File 118
fm CRussell

AGENDA

SECOND HIGH-LEVEL WASTE TASK FORCE MEETING

AUGUST 28, 1985

HEALTH AND WELFARE AUDITORIUM, CONCORD

1. INTRODUCTORY REMARKS - ALDEN H. HOWARD, TASK FORCE CHAIRMAN

2. OUTLINE GROUND RULES - ALDEN H. HOWARD

3. PRESENTATION BY DEPARTMENT OF ENERGY

   PAUL KEARNS, SITE EVALUATIONS BRANCH CHIEF
   HUNTER WEILER, NORTHEASTERN REGIONAL MANAGER
   SCOTT HIRSCHBERGER, STAFF GEOLOGIST

4. PRESENTATION BY ENVIRONMENTAL PROTECTION AGENCY

   SHELDON MYERS, DIRECTOR, OFFICE OF RADIATION PROGRAMS

5. PRESENTATION BY NUCLEAR REGULATORY COMMISSION

   JOSEPH BUNTING, CHIEF OF POLICY AND PROGRAM CONTROL BRANCH, DIVISION OF WASTE MANAGEMENT
   CATHY RUSSELL, PROJECT MANAGER FOR STATE AND TRIBAL ACTIVITIES
   PAUL LOHAUS, REGION ONE STATE LIAISON OFFICER

6. QUESTIONS FROM AUDIENCE

7. ADJOURNMENT

August 28, 1985 Meeting of the New Hampshire Governor's
High-Level Waste Task Force
-- DOE Participants

The Crystalline Repository Project is managed by DOE's Crystalline Repository Project Office, which is located in DOE's Chicago, Illinois Office.

The following is brief background information on the DOE participants in the August 28, 1985 meeting of the Governor's High-Level Waste Task Force in Concord, New Hampshire.

Dr. Paul K. Kearns

Dr. Kearns is Chief of the Crystalline Repository Project Office's Siting Evaluation Branch. In this capacity he is responsible for leading the project's technical siting evaluation activities. He has a Ph.D. in Bionucleonics from Purdue University. He also received an M.S. in Environmental Health and a B.S. in Natural Resources from Purdue.

Hunter Weiler

Mr. Weiler is the Siting Evaluation Branch's Northeastern Regional Manager and is responsible for day to day liaison with the northeastern states under consideration in the Crystalline Repository Project. He holds a B.A. in Geography from the University of Colorado. He has extensive experience in the siting area with two different state agencies and experience with the U.S. Department of Interior in Land Use and Environmental Planning.

Scott Hinschberger

Mr. Hinschberger is coordinator of Area Phase Activities and Engineering Geologist for the Crystalline Repository Project. He holds a B.A. in Geology from California State University at Fullerton. Further, he has extensive siting experience and has done research on groundwater flow in fractured rock at the Idaho National Engineering Laboratory.

U. S. DEPARTMENT OF ENERGY
CHICAGO OPERATIONS OFFICE
9800 SOUTH CASS AVENUE
ARGONNE, ILLINOIS 60439

DOENEWS:

FOR IMMEDIATE RELEASE
August 20, 1985

Note to Editors: Briefing on high-level nuclear waste activities

The U.S. Department of Energy will conduct a media availability session to discuss its high-level nuclear waste activities in New Hampshire. The session will be August 28 from 11 a.m. to noon in Room 204 of the Legislative Office Building.

Representatives from DOE's Crystalline Repository Project Office (CPO) have been invited to brief the Governor's High-Level Waste Task Force. The Task Force meeting is scheduled for 1:30 p.m. Wednesday in the auditorium of the Health and Welfare building.

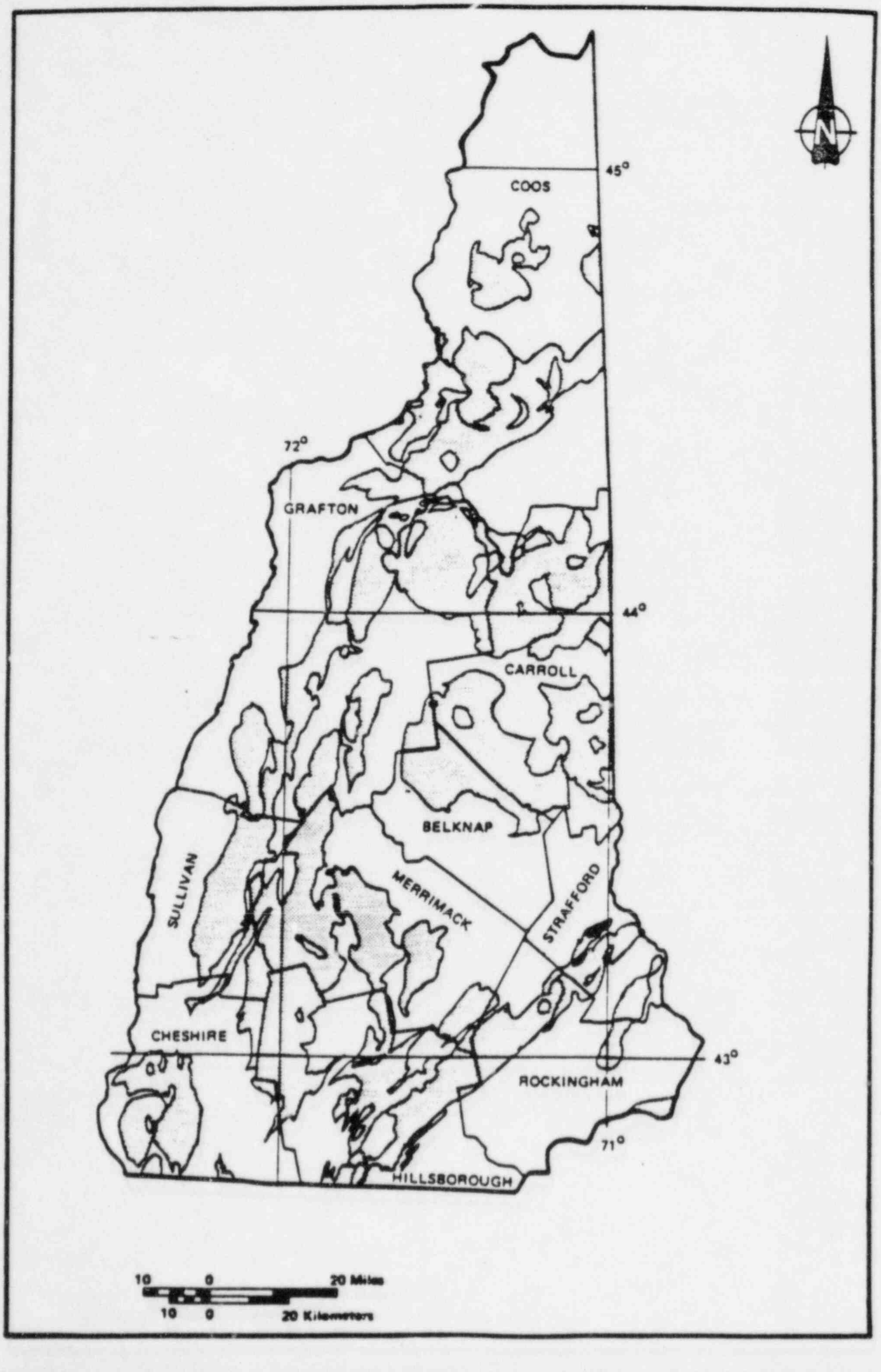
The session is planned to give media representatives a short background on DOE activities and to answer media questions. Video and audio taping are welcome.

Representing DOE will be Dr. Paul Kearns, CPO siting chief; Hunter Weiler, Northeast regional manager; and Scott Hinschberger, geologist. Contact DOE Public Affairs Office Brian Quirke at the meeting if you have any specific requirements.

--DOE--

DOE News Media Contact--Brian J. Quirke--(312) 972-2423

CRYSTALLINE ROCK BODIES OF NEW HAMPSHIRE



U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Crystalline Repository Project Office

New Hampshire Public Meeting Sponsored by the New Hampshire High-Level Waste Task Force

Concord, New Hampshire
August 28, 1985

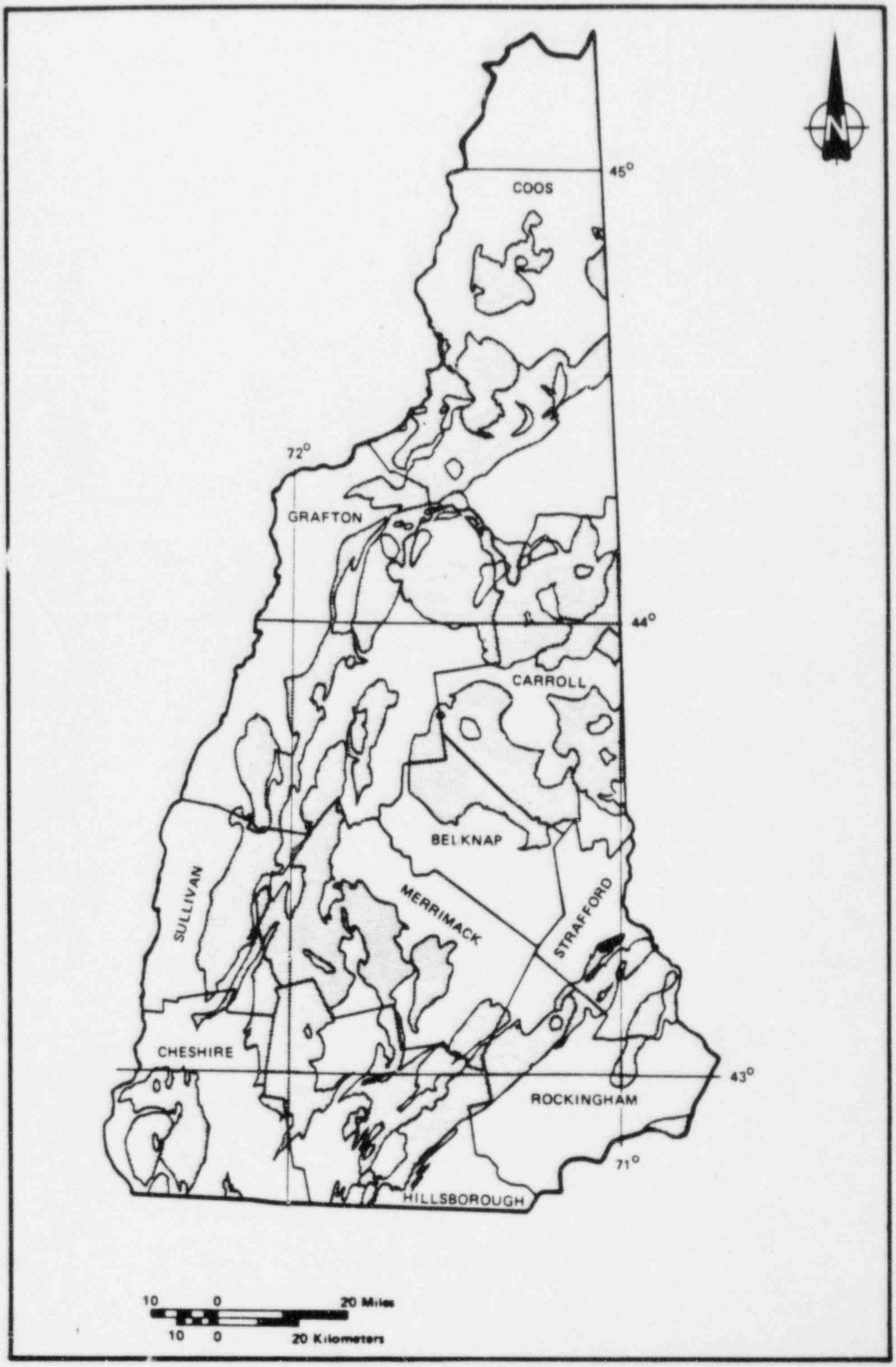
CRYSTALLINE
REPOSITORY PROJECT

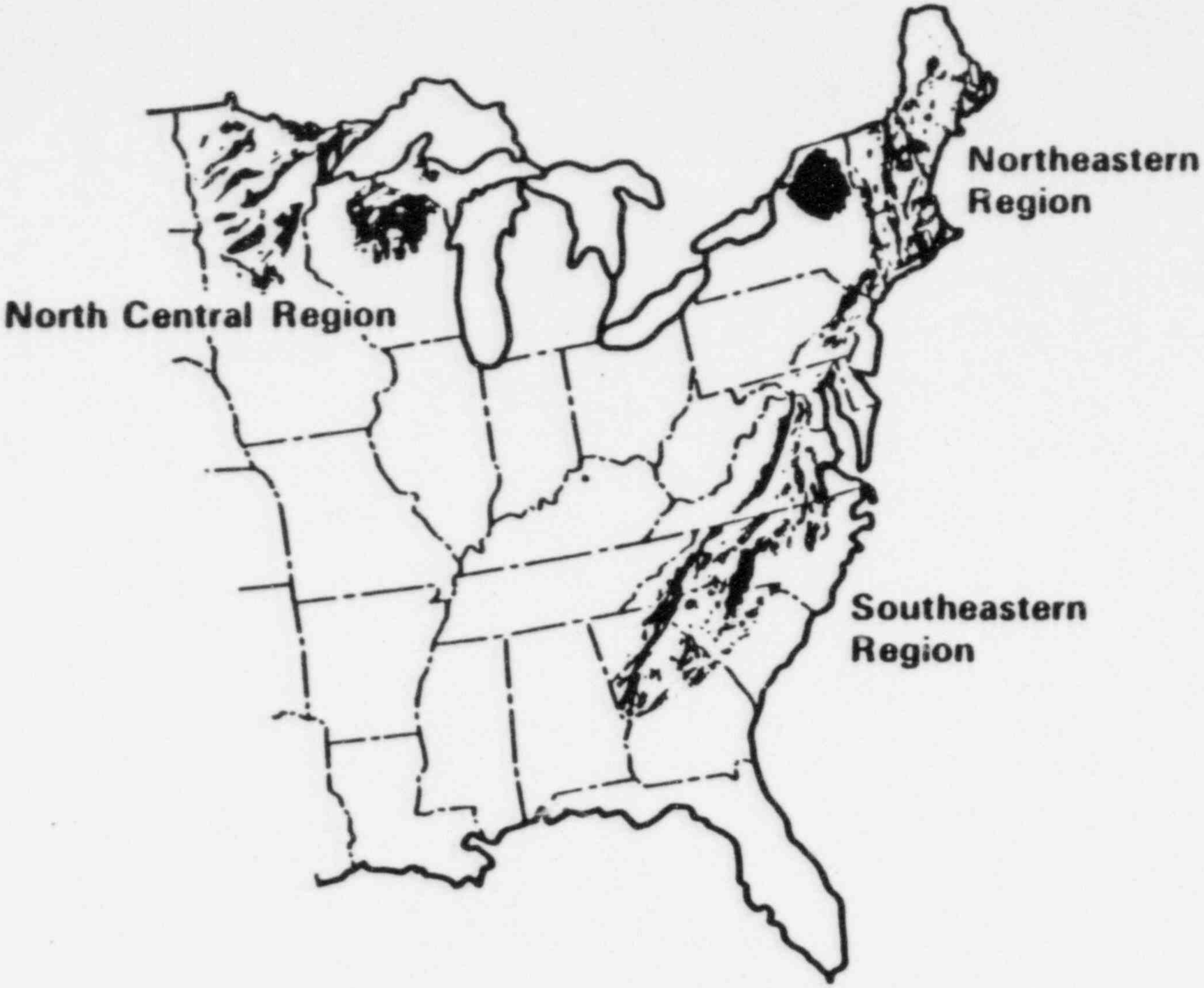
Briefing

Purpose

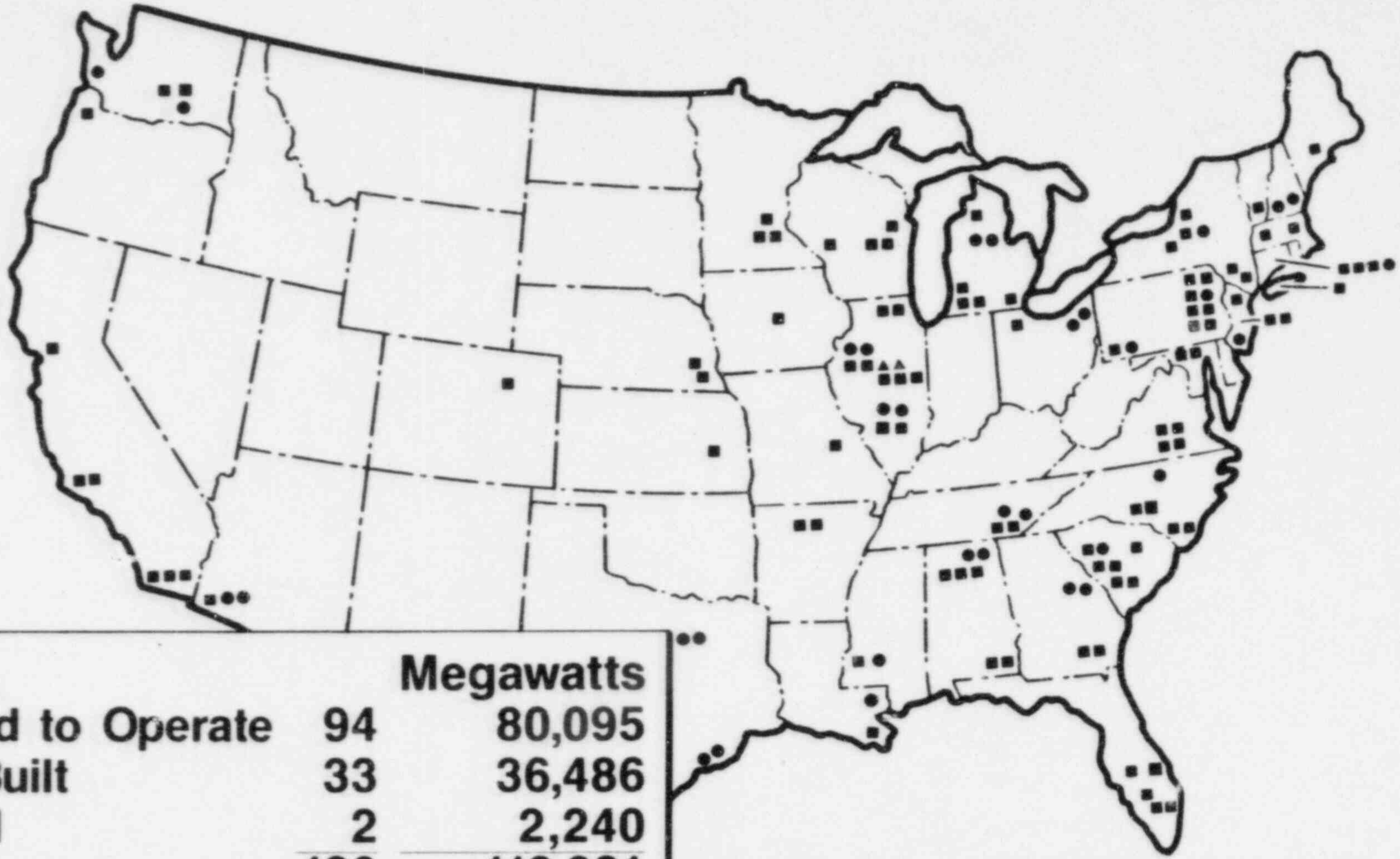
- Provide Information on:
  - The DOE Civilian Radioactive Waste Management Program, in general, and
  - The Crystalline Repository Project, in particular.
- Gain an understanding of local concerns.

CRYSTALLINE ROCK BODIES OF NEW HAMPSHIRE





Crystalline Rock Regions Being Considered for Second Repository



		Megawatts
■ Licensed to Operate	94	80,095
● Being Built	33	36,486
▲ Planned	2	2,240
	129	118,821

Because of space limitations, symbols do not reflect precise locations.

7/1/85

Nuclear Electrical Generating Capacity

Disposal Options Considered

- Antarctic Ice Sheet
- Continued Temporary Storage
- Geologic
- Space
- Subseabed
- Transmutation

Authorizing Legislation

Nuclear Waste Policy Act of 1982

- Approved by Congress 12/21/82
- Signed by President 1/7/83

Purposes

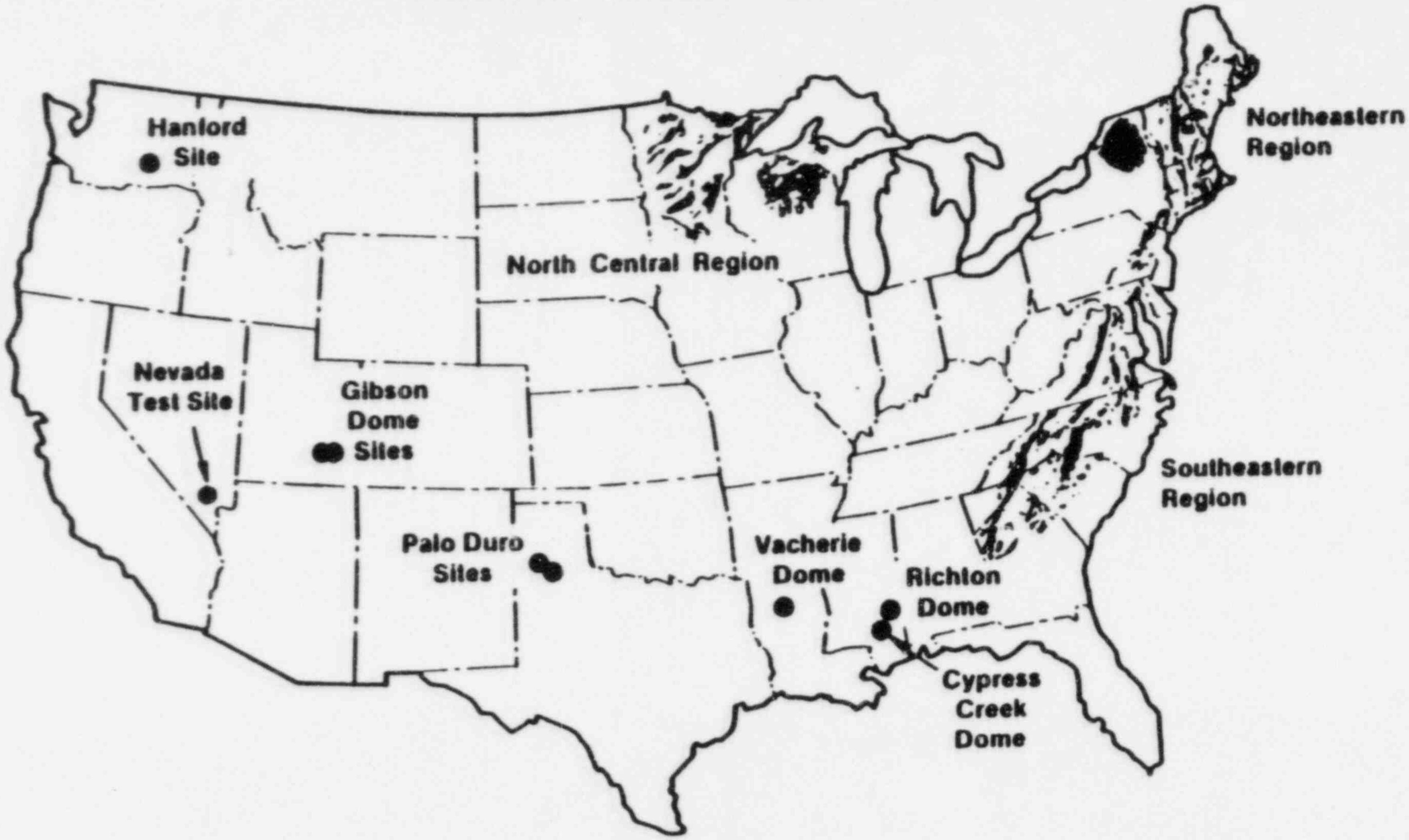
- Establish schedule for siting, construction, operation of repositories; first repository operational in 1998
- Establish federal responsibility and policy for nuclear waste management
- Define relationship between federal government and state goverments—provides for state objection to site selection
- Establish fund to cover disposal costs.

DOE's National Program

Develop an integrated system for permanent disposal of high-level nuclear waste, complying with EPA standards and NRC licensing criteria

- Site, construct, and operate the first mined geologic repository
- Conduct site selection process for second geologic repository
- Prepare a proposal for handling, packaging, and temporary surface storage facility (monitored retrievable storage facility)

Places Being Investigated for High-Level Nuclear Waste Repositories



Geologic Repository Overview

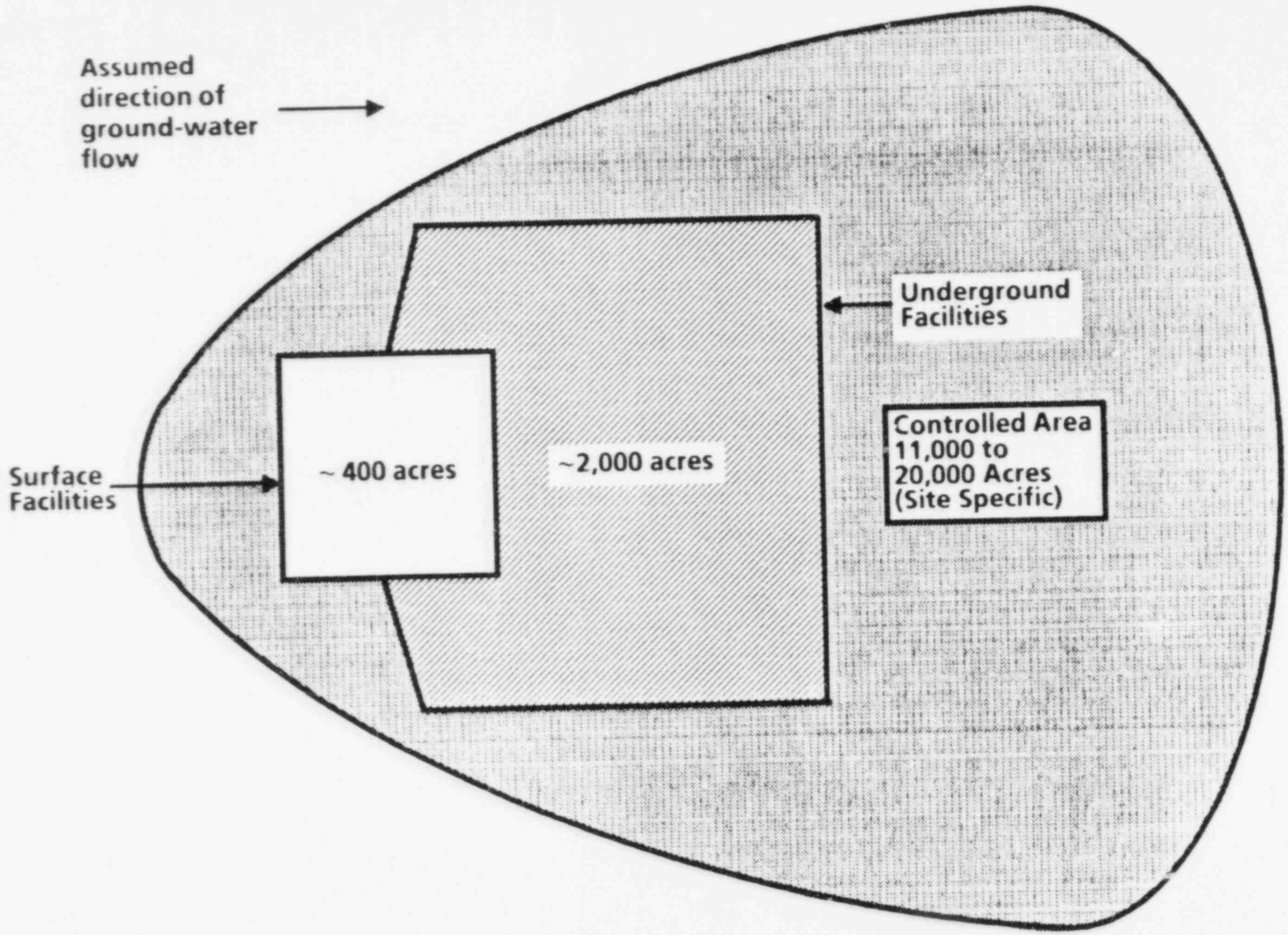
- Waste is emplaced in mined vaults 1,500 to 3,000 feet below the surface

- Surface facilities will comprise about 400 acres; waste will arrive in solid form and be lowered into the mined vault by remote handling

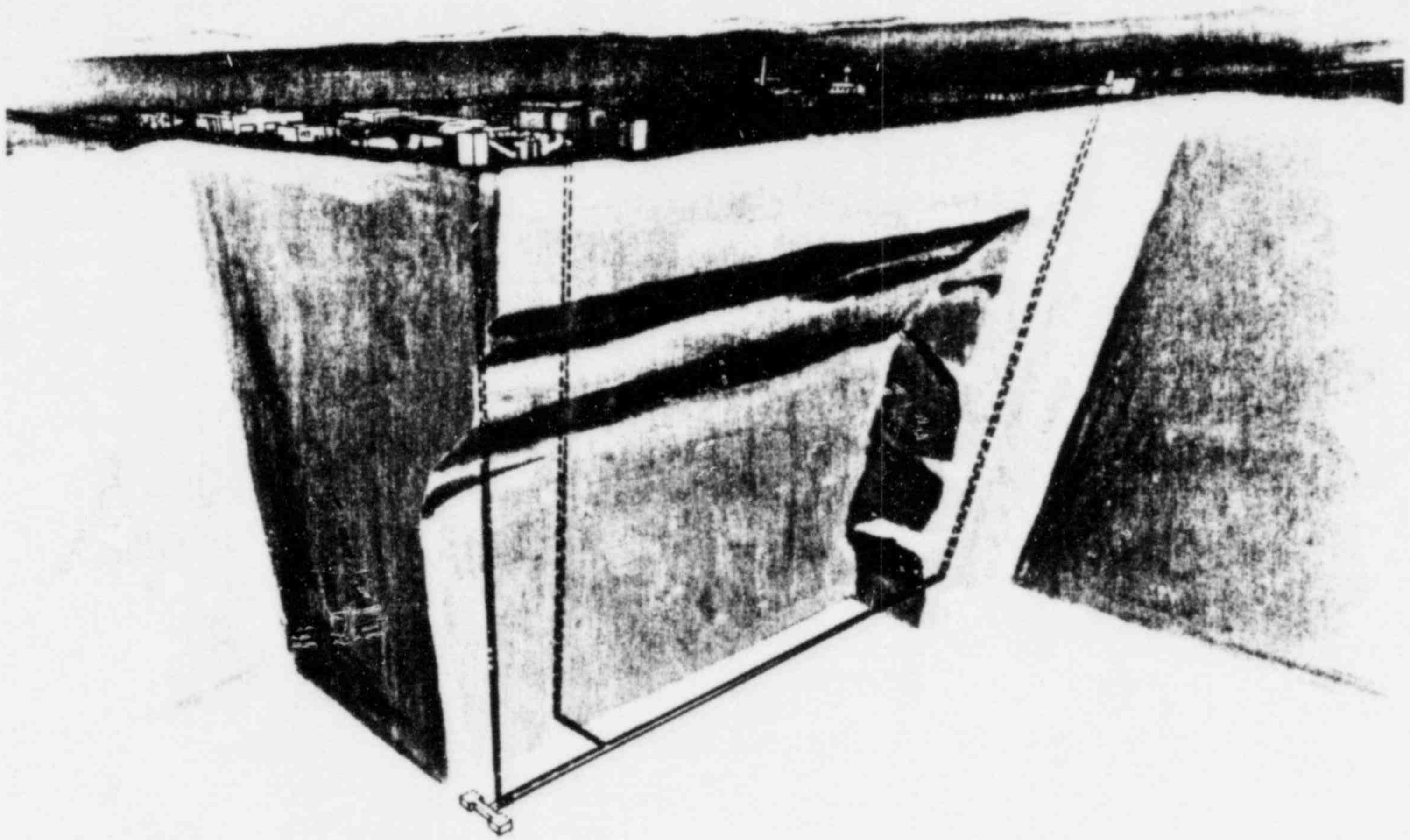
- Underground workings will be about 2,000 acres and have a capacity of 70,000 metric tons

Geologic Repository Overview (Continued)

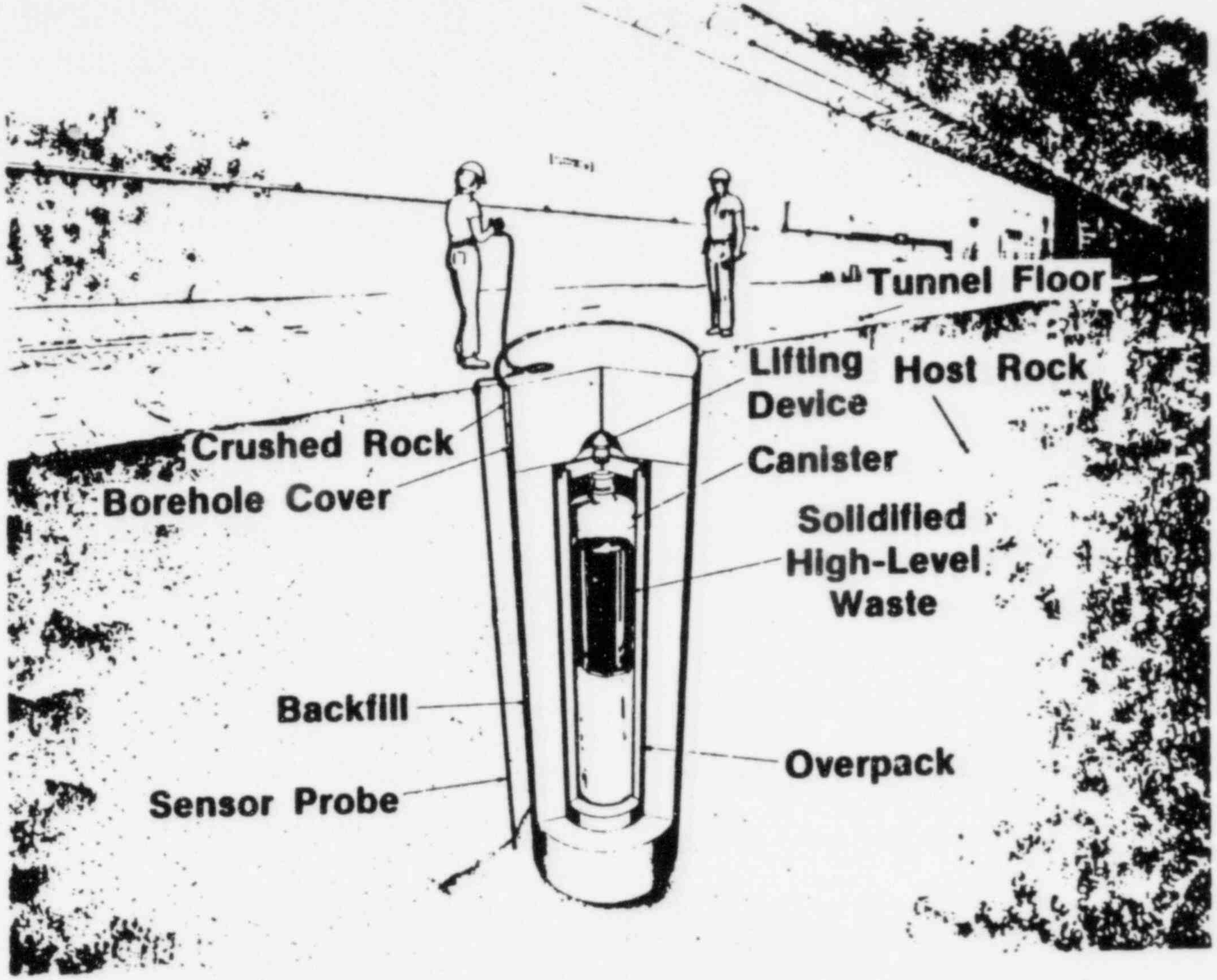
- Control Zone will be 10,000–20,000 acres
- Waste emplaced may include spent nuclear fuel, reprocessed waste, high-level defense waste
- Repository will be regulated by the U.S. Environmental Protection Agency and licensed by the Nuclear Regulatory Commission
- Same concept of high-level radioactive waste disposal being utilized in other countries
- Concept provides multiple barriers, both engineering and geologic, to isolate the waste



Size of Repository Facilities



Artist's Concept of a Geologic Repository



Conceptual Design of Waste Package

Why Crystalline Rock?

- Crystalline rock formations:
  - — Are abundant; many are large homogenous bodies
  - — Are strong, even when subjected to heat
  - — Are stable; mines in crystalline rock have remained intact for centuries without support
  - — Have low permeability.
- Many crystalline rock formations are in tectonically stable regions that are relatively free of economic mineral deposits.

Concerns About Crystalline Rock

- Fractures may provide pathways for unacceptable levels of groundwater flow
- Little data are available about fractures and the presence or absence of groundwater at repository depths

Characteristics of Crystalline Rock Regions Being Studied for Second Repository

The North Central, Northeastern, and Southeastern Regions are considered more favorable for several reasons:

- A large volume of crystalline rock at or near the ground surface is located in each region.
- The abundance of rock provides good opportunities for avoiding environmental conflicts and potential resource conflicts.
- The regions generally have low seismicity, high tectonic stability, and are far from recent (Quaternary) volcanic activity.
- There are large areas within each region of relatively low relief.

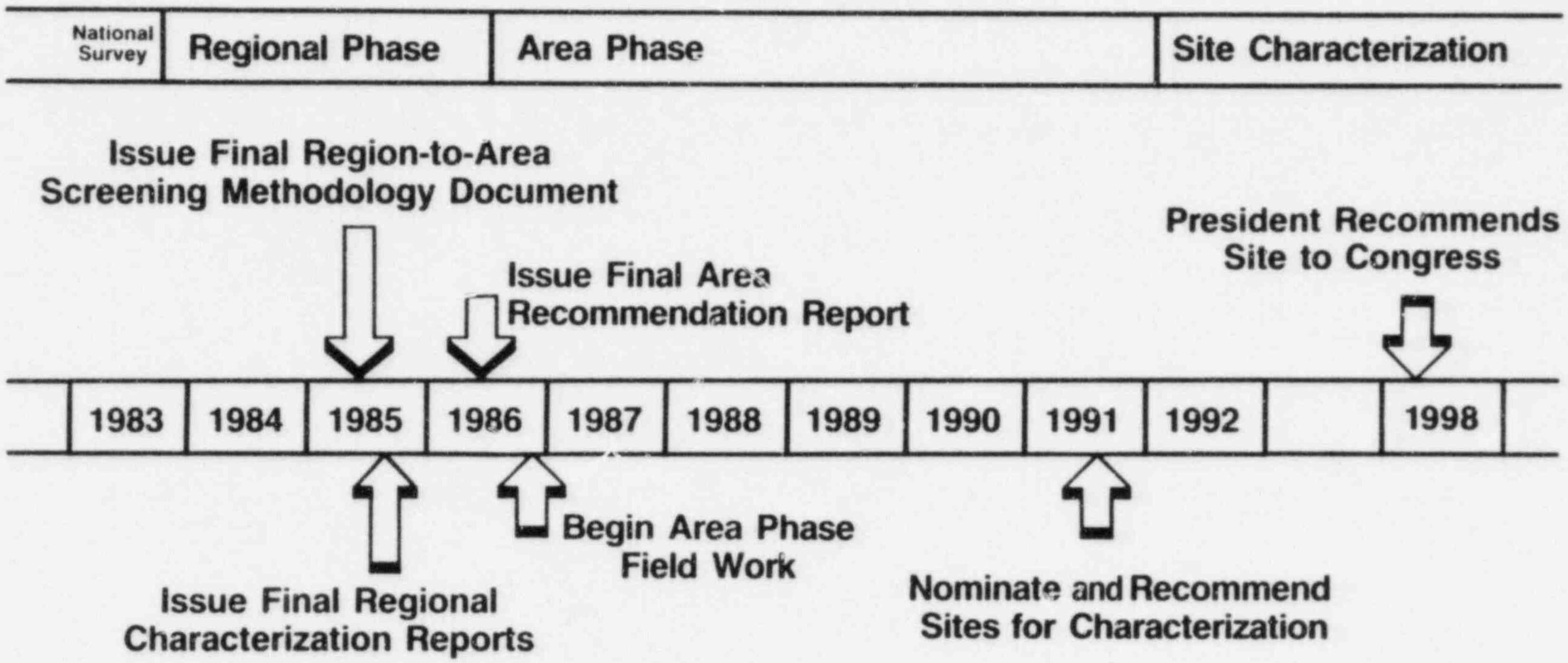
Crystalline Rock Regions

Region	States	
North Central	Michigan Minnesota Wisconsin	
Northeastern	Connecticut Maine Massachusetts New Hampshire New Jersey	New York Pennsylvania Rhode Island Vermont
Southeastern	Georgia Maryland North Carolina	South Carolina Virginia

Crystalline Site Selection Process

- Site screening
  - — National survey—In 1983, DOE completed a national survey of crystalline rocks which indicated regions which might have rocks suitable for further study for possible repository sites.
  - — Regional survey—Develop regional geologic and environmental data base for regions identified in the national survey. Develop methodology for screening from region to specific areas for further study.
  - — Area survey (field work)—Field investigations to determine if there are sites potentially suitable for nomination/recommendation and detailed characterization.
- Nomination and recommendation
- Detailed site characterization
- Site recommendation and selection
- Licensing and construction

Near Term
Crystalline Repository Project Schedule



Confirmation of Screening Results

- Review of results of Steps 1, 2, and 3
- Review of available information of areas to be recommended—including transportation
- State review and comment on draft Area Recommendation Report

Steps in Region-to-Area Screening Process

- Step 1—Application of disqualifying factors
- Step 2—Application of geologic and environmental screening variables and incorporation of variable weights
- Step 3—Sensitivity analysis

Step 1 Disqualifying Factors

- Federally Protected Lands—components of the National Park System, National Wildlife Refuge System, National Wilderness Preservation System, and the National Wild and Scenic Rivers System;
- Research Natural Areas of National Forest Lands;
- State protected Lands—state protected lands which are comparably significant with Federally protected lands and dedicated to Resource Preservation established prior to the enactment of the NWPA;
- Population Distribution and Density—highly populated areas and areas with population density of 1,000 or more persons per square mile;
- Deep Mines and Quarries—active or inactive mines greater than 100 m in depth.

Step 2 Screening Variables

Rock mass extent

Major ground-water discharge zones

Rock and mineral resources

Seismicity

Suspected Quaternary faulting

Postemplacement faulting

Proposed Federally protected lands

Population density

Proximity to existing Federally protected lands

Proximity to State-protected lands

National forest lands

State forest lands

Designated critical habitat for threatened and endangered species

Wetlands

Surface water bodies

Proximity to highly populated areas

Step 3 Sensitivity Analysis

- Incorporates geologic factors for which data is not consistently available for all rock bodies
- Geologic variables to be incorporated:
  - — Thickness of rock mass
  - — Thickness of overburden
  - — State of stress
  - — Ground-water resources

Area Recommendation Report

- Reports the results of region-to-area screening
- Narrows the number of areas for further investigation to approximately 15–20
- Expected to be issued in draft for state review and comment in November 1985
- Final expected to be issued in May 1986

Background Information

Near-Term Crystalline Repository Project Schedule

Issue Final Regional Characterization Reports	9/85
Issue Draft Area Recommendation Report	11/85
Issue Draft Area Characterization Plan	3/86
Issue Final Area Recommendation Report	5/86
Issue Final Area Characterization Plan	9/86
Begin Area Phase Field Work	9/86
Nominate and Recommend Three Sites for Characterization	7/91

Region-to-Area Screening Methodology

- Designed to use regional data to identify 15–20 areas with the highest likelihood of containing licensable sites for development as a second repository
- Methodology applies applicable disqualifying factors and environmental and geologic variables
- Consistent with DOE General Siting Guidelines for Recommendation of Sites for Nuclear Waste Repositories (10 CFR 960) as required by the Nuclear Waste Policy Act of 1982 and concurred in by the Nuclear Regulatory Commission
- Developed with extensive state involvement—three workshops and review and comment on draft document

Region-to-Area Screening Methodology Document

- Describes the Region-to-Area Screening Methodology
- Appendix A responds to the comments received from the crystalline states on the draft Region-to-Area Screening Methodology
- Appendix B summarizes, by category, the proposed treatment of state-protected lands in Region-to-Area Screening
- Issued in final form April 11, 1985

Regional Characterization Reports

- Contain the regional environmental and geologic data to be used in application of the region-to-area screening process
- Data are obtained from studies of available literature only; no field work
- Issued as a revised draft December 11, 1984
- Final expected to be issued in July 1985

The Nuclear Waste Policy Act of 1982 charges the U.S. Department of Energy with developing technology and facilities for the management of high-level nuclear waste. Studies are under way in four types of geologic formations—basalt, crystalline rock, salt, and tuff.

The Crystalline Repository Project is carried out through DOE's Crystalline Repository Project Office. Additional information may be obtained by contacting:

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Crystalline Repository Project Office
9800 South Cass Avenue
Argonne, Illinois 60439

Dr. Sally A. Mann, Manager of CPO (312) 972-2257
Dr. Paul K. Kearns, Chief, Site Evaluation Branch (312) 972-2253
Mr. Richard J. Schassburger, North Central Regional Manager (312) 972-2570
Mr. F. Hunter Weiler, Northeastern Regional Manager (312) 972-2957
Dr. Maurice F. Bender, Southeastern Regional Manager (312) 972-3115

Fact Sheet
U.S. Department of Energy

CRYSTALLINE
REPOSITORY PROJECT

Overview

Office of Civilian Radioactive Waste Management
Crystalline Repository Project Office

Introduction

The U.S. Department of Energy (DOE) is responsible by federal law for siting geologic repositories for the permanent disposal of high-level radioactive waste. Three rock types—salt, basalt, and tuff—are currently being studied in six states throughout the continental United States as potential sites for a first repository. DOE is also investigating crystalline rock in 17 states for the nation's second high-level nuclear waste repository.

Background

The safe disposal of spent nuclear fuel and high-level radioactive waste in the U.S. has been a matter of national concern since the first commercial nuclear reactor began generating electricity in 1957. Since that time, electric utilities have accumulated over 10,000 metric tons of highly radioactive waste. Most of it is in the form of spent fuel rods that are stored in deep pools of water on the reactor sites. DOE estimates that the total spent fuel inventory will reach approximately 50,000 metric tons by the year 2000.

The Nuclear Waste Policy Act of 1982 (NWPA) was signed into law by the President on January 7, 1983, and established a national policy for the safe storage and disposal of spent nuclear fuel and high-level waste. The Act requires the Department of Energy to provide for the development of mined geologic repositories for the disposal of spent nuclear fuel and high-level waste; to submit a proposal to Congress to develop monitored retrievable storage facilities as a part of the integrated system which includes geologic repositories; and to establish a program of research, development, and demonstration for the disposal of spent nuclear fuel and high-level waste.

In addition, the NWPA establishes a schedule and step-by-step process by which the President, the Congress, the states, affected Indian tribes, the U.S. Department of Energy, and other Federal agencies must work together in the siting and construction of repositories for the disposal of waste generated by civilian nuclear reactors. This law has provided a mandate and a set of rules for proceeding with the identification and selection of sites for a repository. DOE's site selection process involves studies focusing on areas of successively decreasing size to determine whether or not they contain sites that might be suitable for the development of a repository.

Selection of a site for the first repository is required by the NWPA. Initial operation is currently scheduled for 1998.

While the NWPA does not authorize the actual construction of a second repository, it does require DOE to carry out the siting and development activities essential to preparation for such a repository. The NWPA also requires that no more than 70,000 metric tons of waste be placed in the first repository until after a second repository is in operation.

DOE is considering three categories of sites for the second repository. First, there are crystalline rock formations in the

Fact Sheet
U.S. Department of Energy

CRYSTALLINE
REPOSITORY PROJECT

State Interactions

Office of Civilian Radioactive Waste Management
Crystalline Repository Project Office

Interaction between the Crystalline Repository Project (CRP) and states, as well as affected parties, is an important part of the Civilian Radioactive Waste Management Program. The Department of Energy is committed to a process of consultation and cooperation with the states and affected parties in order to ensure that all valid concerns are addressed.

In the 17 states being considered for the second repository, workshops on the region-to-area screening methodology and consultation meetings on the siting guidelines have been frequent and of significant importance. In addition, the Department has conducted briefings for various state officials and the public at-large. Funding for reviewing the Regional Characterization Reports and participating in other activities pertinent to the region-to-area screening process has been made available to the states.

A listing of major DOE/State interactions follows:

February 10, 1983
Letter to governors of 17 states regarding the recently enacted NWPA and transmittal of draft siting guidelines.

February 10, 1983
Central briefing in Chicago for representatives of 17 crystalline states.

February 17, 1983
Briefing for the Wisconsin Radioactive Waste Review Board and the public in Wausau, Wisconsin.

March 2, 1983
Letter to governors transmitting draft Siting Guidelines, schedule for public hearings and offering to discuss siting guidelines.

March 16, 1983
Letter to crystalline state contacts regarding increased time for state review and comment on draft Regional Characterization Reports.

March 17, 1983
Letter to crystalline state contacts offering financial assistance for state review of Crystalline Repository Project draft reports.

March 20, 1983
Discussion with Wisconsin Radioactive Waste Review Board's Policy Advisory Council in Rhinelander, Wisconsin, regarding crystalline project information activities.

March 26, 1983
Briefing for local officials and the public in Knox/Brantwood, Wisconsin.

March 29, 1983
Briefing for state officials in Atlanta, Georgia.

April 11, 1983
Letter to crystalline state contacts transmitting OCRD-1, "A National Survey of Crystalline Rocks and Recommendations of Regions to be Explored for High-Level Radioactive Waste Repository Sites," April 1983.

April 14, 1983
Briefing for the National Conference of State Legislatures in Washington, D.C.

April 16, 1983
Letter to crystalline state contacts regarding siting strategy and increased time for state review and comment on draft Area Recommendation Report and Area Characterization Report.

April 19, 1983
Briefing for the High-Level Nuclear Waste Review Committee of the Vermont State Nuclear Advisory Panel in Montpelier, Vermont.

April 22, 1983
Briefing for Governor Brennan and State officials in Augusta, Maine.

April 22, 1983
Letter to state legislative leadership regarding status of the project.

April 28-29, 1983
Briefing in Washington, D.C., for the Congressional delegations from 17 crystalline states.

May 3, 1983
Regional Characterization Reports sent to 17 crystalline states.

May 11, 1983
Plenary state consultation meeting in Dallas, Texas, to discuss process of developing the proposed siting guidelines.

May 13, 1983
Letter to state legislative leadership regarding status of the project and state review and comment on the draft Area Recommendation Report and Area Characterization Report.

May 19, 1983
Negotiation session with the State of Wisconsin in Madison to begin discussions on a possible Section 117(c) agreement, which would only be executed by DOE if potentially acceptable sites were identified in Wisconsin.

June 1983
Briefings on public comments and DOE responses on proposed siting guidelines (various locations). Fifteen crystalline states participated in the briefings.

June 29-30, 1983
First methodology workshop on screening process in Columbus, Ohio, for representatives of 17 crystalline states.

July 6, 1983
Public meeting in Davidson County, North Carolina.

July 7, 1983
Briefing for the Vermont State Nuclear Advisory Panel in Montpelier, Vermont.

July 7, 1983
Letter to state contacts regarding increased time for review of the Regional Characterization Reports.

July 18, 1983
Briefing for Wisconsin Radioactive Waste Review Board and members of the public in Rhinelander, Wisconsin.

July 18, 1983
Presentations at the Southern Legislative Conference in Savannah, Georgia.

July 21, 1983
Letter to state contacts and state legislative leadership transmitting copies of DOE internal guidelines on consultation and cooperation agreements and grants.

July 22, 1983
Letter to state legislative leadership regarding increased time for review of Regional Characterization Report.

August 5, 1983
Letter to crystalline state contacts offering additional financial assistance for state review of Crystalline Repository Project draft reports.

August 10, 1983
Briefing for the New Jersey State Department of Environmental Protection in Trenton.

August 17-19, 1983
Consultation meeting in Dallas, Texas, to discuss proposed siting guidelines.

August 22-23, 1983
Briefing for the Michigan High-Level Waste Task Force in Marquette, Michigan.

September 10, 1983
Presentation at the Wisconsin Audubon Council quarterly meeting in Whitewater, Wisconsin.

September 16, 1983
Overview presentation of the Crystalline Repository Project to the Wisconsin Chapter of the American Society of Civil Engineers in Madison, Wisconsin.

September 26, 1983
Briefing for the Virginia Solid Waste Study Commission in Richmond, Virginia.

October 26, 1983
Letter to state contacts transmitting "Overview of the Proposed Region-to-Area Screening Methodology."

November 14, 1983
Letter to crystalline state contacts offering additional financial assistance for state review of Crystalline Repository Project draft reports and participation in screening workshops.

November 16-18, 1983
Second screening methodology workshop in Chicago, Illinois, for representatives of the crystalline states.

December 2, 1983
Briefing by DOE to the CAWP Forum for Women State Legislators in San Diego, California.

December 16-17, 1983
Briefing for the National Conference of State Legislatures in Washington, D.C.

February 3, 1984
Letter to state contacts transmitting "Overview of the Proposed Region-to-Area Screening Methodology" (Revised Draft) and "Proceedings of the Second Workshop on Region-to-Area Screening Methodology for the Crystalline Rock Project."

February 14-15, 1984
Tour of the Climax Test Site in Nevada for crystalline state officials.

February 16, 1984
Participation in a regional phase negotiation meeting with the State of Wisconsin in Wausau, Wisconsin.

February 21-24, 1984
Third screening methodology workshop in Atlanta, Georgia, for representatives of the crystalline states.

March 12, 1984
Public briefings in Churchland and Oak Ridge, North Carolina, requested by U.S. Representative C. Robin Britt, Sixth District, North Carolina.

March 24, 1984
Briefing for the Minnesota Citizens Advisory Committee, St. Paul, Minnesota.

May 3, 1984
Briefing for Blue Ridge Environmental League, Jefferson, Ashe County, North Carolina, requested by U.S. Representative Stephen L. Neal, Fifth District, North Carolina.

May 16, 1984
Briefing for the National Congress of American Indians in Denver, Colorado.

June 1, 1984
Letter to states modifying CRP schedule.

June 7-8, 1984
Briefing for crystalline states in Washington, D.C. Project schedule, Mission Plan, Region-to-Area Screening Methodology, and Draft Regional Characterization Reports are discussed.

July 30, 1984
Letter to crystalline state contacts offering additional financial assistance for state review of Crystalline Repository Project draft reports and participation in workshops and meetings.

August 9, 1984
Briefing for crystalline states on project status at the National Governors' Association meeting in Washington, D.C.

August 10, 1984
Letter to states modifying CRP schedule.

September 5, 1984
Letter to states transmitting draft Screening Methodology Document for state review and comment.

September 6, 1984
Briefing in Washington, D.C. for the Congressional delegations from 17 crystalline states. The crystalline project screening process and status of Revised Draft Regional Characterization Reports are discussed.

September 10, 1984
Briefing for staff of National Conference of State Legislatures in Chicago, Illinois.

October 3, 1984
Participation in crystalline states meeting in Atlanta, Georgia. The crystalline project screening process and status of the Revised Draft Regional Characterization Reports are discussed.

October 4, 1984
Meeting of both 1st and 2nd repository states as well as affected Indian Tribes of the 1st Repository program.

December 10, 1984
Letter to states transmitting Revised Draft Regional Characterization Reports for state review and comment.

December 11, 1984
Briefing in Washington, D.C. for the Congressional delegations from 17 crystalline states. The Revised Draft Regional Characterization Reports and the status of the project are discussed.

December 28, 1984
Letter to states modifying CRP schedule.

January 16, 1985
Participation in a meeting of the Marquette County Ad Hoc Planning Committee on Nuclear Waste Disposal in Marquette, Michigan.

January 23-24, 1985
Participation in meetings held by the Michigan Governor's Task Force on Nuclear Waste Disposal in Marquette, Michigan.

February 6, 1985
Meeting with crystalline states in attendance at Transportation Workshop in Albuquerque, New Mexico.

February 20-21, 1985
Briefing for citizens and local officials of Stokes County, North Carolina (held in Danbury, North Carolina).

March 26, 1985
Meeting with crystalline states in attendance at Waste Management '85 Conference in Tucson, Arizona.

April 10, 1985
Letter to states transmitting final Screening Methodology Document.

April 24, 1985
Presentation to NCAI National Indian Waste Review Committee in Minneapolis, Minnesota.

April 24, 1985
Public meeting in West Charleston, Vermont, at the request of State Representative Benoit U. Blais.

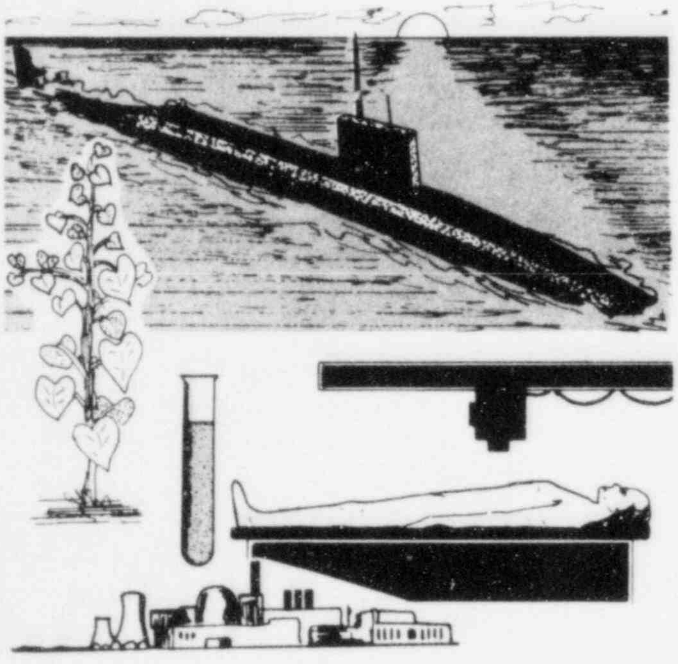
April 25, 1985
Public meeting in Marion, North Carolina, requested by the Blue Ridge Environmental Defense League.

For Further Information

Dr. Sally A. Mann, Manager of CPO
Dr. Paul K. Kearns, Chief, Site Evaluation Branch
Mr. Richard J. Schassburger, North Central Regional Manager
Mr. F. Hunter Weiler, Northeastern Regional Manager
Dr. Maurice F. Bender, Southeastern Regional Manager

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
Crystalline Repository Project Office
9800 South Cass Avenue
Argonne, Illinois 60439
312/972-2548

What is nuclear waste?



Nuclear wastes result from various uses, including military, medical, industrial, and agricultural activities, and electrical power generation.

Nuclear waste is a waste material, usually generated as the result of human activity, whose radioactivity is of special concern. Most nuclear wastes require special handling to avoid the health hazards associated with radiation. There are four categories of nuclear wastes, depending on their origin, level of radioactivity, and potential hazard: high-level wastes, low-level wastes, transuranic wastes, and tailings.

High-level wastes

These are the most highly radioactive wastes. They are characterized by high-level radiation which decays rapidly, though high-level wastes also may contain quantities of the slowly decaying transuranic (heavier than uranium) elements. High-level wastes must be handled by remote control behind heavy protective shielding.

High-level wastes are produced by nuclear reactions in the fuel of both commercial and defense reactors. Initially, these by-products are locked up in spent (used) reactor fuel along with remaining uranium and plutonium. The uranium and plutonium have valuable energy content. Spent fuel has been used in a nuclear reactor to the point where it is so contaminated with wastes that it will no longer contribute efficiently to the nuclear chain reaction. Spent fuel can be reprocessed to separate the highly radioactive by-product wastes from most of the uranium and plutonium.

Low-level wastes

As defined by law*, these are radioactive wastes not classified as high-level

waste, transuranic waste, spent nuclear fuel, or by-product material. Low-level wastes do not require extensive shielding. Some shielding may be needed for handling certain low-level wastes; other low-level wastes may have no more than natural background radioactivity.

Low-level wastes are produced by many commercial, medical, and industrial uses. They include wastes from the "housekeeping" functions of commercial and university nuclear facilities such as rags, papers, filters, resins, and discarded protective clothing. Typically, they have small amounts of radioactive material in large total volumes and pose little potential hazard. Low-level wastes are disposed of by shallow burial in controlled locations.

Transuranic wastes

These wastes contain the so-called man-made transuranic elements, which are heavier than uranium. They are predominantly characterized by medium energy radiation and slow decay, though their total radioactivity may be no greater than certain low-level wastes. Most transuranic wastes result from reprocessing nuclear fuel.

Some transuranic wastes are being stored in surface facilities but eventually all of these wastes must be placed in deep geologic repositories. This is because, like high-level wastes, they remain hazardous for long decay times.

Tailings

The by-products of uranium mining and milling, tailings are volumes of naturally radioactive rock and soil. They contain small amounts of radium which decay to emit a radioactive gas (radon). Plans are being developed for controlled disposal of tailings at isolated locations and under sufficient soil cover to reduce the emission of radon gas.

For further information—

"Answers to Your Questions About High-Level Nuclear Waste Isolation," Office of Nuclear Waste Isolation, 1981.

"Nuclear Waste: How Will We Manage It?" League of Women Voters, 1979.

"The Promise and the Peril of Nuclear Energy," *National Geographic*, April, 1979.

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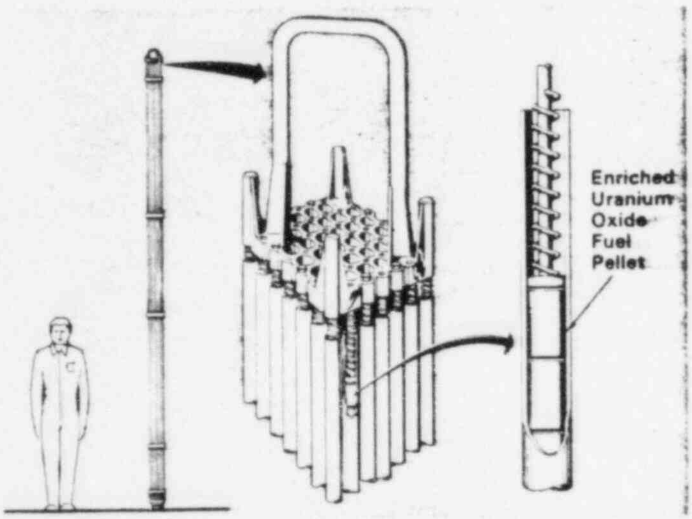
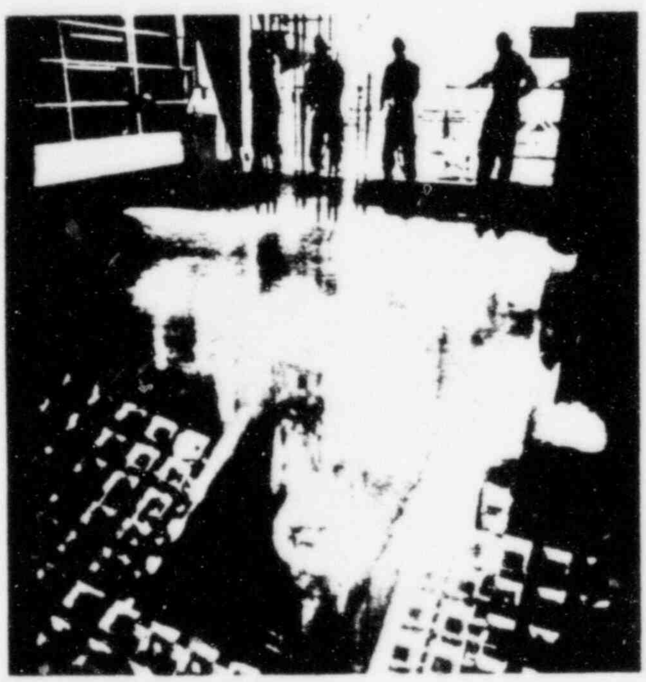
*Low-Level Radioactive Waste Policy Act of December 22, 1980 (Public Law 96-573,94 Stat. 3347).

What is "spent" nuclear fuel?



Fuel for a nuclear power plant consists of pellets of uranium oxide each about the size of a pencil eraser. Pellets are loaded into zircalloy tubes, which are sealed and bundled together into fuel assemblies.



Spent fuel assemblies are placed in temporary storage below 20 feet of water in pools adjoining nuclear power reactors.

Spent fuel is fuel that has been "burned" (irradiated) in a nuclear reactor to the point where it no longer contributes efficiently to the nuclear chain reaction and must be replaced.

Pellets containing uranium oxide are the fuel for nuclear plants generating electrical power in the United States. These pellets are sealed in metal tubes slightly larger than the diameter of a pencil and about 12 to 13 feet long. The tubes are bundled together into assemblies, each containing between 50 and 270 tubes, depending on the design of the reactor in which they are to be used. About a third of the assemblies in a typical power reactor are "spent" and replaced each year. This totals between 65 and 180 fuel assemblies per reactor per year.

When it leaves the reactor, spent fuel is thermally hot and highly radioactive. Most of this heat and radiation decays away after about five years of storage. But spent fuel remains potentially dangerous for much longer periods of time. This danger exists because exposure to even low levels of radiation over sufficiently long periods could cause harmful health effects. Also, some of the waste products could be chemically poisonous if ingested. However, spent fuel is not explosive from either a chemical or a nuclear standpoint.

After removal from a reactor, spent fuel is stored in a pool of water at the power plant site. This was intended to be a temporary solution, but some spent fuel has been held in storage for more than 30 years. The goal of the U.S. nuclear waste management program is to develop a permanent disposal method that poses no significant threat to people or the environment now or in the future. This program emphasizes the permanent disposal of

high-level wastes in mined geologic repositories deep underground in stable rock formations.

Spent fuel can be disposed of in the form in which it comes from a reactor or it can be reprocessed before disposal. Reprocessing dissolves the fuel pellets from spent fuel assemblies and separates the unused uranium and plutonium for reuse. The remaining radioactive materials would still need to be disposed of.

For further information—

"Spent Fuel Storage Fact Book" (DOE/NE-0005), U.S. Department of Energy, April, 1980.

"Answers to Your Questions About High-Level Nuclear Waste Isolation," U.S. Department of Energy, February, 1982.

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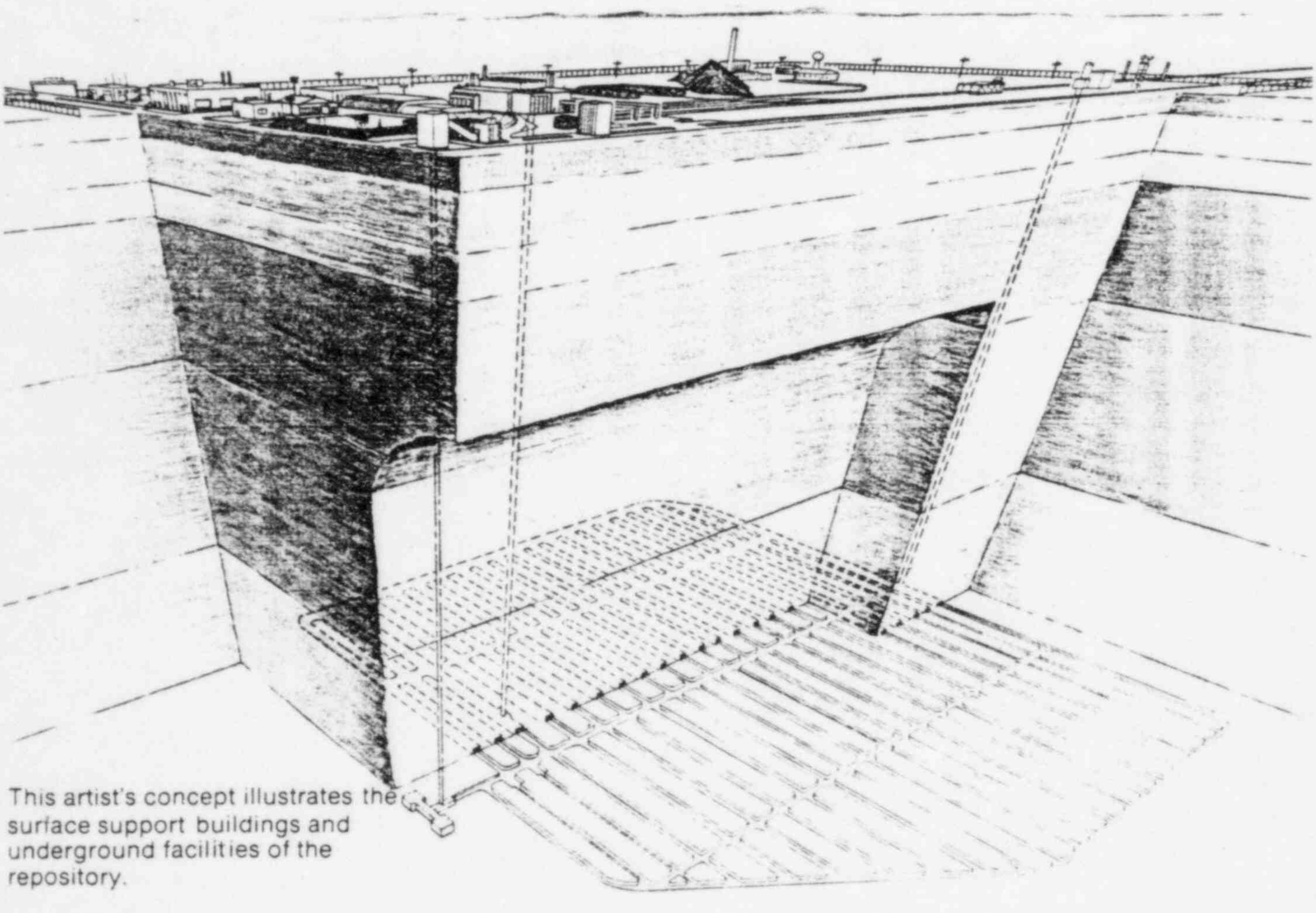
What will a nuclear waste repository look like?



This artist's concept illustrates the surface support buildings and underground facilities of the repository.

The repository being designed to contain high-level nuclear wastes will resemble a large mining complex. It will combine two types of industrial facilities—a waste handling facility at the surface and a large mine constructed 2,000 to 4,000 feet below the surface.

A central area of about 400 surface acres will contain buildings and other repository facilities during the expected 30- to 40-year operating period. An additional 50 acres may be required during the five- to eight-year construction period for temporary buildings, parking lots for vehicles of construction workers, storage of materials, and a concrete batch plant. The central area will be surrounded by an inner controlled area, equivalent in dimensions to the underground working repository plus a buffer zone of a minimum of 800 feet. There will be restrictions on surface and subsurface activities within this inner controlled area of approximately 2,000 acres.

The outer controlled area will extend a minimum of 1-1/4 miles beyond the outside perimeter of the inner controlled area. The outer controlled area will have restrictions on subsurface activities, including drilling and mining, although surface uses, such as farming or grazing, could continue.

The surface structures for handling and related activities will consist of railroad unloading areas, various buildings for administration, maintenance, and warehousing, water and sewage treatment plants, a storage area for excavated rock, and the principal structure, the waste-handling building. The waste-handling building will contain the facilities and equipment to handle high-level waste or spent fuel. Canisters of solidified high-level waste will be unloaded from shipping casks and transferred to a shielded cell. The integrity will be inspected and then the canisters will be lowered through the waste shaft to the emplacement level and moved to their final location by a shielded transport vehicle.

The underground area of the repository will cover approximately 2,000 acres. Separate shafts with elevators will lead below ground for personnel and equipment and for lowering nuclear waste canisters. Other shafts will provide ventilation. Tunnels will spread out into the underground area. Canisters of solidified high-level waste will be lowered to the repository emplacement area where a transport vehicle will carry them into a tunnel for emplacement. Canisters will be lowered into holes drilled in the tunnel floor.

In addition to the geologic barriers that surround the repository, various types of engineered barriers will be used to contain the waste, i.e., the canister, liner, absorbent packing material. As each storage zone is filled, the holes, tunnels, and shafts will be backfilled and sealed. However, provisions are being made to provide for retrievability of the waste canisters for up to 50 years following emplacement of the last canister, in accordance with draft U.S. Nuclear Regulatory Commission regulations. Following closure, all reasonable means will be taken to alert future generations of the locations and significance of repositories. Methods being considered include surface symbols as well as permanent records in public libraries and computerized information centers.

For further information—

"The Search for Safe Nuclear Waste Disposal," *Machine Design,* March, 1980.

"Answers to Your Questions About High-Level Nuclear Waste Isolation," U.S. Department of Energy, February, 1982.

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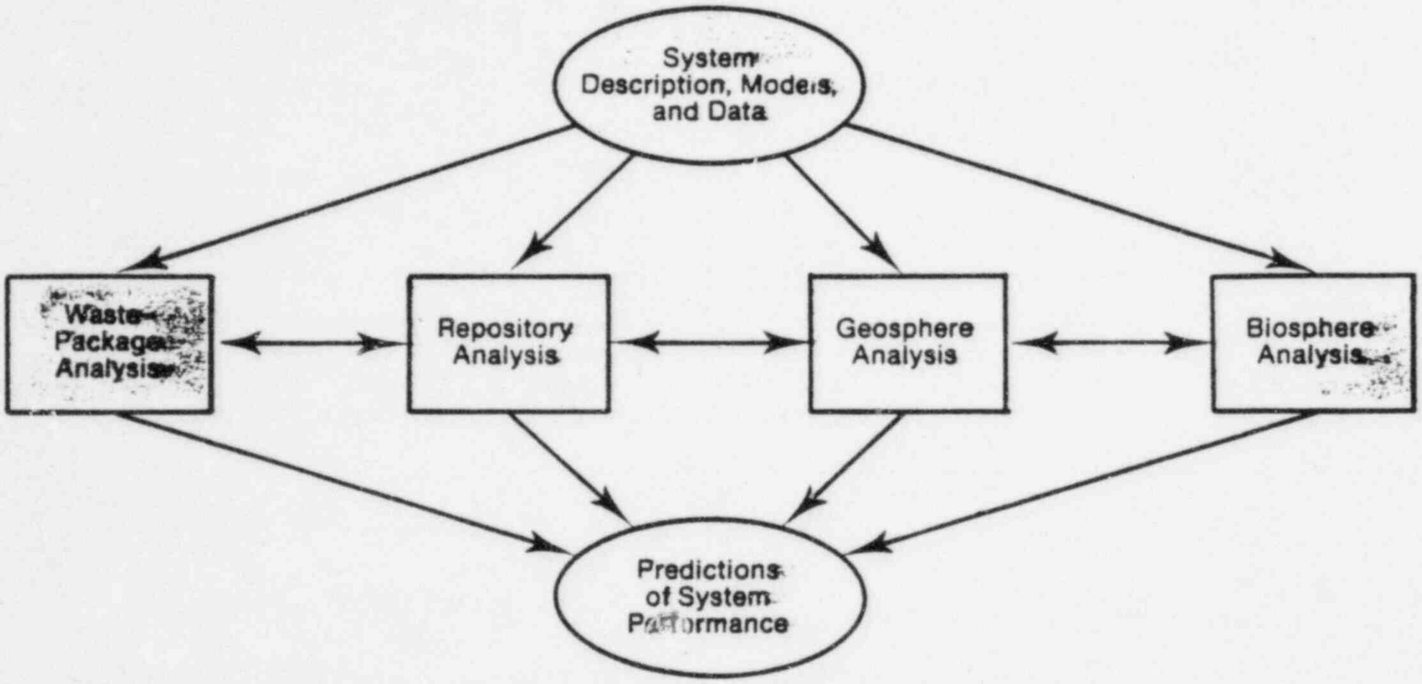
Can nuclear wastes be isolated safely?



This diagram indicates steps in predicting repository performance.

The primary objective of this country's program to isolate highly radioactive waste is to protect public health and safety. Spent fuel containing highly radioactive waste products is currently being stored safely in water pools at every nuclear power reactor site. But this is only a temporary solution because storage pools require constant maintenance. Nuclear wastes that have been isolated deep underground in a repository will not require maintenance and monitoring.

Predictions of the long-term performance of the disposal system after the waste has been emplaced and the repository closed are important to selecting the site, designing the repository, and designing the waste package. Long-term repository performance is assessed by analyzing what events or processes could release radioactive materials from the waste and move these materials into the biosphere (environment) to people. Then a system of natural and man-made barriers is introduced to stop this movement. The engineered, man-made barriers are those which are built into the waste package and protective layers around it—including the waste form itself.

Performance studies have considered the two most likely modes of release of radioactive materials from a mined repository. These are small, concentrated releases caused by human intrusion (such as digging a well in or near the repository) and gradual, long-term chemical releases into the ground water (and ultimately into the environment). The first of these modes could expose a few individuals to relatively large radiation doses; the second could expose more individuals to very small doses over long periods of

time. The Environmental Protection Agency has calculated that the health effects of either of these kinds of release, over 10,000 years, would be much less than one percent of the effects of natural background radiation.*

During the operation of a repository (mining, regular operation, and decommissioning) before its use as a permanent disposal site, there are other potential safety impacts. Such impacts also are being studied and modeled extensively.

Most potential safety impacts from the mechanical operations of mining and excavation can be avoided by careful design and accident prevention. During the 20 to 50 years of normal repository operations, radiation exposure coming from the facility to the general population in its vicinity would be a millionth or less of the exposure they would get from naturally occurring, undisturbed radioactive elements. A small amount of radon gas also would be released from the natural radium in the rock, as in any other mine.

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*The natural background radiation varies from area to area. The average U.S. natural background radiation is about 110 millirem per person per year. (One millirem equals one thousandth of a rem. A rem—roentgen equivalent in man—measures the effects on human tissue from a dose of radiation.)

Procedures are being developed to ensure that nuclear waste will be safely transported, received, handled, packaged, and emplaced. Many existing Nuclear Regulatory Commission (NRC) regulations and guidelines are applicable to waste disposal, and others are being developed. The U.S. Environmental Protection Agency will set applicable safety standards. The NRC and the U.S. Department of Transportation are responsible for transportation regulations and requirements. (Transportation issues are discussed in the fact sheet, "Can nuclear wastes be transported safely?")

For further information—

"Managing Commercial High-Level Radioactive Waste," Summary, 1982, U.S. Congress, Office of Technology Assessment.

"Final Environmental Impact Statement, Management of Commercially Generated Radioactive Waste," Volume 1, U.S. Department of Energy, 1980.

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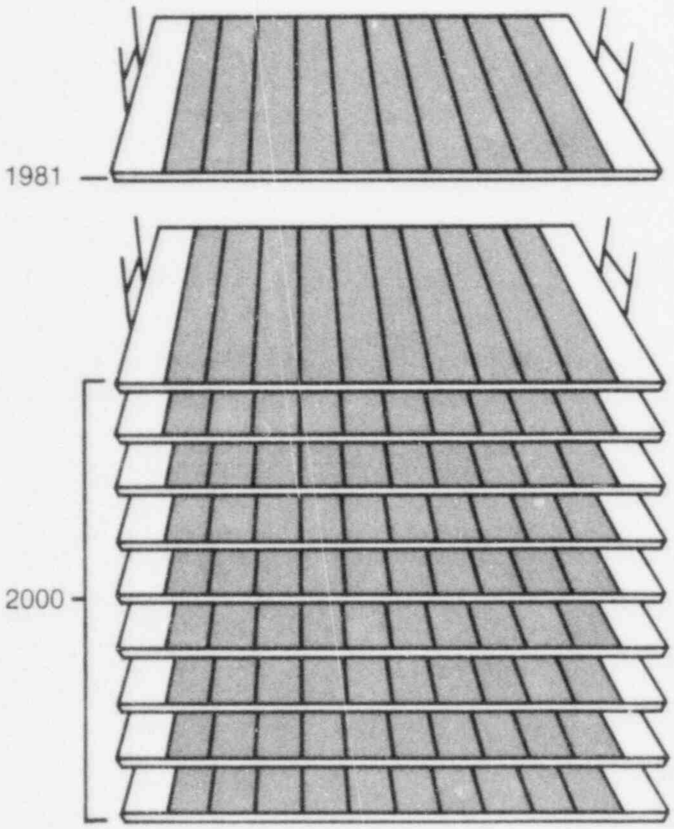
How much high-level nuclear waste is there?



The accumulation of spent fuel from reactors at commercial nuclear power plants today totals about 104,000 cubic feet, the equivalent of one football field 2 feet deep. By the year 2000, the accumulation is projected to be 950,000 cubic feet.

At the beginning of 1981, there were about 8,000 tons of spent fuel assemblies from commercial nuclear power plants in temporary storage. Those spent fuel assemblies would occupy 104,000 cubic feet of space—about the equivalent of one football field 2 feet deep. Each nuclear power plant generating a million kilowatts of electricity produces about 33 tons (390 cubic feet) of spent fuel assemblies each year. By the year 2000, the accumulation of spent fuel from commercial nuclear power reactors is projected to total about 950,000 cubic feet.

Future quantities of wastes will vary according to decisions affecting the form of the wastes at the time of disposal. Spent fuel could be packaged and disposed of as is, after being removed from the reactor site. Or the fuel may be further treated to remove the potentially useful uranium and plutonium and to concentrate the remaining highly radioactive elements. This reprocessing involves dissolving the fuel pellets and separating the unfissioned (unused) uranium and plutonium for reuse.

The unused uranium or plutonium would then be used to make new nuclear fuel pellets. Reprocessing would remove substantial percentages of the long-lived radioactive elements. However, most of the highly radioactive fission products would still need to be disposed of and the quantities would not be significantly reduced. The geologic repository being designed under the federal nuclear waste management program will accept either commercial spent fuel or wastes from reprocessing.

Low-level wastes, including such items as air and water filters, used laboratory equipment, and discarded protective clothing, are also produced during the ordinary

operation of a nuclear power plant. These wastes can be handled commercially by shallow land burial. A typical reactor produces about 50 thousand cubic feet of these wastes per year; if necessary, this amount could be compacted considerably.

Currently, there are many times more wastes by volume from defense uses of nuclear energy than from the commercial nuclear power industry. However, the total radioactivity of existing commercial wastes now exceeds that of defense wastes.

High-level defense wastes in temporary storage in 1980 totaled more than 10 million cubic feet. This could be reduced to 670,000 cubic feet if solidified for disposal in a repository and reprocessing chemicals are removed. The total amount of defense wastes by the year 2000 is estimated to be 1,130,000 cubic feet (if solidified). All wastes will be in solid form before transportation and disposal.

For further information—

"Spent Fuel Storage Fact Book" (DOE/NE-0005), April, 1980.

"Answers to Your Questions About High-Level Nuclear Waste Isolation," U.S. Department of Energy, February, 1982.

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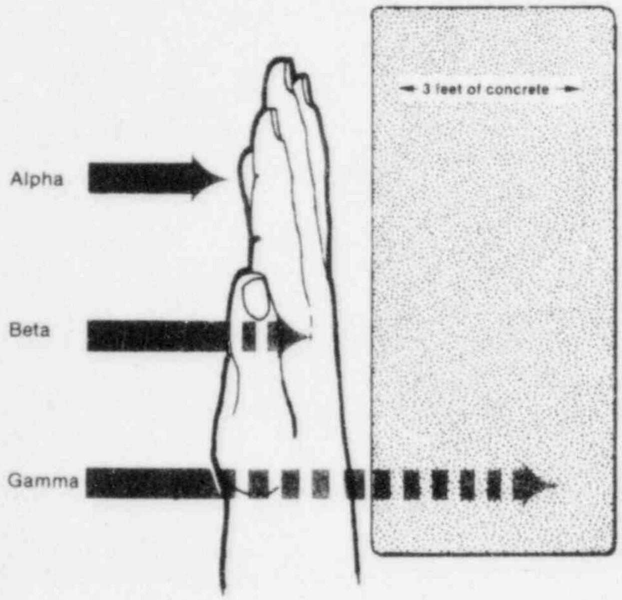
Radiation and nuclear wastes—how are they related?

The Penetrating Power of Radiation



From "Radiation—A Fact of Life," International Atomic Energy Agency and American Nuclear Society.

Radiation, the emission of waves or particles, occurs in nature as well as in nuclear wastes. Nuclear wastes usually contain higher than natural concentrations of radioactive atoms. Three types of radiation are associated with using nuclear energy and creating nuclear wastes; all three also are found in nature. These types are called "ionizing" radiations because they can produce charged particles (ions) in materials they strike. (Heat and sunlight are not ionizing radiations.)

- **Alpha radiation** consists of positively charged particles. These particles can be stopped by a sheet of paper or even the outer layer of skin. So-called *transuranic* nuclear wastes emit alpha radiation.
- **Beta radiation** consists of high-speed electrons. Beta radiation is more penetrating than alpha radiation and can pass through about an inch of water or human flesh. It can be stopped by a thin sheet of aluminum. Beta and gamma radiation dominate for the first 500-1,000 years in *high-level* nuclear wastes, and alpha radiation dominates thereafter.
- **Gamma radiation** consists of high-energy electromagnetic waves and can pass through the human body like high-energy X-rays. (X-rays and gamma rays have identical behaviors.) Dense materials such as concrete and lead can provide shielding against gamma radiation. For this reason, *high-level* wastes emitting gamma rays must be handled by remote-control mechanisms.

When spent fuel is removed from a

nuclear power plant, it contains the remains of split atoms, called "fission products," some of which are highly radioactive. These fission products decay by emitting beta and gamma radiation. Spent fuel also contains radioactive forms of uranium and newly created elements that are heavier than uranium. These artificial elements form the basis of transuranic wastes which emit alpha particles. Taken together, the transuranic elements and the fission products are handled with caution as high-level wastes. Spent fuel can be reprocessed to remove a major portion of the transuranic elements.

Nuclear wastes ultimately lose their radioactivity, decaying to background levels that correspond to radiation in nature. Some fission products are extremely short lived; others require long periods to decay. Natural background radiation comes from cosmic rays and from the radioactivity of substances in the earth. Cosmic radiation increases as one goes from sea level to high altitude. Other background radiation we receive comes from X-rays used in medicine and dentistry, and from our activities such as watching television, living in a brick house, and drinking water from deep wells.

Doses of radiation received by people are measured in units called "millirem."* The average person receives 100 to 200 millirem of radiation a year from natural and artificial sources, depending on where and how one lives. A *single* dose of 600,000 millirem received all at one time is considered lethal to 50 percent of those exposed.

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*One millirem equals one thousandth of a rem. A rem (roentgen equivalent in man) measures the effects on human tissue from a dose of radiation.

For further information—

"Radiation—A Fact of Life," 1980, International Atomic Energy Agency and American Nuclear Society.

"The Biological Effects of Low-Level Ionizing Radiation," by Arthur C. Upton, *Scientific American*, February, 1982.

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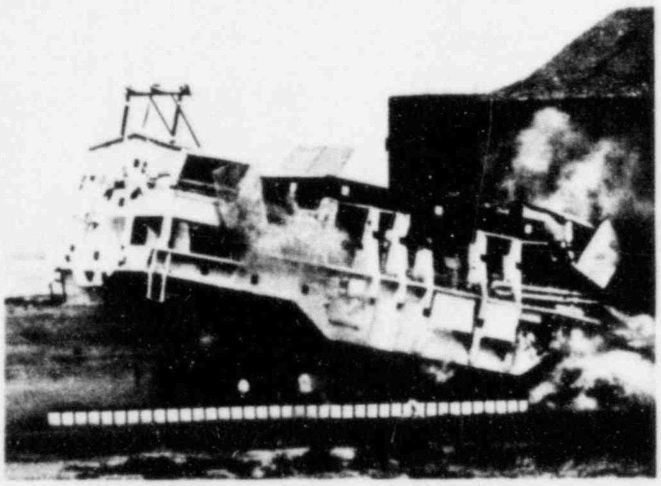
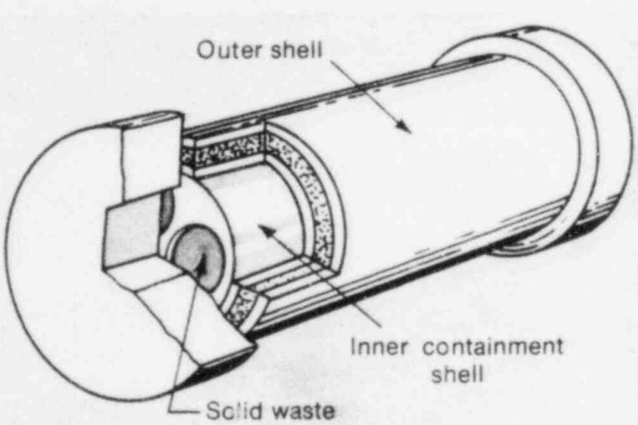
Can nuclear wastes be transported safely?



Nuclear waste shipping casks have undergone rigorous crash and fire tests.



High-level nuclear waste will be shipped in heavily shielded casks via truck or railcar in accordance with applicable federal regulations.

Studies to ensure the safe transportation of nuclear waste to the repository are being conducted. These include consideration of the risks of exposure to people from waste being transported past their homes and from accidents involving vehicles carrying nuclear waste casks.

Studies show that any radiation exposure to the general population from vehicles carrying shielded casks of high-level or transuranic waste would be insignificant. The dose to persons near (100 feet to 2,500 feet) the route of a vehicle containing spent fuel (or high-level waste) would be from 0.0006 to 0.000001 millirem* per shipment. If 1,000 casks carrying nuclear waste went by the same house every year, the increase in radiation exposure to the inhabitants would be less than one percent of the dose due to natural background radiation.

There is no risk of a self-sustaining nuclear reaction in a shipping cask. The spacing of the nuclear waste within each cask would make it impossible to bring enough radioactive material together to initiate a chain reaction.

During almost 30 years of nuclear waste shipments, there has not been a death or injury attributable to the radioactive nature of nuclear materials shipments. There are 2.5 million nuclear materials shipments per year, representing less than 3 percent of the estimated 100 million hazardous materials shipments. About 95 percent of nuclear materials shipments involve small amounts of radioisotopes for

*The average U.S. natural background radiation is 110 millirem per year. A millirem is a measurement of the effects on human tissue from a dose of radiation.

medicine, agriculture, research, and industry. The remainder includes shipments of uranium, nuclear wastes, and relatively large quantities of radioisotopes for industry.

Different types of shipping containers are used for radioactive materials with low activity and materials with high activity. There have been no spills from the heavy containers used for shipping spent fuel or high-level wastes. Packaging specifications for materials with low radioactivity do not require complete containment in case of severe accidents, and there have been accidents resulting in spills of such materials. However, these spills have been cleaned up without radiological damage to people or permanent contamination of the environment.

A high-level waste shipping cask must withstand normal transport conditions without losing its contents or shielding efficiency. Extensive testing of high-level nuclear waste casks, conducted by the Transportation Technology Center of Sandia National Laboratories in New Mexico, has shown that there would be no significant loss of contents or shielding in case of accidents. Casks have undergone a rigorous series of crash and fire tests, which have been open to the public.

In a typical test, a spent fuel cask was mounted on a truck and crashed into a concrete wall at 60 mph. The same cask was crashed again at 80 mph. There was only slight superficial damage. In a third test, a locomotive crashed into the broadside of a cask. The 80-mph impact demolished the locomotive but hardly dented the cask. A 150-ton railcar-cask assembly was crashed into a concrete barrier at over 80 mph and then subjected to a fire of more than two hours' duration. Results of these tests indicated that there would have been no radiological hazard had the casks actually been loaded with spent fuel or solidified high-level waste.

The U.S. Nuclear Regulatory Commission and Department of Transportation are responsible for the regulations and requirements governing the packaging and transportation of nuclear materials. In April, 1981, the NRC announced that existing regulations governing the transportation of nuclear wastes and other materials are sufficient to protect the public against unreasonable risk.

For further information—

"Everything You Always Wanted to Know About Shipping High-Level Nuclear Wastes," U.S. Department of Energy, 1978.

"Shipments of Nuclear Fuel and Waste . . . are they really safe?" (DOE/EV-0004/2) U.S. Department of Energy, 1978.

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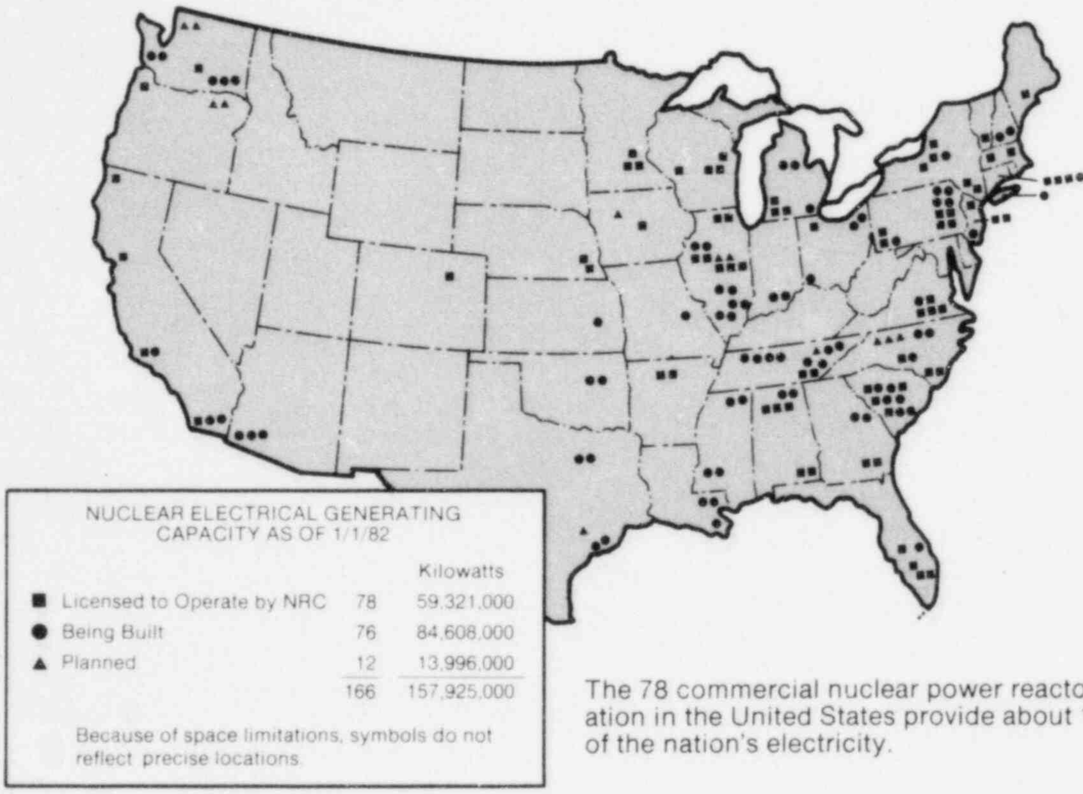
Where are commercial nuclear power wastes generated?



The 78 commercial nuclear power reactors in operation in the United States provide about 12 percent of the nation's electricity.

Commercial nuclear power plants generating electricity are located near the centers of demand for electrical power. As the map above indicates, the reactor sites are scattered but generally are near major population centers.

At the end of 1981, there were 78 commercial nuclear power reactors generating electricity in the United States. An additional 76 reactors are under construction and 12 are in the planning stages. By the year 2000, more than 160 commercial reactors are expected to be generating electrical power and producing high-level wastes. These plants will be located in all but 13 states. While wastes from commercial power generation are not produced in every state, most people in the country benefit from the electricity produced. Approximately 12 percent of all U.S. electrical output is produced by nuclear power plants. This electricity flows through interconnected power system grids and is shared by residents of nearly every state. People also have access to commercial products made in plants powered by nuclear-generated electricity.

National defense activities, some of which produce high-level wastes, are conducted in many locations. Across the country there also is wide use of radioactive materials in research, medicine, testing, and industrial manufacturing applications, which produce small quantities of nuclear wastes.

For further information—

"Environmental Impact Statement, Management of Commercially Generated Radioactive Waste," Volume 1, U.S. Department of Energy, Washington, D.C., September, 1980.

"Energy Data Report," June 12, 1980, Energy Information Administration, U.S. Department of Energy.

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DOEFACTS:

CRYSTALLINE REPOSITORY PROJECT REGION-TO-AREA SCREENING METHODOLOGY

The U.S. Department of Energy's Crystalline Repository Project Office issued its draft "Region-to-Area Screening Methodology" document today for state comment and review. This document describes the process that will be used to narrow the geographic focus from large regions to smaller areas in the studies to identify potential crystalline rock sites for the nation's second nuclear waste repository.

The Crystalline Repository Project is part of DOE's program mandated by the NWPA of 1982, which requires DOE to site, construct and operate geologic repositories for the disposal of spent nuclear fuel and high level waste from commercial reactors. Potential sites have been identified for the first repository in Washington, Nevada, Utah, Texas, Louisiana, and Mississippi.

The purpose of region-to-area screening is to narrow the number of rock bodies within the 17 crystalline states of the North Central, Northeastern, and Southeastern Regions to determine which areas will be studied in more detail during the area phase. The region-to-area screening process is designed to use regionally applicable data to identify areas most suitable for more detailed investigations. Subsequent field studies will determine if these areas actually contain sites which are potentially suitable for nomination and detailed characterization.

The region-to-area screening methodology was developed to incorporate:

- A systematic approach which has a logical progression of steps that indicate a trackable process including input from state representatives and peer review groups;

- A consistent approach including equitable treatment of all 17 crystalline states in the screening process through the use of a reasonably consistent regional data base and sensitivity analyses. Sensitivity analyses improve technical defensibility of the approach and the results;

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- A comprehensive approach which uses regionally applicable disqualifying factors and screening variables in compliance with the DOE Siting Guidelines for identification of potentially acceptable sites for nuclear waste repositories.

The region-to-area screening methodology consists of a three-step process:

- Step 1 - This step directly applies appropriate disqualifying conditions specified in the DOE Siting Guidelines. This step will eliminate certain land units and rock bodies or parts of rock bodies from any further consideration. Disqualifying conditions to be used are:

  - Federally Protected Lands - components of the National Park System, National Wildlife Refuge System, National Wilderness Preservation System, and the National Wild and Scenic Rivers System;

  - Research Natural Areas of National Forest Lands;

  - State-Protected Lands - Comparably significant to federally protected lands, state protected lands, which are dedicated to resource preservation and were established prior to the enactment of the NWPA;

  - Population Distribution and Density - highly populated areas and areas of 1,000 or more persons per square mile;

  - Hydrologically Significant Natural Resources - rock and mineral resources greater than 100m in depth.

- Step 2 - This step applies to potentially adverse and favorable conditions specified by the DOE Siting Guidelines as scaled regional screening variables to identify the most suitable rock bodies/candidate areas that warrant further analysis in subsequent screening phases. Individual weights are associated with each variable in Step 2 to assign a relative importance to the variables and to help discriminate the most suitable candidate areas from alternate points of view on the relative importance of the variables. Step 2 screening variables are:

Rock mass extent
Major ground-water discharge zones
Rock and mineral resources
Seismicity
Quaternary faulting
Postemplacement faulting
Proposed Federal-protected lands
Population density
Proximity to existing Federal-protected lands
Proximity to State-protected lands
National forest lands
State forest lands
State wildlife lands
Designated critical habitat for threatened and endangered species
Wetlands
Surface water bodies
Proximity to highly populated areas

- Step 3 - This step (sensitivity analyses) is designed to accomplish four major objectives. The first is to explore the implications of modifying the scales of Step 2 variables in the selection of candidate areas. The second is to prepare summary composite maps derived by utilizing different sets of weights for the Step 2 variables. The third is to evaluate the effects of using different indices of aggregate favorability (e.g., the geometric mean instead of the weighted average). The fourth allows further differentation by incorporating other geologic factors based upon available rock-body-specific data. The geologic factors to be incorporated are:

  Thickness of rock mass
  Thickness of overburden
  State of stress
  Ground-water salinity
  Ground-water resources

The main body of the Document describes the Region-to-Area Screening Methodology which resulted from extensive consultation, including three workshops, with the crystalline states. Section 3.2.3 of the Document describes the proposed state involvement in the establishment of different sets of weights to be utilized in region-to-area screening.

Appendix A of the Document explains how DOE considered the comments received from the crystalline states following each of the workshops. Appendix B summarizes, by category, the proposed treatment of state protected lands in region-to-area screening.

xxx

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September 1984

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DOENEWS:

FOR IMMEDIATE RELEASE
SEPTEMBER 6, 1984

DEPARTMENT OF ENERGY ISSUES DRAFT SCREENING METHODOLOGY FOR CRYSTALLINE REPOSITORY PROJECT

The U.S. Department of Energy's Crystalline Repository Project Office issued its draft "Region-to-Area Screening Methodology" document today for state comment and review. This document describes the process that will be used to narrow the geographic focus from large regions to smaller areas in the studies to identify potential crystalline rock sites for the nation's second nuclear waste repository.

Under the Crystalline Repository Project (CRP), the U.S. Department of Energy (DOE) is conducting studies of crystalline rocks in 17 states for possible location of a repository. This Project is part of DOE's program mandated by the Nuclear Waste Policy Act of 1982, which requires DOE to site, construct and operate geologic repositories for the disposal of spent nuclear fuel and high level waste from commercial reactors. Potential sites have been identified for the first repository in

(more)

Washington, Nevada, Utah, Texas, Louisiana, and Mississippi. Crystalline rocks are intrusive igneous and high-grade metamorphic rocks such as granite. These 17 states are in three regions:

North Central Region	Southeastern Region	Northeastern Region
Michigan	Georgia	Connecticut
Minnesota	Maryland	Maine
Wisconsin	North Carolina	Massachusetts
	South Carolina	New Hampshire
	Virginia	New Jersey
		New York
		Pennsylvania
		Rhode Island
		Vermont

The proposed screening methodology consists of a three step process:

In the first step, DOE will use disqualifying factors, such as locations within national and state parks, national wilderness and wildlife areas, national and state wild and scenic rivers, and deep mine areas, to eliminate sites from further consideration;

In the second step, environmental and geologic variables such as national and state forests, state wildlife areas, surface water bodies, seismicity and geologic faulting will be used to evaluate potentially adverse and favorable conditions.

In the last step, differences in technical opinion from widely varying perspectives will be analyzed to identify the crystalline rock bodies most suitable for consideration.

(more)

This screening methodology has been developed in consultation with the involved states and is consistent with the General Guidelines for Recommendation of Sites for Nuclear Waste Repositories, required by the Nuclear Waste Policy Act of 1982 and concurred in by the Nuclear Regulatory Commission.

DOE's site screening process involves studies focusing on areas of successively decreasing size to determine whether they contain sites that might be suitable for the development of a repository. CRP's screening process consists of three phases--national survey, regional studies, and area studies.

Previously, a national survey identified the North Central, Southeastern and Northeastern regions with crystalline rock bodies as candidates for further study. In the current regional phase, DOE is developing a regional data base to be used with the screening methodology to select 15-20 candidate areas for the upcoming area phase. In the future, an Area Recommendation Report will be used to document the results of implementing the region-to-area screening methodology. Then, field investigations will determine if there are sites suitable for detailed site characterization, as mandated by the NWPA, within those candidate areas.

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Revised Draft Regional Characterization Reports
and Comment Response Document

The U. S. Department of Energy (DOE) has issued revised draft Regional Environmental Characterization Reports (RECR's) and Regional Geologic Characterization Reports (RGCR's) for state review and comment. These documents describe the environmental and geologic data collected from existing literature that will be used for region-to-area screening of crystalline rocks in an effort to identify possible candidate sites for the nation's second high-level nuclear waste repository. In addition, DOE addressed more than 2,000 written state comments to the May 1983 draft regional reports in a 129-page "Comment Response Document." This document focuses on state comments on the geologic and environmental characterization data presented in the earlier draft reports.

The Crystalline Repository Project (CRP) is part of DOE's Civilian Radioactive Waste Management Program, mandated by the Nuclear Waste Policy Act of 1982 (NWPA), which requires DOE to site, construct, and operate mined geologic repositories for the disposal of spent nuclear fuel and high-level waste from commercial reactors. Nine potential sites have been identified for the first repository in Louisiana, Mississippi, Nevada, Texas, Utah, and Washington.

The 17 crystalline states currently under study in three regions are:

North Central Region	Northeastern Region	Southeastern Region
Michigan	Connecticut	Georgia
Minnesota	Maine	Maryland
Wisconsin	Massachusetts	North Carolina
	New Hampshire	South Carolina
	New Jersey	Virginia
	New York	
	Pennsylvania	
	Rhode Island	
	Vermont	

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DOE's site screening process involves studies focusing on geographic areas of successively decreasing size to determine whether they contain sites that might be suitable for the development of a repository. The CRP's site screening process consists of three phases--national survey, regional studies, and area studies--leading up to site nomination and recommendation for characterization.

Previously, a national survey identified the North Central, Northeastern, and Southeastern Regions as having crystalline rock bodies which offered the greatest likelihood of being suitable as a nuclear waste repository site. In the current phase, DOE will use data from these Regional Characterization Reports and the Region-to-Area Screening Methodology previously issued for state review and comment to screen from three regions down to approximately 15-20 candidate areas for further investigation. No field work has been conducted by DOE during this phase. An Area Recommendation Report will be used to document the results of implementing this region-to-area screening process. Then, field investigations will determine if there are sites suitable for detailed site characterization within the candidate areas.

Regional Characterization Reports present the available information on those disqualifying factors and regional screening variables that have been selected for use in the region-to-area screening process developed in consultation with the 17 crystalline states and present supplementary descriptive information providing a general characterization of each region. There are six characterization documents, one environmental and one geologic report for each of the three regions.

Disqualifying factors and screening variables for which data are presented in these reports include:

	Environmental	Geologic
Disqualifying Factors	Federal protected lands Components of National Forest System State protected lands Population distribution and density	Hydrologically significant natural resources

	Environmental	Geologic
Screening Variables	Proposed federal protected lands Proximity to federal protected lands Proximity to state protected lands Proximity to highly populated areas Population density National forest lands State forest lands State wildlife lands Designated critical habitat for threatened and endangered species Surface water bodies Wetlands	Rock mass extent Major ground water bodies Rock and mineral resources Seismicity Suspected quaternary faulting Post emplacement faulting Thickness of rock mass Thickness of overburden State of stress Ground water resources

In line with DOE's policy of federal-state cooperation, the Crystalline Repository Project Office provided draft Regional Characterization Reports to the states in May 1983 for their review and comment. These reports addressed such geological matters as regional physiography, tectonic setting, energy and mineral resources, historical seismicity, and hydrology. Among the environmental matters addressed in the draft reports were regional socioeconomics, natural resources, land use, ecosystems, and meteorology.

Subsequently, DOE developed siting guidelines, to be released soon, and conducted three workshops on the Region-to-Area Screening Methodology with representatives of the 17 crystalline states. During the course of developing these guidelines and the screening methodology, it was determined that additional data was essential to the screening process. The draft documents were, therefore, revised.

Thirteen of the seventeen crystalline states provided specific comments. DOE has found many of these comments to be helpful and has incorporated them into the revised draft Regional Characterization Reports. The "Comment Response Document" paraphrases state comments and groups them into 23 different subject areas under four topical headings. These topics are:

- Geology
- Environment
- General Programmatic Concerns
- General Editorial Concerns

After consideration of all state comments received on the revised draft RECR's and RGCR's, DOE will issue these reports in final form.

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DOENEWS:

FOR IMMEDIATE RELEASE
December 11, 1984

DEPARTMENT OF ENERGY ISSUES REVISED DRAFT REGIONAL CHARACTERIZATION REPORTS AND COMMENT RESPONSE DOCUMENT

The U. S. Department of Energy (DOE) issued today its revised draft Regional Environmental Characterization Reports and Regional Geologic Characterization Reports for state review and comment. The data in these reports will be used for region-to-area screening of crystalline rocks in an effort to identify potential sites for the nation's second high-level nuclear waste repository. These documents describe regional environmental and geologic data collected from existing literature.

In addition, DOE addressed more than 2,000 written state comments to the May 1983 draft regional reports in a 129-page "Comment Response Document." This document focuses on state comments on the geologic and environmental characterization data presented in the earlier draft reports.

The Crystalline Repository Project (CRP) is part of the overall responsibility of DOE's Office of Civilian Radioactive Waste Management, as mandated by the Nuclear Waste Policy Act of 1982 (NWPA). The NWPA requires DOE to site, construct, and operate geologic repositories for the disposal of spent nuclear fuel and high-level waste from commercial reactors. DOE is conducting studies of crystalline rocks in 17 states for possible location of a second repository. Crystalline rocks are high-grade metamorphic and intrusive igneous rocks such as gneiss and granite. The 17 states are in three regions:

(more)

North Central Region	Northeastern Region	Southeastern Region
Michigan	Connecticut	Georgia
Minnesota	Maine	Maryland
Wisconsin	Massachusetts	North Carolina
	New Hampshire	South Carolina
	New Jersey	Virginia
	New York	
	Pennsylvania	
	Rhode Island	
	Vermont	

Potential sites have been identified for the first repository in Louisiana, Mississippi, Nevada, Texas, Utah and Washington.

The major changes in the revised reports are: including data relevant to the region-to-area screening process; addressing key environmental matters in more detail; refining the overall geologic data base to provide consistent and comparable information on the rock bodies in all three regions; and improving the regional maps and regionalized information.

In September 1984, DOE also issued its draft Screening Methodology Document which charts the process used to narrow the number of sites under consideration in the CRP.

DOE's site screening process involves studies focusing on geographic areas of successively decreasing size to determine if they contain sites that might be suitable for the development of a repository. The CRP's site screening process leading up to site nomination and recommendation for characterization consists of three phases--national survey, regional studies, and area studies.

Previously, a national survey identified the North Central, Northeastern, and Southeastern Regions with crystalline rock bodies as candidates for further study. In the current regional phase, DOE will use data from these Regional Characterization Reports and the Region-to-Area Screening Methodology previously released for state review and comment to screen from three regions down to approximately 15-20 candidate areas for further investigation. No field work has been conducted by DOE during this phase. Implementation of the region-to-area screening process will be documented in the Area Recommendation Report. Later, field investigations will determine if there are sites suitable for detailed site characterization within the candidate areas.

State comments on the revised draft Regional Characterization Reports have been requested by March 15, 1985.

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This news announcement is being distributed simultaneously with a similar release from DOE Headquarters in Washington, D. C.

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DOEFACTS:

CRYSTALLINE REPOSITORY PROJECT REGION-TO-AREA SCREENING METHODOLOGY

The U.S. Department of Energy issued its final "Region-to-Area Screening Methodology" document on the Crystalline Repository Project today. This document describes the steps that will be used to narrow the geographic focus from large regions to smaller areas in the studies to identify potential crystalline rock sites for the nation's second high-level nuclear waste repository.

The Crystalline Repository Project is part of DOE's Office of Civilian Radioactive Waste Management program. The National Waste Policy Act of 1982 requires DOE to site, construct, and operate geologic repositories for the disposal of spent nuclear fuel and high-level waste. Potential sites have been identified for the first repository in Louisiana, Mississippi, Nevada, Texas, Utah, and Washington.

The purpose of region-to-area screening is to narrow the number of rock bodies within the 17 crystalline states of the North Central, Northeastern and Southeastern Regions to determine which areas will be studied in more detail during the area phase. The region-to-area screening process is designed to use regionally applicable data to identify areas most suitable for more detailed investigations. Subsequent field studies will determine if these areas actually contain sites which are potentially suitable for nomination and detailed characterization.

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The region-to-area screening methodology was developed to incorporate:

- A systematic approach which has a logical progression of steps that indicate a trackable process including input from state representatives and peer review groups;

- A consistent approach including equitable treatment of all 17 crystalline states in the screening process through the use of a reasonably consistent regional data base and sensitivity analyses. Sensitivity analyses improve technical defensibility of the approach and the results;

- A comprehensive approach which uses regionally applicable disqualifying factors and screening variables in compliance with the DOE Siting Guidelines for identification of potentially acceptable sites for nuclear waste repositories.

The region-to-area screening methodology consists of three steps:

- Step 1 - This step directly applies appropriate disqualifying conditions specified in the DOE Siting Guidelines. This step will eliminate certain land units and rock bodies or parts of rock bodies from any further consideration. Disqualifying conditions to be used are:

    - Federally Protected Lands - components of the National Park System, National Wildlife Refuge System, National Wilderness Preservation System, and the National Wild and Scenic Rivers System;

    - Research Natural Areas of National Forest Lands;

- State-Protected Lands - Comparably significant to federally protected lands, state-protected lands, which are dedicated to resource preservation and were established prior to the enactment of the NWPA;

- Population Distribution and Density - highly populated areas and areas of 1,000 or more persons per square mile;

- Deep Mines and Quarries - rock and mineral resources greater than 100m in depth.

- Step 2 - This step applies to potentially adverse and favorable conditions specified by the DOE Siting Guidelines as scaled regional screening variables to identify the most suitable rock bodies/candidate areas that warrant further analysis in subsequent screening phases. Individual weights are associated with each variable in Step 2 to assign a relative importance to the variables and to help discriminate the most suitable candidate areas from alternate points of view on the relative importance of the variables. Step 2 screening variables are:

  Rock mass extent
  Major ground-water discharge zones
  Rock and mineral resources
  Seismicity
  Quaternary faulting
  Postemplacement faulting
  Proposed Federal-protected lands
  Population density
  Proximity to existing Federal-protected lands

Proximity to State-protected lands
National forest lands
State forest lands
Designated critical habitat for threatened and endangered species
Wetlands
Surface water bodies
Proximity to highly populated areas

- Step 3 - This step (sensitivity analyses) is designed to accomplish four major objectives. The first is to explore the implications of modifying the scales of Step 2 variables in the selection of candidate areas. The second is to prepare summary composite maps derived by utilizing different sets of weights for the Step 2 variables. The third is to evaluate the effects of using different indices of aggregate favorability (e.g., the geometric mean instead of the weighted average). The fourth allows further differentation by incorporating other geologic factors based upon available rock-body-specific data. The geologic factors to be incorporated are:

  Thickness of rock mass
  Thickness of overburden
  State of stress
  Ground-water resources

The main body of the document describes the Region-to-Area Screening Methodology which resulted from extensive consultation with the crystalline states, including three workshops on a review and comment period on the draft document, issued in September 1984. Section 3.2.3 of the document describes the proposed state involvement in the establishment of different sets of weights to be utilized in region-to-area screening.

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Appendix A of the document explains how DOE considered the comments received from the crystalline states on the draft Screening Methodology Document. Appendix B summarizes, by category, the proposed treatment of state protected lands in region-to-area screening.

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DOENEWS:

FOR IMMEDIATE RELEASE
APRIL 11, 1985

DEPARTMENT OF ENERGY ISSUES FINAL SCREENING METHODOLOGY FOR CRYSTALLINE REPOSITORY PROJECT

The U.S. Department of Energy (DOE) today issued its final Region-to-Area Screening Methodology Document for the Crystalline Repository Project. This document describes the process that will be used to narrow the geographic focus of lands under consideration from large regions to 15-20 smaller areas. This is part of DOE's studies to identify potential crystalline rock sites for the nation's second high-level nuclear waste repository.

The Crystalline Repository Project (CRP) is part of the overall responsibility of DOE's Office of Civilian Radioactive Waste Management, established by the Nuclear Waste Policy Act of 1982 (NWPA). The NWPA requires DOE to site, design, construct, and operate geologic repositories for the disposal of spent nuclear fuel and high-level waste. DOE is conducting studies of crystalline rocks, such as granite, in 17 states for possible location of the second repository. These states are in three regions:

North Central Region	Northeastern Region	Southeastern Region
Michigan	Connecticut	Georgia
Minnesota	Maine	Maryland
Wisconsin	Massachusetts	North Carolina
	New Hampshire	South Carolina
	New Jersey	Virginia
	New York	
	Pennsylvania	
	Rhode Island	
	Vermont	

(more)

The screening methodology consists of three-steps:

In the first step, DOE will use disqualifying factors to eliminate sites from further consideration. Some of those disqualifiers are national and state parks, national wilderness areas, national and state wild and scenic rivers, population density and distribution, and deep mine areas.

In the second step, environmental and geologic variables will be used to evaluate potentially adverse and favorable conditions. Some of the 19 screening variables are national and state forests, surface water bodies, seismicity, and geologic faulting.

In the last step, varying perspectives will be analyzed and compared with results of the second step. This allows for consideration of differences in technical opinion and available information.

This screening methodology has been developed in consultation with the 17 involved states listed above. It is also consistent with the General Guidelines for Recommendation of Sites for Nuclear Waste Repositories.

DOE's site screening process involves studies focusing on areas of successively decreasing size to determine if they contain sites that might be suitable for the development of a repository. The CRP's site screening process, leading up to site nomination and recommendation for detailed site characterization, consists of three phases--national survey, regional studies, and area phase.

Previously, a national survey identified the North Central, Northeastern, and Southeastern Regions with crystalline rock bodies for further study in the current regional phase. DOE will apply the region-to-area screening methodology to environmental and geologic data contained in the Regional Characterization Reports to identify 15-20 candidate areas for field work during the area phase.

No field work has been conducted by DOE during the current phase. Later this year, an Area Recommendation Report will document the results of implementing the region-to-area screening methodology. Field investigations, primarily involving samples from the drilling of boreholes, will determine if there are sites suitable for detailed site characterization within those candidate areas.

In 1983, potential sites were identified for the first repository in Louisiana, Mississippi, Nevada, Texas, Utah and Washington. In late 1984, DOE proposed three of these sites for recommendation for detailed site characterization. These sites are Yucca Mountain in Nevada, Deaf Smith County, Texas, and Hanford in Washington.

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A similar news announcement is being distributed simultaneously by DOE Headquarters in Washington, D.C.

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