FINAL DRAFT

NUCLEAR WASTE BRIEFING PAPER

The enclosed draft should be considered only a working draft of the Nuclear Waste Briefing paper. The paper reflects neither the official positions of the Department of Energy or the National Congress of American Indians. Written or oral comments are welcome regarding content additions, deletions, and paper structure.

A BRIEFING PAPER ON NUCLEAR WASTE MANAGEMENT

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OVERVIEW

The Nuclear Waste Policy Act of 1982, P.L. 97-425, addresses the critical need to identify suitable repository sites to store rapidly accumulating high level nuclear wastes including the development of effectively safe storage containers and transportation strategies. The U.S. Department of Energy, currently exploring sites for two underground repositories, is required by law to nominate five potentially suitable sites for concentrated consideration by January 1, 1985 for the first repository site and five similar sites for a second repository by July 1, 1989. Also, one or more monitored retrievable sites storing nuclear wastes in above ground facilities accessible for future reprocessing or underground storage are to be proposed by June 1, 1985 for Presidential consideration. The Act also requires an assessment of waste disposal at sea by 1989. The implications for Tribal governments and their peoples are enormous considering that the underground radioactive waste storage repositories must be capable of effectively containing the radioactive materials for up to 10,000 years. And, transportation of this radioactive waste by truck or railroad will undoubtedly favor routes through rural, sparsely populated areas potentially through or near reservation lands.

This briefing paper will introduce the subjects of nuclear power generation and nuclear waste management to Tribal leadership and interested Tribal members to provide background information for future discussions at the national, regional, and local levels. The controversial issue of man-made radioactivity is often mistakenly associated with nuclear war rather than the nuclear power industry and the extensive contribution of electrical power. Public apprehension is also created by reports of major leaks of defense radioactive waste at the Hanford,

Washington site, the Three Mile Island Nuclear Power Plant breakdown in Pennsylvania, and a general lack of knowledge. Proponents of nuclear reactor technology point out that few, if any, deaths can be attributed to nuclear power generation operations and that upwards to 25 percent of our energy needs will be supplied by nuclear power in the future. This paper is not designed to promote a particular view on the topic, but will attempt to present a balanced view with extensive reference for more in depth analysis by interested parties.

The Nuclear Waste Policy Act specifically references Indian Tribes along with state governments potentially affected by the repository site selection to be involved in the decision-making process. The law states the Secretary of the Department of Energy must enter into written agreement with the governing body of an affected Indian Tribe in an area under study for possible repository site selection so that the Tribe may "study, determine, comment on, and make recommendations with regard to the possible public health and safety, environmental and economic impacts of any such repository." This "Consultation and Cooperation" or C & C Agreement then serves as a negotiating tool initiating an official means of dialogue between the Federal government and the Tribe during preliminary and final site selection as well as financial assistance. According to the law, an affected Indian Tribe includes:

> "any Indian tribe--(A) within whose reservation boundaries a monitored retrievable storage facility, test and evaluation facility, or a repository for high-level radioactive waste spent fuel is proposed to be located; (B) whose federally defined possessory or usage right to other lands outside of the reservation's boundaries arising out of Congressionally ratified treaties may be substantially and adversely affected by the locating of such a facility: Provided, that the Secretary of Interior finds, upon the petition of the appropriate governmental officials of the tribe, that such effects are both substantial and adverse to the tribe;" Sec. 2(2) of the Act.

The Secretary of Interior, then, serves to review the treaty rights of Federally-Recognized Tribes and determine their eligibility to participate in

the site selection process.

The Department of Energy is currently considering repository site locations in six states for the first repository site as well as their geological structure and includes: Louisianna (Salt), Mississippi (Salt), Nevada (Tuff), Utah (Salt), and Washington (Basalt). On March 4, 1984 Department of Energy notification letters of potentially affected Tribal states were sent to nine Tribal Chairmen representing:

Coeur d'Alene Tribe, Idaho
Las Vegas Tribe, Nevada
Mississippi Band of Choctaw, Mississippi
Moapa Indian Tribe, Nevada
Navajo Indian Tribe, Nevada
Nez Perce Tribe, Idaho
Uintah-Ouray Tribe, Utah
Umatilla Tribe, Oregon
Yakima Nation, Washington

As of August, 1984, the Yakima Nation and Umatilla Tribes have received planning grants from the Department of Energy and are negotiating C & C Agreements. The Moapa Indian Tribe was denied affected status due to treaty limitations on off-reservation possessory or usage rights, and the Nez Perce application is pending a decision.

The second repository site area under consideration by the Department of Energy includes those 17 states with crystalline or granite rock formations, including: Connecticut, Georgia, Maine, Maryland, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, North Carolina, Pennsylvania, Rhode Island, South Carolina, Vermont, Virginia, and Wisconsin. The 16 Tribal Chairmen notified by the Department of Energy on November 2, 1983 as potentially affected included:

Bad River Tribe, Wisconsin
Lac Courte Oreilles Tribe, Wisonsin
Lac du Flambeau, Wisconsin
Menominee Tribe, Wisconsin

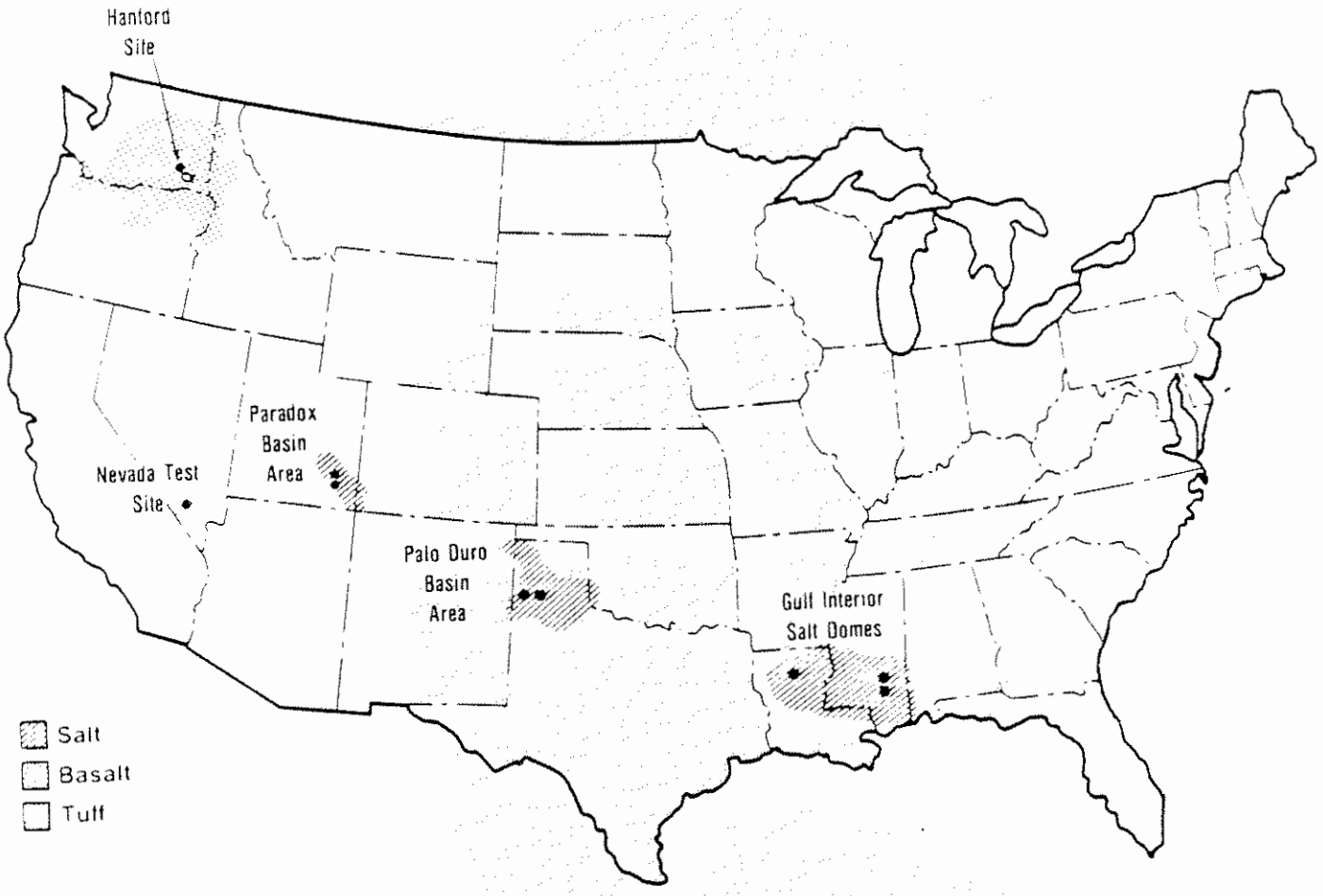
Oneida Tribe, Wisconsin
Red Cliff Tribe, Wisconsin
Sokaogon Chippewa Tribe, Wisconsin
St. Croix Tribe, Wisconsin
Nett Lake Tribe, Minnesota
Fond duLac Tribe, Minnesota
Grand Portage Tribe, Minnesota
Mille Lacs Tribe, Minnesota
Bay Mills Tribe, Michigan
Grand Traverse Band, Michigan
Keweenaw Bay Tribe, Michigan
Hannahville Indian Community Council, Michigan

Although the Tribes have been contacted, no Consultation and Cooperation Agreements have been made as the Department of Energy is still generally exploring geographic areas and has yet to determine if there are potentially acceptable sites in the crystalline rock formation. The maps on the following page illustrate the specific geographic areas under consideration for the first repository site and the general areas under review for the second repository site.

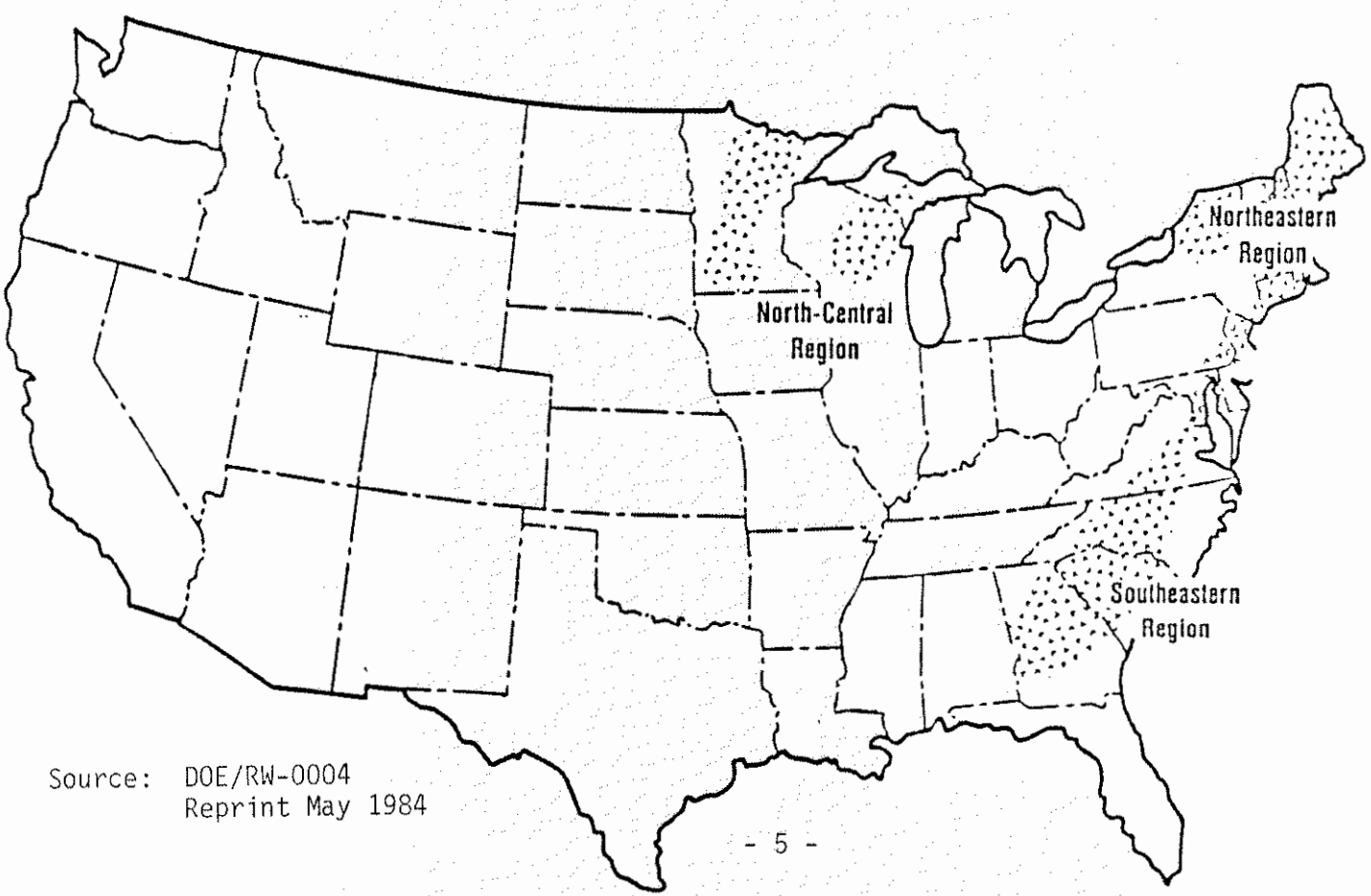
The nine sites for the first repository are under environmental assessments which are due for completion in the Fall, 1984. These sites include:

- Vacherie Salt Dome, Gulf Coast Salt Dome Basin, Webster and Bienville Parishes, Louisiana
- Cypress Creek Salt Dome, Gulf Coast Salt Dome Basin, Perry County, Mississippi
- Richton Salt Dome, Gulf Coast Salt Dome Basin, Perry County, Mississippi
- Yucca Mountain Site (tuff) on the Nevada Test Site, Southern Great Basin, Nye County, Nevada
- Palo Duro Site A (bedded salt), Permian Basin, Deaf Smith County, Texas
- Palo Duro Site B (bedded salt), Permian Basin, Swisher County, Texas
- Davis Canyon Site (bedded salt), Paradox Basin, San Juan County, Utah
- Lavender Canyon Site (bedded salt), Paradox Basin, San Juan County, Utah
- A-11 Site (basalt) on the Hanford Reservation, Pasco Basin, Benton County, Washington

POTENTIALLY ACCEPTABLE SITES FOR THE FIRST REPOSITORY



REGIONS BEING CONSIDERED FOR THE SECOND REPOSITORY



Source: DOE/RW-0004
Reprint May 1984

The site selection process further involves a 60 day approval period by the President of the United States after recommendation by the Department of Energy. If the President neither approves or disapproves of the selected site within that time frame, the site will be considered approved unless:

1) the President may invoke a 6 month delay in the siting decision which will require an approval/disapproval decision within that time period or the site will be considered approved; (Sec 112)

or

2) the governing body of the affected Indian Tribe may submit written disapproval of the site to congress 60 days after the President approves of such siting within an explanatory statement (Sec. 118); and,

3) an approval by both the House of Representatives and the Senate by joint resolution will be required to overturn a Tribal or state denial of repository site location.

In other words, the selection process will require extensive repository site review and justifications by the Department of Energy followed by specific time-lines for Presidential and Tribal approval/disapproval prior to Congressional action on specific siting.

The National Congress of American Indians, recognizing the importance of keeping Tribal governments informed as to developments under the Nuclear Waste Policy Act and the potential need for technical assistance at the local level, began negotiations with the Department of Energy, Office of Civilian Radioactive Waste Management in the Summer of 1983 to provide such services. In March, 1984 a cooperative agreement was awarded NCAI to:

1) Develop/Disseminate a Nuclear Waste Briefing Paper

2) Develop a Government-to-Government Rationale and Methodology Issue Paper

3) Facilitate formulation of a Nuclear Waste National Indian Review Committee comprised of representatives from affected Tribes, potentially affected Tribes, and interested Indian Tribal governments;

4) Provide information on P.L. 97-425 developments impacting Tribal governments in a timely manner

5) Provide a liaison role between Tribal governments and the Departments of Energy/Interior;

6) Coordinate briefings and presentations; and

7) Provide progress reports, Tribal policy concerns and recommendations, and identification of future needs to the Department of Energy.

The NCAI, under the cooperative agreement, has also included a logical sub-contract arrangement with the Council of Energy Resource Tribes (CERT) to address the more technical aspects of the site selection process as they relate to American Indian governments. Basically, CERT will provide during the first year:

1) technical needs assessments;

2) analysis of DOE research programs and information to determine applicability to Tribes;

3) translation, in conjunction with NCAI, of technical information into conventional language for laymen use; and,

4) technical support for Tribes in the first site selection category necessary to enter Consultation and Cooperative Agreement negotiations with DOE, review technical needs and advise those Tribes potentially affected by the second repository site, and, offer technical knowedge to other interested Tribes.

CERT will also provide technical staff support and information, as required, for NCAI forums and general information dissemination.

The NCAI mid-year convention held mid-May, 1984 in Denver, Colorado was the first opportunity to address the Nuclear Waste Policy Act in a public forum. Representatives from the Department of Energy, Office of Civilian Radioactive Waste Management and the Nuclear Regulatory Commission gave presentations on the act and their respective roles and responsibilities. After this session, Tribal representatives met privately to form the initial membership of the Nuclear Waste National Indian Review Committee with the charge of focusing attention on the surrounding potential legal, political, environmental issues of the Nuclear Waste Polict Act and provided both programmatic and policy recommendations to the NCAI. Representative of affected tribes and potentially affected Tribes in the first and second repository site area were encouraged to participate although membership has been open to representatives from all interested Tribes.

ISSUES FOR TRIBAL CONSIDERATION

The National Congress of American Indians at their 1984 annual convention in Spokane, Washington held three days of informational meetings and discussions regarding the Nuclear Waste Policy Act of 1982 and its implications for Tribal governments. The NCAI Nuclear Waste National Indian Review Committee submitted a policy paper to the NCAI General Assembly for adoption. The policy paper, adopted in principal by the NCAI Executive Council on September 14, 1984, is as follows:

I. GENERAL POLICY STATEMENT ON THE ISSUE OF NUCLEAR WASTE

Two years ago, "The Nuclear Waste Policy Act of 1982" was enacted by the U.S. Congress in Public Law 97-425.

The federal law was a belated recognition that no rational national policy had previously been established for addressing, and determining answers to, crucial questions related to the use, processing and disposition of toxic and radioactive nulcear materials, by-products and wastes, being produced in the United States and elsewhere.

In the short history of the rapidly advancing technologies of a Nuclear Age, it had become clear that production and use technologies had fastly out-paced the technology on nuclear waste handling and disposal. The production and build-up of nulcear wastes outraced the development of knowledge and answers regarding how they should be handled, stored, or otherwise disposed of -- indeed, even the knowledge of the actual and potential dangers.

A growing public awareness of actual and potential, known and unknown, dangers relative to nuclear technologies and wastes disposals and repositories, prompted enactment of the 1982 Act. Past actions were being recognized as nothing less than a careless violation of the public trust. In sense, the public became conscious of an on-going industry in nuclear wastes operating within its midst and sometimes threatening the human community with a range of possible and incipient dangers -- both to their persons and to their environment.

Because the public was conerned, and many people justifiably fearful of consequences and costs of this uncontrolled nuclear industry -- including those derived from some most beneficial uses, as in medicine or in energy production the Congress acted. And Congress acted with the knowledge that new wastes were

produced daily; that these wastes must be disposed of somehow -- somewhere.

Fortunately, the Congress recognized that Native people of the United States -- particularly Indian Tribes -- have direct interests in the public policies governing these issues, and in related actions and practices.

It has become evident, however, that, unfortunately, the 1982 legislation may fail -- rather, does fail -- to fully recognize the range of actual interests, rights and concerns, of Native American communities, as affected by the policies and provisions of the Act and its initial implementation or administration.

Who could be more concerned about thoughtful consideration being given to the matters of nuclear wastes disposition -- with all the attendant problems of endangerment by accident in immediate terms, environmental contamination in gradual or accelerating degrees with faulty depository selections, and the time lapse endangerments inherent to the radiological lifetimes of stored contaminants than the American Indian and Alaskan Native people who have held this continent sacred since time immemorial, and who continue to consider its protection a mindful duty?

The question is asked more than rhetorically. It is asked because the 1982 law and it's administration serves to recognize the rights of some tribes, then to deny the interests of others -- in part by mandating a say to some, while providing no say to others, in government-to-government relations and in the workings of decision-making processes. This defect ignores the seriousness of the issues involved, and their often transcendent nature over time and place or geography. Discriminating judgment, not discrimination, is required on these issues.

Outside of Alaska in the lower 48 States, Indian tribes retain an approximate

2% of the land base of these States within established reservation boundaries. For many, tribes, the extra-territorial rights reserved by treaties -- tribal rights of hunting, fishing, gathering and harvesting -- are more extensive than the lands secured as reservations. Water, together with the rights to that water, are another tribal interest which may be impacted by nculear waste disposal. These waters, which may arise on off-reservations, form aquifers and watersheds which may carry nuclear pollution, impacting Indian reservations. These consideration warrant concerns in the application of nuclear waste policies throughout the U.S.

The 1982 Nuclear Waste Policy Act likely did not assay the broad range of Indian interests and concerns during the process of formulation. Tribal governments were not sufficiently informed regarding its drafting and provisions, and have had but limited consultative opportunities in the P.L. 97-425 implementation.

The United States Congress is to be commended for addressing the Nuclear Wastes issues in a comprehensive approach. Yet, it is imperative that past mistakes not be repeated in the nation's continuing use and reliance upon nuclear substance technologies. The health and welfare of native people should not again be sacrificed by any neglect or withholding of the best available information, knowledge and technology, relative to these issues. Those already injured in health and body and family life should be fully cared for; and where remedies are needed and possible for communities adversely impacted by the primal stages of nuclear development, attention should be given to remedies.

The Nuclear Waste National Indian Review Committee was formed then convened on May 16, 1984, in conjunction with the mid-year conference of the National Congress of American Indians, in response to the broad Indian concern on these issues.

IT IS THE STATED POLICY OF THE COMMITTEE THAT:

Application of the Nuclear Waste Policy Act of 1982 should be implemented in the clearest context of the United States' obligations and trust responsibilities toward respecting, honoring, enforcing preserving, protecting and guaranteeing the varied rights and interests of Indian Nations under treaties and other established law.

Equitable funding should be accorded tribal governments commensurate with their governmental responsibilities under the Nuclear Waste Policy Act, and in parity with State and local governmental funding under the Act.

The 1982 Act must not be permitted to become another back-door attack on Indian governmental and property rights; nor to resurrect a concept of Indian people and properties as being expendable as a "national sacrifice" commodity nor be made pawns of "national security' pretexts. Tribes should be supported in preventing even "next door" attacks, particularly in protection of Indian interests in the transportation of high level radioactive waste across Indian lands and in siting of waste deposits in dangerous or impacting proximities.

The 1982 Act should serve as a model for the best in government-to-government relationships, and nothing less. And, while actual interests in a particular issue or action may vary in degree from tribe to tribe, as it does from State to State, all caution must be taken to avoid development of any adverse legal precedents under the Act which might tend to reshape or alter Indian rights to conform with a temporary or limited interest of measures under the Act. Both States and Tribes should be afforded all necessary consultations and participation appropriate to their governmental interests. Where doubts or defects exist in the 1982 law relative to the rights of affected Native poeple, any doubts should

be clarified or defects removed by government-to-government relations which assure that established Indian treaty, governmental and other legal rights are adequately protected and safeguarded.

II. STATEMENTS REGARDING PARTICULAR CONCERNS RELATING TO NUCLEAR WASTE

Trust Responsibility

Although the NCAI is aware that the trust responsibility which the United States of America owes to American Indian Tribes is shared by all three branches of the federal government, the NCAI wishes to begin its process of dealing with the federal government on nuclear waste issues by focusing on two matters of particular concern to the Executive Branch.

Regarding the trust responsibility of the BIA, NCAI urges that the BIA explore and consider with interested Tribal governments the development of a statement outlining the proper manner in which BIA fulfill its trust responsibilities to those Tribes who have not or may not meet the qualifications for "Affected Tribe" status under the NWPA even though they will be impacted by facilities authorized or planned by the NWPA.

Regarding the Trust Responsibility of the DOE, NCAI recognizes that the NWPA recognizes States and Tribes as sovereign governments. The DOE has funded States in the regions considered for the second repository, and yet has denied any funding arrangement recognizing the Tribal Governments within those regions. The effect of this is to deny the Tribes the special status mandated by the Act, while allowing States to enter into informal agreements to enjoy the funding privileges of the Act. The NCAI therefore urges that the DOE consult with and provide funding for those Tribes in second repository regions in such a manner as to follow the precedents it has already established in consulting with and providing money for the States in those regions.

Fearful that these issues not be lost sight of within the Executive Branch, the NCAI also urges that the Department of Interior assume its burden of trust responsibility by ensuring that parity between Tribes and States in second repository regions is enforced at the earliest possible date and that the Department of Interior continue its relationship with any Tribe on these issues once the Tribe begins to consult with DOE. The NCAI believes that the particular primary trust responsibility of the Department of Interior cannot relegated or delegated.

Tribal Cooperation

The NCAI encourages Tribes to explore avenues of cooperation which allow States and Tribes to circumvent barriers created by the Federal Government process mandated by the NWPA.

Transportation

The transportation of radioactive wastes through Indian lands jeopardizes Indian health, safety, and environment. Recognizing that the Federal Government has established processes which may enable Tribal governments to participate in decisions regarding the transportation of radioactive wastes through Tribal lands and lands in which Tribes hold reserved interests, NCAI urges that the Executive Branch work with interested Tribes to reroute radioactive wastes around these lands. Guidelines or regulations on these issues should be made available to all interested Tribes, commented on by those Tribes, and revised to reflect Tribal concerns if necessary.

Uranium Mining and Milling

Recognizing that American Indian governments are involved in the nuclear waste process, not only regarding NWPA facilities, but also in the mining which begins the cycle of these wastes, NCAI urges that the Executive Branch of the Federal Government keep Tribal leaders and their membership fully

informed of the harmful effects of uranium mines or mill tailings upon their reservations or other lands in which they have an interest if such activities have been done or are ever contemplated. More importantly, Tribal leaders must be kept fully involved in any remedial actions taking place as the result of tailings contaimination. The responsibilities of all Federal agencies involved must be clearly defined by those agencies and interested Tribes, in order to eliminate bureaucratic entanglements and uphold the trust responsibility. It is imperative that Tribes have access to all medical, technical, and legal information available so that sound decisions can be made that will maintain the existence of Indian people free from radioactive contamination.

III. ENDORSEMENT OF RESOLUTIONS OF OTHER BODIES

The attached resolution of a regional inter-Tribal organization is endorsed. NCAI will counsel and cooperate with this regional organizationa in their efforts to implement these resolutions.

IV. ENDORSEMENT OF TRIBAL LAWS

The attached Tribal law is commended. NCAI will counsel and cooperate with this Tribe in their efforts to give effect to these laws.

Ojibway • Oneida • Potawatomi • Stockbridge-Munsee • Winnebago

GLITC INC: GREAT LAKES INTER-TRIBAL COUNCIL INC

POST OFFICE BOX 9, LAC DU FLAMBEAU, WISCONSIN 54538 PHONE (715) 588-3324

RESOLUTION NO. 7-13-84A

WHEREAS, the Great Lakes Inter-Tribal Council, Inc. is a consortium of ten (10) Federally recognized Tribes and Bands, incorporated in the State of Wisconsin to "preserve the rights of the Indian people under Treaties or agreements with the United States and with any political subdivision" and "to do all manner of things necessary to improve the education, economic status, living environment, and general welfare of American Indians, and particularly those Indians who reside in the State of Wisconsin," and

WHEREAS, the Government of the United States is presently considering the development of a high level nuclear waste repository in Northern Wisconsin rock formations which underlay lands which are occupied by Native Americans; or are adjacent to lands occupied by Native Americans who are members of the Tribes and Bands of the Great Lakes Inter-Tribal Council, and

WHEREAS, the development of a high level Nuclear Waste Repository within the sovereign borders of lands occupied by member Tribes and Bands, or on lands ceded to the Federal government by member Tribes, is contrary to those Tribes and Bands responsibility to preserve the health and welfare of their citizens and environment, and

WHEREAS, the member Tribes and Bands of the Great Lakes Inter-Tribal Council retain certain TREATY RIGHTS, and will not give the govenment of the United States of America the right to contaminate the lands of the subjects of these reserved rights, and

WHEREAS, the Bureau of Indian Affairs and the Secretary of the Interior have the statutory responsibility of Trusteeship over the recognized Tribes and Bands of Great Lakes Inter-Tribal Council; their lands, their people, and their environment, and have as a part of that Trusteeship the responsibility for the protection of the people, their environment, and their TREATY RIGHTS, and

WHEREAS, the Wisconsin Radioactive Waste Review Board is requesting responses from Tribes and Bands on how they will relate to Review Board activities.

NOW, THEREFORE BE IT RESOLVED, that the member Tribes and Bands of the Great Lakes Inter-Tribal Council confirm the policies of:

1. Total opposition to the development of any nuclear waste facility which falls within the sovereign borders of any member Tribe or Band; or within any lands ceded to the Federal government by any member Tribe.

2. Total opposition to the sinking of test holes within the sovereign boundaries by any entity associated with the United States Department of Energy.

3. Cooperation with the United States Department of Energy only to the extent that member Tribes and Bands are bound by law.

BE IT FURTHER RESOLVED, that the Great Lakes Inter-Tribal Council, Inc. and its member Tribes and Bands will work cooperatively with the Wisconsin Radioactive Waste Review Board through attendance at meetings, by providing written and oral comments and by requesting an agreement for the purposes of related information exchange.

BE IT FINALLY RESOLVED, that certified copies of this Resolution will be forwarded to the United States Department of Energy, the Wisconsin Radioactive Waste Review Board, to the Governor of the State of Wisconsin, to the Secretary of the Interior and to the entire Wisconsin Congressional delegation.

CERTIFICATION

I, the undersigned as Secretary of the Great Lakes Inter-Tribal Council, Inc., Board of Directors do hereby certify tht the Board is comprised of ten (10) members of whom 8 were present, thus constituting a quorum, at a meeting duly called, noticed, convened and held on the 13th of July, 1984, and that the foregoing resolution was passed at said meeting by an affirmative vote of 8 members for, and 0 against, with 0 members abstaining.

Victoria A Ackley

Victoria Ackley, Secretary
Great Lakes Inter-Tribal Council, Inc.

MOTION by Ron Therriault to declare the Flathead Nation a Nuclear Free Zone. Further, to direct the legal staff to initiate the required action to develop an ordinance establishing the same. Seconded by Jim Steele. Carried (9 present)

1. NUCLEAR ENERGY: A HISTORICAL AND TECHNICAL PERSPECTIVE

A. The Science of Nuclear Power

The United States exploded the first atomic bomb over the New Mexico desert after several years of concentrated research on July 16, 1945. In early August, 1945 the awesome destructive capabilities of this new science were displayed by the dropping of atomic bombs on Hiroshima and Nagasaki, Japan to quicken the end of World War II. Almost a decade later President Dwight D. Eisenhower. announced the "Atoms for Peace" program with these words: "The atom stands ready to become man's obedient, tireless servant if man will only allow it." [1] Almost four decades later, nuclear bomb advancements and the proliferation of nuclear weapons continues as the primary threat to human existence as we know it. Advancements in nuclear technology for peaceful purposes, primarily nuclear fission reactors for electrical generation, have also developed as a promising energy source with the possibility of nuclear fusion providing renewable energy for centuries. The Federal government has sponsored extensive research on nuclear power generation. In recent years and through the Nuclear Waste Policy Act, research is being concentrated on the safe and economically efficient handling, packaging, transportation, and storage of nuclear waste generated for defense and commercial purposes. Almost all nuclear waste commercially produced by nuclear reactors is being temporarily stored safely in casks immersed in swimming-pool like structures at the reactor sites. These pools are gradually being filled to capacity requiring a more long term solution.

The world, as science knows it today, is comprised of countless atoms with varying combinations of positive, negative, and neutral charges. Groups of atoms form into molecules which become chemical compounds in nature compris-

ing the gases, liquids and solid matter of the world. Most atoms are known as "stables" as their structure remain relatively the same. A limited number of atoms are highly unstable in that they readily lose or gain parts of their basic structure. These very unstable atoms, known as "radioactive" elements, are in a constant state of decay as unstable or radioactive elements are lost until the atom becomes stable forming into new molecular structures.

"Radiation is the emission of rays, wave motion, or particles from a source. Examples of radiation are light rays, x rays, radiant heat, and particles smaller than atoms emitted by radioactive materials.[2] These subatomic particles released by radioactivity are joined by Alpha, Beta, and Gamma rays which are capable of changing the electrical charge of an atom or molecule. If enough molecules are changed in a living cell, the cells chemical process may be altered so that it dies. And if enough cells die in a living organism the organism itself will most likely die. This type of radiation which changes the electrical structure of an atom as molecule is known as ionizing radiation. "Other forms of radiation--for example, visible light, ultraviolet radiation, radio waves, and micro waves--produce less energy than ionizing radiation and so are less likely to damage the molecules that make up living cells, the fundamental unit of life."[3] "Man-made sources of radiation, such as fallout from nuclear weapons, diagnostic x-rays, and radioactive gases released routinely from nuclear power plants, constitute less than half the radiation to which we are exposed -nature supplies the rest. This natural, or background, radiation includes cosmic rays from outer space, uranium and thorium in the ground (which means that brick, stone, and other building materials are slightly radioactive), and radioactive chemicals (like Potassium-40) found in our bodies. We measure these various levels of exposure with the rem, a measure of the biological

damage to the tissue caused by a certain amount of radiation. A millirem is 1/1000 of a rem (1 rem equals 1000 millirems).

By way of background radiation the population is exposed to approximately 100 millirems per year, while man-made radiation exposes us to an additional 800 millirems annually. Individual sources of exposure vary: chest x-rays expose the lungs to approximately 10 millirems (0.01 rems), whereas the natural background radiation in a high-altitude city like Denver, Colorado, exposes the local population to 200 millirems (0.2 rems) yearly. By contrast, radioactive gases vented regularly from nuclear power plants on the average account for an exposure of less than 1 millirem (0.001 rem) each year."[4]

The United States has set limits of exposure to rems at 0.5 rems per year to individual members of the public; 5 rems for workers in university and government laboratories; and, a maximum of 0.17 rems as an average yearly dose to any population group.[5] The scientific community does not know the long term effect of exposure to various rem levels as long term studies are simply not available. Approximately a decade ago, chest x-rays were common practice in hospitals and clinics exposing patients each time to 0.01 rems. Due to the continued debate over the long term exposure to rems, x-rays have now been reduced to use as necessary for particular medical diagnosis.

These subatomic particles travel at speeds up to 100,000 miles per second through our bodies with the potential for damaging cells. However, it must be understood that each of us is bombarded "by about 15,000 of these particles of radiation--from natural sources--every second of (our) lives. In addition, when we get a medical x-ray we are struck by about a hundred billion of them."[6] The chances that they would do any harm, however, is "one chance in 30 quadrillion (30 million billion)."[7]

These estimates are based on naturally produced radiation. Man-made radiation is in more concentrated, lethal form. The testing of nuclear bombs

in the atmosphere was banned in 1963 by a treaty between the U.S. and U.S.S.R. as the dangers associated with exposure to radiation from greater distances was recognized. Unfortunately, individuals in Utah and Nevada who observed these blasts in the distance were exposed to dangerous, harmful rem levels. Pregnant women and children, it appears, are particularly susceptible as the cells in the fetus or young child are actively growing and splitting. A group of citizens, known as the "down-winders," have become active because of the high incidence of cancer and early death of those who watched the atomic blast. And, the Department of Defense has initiated a major study of those military personnel who took part in the bomb tests to determine the possible adverse affects to the participants, their children and grandchildren.

The most unstable or radioactive atoms natural to nature are found in uranium ore. Approximately 99.3 percent of the uranium mined for nuclear reactor or weapons purposes is relatively stable with .7 percent highly unstable or radioactive. The ore is mined and processed to enrich the small amount (.7 percent) of the fissionable isotope U235 to approximately 3 percent for sustaining a nuclear "chain reaction". Weapons grade U235 is enriched up to 90 percent. All the ore is radioactive to some extent and long term exposure to this low level radioactivity is now considered dangerous.

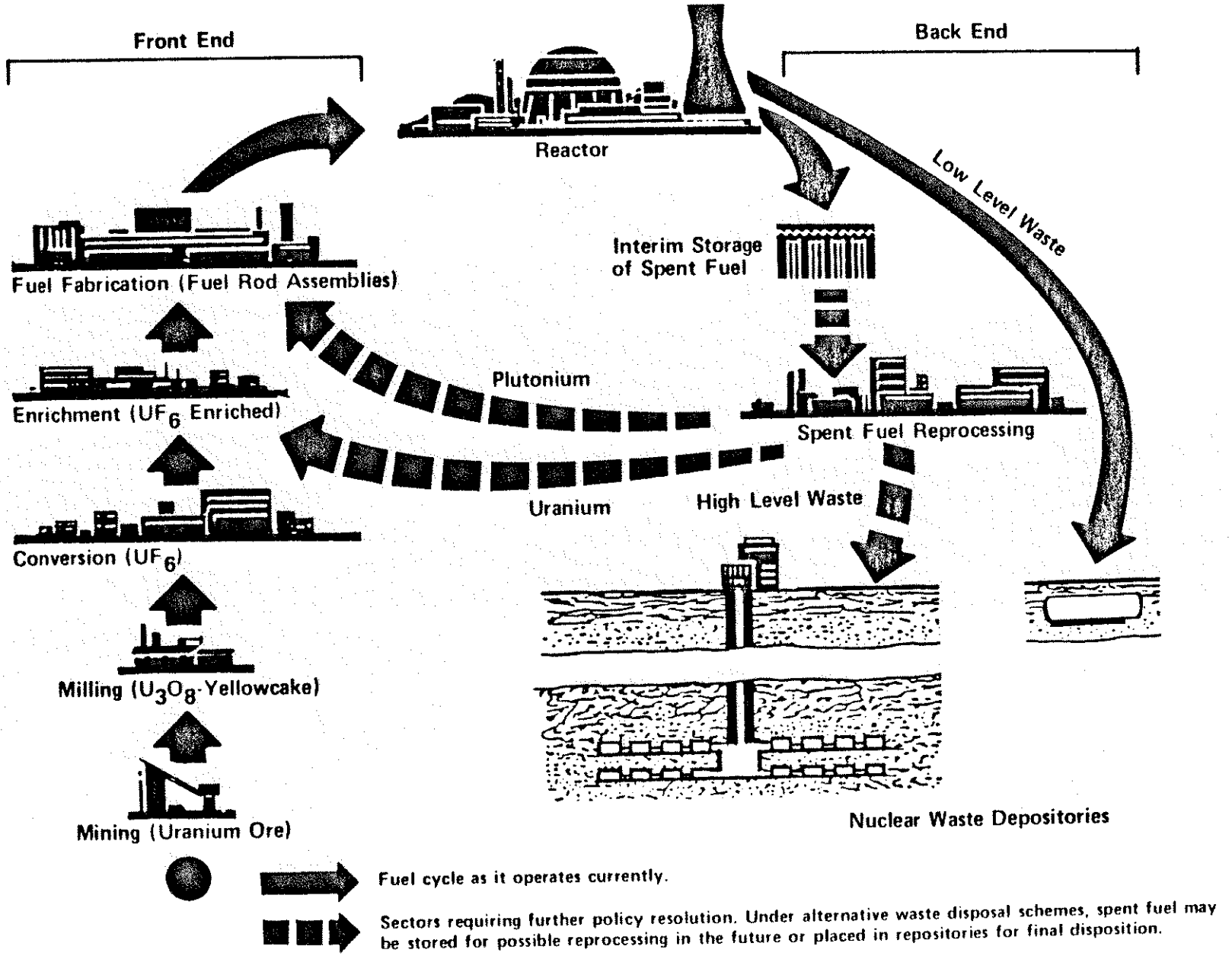
The ore is mined, chemically processed, and shipped in a solid form, known as "yellow cake", for further processing into small pellets stored in rows of metal tubes on nuclear fuel trays or "assembly". These pellets have been enriched to increase the highly unstable uranium to 2 to 3 percent of the original uranium making it much more fissionable. A ton of uranium ore will yield about four pounds of yellow cake.[8]

The nuclear power plant operates on a similar basis, in principle, as conventional coal-fired power plants in that steam produced by heat turns the generators to create electrical power. In the nuclear fission cycle, the highly unstable or radioactive atoms bombard each other as they decay in compacted form heating water under pressure above the boiling point; much like a pressure cooker. This pressurized water, in turn, heats clean water to create the steam. Control rods with chemical properties that absorb the atomic particles are utilized to control the nuclear fission by placing them closer to the fuel assembly to reduce fission reaction and lessen the heat or withdraw them to increase the nuclear reation and raise the heat.

The spent fuel of a nuclear reactor is highly radioactive due to the fission activity. This nuclear waste from commercial reactors is currently stored in special spent fuel storage pools at the reactor sites. Approximately 7000 tons of this commercial reactor waste is now stored in these pools awaiting either reprocessing or disposal.[9]

Spent fuel or nuclear waste is still valuable if reprocessed which creates a nuclear weapons grade element, plutonium, and reuseable nuclear fuel by-products thus reducing the waste. The danger that this weapons-grade material will be stolen by terrorists, thus proliferating nuclear weapons, led President Carter to ban all commercial reprocessing operations in 1977. President Reagan, however, has supported the concept. Foreign nations, such as France and Russia, reprocess spent fuel not only for themselves, but other nations as well. An illustration of this nuclear fuel cycle is provided on the following page.

COMMERCIAL NUCLEAR FUEL CYCLE



Source: FEMA REP 5, March, 1983
Guidance for Developing State and Local Radioactive Emergency Response Plans
and Preparedness for Transportation Accidents.

B. Growth of the Nuclear Power Industry

The "Atoms for Peace" initiative placed high hopes on nuclear power as the cheap fuel of the future. Some utility representatives claimed that electricity generated by nuclear fission would be almost too cheap to meter.[10] The Federal government comprised of the Congressional Joint Committee on Atomic Energy and the Atomic Energy Commission (AEC) worked closely and cooperatively with the public utility industry to license and build nuclear reactors.

The Federal government and "power companies" promoted the rapid growth of nuclear power. By the early 1970's, the sub system's direct and indirect subsidies such as basic research, technological demonstrations; cheap fuel, waste disposal, insurance underwriting, and expeditious licensing, had made nuclear power a far greater reality and prospect than its inherent competitiveness justified".[11] In the 1960's a nuclear plant cost $200 million. Nuclear reactors in the early 1970's were popular with 110 nuclear plants ordered between 1972 and 1974 with only 15 cancellations. Between 1978 and 1982 no new orders were placed and there were 44 cancellations. A modern nuclear power plant costs approximately $4 billion dollars.

The decline in orders for nuclear power plant cannot be blamed on high construction costs alone. High interest rates, reluctance of investors to gamble on such high stake construction, increased regulation, and loss of public confidence have all contributed to nuclear plant construction decline. High operation and maintenance costs coupled with a much lower projection of electrical energy demands has reduced the profitability of nuclear power. In the early 1970's energy sales were growing at an annual rate of 7 to 8 percent.

By the early 1980's, however, annual demand had dropped to 3 to 4 percent. Government estimates of future energy needs past the year 2000 have correspondingly dropped.[12] "Recent studies, including one by the utility industry, estimate that power from some of the reactors coming on line from 1983 until the early 1990's will cost 50 percent more than from comparable coal facilities".[13]

Nuclear power, however, has become a very important source of energy production domestically and internationally. In 1981, at least 78 nuclear power plants were licensed to operate providing 12 percent of the Nation's electricity. By 1990, it is estimated, with new plants coming on line, that nuclear power will provide 15 percent of the Nation's energy needs.[14]

The future of nuclear power is heavily dependent on scientific discoveries, electrical consumption or the economy and politics. Scientists are attempting to harness nuclear fusion with the promise of a much more energy efficient productive capacity. The breeder reactor, which creates more energy in the production of power is another possibility. However, the demonstration plant for breeder reactors in the United States, the Clinch River Breeder Reactor, is under extensive controversy in Congress and with the public at large. The environmental movement, which grew so rapidly in the 1970's, has raised the argument of nuclear reactor and nuclear power advancements to scientific debate. Ultimately, the future of the nuclear industry will rest in the political arena. The fact remains that nuclear power is a major contributor to electrical generation and will continue to grow with scientific discoveries and break throughs in the future. Indian Tribes and States, with the passage of the Nuclear Waste Policy Act, have an unprecedented direct role in the decisions being made regarding the packaging, transportation, and storage or disposal of nuclear waste. Indian Tribes will need factual, objective information to make knowledgeable decisions on nuclear waste issues.

C. Potential Benefits and Problems Associated with Nuclear Power

The supporters of the nuclear power industry point out that conversion to other sources of energy, such as coal, will be much more harmful to the environment due to the massive increase in air pollution and is extremely hazardous to mine. Dependence on natural gas and oil will only make us economically subject to the politics of third world sources of this finite fuel. Hydro-electric power is limited by the great demand on water. Solar energy, although a promising technology for limited levels of electrical generation, simply cannot capture and transform the energy necessary for industry. And, conversion to another major source of fuel to maintain industrial growth and quality of life will take at least a half century. Thus, the argument is to research, develop, and expand existing known technologies.

Those detractors of nuclear power contend that the risks of a nuclear accident by human error in a power plant, releasing large amounts of radioactive material into the environment are too great and irreversible. The damage to humans and other living organisms from low level waste contamination, creating cancer and destroying reproductive cells, may not be realized for several more decades.[15] Anti-nuclear individuals also believe research should be applied to more environmentally safe renewable fuels rather than continued reliance on nuclear advancements. And, finally, wastes from nuclear reactors will be the responsibility of future generations on the planet as we leave a deadly, accumulating legacy potentially creating environmental disaster according to those against the nuclear industry.

D. The Issue of Nuclear Waste

Nuclear waste is generally categorized as either low level or high level radioactive waste depending on the concentration of radioactivity. Low level radioactive waste consists of contaminated tools, clothing, and other items used in the handling of radioactive materials as well as the mill tailings left

from uranium mining. High level radioactive waste consists of spent fuel rods from nuclear power generation and defense-related highly radioactive waste created by the production of nuclear weapons. The problems, again, is that the amount of waste continues to accumulate each year. The scientific community had simply not anticipated any insurmountable problem in the packaging, and storage of radioactive waste.

"Today we are sitting on 70 million gallons of highly radioactive military waste that is stored temporarily at government facilities in Washington State, South Carolina, and Idaho, 69 million cubic feet of low-level commercial and military radioactive waste that is stored in shallow trenches in Washington State, South Carolina , and Kentucky, and 140 million tons of uranium mill tailings that are collecting in hill-like piles throughout the Southwest. Approximately 7000 tons of spent fuel from commercial reactors is stored on racks submerged in cooling ponds or "swimming pools" at each reactor site. Although military waste has been reprocessed in military centers since the end of World War II, of the three commerical reprocessing centers planned over a decade ago, only one, at West Valley, New York, saw completion, and it was closed down in 1972 under a cloud of controversy concerning accidental contamination at the site." [16]

A further problem with nuclear waste is that the nuclear power plants, themselves, will become non-useable after 30-40 years transforming "useful plants to a unique type of junk. The materials present in retired plants will include large volumes of concrete, metals, and other materials ranging in radioactivity from high levels for materials near the reactor cores to very low levels for exterior walls. Decisions are yet to be made about the treatment of retired reactors. They could be entombed in place after dismantling and removing

some of the most highly radioactive materials, left to decay for periods of decades or centuries, and ultimately dismantled. At the other extreme, they could be dismantled soon after retirement, and seperated into the then current class of radioactive waste...[17] In other words, every cycle of the nuclear fuel process from uranium mining to the reactor, itself, creates radioactive waste which will have to be addressed in future years. The first nuclear reactor to undergo decommissioning and decontamination is expected in the mid-1990's.

Also, "the U.S. Navy has about 120 nuclear submarines now in operation, 100 of which will be taken out of service in the next 20 to 30 years at a rate of three to five a year. Five already have been decommissioned and await permanent disposal.

The Navy presented three disposal options for these defueled craft in a Draft Environmental Impact Statement (DEIS) dated December 1982: bury the radioactive hull section and reactor at existing governmental land disposal sites; drop the entire defueled submarine onto a predetermined part of the ocean floor off a U.S. coast; or, continue protective storage at an inactive ship facility until permanent disposal is decided.

If land disposal is the choice, the submarine's reactor compartments would be buried either at the Hanford Reservation in Washington or at the Savannah River Plant in South Carolina - each of which is already a Low-Level Waste site.

If they are to be disposed in the ocean, the submarines would be towed ti designated sites and sunk by a system of controlled interior flooding, to rest intact on the sea floor. Since the fuel would be removed before disposal, the remaining radioactivity in the submarine at the time of disposal would be

radionuclides that are neutron-activated metal atoms within the structure of the reactor compartment. Those radionuclides could only be released by corrosion of the metal structure. Over a period of about 100 years, the reactor compartment containment barrier would be penetrated by corrosion, and bottom currents would begin to flow through it, transporting corrosion products into the adjacent environment. Naval engineers and radiologists calculate, however, that by then such reduced radionuclide emissions would be harmless to man.

The Navy DEIS does not select potential disposal sites, although study areas avoided regions that: (1) produce large amounts of seafood or which are food sources for commercial fishers; (2) are currently used by humans for any purpose; or, (3) have future resources potential - such as oil and gas fields, or ocean mining areas."[18]

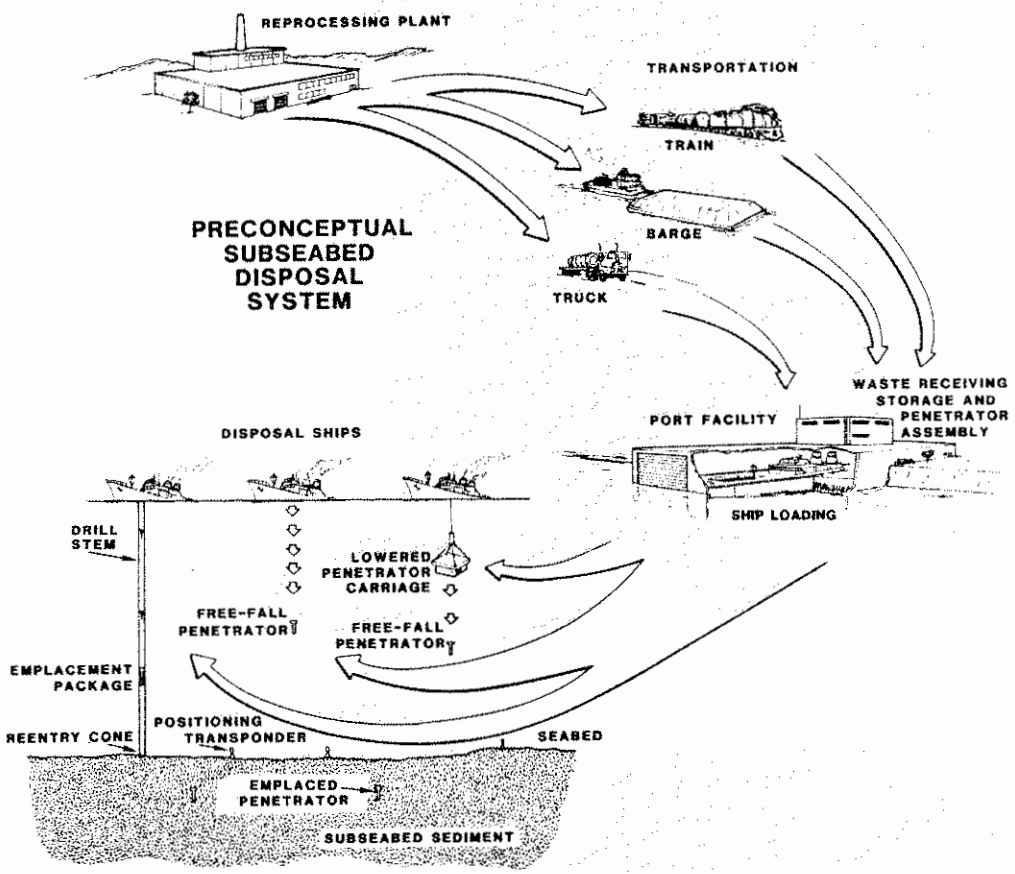
The low level waste problem, particularly uranium mine mill tail filings, became apparent to Congress with the enactment of the Uranium Mill Tailings Radiation Control Act of 1978, P.L. 95-604. Congress further concentrated on Indian Country regarding this problem with the Indian Health Care Amendments of 1980, P.L. 96-537 adding a new section 707, "Nuclear Resource Development Health Hazards" requiring a study be conducted of the health hazards to Indian miners and Indians living on or near Indian reservations, and in Indian communities, as a result of nuclear resource development. The sand-like substance left in the mill tail filings appeared ideal for construction purposes in the 1960's and 1970's. Unfortunately, homes were built in the Southwest with this low level radioactive waste material and miners exposed in early mining operations developed lung cancers. Stricter mining regulations have been enforced in uranium extraction operations and the Department of Energy is charged with completing remedial action on abuse of mill tailings by 1989.[19] Future mill tailings are to be

buried and sealed from water sources. However, it is estimated that mill tailing waste will reach 1.5 billion tons by the year 2000, ten times more than today.[20]

The scientific community continues to debate various methods of disposal for high level nuclear wastes. Strategies include burying the waste in sacks sunk into the ice in Antartica, drilling holes in the ocean floor deemed stable over several million years and dropping canisters of waste into the holes, sending the waste by rocket into orbit around the sun or into outer space, or burial into deep mine shafts in stable geographic areas. The scheme for ice burial are too unknown in terms of potential ecological disaster to attempt. Space jetison of nuclear waste would be too costly and dangerous (i.e. a rocket exploding on a launch pad.) The Nuclear Waste Policy Act does designate studies of ocean disposal of nuclear waste. The United States and foreign nations have dumped low level waste into the ocean over the years. Risks to man, in the dumping of high level wastes, has been considered negligible given the vast expance of water. However, radionuclides can travel through the marine food chain into fish and shellfish. If consumed by humans, effects would be harmful.

The National Advisory Council on Oceans and Atmosphere recently published a report, Nuclear Waste Manaegment and the Use of the Sea, which recommends research and consideration of nuclear waste burial in the ocean. Methods under consideration include drilling holes in the floor of the ocean and implanting

nuclear waste canisters or simply dropping the canisters into deep, stable ocean areas. Below is an artist's concept of various ocean disposal methods. The Department of Energy will be exploring this option with a decision due by 1989. The London Dumping Convention, signed by the U.S., allows for ocean disposal of low-level nuclear waste within limits set by the International Atomic Energy Agency.



SOURCE: Proceedings of the 1983 Civilian Radioactive Waste Management Information Meeting, December 12-15, 1983, Washington, D.C., DOE/CONF - 831217, p. 207.

Congress has focused primary research and development attention on deep mine storage beginning in 1998 under the Nuclear Waste Policy Act. But Congress, within this law, also provided for monitored retrievable storage of nuclear waste with potential sites to be identified in mid-1985.

The Monitored Retrievable Storage concept would be similar to a deep, underground repository excepting the nuclear waste would be stored near the surface on 200 to 1000 acres of land. This would allow the government the option to store high level radioactive waste for indefinite periods pending delays in the preparation of repository sites or breakthroughs in technological advancements. Currently, the Department of Energy is both exploring potential sites and considering acceptable dry storage technologies including metal storage casks, concrete casks, drywells, and vaults. [21] The waste could be deposited and retrieved for restorage or reprocessing in future years dependent on developing circumstances. Unfortunately, this system also exposes high level radioactive waste to the environment and potential terrorist intrusion.

The major scientific obstacles in packaging and storage of radioactive waste are the containment package levels of heat generated by the radioactive decay process and the potential seepage of radionuclides by under ground water systems into the environment. The Nuclear Waste Policy Act disqualifies any repository site where the ground water travel time from the waste deposit area to accessible environment is less than 1000 years.[22] Little is known as to the amount of heat potentially generated and its impact on the surrounding geologic formations. Granite in the crystalline states may possibly crack allowing for seepage of groundwater. The pro's and con's of the other favored

geologic formations including salt, tuff, and basalt are outlined by the Department of Energy on the following page. In terms of containment packages for long term storage of nuclear waste up to 10,000 years, there is obviously no "proven" technology to ensure complete containment. We are dealing with an issue requiring on-going research and development in conjuction with planning and implementation. The Nuclear Waste Policy Act, however, also provides for a test and evaluation facility, if necessary, to:

1) supplement site characterization
2) integrate and demonstrate known technologies
3) resolve repository licensing issues
4) validate scientific models
5) refine engineering
6) supplement siting data
7) evaluate waste packaging
8) establish operation capability

These facilities are to receive not more than 100 cannisters or 100 tons of retrieveable solidified waste.

GENERAL COMPARISON OF POTENTIAL HOST ROCKS FOR THE FIRST REPOSITORY

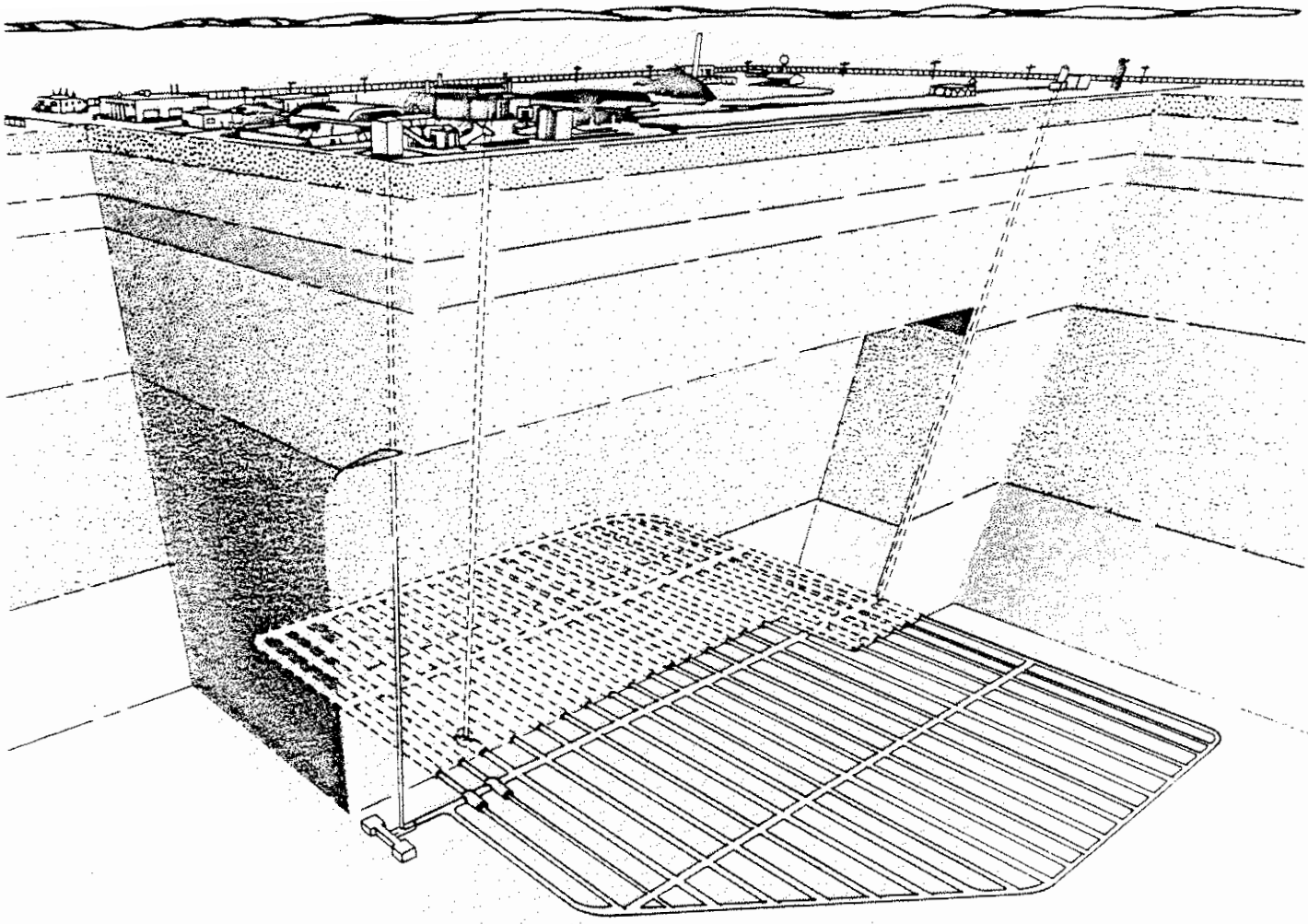
ADVANTAGES	DISADVANTAGES
BASALT	
Very strong rock	Complex hydrology very difficult to characterize and model
Low permeability at depth due to secondary minerals in fractures	Variations in lateral and vertical extent and properties make it difficult to characterize and model
Minerals that fill fractures and minerals that will form by chemical reactions during thermal pulse are commonly highly sorptive	Reduced mechanical stability due to fracturing
Characterized by geochemical conditions that generally inhibit radionuclide transport	Relatively expensive to excavate
No resource potential of the rock	Some layers have high permeability at shallow depth where they constitute aquifers
	Unknown resource potential in deep underlying rocks
SALT	
Very low water content	Natural resources (other than salt) commonly are associated with salt deposits; these include potash in bedded salt and sulfur, oil, and gas near salt domes
Very low permeability	
High thermal conductivity	
Deforms by plastic flow rather than fracture; fractures tend to self-heal	Highly soluble in water; extent and rate of dissolution difficult to characterize
Low cost of excavation	Creep closure of mined openings complicates modeling
Bedded salt is relatively easy to characterize and model	Likelihood of pockets of gas or brine
Extensive mining experience	Low sorptive capacity
	Salt domes are relatively difficult to characterize and model
	Highly corrosive to metal
TUFF	
Virtually no mineral or energy potential	Because composition and physical properties are highly variable, strata are relatively difficult to characterize and model
High sorptive minerals constitute large proportion of many beds	Reduced mechanical stability due to fracturing
Very low flux of water in arid regions	Aquifers in arid regions may be attractive to future generations
Present in significant thicknesses above the water table	Unsaturated zone hydrology not well understood and difficult to characterize and model
	Seismic activity tends to be high in regions where tuffs occur

Source: U.S. DOE Office of Civilian Radioactive Waste Management, Draft Mission Plan for the Civilian Radioactive Waste Management Program, April, 1984 DOE/RW-0005

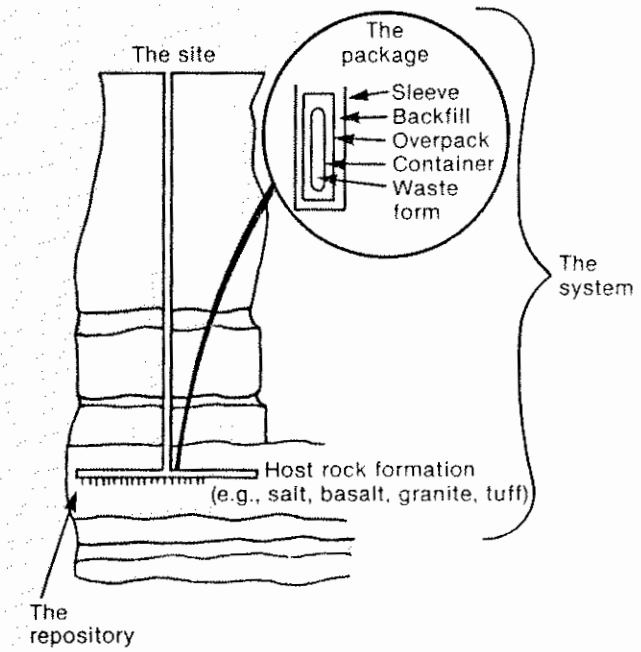
The nuclear waste repository site finally selected will be operable from 30 to 50 years as waste casks are stored underground. Radiation from the repository will be almost negligible due to the precautions in packaging the waste and burial 2000 to 4000 feet below the surface. The repository site on the surface will cover 4000 acres with a 1¼ mile controlled area around the facility to restrict any subsurface activity such as drilling and mining. The underground area will cover approximately 2000 acres with series of tunnels. Artists conceptions of a repository site and protective layers are provided on the following page.

When the nuclear waste arrives at the repository by truck or rail, the canisters will be unloaded, inspected to ensure it is completely sealed, lowered to an emplacement level, and transported to a final burial tunnel by a shielded vehicle. The canisters will then be lowered into holes drilled in the tunnel floors. As each tunnel floor is filled, the holes, tunnels, and shafts will be sealed. Ultimately, the whole storage area will be sealed.

The Nuclear Waste Policy Act requires, however, that the waste canisters may be retrieved for up to 50 years following the burial of the last canisters. After the repository closure, the government plans to use all reasonable methods to alert future generations of the repository site and its purpose. The repository should not be disturbed for thousands of years as the radioactive elements decay into other non-lethal chemical forms.



Mined Geologic Disposal Concept



Mined geologic disposal will use a system comprised of engineered barriers (the waste package and the mined repository) and naturally occurring barriers (the host rock formation and the chemical and physical properties of the repository site itself) to provide long-term isolation of waste from the biosphere.

Source: DOE/RW-0004, Reprinted May 1984
OTA-O-172, April, 1982

E. Federal Responsibilities

The costs associated with this massive undertaking by the Federal government is estimated currently at $7.4 billion including $3 billion for the first repository site, $2.2 billion for the second repository site, and the remainder divided between site screening and characterization, design and technology development, regulatory and institutional, project management, and financial assistance to States or Tribes.[23] Costs for Monitored Retrieval Storage facilities have yet to be developed. The Congressional Budget Office estimates a total financing cost of $13 billion up to the year 2000. The Nuclear Waste Policy Act established a Nuclear Waste Trust Fund which levies a millage rate at 1 mil per kilowatt hour generated by nuclear reactors to pay the costs.

Primary Federal responsibility for implementing the Nuclear Waste Policy Act rests with the Office of Civilian Radioactive Waste Management in the Department of Energy. The varying roles of Federal agencies are delineated as follows:

> "Department of Energy (DOE) has the primary overall assignment of developing the technologies and administering the facilities for radioactive waste management. In particular it will design, construct, and operate the final containment and isolation system for disposing of high level and transuraic wastes or spent fuel.
>
> Environmental Protection Agency (EPA) issues generally applicable environmental radiation standards effective outside the boundaries of sites that possess radioactive materials. Draft standards now are available on geologic waste repositories.
>
> Nuclear Regulatory Commission (NRC) develops and enforces regulations to protect the public health and safety from all domestic commercial nuclear activities. Rules on mined geologic repositories have been formulated and will implement specifically the general environmental standards set forth by EPA.

Department of Transportation (DOT) governs the shipment of all privately owned radioactive materials, including nuclear waste, by all modes of transport. It also administers the labeling, classification and marketing of all radioactive waste packages.

Department of Interior (DOI) through the U.S. Geological Survey (USGS) cooperates with DOE on technical activities in the earth sciences, including geologic investigations in support of waste disposal."24 The BIA also determines the status of affected tribes.

2. IMPACTS ON TRIBAL GOVERNMENTS UNDER THE NUCLEAR WASTE POLICY ACT

A. Provision for Tribal Government Participation

The Department of Energy guidelines for implementing early financial assistance assume two phases of a four phase framework designed to ensure effective Tribal and State participation, and, to provide adequate resources to accomodate that participation. As the repository site selection narrows, a Tribe may move from one phase to the next and funding will be discontinued for those Tribes whose affected status no longer applies. Tribes may be eligible for financial assistance for a "limited range" of activities prior to notification if a location is undergoing exploration/screening by the Department of Energy - Tribal participation includes review and comment on DOE documents and plans (see Phase 1 following this narrative)

Grant applications will be required to cover a detailed scope of the planned activites by the Tribe for the grant phase. Tribes will be expected to report on the progress and nature of their activities as well as budget maintenance. Grants made to Tribes during the later phases of the process (phases III & IV) will develop directly from the consultation and cooperation agreements entered into through the first two phases.

The following outline briefly describes the four phases of financial assistance Tribes may apply for:

PHASE I

PRENOTIFICATION

If exploratory or screening work is taking place in their area, but Tribes have not been formally notified, grants may be awarded to review documents and plans. Tribes which may at some future date be affected by sites under consideration for the second repository qualify for this financial assistance. Funds under this prenotification phase may also be used to assist the Tribes in preparing and negotiating consultation and cooperation agreements

PHASE II

NOTIFICATION

Tribes eligible for Phase II grants are those which have been notified that they have a potentially acceptable site for a repository. These grants are intended to maximize Tribal participation in the repository development program and are to facilitate the development of binding consultation and cooperation agreements. A Tribe may use these funds to gather information, develop draft provisions, monitor and evaluate DOE activities, and orient and train staff for the negotiation of consultation and cooperation agreements.

PHASE III

CHARACTERIZATION

Affected Tribes with recommended candidate sites which have been approved for site characterization by the President fall into this category of financial assistance. Funds under this phase cover expenses related to participation in repository site decisions, i. e. technical assistance, consultation, research etc.

PHASE IV

CONSTRUCTION

Tribes are eligible for grants through this phase when they have achieved affected status through a site which has been authorized by the Nuclear Regulatory Commission for construction of a repository. Funding under this phase will include only the sites ultimately selected for repositories.

The Department of Energy project offices for official contact by a Tribe are listed in Appendix B of this paper under National Nuclear Waste Resource Organizations and Agencies.

B. Socio-Economic Consideration

The placing of a nuclear waste repository site on or near reservation will create disruptions to the surrounding environment from construction, operation, and sociological standpoints. The Department of Energy forecasts a set of assumptions regarding socio-economic factors, including:

DEMOGRAPHIC IMPACTS

The demographic impacts of repository construction and operation include the following:

- Increases in population due to the influx of repository workers and their families.
- Secondary population growth to support repository workers.
- Changes in the age, income, and educational characteristics of the population.
- Possible in-migration and out-migration of transient or temporary specialized labor.

ECONOMIC IMPACTS

A repository will exert both positive and negative effects on the local economy. The significant economic impacts are likely to include the following:

- Increased local employment and competition for labor.
- Higher wages.
- Increased business sales and development of new business.
- Higher cost of living.
- Increased competition for resources.
- Changes in land values.

- Changes in uses of land and restrictions in uses of adjacent land.

SOCIAL IMPACTS

Experience with, and research on, large-scale development indicate that a repository is likely to affect the social organization of communities in some of the following ways:

- Changes in the quality of life.
- Increases in social disorders (e.g., crime, delinquency, and marital stress).
- Emergence of new sources of comunity leadership.

The influx of a large number of people during repository construction may change the informal and intimate nature of social relationships. Long-time residents may feel that their community is less familiar, less friendly, and less harmonious. Rapid increases in population can contribute to increased rates of family conflict and divorce,crime, drug abuse, and mental illness. Conflicts between long-time residents and newcomers may occur. Furthermore, some people may move to the area before they have found a job, and these individuals may burden social services if their expectations of employemnt are not met.

Because of increased demands on local institutions, leadership requirements may change. Professional managers, technical personnel, and planners may be needed to carry out impact-assistance programs. New residents may also influence local community relations by participating in politics and civic groups. New organizations will form, and new community leaders may emerge.

Another kind of impact is related to the attitudes and apprehension of the public. Citizens will expect to receive complete and candid information about the possible hazards of a repository; they will also expect to see con-

siderable attention devoted to safety precautions and emergency preparedness. At the outset, local citizens may feel that major decisions concerning the repository are made by others and that their views are given limited attention. This attitude may create a climate of mistrust that makes it more difficult to develop appropriate impact-assistance plans.

As repository development proceeds, local citizens may see good and bad effects more clearly, with unpredictable results. For example, they may see that many social and service impacts are more negative than they first expected. On the other hand, they may see that development-related changes provide a needed boost to the economy and additional job opportunitites, enhancing the community's long-term viability and creating a more varied service base. It is likely that the views of local citizens will change during the life of the project.

FISCAL IMPACTS

Most large development projects result in financial burdens or benefits for some individual or organization, often a local or county government. The fiscal effects of the repository will include the following:

- o Financial assistance to affected States, affected Indian tribes, or communities.
- o Increased property taxes
- o Increased cost of community services.
- o Additional tax revenues.

COMMUNITY SERVICES

Population increases may affect the quality and distribution of community services, especially in sparsely populated areas. Like other impacts, service impacts may be either beneficial or adverse.

Increased demand may improve the quality of some services. For example, declining birth rates have led to decreased enrollments in rural schools and to fewer educational opportunitites. New workers with young children, however, will demand additional educational services, which may result in improved overall quality of education. Similarly, the occupancy rates of rural hospitals have often been too low to maintain many specialized services, but growing populations may require additional health-case services.

However, new demands could also burden or disrupt other services--such as water and sewage treatment, housing, solid-waste disposal, police and fire protection, social services, and recreation--unless these services are expanded. Overextension in public services may be the most troublesome impact associated with repository development, and communitites will need to plan carefully for it.

The population increases that accompany repository development may also change the distribution and form of service delivery. For example, part-time law-enforcement personnel or nonscheduled garbage collection may have been sufficient in the past, but more predictable service may be needed to meet the increased demands of a larger population.[25]

The National Academy of Science's Panel on Social and Economic Aspects of Radioactive Waste Management recently published a report entitled: Social and Economic Aspects of Radioactive Waste Disposal. The report encourages the Department of Energy to spend more research attention on the socio-economic issues of a nuclear waste repository. Assurance should be

made for local public participation and the resolution of adverse impacts. As social theory research in this arena is limited, the panel advises that DOE take extra precautions to explore socio-economic consequences of repository siting.

In summary, extensive scientific and financial resources are being applied to the packaging, transport, and permanent burial of high level nuclear wastes. Active Tribal involvement in th planning and development stages with respective State governments and Federal government will help ensure a safe environment and effective nuclear waste repository process.

C. Transportation of Nuclear Wastes

(1) Current and Planned Transportation Modes

The Department of Energy currently proposes to transport nuclear waste primarily by railroad with limited truck carriers on interstate highway systems. Railroad transport is currently considered more cost-effective due to volume and weight per cask or container unit. The possibility that nuclear waste transportation routes will be through or near Indian reservation lands will depend on the geographic location of the reservation in relation to nuclear reactor site locations creating the waste and the selected locations for nuclear waste repositories. Geographic proximity to the nuclear waste repositories will obviously increase the likelihood of nuclear waste transport impacting the reservation area.

Based on current repository location considerations and the location of existing and planned nuclear reactors, the Department of Energy has developed possible truck route scenarios illustrated on the following pages for repository sites located in the Northwest, Southwest, Gulf states, and Midwest. The thickness of the black lines on the transportation routes indicate the number of shipments as shown by the bar chart above each map. These routing illustrations are followed by an illustration of current nuclear reactor locations and a more refined map of all nculear waste generation sites in the United States including military and Federal locations.

The government estimates that "approximately 500 billion packages of all types of commodities are shipped in the United States each year, and approximately 100 million (.02 percent) of the total estimated shipments involve hazardous materials such as flammables, explosives, poisons, corrosives and radioactive materials. The most recent estimate of annual radioactive material shipments in the U.S. indicates that there are approximately 2 million shipments of

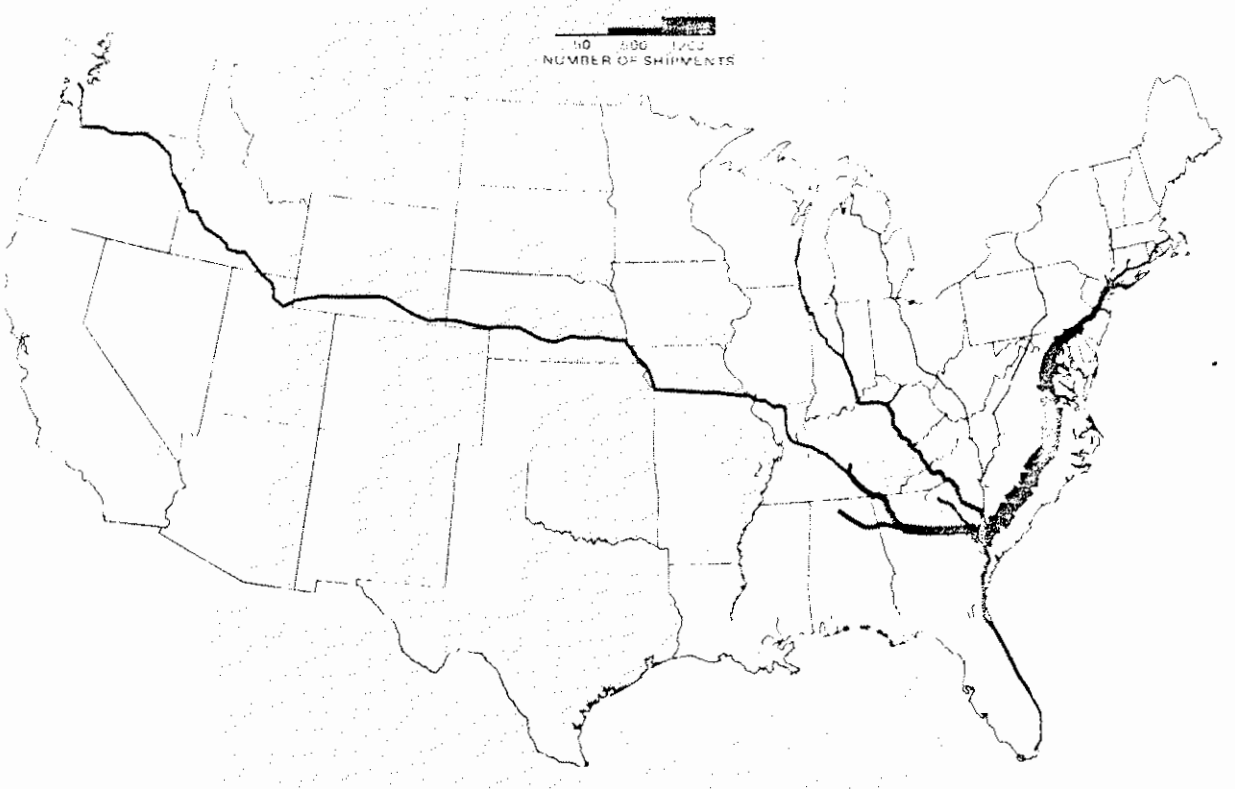


FIGURE A.1 Projected annual spent-fuel shipments to a southeastern storage site in 2004. Basis: reactors with truck service only (for demonstration purposes only).

FIGURE A.2 Projected annual spent-fuel shipments to a southeastern storage site in 2004. Basis: reactors with rail service (for demonstration purposes only).

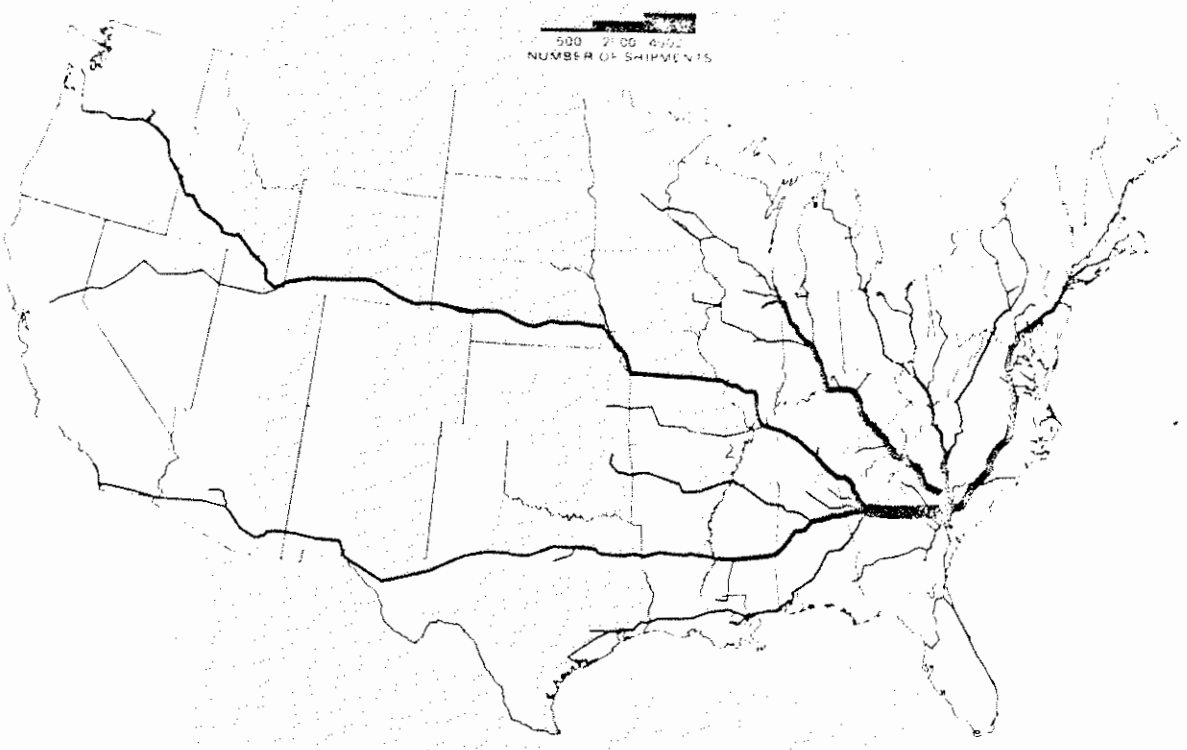


FIGURE A.3 Projected annual spent-fuel shipments to a southeastern storage site in 2004. Basis: truck shipments from all reactors (for demonstration purposes only).

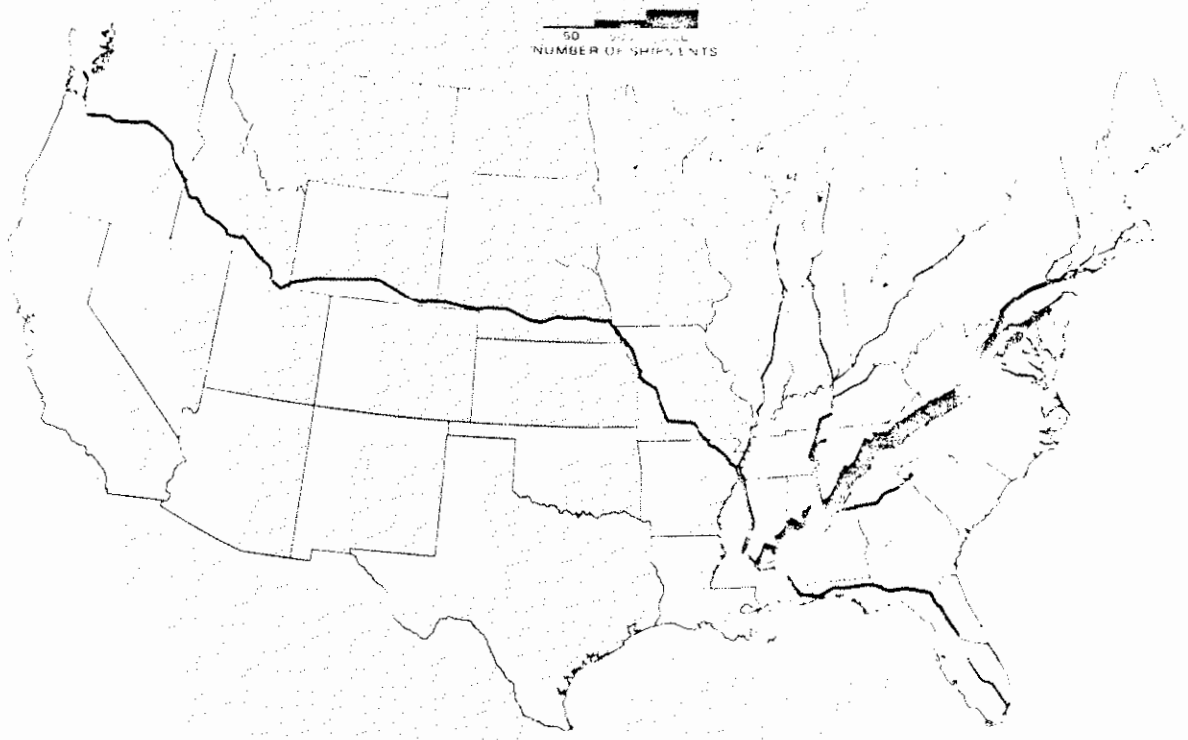


FIGURE A.4 Projected annual spent-fuel shipments to a Gulf Coast storage site in 2004. Basis: reactors with truck service only (for demonstration purposes only).

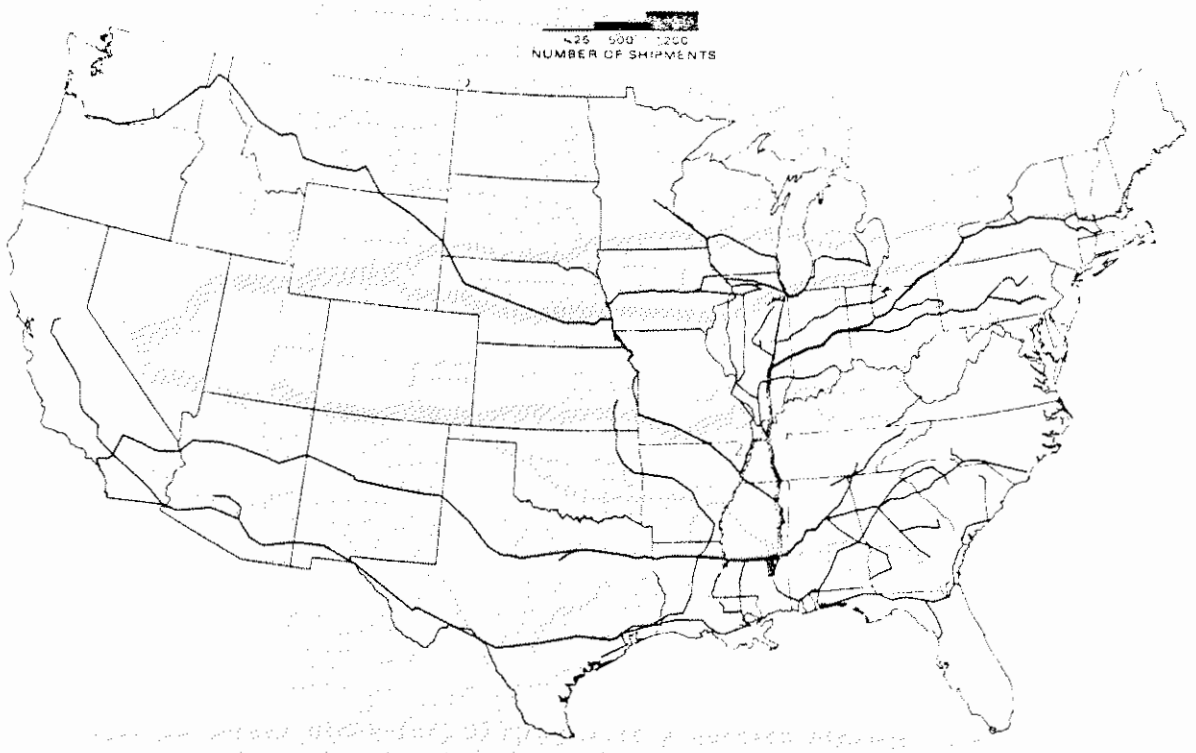


FIGURE A.5 Projected annual spent-fuel shipments to a Gulf Coast storage site in 2004. Basis: reactors with rail service (for demonstration purposes only).

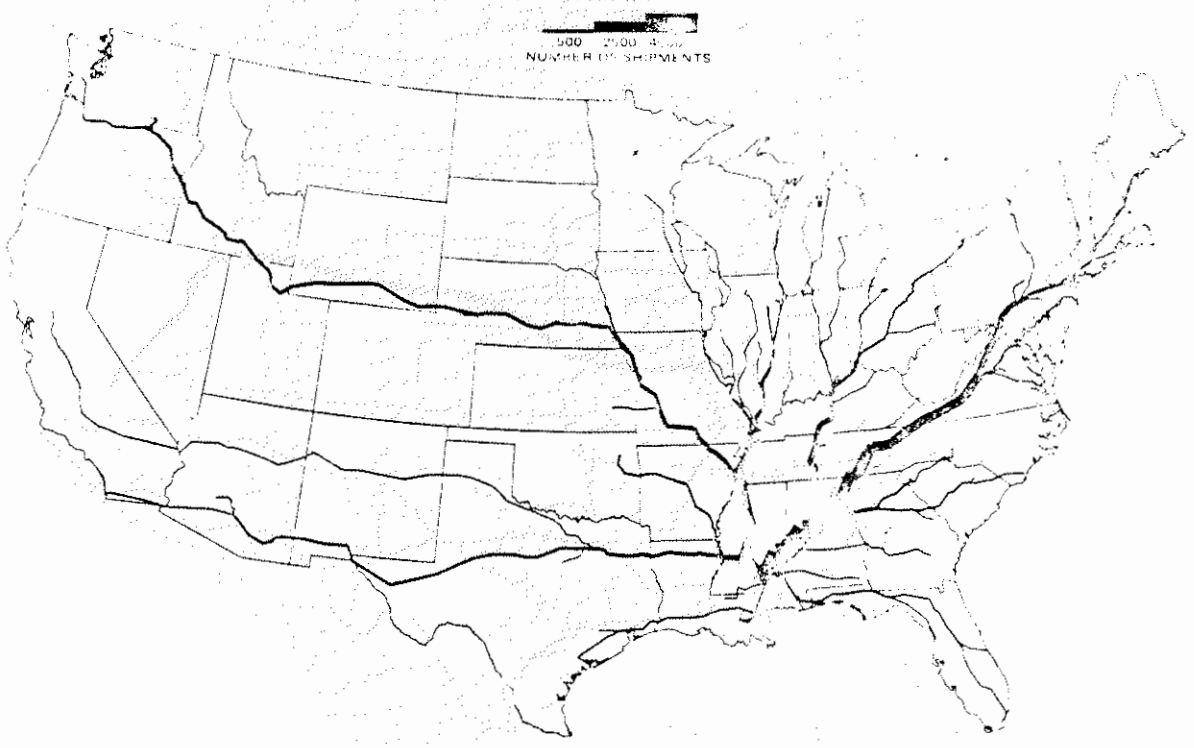


FIGURE A.6 Projected annual spent-fuel shipments to a Gulf Coast storage site in 2004. Basis: truck shipments from all reactors (for demonstration purposes only).

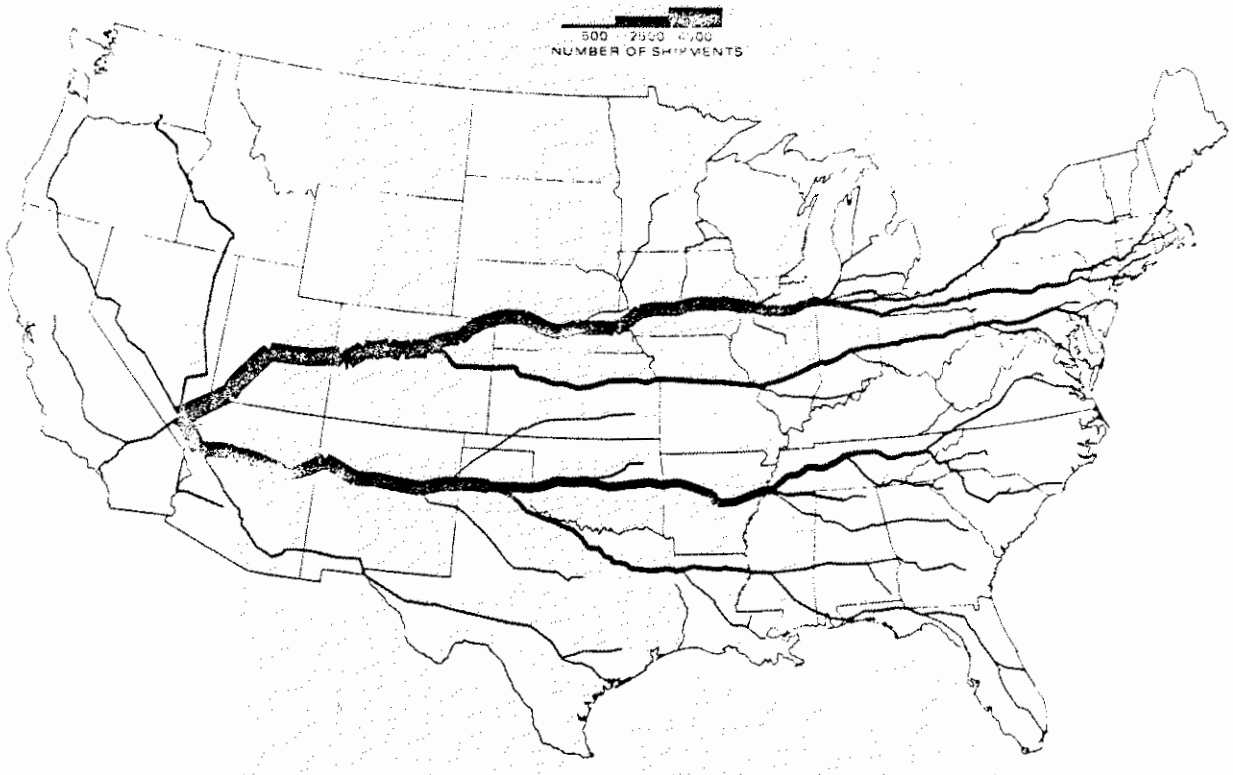


FIGURE A.9 Projected annual spent-fuel shipments to a western storage site in 2004. Basis: truck shipments from all reactors (for demonstration purposes only).

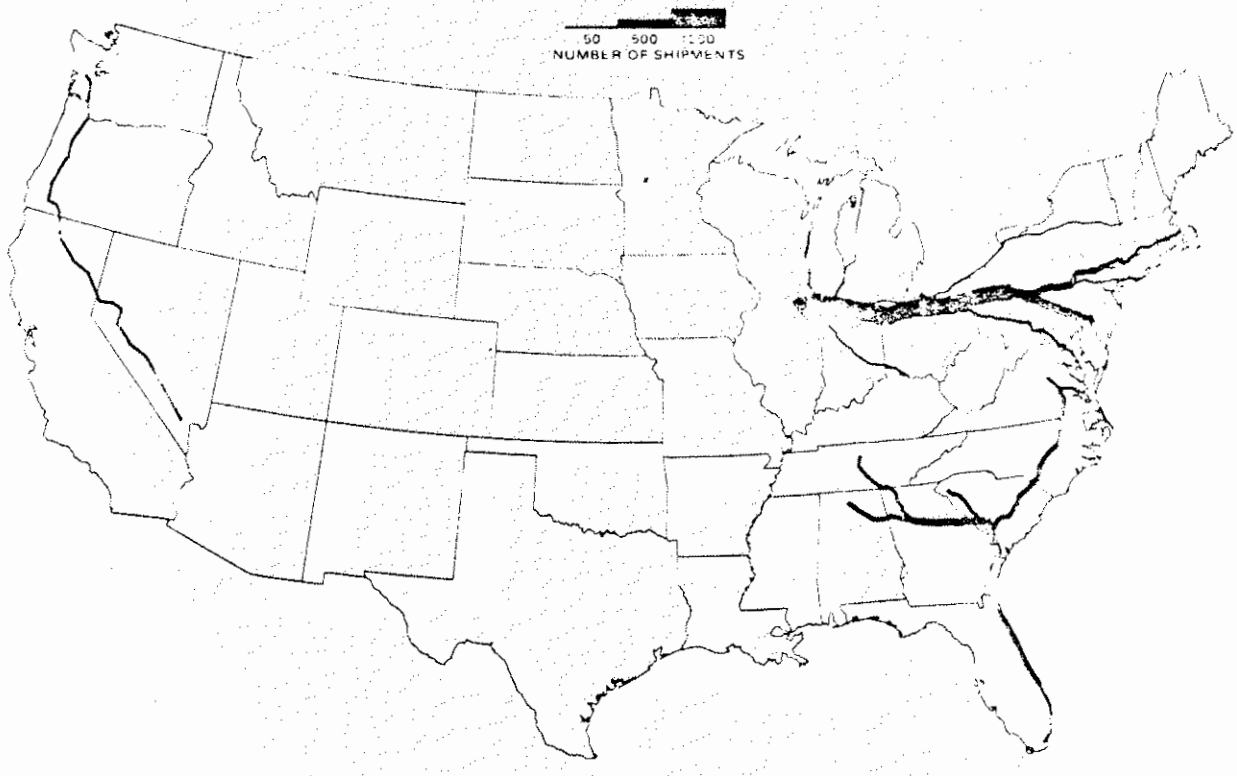


FIGURE A.10 Projected annual spent-fuel shipments to regional storage sites in 2004. Basis: reactors with truck service only (for demonstration purposes only).

FIGURE A.11 Projected annual spent-fuel shipments to regional storage sites in 2004. Basis: reactors with rail service (for demonstration purposes only).

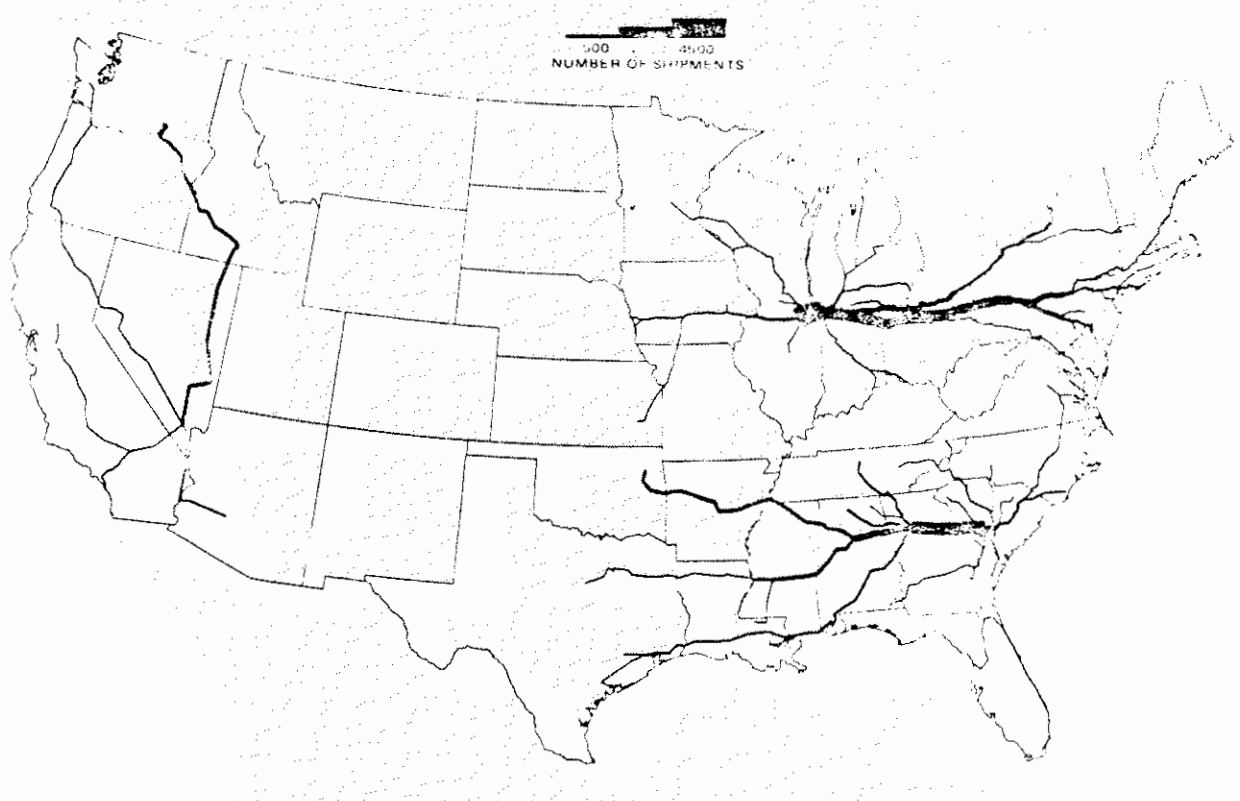
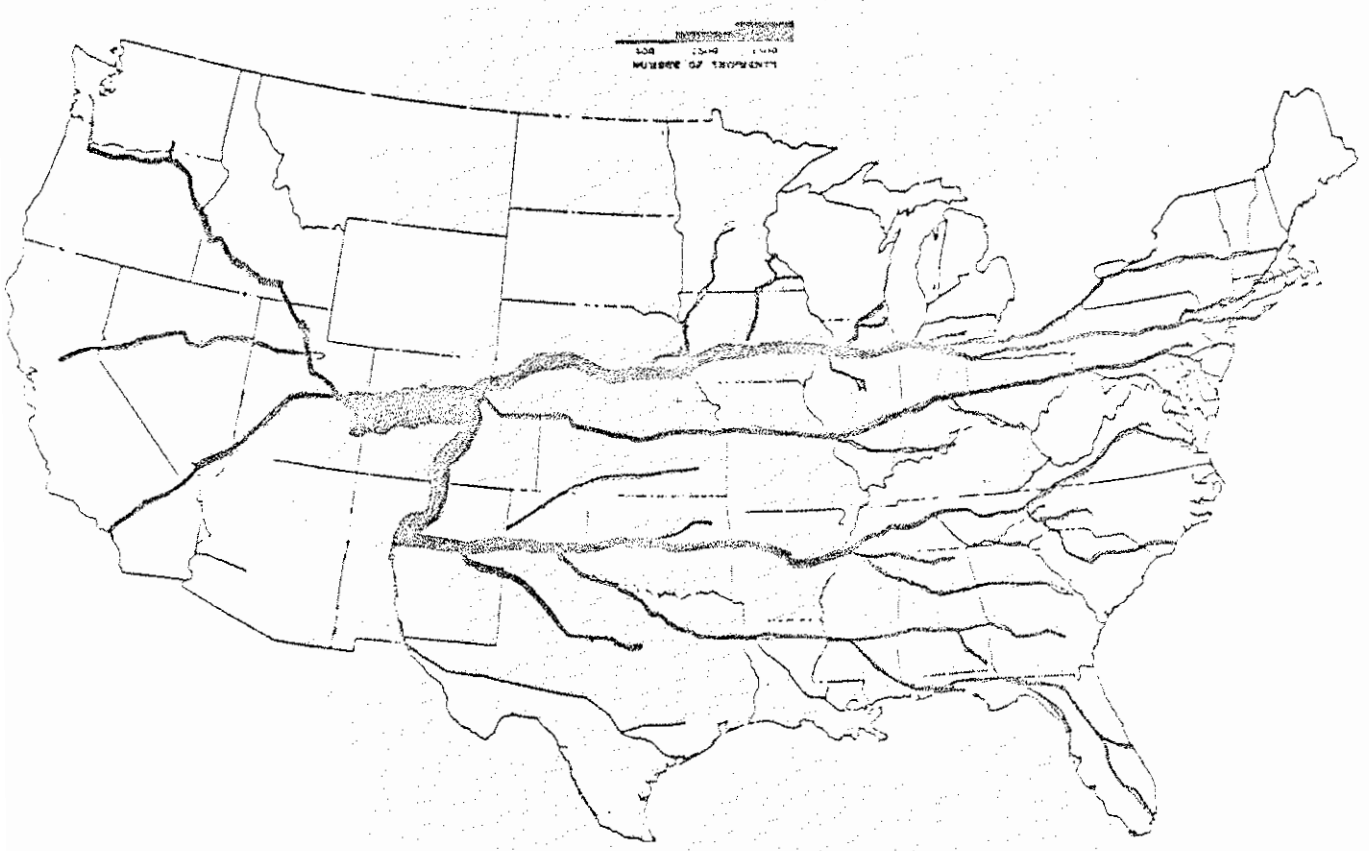
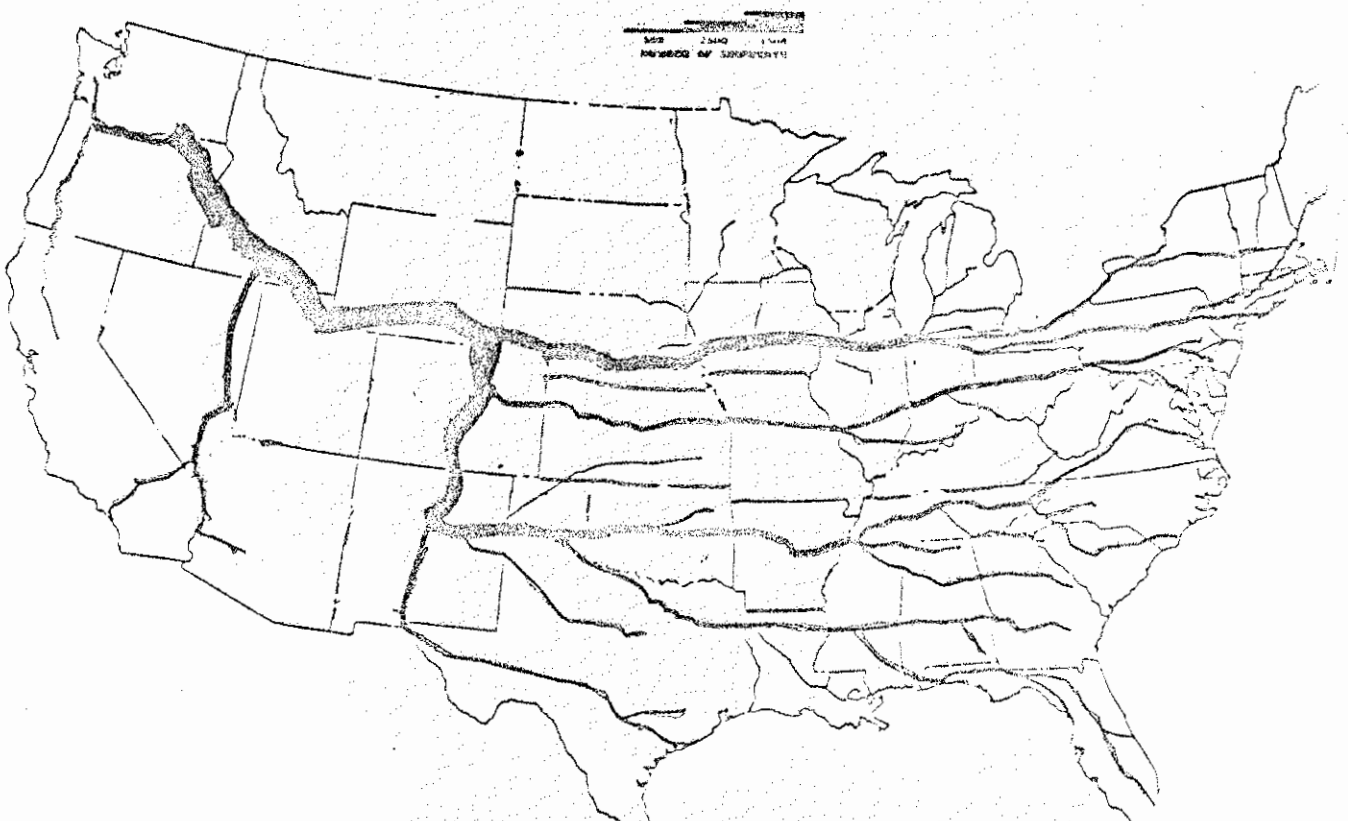


FIGURE A.12 Projected annual spent-fuel shipments to regional storage sites in 2004.

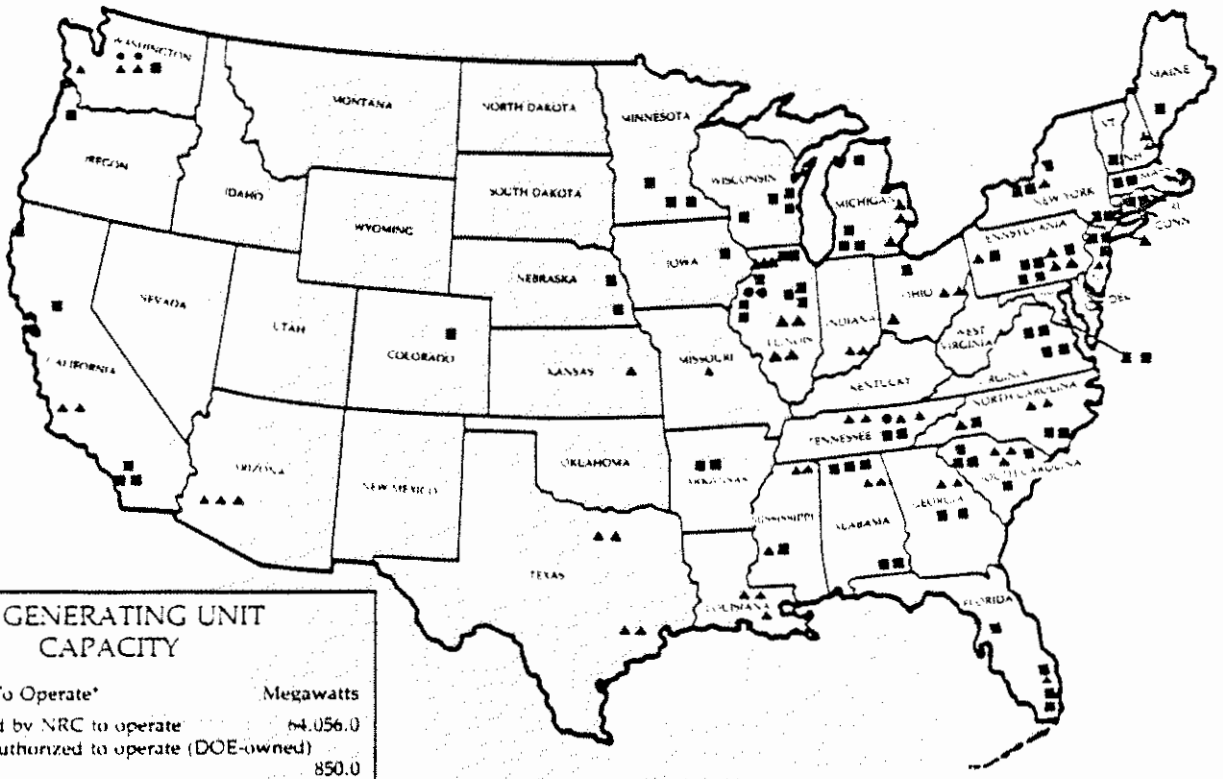
PROJECTED ANNUAL SPENT FUEL SHIPMENTS
TO A WESTERN STORAGE SITE IN 2004
BASIS: TRUCK SHIPMENTS FROM ALL REACTORS
(FOR DEMONSTRATION PURPOSES ONLY)



PROJECTED ANNUAL SPENT FUEL SHIPMENTS
TO A WESTERN STORAGE SITE IN 2004
BASIS: TRUCK SHIPMENTS FROM ALL REACTORS
(FOR DEMONSTRATION PURPOSES ONLY)



COMMERCIAL NUCLEAR POWER REACTORS IN THE UNITED STATES



NUCLEAR GENERATING UNIT CAPACITY

	Megawatts
■ Licensed To Operate*	
81 licensed by NRC to operate	64,056.0
1 other authorized to operate (DOE-owned)	850.0
▲ Being Built	
80 construction permits	86,004.6
■ Planned	
5 reactors ordered	5,140.0
147	136,050.6

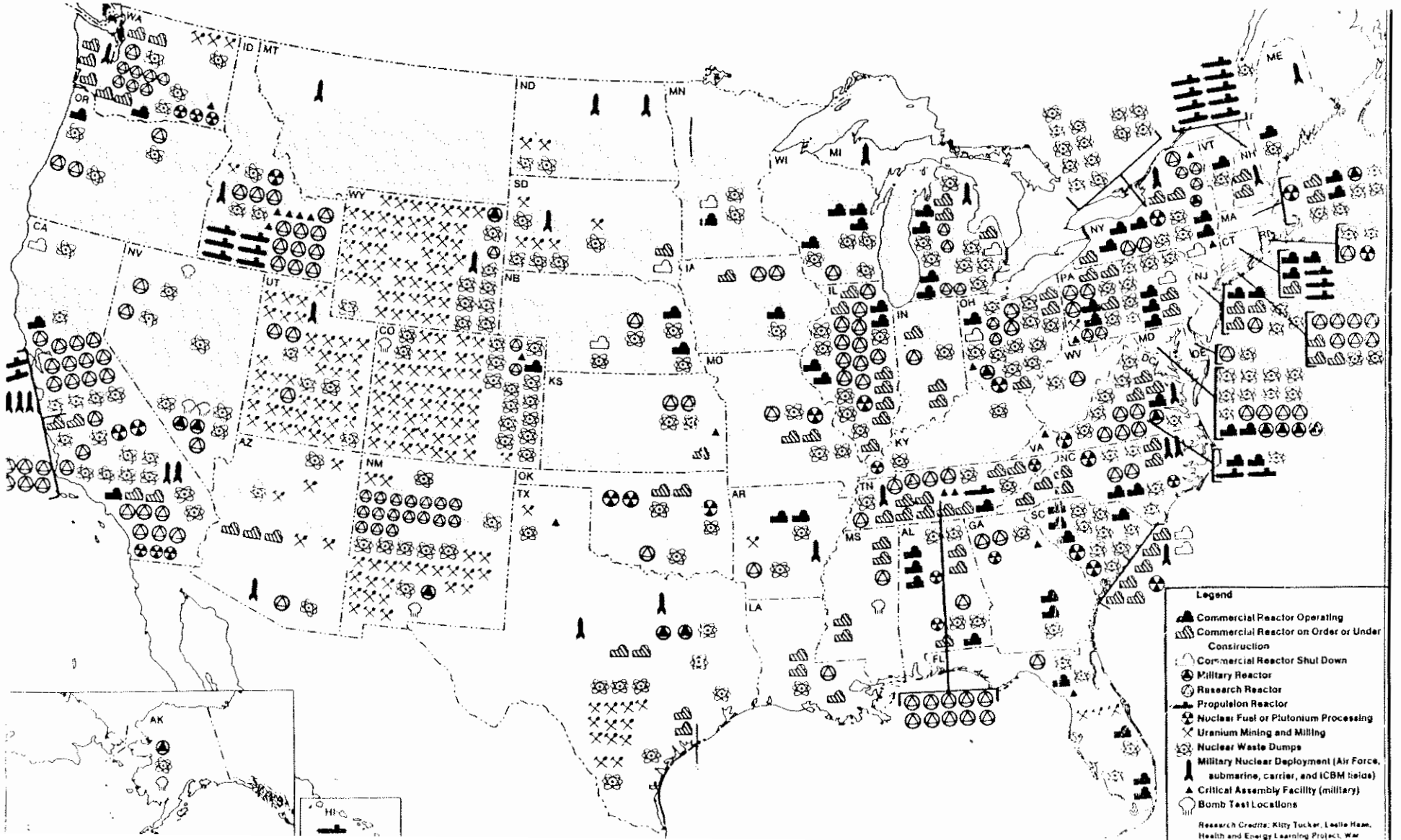
*Includes San Onofre 3 and Grand Gulf 1, which, as of Jan. 1, 1983 are authorized to load fuel and conduct low power testing.

There are no symbols for units planned but not sited. Because of space limitations, symbols do not reflect precise locations.

DOE-Department of Energy
NRC-Nuclear Regulatory Commission

Figure I-1.—Status of Commercial Nuclear Power Reactors in the United States as of January 1, 1983.

Source: U.S. Department of Energy. 1983. Nuclear Reactors Built, Being Built, or Planned. DOE/TIC-8200-R47, Technical Information Center, Oak Ridge, Tennessee, p. 6.


WA
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MD
DE
NJ
CT
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Legend
Commercial Reactor Operating
Commercial Reactor on Order or Under Construction
Commercial Reactor Shut Down
Military Reactor
Research Reactor
Propulsion Reactor
Nuclear Fuel or Plutonium Processing
Uranium Mining and Milling
Nuclear Waste Dumps
Military Nuclear Deployment (Air Force, submarine, carrier, and ICBM fields)
Critical Assembly Facility (military)
Bomb Test Locations
Research Credits: Kitty Tucker, Leslie Hawe, Health and Energy Learning Project, War

radioactive materials per year. About one-third of the radioactive material packages which are shipped annually contain such small quantities of radioactive materials that they are exempt from the packaging and labeling requirements of the Department of Transportation regulations.[26] In terms of spent nuclear fuel, the government notes that there have been 5500 shipments in the last twenty years involving only two transportation accidents of any kind and none involved the release of radiation.[27] The government regulation of nuclear waste transportation, as will be explained, has made the possibility of an accident involving the spillage of lethal nuclear waste quite remote.

The amount of spent fuel currently stored in reactor plant water pools is 8000 metric tons. It is estimated that 72,000 metric tons will be in temporary storage by the year 2000. According to the Congressional Office of Technology Assessment, "full-scale operation of a radioactive waste management system will involve handling highly radioactive materials in quantities and at annual rates that are unprecedented"[28] due to the backlog of waste and annual reactor waste generation of 30 tons. The Energy Department estimates this will require an average of 1 to 2 rail shipments and 2 to 3 truck shipments per day to the repository site by the end of the century.

A Panel on Social and Economic Aspects of Radioactive Waste Management of the National Academy of Sciences recently concluded that, due to the high volume of waste being transported to a particular region of the country, the Department of Energy should consider the unequal burdens placed on populations within the repository region. The panel suggests that the Department consider regional repository siting. Also, the panel suggests that current plans for primarily rail transport should be reconsidered as "the rail industry appears to have few economic incentives and a stated reluctance to take on radioactive waste transport. Rail also does not appear to have a decisive economic advantage over truck

transport, and the rail system is less responsive to possible demands for routing changes."[29] If truck transportation is ultimately utilized, the panel suggests either a Federally owned and operated fleet or private trucking contractors operating subject to Federal and State regulations. "The Department of Energy estimated that from 350,000 to 450,000 truck shipments or 35,000 to 45,000 rail shipments would be necessary to transport the waste produced by the currently operating nuclear reactors over their 30-year lifetime."[30]

Over the next fourteen years, the Department of Energy plans to expend extensive resources in developing the transportation system for handling nuclear waste. These activities include engineering research and development to design more effective containers or casks; transportation issues such as safety, handling, and licensing; and, optional combinations of transport modes. During the interim years, the Department of Energy is authorized to ship 1900 metric tons of spent nuclear fuel to Federal Interim Storage Facilities and "a few hundred" tons of spent fuel to Federal research and development centers. The DOE will utilize existing casks designed to ship spent fuel to reprocessing plants 6 months to a year after being removed from the reactor. These casks, then, are designed to handle spent fuel emitting more heat and radiation than the fuel to be transported which has been stored for ten years or more.

(2) Transportation Safety Factors

The Department of Transportation has primary responsibility for the safe packaging and transportaion standards for radioactive materials in close co-operation with the Nuclear Regulatory Commission. The Department of Transportation regulates carriers of radioactive materials and is the lead agency regarding accidents and incidents involving the transport of radioactive materials. The Nuclear Regulatory Commission regulates users of radioactive material and the

design, construction, use, and maintenance of shipping containers. The Federal Emergency Management Agency holds responsibility for training and response to accidents involving radioactive materials.

A key question regarding the normal transportation of nuclear waste is the danger to exposure by mere proximity. According to a paper prepared by utility representative,

> "There is essentially no risk from the radiation exposure during the normal transportation of spent fuel. An individual living 90 feet from a highway where 250 spent fuel shipments pass each year travelling at an average of 30 miles per hour would receive a radiation dose some 9000 times less than that received from natural sources - the sun, earth and radioactivity naturally in the human body. For comparison, the dose would be only slightly higher than that received from an ordinary smoke alarm in a year's time."[31]

Radiation exposure, then, from pre-packaged transportation casks is negligible as regulated by the NRC. The major problem associated with spent fuel transport is an accident involving breakage of the container casks and spillage of nuclear waste into the environment. ". . . the Nuclear Regulatory Commission says the probability of an accident severe enough to break a cask is similar to that of a cask being struck by a meteor - once in several million years."[32] Even with this low probability estimate, over 200 states and communities have restricted or completely prohibited shipments through their jurisdictions in fear of a possible catastrophe due to human error.

The packaging of radioactive materials is divided by regulation into five categories including such factors as type and quantity of materials, form (normal form is the type of material which might leak radiation if released from the package such as liquid or powder and special form refers to material encased in solids with little possibility of contamination), and fissile properties. The five packaging categories include:

a) Packaging for Limited Quantity materials which have low quantities of radioactive material and surface radiation is extermely low. No warning markings are necessary, but strong industrial packaging is required so there is no loss of content under normal transport conditions. These materials, such as smoke detectors or medical diagnostic kits, are transported by common carriers and the Postal Service

b) Low Specific Activity (LSA) packaging are for materials with low limits of radioactivity with minimal risk if contents were leaked in an accident such as material uranium or yellowcake. Only strong tight packaging is required.

c) Type A packaging must withstand stress associated with accidents and are in greater quantity than limited quantity packages. A majority of radioactive materials are shipped in this form as accidents releasing the materials would cause minimal radiation hazards. Packages must withstand certain stress standards. These materials include radio-pharmaceuticals, research and industrial sources.

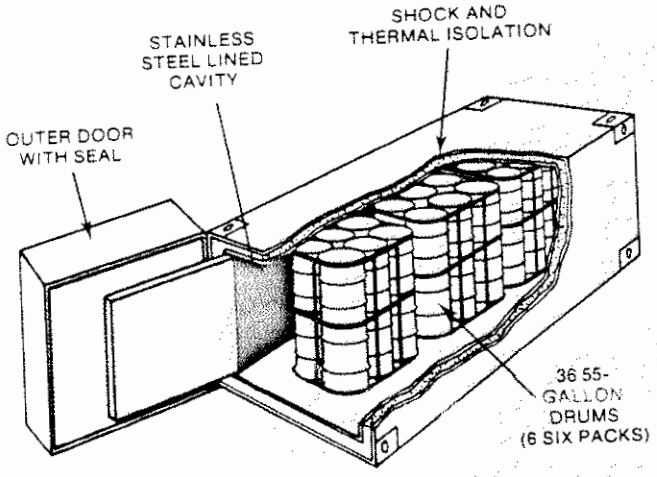
d) Type B packaging is designed for larger quantities of radioactive materials than Type A, must withstand more severe regulated stresses, and require more stringent design. These materials involve large research and industrial sources.

e) Type B large quantity packaging has the same stress requirements of Type B packages, but are specially designed to allow loss of heat generated by the radio-active contents. Release of these radioactive materials such as spent fuel, would be extremely hazardous. No Type B or Type B large quantity packages have released radioactive materials to date under accident conditions [33]

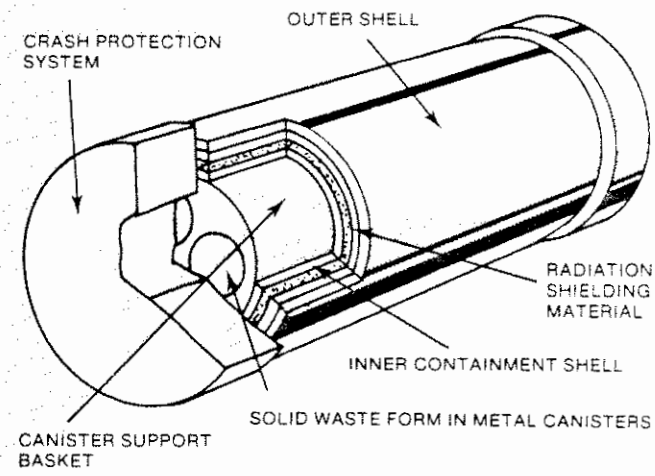
Type B packaging must withstand serious accident damage test conditions resulting in no loss of contained materials and limited loss of radiation shielding capabilities. The NRC requires that Type B packages sustain all of the following hypothetical accident conditions:

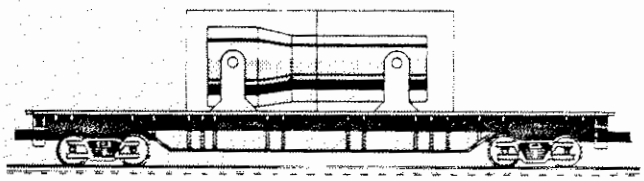
1. A 30-foot free drop onto an unyielding surface.
2. A puncture test which is a free drop (over 40 inches) onto a a six-inch diameter steel pin.
3. Thermal exposure at 1,475°F for 30 minutes.
4. Water immersion for eight hours (for fissile materials packaging only).

Illustrations of Type B container casks are provided on the following page.

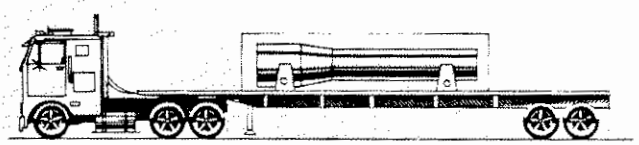


Contact-handled transuranic wastes will be packaged in a system of steel boxes similar to this concept. The design is not yet final.



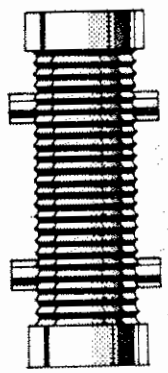


CONVENTIONAL RAILROAD CAR

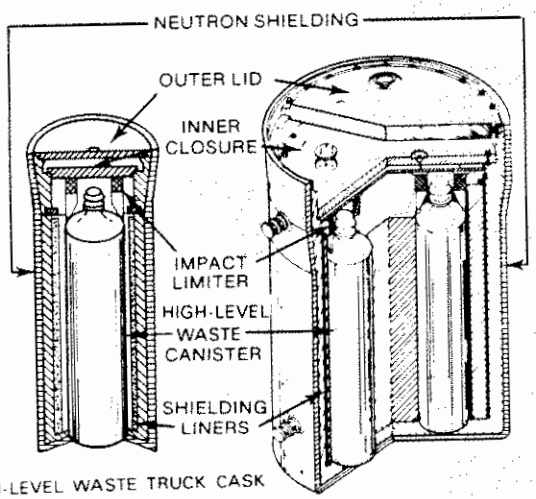


CONVENTIONAL TRACTOR-TRAILER
EQUIPMENT

High-level waste and remote-handled transuranic waste will be packaged and transported as shown in these illustrations. Canister sizes will vary, and shielding may be lead, uranium, iron, or in some cases, solid steel. The loaded package will weigh up to 90 tons for railroad transportation and 25 tons for transport by truck.



SPENT FUEL CASK



HIGH-LEVEL WASTE TRUCK CASK

HIGH-LEVEL WASTE RAIL CASK

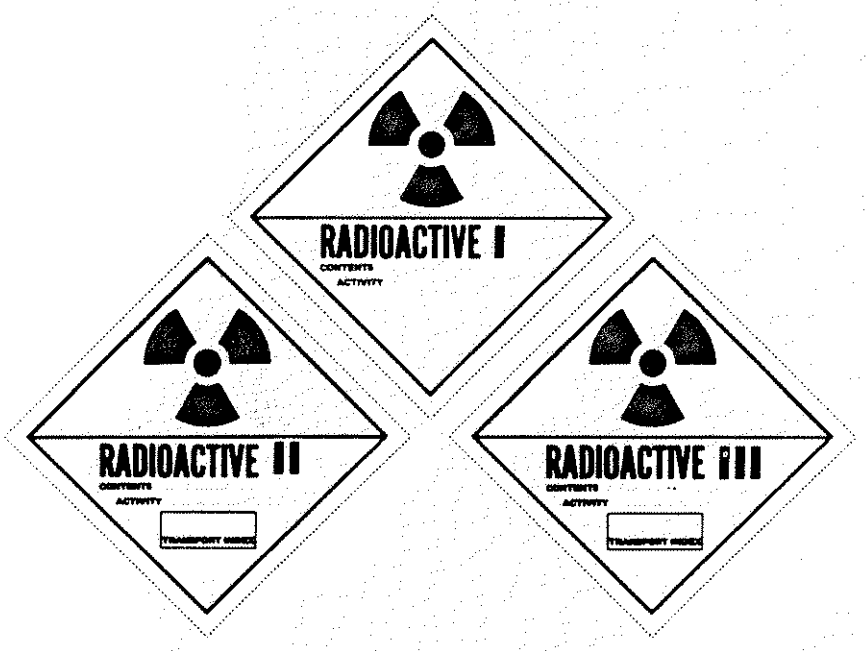
Casks for transporting spent fuel, high-level wastes, and remote-handled transuranic wastes will be similar to each other.

Source: Battelle's Office Of Nuclear Waste Isolation
Columbus, Ohio

The government also requires that packages containing radioactive material, particularly of the Type A, B, and B Large Quanitity variety, be labeled. The labels represent acceptable levels of millirems per hour at the package surface and at three feet distance.

Requirements for package labels

Label:	Radiation level associated with package:
Radioactive-White I	Almost no radiation; 0.5 mrem/hr maximum on surface
Radioactive-Yellow II	Low radiation levels; 50 mrem/hr maximum on surface, 1 mrem/hr maximum at 3 ft
Radioactive-Yellow III	Higher radiation levels; 200 mrem/hr maximum on surface, 10 mrem/hr maximum at 3 ft. Also required for fissile class III or large-quanitity shipments, regardless of radiation level



These labels must identify the radionuclide (contents) and quantity (curies) in the container. The Yellow II and Yellow III labels must also list the transportation index which is equal to the maximum radiation level at 3 feet from the package.[34] As another safety factor for nuclear waste transport the Energy Department has initiated extensive research to transform the spent fuel into

a dry or hardened form. Currently transformation of the waste into glass or crystalline is planned to improve the handling of the waste product and reduce the danger of environmental exposure.

Federal and State personnel have been trained to respond to accidents involving radioactive materials. The Federal government and some States maintain a 24 hour response team in case of emergencies. A Joint-Nuclear Accident Coordinating Center (JNACC) has been established to respond to transportation accidents involivng military materials or devices such as nuclear weapons or materials and could be utilized in case of an emergency. Direct contact for JNACC is:

Joint Nuclear Accident Coordination Center
Kirkland Air Force Base
Albuquerque, New Mexico
(505)844-4667

A complete listing by regions for telephone contacts in the case of radiological assistance or emergency are included in Appendix B for the Departments of Energy and Transportation, Federal Emergency Management Agency, and Environmental Protection Agency. Also included are listings of Federal and National contacts for further information on the topic of nuclear waste management. State and local contacts are included in Appendix C.

The Department of Energy, utilizing results of Defense-related research and concentrating resources on scientific advancements on the handling, packaging, transportation, and storage of nuclear waste over the next fifteen years, expects to provide an environmentally safe and economically efficient program of permanent repository storage by 1998. There is a decided lack of public confidence in the Federal government's capabilities in this arena partially due to lack of public knowledge, association of nuclear power with nuclear weapons, and an understandable fear of radiation. Nuclear power and the generation of nuclear wastes, however, are a fact of life which must be

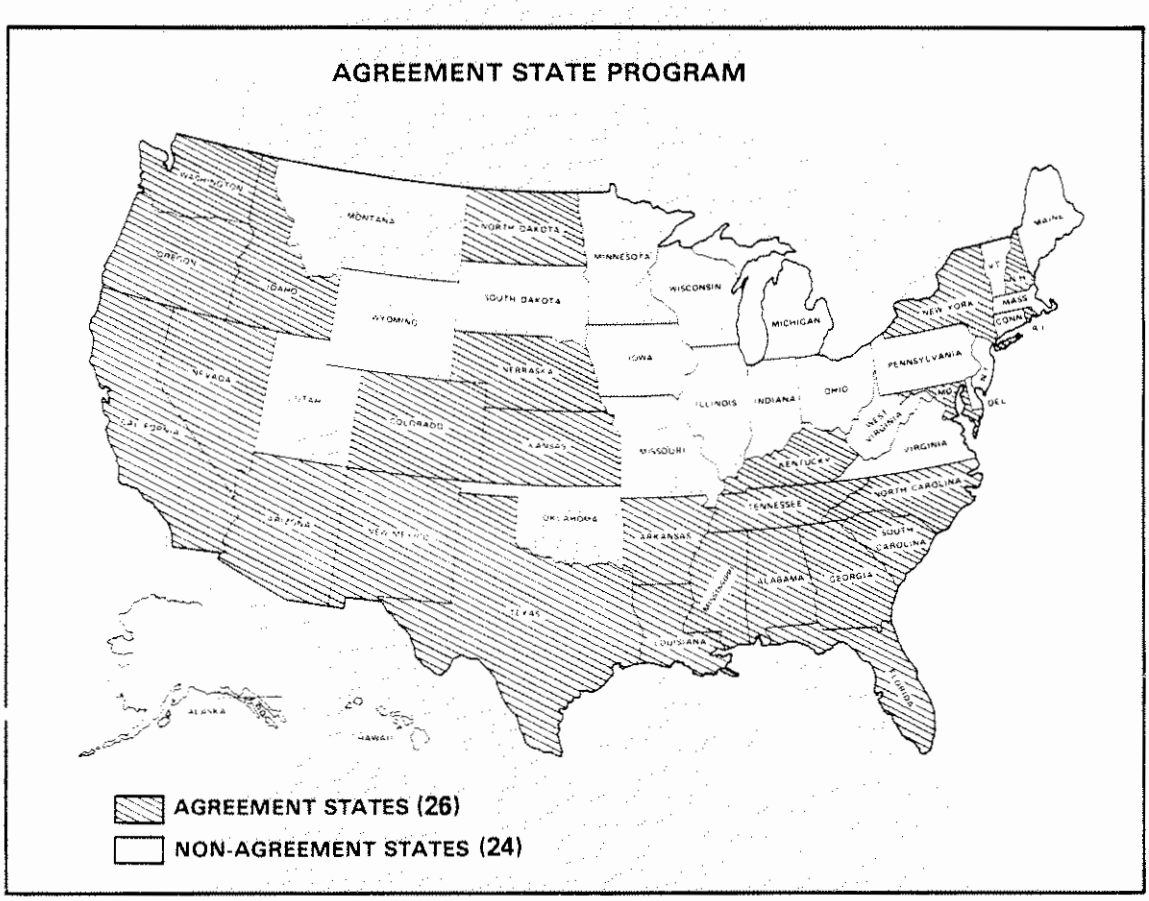
addressed for present and future generations. Tribal governments, specifically included in the Nuclear Waste Policy Act of 1982, have a prime responsibility to become involved and understand the planning and implementation process of this most necessary public venture.

D. Tribal Government Planning Considerations

Tribal governments, in general, will not be directly impacted by the siting of the first and second repository, interim storage facility, and test facilities as currently planned by the Department of Energy. If plans change in the future to consider regional repositories and interim storage facilities as suggested by the recent National Research Council study, many more Tribes could be directly affected. A larger proportion of Tribal governments will, however, be potentially impacted by the truck and rail shipments of radioactive wastes to the repositories and interim storage facilities as currently planned given the rural reservation locations and the possibilities of a first repository located in the Northwest or Southwest.

State governments have assumed an increasingly active role in the regulation of nuclear by-products. Although the Nuclear Regulatory Commission has ultimate responsibility for regulations and licensing related to nuclear waste, a growing number of States have assumed authority under agreements with the NRC to regulate the transport and burial of low-level nuclear wastes. By the end of 1983, twenty-six State governments had assumed regulatory responsibility as indicated on the map on the following page.

Tribal governments should designate a staff person responsible for radioactive waste developments impacting the reservation. Tribal staff should contact State radiation control staff as indicated in Appendix C to



SOURCE: U.S. Nuclear Regulatory Commission 1983, Annual Report, page 100.

determine state regulations, procedures, and plans relative to both low and high level radioactive waste licensing, packaging, transport, and routing. Given the findings in their respective States, Tribal governments may wish to become more involved in the decision-making process through the State governments or legislatures.

The Federal Amergency Management Agency requires State Radiological Emergency Response Plans (RERP) for States with nuclear power plants. This requirement will likely expand to all States with the planned expansion of high-level radioactive waste shipments. The Department of Transportation has forwarded training packages to each State entitled: Handling of Radioactive Materials Transportation Emergencies. The training kit is designed

for first-on-the-scene response personnel, such as police or ambulance, who must cope with the accident prior to the arrival of radiological experts. Tribal governments should consider developing their own reservation radiological emergency response plans and train Tribal emergency response staff. At the least, Federal/Regional/State personnel and telephone numbers should be recorded for emergency assistance and trained personnel within geographic proximity should be identified for quick reference.

Tribal governments developing their own radiological emergency response teams may either seek State training or direct Federal training. The Department of Energy, through the Oak Ridge Associated Universities (ORAU) offers:

- o "Medical Planning and Care in Radiation Accidents," a one week course for physicians, training about 48 participants per year.
- o "Health Physics in Radiation Accidents," a one week course for health physicists, training about 36 participants per year.
- o "Handling of Radiation Accidents by Emergency Personnel," a 2½ day course for emergency room surgeons and nurses, training about 45 participants per year.

ORAU has also developed supplementary training packages. Direct contact with ORAU should include:

Dr. Robert Dicks, Director
Radiation Emergency Assistance Center
Oak Ridge Associated Universities
P.O. Box 117
Oak Ridge, TN 37831
615/576-3131 (24-hour access #)

or, 270 West Tyrone Road
Oak Rdige, TN 37830

also, Connie Lewis, Information Specialist
Office of Information Services
(address same as above)
615/346-3146

The Department of Transportation offers two-self-study courses related to radioactive waste. The Emergency Response to Hazardous Materials Transportation covers the full spectrum of transportation regulations in all

hazardous materials. A Radioactive Materials Transportation Information and Incident Guidance self-training manual is currently under revision. Both should be available from:

Office of Hazardous Materials
DOT/RSPA/DMT-223-40
400 - 7th Street, S.W.
Washington, D.C. 20590
202/426-2311

Another publication, Hazardous Materials: 1980 Emergency Response Guidebook is useful, particularly for emergency vehicle operators. The publication is available free from the Department of Transportation Publication Division (202/426-3601).

The Federal Emergency Management Agency conducts annual training courses at its National Emergency Training Center in Emmitsburg, Maryland and at the Nevada test site including:

- o "Radiological Emergency Planning Seminar," a one week seminar focusing on nuclear power plant offsite planning requirements conducted at the National Emergency Training Center (NETC), Emmitsburg, Maryland
- o "Radiological Accident Assessment Course," a one week course to train radiological health personnel in offsite dose assessment and projection techniques, conducted at the NETC.
- o "Radiological Emergency Response Course," a ten day course to train State and Federal radiological emergency response team personnel in techniques of responding to a wide range of radiological accidents conducted at the Nevada Test Site in Mercury, Navada. Approximately 400 persons are trained each year.

For further information about the courses, contact:

FEMA Emergency Management Institute
National Emergency Training Center
Emmitsburg, Maryland 21727
301/447-6771

The State of Colorado offers a three day seminar and two week course on all phases of hazardous materials transportation incident response, including radioactive materials. Information on these training programs is available from:

Colorado Training Institute
1001 East 62nd Avenue
Denver, Colorado 80216
303/289-4891

From the private sector, a training package for first-on-the-scene responders entitled: Handling Radioactive Materials Transportation Emergencies including a six to eight hour tape/slide presentation is available for purchase from:

Media Enterprises, Inc.
1833 Manchester
Anaheim, California 92804
714/740-1000

The above mentioned training package was developed under a Department of Transportation contract.

And finally, the National Fire Protection Association maintains an inventory of all hazardous materials training programs. They may be contacted at:

National Fire Protection Association
Battery March
Quincy, Massachusetts 02269
617/770-3000

In the event of an accident, involving radioactive waste, there are basic principles for protection from external and internal exposure from radiation. External exposure, such as intact packages or casks, can be minimized by reducing the time-spent in the radiation area, increasing the distance of self and others from the radiation source, and shielding yourself and others from the radiation. Internal exposure is possible in the rare instance that radioactive waste is released from the cask or package. The general principles is to prevent the radioactive material from getting on or into your body by:

1. staying upwind from the accident, particularly if smoke or fumes are present
2. stay away from the spill and container
3. wear protective clothing
4. use air filters ranging from a respirator to a handkerchief
5. as soon as possible, wash with soap and water any part of the body that contacted the contaminated area
6. assume everything in the area is contaminated and keep everyone away from the accident site until experts with radiation monitoring equipment arrive

The above suggestions by the Department of Transportation and the chart of action steps on the following page should be considered only basic recommendations to emergency personnel. In-depth response training is advised. The chart on the following page, with emergency number, should possibly be posted with law enforcement and emergency vehicle stations.

Tribal government authority on the resevration may also address safety standards for the handling and shipment of radioactive waste. In 1982 the Supreme Court upheld the right of the State of Pennsylvania to regulate the safety of hazardous materials transport within the State in the American Trucking Association vs. Larson. Tribal governments can adopt their own safety standards and encourage the State to also consider such standards to reduce the chance of transportation accidents.

Tribal governments are ultimately responsible for the safety of their members. Tribal action should include monitoring and Tribal representative involvement in Federal, State, and local area developments and decision-making processes relative to the transportation and disposal of high level radioactive waste. Tribal governments should also develop appropriate safeguards ranging from Tribal safety standards to personnel radiological emergency response training. These are basic measures Tribal governments

may employ in ensuring a safe, effective radioactive waste transportation and repository system in the United States. Radioactive waste management is an issue impacting many future generations.

ACTIONS TAKEN BY FIRST-ON-THE-SCENE EMERGENCY RESPONSIBLE PERSONNEL AT TRANSPORTATION ACCIDENTS INVOLVING RADIOACTIVE MATERIALS

1. REMAIN CALM. Do not be overly concerned with the presence of radioactive material or allow it to disrupt usual emergency response activities. Remember, it is improbable that emergency personnel will receive any radiation injury during these operations.

2. PERFORM LIFE-SAVING RESCUE AND EMERGENCY FIRST-AID. Delay other first aid care until victims can be removed from the vicinity of any potentially hazardous materials. Notify receiving medical facilties of possible contamination or radiation exposure of the injured.

3. ESTABLISH A CONTROL ZONE. The perimeter of this zone will be determined by the accident scene conditions. If there is no chance of release of radioactive material, a minimum distance of 150 feet is recommended. If containers are breached and dispersal is possible, the minimum distance may be 200 feet or more, depending on the quantity of material, its radiotoxicity, the weather and atmospheric conditions, or as required by other hazardous materials.

4. NOTIFY RADIOLOGICAL ASSISTANCE and other emergency service agencies as needed.

5. EVACUATE PERSONNEL from the immediate downwind area. Detain personnel in the immediate area and items with possible contamination until they can be checked by radiological monitors.

6. KEEP UPWIND OF FUMES OR SMOKE.

7. LIMIT TIME near radioactive shipping package to the minimum necessary.

8. OBTAIN INFORMATION concerning the cargo from placards, labels, shipping documents, and other immediately available sources.

9. NOTE CONDITIONS that may indicate damage to shipping packages. Cover spilled radioactive material to limit dispersal and identify the area.

10. AVOID DIRECT CONTACT with radioactive materials where possible. Utilize protective clothing and anything available for remote handling (shovels, branches, ropes, etc.).

11. WRAP AND LABEL or separate all clothing, tools, etc., used in the emergency and retain them until they can be cleared by radiation monitoring personnel.

12. MAKE DETAILED RECORDS of actions and findings, including times, names, locations, etc. This information will assist in reconstructing the accident and estimating radiation exposures, if any.

13. PERFORM RADIOLOGICAL MONITORING if trained to do so.

14. DO NOT ALLOW eating, drinking, smoking, or other activities within contaminated areas that might lead to intake of radioactive material.

SOURCE: Radioactive Materials Transportation Information and Incidence Guidance, Oak Ridge Association Universities for the U.S Department of Transportation. (DOT/RSPA/MTB-81/4), final page.

NOTES

1. Charles A. Walker, Leroy C. Gould and Edward J. Woodhouse, Too Hot To Handle (Connecticut: Yale University Press, 1983), p. ix.
2. Irene Kiefer, Nuclear Energy at the Crossroads (New York: Atheneum, 1982), p. 15.
3. Ibid., p. 18.
4. Dr. Michio Kaku and Jennifer Trainer, eds., Nuclear Power: Both Sides (New York: W.W. Norton & Company, 1982), pp. 27-28.
5. Ibid., p. 31.
6. Ibid., p. 70.
7. Ibid.
8. Ibid., p. 111.
9. Ibid., p. 109.
10. Irene Kiefer, see no. 2 above, p. 3.
11. John E. Chubb, Interest Groups and the Bureaucracy - The Politics of Energy (California: Stanford University Press, 1983), p. 71.
12. Dr. Michio Kaku and Jennifer Trainer, eds., see no. 4 above, pp. 135-36.
13. Stuart Diamond, "Nuclear Plants Lose Cost Edge," The New York Times, September 3, 1984, p. 1.
14. Irene Kiefer, see no. 2 above, p.3.
15. Ibid., pp. 8-9.
16. Dr. Michio Kaku and Jennifer Trainer, eds. see no. 4 above, p. 109.
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APPENDIX A

Glossary of Terms

Absorbed Dose - The energy imparted to matter by ionizing radiation per unit mass of irradiated material at the place of interest. The unit of absorbed is the rad.

Act - Nuclear Waste Policy Act of 1982

Active Fault - a fault along which there is recurrent movement, which is usually indicated by small, periodic displacements or seismic activity. (Act)

Adsorption - the action of a body, such as charcoal, in condensing and holding a gas or soluble substance upon its surface; distinguished from absorption in which the material is taken up within the body by either physical or chemical forces.

Affected Area - either the area of socioeconomic impact or the area of environmental impact, each of which will vary in size among potential repository sites. (Act)

Affected Indian Tribe - any Indian tribe (1) within whose reservation boundaries a repository for radioactive waste is proposed to be located or (2) whose federally defined possessory or usage rights to other lands outside the reservation's boundaries arising out of congressionally ratified treaties may be substantially and adversely affected by the locating of such a facility: provided that the Secretary of the Interior finds, upon the petition of the appropriate governmental officials of the tribe, that such effects are both substantial and adverse to the tribe. (Act)

Affected State - any State that (1) has been notified by the DOE in accordance with Section 116(a) of the Nuclear Waste Policy Act as encompassing a potentially acceptable site; (2) contains a candidate site for site characterization or repository development; or (3) contains a site selected for repository development. (Act)

Alpha Particle - a positively charged particle given off by certain radioactive materials. An alpha particle consists of two neutrons and two protons bound together; it is the same as the nucleus of a helium atom. Its penetration can be stopped by a sheet of paper, and is not dangerous to plants or animals unless the alpha-emitting substance has entered the body.

Anthropogenic - originated through human activities.

Aquifer - a formation, a group of formations, or a part of a formation that contains sufficient saturated permeable material to yield significant quantities of water to wells and springs. (Act)

Atom - a particle that cannot be divided by chemical means. Atoms are the building blocks of chemical elements, and the atoms of elements differ from each other. According to present theory, an atom consists of a relatively dense nucleus and a much less dense outer part where electrons move around the nucleus.

Atomic Weight - the number of protons plus the number of neutrons in the nucleus. A relative number: the atomic weight of hydrogen-1 is 1; of uranium-238, 238. Uranium-235, the fissile form of uranium, has three fewer neutrons in its nucleus than uranium-238.

Background (Natural) Radiation - the radiation in the natural environment, including cosmic rays and radiation from naturally radioactive elements, both outside and inside the bodies of humans and animals.

Barrier - any material or structure that prevents or substantially delays the movement of water or radionuclides. (Act)

Becquerel (Bq) - international unit of radioactivity equal to one nuclear disintegration per second.

Beta Particle - an electron or positron emitted by the nucleus of an atom during radioactive decay. Beta radiation, a stream of beta particles, is a more penetrating type of ionizing radiation than is alpha. Beta particles can be stopped by a thin sheet of metal, but they can cause skin burns. Most fission products in spent fuel and reprocessed waste (e.g., iodine-131, cesium-137, and strontium-90) are beta emitters. Beta-emitting nuclides are of concern mainly when they decay within the body.

Bioaccumulation - the build-up of radionuclides in living organisms. The chemical similarities between some radionuclides and naturally occurring elements in the human body makes this a potentially dangerous process. (For example, strontium-90 resembles calcium and concentrates in bones). A danger also exists in that marine organisms can bioaccumulate radionuclides and then be consumed by man.)

Boiling Water Reactor - light water reactor in which the water used as a moderator is allowed to boil at the normal temperature (100° Celsius at sea level) in the core.

Breeder Reactor - a nuclear reactor that produces fissionable fuel as well as consuming it, especially one that creates more than it consumes. The new fuel is created when neutrons from a fission reaction are absorbed by certain nuclei.

Candidate Site - an area, within a geohydrologic setting, that is recommended by the Secretary of Energy under Section 112 of the Act for site characterization, approved by the President under Section 112 of the Act for characterization, or undergoing site characterization under Section 113 of the Act. (Act)

Capillary Fringe - the zone immediately above the water table in which all or some of the interstices are filled with water that is under less than atmospheric pressure and that is continuous with the water below the water table. (Act)

Cell - the fundamental unit of life. All living organisms are composed of cells.

Cesium-137 - a radioactive fission product with a 30-year half-life.

Chain Reaction - a reaction that stimulates its own repetition. In a fission chain reaction a fissionable nucleus absorbs a neutron and fissions, releasing additional neutrons. These, in turn, can be absorbed by other fissionable nuclei, releasing still more neutrons. A fission chain reaction is self-sustaining when the number of neutrons released in a given time equals or exceeds the number of neutrons lost by absorption in nonfissioning material or by escape from the system.

Characteristics and Processes Affecting Expected Repository Performance - those natural characteristics and processes that are reasonably likely to exist or occur in the geologic setting during the period over which the intended performance objective must be achieved. To the extent reasonable on the basis of the geologic record, it shall be assumed that those characteristics and processes existing and/or operating during the Quaternary Period will continue to exist and/or operate, but with the perturbations induced by the presence of the repository superimposed thereon. (Act)

Cladding - protective alloy shielding in which fissionable fuel is inserted; is relatively resistant to radiation and the physical and chemical conditions in a reactor core; may be stainless or some alloy such as zircaloy.

Closure - final backfilling of the remaining open operational areas of the underground facility and boreholes after the termination of waste emplacement, culminating in the sealing of shafts. (Act)

Confining Unit - a body of impermeable or distinctly less permeable material stratigraphically adjacent to one or more aquifers. (Act)

Containment - the confinement of radioactive waste within a designated boundary. (Act)

Containment Building - a concrete enclosure around a nuclear reactor intended to prevent escape of radioactive materials.

Controlled Area - a surface location, to be marked by suitable monuments, extending horizontally no more than 10 kilometers in any direction from the outer boundary of the underground facility, and the underlying subsurface, which area has been comitted to use as a geologic repository and from which incompatible activities would be prohibited before and after permanent closure. (Act)

Control Rod - a rod, plate, or tube containing a material that readily absorbs neutrons, used to control the power of a nuclear reactor. A control rod prevents the neutrons from causing further fission, by absorbing neutrons.

Coolant - a substance circulated through a nuclear reactor to remove or transfer heat. Water, carbon dioxide, air, and liquid sodium are common coolants.

Core - the central portion of a nuclear reactor; it contains the fuel elements and possibly the moderator.

Cosmic Rays - radiation of intense penetrating power, emanating from outer space and consisting mainly of high energy positively charged particles.

Critical Pathway Approach - evaluation of a series of events through which racioactive material that is introduced into the marine environment is diluted or concentrated, and eventually reaches humans in food or from other contacts.

Cumulative Releases of Radionuclides - the total number of curies of radionuclides entering the accessible environment in any 10,000-year period, normalized on the basis of radiotoxicity in accordance with 40 CFR Part 191. The peak cumulative release of radionuclides refers to the 10,000-year period during which any such release attains its maximum projected value. (Act)

Curie - A unit of radioactivity approximately equal to the amount available per second from 1 gram of radium. A curie is equal to 37 billion disintegrations per second.

Decay, Radioactive - spontaneous transformation of one atomic form of an element into a different form, or into a different energy state of the element. This results over a period of time in a decrease in the number of radioactive atoms in a sample. It involves the emission from the nucleus of alpha particles, beta particles, or gamma rays; or fission.

Decay Product - nuclide resulting from the radioactive disintegration of a radionuclide, formed either directly or as the result of successive transformations in a radioactive series; may be radioactive or stable.

Decommissioning - the permanent removal from service of surface facilities and components necessary for preclosure operations only, after repository closure, in accordance with regulatory requirements and environmental policies. (Act)

Disposal - the emplacement in a repository of high level radioactive waste, spent nuclear fuel, or other highly radioactive material with no foreseeable intent of recovery, whether or not such emplacement permits the recovery of such waste, and the isolation of such waste from the accessible environment. (Act)

Disqualifying Condition - a condition that, if present at a site, would eliminate that site from further consideration. (Act)

Disturbed Zone - that portion of the controlled area, excluding shafts, whose physical or chemical properties are projected to change permanently as a result of underground facility construction or heat generated by the emplaced radioactive waste such that the resultant change of properties could have a significant effect on the performance of the geologic repository. (Act)

Dose, Radiation - an accumulated quantity of ionizing radiation. It is a measure of the energy absorbed per gram of absorbing material. The unit of absorbed dose is the rad. The term "dose" is often used in the sense of the exposure, expressed in roentgens, which is a measure of the total amount of ionization that the quantity of radiation could produce in air. The absorbed dose in tissue is about one rad when the exposure in air is one roentgen.

Dose Equivalent - a quantity used in radiation protection. It expresses all radiations on a common scale for evaluating and comparing the effects of radiation in man. It is defined as the product of the absorbed dose in rads and certain modifying factors. The unit of dose equivalent is the rem. For the most common forms of radiation (X, gamma, and beta), the dose equivalent in rems is numerically equal to the absorbed dose in rads.

Dose Rate - as a general rule, the amount of radiation absorbed per unit of time. It is usually expressed in rads per hour or in multiples or submultiples of this unit, such a millirads per hour. The dose rate is commonly used to indicate the level of hazard from a radioactive source.

Dosimeter - a portable instrument for measuring and registering the total accumulated exposure to ionizing radiations.

Effective Porosity - the amount of interconnected pore space and fracture openings available for the transmission of fluids, expressed as the ratio of the volume of interconnected pores and openings to the volume of rock. (Act)

Electron - a particle that carries a negative electrical charge and spins around the nucleus of an atom.

Element - one of the 106 known chemical substances that cannot be divided into simpler substances by chemical means and from which all molecules are formed.

Electromagnetic Radiation - a packet of emitted energy in the form of a wave resulting from changing electric or magnetic fields. Familiar electromagnetic radiations range from Xrays (and gamma rays) at short wavelengths, through the ultraviolet, visible, and infrared regions, to radar and radio waves of relatively long wavelength.

Engineered Barrier Systems - the manmade components of a disposal system designed to prevent the release of radionuclides from the underground facility or into the geohydrologic setting. Such term includes the radioactive-waste form, radioactive-waste canisters, materials placed over and around such canisters, any other components of the waste package, and barriers used to seal penetrations in and into the underground facility. (Act)

Enrichment - the process by which the percentage of a given isotope present in a material is artificially increased to a higher percentage than that naturally found in the material. Enriched uranium, for example, contains more of the fissionable isotope uranium 235 than is found in naturally occurring uranium.

Entombment - process by which nuclear reactor plants are sealed with concrete or steel after liquid waste, fuel and surface contamination have been removed to the greatest extent possible.

Erosion - the natural processes, including weathering and transportation, by which an earthy or rocky material is removed from any part of the earth's surface.

Expected - assumed to be probable or certain on the basis of existing evidence and in the absence of significant evidence to the contrary. (Act)

Expected Repository performance - the manner in which the repository is projected to function, considering those conditions, processes, and events that are most likely to prevail or occur during the time period of interest. (Act)

Fast Breeder Reactor - a reactor that operates with fast neutrons; it produces more fissile material than it consumes.

Fault - a fracture or a zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture or zone of fractures. (Act)

Faulting - the process of fracturing and displacement that produces a fault. (Act)

Favorable Condition - a condition that, though not necessary to qualify a site, is presumed, if present, to enhance confidence that the qualifying condition of a particular guideline can be met. (Act)

Feedwater (Secondary) Loop - the sealed system in a pressurized water reactor where water (heated by the primary loop) is converted to steam used to generate electricity.

Fertile Material - a material, not itself fissionable by slow-moving neutrons, which can be converted into fissile material by irradiation in a reactor. Two basic fertile materials are uranium-238 and thorium-232. When they capture neutrons, they are partly converted into plutonium-239 and thorium-233, which are both fissile.

Film Badge - a pact of photographic film used for approximate measurement of radiation exposure for personnel monitoring purposes. The badge contain two or three films of differing sensitivity, and it may contain filters that shield parts of the film from certain types of radiation for determining the types and energies of the radiations.

Fissile - capable of fission.

Fission - splitting of atomic nuclei into two more or less equal parts with the release of energy and generally of one or more neutrons. Fission can occur spontaneously, but is usually caused by absorption into the nucleus of gamma rays, neutrons, or other particles.

Fission Product - a nuclide produced either directly by the fission of a chemical element or by the subsequent disintegration of products of this process.

Food Chain - the pathways by which a material passes from the first organism absorbing it through plants and animals to humans.

Fuel (Nuclear) - fissionable material used to produce energy in a nuclear reactor.

Fuel Cycle - a series of steps including mining, refining, fabrication of fuel elements, their use in a reactor, chemical reprocessing to recover the fissionable material remaining in spent fuel rods, re-enrichment of the fuel material, and refabrication into new elements. A "throwaway" cycle ends with the storage of spent fuel rods.

Fuel Reprocessing - the processing of reactor fuel to recover unused fissile material.

Fusion (Nuclear) - formation of a heavier nucleus from two lighter ones, with the release of large amounts of energy.

Gamma Rays - high-energy, short-wavelength electromagnetic radiations. Gamma rays frequently accompany alpha and beta emissions, and always accompany fission. They are very penetrating, and can be stopped best by dense materials such as lead or depleted uranium. Gamma rays are similar to Xrays but usually have more energy and are nuclear in origin.

Geiger Counter or Geiger-Muller (GM) Meter - an instrument designed primarily for the detection of radiation or contamination. It is very sensitive and reliable instrument but has a limited capacity for measuring radiation and may fail at high radiation levels.

Geohydrologic Setting - the system of geohydrologic units that is located within a given geologic setting. (Act)

Geohydrologic System - the geohydrologic units within a geologic setting, including any recharge, discharge, interconnections between units, and any natural or man-induced processes or events that could affect ground-water flow within or among those units. (Act)

Geohydrologic Unit - an aquifer, a confining unit, or a combination of aquifers and confining units comprising a framework for a reasonably distinct geohydrologic system. (Act)

Geologic Repository - a system, requiring licensing by the NRC, that is intended to be used, or may be used, for the disposal of radioactive waste in excavated geologic media. A geologic repository includes (1) the geologic-repository operations area and (2) the portion of the geologic setting that provides isolation of the radioactive waste and is located within the controlled area. (Act)

Geologic Setting - the geologic, hydrologic, and geochemical systems of the region in which a geologic-repository operations area is or may be located. (Act)

Geomorphic Processes - geologic processes that are responsible for the general configuration of the Earth's surface, including the development of present landforms and their relationships to underlying structures, and are responsible for the geologic changes recorded by these surface features. (Act)

Gigawatt - billions of watts of electricity generated (1 GW_e = 1,000 MW_e)

Gray (Gy) - the international unit of absorbed radiation dose (1 Gy = 1 joule of absorbed energy per kilogram of material = 100 rad.)

Groundwater - water under the earth's surface that is the source of wells and springs.

Ground-Water Flux - the rate of ground-water flow per unit area of porous or fractured media measured perpendicular to the direction of flow. (Act)

Ground-Water Sources - aquifers that have been or could be economically and technologically developed as sources of water in the foreseeable future. (Act)

Ground-Water Travel Time - the time required for a unit volume of ground water to travel between two locations. The travel time is the length of the flow path divided by the velocity, where velocity is the average ground-water flux passing through the cross-sectional area of the geologic medium through which flow occurs, perpendicular to the flow direction, divided by the effective porosity along the flow path. If discrete segments of the flow path have different hydrologic properties, the total travel time will be the sum of the travel times for each discrete segment. (Act)

Half-Life - the time required for one-half of the nuclei of a radioactive element to decay to another nuclear form, which may range from seconds to thousands of years.

Heat Exchanger - a device that transfers heat from one liquid or gas to another or to the environment.

Heavy Water - water containing significantly more than the natural proportion of heavy hydrogen (deuterium) atoms to ordinary hydrogen atoms. Heavy water is used as a moderator in some reactors because it slows down neutrons effectively and has a low probability of absorbing them.

Heavy Water Reactor - one that uses heavy water as its moderator. Heavy water is such a good moderator that unenriched uranium can be used a a fuel.

High-Level Radioactive Waste - (1) the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations and (2) other highly radioactive material that the NRC, consistent with existing law, determines by rule requires permanent isolation. (Act)

Host Rock - the geologic medium in which the waste is emplaced, specifically the geologic materials that directly encompass and are in close proximity to the underground facility. (Act)

Hydraulic Conductivity - the volume of water that will move through a medium in a unit time under a unit hydraulic gradient through a unit area measured perpendicular to the direction of flow. (Act)

Hydraulic Gradient - a change in the static pressure of ground water, expressed in terms of the height of water above a datum, per unit of distance in a given direction. (Act)

Hydrologic Process - any hydrologic phenomenon that exhibits a continous change in time, whether slow or rapid. (Act)

Hydrologic Properties - those properties of a rock that govern the entrance of water and the capacity to hold, transmit, and deliver water, such as porosity, effictive porosity, specific retention, permeability, and the directions of maximum and minumum permeabilities. (Act)

Igneous Activity - the emplacement (intrusion) of molten rock material (Magma) into material in the Earth's crust or the expulsion (extrusion) of such material onto the Earth's surface or into its atmosphere or surface water. (Act)

Ion - an atom or molecule that has lost or gained one or more electrons, making it electrically charge.

Ionizing Radiation - any radiation that displaces electrons from atoms or molecules and thus produces ions. Examples of ionizing radiation are alpha, beta, and gamma radiation, and X rays. Ionizing radiation can produce severe skin or tissue damage.

Irradiation - intentional exposure of a substance to radioactivity.

Isolation - inhibiting the transport of radioactive material so that the amounts and concentrations of this material entering the accessible environment will be kept within prescribed limits. (Act)

Isotope - one of two or more species of atoms of the same chemical element that have the same atomic number, and which occupy the same position in the periodic table. Isotopes are nearly identical in chemical behavior but differ in atomic mass or mass number (number of neutrons, but not protons in the nuclei), and so behave differently in radioactive transformations and in physical properites (for example, diffusion in the gaseous state).

Kinetic Energy - energy resulting from motion of objects; also called mechanical energy.

Light-Water Reactor - a nuclear reactor in which ordinary water is the moderator. Two kinds are in use in the United States: pressurized water reactors and boiling water reactors.

Lithosphere - the solid part of the Earth, including any ground water contained within it. (Act)

Low-Level Wastes - wastes containing small amounts of radiation.

Megawatt - one million watts of electricity generated.

Millirem - one-thousandth of a rem which is the unit that measures the effects of ionizing radiation on humans. (Abbreviation - mrem)

Milliroentgen - a one-thousandth part of a roentgen. (Abbreviation - mR)

Mitigation - (1) avoiding the impact altogether by not taking a certain action or parts of an action; (2) minimizing impacts by limiting the degree or magnitude of the action and its implememtation; (3) rectifying the impact by repairing, rehabilitating, or restoring the affected environment; (4) reducing or eliminating the impact over time by preservation and maintenance operations during the life of the action; or (5) compensating for the impact by replacing or providing substitute resources or environments. (Act)

Moderator - a material, such as ordinary water, heavy water, or graphite, used in a reactor to slow the speed of neutrons and increase the probability of fission.

Molecule - a group of two or more atoms held together by chemical forces.

Mutation - a chemical change in a gene. A mutation in a somatic cell is passed on every time the cell divides. A mutation in a reproductive cell is passed on to all cells in the offspring of the organism.

Mothballing - decommissioning a nuclear facility.

Neutron - an unchanged particle with a mass slightly more than that of a proton. Neutrons are found in the nucleus of every atom but hydrogen. A free neutron is unstable and has a half-life of about 13 minutes. Neutrons are used to sustain fission in nuclear reactors.

Nuclear Fuel Cycle - all steps involved in supplying fuel for nuclear reactors, including mining of the ore, manufacturing of fuel assemblies and their use in reactors, reprocessing of spent fuel, and disposal of wastes.

Nuclear Reactor - an atomic device, in which a chain reaction can be begun, maintained, and controlled, for splitting atoms at a controlled rate. It consists essentially of a core with fissionable fuel, and usually has a moderator, a reflector, shielding, coolant, and control mechanisms.

Nucleus - (Nuclei) the central part or core of an atom. It contains protons and neutrons. It must be split to release atomic energy.

Nuclide - a general term referring to any nuclear species of the chemical elements. There are about 270 stable nuclides and about 1250 radioactive nuclides.

Parent - a radionuclide that upon disintegration yields a specified nuclide, called the "daughter," either directly or as a later member of a radioactive decay series.

Particle - a minute unit of matter which generally has a measurable mass. The main particles considered in radioactivity are alpha particles, beta particles, neutrons, and protons.

Perched Ground Water - unconfined ground water separated from an underlying body of ground water by an unsaturated zone. Its water table is a perched water table. Perched ground water is held up by a perching bed whose permeability is so low that water percolating downward through it

is not able to bring water in the underlying unsaturated zone above atmospheric pressure. (Act)

Plutonium - a heavy, radioactive, man-made metallic element. Fissonable plutonium-239 is produced by neutron irradiation of uranium-238 and is used for reactor fuel and in weapons.

Potentially Acceptable Site - any site at which, after geologic studies and field mapping but before detailed geologic data gathering, the DOE undertakes preliminary drilling and geophysical testing for the definition of site location. (Act)

Pressure Vessel - a strong-walled container housing the core of most types of reactors built to produce power.

Pressurized-Water Reactor - a reactor in which heat is transferred from the core to a heat exchanger by water that is kept under high pressure to achieve high temperatures without boiling. This is called the primary system.

Primary Loop - the sealed system in a pressurized water reactor that circulates water around the fuel rods in the reactor core. The heat it picks up from the reactor fuel is transferred to the feedwater (secondary) loop for conversion to steam and then electricity.

Proton - an elementary particle with a positive electrical charge. All nuclei contain one or more protons.

Qualifying Condition - a condition that must be satisfied for a site to be considered acceptable with respect to a specific guideline. (Act)

Quaternary Period - the second period of the Cenozioc Era, following the Tertiary, beginning 2 to 3 million years ago and extending to the present. (Act)

Rad - (Radiation Absorbed Dose) - the amount of radiation that gives an energy absorption of 100 ergs of energy per gram of substance (tissue). Nearly the equivalent of the roentgen, but the roentgen was designed to be used with X rays and gamma rays.

Radiation - the emmission of rays, wave motion, or particles from a source. Examples are visible light rays, x rays, cosmic rays, and particles smaller than atoms emitted by radioactive nuclei.

Radioactivity - the spontaneous emission of various forms of radiation (usually alpha or beta particles or gamma rays) by the disintegration of the nuclei of atoms.

Radioactive Waste - Equipment and materials that are radioactive from nuclear operations and for which there is no further use.

Radionuclide Retardation - the process or processes that cause the time required for a given radionuclide to move between two locations to be greater than the gounrd-water travel time, because of physical and chemical interactions between the radionuclide and the geohydrologic unit throubn which the radionuclide travels. Act)

Reactor (Nuclear) - a device in which a chain reaction can be started, sustained and controlled to produce heat, and from which the resulting heat can be recovered.

Reactor Cooling Pond - A body of water in which reactor fuel elements are placed immediately after being taken out of the reactor core to absorb radioactive fission products. Elements are transported from the cooling pond to storage or reprocessing plants.

Reactor Vessel - a steel container usually surrounded by concrete and steel shields; holds the nuclear reactor's core of fuel, control rods, and circulating water.

REM - Roentgen Equivalent Man - a unit devised to express the degree of biological injury caused by radiation. The amount of radiation that produces the same biological injury in humans as that resulting from the absorption of 1 roentgen of X-radiation.

Repository - a site in a stable rock formation a few thousand meters into the earth where high-level and transuranium wastes will be buried.

Reprocessing - chemical process by which unfissioned uranium-235 and plutonium-239 are removed from spent reactor fuel.

Retrieval - the act of intentionally removing radioactive waste before repository closure from the underground location at which the waste had been previously emplaced for disposal.

Roentgen - a unit of exposure to ionizing radiation. The amount of gamma or X rays required to produce ions carrying 1 electrostatic unit of electrical charge in 1 cubic centimeter of dry air under standard conditions. Named for Wilhelm Roentgen, the discoverer of X rays (1895)

Safety Rod - a control rod used as a standby to shut down a nuclear reactor rapidly in case of an emergency.

Saturated Zone - that part of the Earth's crust beneath the water table in which all voids, large and small, are ideally filled with water under pressure greater than atmospheric. (Act)

Site Characterization - activities, whether in the laboratory or in the field undertaken to establish the geologic condition and the ranges of the parameters of a candidate site relevant to the location of a repository, including borings, surface excavations, excavations of exploratory shafts, limited subsurface lateral excavations and borings, and in situ testing needed to evaluate the suitability of a candidate site for the location of a repository, but not including preliminary borings and geophysical testing needed to assess whether characterization should be undertaken.(Act)

Siting - the collection of exploration, testing, evaluation, and decision-making activities associated with the process of site screening, site nomination, site recommendation, and site approval for characterization or repository development. (Act)

Sorption Coefficient - (K_6) an inverse measure of the potential for nuclide transport through sediments. Defined as the ration of solid phase concentration to solution phase concentration.

Spallation - a nuclear reaction in which light particles are ejected as the results of bombardment (as by high-energy protons); especially a reaction resulting in numerous products.

Steam Generator - a large piece of equipment for turning water into steam. In a pressurized water reactor, heat from the primary loop moves to the steam generator, where it flows through a series of small tubes. Water in the secondary loop flows around the tubes, is heated, and turns to steam.

Spent Fuel - nuclear fuel that has been exposed to so much radiation that it can no longer effectively sustain a chain reaction in a nuclear reactor. In commercial reactors, this material typically contains about 96 percent unused uranium, 1 percent plutonium, and 3 percent other fission products categorized as high-level waste.

Storage - isolation permitting easy access to the waste after emplacement; requires human control and maintenance to guarantee isolation.

Tailings - residue from uranium mining and milling operations (in the form of fine sand) that contain low concentrations of naturally occurring radioactive materials.

Tetonics - the branch of geology dealing with the broad architecture of the outer part of the Earth, that is, the regional assembling of structural or deformational features and the study of their mutual relations, origin, and historical evolution. (Act)

Thermal Neutron - a neutron that has been slowed down by a moderator to an average speed of about 2200 meters per second at room temperatures from the much higher speed it had immediately on being expelled by fission. Thermal neutrons are slow compared with their original speed but not slow compared with common movement.

Tracer - a radionuclide that can be traced through a chemical, biological, or physical system in order to study the system.

Transuranic Elements or Transuranium Elements - elements that have atomic numbers greater than that of uranium. They are produced artificially and are important in nuclear wastes because of their radioactivity.

Tuff - fragmented rock consisting of the smaller kinds of volcanic detritus, usually more or less stratified.

Type A Packaging - Packaging designed to prevent the loss or dispersal of its radioactive contents under normal conditions of transport. This type of packaging carries raioactive materials that, because of their level of raioactivity or physical properties, constitute little hazard.

Type B Packaging - packaging that meets the same criteria as Type A but in addition is designed to meet standards for performance under hypothetical accident conditions. This type of packaging is designed to carry greater quantities of radioactivity than Type A.

Underground Facility - the underground structure and the rock required for support, including mined openings and backfill materials, but excluding shafts, boreholes, and their seals. (Act)

Unsaturated Zone - the zone between the land surface and the water table. It includes the "capillary fringe". Generally, water in this zone is under less than atmospheric pressure, and some of the voids may contain air or other gases at atmospheric pressure. Beneath flooded areas or in perched water bodies, the water pressure locally may be greater than atmospheric.

Uranium - a radioactive element found in natural ores with an average atomic weight of approximately 238. The two principal forms are uranium-238 (99.3% of natural uranium), which is fertile, and uranium - 235 (0.7% of natural uranium), which is fissile. Uranium undergoes very slow radioactive decay and captures neutrons in a nuclear reactor to produce a heavier isotope, uranium-239, which decomposes by beta emission and is used primarily in atomic energy programs to sustain chain reactions, to provide a source of the light isotope uranium-235, and to make plutonium.

Uranium Hexafluoride (UF_6) - a corrosive chemical compound in the nuclear fuel cycle. Uranium oxide (U_3O_8) or yellowcake is converted to uranium hexaflouride (UF_6), the so-called "conversion process". With the application of heat, UF_6 becomes a gas that permits the concentration (enrichment) of uranium-235, the uranium isotope required for reactor fuel.

Vitrification - formation of glassy or noncrystalline material out of nuclear wastes after subjection to temperatures between 950°C and 1,150°C.

Waste Form - the radioactive waste materials and any encapsulating or stabilizing matrix. (Act)

Waste Package - the waste form and any containers, shielding, packing, and other sorbent materials immediately surrounding an individual waste container. (Act)

Water Table - that surface in a body of ground water at which the water pressure is atmospheric. (Act)

X Rays - a penetrating form of ionizing radiation emitted when a stream of electrons strikes an object.

Yellowcake - a uranium ore concentrate, consisting mostly of uranium oxide (U_3O_8). It is usually yellow-green in color.

The definitions contained in this glossary were obtained from the following sources:

Federal Emergency Management Agency. Guidance for Developing State and Local Response Plans and Preparedness for Transportation Accidents. Washington, D.C.: 1983.

Foster, R.F., I.L. Ophel, and A. Preston, 1971. Evaluation of Human Radiation Exposure. In Radioactivity in the Marine Environment, National Academy of Sciences, Washington, D.C., p. 240-262.

Gove, Philip Babcock. (Editor) 1976. Webster's Third New International Dictionary. (Unabridged) G. & C. Merriam Co., Springfield, Massachusetts, 2,662 p.

Hyde, Margaret O. & Bruce G. Everybody's Trash Problem: Nuclear Wastes. New York: McGraw-Hill Book Company, 1979.

Kiefer, Irene. Nuclear Energy at the Crossroads. New York: Atheneum, 1982

Lipschutz, Ronnie D. 1980. Radioactive Waste: Politics, Technology, and Risk. A Report of the Union of Concerned Scientists. Ballinger Publishing Company, Cambridge Massachusetts, p. 203-214.

National Advisory Committee on Oceans and Atmosphere. Nuclear Waste Management and the Use of the Sea. Washington, D.C.: April, 1984

Office of Technology Assessment. 1982. Managing Commercial High-Level Radioactive Waste. OTA-O-1972, Congress of the United States, Washington, D.C., 65 p.

Stein, Jess. (Editor) 1975. The Random House College Dictionary. Revised Edition. Random House, Inc., New York, 1,568 p.

Triplett, Mark B., et al. 1982. Monitoring Technologies for Ocean Desposal of Radioactive Waste. Prepared for the National Oceanic Atmospheric Admininstration, R-2773 -NOAA, Rand, Santa Monica, California, p. xvii-xix.

U.S. Dept. of Transportation, Research and Special Programs Administration. Radioactive Materials Transportation Inforamtion and Incident Guidance.

U.S. Dept. of Energy. 1983. Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics. DOE/NE-0017/2, Assistant Secretary for Nuclear Energy and Assistant Secretary for Defense Programs, Washington, D.C., p. 2.

Weast, Robert C., and Melvin J. Astle. (Editors) 1981. CRC Handbook of Chemistry and Physics. Chemical Rubber Publishing Co., Boca Raton, Florida, Section F.

APPENDIX B

National and Regional Agencies & Organizations as Resources on Nuclear Waste

This Appendix is divided into five sections identifying resources and their contact addresses and phone numbers for follow-up to gather additional information and establish linkages. The sections include:

Environmental Protection Agency
Office of Radiation Programs
Mail Code (ANR-460)
401 M Street, S.W.
Washington, D. C. 20460
Phone: 703-557-8610

The Environmental Protection Agency, (EPA) established in 1970 assumes lead Federal responsibility for identifying, evaluating, and controlling environmental pollutants. EPA is responsible for setting generally applicable standards for radiation exposures, radiation releases and levels in the environment. The EPA also performs analytical assessments of risks and costs associated with levels of radiation standards. The EPA is responsible for the issuance of permits for the ocean dumping of any material, except dredged material, including low level radioactive waste.

Federal Emergency Management Agency
Office of Natural and Technological Hazards
Technological Hazards Division
Room 506
500 "C" Street, S.W.
Washington, D. C. 20472
Phone: 202-287-0200

The Federal Emergency Management Agency (FEMA), as part of its mission, is responsible for coordinating all Federal off-site nuclear emergency planning and response functions including accidents at nuclear power plants, transportation incidents, and other nuclear-related emergencies. FEMA published a Guidance for Developing State and Local Radiological Emergency Response Plans and Preparedness for Transportation Accidents in March, 1983 in cooperation with a Federal Radiological Preparedness Committee comprised of representatives from twelve Federal agencies. FEMA also published an interim "Federal Radiological Emergency Response Plan" in the September 12, 1984 Federal Register. These planning documents provide an excellent reference to Federal plans, proposed procedures, and contracts in the case of a civilian nuclear accident.

National Advisory Committee on Oceans and Atmosphere (NACOA)
NACOA Panel on Nuclear Waste Management
Page 1 Building, Room 438
3300 Whitehaven Street, N.W.
Washington, D. C. 20235
Phone: 202-653-7818

The National Advisory Committee on Oceans and Atmosphere (NACOA) is an eighteen member committee appointed by the President to advise the Executive Branch and Congress on the state of national ocean and atmosphere research, policies, services, and programs. NACOA meets eight times a year with subcommittee panels meeting more often on specific topics. In April, 1984, NACOA released a publication: Nuclear Waste Management and the Use of the Sea. The report recommends a reversal of U.S. current practice of dumping low-level radioactive waste in the ocean until a full assessment of the effects can be determined through monitoring and research. The report also recommends research and exploration of ocean dumping of high-lvel radioactive waste considering also the international consequences of such research. The extensive report is available while supplies last from the above address.

Office of Technology Assessment
U.S. Congress
Washington, D. C. 20510
Phone: 202-226-2115

The Congressional Office of Technology Assessment is a bi-partisan arm of Congress which undertakes technical studies at the request of Congressional members or committees. The Congressional board is comprised of ten Congressional members; six from each House and a non-voting OTA Director. An OTA Advisory Council from universities, the private sector, and Federal agencies with technical expertise also makes recommendations to the Board and reviews OTA work. OTA performs its research through in-house staff and by contract with outside experts.

OTA published a 1982 report, "Managing Commercial High-Level Radioactive Waste" analyzing comprehensive policy on nuclear waste. It is available for purchase through the Government Printing Office. A summary of this report is available through OTA by referencing "Managing Commercial High-Level Radioactive Waste -- A Summary" (OTA-O-172, April, 1982.)

U.S. Department of Energy
Office of Civilian Radioactive Waste Management
U.S. Department of Energy
Forrestal Building
1000 Independence Avenue, S.W.
Washington, D. C. 20585
Phone: 202-252-6842

The U.S. Department of Energy (DOE) is responsible for planning, research, development, and management relative to the implementation of the Nuclear Waste Policy Act of 1982. DOE also has responsibility for the handling, storage or disposal of low level nuclear waste and defense/commercial high level waste and/or spent fuel. A public briefing packet on all aspects of the Act is available from the above address free of charge. Also, a comprehensive description of DOE plans entitled: Mission Plan for the Civilian Radioactive Waste Management Program, Volumes I & II, Draft, (DOE/RW-0005) is available free of charge by contacting:

Office of Public Affairs
Draft Mission Plan for
Radioactive Waste
U.S. Department of Energy
Room 1E-218
Forrestal Building
1000 Independence Avenue, S.W.
Washington, D. C. 20585
Phone: 202-252-5568

The DOE maintains several field offices to manage particular repository research or depository functions required by the Act including an active repository test site in Nevada. These office addresses and their missions include:

National Waste Terminal Storage
Program Office (Salt Sites reporting to Chicago Office)
U.S. Department of Energy
505 King Avenue
Columbus, OH 43201
Phone: 614-424-5916
FTS 8-976-5916

Waste Management Project Office
Nevada Operations Office (Nevada Test Site)
U. S. Department of Energy
P. O. Box 14100
Las Vegas, NV 89114
Phone: 702-295-3662
FTS 8-575-3662

Basalt Waste Isolation Project Office
U.S. Department of Energy
Richland Operations Office
P.O. Box 550
Richland, Washington 99352
Phone: 509-376-7334
FTS 8-444-7334

Crystalline Repository Project Office
U.S. Department of Energy
Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439
Phone: 312-972-2257
FTS 8-972-2257

Albuquerque Operations Office (Subseabed, Waste
Isolation Pilot Project, Transportation)
Box 5400
Albuquerque, New Mexico 60439
Phone: 505-846-7231
FTS 8-844-7231

A private DOE contractor, Battelle, maintains an Office of Nuclear Waste Isolation (ONWI) library of all Federal documents, some non-Federal publications and mailing lists for technical data. Requests for their publication catalogues on the wide range of nuclear waste topics should be addressed to:

ONWI Library (Battelle)
505 King Avenue
Columbus, Ohio 43201
Phone: 614-424-7697

U.S. Department of Health and Human Services
Environmental Health Branch
Indian Health Service
Room 6 A-54
Parklawn Building
5600 Fishers Lane
Rockville, Maryland
Phone: 301-443-1046

The Indian Health Service serves to improve the health of Indian peoples through direct clinical care, contract care, and environmental health through construction and maintenance of water and sewage treatment systems on reservations. The IHS is committed to monitoring radiation exposure levels to Indian populations and educating Indian people as to radiation and its effects in the uranium industry, water, as well as diagnostic and therapeutic radiation.

The Indian Health Care Amendments of 1980, P.L. 96-537, included a Section 707(a) requirement to study the health hazards to Indians as a result of nuclear resource development on or near Indian land. The subsequent IHS report, Health Hazards Related to Nuclear Resource Development on Indian Land of November, 1982 concluded that the major sources of radiation on Indian land are uranium mining and milling activities and abandoned uranium mill tailings piles. The report summarizes the development of the nuclear industry on Indian land, the adverse health effects to Indians associated with such development, and the actions taken in response to the potential health problems resulting from exposure to radiation.

U.S. Department of Interior
Environmental Services Staff
Office of Trust Responsibility
Bureau of Indian Affairs
Mail Code 204
18th and E Streets, N.W.
Washington, D. C. 20245
Phone: 202-343-6574

Environmental Services staff of the BIA Office of Trust Responsibility determine the affected status of American Indian Tribes and their respective treaty provisions upon Tribal petition under the Nuclear Waste Policy Act of 1982. BIA affected status determinations are forwarded to the Office of Civilian Radioactive Waste Management in the U. S. Department of Energy for further action if identified as defintely affected. The Office of Trust Responsibility also addresses the Tribal concerns regarding the clean-up and containment of uranium mill tail filings.

U.S. Department of Transportation
Office of Hazardous Materials Regulation
Materials Transportation Bureau/RSPA
400 Seventh Street, S.W.
Washington, D. C. 20590
Phone: 202-426-2311

The U.S. Department of Transportation (DOT) has the regulatory responsibility for the safe transport of all hazardous materials including radioactive materials by all modes and means of transport except postal shipments regulated

by the U.S. Postal Service. The DOT regulations govern the packaging and shipment of radioactive materials. The Nuclear Regulatory Commission also has responsibility for safety in the possession, use, and transfer of by-products, sources, and special nuclear materials which requires a license for handling and transport.

The DOT regulations outline specifications for packaging and labeling according to type/amount of radioactive materials and shipping modes. Also, regulations outline training requirements for shippers/handlers and routing requirements such as pre-notification to States and precautionary measures for emergency response in case of accidents. Although an actual emergency response will be the responsibility of State and local units of government, the DOT maintains a chemical Transportation Emergency Center (CHEMTREC) with a toll free number (800) 424-9300 for reference to Federal/State authorities in the case of emergencies involving radioactive materials.

U.S. Nuclear Regulatory Commission
Office of Nuclear Material Safety and Safeguards
Division of Waste Management
Mail Stop 623-55
Washington, D. C. 20555
Phone: 301-427-4069

NRC Technical Information Clearinghouse
Toll-Free Number (800) 638-8282 (The Clearinghouse will respond to questions regarding NRC decisions and information as well as refer inquiries to appropriate offices in the NRC or other Federal agencies)

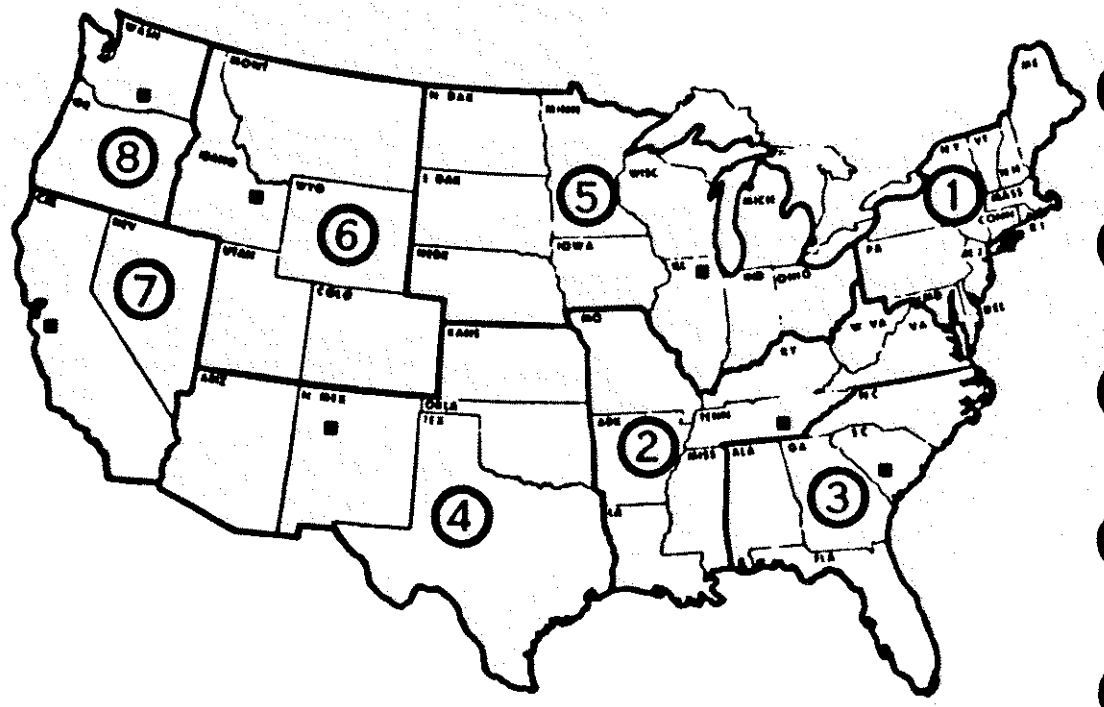
The Nuclear Regulatory Commission (NRC) established by Congress in 1974 to replace the Atomic Energy Commission, is an independent agency governed by five board members appointed by the President. The mission of the NRC is to assure that non-military uses of nuclear materials in the United States, such as the operation of nuclear power plants or medical, industrual or research applications, provisions for the protection of public health, safety, and the environment; the safeguarding of nuclear materials and facilities from theft and sabotage; and the safe transport and disposal of nuclear materials and wastes. The NRC accomplishes its purposes through the licensing of nuclear reactor operations and other possession and use of nuclear materials, the issuance of rules and regulations governing licensed activities, and inspection and enforcement actions. NRC basically regulates all commercial nuclear activities from uranium mill tailing sites, the nuclear fuel cycle, packaging of nuclear waste and licensing of high-level waste disposal sites.

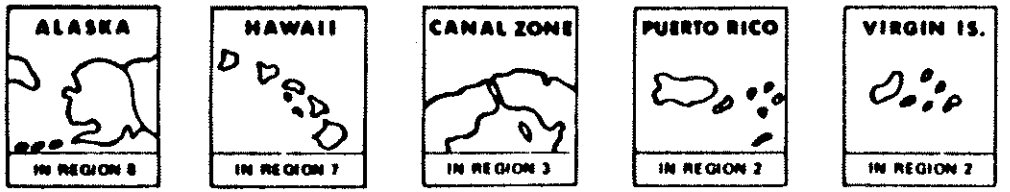
The NRC documents and publications are maintained by the Division of Technical Information and Document Control (TIDC). A free publication, NUREG/BR-0010 which describes all aspects of the NRC information services is available from TIDC. Write:

Division of Technical Information and
Document Control (TIDC)
U.S. Nuclear Regulatory Commission
Washington, D. C. 20555

DEPARTMENT OF ENERGY

REGIONAL COORDINATING OFFICES FOR RADIOLOGICAL ASSISTANCE AND GEOGRAPHICAL AREAS OF RESPONSIBILITY



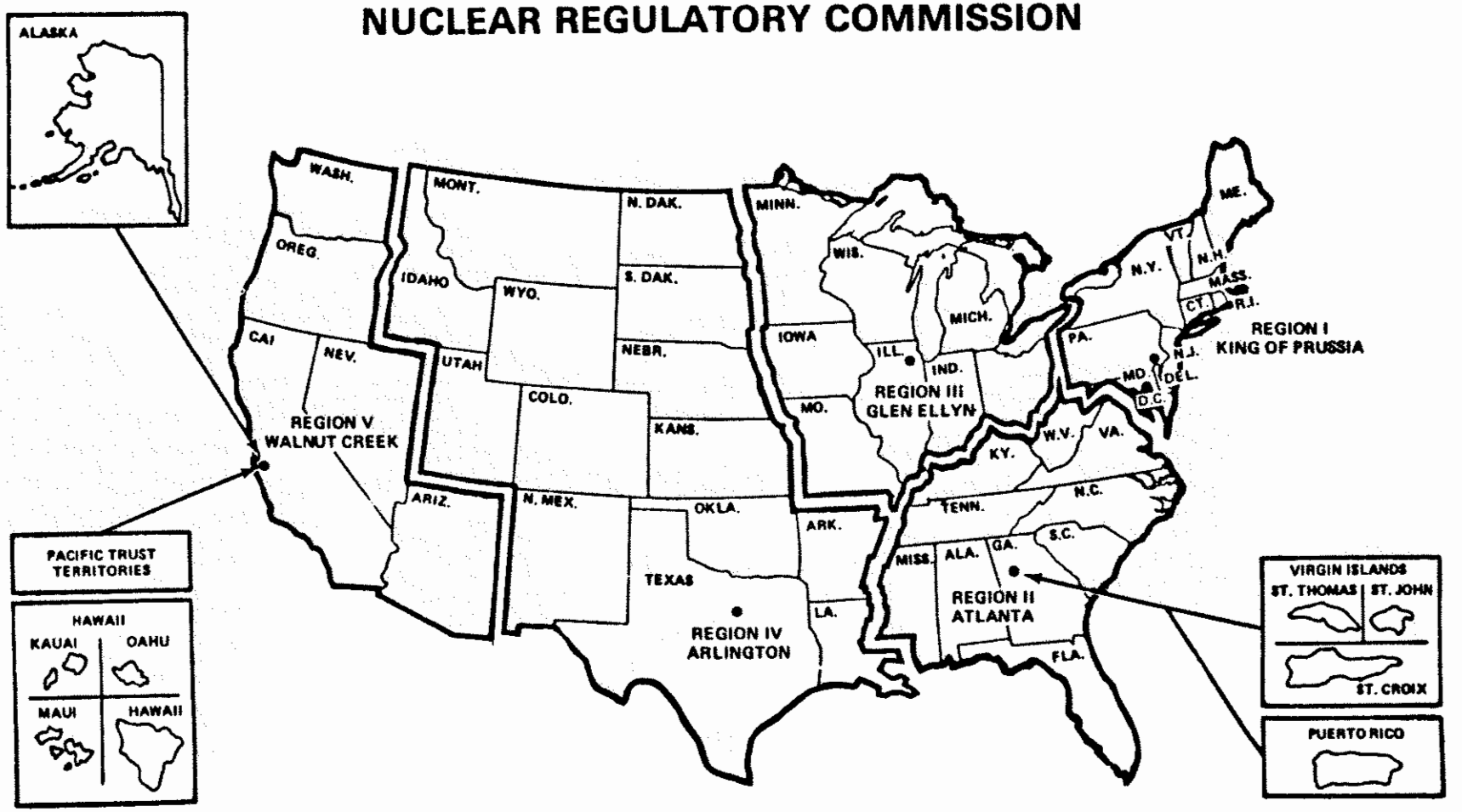


	REGIONAL COORDINATING OFFICE	POST OFFICE ADDRESS	TELEPHONE for ASSISTANCE
1	BROOKHAVEN AREA OFFICE	UPTON, L. I. NEW YORK 11973	(516) 282-2200
2	OAK RIDGE OPERATIONS OFFICE	P. O. BOX E OAK RIDGE, TENNESSEE 37830	(615) 576-1006 or (615) 626-7885
3	SAVANNAH RIVER OPERATIONS OFFICE	P. O. BOX A AIKEN, S. C. 29801	(803) 725-3333
4	ALBUQUERQUE OPERATIONS OFFICE	P. O. BOX 5400 ALBUQUERQUE, NEW MEXICO 87115	(505) 844-4667
5	CHICAGO OPERATIONS OFFICE	9800 S. CASS AVE. ARGONNE, ILLINOIS 60439	Duty Hrs. (312) 972-4800 Off Hrs. 972-5731
6	IDAHO OPERATIONS OFFICE	550 SECOND ST. IDAHO FALLS, IDAHO 83401	(208) 526-1515
7	SAN FRANCISCO OPERATIONS OFFICE	1333 BROADWAY OAKLAND CALIFORNIA 94612	(415) 273-4237
8	RICHLAND OPERATIONS OFFICE	P. O. BOX 550 RICHLAND, WASHINGTON 99352	(509) 376-7381

Correct as of December 27, 1982

Source: FEMA REP 5, March, 1983
Guidance for Developing State and Local Radioactive Emergency Response Plans and Preparedness for Transportation Accidents

NUCLEAR REGULATORY COMMISSION



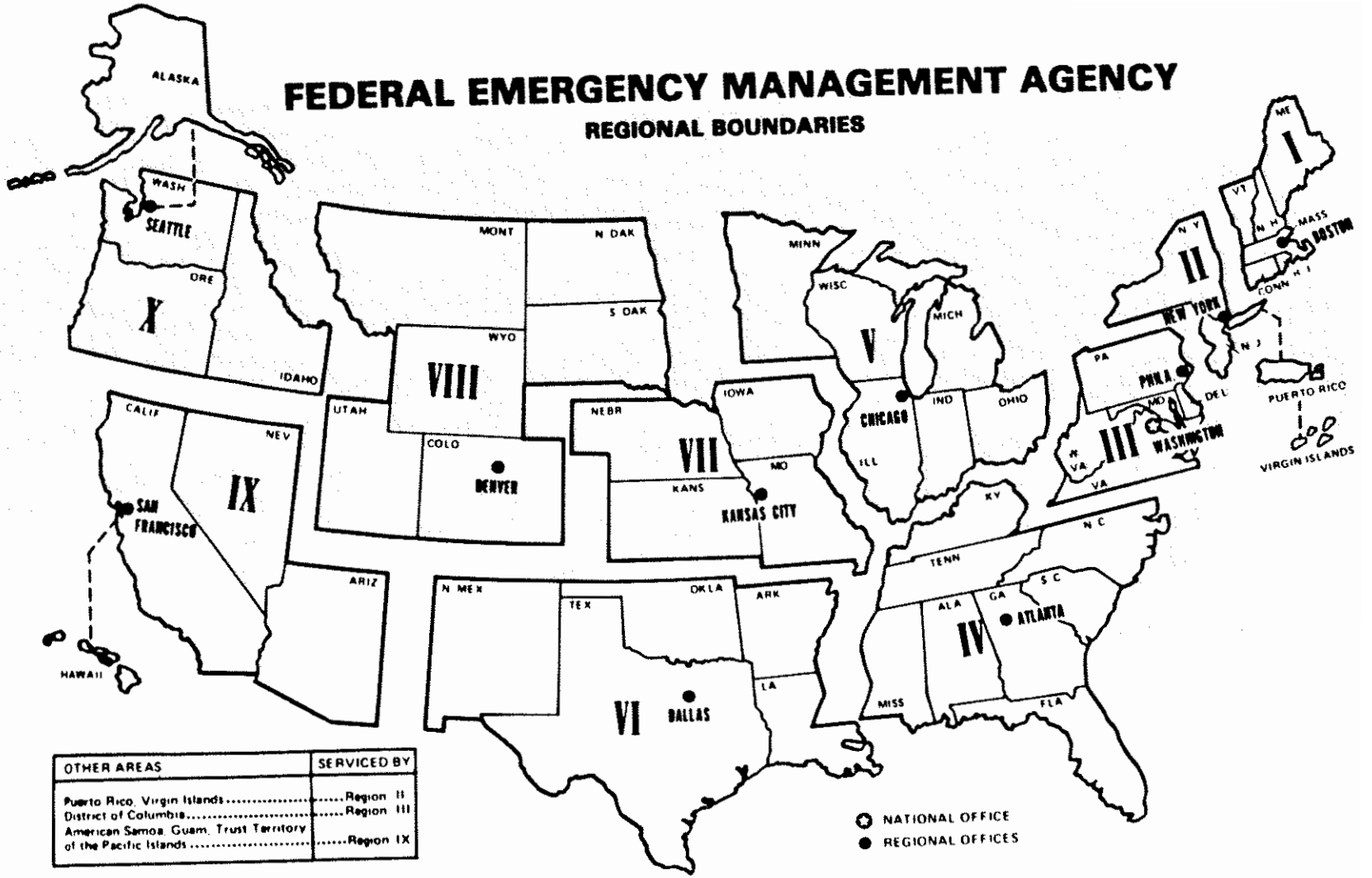
NUCLEAR REGULATORY COMMISSION

HEADQUARTERS		202-951-0550
REGIONS		
I	King of Prussia, Pennsylvania	213-337-5000
II	Atlanta, Georgia	404-221-4503
III	Glen Ellyn, Illinois	312-932-2500
IV	Arlington, Texas	817-860-8100
V	Walnut Creek, California	415-943-3700

Telephone numbers correct as of December 28, 1982.

FEDERAL EMERGENCY MANAGEMENT AGENCY

REGIONAL BOUNDARIES



OTHER AREAS	SERVICED BY
Puerto Rico, Virgin Islands	Region II
District of Columbia	Region III
American Samoa, Guam, Trust Territory of the Pacific Islands	Region IX

November 1979
FEMA Chart No. 3

FEMA REGIONAL DIRECTORS OFFICE LISTING

Region I (Boston)

Regional Director
FEMA Region I
442 J. W. McCormack POCH
Boston, MA 02109

FTS 8-223-4741
ALT 8-223-6230/4271
FAX 8-223-1812
COMM (617) 223-4741
TWIX 710-347-0158

Region II (New York)

Regional Director
FEMA Region II
26 Federal Plaza
New York, NY 10278

FTS 8-264-8980
ALT 8-264-8395
FAX 8-264-4701
COMM (212) 264-8980

Region III (Philadelphia)

Regional Director
FEMA Region III
Curtis Building, 7th Floor
6th and Walnut Streets
Philadelphia, PA 19106

FTS 8-597-9416
FAX 8-597-0459
COMM (215) 597-9416

Region IV (Atlanta)

Regional Director
FEMA Region IV
Gulf Oil Building, Suite 664
1375 Peachtree Street, N.E.
Atlanta, GA 30309

FTS 8-257-2400
FAX 8-257-2549
COMM (404) 881-2400

Region V (Chicago)

Regional Director
FEMA Region V
One N. Dearborn St., Rm. 540
Chicago, IL 60602

FTS 8-353-1500
FAX 8-353-2257
COMM (312) 353-1500

Region VI (Dallas)

Regional Director
FEMA Region VI
Federal Regional Center, Rm. 206
Denton, TX 76201

FTS 8-749-9201
FAX 8-749-9367
COMM (817) 387-5811

Region VII (Kansas City)

Regional Director	FTS	8-758-5912
FEMA Region VII	FAX	8-758-6912
Old Federal Office Bldg., Rm. 300	COMM	(816) 374-5912
Kansas City, MO 64106		

Region VIII (Denver)

Regional Director	FTS	8-234-2553
FEMA Region VIII	ALT	8-234-6994
Federal Regional Center, Bldg. 710	AUTO PAN	8-322-8235
Denver, CO 80225	COMM	(303) 234-6542/ 234-2104

Region IX (San Francisco)

Regional Director	FTS	556-8794
FEMA Region IX	FAX	8-556-5157
211 Main Street, Rm. 220	COMM	(415) 556-8794
San Francisco, CA 94105		

Region X (Seattle)

Regional Director	FTS	8-396-0284
FEMA Region X	FAX	8-396-0307
Federal Regional Center	COMM	(206) 481-8800
Bothell, WA 98011		

Headquarters (Washington, D.C.):

FEMA's 24-hour Emergency Information and Coordination Center (EICC) can be reached at (202) 634-7800 or FTS 634-7800. Also, when the Regional Offices are closed, calls to these offices are automatically routed to the FEMA EICC. The telephone numbers provided are correct as of December 6, 1982.

DOT REGIONAL EMERGENCY TRANSPORTATION COORDINATORS
AND REGIONAL EMERGENCY TRANSPORTATION REPRESENTATIVES

The DOT Regional Emergency Transportation Coordinators (RECTOs) and Regional Emergency Transportation Representatives do not provide radiological expertise or monitoring for resolution of emergencies. Their expertise consists of assistance and advice given upon request and coordination of transportation resources needed to support emergency response organizations and operations.

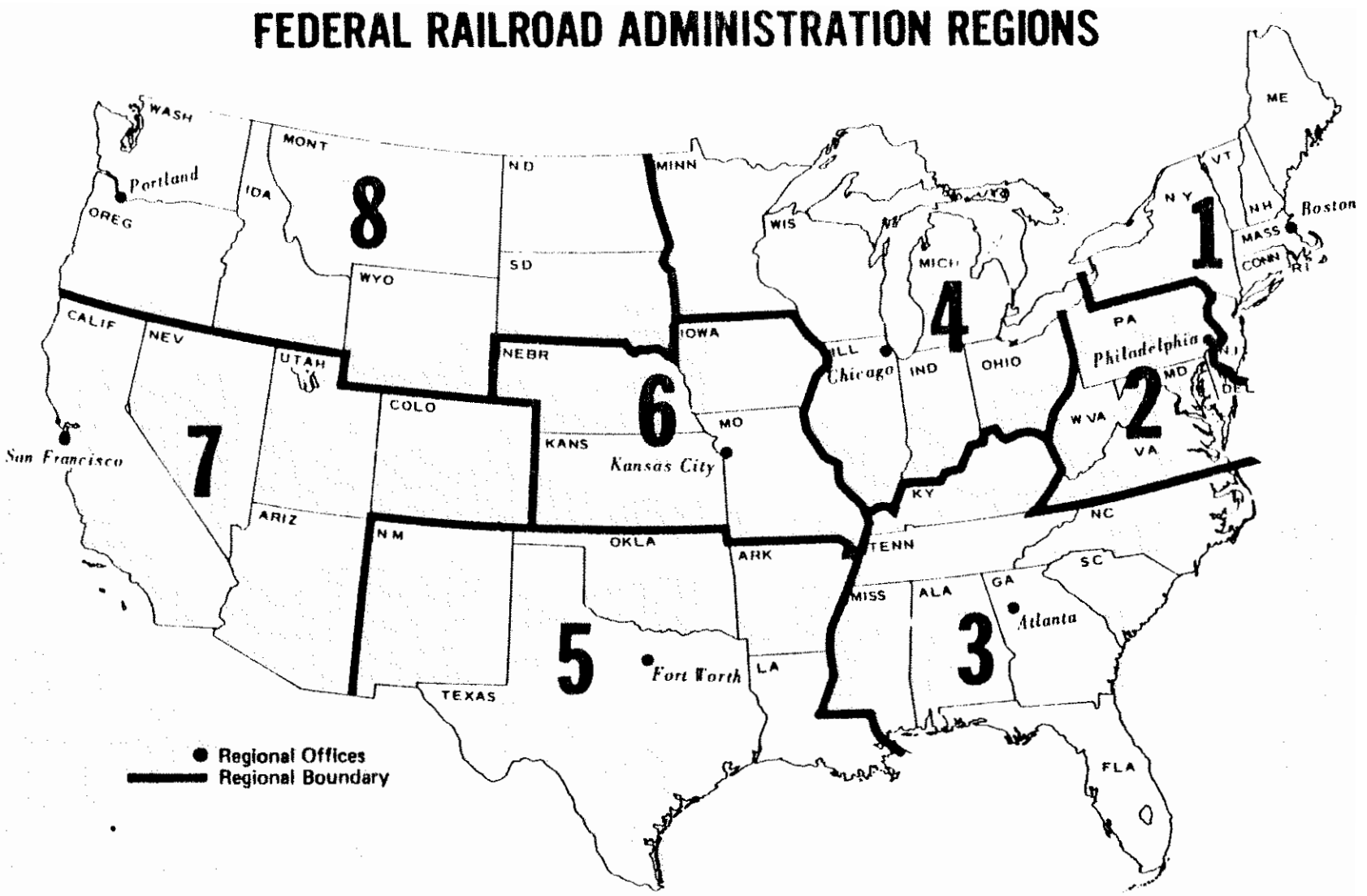
OET/DOT Region	Regional Emergency Transportation Coordinators	Regional Emergency Transportation Representatives
1/2 ME NY VT NJ NH MA CT RH	Commander, 1st CG District 150 Causeway Street Boston, MA 02114 FTS 223-3601 Comm: (617) 223-3601	1st Coast Guard District 150 Causeway Street Boston, MA 02114 FTS 223-5707 Comm: (617) 223-5707
3 PA MD VA WV DE	Regional FHWA Administrator 31 Hopkins Plaza Baltimore, MD 21201 FTS 922-2361 Comm: (301) 962-2361	Federal Highway Administration 31 Hopkins Plaza Baltimore, MD 21201 FTS 922-2372 Comm: (301) 962-2372
4 KY TN MS GA NC SC AL FL	Deputy Director FAA Southern Region P.O. Box 20636 Atlanta, GA 30320 FTS 246-7333 Comm: (404) 763-7333	FAA Southern Region P.O. Box 20636 Atlanta, GA 30320 FTS 246-7541 Comm: (404) 763-7541 FTS 246-7671
5 MN MI IN WI IL OH	Regional FHWA Administrator 18209 Dixie Highway Homewood, IL 60430 FTS 370-9108 Comm: (312) 799-6300	Federal Highway Administration 18209 Dixie Highway Homewood, IL 60430 FTS 370-9105 Comm: (312) 799-6300
6 NM OK LA TX AR	Regional Planning Staff FAA Southwest Region P.O. Box 1689 Ft. Worth, TX 76101 FTS 736-9361 or 736-9215 Comm: (817) 624-4911 Ext. 361 or 215	FAA Southwest Region P.O. Box 1689 Ft. Worth, TX 76101 FTS 736-9361 Comm: (817) 624-4911 Ext. 361

OST/DOT Region	Regional Emergency Transportation Coordinators	Regional Emergency Transportation Representatives
7 NE IA KS MO	Regional FHWA Administrator P.O. Box 19715 Kansas City, MO 64161 Comm: (816) 926-7563 FTS 926-7563	Federal Highway Administration P.O. Box 19715 Kansas City, MO 64141 Comm: (816) 926-7564 FTS 926-7564
8 MY WY UT CO	Regional FHWA Administrator P.O. Box 25246 Denver, CO 80225 Comm: (303) 234-4051 FTS 234-4051	Federal Highway Administration P.O. Box 25246 Denver, CO 80225 Comm: (303) 234-4158 FTS 234-4158
9 CA NV AZ	Commander, Pacific Area 630 Sansome Street San Francisco, CA 94126 Comm: (415) 556-3860 FTS 556-3860	Pacific Area, USCG 630 Sansome Street San Francisco, CA 94126 Comm: (415) 556-6524 FTS 556-6524
10 ID OR WA	Commander, 13th CG District Federal Building, Rm. 3590 915 Second Avenue Seattle, WA 98174 Comm: (206) 442-5078 FTS 399-5078	United States Coast Guard Federal Building, Rm. 3588 915 Second Avenue Seattle, WA 98174 Comm: (206) 442-0949 FTS 399-0949
AK	Deputy Director FAA Alaskan Region 701 C Street, POB 14 Anchorage, AK 99513 *(907) 271-5645	Emergency Plans Officer FAA Alaskan Region 701 C. Street, POB 14 Anchorage, AK 99513 *(907) 271-5286

*FTS - Call Seattle, Washington operator 399-0150.

The telephone numbers provided are correct as of September 28, 1982.

FEDERAL RAILROAD ADMINISTRATION REGIONS



REGION	STATE	NAME	PHONE
1	BOSTON	E.B. HASSEL	(617) 223-2775
2	PHILADELPHIA	W.F. HOLL	(215) 597-0750
3	ATLANTA	C.R. MEYRICK	(404) 881-2751
4	CHICAGO	J.J. SHARPE	(312) 353-6203
5	FORT WORTH	D.M. PRESTON	(817) 334-3601
6	KANSAS CITY	H.R. BIRD	(816) 374-2497
7	SAN FRANCISCO	H.R. BIRD	(415) 556-6411
8	PORTLAND	R. MOWATT-LARSSEN	(503) 221-3011

LIST OF PERSONS TO CONTACT

FEDERAL RAILROAD ADMINISTRATION*

WASHINGTON, D.C., HQTRS

Frank V. Fanelli, Chief
400 Seventh Street, S.W., Room 7315
Washington, D.C. 20590
(202) 426-9178
E.W. Pritchard; Alfred Brooks;
Dave Dancer: (202) 426-2748

REGION 1

E.B. Hassel, Director, Railroad Safety
Room 1307, Analex Building
150 Causeway Street
Boston, MA 02114
FTS: 8-223-2775
COM: (617) 223-2775

REGION 2

W. F. Holl, Director, Railroad Safety
Room 1020, Independence Bldg.
434 Walnut Street
Philadelphia, PA 19106
FTS: 8-597-0750
COM: (215) 597-0750

REGION 3

C. R. Meyrick, Director, Railroad Safety
Suite 440 North Tower
1720 Peachtree Road, N.W.
Atlanta, GA 30309
FTS: 8-257-2751
COM: (404) 881-2751

REGION 4

J. J. Sharpe, Director, Railroad Safety
165 North Canal Street
14th Floor
Chicago, IL 60606
FTS: 8-353-6203
COM: (312) 353-6203

REGION 5

D. M. Preston, Director, Railroad Safety
Federal Office Bldg., Room 7A35
819 Taylor Street
Fort Worth, TX 76102
FTS: 8-334-3601
COM: (817) 334-3601

REGION 6

H. R. Bird, Director, Railroad Safety
1807 Federal Building
911 Walnut Street
Kansas City, MO 64106
FTS: 8-758-2497
COM: (816) 374-2497

REGION 7

H. R. Bird, Director, Railroad Safety
2 Embarcadero Center, Suite 630
San Francisco, CA 94111
FTS: 8-556-6411
COM: (415) 556-6411

REGION 8

R. Mowatt-Larssen, Director, Railroad Safety
302 Mead Building
421 S. W. Fifth Avenue
Portland, OR 97204
FTS: 8-423-3011
COM: (503) 221-3011

*Addresses and phone numbers subject to change without notice.
List revised August 1984

ENVIRONMENTAL PROTECTION AGENCY

(Key Contacts for Radiological Emergencies)

EPA HEADQUARTERS	COMMERCIAL	FTS
Washington, D.C.	(703) 557-2380	557-2380
EPA Response Teams		
Eastern Environmental Radiation Facility (Montgomery)	(205) 272-3402	534-7615
Office of Radiation Programs (Las Vegas)	(702) 798-2476	545-2476
Office of Research and Development (Las Vegas)	(702) 798-2305	545-2305
Radiation Representatives		
Region I (Boston)	(617) 223-5708	223-5708
(24 hour emergency number)	(617) 223-7265	223-7265
Region II (New York)	(212) 264-4418	264-4418
(24 hour emergency number)	(201) 548-8730	548-8730
Region III (Philadelphia)	(215) 597-8188	597-8188
(24 hour emergency number)	(215) 597-9898	597-9898
Region IV (Atlanta)	(404) 881-3936	257-3936
(24 hour emergency number)	(404) 881-4062	257-4062
Region V (Chicago)	(312) 353-2654	353-2654
Region VI (Dallas)	(214) 767-2734	729-2734
(24 hour emergency number)	(214) 767-2666	729-2666
Region VII (Kansas City)	(816) 374-6525	758-6525
(24 hour emergency number)	(816) 374-3778	758-3778
Region VIII (Denver)	(303) 837-6008	327-6008
(24 hour emergency number)	(303) 974-8378	454-8378
Region IX (San Francisco)	(415) 556-4606	556-4606
(24 hour emergency number)	(415) 974-8131	none
Region X (Seattle)	(206) 442-1261	399-1261

A more complete and up-to-date list of key contacts is included in the "EPA Radiological Emergency Response Plan" which is maintained by the EPA Office of Radiation Programs, Washington, D.C. 20460. For identification of corresponding States for each EPA Region, refer to the FEMA Regional map

AMERICAN FRIENDS SERVICE COMMITTEE
WASHINGTON OFFICE
1822 "R" STREET, N.W.
WASHINGTON, D.C. 20009
202/483-3341

The American Friends Service Committee (AFSC) is a non-profit religious and charitable philanthropic organization sponsored principally, by the Quaker religion promoting goals of peace, social justice, humanitarian relief, and international development efforts. Civilian nuclear power issues is a secondary theme to the organizations efforts to reduce military spending and halt the nuclear dimensions of the armsrace. The AFSC has been a public advocate in the issues of uranium mining in the Southwest, nuclear weapons shipments nationwide, and a sponsor of the Nuclear Victims Forum for those exposed to nuclear bomb testing fallout in the Southwest.

The AFSC supports public awareness initiatives ranging from Congressional testimony to regional/local information and involvement campaigns. Some regional AFSC offices deal directly with the nuclear power and waste issues; however, their concerns primarily address the potential weapons production from nuclear power plant by-products and public awareness of nuclear weapons production and shipments such as the white trains.

AMERICANS FOR INDIAN OPPORTUNITIES, INC.
SUITE 200
1010 MASSACHUSETTS AVENUE, N.W.
WASHINGTON, D.C. 20001
202/371-1280

Americans for Indian Opportunity (AIO) is a nonprofit organization founded in 1970 to work toward economic self-sufficiency for American Indians, and for political self-government for Tribal members. To accomplish these two goals, AIO works toward full citizenship and full opportunity for American Indians. AIO serves as a catalyst for change, often pioneering concepts and fostering opportunities for dialogue on emerging issues.

The AIO conducted six regional seminars sponsored by the Indian Health Service in 1980-81 regarding environmental issues including radiation. AIO published and distributed Radiation and Its Health Effects to Indian Tribes and Indian organizations to increase awareness of the radiation issue.

AIO in its advocacy role has focused on the broad spectrum of issues confronting Indian Country and Indian peoples. Recently AIO published an environmental awareness document, Messing With Mother Nature Can Be Hazardous to Your Health, which outlines environmental concerns including radiation and nuclear waste. AIO currently is conducting seminars and workshops at the Federal and Regional levels to instruct non-Indian leaders as to the treaty-trust relationship and help refine into functional terms the "government to government" relationship.

ATOMIC INDUSTRIAL FORUM, INC.
PUBLIC AFFAIRS & INFORMATION PROGRAM
7101 WISCONSIN AVENUE
BETHESDA, MARYLAND 20814-4805
301/654-9260

The Atomic Industrial Forum (AFI) is an international association of more than 500 organizations dedicated to the development of peaceful applications of nuclear energy. Among its members in some 25 countries are manufacturers, electric utilities, architect engineers and constructors, uranium mining and milling companies, radioisotope suppliers, service organizations, consultants, labor unions, law firms, financial institutions, universities and governmental agencies. The AFI offers public information on the nuclear power industry and its benefits. An AFI publication, Nuclear Waste Disposal: Closing the Circle describes the nuclear cycle and the topic of high level nuclear waste disposal. The publication is available on request free of charge.

COUNCIL OF ENERGY RESOURCE TRIBES
SUITE 400
1580 LOGAN STREET
DENVER, COLORADO 80203
303/832-6600

The Council of Energy Resource Tribes (CERT) is a non-profit coalition of 38 American Indian Tribes that own a substantial share of the energy resources in the United States. CERT assists the member Tribes to promote the general welfare of their people through the protection, conservation, control, and prudent management of their oil, natural gas, coal, uranium, geothermal and other energy resources.

CERT was incorporated in 1976. It is run by a Board of Directors comprised of the Chairman, President, or Governor of each CERT-member Tribe. CERT is located in Denver, Colorado and maintains a staff of Senior Professional Consultants which includes geologists, mining and petroleum engineers, hydrologists, environmental scientists and engineers, management and planning specialists, economists, financial analysts, and specialists in education and manpower.

CERT provides technical support as sub-contractor to the National Congress of American Indians on the nuclear waste project including direct assistance to potentially affected Tribal governments such as the Umatilla and Yakima Tribes. CERT is developing an extensive technical library on the subject of nuclear waste and is capable of responding to written or telephone inquiries.

CONFERENCE OF RADIATION CONTROL PROGRAM DIRECTORS, INC.
71 FOUNTAIN PLACE
FRANKFORT, KENTUCKY 40601
502/227-4543

The Conference of Radiation Control Program Directors, Inc., founded in 1968 as a major purpose serves as a common forum for radiation protection professionals at the Federal, State, and local levels of government including persons employed in a radiation control program under Tribal government authority. The Conference, with as many as forty task forces and working groups addressing the broad spectrum of radiation protection issues, meets annually to promote radiological health in all aspects and phases. There are five classes of membership for individuals working in the field of radiaiton control.

EDISON ELECTRIC INSTITUTE
1111 - 19th STREET, N.W.
WASHINGTON, D.C. 20036
202/828-7400

The Edison Electric Institute (EEI) is a nationwide trade association representing over 200 investor-owned electric utilities including nuclear, coal, and hydroelectric generation. The over 300 EEI staff monitors and reports on regulatory and legislative developments, research issues of membership concern, and provide descriptive information representing the association's perspective covering all aspects of electrical power generation. An EEI catalog of publications is available free of charge. Most publications are for sale from the above address.

ENVIRONMENTAL POLICY INSTITUTE
218 "D" STREET, N.E.
WASHINGTON, D.C. 20003
202/544-2600

The Environmental Policy Institute (EPI), a non-profit public foundation founded in 1974, influences national policy on energy and the environment by research, public education, litigation and Congressional lobbying. EPI attempts to increase the use of renewable resources and reduce the United States dependence on nuclear power and foreign oil. Six of EPI's fifteen projects concern nuclear power and nuclear weapons reduction issues including:

- o Nuclear Power & Weapons Project
- o Nuclear Accountability & Insurance Project
- o Nuclear & Hazardous Materials Transportation Project
- o Nuclear Waste and Safety Project
- o Nuclear Weapons Production & Testing Project
- o Radiation Victim Compensation Project

EPI provides educational briefing papers on topical subjects relative to energy and environmental concerns.

HEALTH AND ENERGY INSTITUTE
236 MASSACHUSETTS AVENUE, N.W.
WASHINGTON, D.C. 20002
202/543-1070

The Health and Energy Institute is a non-profit organization focusing on human health and environment concerns, particularly the health effects of radiation. The Institute maintains a Radiation Victims Roundtable to faster information exchange and dialogue networks for individuals impacted by radiation. An Institute-sponsored Commission on Pre-Natal and Child Health is researching the impacts of environmental pollutants during pregnancy. Brochures are available on radiation health effects on workers and women. And, a technical report is in the development stage with citizens organizing materials on the problems associated with solidifying high level nuclear waste from the nuclear weapons program. The Institute also is studying the effects of current proposals to preserve foods by irradiation.

NATIONAL CONGRESS OF AMERICAN INDIANS
804 "D" STREET, N.E.
WASHINGTON, D.C. 20002
202/546-9404

The National Congress of American Indians (NCAI), founded in 1944, is the oldest, largest, and most representative Indian organization in America. Serving an advocacy role with the Federal government and Congress, NCAI seeks to preserve Indian rights under treaties and agreements with the United States; promote the common wlefare of the American Indian people; preserve Indian cultural values; seek an equitable adjustment of Indian Affairs; and, promote a better understanding of Indian peoples. Although each individual Indian nation or Tribe maintains its own distinct set of priorities, Tribal leaders have collectively pursued issues of broader common concern affecting the internal security and progress of each Tribe in utilizing NCAI as a forum for dialogue and decisions.

The NCAI membership, Tribal and individuals, unilaterally support the full exercise of Tribal governments' legal and political jurisdiction within the geographic boundaries of each Tribal territory, including natural resources and the environment. NCAI's communication with Tribal governments, members and non-members alike, is well established through traditional mechanisms. Also, NCAI has close working relationships with intertribal organizations comprising various geographic sectors.

NCAI is the logical organization to take the lead role in informing Indian Tribes and individuals on the provisions and implications of the Nuclear Waste Policy Act of 1982, monitoring and reporting developments related to disposal of nulcear waste, and serving as a forum for Tribal leadership dialogue and decisions through the National Indian Nuclear Waste Review Group. This group, established in May, 1984 at the NCAI mid-year convention in Denver, Colorado, is comprised of representatives from potentially affected Indian Tribes in the first and second repository geographic area and interested individual. The group serves in an advisory capacity to NCAI Nuclear Waste project staff, reviews developments under the Act, and makes recommendations to the NCAI General Council on Policy issues. NCAI staff are available to assist Tribes and individuals with inquiries regarding the Nuclear Waste Policy Act.

NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS
7910 WOODMONT AVENUE
BETHESDA, MARYLAND 20814
301/657-2652

The National Council on Radiation Protection and Measurements (NCRP) is a non-profit corporation chartered by Congress in 1964 to collect, analyze, develop, and disseminate information about protection against radiation and about radiation measurements. The NCRP is comprised of over 600 volunteer scientists from universities and national laboratories that serve the 70 active scientific committees. The committees and their respective scientists develop scientific reports on all aspects of radiation protection and measurement. These reports, available at a nominal fee, are reviewed by at least 75 scientific peers prior to publication. The NCRP is supported through the sale of its publications and Federal/State research contracts. A free catalog of publications is available free on request.

NATIONAL RESEARCH COUNCIL
BOARD ON RADIOACTIVE WASTE MANAGEMENT
COMMISSION ON PHYSICAL SCIENCES, MATHEMATICS, AND RESOURCES
ROOM 826 - JH
2101 CONSTITUTION AVENUE, N.W.
WASHINGTON, D.C. 20418
202/334-3066

The National Research Council is a non-profit organization established by the National Academy of Sciences to perform independent technical research on a broad spectrum of topics. The Board of Radioactive Waste Management is comprised of scientists and engineers from universities, the private sector, and Federally-sponsored laboratories with technical background in the nuclear field. The Board is divided into sub-panels focusing selected expertise on narrower topics of research. The Council basically provides an independent scientific viewpoint on complex issues. In May, 1984 the Board's Panel on Social and Economic Aspects of Radioactive Waste Management published a critical review of Department of Energy plans entitled Social and Economic Aspects of Radioactive Waste Disposal: Considerations for Institutional Management. The publication is available for sale from the National Academy Press at the above address.

NATURAL RESOURCES DEFENSE COUNCIL
SUITE 300
1350 NEW YORK AVENUE, N.W.
WASHINGTON, D.C. 20005
202/783-7800

The Natural Resource Defense Council (NRDC) is a non-profit environmental membership organization concerned with the broad spectrum of environmental issues including air, water, land use, energy, international environmental concerns, and endangered species. The NRDC currently monitors and attempts to influence the Federal regulatory and guidance process to ensure effective safeguards by the Departments of Defense and Energy in the management and disposal of nuclear waste. NRDC staff are available for advice from general public inquiries and have explanatory print materials available to explain their organizational concerns and positions on nuclear waste management.

NUCLEAR INFORMATION AND RESOURCE SERVICE
1346 CONNECTICUT AVENUE, N.W.
WASHINGTON, D.C. 20036
202/296-7552

The Nuclear Information and Resource Service (NIRS) develops and disseminates fact sheets, slide shows, and resource guides on radioactive waste for interested professionals and the general public. In May, 1984, NIRS released a comprehensive publication, The Citizen's Nuclear Waste Manual which provides:

- a complete guide to the laws and regulatory framework governing the waste site selection process
- an inside look at the relevant federal agencies (Department of Energy, Nuclear Regulatory Commission, etc.)
- concrete suggestions on how to have an impact on the process from the state and local level
- in-depth, clear explanation of technical issues involved in waste dump siting

The manual has a three tiered price tag:

- $20 for citizens, non-profit groups and libraries
- $45 for State officials and Congressional offices
- $125 for industry representatives & Federal agencies

The organization promotes an educated citizen involvement and influence in the process of siting nuclear waste to adequately protect public health and safety.

SIERRA CLUB
330 PENNSYLVANIA AVENUE, S.E.
WASHINGTON, D.C. 20003
202/547-1141

The Sierra Club is a national, non-profit environmental protection organization involved with legislation, litigation, grass roots organizing, and public information issues. Club staff were closely involved in the Congressional debate over the Nuclear Waste Policy Act. Current staff activities related to nuclear waste regard monitoring of the government implementation of the Act at the national and regional levels with particular focus on the geologic host repository. The Sierra Club provides information briefs from their particular perspective on the Act and related site selection, packaging, transportation, and repository concerns.

SOUTHWEST RESEARCH AND INFORMATION CENTER
P.O. BOX 4524
ALBUQUERQUE, NEW MEXICO 87106
505/262-1800

The Southwest Research and Information Center promotes citizen information networks on radioactive waste through technical analysis of Federal/State decisions and activities, dissemination of information, and the provision of technical advice and legal assistance. The SRIC publishes a quarterly Nuclear Waste News and has a slide show and print media available on the topic of radioactive waste.

UNION OF CONCERNED SCIENTISTS
26 CHURCH STREET
CAMBRIDGE, MASSACHUSETTS 02238
617/547-5552

The Union of Concerned Scientists (UCS) established in 1969, is a national organization of scientists and citizens concerned about the impact of advanced technology on society focusing primarily on the issues of nuclear power safety, national energy policy, and nuclear arms control. The UCS work includes education activities, public interest litigation, and legislative lobbying with perspectives supported by a core group of professional scientists and engineers conducting independent technical research and analyses. The UCS publishes numerous reports, articles, and briefing papers often critiquing U.S. government positions on nuclear technology issues. A 1980 UCS publication Radioactive Waste: Politics, Technology, and Risk will be up-dated with a briefing paper on "radwaste" in the near future.

U.S. COMMITTEE FOR ENERGY AWARENESS
SUITE 500
1735 "I" STREET, N.W.
WASHINGTON, D.C. 20006
202/293-0770

The U.S. Committee for Energy Awareness (USCEA) is a non-profit, private organization with a broad mission "to gain broader public understanding that an adequate and reasonably priced supply of electrical energy is essential for a strong and expanding American economy; diversity of energy sources, including especially coal and nuclear, is necessary; and, to disseminate information to inform the public about the benefits with having new electrical generating plants when needed."

The USCEA has information briefs and booklets available on nuclear power generation, nuclear waste transportation and disposal as well as a Question & Answer publication on radioactive shipments. The Organization is supported primarily by public utilities, construction companies, large energy users, and investors.

INTERNATIONAL ORGANIZATIONS*

International Atomic Energy Agency (IAEA)
Director General
Wagramer 5
A-1220 Vienna
Austria

Since its establishment in 1957, the IAEA has been concerned with radioactive waste management within its general mandate of seeking to accelerate and to enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world.

International Commission on Radiological Protection (ICRP)
Secretariate
Cliston Avenue
Sutton Surrey SM25PU
England
Phone: 01-6424680

The ICRP has functioned since 1928, when it was established as the International X-ray and Radium Protection Committee. It is the international body that has given global guidance on the use of radiation sources caused by the developments in the field of nuclear energy. Its mission is to provide principles of radiation protection as a basis for each country to use to establish technical codes of practice.

Organization for Economic Cooperation and Development-Nuclear Energy Agency (OECD-NEA)
2 Rue Andre Pascal
75775 Paris 16
France

The mission of NEA is to promote orderly development of peaceful uses of nuclear energy through cooperation among Member States. NEA initiates, encourages, and coordinates cooperative work in reactor research, nuclear fuel cycle studies, radiation protection, waste management, nuclear safety regulatory matters, and nuclear data collection.

* International organization description source from the National Advisory Council on Oceans and Atmosphere publication: Nuclear Waste Management and the Use of the Sea, April, 1984, Appendix I, "Glossary of Organizations," p. 206.

APPENDIX C

STATE CONTACTS FOR RADIOACTIVE WASTE MANAGEMENT

The following listing provides the offices, addresses, and phone numbers (including off-duty and 24-hour numbers where available) for key contacts responsible for management of radioactive waste at the State level. Their responsibilities include management of all types of radioactive materials ranging from low level waste of milltail filings or medical technology to high level waste transport. Individuals responsible for notification of radioactive waste transport within the State are also included where available. The listing provides an up-to-date reference for further inquiry by Tribal officials.

The listing is limited and obviously can become out-dated over time. The key State contacts are current as of May, 1984 as listed in the Directory of Personnel Responsible for Radiological Health Programs. This directory lists the primary contacts in each State "who administer the radiation control activities in State and local governmental agencies." A copy of this directory or its up-date may be purchased for $3.00 by sending a check or money order to:

Office of the Executive Secretary
Conference of Radiation Control Program Directors, Inc.
71 Fountain Place
Frankfort, Kentucky 40601
Phone: 502/227-4543

A description of this organization and its purposes is included in Appendix B.

A second resource providing more in-depth listings of State contacts and descriptions of State legislative and regulatory initiatives relative to radioactive waste management is a Department of Energy publication entitled: Radioactive Waste Management: A Summary of State Laws and Administration. Although focusing more towards low-level radioactive waste management programs, this publication current to February, 1984 provides an excellent resource for

State contacts. The publication, entitled and identified as:

Radioactive Waste Management: A Summary of State Laws and Administration
DOE/LLW-18T Rev. 3
Distribution Category: UC-70B

is available by purchase from:

National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, VA 22161
NTIS Price Codes: Printed Copy A22
Microfiche A01

Further information or assistance in locating appropriate State/local offices responsible for radioactive waste is also available from either:

Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW-13
Forrestal Building
1000 Independence Avenue, S.W.
Washington, D. C. 20585

or

National Congress of American Indians

The following listing, current as of February and May, 1984 lists States alphabetically for reference purposes.

ALABAMA (AL)

RADIATION CONTROL OFFICER

AUBREY GODWIN, Director
Division of Radiological Health
Department of Public Health
State Office Building
Montgomery, AL 36130
205/261-5315
Off-Duty: 205/272-6540
24-Hour Phone #: 205/261-4378
Pager 215

SPENT FUEL SHIPMENT NOTIFICATION

COLONEL BYRON PRESCOTT, Director
Department of Public Safety
P. O. Box 1511
Montgomery, AL 36192
205/261-4394

ALASKA (AK)

RADIATION CONTROL OFFICER

SIDNEY HEIDERSDORF, Chief
Radiological Health Program
Department of Health & Social Services
Pouch H-06F
Juneau, AK 99811-9976
907/465-3019
Off-Duty: 907/789-9858
24-Hour Phone #: 907/789-9858

SPENT FUEL SHIPMENT NOTIFICATION

RICHARD A. NEVE, Commissioner
Department of Environmental Conservation
Pouch O
Juneau, AK 99811
907/465-2600

ARIZONA (AZ)

RADIATION CONTROL OFFICER

CHARLES F. TEDFORD, Director
Arizona Radiation Regulatory Agency
925 South 52nd Street, Suite 2
Tempe, AZ 85281
602/255-4845
Off-Duty: 602/998-4662
24-Hour Phone #: 602/262-8011

HIGH-LEVEL WASTE

Same

SPENT FUEL SHIPMENT NOTIFICATION

Same

ARKANSAS (AR)

RADIATION CONTROL OFFICER

E. FRANK WILSON, Director
Division of Radiation Control and Emergency Management
Department of Health
4815 West Markham Street
Little Rock, AR 72201
501/661-2301
Off-duty: 501/753-2256
24-Hour Phone #: 501/661-2136

SPENT FUEL SHIPMENT NOTIFICATION

Same

CALIFORNIA (CA)

RADIATION CONTROL OFFICER

JOSEPH O. WARD, Chief
Radiological Health Branch
State Department of Health Services
714 P Street, Office Bldg. #8
Sacramento, CA 95814
916/322-2073
Off-Duty: 916/796-3083

SPENT FUEL SHIPMENT NOTIFICATION

E. E. KYNASTON, Chief
California Highway Patrol
P. O. Box 898
Sacramento, CA 95804
916/445-6211

GEORGIA (GA)

RADIATION CONTROL OFFICER

BOBBY G. RUTLEDGE, Director
Radiological Health Section
Department of Human Resources
1256 Briarcliff Road, Rm. 425-South
Atlanta, GA 30306
404/894-5795
Off-Duty: 404/787-5046
Weekend #: 404/896-4712

HIGH-LEVEL WASTE

J. LEONARD LEDBETTER, Director
Division of Environmental Protection
Department of Natural Resources
270 Washington Street, SW
Atlanta, GA 30334
404/656-4713

SPENT FUEL SHIPMENT NOTIFICATION

KEN M. COPELAND, Director
Office of Permits and Enforcement
Department of Transportation
940 Virginia Avenue
Hapeville, GA 30354
404/656-5435

HAWAII (HI)

RADIATION CONTROL OFFICER

THOMAS ANAMIZU, Chief
Noise and Radiation Branch
Environmental Protection and Health Services Division
Department of Health
591 Ala Moana Boulevard
Honolulu, HI 96813
808/548-4383
Off-Duty: 808/955-3666

SPENT FUEL SHIPMENT NOTIFICATION

Governor George R. Ariyoshi
State Capitol
Honolulu, HI 96813
808/548-5420

IDAHO (ID)

RADIATION CONTROL OFFICER

ROBERT FUNDERBURG, Program Manager
Radiation Control Section
Idaho Department of Health and Welfare
Statehouse Mail
Boise, ID 83720
208/334-4107
Off-Duty: 208/362-5260

SPENT FUEL SHIPMENT NOTIFICATION

Same

ILLINOIS (IL)

RADIATION CONTROL OFFICER

DON ETCHISON, Director
Department of Nuclear Safety
1035 Outer Park Drive
Springfield, IL 62704
217/546-8100
Off-Duty: 217/546-6234
24-Hour Phone #: 217/782-7860

HIGH-LEVEL WASTE

same as Radiation Control Officer

SPENT FUEL SHIPMENT NOTIFICATION

JOHN COOPER, Transportation Coordinator
Office of Waste and Transportation Management
Illinois Department of Nuclear Safety
1035 Outer Park Drive
Springfield, IL
217/546-8100

INDIANA (IN)

RADIATION CONTROL OFFICER

HAL S. STOCKS, Chief
Radiological Health Section
Indiana State Board of Health
1330 West Michigan Street
Post Office Box 1964
Indianapolis, IN 46206
317/633-0152
Off-Duty: 317/253-6189

SPENT FUEL SHIPMENT NOTIFICATION

JOHN T. SHETTLE, Superintendent
Indiana State Police
301 State Office Building
100 North Senate Avenue
Indianapolis, IN 46204
317/232-8241

IOWA (IA)

RADIATION CONTROL OFFICER

JOHN A. EURE, Director
Environmental Health Section
Iowa Department of Health
Lucas State Office Building
Des Moines, IA 50319
515/281-4928
Off-Duty: 515/279-2208

SPENT FUEL SHIPMENT NOTIFICATION

JOHN D. CRANDALL, Director
Office of Disaster Services
Hoover State Office Building
Des Moines, IA 50319
515/281-3231

KANSAS (KS)

RADIATION CONTROL OFFICER

ROBERT EYE, Manager
Bureau of Air Quality and Radiation Control
Department of Health and Environment
Forbes Field, Bldg. 740
Topeka, KS 66620
913/862-9360

HIGH-LEVEL WASTE

Deborah "Deb" Miller
Office of the Governor
State Capitol
Topeka, KS 66612
913/296-4052, 296-4034

SPENT FUEL SHIPMENT NOTIFICATION

LEON H. MANNELL, P.E., Administrator
Radiological Systems
The Adjutant General's Department
Division of Emergency Preparedness
P. O. Box C-300
Topeka, KS 66601
913/233-9253, Ext. 321

KENTUCKY (KY)

RADIATION CONTROL OFFICER

DONALD R. HUGHES, Supervisor
Radiation Control Section
Cabinet for Human Resources
275 East Main Street
Frankfort, KY 40621
502/564-3700
Off-Duty: 502/695-1382
24 Hour Phone #: 502/564-7815

SPENT FUEL SHIPMENT NOTIFICATION

Same

LOUISIANA (LA)

RADIATION CONTROL OFFICER

WILLIAM H. SPELL, Administrator
Nuclear Energy Division
Office of Air Quality
Department of Environmental Quality
Post Office Box 14690
Baton Rouge, LA 70898-4690
504/925-4518
24-Hour Phone #: 504/925-4518

HIGH-LEVEL WASTE

L. HALL BOHLINGER, Assistant Administrator
Nuclear Energy Division
Department of Natural Resources
P. O. Box 14690
Baton Rouge, LA 70898
504/925-4518

SPENT FUEL SHIPMENT NOTIFICATION

COLONEL J. C. WILLIE, Acting Head
Louisiana State Police
265 South Foster Drive
P. O. Box 66614
Baton Rouge, LA 70896
504/925-6112

MAINE (ME)

RADIATION CONTROL OFFICER

WALLACE HINCKLEY, Assistant Director
Division of Health Engineering
157 Capitol Street
Augusta, MA 04333
207/289-3826
Off-Duty: 207/377-8834
24-Hour Phone #: 207/289-2155

HIGH-LEVEL WASTE

WALTER ANDERSON, State Geologist
Geological Survey
Department of Conservation
State House, Station 22
Augusta, ME 04333
207/289-2801

MAINE Continued

SPENT FUEL SHIPMENT NOTIFICATION

COLONEL ALAN WEEKS, Chief
Bureau of State Police
Department of Public Safety
36 Hospital Street
Augusta, ME 04333
207/289-3801

MARYLAND (MD)

RADIATION CONTROL OFFICER

DAVID L. RESH, Administrator
Community Health Management Program
Department of Health & Mental Hygiene
O'Conor Office Building
201 West Preston Street
Baltimore, MD 21201
301/383-2754

HIGH-LEVEL WASTE

WILLIAM EICHBAUM
Department of Health and Mental Hygiene
201 West Preston Street
Baltimore, MD 21201
301/393-7328

SPENT FUEL SHIPMENT NOTIFICATION

LT. COL. J. G. LOUGH, Chief
Field Operations Bureau
Maryland State Police
1201 Reisterstown Road
Pikeville, MD 21208
301/486-3101

MASSACHUSETTS (MA)

RADIATION CONTROL OFFICER

ROBERT M. HALLISEY, Director
Radiation Control Program
Department of Public Health
Seventh Floor, 150 Tremont Street
Boston, Massachusetts 02111
617/727-6214
Off-Duty: 617/729-5728

HIGH-LEVEL WASTE

Same

SPENT FUEL SHIPMENT NOTIFICATION

Same

MICHIGAN (MI)

RADIATION CONTROL OFFICER

GEORGE W. BRUCHMANN, Chief
Division of Radiological Health
Bureau of Environmental and Occupational Health
Department of Public Health
3500 North Logan Street
Post Office Box 30035
Lansing, MI 48909
517/373-1578
Off-Duty: 517/337-6100
24-Hour Phone #: 517/337-6100

HIGH-LEVEL WASTE

LEE JAGER, Chairman
High-Level Radioactive Waste Task Force
Bureau of Environmental and Occupational Health
Department of Public Health
3500 North Logan Street
Lansing, MI 48909
517/373-3720

SPENT FUEL SHIPMENT NOTIFICATION

CAPTAIN GENE A. ROOKER, Commanding Officer
Operations Division
Michigan Department of State Police
714 South Harrison Road
East Lansing, MI 48823
517/337-6100

MINNESOTA (MN)

RADIATION CONTROL OFFICER

ALICE T. DOLEZAL HENNIGAN, Chief
Section of Radiation Control
Environmental Health Division
Minnesota Department of Health
717 Delaware Street, S.E.
Post Office Box 9441
Minneapolis, MN 55440
612/623-5323
Off-Duty: 612/890-7782

HIGH-LEVEL WASTE

THOMAS KALITOWSKI, Chairman
Envrionmental Quality Board
100 Capitol Square Building
550 Cedar Street
St. Paul, MN 55101
612/296-1424

MINNESOTA continued

SPENT FUEL SHIPMENT NOTIFICATION

DEIDRE M. A. KRAUSE, Operations Officer
Minnesota Division of Emergency Services
State Capitol, Room B5
St. Paul, MN 55155
612/296-0453

MISSISSIPPI (MS)

RADIATION CONTROL OFFICER

EDDIE S. FUENTE, Director
Division of Radiological Health
State Department of Health
3150 Lawson Street
Post Office Box 1700
Jackson, MS 39215-1700
601/354-6657
Off-Duty: 601/982-2861

HIGH-LEVEL WASTE

WILBUR G. BALL, Executive Director
Department of Energy and Transportation
300 Watkins Building
510 George Street
Jackson, MS 39202
601/961-4733

SPENT FUEL SHIPMENT NOTIFICATION

JAMES E. MAHER, Director
Mississippi Emergency Management Agency
P. O. Box 4501, Fondren Station
Jackson, MS 39216
601/352-9100

MISSOURI (MO)

RADIATION CONTROL OFFICER

KENNETH V. MILLER, Administrator
Bureau of Radiological Health
1511 Christy Lane
Post Office Box 570
Jefferson City, MO 65102
314/751-2713 Ext. 361
Off-Duty: 314/635-5489

SPENT FUEL SHIPMENT NOTIFICATION

RICHARD RICE, Director
Disaster Planning and Operations
1717 Industrial Drive, P.O. Box 116
Jefferson City, MO 65102
314/751-2321, 751-2748

MONTANA (MT)

RADIATION CONTROL OFFICER

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SPENT FUEL SHIPMENT NOTIFICATION - PART 73

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SPENT FUEL SHIPMENT NOTIFICATION

Same as Radiation Control Officer

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SPENT FUEL SHIPMENT NOTIFICATION

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HIGH-LEVEL WASTE

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SPENT FUEL SHIPMENT NOTIFICATION

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SPENT FUEL SHIPMENT NOTIFICATION

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HIGH-LEVEL WASTE

Same as Radiation Control Officer

SPENT FUEL SHIPMENT NOTIFICATION

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SPENT FUEL SHIPMENT NOTIFICATION

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SPENT FUEL SHIPMENT NOTIFICATION

Same as Radiation Control Officer

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SPENT FUEL SHIPMENT NOTIFICATION

Same as Radiation Control Officer

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VIRGINIA continued

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SPENT FUEL SHIPMENT NOTIFICATION

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Energy Facility Site Evaluation Council
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SPENT FUEL SHIPMENT NOTIFICATION

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SPENT FUEL SHIPMENT NOTIFICATION

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SPENT FUEL SHIPMENT NOTIFICATION

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APPENDIX D
BIBLIOGRAPHY OF READING MATERIALS

This listing of reading materials and brief description of content should serve as a reference tool for those interested in more in-depth information in the topical areas. When only a publisher is mentioned, the publication should be available from a local library or bookstore. In other instances, the address and price are provided for publication access. Government publications are sometimes available direct from the Federal agency as referenced in Appendix B. Information on government publications may also be secured from the following sources:

(1) Superintendent of Documents
U.S. Government Printing Office
Washington, D.C. 20402
202/783-3238

The U.S. Government Printing Office (GPO) prints and sells the majority of Federal Publications. The reference in the bibliography will be (USGPO).

(2) ONWI Library (Battelle)
505 King Avenue
Columbus, Ohio 43201
614/424-7697

The Office of Nuclear Waste Isolation (ONWI) maintains Federal and some non-Federal publications related to nuclear waste. A catalog of their publications is available. The bibliography reference will be (ONWI Library).

(3) Division of Technical Information and Document Control (TIDC)
U.S. Nuclear Regulatory Commission (NRC)
Washington, D.C. 20555
301/492-8989

The Nuclear Regulatory Commission Division of Technical Information and Document Control handles the distribution of most NRC publications. A free publication catalog, identified as NUREG/BR-0010 describes NRC publications and information services available. The bibliography reference will be (TIDC).

(4) National Energy Information Center
Forrestal Building
U.S. Department of Energy
Washington, D.C. 20585
202/252-8800

The Energy Information Administration collects, and publishes statistical data and analytical studies on energy consumption, prices, resource availability, and projections of energy and demand. An annual EIA Publication Directory: A User's Guide is available free.

Selected references have been excerpted with permission from the excellent Nuclear Information and Resource Service publication: The Citizen's Nuclear Waste Manual. These sources in the bibliography are noted with an asterisk (*). Information on obtaining this manual is included in Appendix B-4.

The bibliography is divided into four general sections, including:

- Background Information on Nuclear Power and Waste
- Technical Publications Related to Nuclear Waste
- Socio-Economic Planning Publications
- Publications on the Transportation of Radioactive Waste

BACKGROUND INFORMATION ON NUCLEAR POWER & WASTE

* Colglazier, William, Jr., ed. The Politics of Nuclear Waste. New York: Pergamon Press, 1982.

Essays on Federal-state conflicts in radioactive waste management.

Chubb, John E. Interest Groups and the Bureaucracy: The Politics of Energy. Stanford, California: Stanford University Press, 1983.

A revealing study of the relationship between interest groups and executive bureaucracies and their influence on U.S. energy policies in the 1970's.

* Hancock, Don. "The Nuclear Legacy -- How Safe Is It?" Resources for Self Reliance, The Workbook. Vol. VIII. Nos. 4&5. July-October, 1983. Available from the Workbook, Box 4524, Albuquerque, New Mexico 87106. $1.00.

Concise history, summary of the Nuclear Waste Policy Act, current sites under consideration, and opportunities for citizen involvement.

Hyde, Margaret O. and Bruce G. Hyde Everyone's Trash Problem: Nuclear Wastes. New York: McGraw-Hill Book Company, 1979. Price: $7.95.

A good explanation of radiation and the nuclear waste problem for young readers.

Kaku, Dr. Michio and Jennifer Trainer Nuclear Power: Both Sides. New York: W.W. Norton Company, 1982. Price: $14.95.

The pro's and con's of nuclear issues are presented by experts from both perspectives including the topics of radiation, reactor safety, nuclear waste disposal, economics, technology beyond light-water reactors, and the future of nuclear energy. A balanced, although somewhat technical, presentation by the editors which avoids the emotional reaction to complex nuclear issues.

* Kemp, Loni. Radioactive Waste: A Handbook for Minnesotans. Minneapolis, MN: The Minnesota Project, 1983. To order write 2222 S.E. Elm St., Minneapolis, MN 55414. $3.00.

General instructions to radioactive waste issues with emphasis on its relationship to Minnesotans. Good model for other regions.

Kiefer, Irene. Nuclear Energy at the Crossroads. Atheneum Press: New York, 1982. Price: $10.95.

This book is easy to understand in its factual presentations in the sciences of nuclear power and the nuclear waste issues. However, it is quickly becoming out-dated.

League of Women Voters Education Fund. A Nuclear Waste Primer. Publication #391, 1982, 63 pages, League of Women Voters, Publication and Sales Department, 1730 M Street, N.W., Washington, D.C. 20036. $5.95

A readable, factual introduction to nuclear waste management.

* Lipschutz, Ronnie D. Radioactive Waste: Politics, Technology and Risk. Cambridge, MA: Ballinger Publishing Co., 1980.

Detailed history of waste management, review of technical and political controversies, and recommendations.

National Advisory Committee on Oceans and Atmosphere. Nuclear Waste Management and the Use of the Sea - A Special Report to the President and the Congress. April, 1984.(See National Organizations - Appendix B-4 for contact). Available free from NACOA while supplies last.

This 200 page report is an excellent reference to historical, scientific, political, and international considerations to using the sea as a repository for high level nuclear waste. The publication would be particularly enlightening for those Tribal governments dependent on ocean resources.

Office of Nuclear Waste Isolation Library. Answers to Your Questions About High-Level Nuclear Waste Isolation. Batelle Columbus Laboratory October 1981. 69 pages. Fact Sheets. Office of Nuclear Waste Isolation.

What might a nuclear waste repository look like?
Can nuclear wastes be launched into space?
What are the waste products of a nuclear reaction?
How much waste is there from nuclear power production?

Can nuclear wastes be isolated beneath the oceans?
Where are nuclear power wastes generated?
What is "spent" nuclear fuel?
Can nuclear waste be transported safely?
(ONWI), Free.

Factual information presented by the Department of Energy in readable format with graphics. The presentations are couched in optomistic terms.

Office of Technology Assessment. U.S. Congress, Managing Commercial High Level Radioactive Waste - Summary, (OTA-O-172), April, 1982. Available through OTA, U.S. Congress, Washington, D.C. 20510.

A summary of the social, economic, and technical problems and proposed solutions in the management of high-level radioactive waste. The Nuclear Waste Policy Act adopted some of OTA's recommendations.

Russ, George D. Nuclear Waste Disposal: Closing the Circle. Public Affairs and Information Program. Atomic Industrial Forum, Inc., 1974. Available free of charge from Atomic Industrial Forum, Inc., 7101 Wisconsin Avenue, Bethesda, Maryland 20814-4805.

A description of the problem of nuclear waste and the process involved in repository site selections. A readable publication with a fairly balanced perspective with illustrations.

Shapiro, Fred. Radwaste. New York: Random House. 1981.

Easy-to-read, journalistic discussion of history, problems and politics of radioactive waste management.

The Nuclear Age: Power, Proliferation and the Arms Race. Congressional Quarterly, Inc., 1984. 1414 - 22nd Street, N.W., Washington, D.C. 20037. Price $11.95 plus postage & handling.

An informative discussion on nuclear energy, nuclear proliferation, and the Arms Race providing a basic understanding of the domestic/ international dimensions. The subject matter briefly addressed nuclear waste issues.

U.S. Department of Energy. Mission Plan for the Civilian Radioactive Waste Management Program - Draft Volumes I & II. April, 1984 (DOE/RW-0005) Office of Public Affairs, U.S. Department of Energy, Room 1E-218, Forrestal Building, 1000 Independence Avenue, S.W., Washington, D.C. 20585. Available free.

A comprehensive review as required by Congress of DOE implementation plans and assumptions regarding the Nuclear Waste Policy Act of 1982. A most important publication for those interested. Transportation, repository site selection process, monitored retrieval storage, and system integration are discussed.

U.S. Nuclear Regulatory Commission. Annual Report. Published each year. (TIDC)

Describes functions and actions of all offices in NRC, names of many officials, and descriptions and lists of publications and regulatory actions.

U.S. Nuclear Regulatory Commission. Essays on Issues Relevant to the Regulation of Radiactive Waste Management, NUREG 0412. Washington, D.C.: May 1978 (TIDC)

Series of philosophical essays on history, federal agency credibility, approaches to uncertainty, managerial errors and public participation.

Worby, Laura D., The Citizen's Nuclear Waste Manual
Information and Resource Service, 1346 Connecticut Avenue, N.W.
Washington, D.C. 20036 Tiered Price at:

$20 - Citizens, non-profit groups and libraries
$45 - State officials and Congressional offices
$125 - Industry representatives & Federal agencies

This loose-leaf publication is an excellent reference tool for understanding the Act and regulations with an in-depth discussion of the technical issues involved in waste dump-siting and a "How-To" guide to impacting the process.

TECHNICAL PUBLICATIONS RELATED TO NUCLEAR WASTE:

*Baird, Brian. High-Level Nuclear Waste Disposal at Hanford: A Geologic Critique. Washington Public Interest Research Group, Dec. 1983. Available from WashPIRG, Mail Stop FK-30, University of Washington, Seattle, WA 98195. $5.00 + $1.00 postage.

Example of independent review of DOE documents and proposals, regarding a specific proposed repository site.

*Hebel, L. Charles. "Report to the American PHysical Society by the Study Group on Nuclear Fuel Cycle and Waste Mangement," Reviews of Modern Physics, Vol. 50, No. 1, Part II, January, 1978. AVailable from the American Insitute of Physics, 335 W. 45th St. New York, NY 10017, $11.00.

Scientific review of the technical controversies in radioactive waste management.

*"Managing Nuclear Waste: The Underground Perspective." Underground Space. Vol. 6, Jan/April 1982. Pergamon Press, Ltd.

Essays by representatives of government, industry, academia and others on federal management, technical and public policy issues regarding high-level radioactive waste.

*National Academy of Sciences. National Research Council. A Study of the Isolation System for Geologic Disposal of Radioactive Wastes. Washington, DC: National Academy Press. 1983. Price: $24.50 2101 Constitution Avenue, NW., Washington, D. C. 20418

Detailed evaluation of the current federal waste program, with particular emphasis on hydrology and geochemistry. Reviews current sites under consideration, as well as the regulatory appropaches of the NRC and EPA.

*State Planning Council on Radioactive Waste Management. Technical Paper -- High-Level Radioactive Waste Mangement: An Intergovernmental Agreement To Cover Federal Activities Within a State. (ONWI)

Model federal - state written agreement on information exchange, siting and conflict resolution.

*U.S. Department of Energy. Final Environmental Impact Statement Management of Commercially Generated Radioactive Waste, Vol. I. DOE/EIS-0046F. Washington, DC: U.S. DOE, Oct. 1980. (ONWI)

DOE justification for selecting deep geologic disposal as the preferred high-level waste disposal option. Contains estimated environmental impacts of normal operations and potential accidents in various media.

*U.S. Department of Energy. Proceedings of the 1983 Civilian Radioactive Waste Management Information Meeting. Dec. 12-15, 1983, Washington, DC: U.S. DOE, Feb. 1984. (ONWI)

Contains papers by Federal officials, some state officials and contractors on technical, regulatory, socio-economic, logistic snd programmatic aspects of the high-level waste program.

*U.S. Department of the Interior, Geological Survey. Harry W. Smedes. Rationale for Geologic Isolation of High-Level Radioactive Waste, and Assessment of the Suitability of Crystalline Rocks. Open File Report 80-1065, 1980. Available from Open-File Services Section, Branch of Distribution, Box 25425, Federal Center, Denver, CO 80225.

Lays out criteria for repository site selection, evaluates crystalline rocks according to these criteria, and recommends where additional research is needed.

*U.S. Environmental Protection Agency. Report of an Ad Hoc Panel of Earth Scientists; State of Geologic Knowledge Regarding Potential Transport of High-Level Radioactive Waste From Deep Continental Repositories. EPA/520/4-78-004. Washington, D. C.: U.S. EPA, June 1978 (USGPO)

Review of uncertainties in geologic knowledge for various aspects of waste repository performance and different geologic media.

*U.S. Nuclear Regulatory Commission. Commission Paper: Highlights of P.L. 97-425 the Nuclear Waste Policy Act of 1982. SECY-83-107. March 16, 1983. (TIDC)

Summary and interpretation of the NWPA from NRC's point of view.

*U.S. Nuclear Regulatory Commission. Draft Site Characterization Analysis of the Site Characterization Report for the Basalt Waste Isolation Project Hanford Washington Site. NUREG-0960 Washington, DC: U.S. NRC, March 1983. (TIDC)

*U.S. Nuclear Regulatory Commission. Draft Technical Position on Borehole and Shaft Sealing of High-Level Nuclear Waste Repositories. High-Level Waste Technical Development Branch, Division of Waste Management, July 1983. (TIDC)

Establishes draft criteria which NRC will use to evaluate DOE plans for borehole and shaft seals.

SOCIO-ECONOMIC PLANNING PUBLICATIONS:

*Cummings, Ronald G.; Burness, H. Stuart; and Norton, Roger G. The Proposed Waste Isolation Pilot Project (WIPP) and Impact in the State of New Mexico: A Socio-Economic Analysis. EMD 2-67-1139, available from New Mexico Energy and Minerals Dept., P.O. Box 2770, Santa Fe, NM 87503

Example of an independent socioeconomic analysis of the employment, tax, public services and transportation impacts of a specific proposed repository.

National Academy of Sciences, Nation Research Council, Panel on Social and Economic Aspects of Radioactive Waste Disposal. Social and Economic Aspects of Radioactive Waste Disposal: Considerations for Institutional Management. Washington, DC: National Academy Press, 1984. Price: $14.50. 2101 Constitution Avenue, N.W., Washington, DC 20418.

A scientific critique of the socio-economic assumptions by the Department of Energy in siting nuclear waste repositories including analysis of suggested transportation modes, routes, and regulations.

Office of Nuclear Waste Isolation. Framework for Community Planning Associated with Nuclear Waste Repository Siting. Draft. ONWI-254 October, 1981.

DOE view of repository impacts on communities. Includes detailed information on available federal assistance programs.

U.S. Department of Health and Human Services. HRSA, PHS. Indian Health Services Office of Environmental Health. Health Hazards Related to Nuclear Resource Development on Indian Land. November, 1982. Available through IHS while supplies last.

This 25 page IHS publication discussed radiaction, sources of radiation from development on Indian land, findings from the IHS investigations as Congressionally mandated, and IHS future plans. The publication is educational; however, the title is more attractive than the content.

Walker, Charles A.; Leroy C. Gould and Edward J. Woodhouse, Ed. Too Hot to Handle: Social and Policy Issues in the Management of Radioactive Wastes. Connecticut: Yale University Press, 1983

A technical presentation on problems of radioactive waste management in seven papers covering science and technology, risks to human health, public attitudes, politics, and value issues.

PUBLICATIONS ON THE TRANSPORTATION OF RADIOACTIVE WASTE

Federal Emergency Management Agency. Guidance for Developing State and Local Radiological Emergency Response Plans and Preparedness for Transportation Accidents, March, 1983.(FEMA-Rep-5) (See Appendix B-1 for agency contact) Available only in copy form on request)

A comprehensive, instructive planning guide for Tribal administrators with highway/rail transportation routes near or though reservation boundaries.

*McSweeney, T.I.and R.W. Peterson. Assessing the Estimated Cost and Risk of Nuclear Waste Transportation to Potential Commercial Nuclear Waste Repository Sites, IAEA-CN-43/243. Columbus, OH: Battelle Memorial Institute, May 1983. (ONWI)

*National Conference of State Legislatures State Statutes and Regulations on Radioactive Materials Transportation. Denver, CO: National Conference of State Legislatures, Dec. 1983. Available from NCSL, 1125 17th Street, Suite 1500, Denver, CO 80202, Attn. Chris Tracy. Cost: $15.00.

U.S. Department of Transportation Research and Special Programs Administration Materials Transportation Bureau A Review of the Department of Transportation of Radioactive Materials Revised Summer 1983 (USEPO)

A basic 64 page review of Department of Transportation regulations on transport of nuclear materials written in readable, double-spaced format with limited graphics.

U.S. Department of Transportation. Research and Special Programs Administration. Materials Transportation Bureau. Guidelines for Selecting Preferred Highway Routes for Highway Route Controlled Quantity Shipments of Radioactive Materials. (DOT/RSPA/MTB-84-22) June, 1984 (USGPO)

Although somewhat technical, the publication offers an extensive review of Federal and State methodologies and factors considered in selecting highway routes for radioactive waste.

U.S. Department of Transportation. Research and Special Programs Administration. Office of Hazardous Materials Regulation. Radioactive Materials Transportation and Incident Guidance (DOT/RSPA/MTB-81/4) (USGPO)

A useful, although somewhat dated, guide to radioactive waste shipment procedures and practical emergency measures.

*Wilmont, Edwin L.: Madsen, Marcella M.; Cashwell, Jonathan W.; and Joy, David S. A Preliminary Analysis of the Cost and Risk of Transporting Nuclear Waste to Potential Candidate Commercial Repository Sites SAND83-0867-TTC-0434. Albuquerque, NM and Livermore, CA: Sandia National Laboratories, for U.S. DOE, June, 1983 (ONWI)