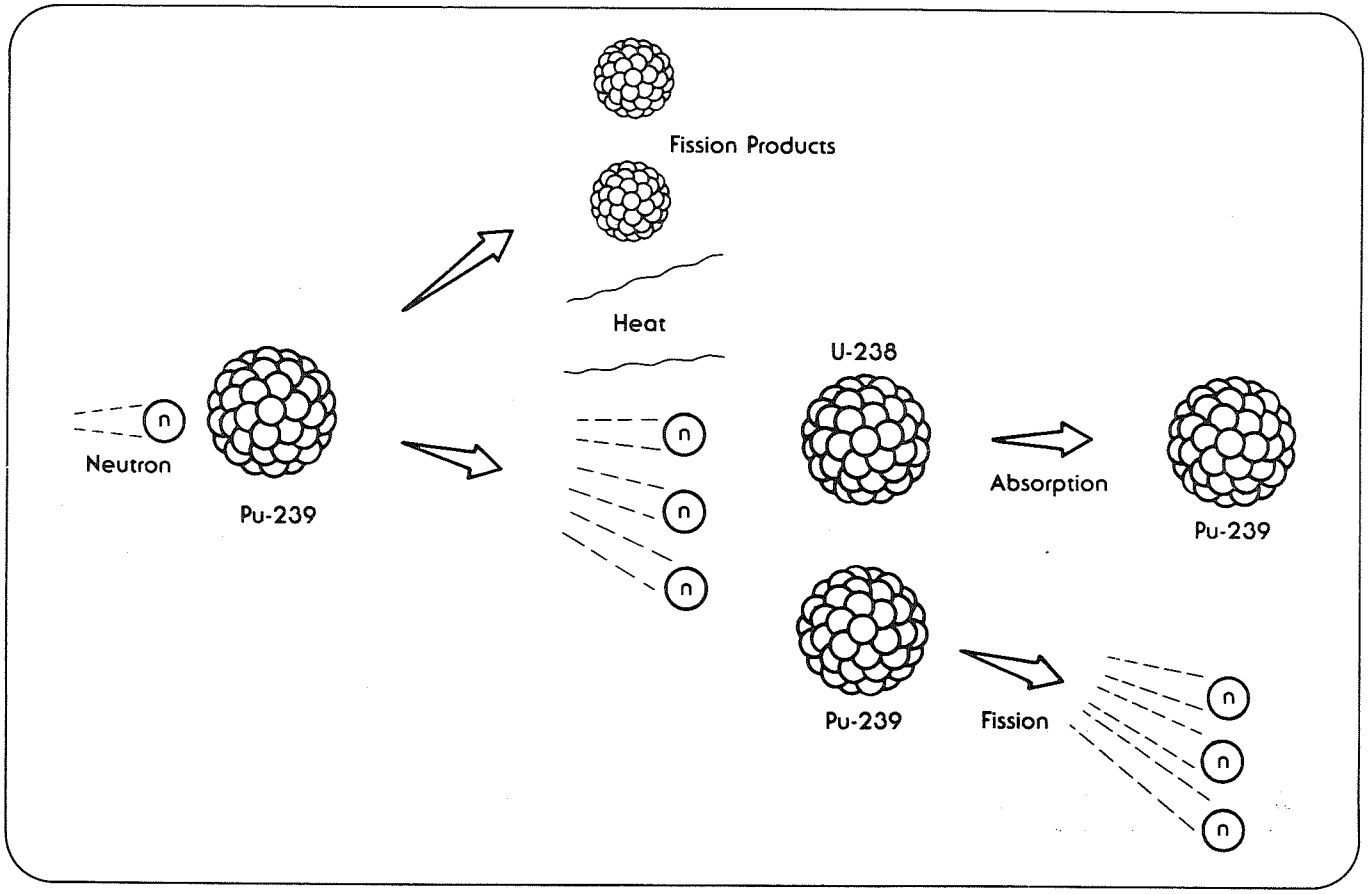
Nuclear material that is recovered during reprocessing can be reused many times. Uranium can be enriched again and used in light water reactors. Recovered plutonium would probably be stored until it could be used in advanced reactors.

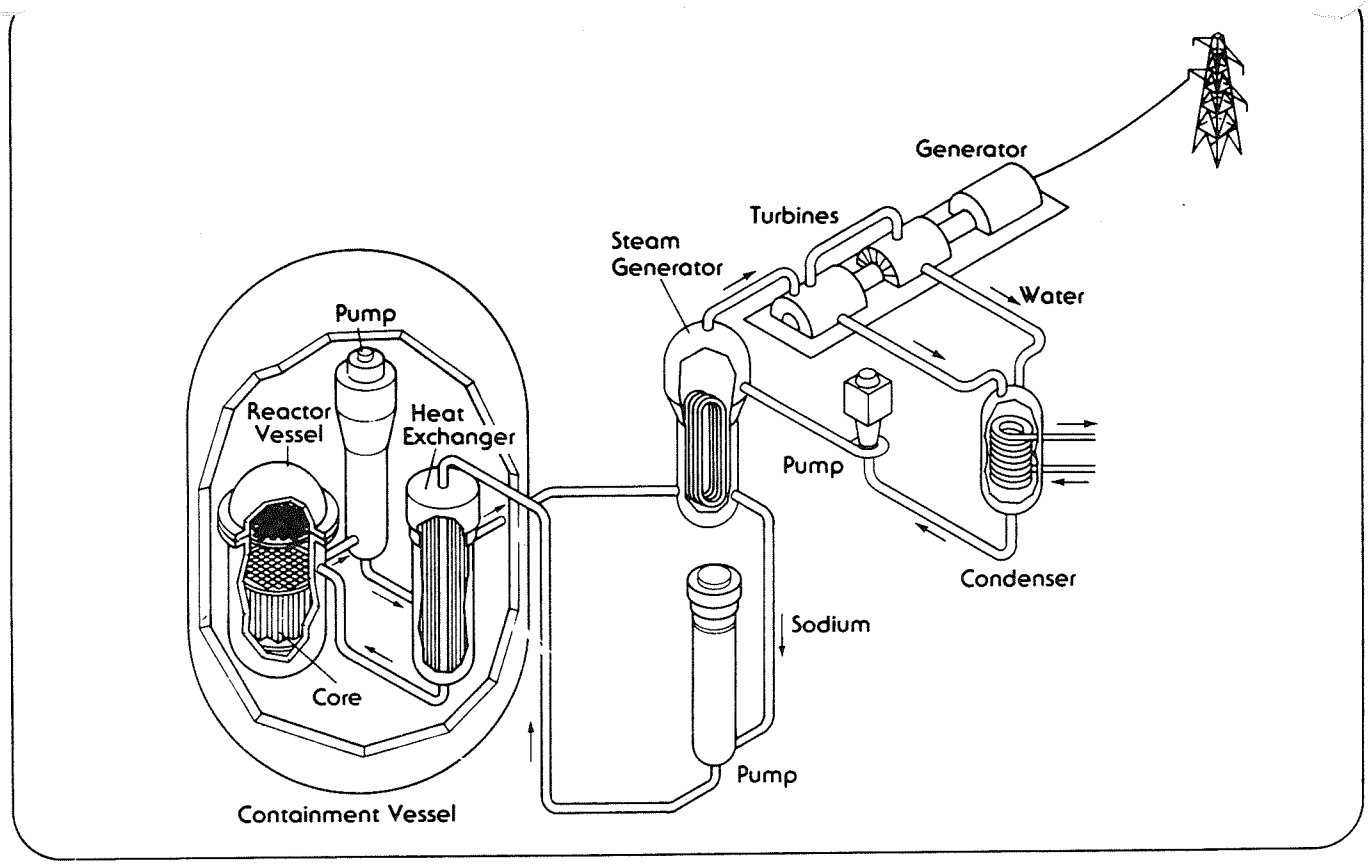
Waste material can be changed in form from a liquid to a type of glass and then buried so that it will not contaminate the environment.

reeding Process

e breeder reactor is able to get much more energy from uranium than a light water reactor because it uses it in a different way. In a light water reactor, the fission process depends primarily on U-235, which is found in small quantities in natural uranium. The breeding process depends on a different element, plutonium. When struck by a neutron, plutonium splits into two fission particles and releases heat and several neutrons. If these neutrons strike other plutonium atoms, the fission process can continue in a chain reaction. This is very similar to fission in a light water reactor.

But where do we get the plutonium to start the whole process? It does not occur in nature, and cannot be mined like uranium. Plutonium is, however, formed inside all nuclear reactors that use uranium as a fuel. This occurs when a U-238 atom is struck by a neutron. In general, this does not result in a fission. Rather, the atom of U-238 usually absorbs the neutron, and an atom of plutonium is created. This happens to some extent in light water reactors. Breeder reactors, however, are designed to enhance this effect. In fact, breeder reactors can create more plutonium than they consume.

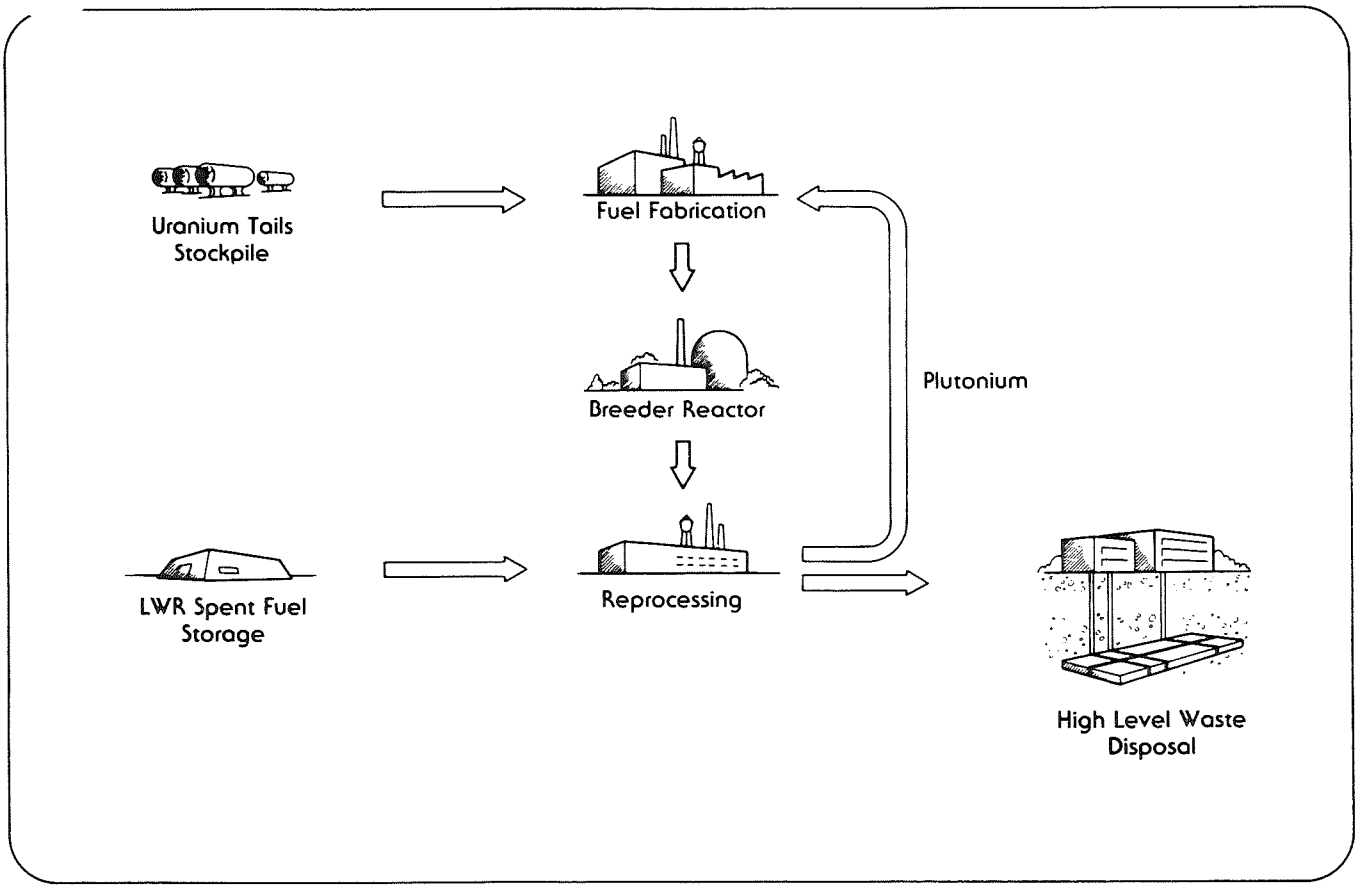




Breeder Reactor Design

The most common design for a breeder reactor uses liquid sodium as a coolant, rather than water. This type of reactor is known as a Liquid Metal Fast Breeder Reactor (LMFBR). Liquid sodium is an excellent heat transfer fluid, and it allows the LMFBR to be operated at high temperatures and low pressures. This produces a more efficient conversion of heat into electricity.

In a breeder reactor, liquid sodium is pumped through the core and into a heat exchanger. There heat from the core is transferred to another sodium coolant system. This second loop of liquid sodium is used to generate steam. Since the sodium in the secondary loop never passes through the core of the reactor, it does not become radioactive.



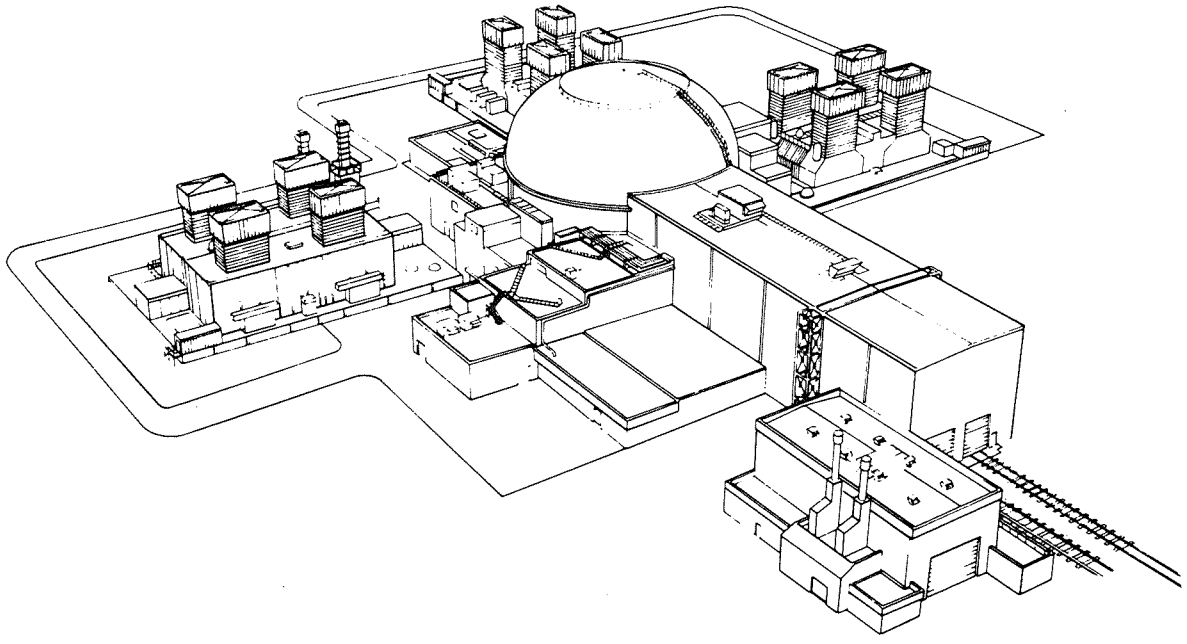
Breeder Reactor Fuel Cycle

The fuel cycle for the breeder reactor is different from the LWR fuel cycle. With the breeder reactor, there is no need to mine, convert, or enrich uranium, since it does not require high concentrations of U-235. The uranium that is used in the breeder reactor can be taken from the depleted stockpile produced by enrichment plants. This is useless in a light water reactor, but can be converted to plutonium and used as fuel in a breeder reactor.

In order to obtain plutonium to fuel a breeder reactor, it is necessary to reprocess nuclear fuel that has been removed from another reactor. Light water reactors produce some plutonium during normal operation, and the spent fuel from this type of reactor may be reprocessed to recover plutonium for a breeder reactor. In addition, fuel discharged from breeder reactors can be reprocessed and reused again and again.

Breeder Reactors in the U.S.

The objective of the U.S..breeder reactor program is to develop the technology to the point where the reactors may be built commercially. As part of this program, the U.S. built several experimental breeder reactors, starting in 1951. The most recent reactor to be completed is the Fast Flux Test Facility, which is used to test materials and fuels that may be used in future reactors. The next step is to complete the Clinch River Breeder Reactor, which is currently under construction. The final stage in developing the breeder reactor would be to construct a large-scale demonstration plant.



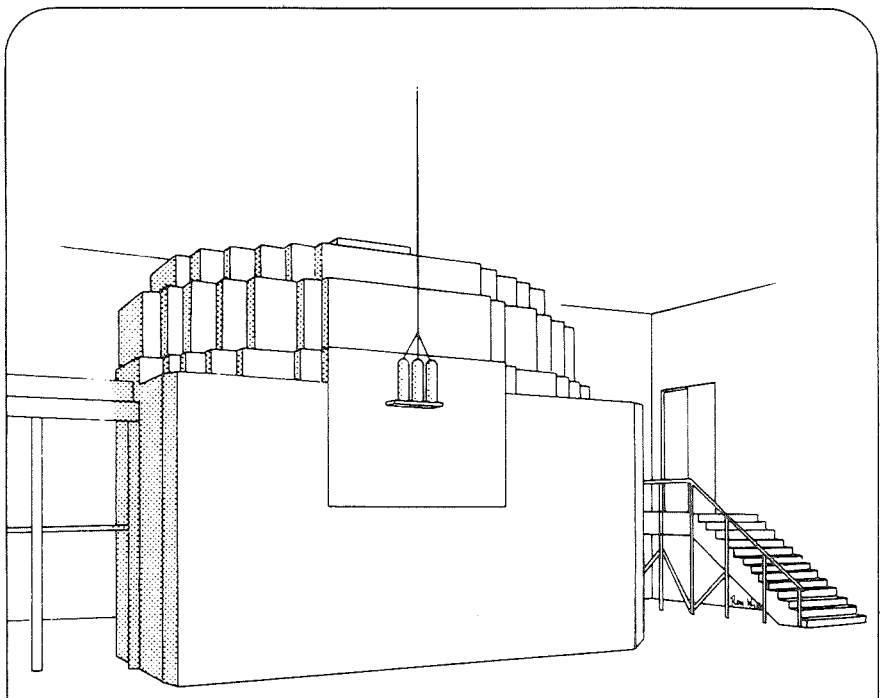
Fast Flux Test Facility

History of Nuclear Power in the U.S.

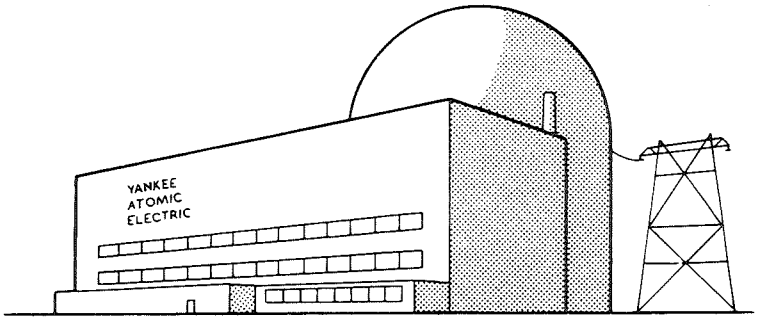
In December of 1942, a team of scientists, led by Nobel prize physicist Enrico Fermi, produced the world's first controlled nuclear chain reaction. The experiment took place at Stagg Field in Chicago in a simple reactor. This early nuclear research was directed toward developing weapons for use in World War II. However, the concept of using nuclear power for peaceful purposes was also important to the scientists. Fermi wrote, "We all hoped that with the end of the war, emphasis would be shifted decidely from the weapon to the peaceful aspects of atomic energy."

Shortly after World War II, the U.S. government began to develop civilian applications of nuclear power. By the mid-1950's, it was a goal of the government to demonstrate that nuclear power could safely produce electricity for use in the private sector. As a first step towards achieving this goal, the U.S. government developed the light water reactor, and commissioned the first one in 1957. This was the first reactor in the U.S. to provide electricity to the public.

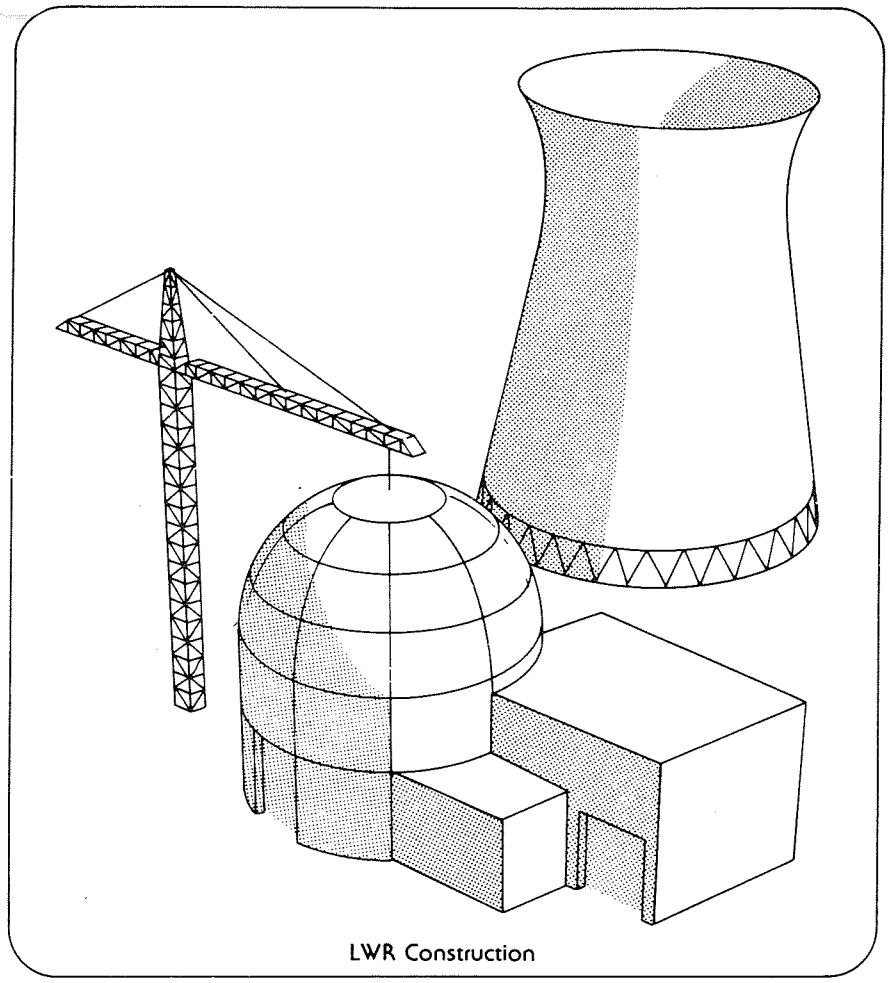
Although this first plant was entirely financed and constructed by the government, subsequent projects encouraged industry participation. Through cooperative efforts by government and industry, a series of reactors were constructed. These plants were the forerunners of today's commercial reactors. The first generation of light water reactors includes Dresden-1 in Illinois and Yankee Atomic Power Station in Massachusetts, which were commissioned in the early 1960's.



First Nuclear Reactor at Stagg Field



Early U.S. Power Reactor



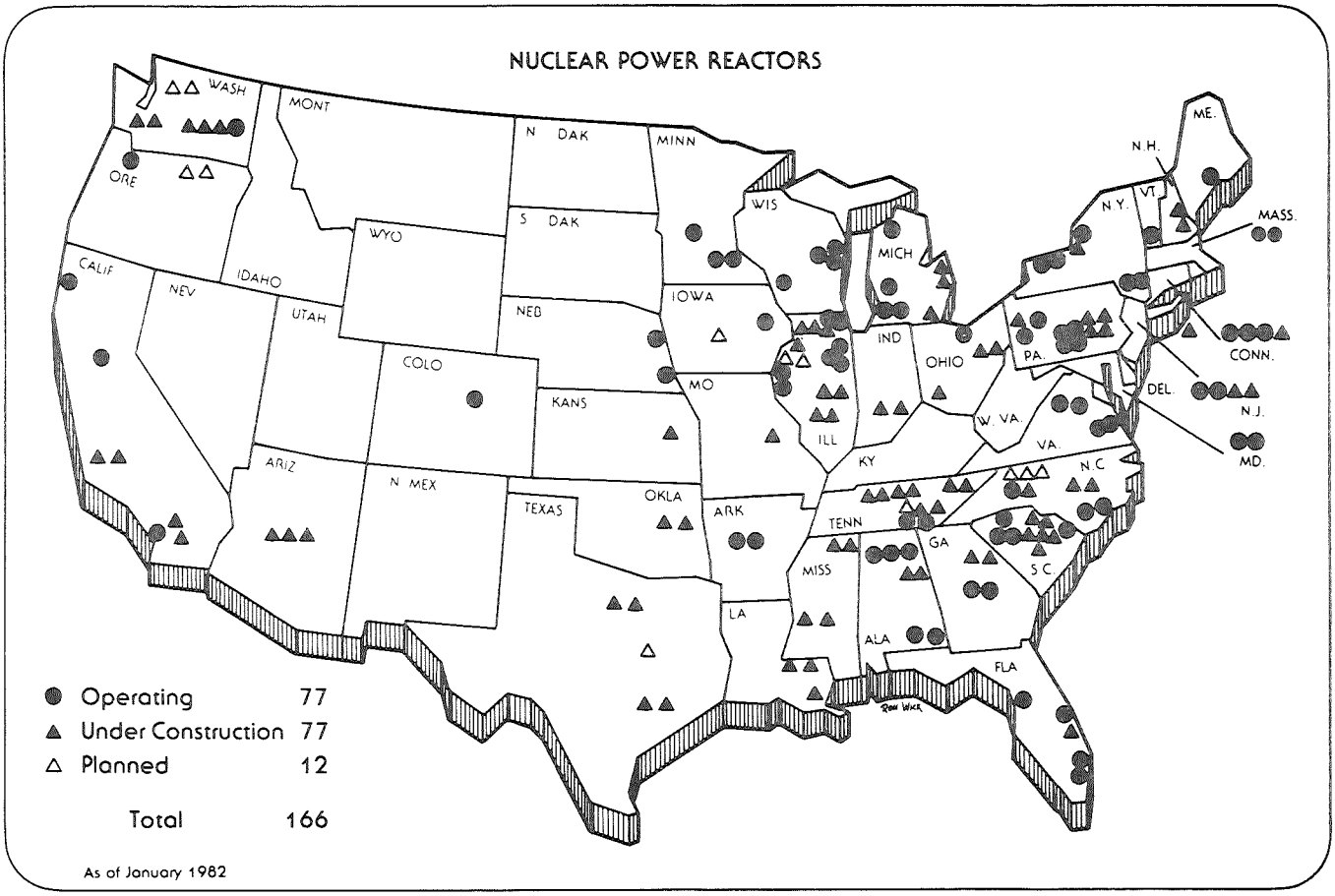
LWR Construction

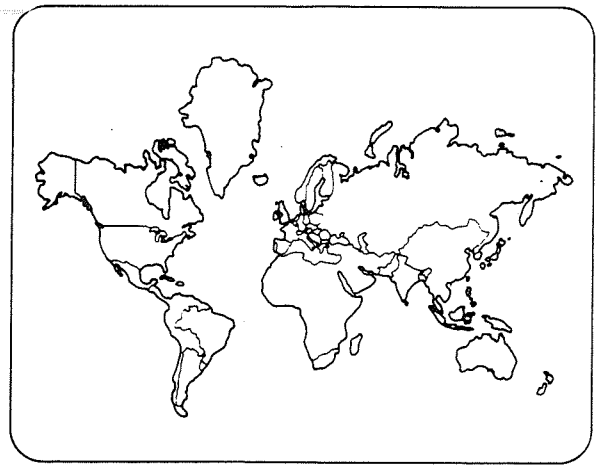
Throughout the development of the first nuclear power plants, an industry grew to meet the new demand for nuclear components and services. By the mid-1960's, a nuclear industry was sufficiently established that government assistance was no longer necessary to build a reactor. In 1963, the first order was placed for a reactor that did not involve government funds. This order opened the door for a large number of reactor sales in the late 1960's and early 1970's. In fact, within five years of the first order, the utilities had committed themselves to building nearly 77,000 MWe of nuclear generating capacity. By 1973, 56 reactors were operating, and today nearly 80 nuclear units are producing electricity.

Nuclear Reactors in the U.S.

In the past few years, nuclear reactors have provided steady and reliable power to many areas of the United States. Approximately 80 nuclear power plants are licensed to operate today, and these reactors provide 11% of all the electricity used in the U.S. In certain areas of the Midwest and Northeast, more than half of the electricity is produced by nuclear generating untis.

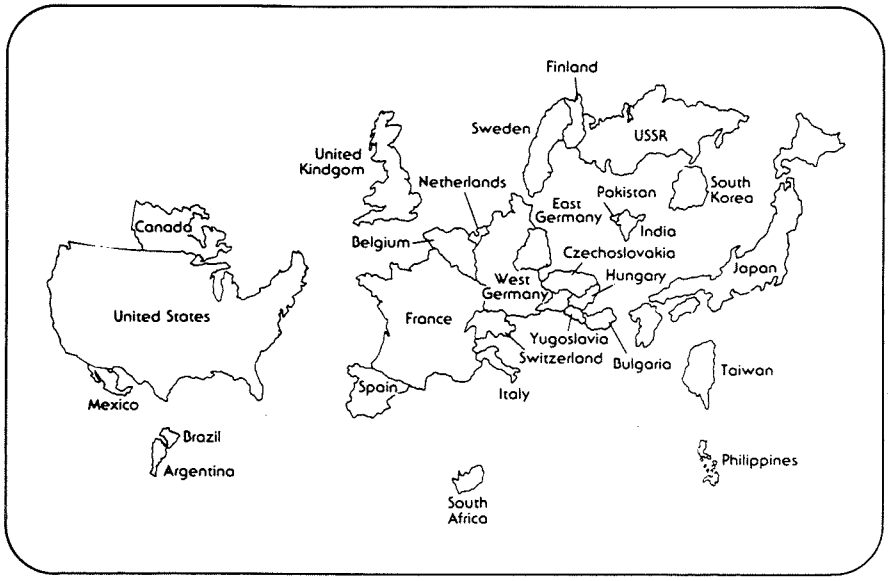
In addition to those plants in operation, another 80 nuclear units are being built and there are plans to construct even more reactors. When these plants are completed, more than 150 nuclear power plants will be operating in the United States.

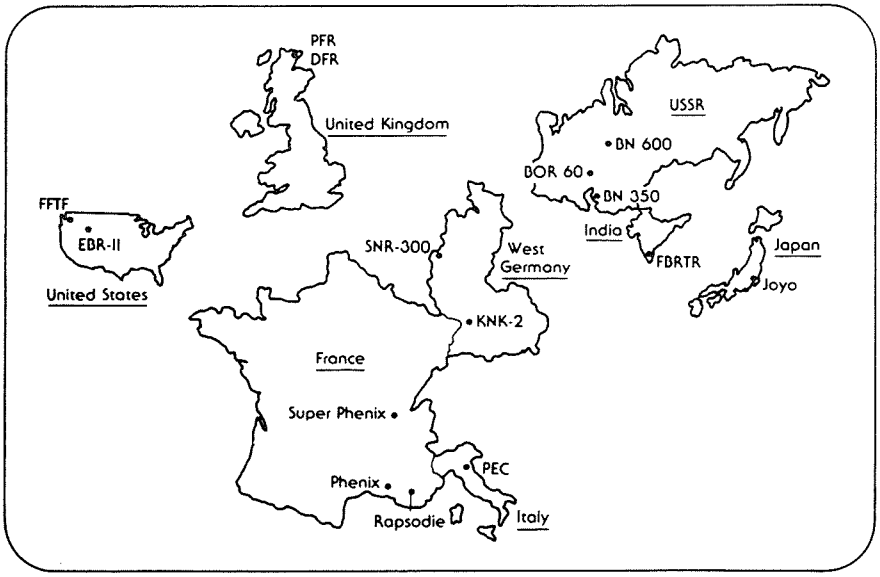




Nuclear Reactors Throughout the World

Nuclear power is an important source of electricity in many nations, as shown by these two maps. The upper map shows the traditional view of the world. In the map below, the area of a nation is proportional to the size of its nuclear program in 1985. It can be seen that the United States has the world's largest nuclear power program. Many other nations, such as France and Japan, plan to develop a large amount of additional nuclear generating capacity.





Breeder Reactors Throughout the World

A number of nations with large nuclear programs have invested in developing breeder reactor technology. France, the United Kingdom, and the Soviet Union have already completed demonstration plants; West Germany and Japan will soon follow. In the figure, the size of each country is determined by the size of the largest breeder reactor that will be operating in 1985.

NITIONS OF BASIC TERMS

THE FISSION PROCESS

Neutron - A basic atomic particle that has no electrical charge. Neutrons and protons, which are positively charged particles, form the central portion of the atom known as the nucleus. Negatively charged electrons orbit the nucleus at various distances. The chemical and nuclear properties of an atom are determined by the number of its neutrons, protons, and electrons.

Fission - The process by which a neutron strikes a nucleus and splits it into two fragments. During the process of nuclear fission, several neutrons are emitted at high speed, and heat and radiation are released.

Chain Reaction - The continuing process of nuclear fissioning, in which the neutrons released from every fission trigger at least one other nuclear fission.

Fission Products - The two small atoms created when a nucleus fissions. The mass of the fission products is less than that of the original nucleus. The difference in mass is released as energy.

Isotopes - Atoms having the same number of protons, but a different number of neutrons. Two isotopes of the same atom are very similar and difficult to separate by ordinary chemical means. Isotopes can have very different nuclear properties, however. For example, one isotope may fission readily, while another isotope of the same atom may not fission at all.

Uranium - A metallic element found in nature that is commonly used as a fuel in nuclear reactors. As found in nature, it contains two isotopes--uranium-235 and uranium-238.

Uranium-235 - The less abundant uranium isotope, accounting for less than one percent of natural uranium. Uranium-235 splits, or fissions, when struck by a neutron. When uranium is used as a fuel in a nuclear reactor, the concentration of U-235 is often increased to enhance the fission process. For example, the fuel for light water reactors contains about 3% uranium-235.

Uranium-238 - The more abundant uranium isotope, accounting for more than 99% of natural uranium. Uranium-238 tends to absorb neutrons rather than fission. When it absorbs a neutron, the uranium atom changes to form a new element--plutonium.

Plutonium - An element that is not found in nature, but can be produced from uranium in a nuclear reactor. Plutonium fissions easily, and can be used as a nuclear fuel.

Fissile - Material composed of atoms which readily fission when struck by a neutron. Uranium-235 and plutonium-239 are examples of fissile materials.

Fertile - Material composed of atoms which readily absorb neutrons to produce fissionable materials. One such element is uranium-238, which becomes plutonium-239 after it absorbs a neutron. Fertile material alone cannot sustain a chain reaction.

FUEL CYCLE

Conversion - The chemical process by which uranium is prepared for treatment in an enrichment facility. The conversion process changes uranium from a solid oxide form to a fluoride gas.

Enrichment - The process by which the concentration of uranium-235 is increased. Generally, uranium is enriched from its natural concentration of less than 1% U-235 to about 3% U-235. This concentration of fissile material is suitable for use in a light water reactor.

Tails - A product of uranium enrichment that is composed of uranium with a very low concentration of U-235. While this material is of little use in a light water reactor, it can be converted to plutonium in a fast breeder reactor.

Fabrication - The final step in preparing nuclear fuel for use in a reactor. During fabrication, the fuel is shaped into small pellets and then stacked in thin metal tubes. The tubes, or rods, of fuel are carefully spaced within a metal grid before being inserted in a reactor.

Spent Nuclear Fuel - Material that is removed from a reactor after it can no longer sustain a chain reaction. Spent fuel from a light water reactor is composed primarily of uranium and contains some radioactive materials, such as fission products. Spent fuel also contains some valuable nuclear materials, such as uranium-235 and plutonium.

Reprocessing - A series of chemical steps in which valuable nuclear materials are extracted from spent nuclear fuel. The useful materials, including uranium and plutonium, can be used again as fuel in other reactors. The remaining waste materials are solidified and isolated from the environment.

NUCLEAR REACTORS

Nuclear Fuel - Nuclear material which fissions easily. The most common nuclear fuels are uranium and plutonium. The material is packed into long, thin tubes known as fuel rods which are arranged in a compact configuration. This allows a controlled chain reaction to occur.

Core - The region of a reactor in which the nuclear chain reaction is initiated, maintained, and controlled. Coolant is constantly circulated through the core to remove heat produced by the fission process.

Control Rods - Long, thin rods that are positioned among fuel rods to regulate the nuclear chain reaction. Control rods are composed of material that absorbs neutrons readily. They interrupt or slow down a chain reaction by capturing neutrons that would otherwise trigger more fissions.

Coolant - Fluid that is circulated through the core of a reactor to remove the heat generated by the fission process. Most reactors operating today used water as coolant, but some are cooled by liquid sodium. In reactors that have more than one coolant system, the fluid which passes through the core of a reactor is known as the primary coolant. It absorbs heat in the core and then transfers it to a secondary coolant system. The secondary system produces steam, which generates electricity.

Pressure Vessel - A heavy steel enclosure around the core of a reactor. It is designed to withstand high pressures and temperatures to prevent radioactive material from escaping from the core.

Containment Building - A thick concrete structure surrounding the pressure vessel and other reactor components. It is designed to prevent radioactive material from being released to the atmosphere in the unlikely event that it should escape from the pressure vessel.

Light Water Reactor - A general term that refers to all nuclear reators which use ordinary water as a coolant. This includes pressurized water reactors and boiling water reactors, which are the predominant reactors in the U.S. LWR's are generally fueled with enriched uranium, although they can operate with other nuclear fuels.

Pressurized Water Reactor - A reactor cooled by water that is kept at high pressure to prevent it from boiling. Primary coolant passes through the core of a PWR, and then transfers its heat to a secondary coolant system. Steam is produced from the heated water in the secondary system.

Boiling Water Reactor - A reactor cooled by water that is allowed to boil as it passes through the core. This coolant is used directly to produce the steam which generates electricity.

Fast Breeder Reactor - A reactor cooled by liquid sodium rather than water. In this type of reactor, the transformation of uranium-238 to plutonium occurs readily. Since plutonium fissions easily, it can be recycled and used as fuel for a breeder reactor. The conversion of uranium to plutonium is so efficient in an FBR that this reactor creates more fuel than it consumes.

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LOW LEVEL RADIOACTIVE WASTE DISPOSAL: THE PROBLEM AND THE SOLUTION

Attachme

Att. 6

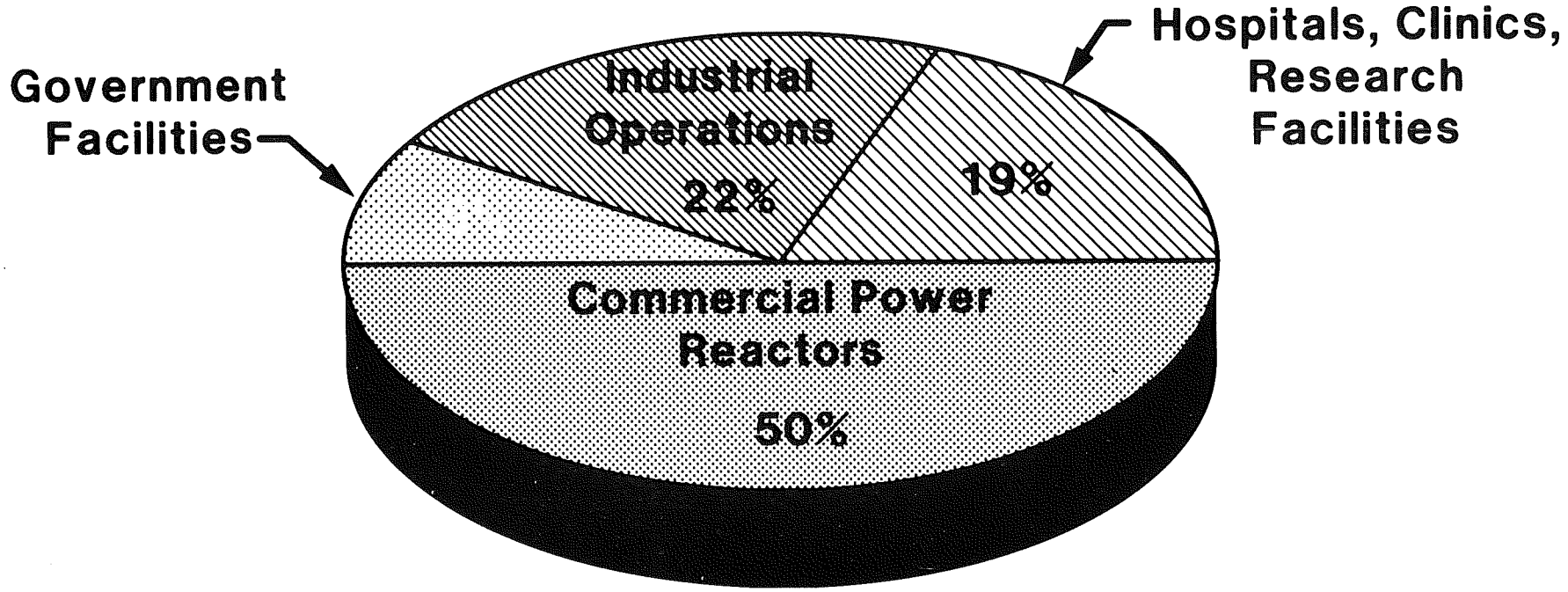
THERE ARE THREE CATEGORIES OF NUCLEAR WASTE

- Low Level
- Transuranic
- High Level

LOW LEVEL WASTE IS SLIGHTLY CONTAMINATED DEBRIS . . .

- Gloves
- Rags
- Clothing
- Tools
- Medical Instruments
- Machine Parts

GENERATED BY HOSPITALS, POWER PLANTS, INDUSTRIAL PROCESSES AND RESEARCH INSTITUTIONS



HOSPITALS, CLINICS AND RESEARCH FACILITIES GENERATE 19% OF THE NATION'S WASTE

- **Cancer Treatment**
- **Diagnostic Procedures**

INDUSTRIAL OPERATIONS GENERATE 22% OF THE NATION'S WASTE

- **Measurement and Gauging**
- **Radioisotopic Tracers**
- **Quality Control Inspection**

NUCLEAR POWER PLANTS GENERATE 50% OF THE NATION'S WASTE

- Tools
- Equipment Parts
- Solidified Ion Exchange Resins

GOVERNMENT SOURCES GENERATE AND DISPOSE OF 9% OF THE NATION'S WASTES AT MILITARY AND LABORATORY FACILITIES

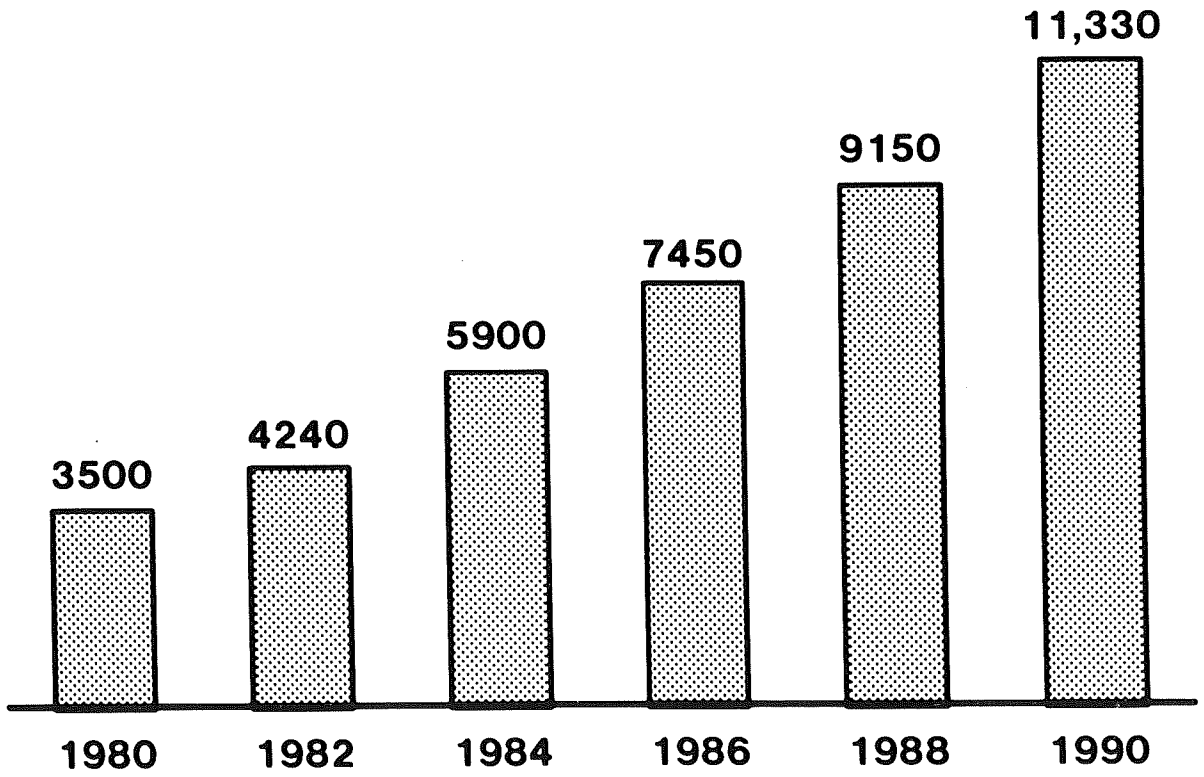
- **Defense Production Facilities**

- **National Laboratory Research Programs**

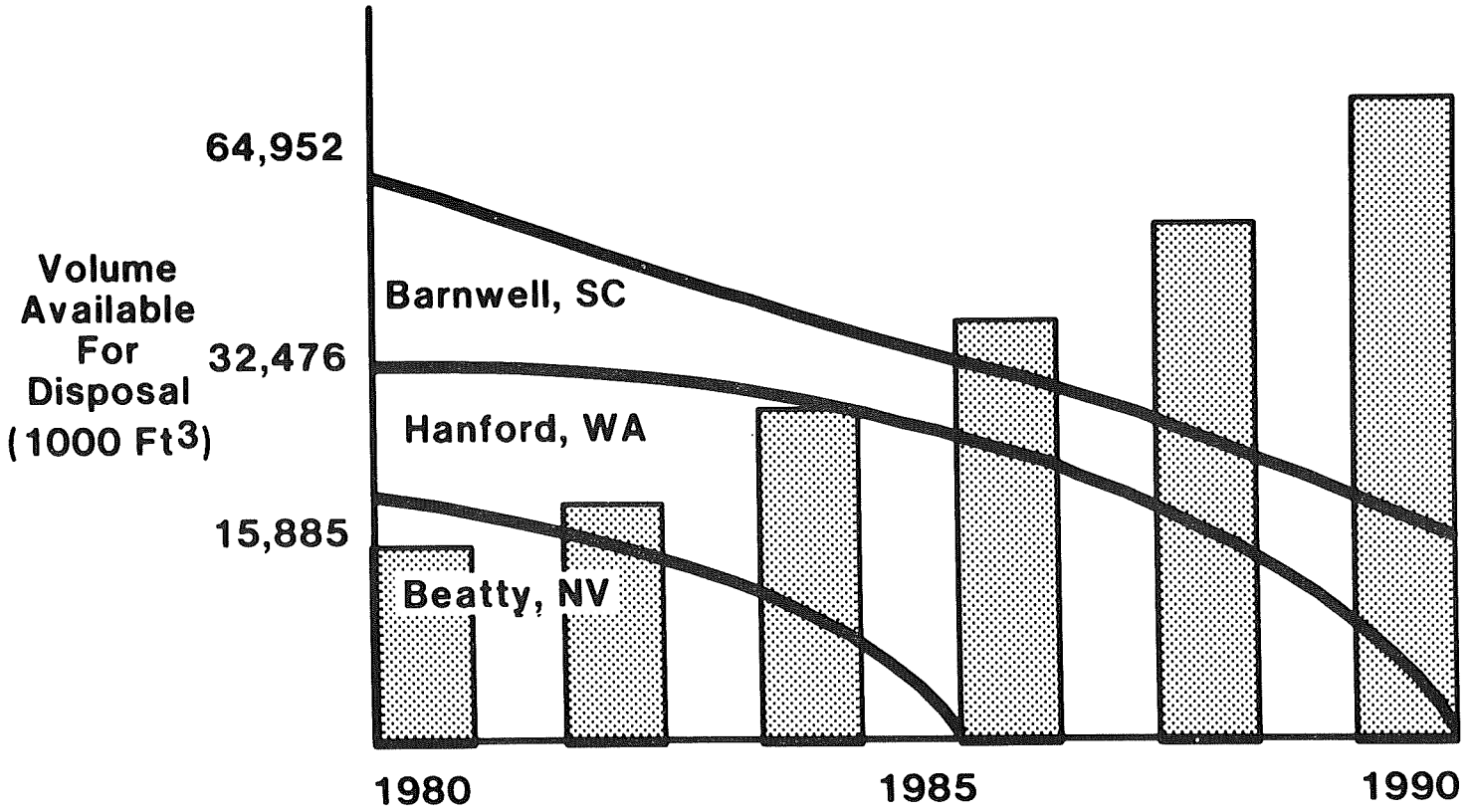
THE VOLUME OF LOW LEVEL WASTE GENERATED EACH YEAR IS GROWING RAPIDLY . . .

WHILE DISPOSAL SPACE IS SHRINKING

BY 1990, THE NATION WILL GENERATE 11 MILLION FT^3 OF LOW LEVEL WASTE EACH YEAR

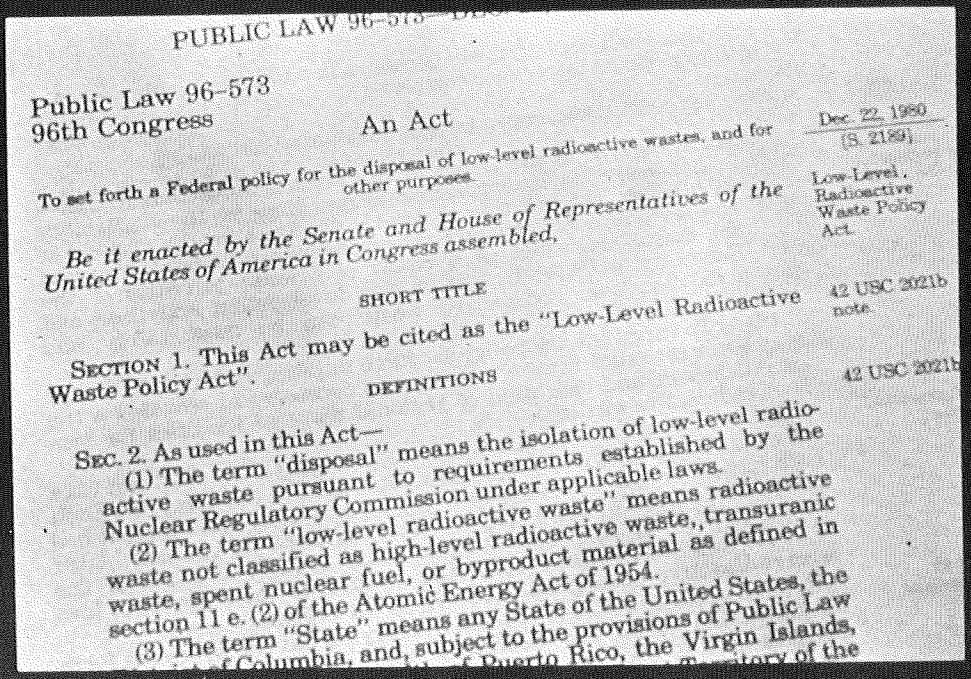


EXISTING DISPOSAL SITES ARE FILLING RAPIDLY



A NEW LAW ADDRESSES THIS PROBLEM

- **The 1980 Low Level Radioactive Waste Policy Act**



PUBLIC LAW 96-573

Public Law 96-573
96th Congress

An Act

Dec. 22, 1980
[S. 2189]

To set forth a Federal policy for the disposal of low-level radioactive wastes, and for other purposes.

Low-Level Radioactive Waste Policy Act.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

SHORT TITLE

42 USC 2021b note.

SECTION 1. This Act may be cited as the "Low-Level Radioactive Waste Policy Act".

DEFINITIONS

42 USC 2021b

SEC. 2. As used in this Act—

(1) The term "disposal" means the isolation of low-level radioactive waste pursuant to requirements established by the Nuclear Regulatory Commission under applicable laws.

(2) The term "low-level radioactive waste" means radioactive waste not classified as high-level radioactive waste, transuranic waste, spent nuclear fuel, or byproduct material as defined in section 11 e. (2) of the Atomic Energy Act of 1954.

(3) The term "State" means any State of the United States, the District of Columbia, and, subject to the provisions of Public Law

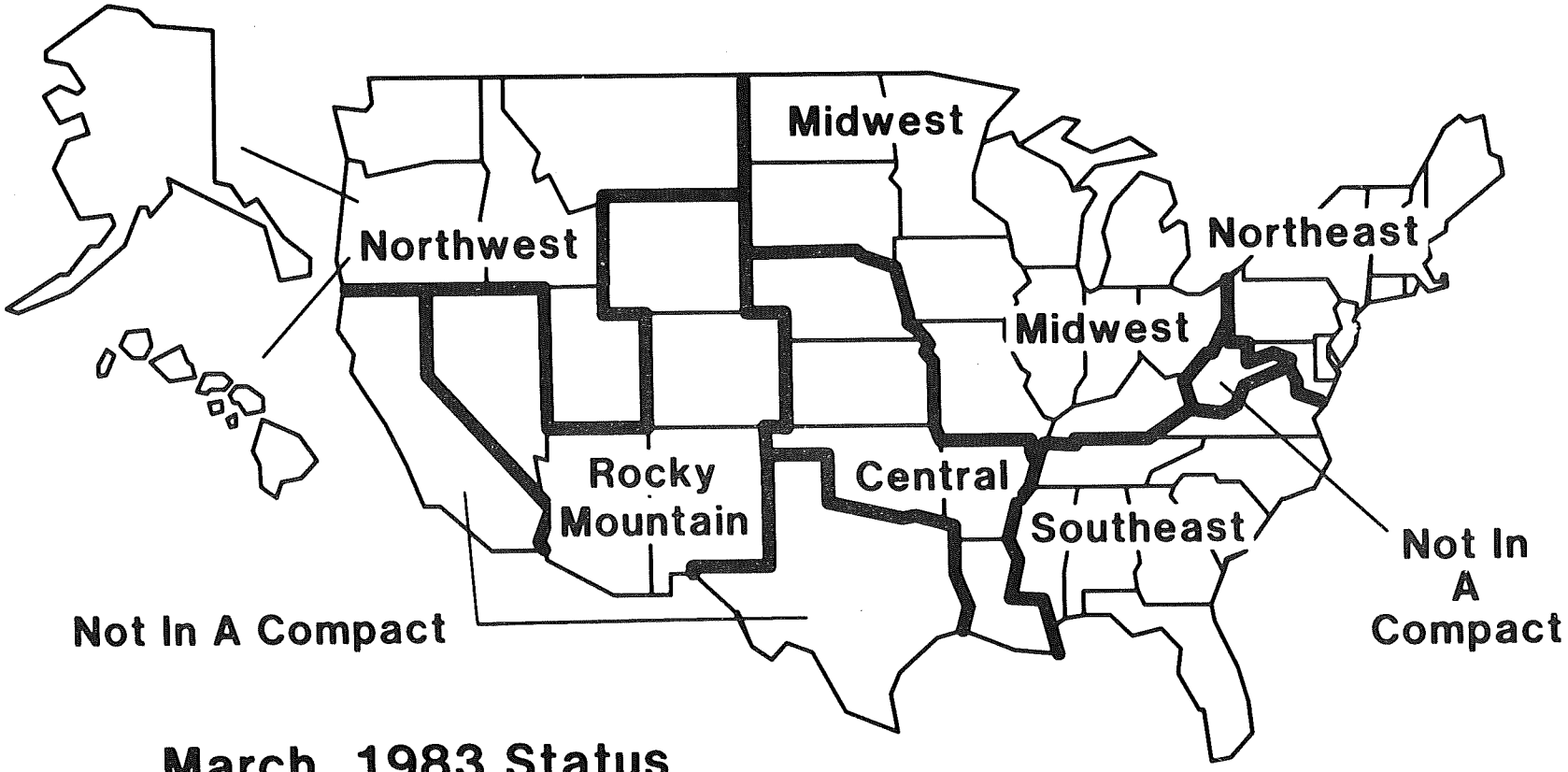
THE NEW LAW STATES . . .

- On January 1, 1986, each state must provide for its own low level waste disposal facility
- Regional compacts are encouraged as an efficient method of establishing central facilities
- Congress must endorse creation of each compact
- After January, 1986, any state can refuse to accept low level waste from states outside the compact

THREE OPTIONS FOR STATES

- Join Large Compact
- Develop a Small Compact and Maintain Control
- Do Nothing and Risk Industrial Interruption

REGIONAL COMPACTS ARE NOW FORMING



March, 1983 Status

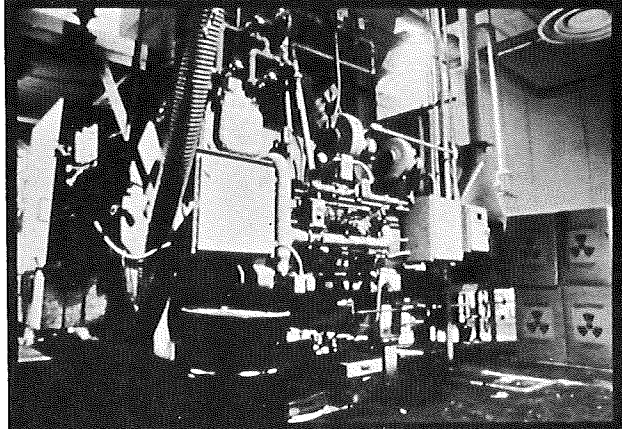
RADIOACTIVE WASTE DISPOSAL IS MORE HIGHLY CONTROLLED THAN HAZARDOUS CHEMICAL WASTE

- No Illicit Disposal
- No Health Hazards Evidenced
- Most Regulated in the World
- Strict New Environmental Standards

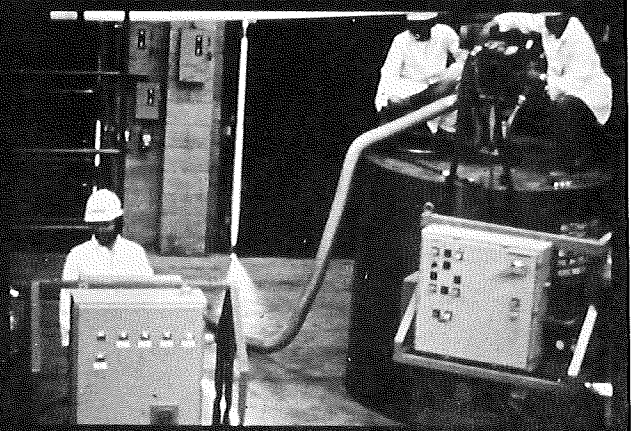
REGULATORY AGENCIES INSURE BROAD SUPERVISION

- Federal Agencies
  - Nuclear Regulatory Commission
  - Department of Energy
  - Department of Transportation
- State Agencies
  - Health Department
  - Transportation Department
  - Natural Resources Department

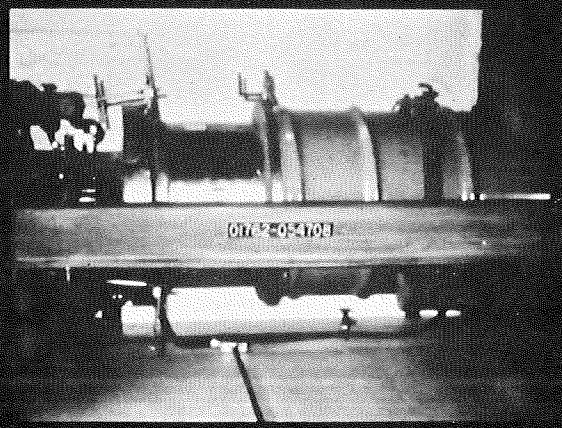
VOLUME REDUCTION TECHNIQUES ARE USED TO TREAT WASTE



Incineration

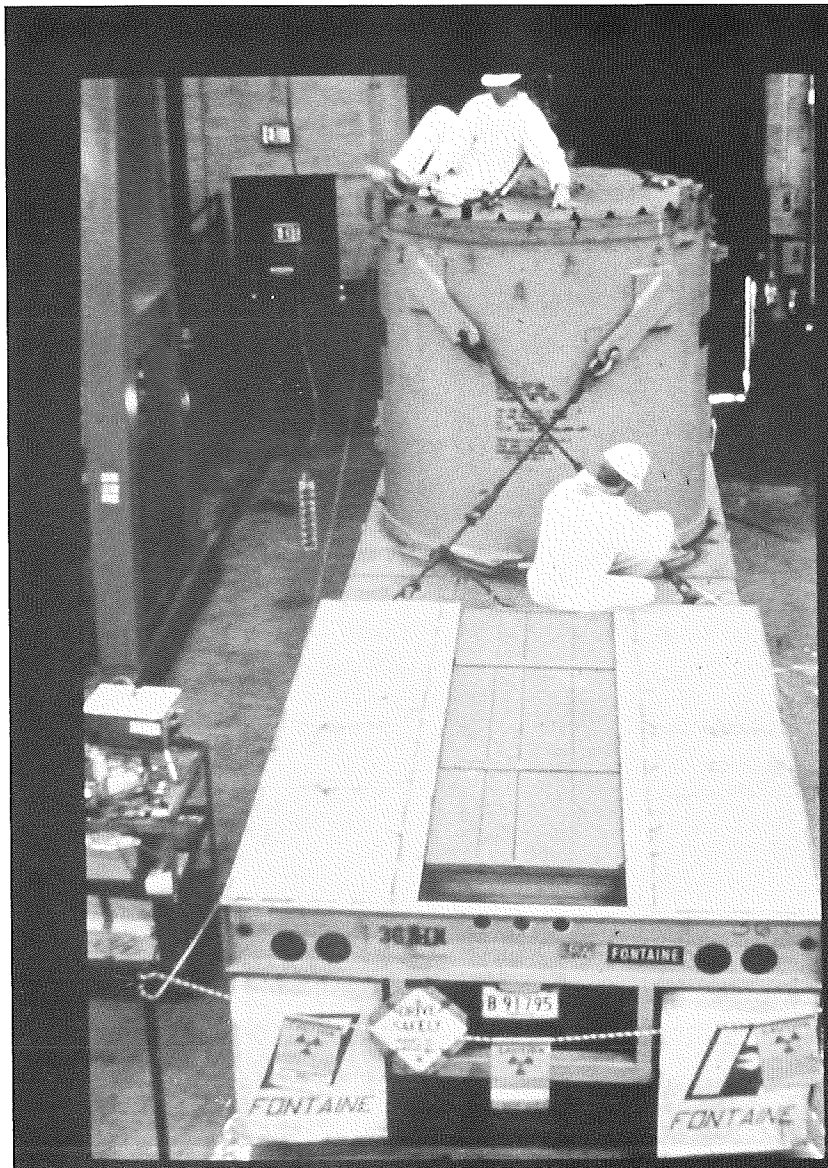


Solidification



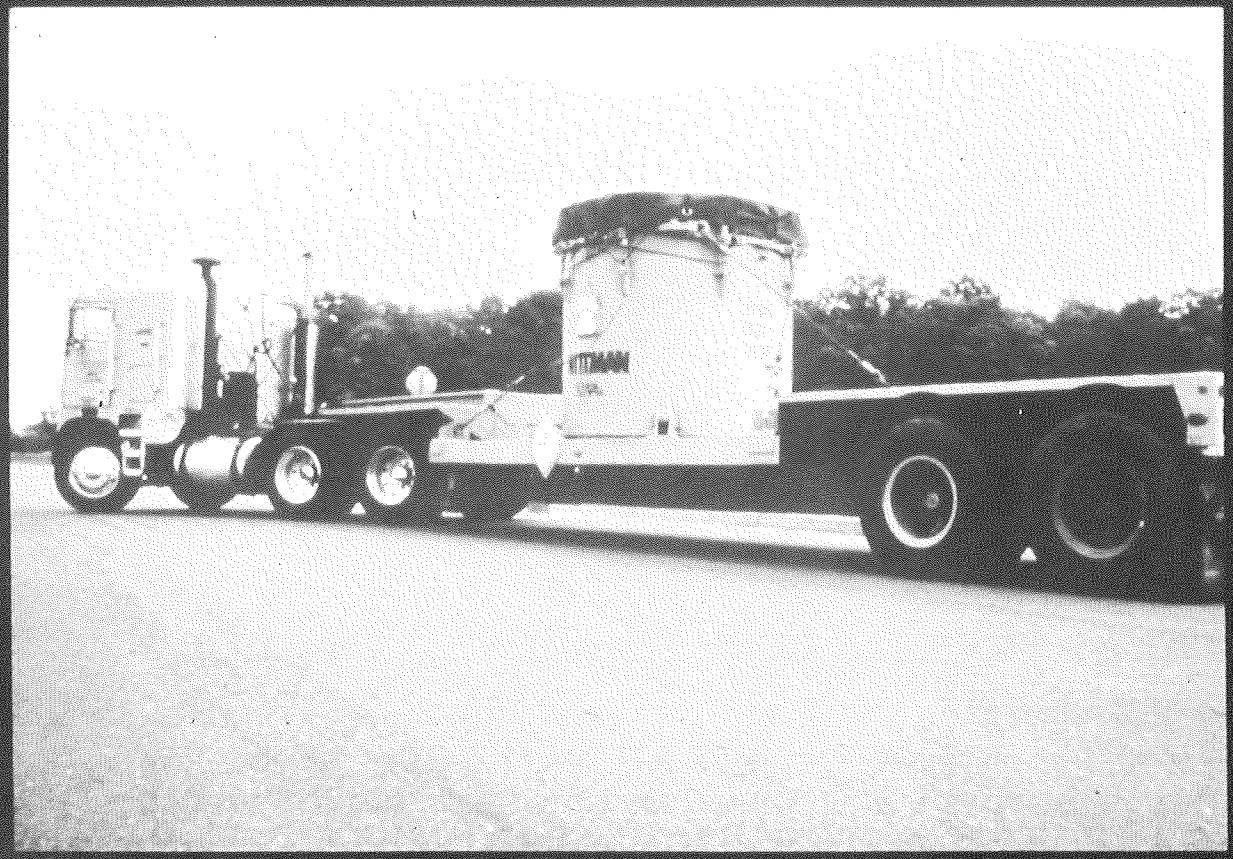
Compaction

LOW LEVEL WASTES ARE PACKAGED IN DRUMS OR SHIELDED CONTAINERS



CONTAINERS ARE PLACED INSIDE SHIELDED SHIPPING CASKS

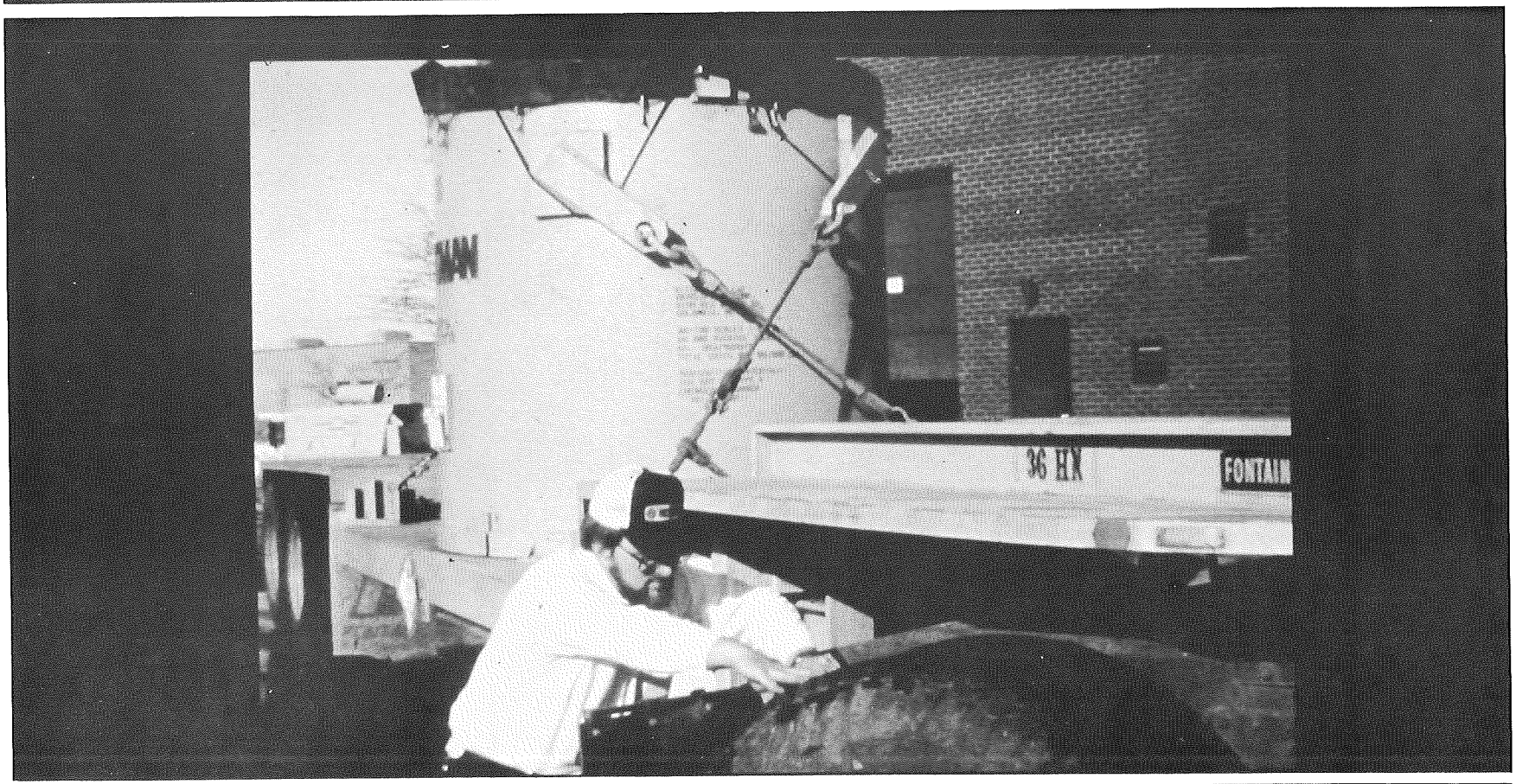
CONTAINERS ARE SHIPPED ACCORDING TO DEPARTMENT OF TRANSPORTATION REGULATIONS



Shielded Shipping Cask

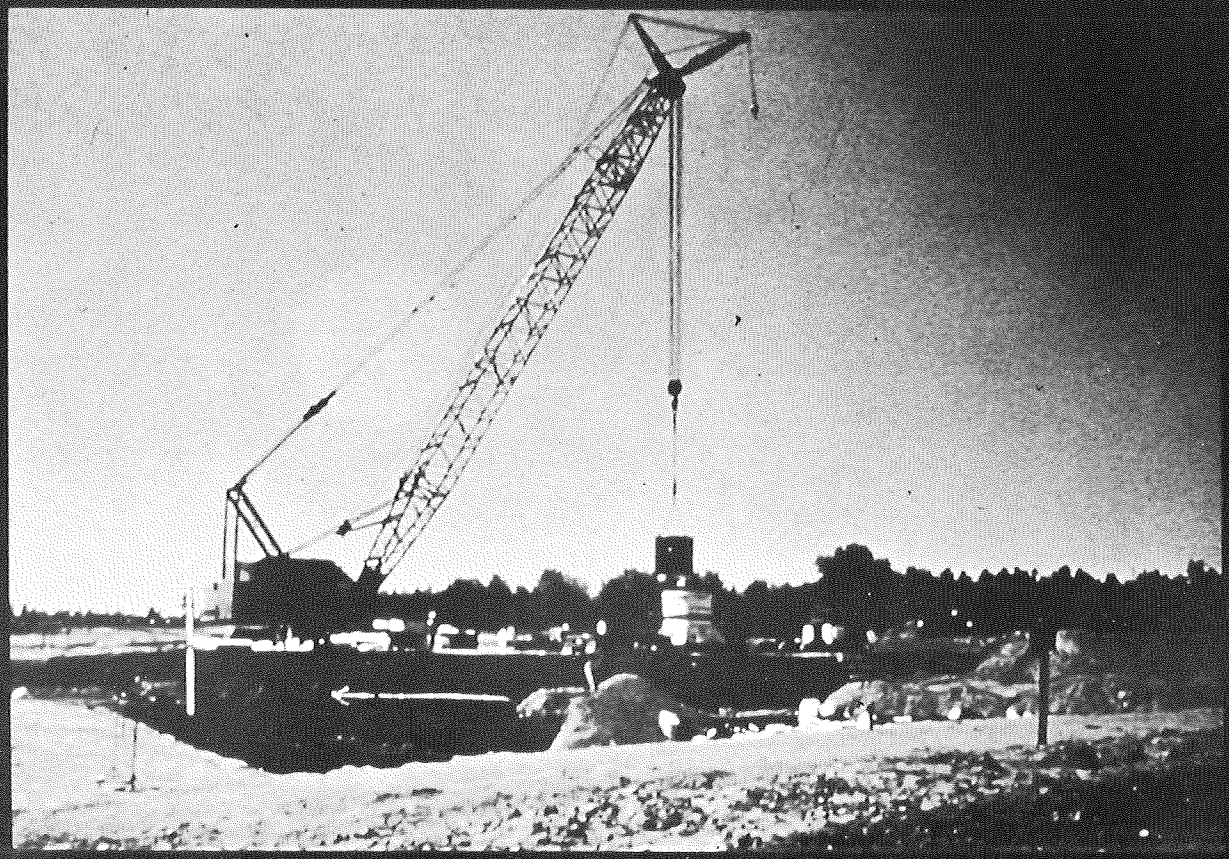
DISPOSAL SITE OPERATION

AT THE DISPOSAL SITE, SHIPMENTS ARE INSPECTED BY THE SITE OPERATOR AND GOVERNMENT AGENTS



Site Inspection of Waste Shipments

WASTE IS SEGREGATED BY CATEGORY AND PLACED INTO TRENCHES



FILLED TRENCHES ARE IMMEDIATELY BACKFILLED WITH AN IMPERMEABLE CLAY CAP

AN IMPERMEABLE CAP OF SOIL AND COMPACTED CLAY IS CONTOURED TO SHED SURFACE WATER

TRENCHES ARE REVEGETATED AND MARKED WITH A PERMANENT MARKER

LABORATORIES MAINTAINED AT EACH SITE MONITOR THE ENVIRONMENT

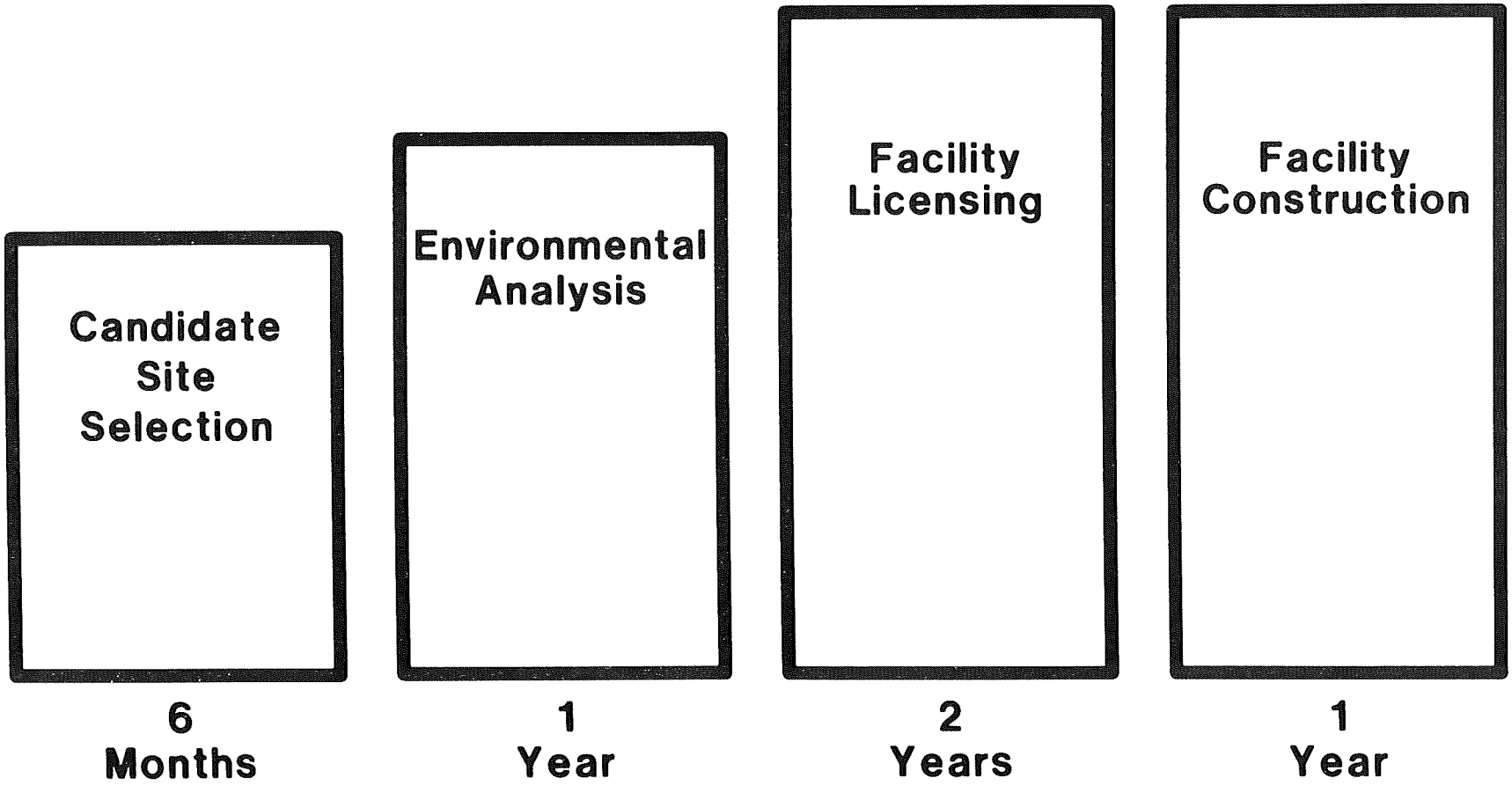
Hittman Nuclear and Development Corporation Laboratory
Maxey Flats, KY

ESTABLISHING NEW SITES

PLANNING FOR REGIONAL DISPOSAL FACILITIES

- Select Candidate Sites
- Perform Environmental Analysis
- License Site and Facility
- Construct New Facilities

THE PROCESS IS TIME CONSUMING



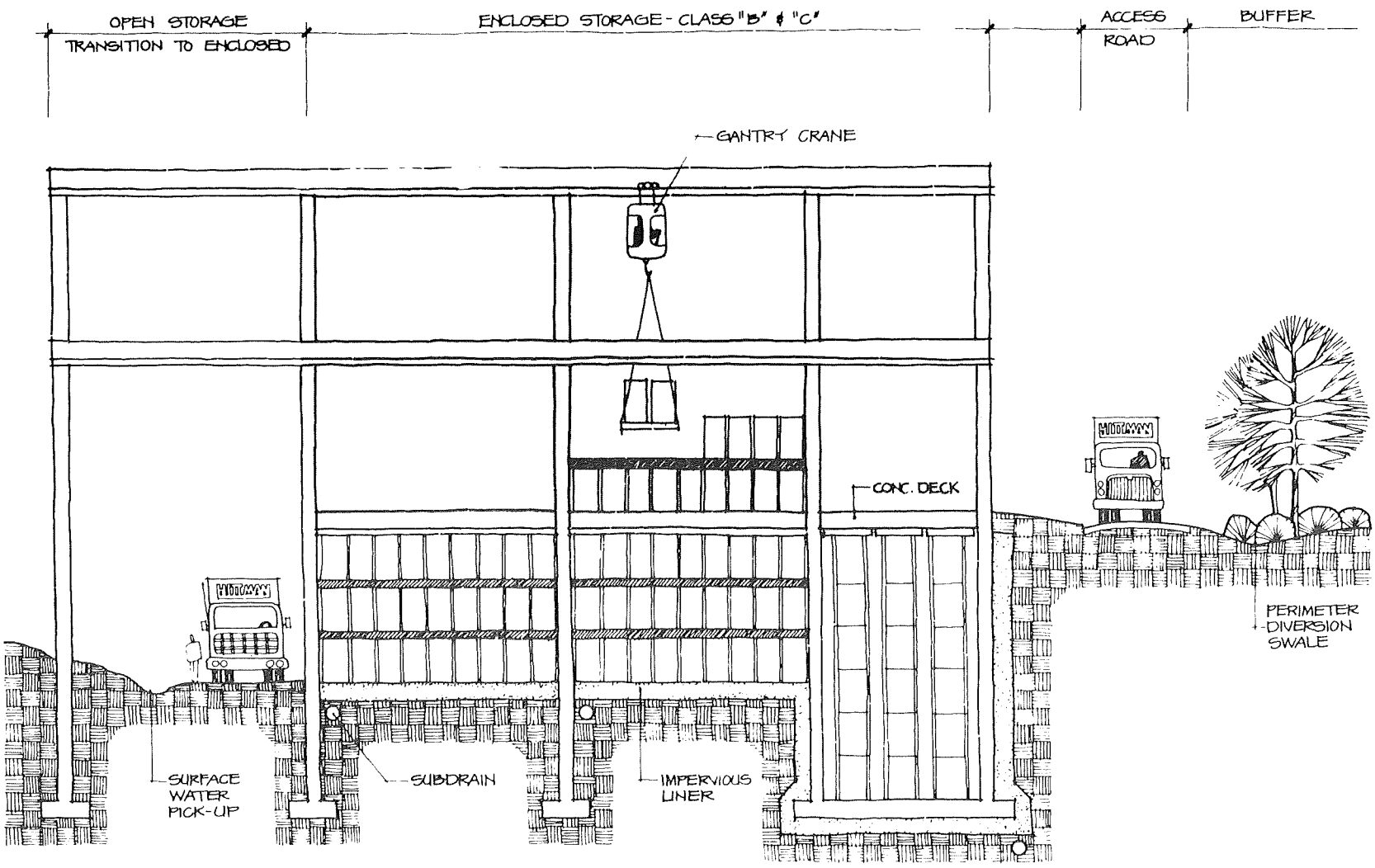
NEW FEDERAL REGULATIONS ADDRESS CONCERNS OF THE PAST

- Additional Environmental Protection
- Segregation of Waste
- Funding for Closure
- Provisions for Perpetual Care

WASTES ARE SEGREGATED ACCORDING TO THE HAZARD THAT EACH REPRESENTS

- Short-Lived Wastes Can Be Placed in Trenches
- Long-Lived Wastes Can Be Placed in Engineered Storage Facilities

THE HITTMAN CONCEPT

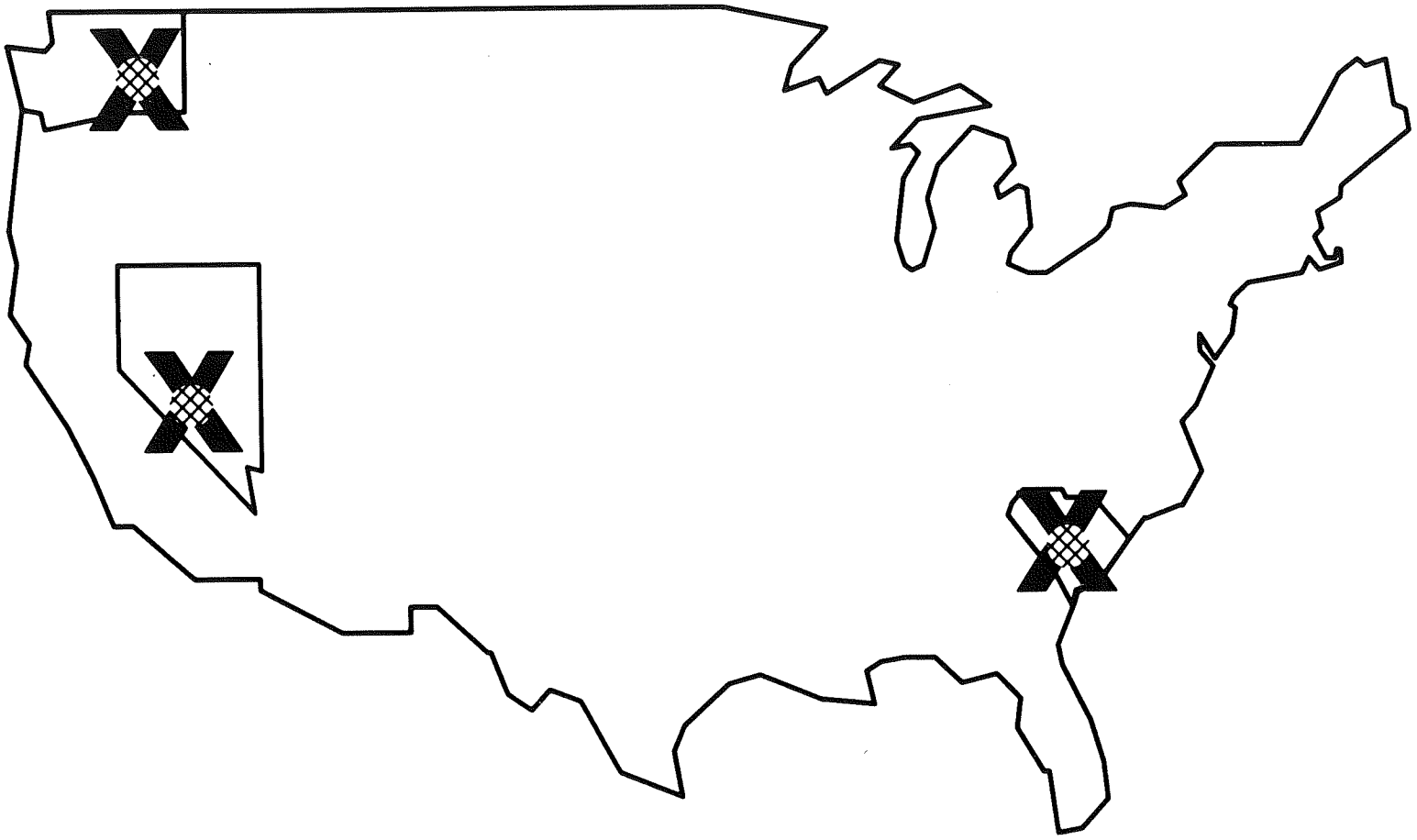


An Engineered Storage Facility That Insures Environmental Protection

ENVIRONMENTAL PROTECTION IS BUILT IN

- Protection of groundwater
- Waste Segregation
- Leachate Collection
- Comprehensive Surveillance System

BY 1986, EXISTING SITES WILL RESTRICT THE LOW LEVEL WASTE VOLUME THEY ACCEPT



FEASIBLE SITES ARE SELECTED BY WORKING WITH STATE AND LOCAL GROUPS

Preferred Sites

- **Must Meet Government Requirements**
- **Must be Government-Owned**
- **Must Develop Environmental Information**
- **Must be Constantly Monitored**
- **Must Have Lifetime Funding**

STATE CONTROL WILL PREVENT TEMPORARY INTERIM STORAGE

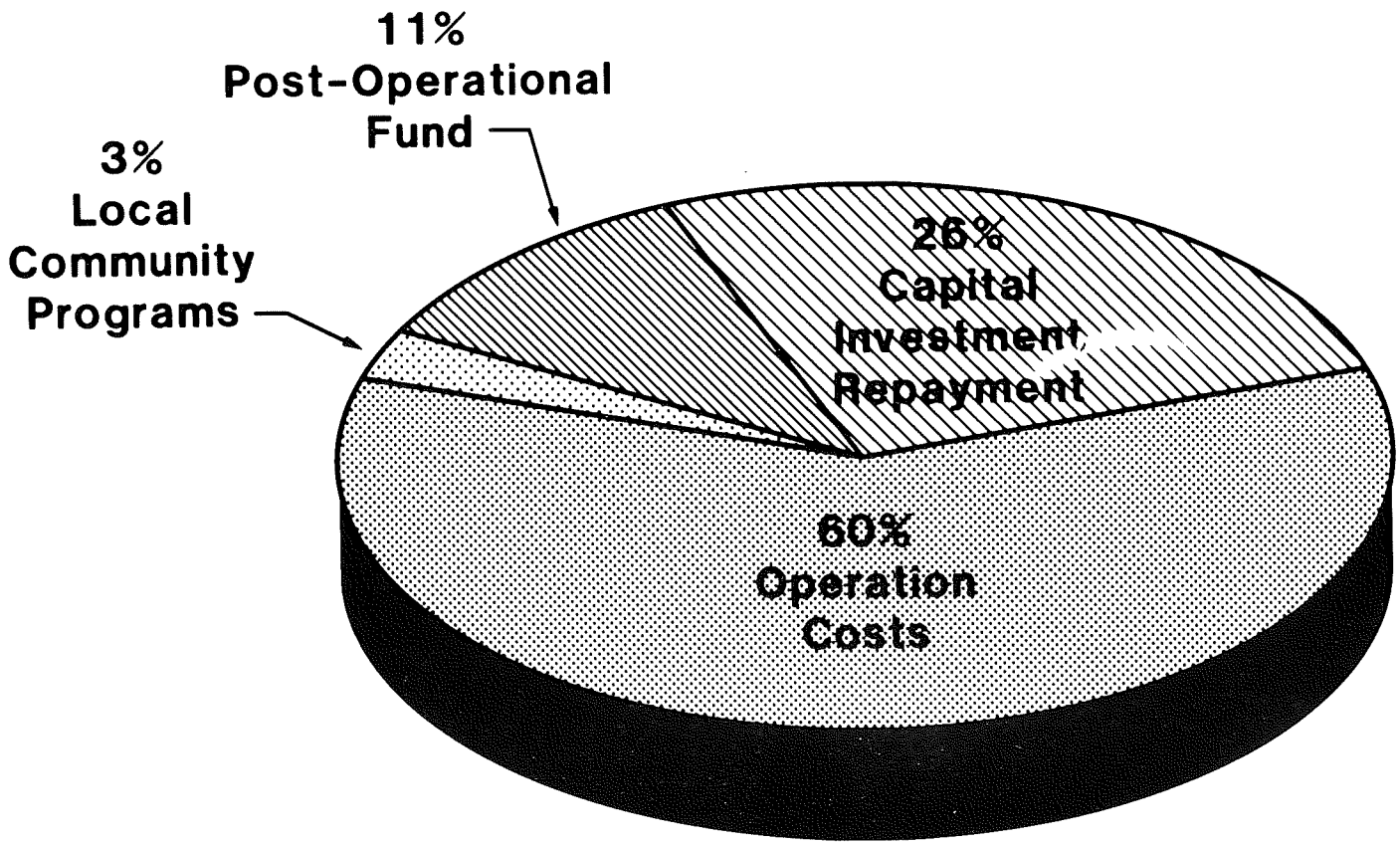
REGULATORY AGENCIES WILL INSURE SELECTION OF A RESPONSIBLE SITE OPERATOR

- Site Operation Experience
- Geotechnical Resources
- Waste Treatment Services
- Project Management Skills
- Long History of Integrity

THE SITE OPERATOR FINANCES DEVELOPMENT COSTS

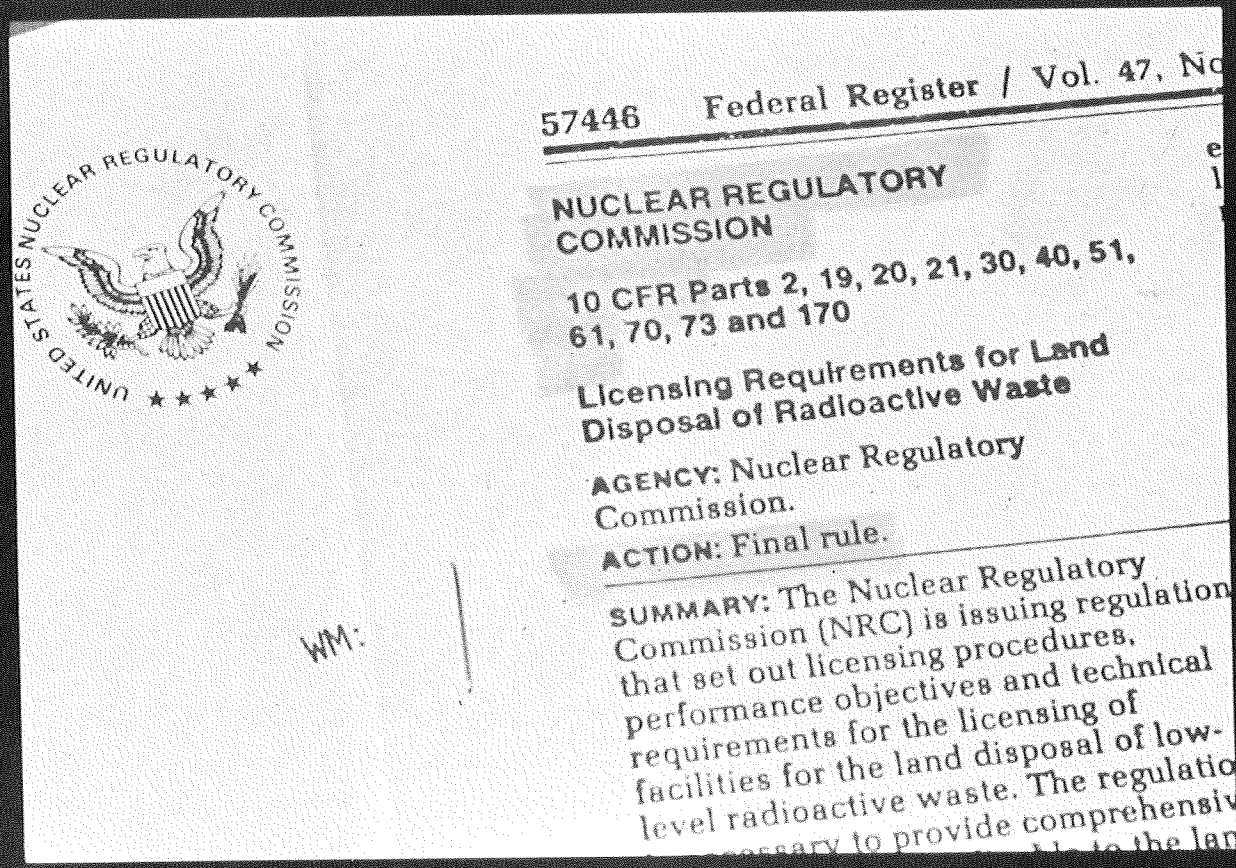
- Preliminary Site Studies
- Licensing
- Legal Fees
- Developmental Construction

COSTS ARE REPAID BY RADWASTE GENERATORS OVER THE 30 YEAR LIFE OF THE SITE



Typical
Disposal
Charge

NEW NRC LOW LEVEL WASTE SITING CRITERIA ASSURE SAFE DISPOSAL



57446 Federal Register / Vol. 47, No

NUCLEAR REGULATORY COMMISSION

10 CFR Parts 2, 19, 20, 21, 30, 40, 51, 61, 70, 73 and 170

Licensing Requirements for Land Disposal of Radioactive Waste

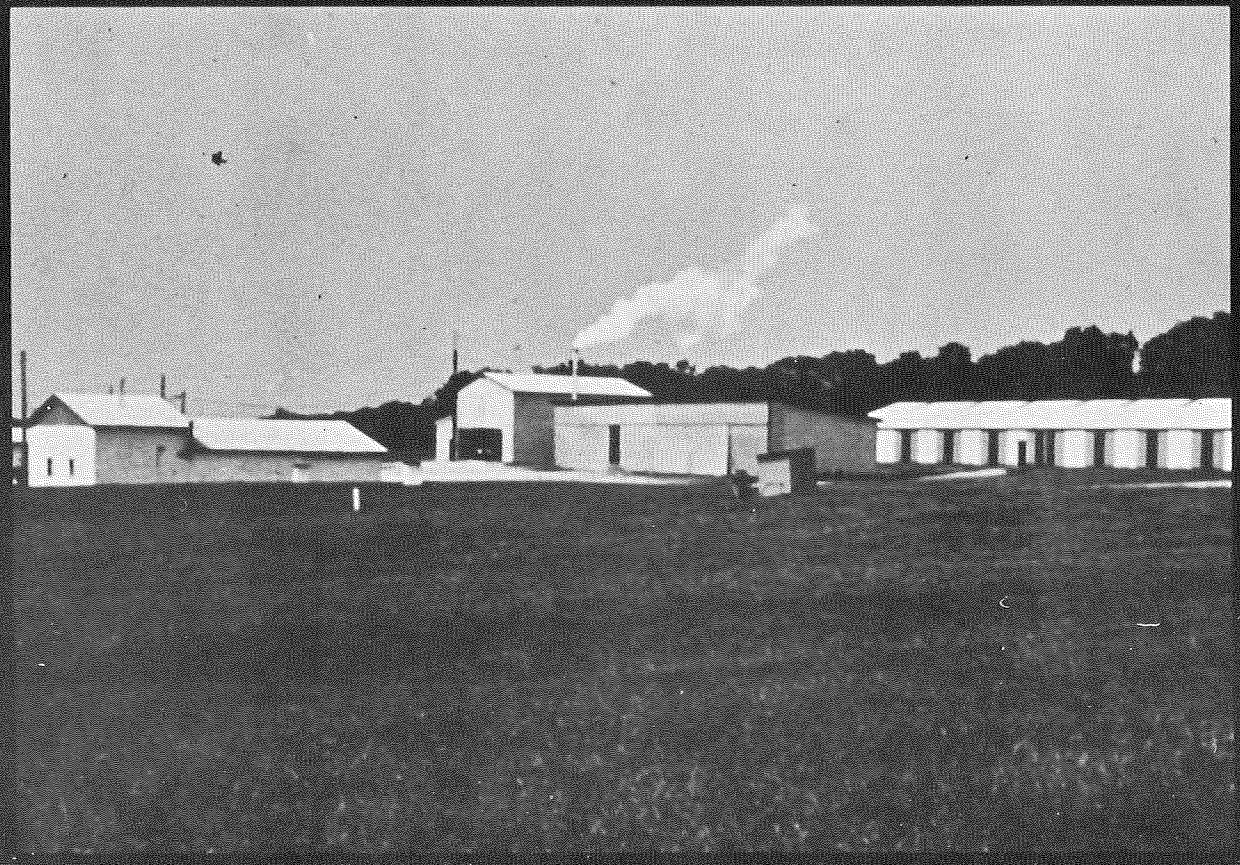
AGENCY: Nuclear Regulatory Commission.

ACTION: Final rule.

SUMMARY: The Nuclear Regulatory Commission (NRC) is issuing regulation that set out licensing procedures, performance objectives and technical requirements for the licensing of facilities for the land disposal of low-level radioactive waste. The regulatio

WM:

INDUSTRY IS ENFORCING PERMANENT SOLUTIONS TO PAST PROBLEMS



Site Surveillance
Maxey Flats, KY

THE RISKS AND THE BENEFITS

LOW LEVEL WASTE SITES ARE NEEDED TO INSURE CONTINUITY OF VITAL HUMAN SERVICES

- Hospitals
- Universities
- Pharmaceuticals
- Utilities

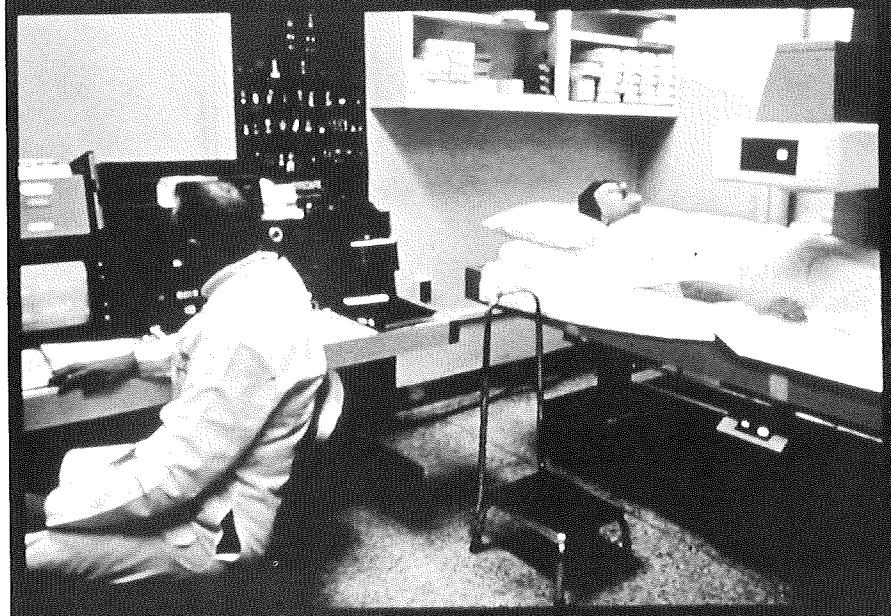
RADIATION'S MANY USES

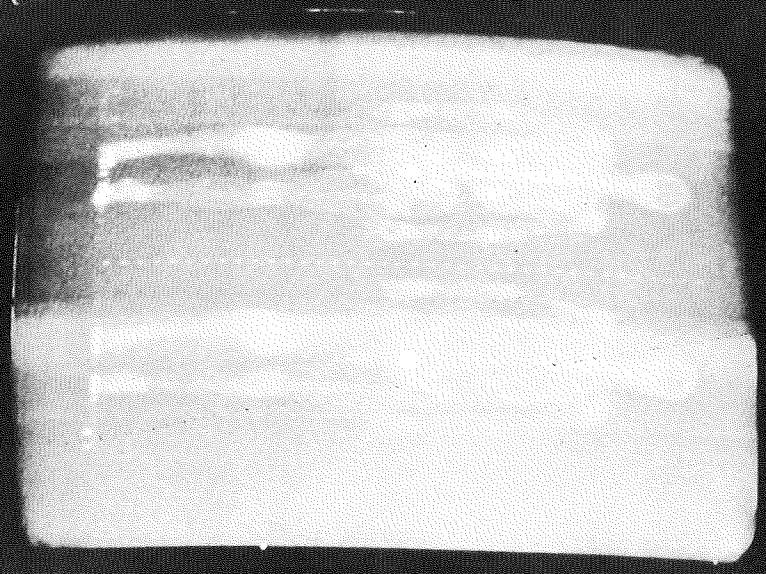
	Application	Benefit
Public Safety		
Radiography	Jet Engine Strength & Reliability	Reduced Accident Rate
Public Health		
Radioactive Pharmaceuticals & Radiation	Diagnosis	Fewer Exploratory Surgeries
Cobalt Treatment	Cancer Therapy	Treatment for One-Half of all Cancer Patients
Nuclear-Powered Pacemakers	Heart Disease Treatment	Powers Heart 10 Years or More Eliminates 8 Operations for Battery Replacement
Radiation	Agricultural Research	Erradication of Plant Diseases

AGRICULTURAL RESEARCH ➡ DISEASE PREVENTION

RADIOACTIVE PHARMACEUTICALS

ACCURATE DIAGNOSIS AND REDUCED EXPLORATORY SURGERY

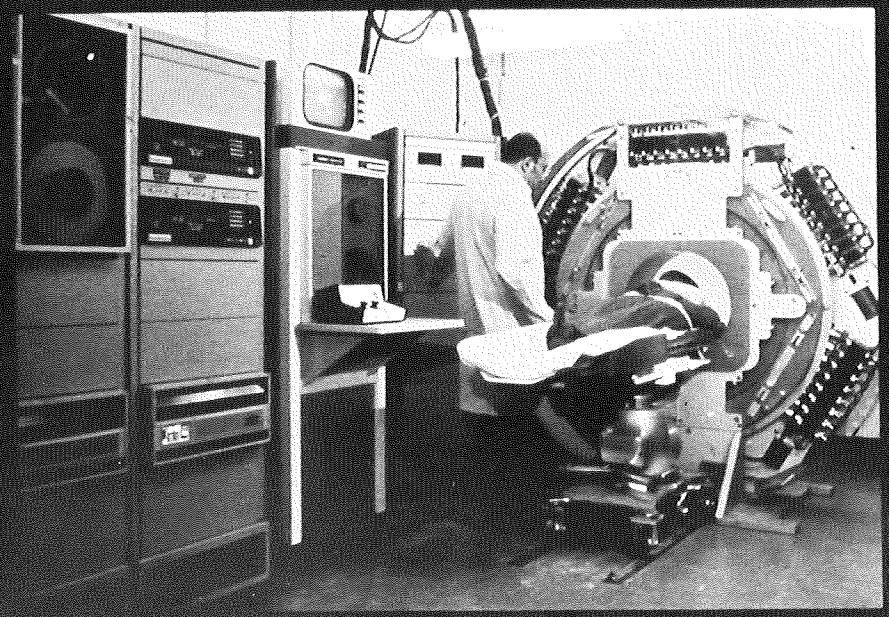


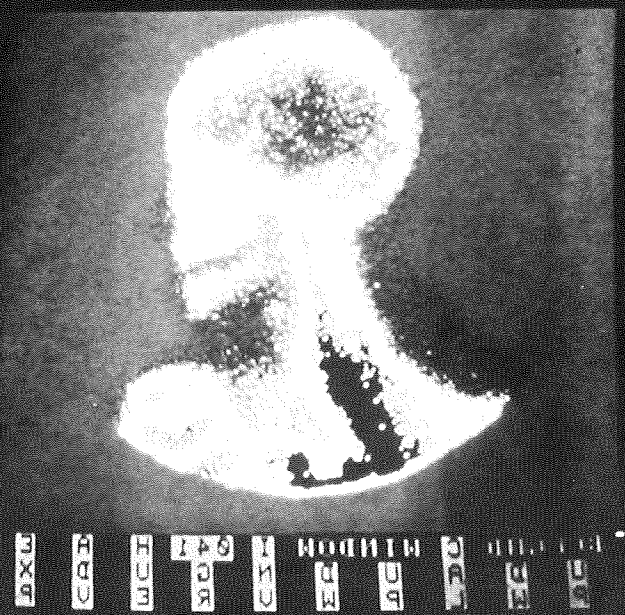


CAT Scans

NUCLEAR MEDICINE TREATMENT

CRUCIAL THERAPY FOR 1/2 OF ALL CANCER PATIENTS





THE RISKS WE TAKE

Activity	Shortened Life Span (in minutes)
Drinking a Diet Soft Drink	0.15
Crossing the Street	0.4
Being Exposed to 1 Millirem of Radiation	1.5
Smoking a Cigarette	10
Eating a Calorie-Rich Dessert	50
Driving Coast to Coast	1000
Skipping Annual Pap Test	6000
Choosing Vietnam Army Duty	600,000

Source: B. Cohen and I. Lee, "A Catalog of Risks", Health Physics 36 (1979): 707-22

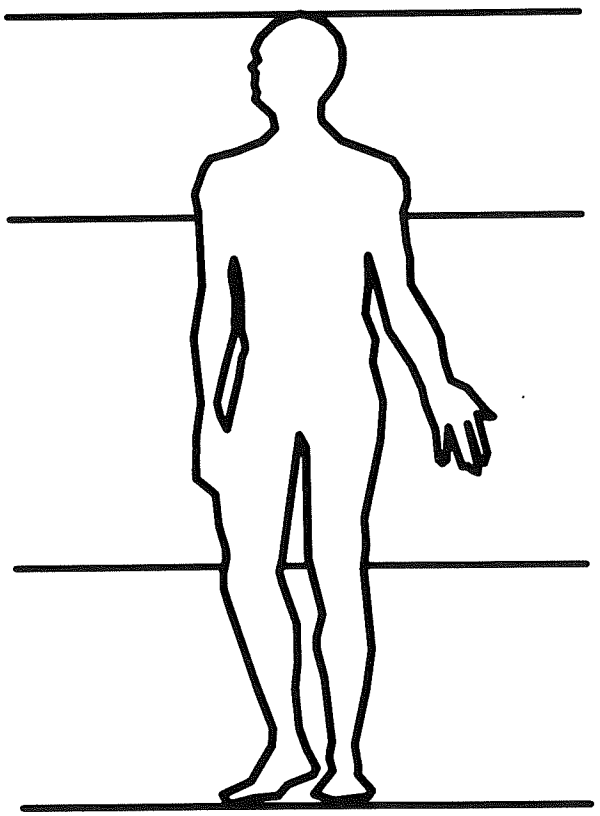
AVERAGE ANNUAL WHOLE BODY RADIATION DOSE IN THE U.S.

Natural Sources - 85 Millirem

- **Cosmic Rays**
- **Decay Products of Natural Uranium**

Medical - 70 Millirem

Occupational - 8 Millirem
Fallout - 3 Millirem
Misc. - 2 Millirem
Nuclear Power - .01 Millirem



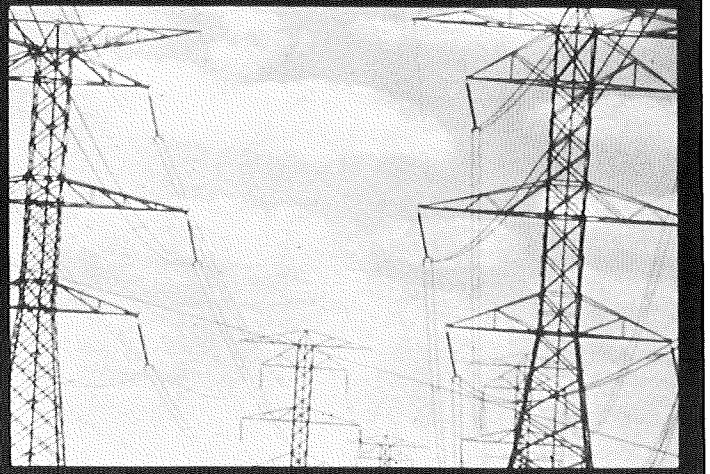
RADIATION EXPOSURE AT LOW LEVEL WASTE SITES

Offsite Radiation Limit - 5 Millirem

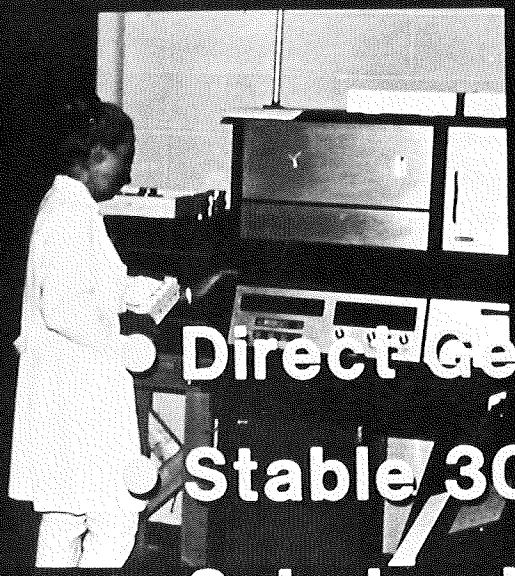
Compared To . . .	**Dental X-Ray**	**- 30-70 Millirem**
	Medical X-Ray	**- 75-200 Millirem**
	Upper GI Series	**- 535 Millirem**

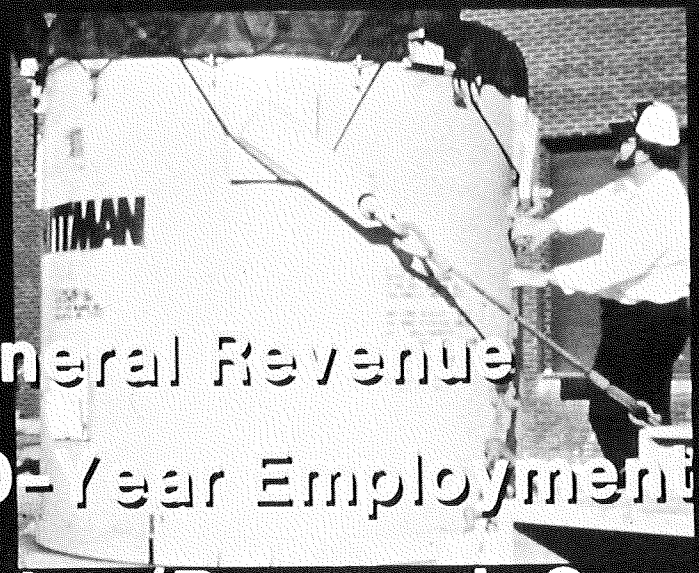
The problem faces us now, solutions must be initiated

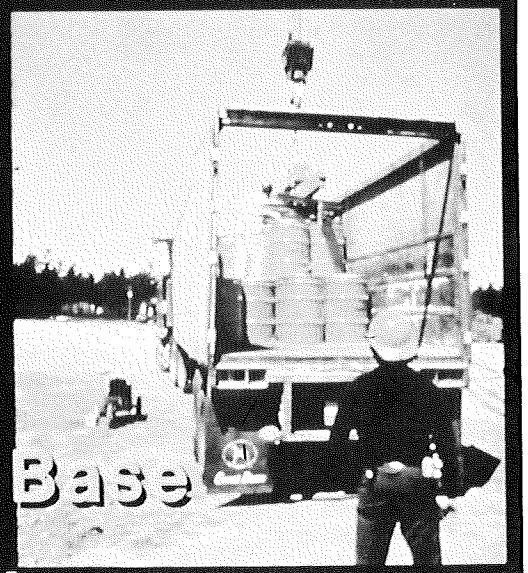
We Risk Disruption of Vital Human Services



LOCAL COMMUNITIES BENEFIT FROM A SITE







- Direct General Revenue
- Stable 30-Year Employment Base
- Scholarships/Research Grants
- Employment Training Center

TECHNOLOGY EXISTS TO SAFELY STORE WASTES . . .

EFFECTIVE LEADERSHIP IS NEEDED NOW

WESTINGHOUSE
WASTE TECHNOLOGY SERVICES
DIVISION
P.O. BOX 10864
PITTSBURGH, PENNSYLVANIA 15236
(412) 892-5600