Natural Resources Defense Council, Inc.

917 15TH STREET, N.W.
WASHINGTON, D.C. 20005
202 737-5000

Western Office
2345 YALE STREET
PALO ALTO, CALIF. 94306
415 327-1080

New York Office
122 EAST 42ND STREET
NEW YORK, N.Y. 10017
212 949-0049

AWAY FROM REACTOR STORAGE FACILITIES:

OUR NEXT NUCLEAR WASTE BLUNDER?

Thomas B. Cochran
Arthur R. Tamplin
Anthony Z. Roisman

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Introduction

The world is now more than 35 years into the nuclear era. Yet the initial radioactive wastes produced in the early 1940's are still stored in tanks and their ultimate disposition is still in doubt. At the same time, radioactive wastes are accumulating at an ever-increasing rate at nuclear power reactors. As a consequence, the pressures are mounting to find a "solution" to this radioactive waste problem. Based upon the past and present history of the bureaucracies and industries involved, it is reasonable to propose that the response to these pressures will result in hurried and inappropriate actions -- actions that could well convert the present difficult situation into an impossible situation in the future.

For years environmentalists have warned that allowing the rate of production of nuclear wastes to increase without linking further production to finding a solution to the nuclear waste problem would inevitably create a situation where the nuclear momentum would become justification for haphazard and patchwork responses to the increasing nuclear waste problem. Unfortunately, that warning has come true and efforts are now rampant to implement "interim solutions" to the increasing backlog of nuclear wastes in the name of keeping nuclear reactors operating. The worst possible action we could take is to listen to these pleas for hasty action. Nuclear wastes are far too serious and the ramifications of their mishandling far too enormous to allow precipitious and inadequately considered proposals to be adopted.

The current vogue in "interim" nuclear waste solutions is to transport all of the wastes now stored at reactor sites and yet to be generated by the reactors hundreds and thousands of miles to so-called away-from-reactor storage facilities (AFRs) built, owned and operated by the federal government. Proposals to this effect have been made by the Department of Energy and have now been added, at the urging of the nuclear utility industry, as an eleventh-hour rider to the House Commerce Committee's version of the DOE authorization. These proposals have never been subjected to the disciplined National Environmental Policy Act decision-making process nor have they been fully examined in the legislative hearing process. Studies of what to do with accumulating spent fuel are being prepared by both DOE and the Nuclear Regulatory Commission but proponents of the AFRs, including DOE, are unwilling to wait for the conclusions of these critical public reviews.

The following analysis is intended to highlight some of the most obvious problems which would be created by the use of AFRs. Some may argue that the problems are real enough but that our past failure to address the waste issue and our present increasing reliance on nuclear power leave us no choice but to implement the AFR solution. Fortunately, this seeming dilemma does not exist. Virtually every operating reactor is fully capable of building new spent fuel storage

pools at the reactor site sufficient to store its own spent fuel. Reactors under construction or on which construction has not yet begun can even more easily expand planned spent fuel storage capacity. Efforts to increase the nuclear wastes at reactor sites may rightly anger those living near the reactors but that is a legitimate cost of the use of nuclear power. It would be a serious and unwarranted step for the federal government to attempt to hide the nuclear waste problem by moving the problem away from the reactor without solving it. In fact, citizen opposition is likely to be far more vociferous to a centralized spent fuel storage facility which is decoupled from the electric power benefits of the creation of those wastes, which involves increased transportation of nuclear wastes and which increases the probability for a major release of radioactivity from such a concentrated facility. The nuclear waste problem is a legitimate cost of nuclear power, a cost which must be addressed squarely in deciding whether to use nuclear power and, if so, how much. AFRs are not a solution to that problem but are merely yet another federal government attempt to bail out the nuclear industry, in this instance providing a federal curtain to hide nuclear power's most embarrassing problem.

Historical Perspective

The present proposal to make a hasty commitment to AFRs is but the latest in a long line of precipitous actions taken with respect to nuclear waste. To fully comprehend how the presently proposed actions may result in serious problems in the future, it is necessary to examine the history of nuclear waste management. That history clearly demonstrates that precipitous actions have usually produced unanticipated and serious consequences -- a clear warning that we should no longer follow the practice of acting in haste and repenting in leisure.

For more than a decade the nuclear establishment has been saying that the disposal of radioactive waste is not a difficult problem. This pronouncement has a hollow sound when one considers that no solution has been found during the 35 plus years of the nuclear age. Moreover this statement is contrary to the admonition of competent scientific authority and to the history of failures and false starts of the nuclear industry and bureaucracies - it is nothing less than deceptive public relations propaganda.

In May 1966 after some 10 years of study related to the AEC's waste management practices, the NAS-NRC Committee on the Geological Aspects of Radioactive Waste Disposal submitted its report to the AEC. In the report the Committee stated:

> Throughout the fabric of the 10-year history of the Committee's deliberations run some continuing threads of purpose and conviction. Prominent

> among them is the realization that none of the major sites at which radioactive wastes are being stored or disposed of is geologically suited for safe disposal of any manner of radioactive wastes other than very dilute, very low-level liquids. 1/
>
> * * * * * * * * *
>
> The Committee thinks that the current practice of disposing of intermediate and low-level liquid wastes and all manner of solid wastes directly into the ground above or in the fresh-water zones, although momentarily safe, will lead in the long run to a serious fouling of man's environment. 2/

Thus, even before 1966, the nuclear bureaucracy knew that competent scientific authority felt that their existing sites and practices were inadequate. The response of the AEC was not to correct the situation but to suppress the report. It was not until pressure was exerted from the U.S. Senate in 1970 that the report was released. In the meantime, the Committee that prepared the report was disbanded and a new committee was appointed with no overlapping membership. In other words, the nuclear bureaucracy had no compunction concerning the manipulation of committees of the National Academy of Sciences.

Nothing has been done concerning the NAS Committee warnings except that the burial of transuranium wastes has essentially stopped. This prohibition resulted not because of diligence on the part of the nuclear industry or government but because the Kentucky Department of Human Resources discovered that plutonium was migrating off site at the Maxey Flats burial site near Moorehead, Kentucky. 3/ Similar migration has occurred at the Nuclear Fuel Services facility in

West Valley, New York. As late as 1974, the AEC was saying that such migration was unlikely in total disregard of the NAS Committee warnings in 1966. 4/

The supressed NAS report was related to the wastes from the military programs. Most of the high level military wastes are still stored in steel tanks. Many of the tanks have leaked, over 500,000 gallons in all. The most notable case was in the spring of 1973 when 115,000 gallons of high level wastes leaked from a tank at Hanford over a 51-day period. Although the level in the tank was recorded each day, no one compared the readings.

Oil contaminated with plutonium wastes was stored outdoors in steel drums at the Rocky Flats Plant near Denver, Colorado. It was subsequently discovered that leaks from these drums had resulted in significant off site contamination by plutonium. This discovery was not made by the AEC but by a scientist member of the general public, Dr. Edward Martell. The AEC purchased some of the contaminated land and enlarged the fenceline of the facility. A multimillion dollar lawsuit is now underway over additional portions of the adjacent land.

Since their early beginnings, the nuclear industries and bureaucracies had planned to reprocess spent fuel in order to extract and recycle its plutonium content. Until the Carter Administration reversed this course these forces have always denigrated and ignored the concerns of outside competent authority related to the inevitable proliferation of nuclear weapons that would result from reprocessing and plutonium recycle. The AEC, for example, issued in 1966

an operating license for the Nuclear Fuel Services (NFS) reprocessing facility in West Valley, New York. This license was issued although there was serious doubt that the plant could operate efficiently and reliably. Moreover, the AEC supplied the facility with a baseload contract of fuels (from the military program). Without this baseload contract, the NFS would not have undertaken the venture.[5/] What happened to NFS is now another example of false and deceptive moves on the part of the nuclear industry and bureaucracies. In early 1972, the plant, after operating at less than 1/4 of its design capacity (most under the baseload contract) was shut down for modifications. The reason, quite simply, is that it had become a radioactive nightmare. In 1976, NFS announced that it was terminating the reprocessing operation because the cost of modification made it uneconomic.

This abortive venture, authorized by the AEC, resulted in excessive radioactive contamination of the Wast Valley envorinment, excessive radiation exposure to the employees of the NFS facility and to more than 2,000 transient workers hired to do the dirtiest jobs. In addition, it left behind a facility highly contaminated with radioactivity and some 600,000 gallons of high level radioactive waste in a condition that will require an extensive research program to determine what should be done with the wastes.

Present estimates of the cost for decommissioning the NFS facility and managing the radioactive wastes run to 500 million

dollars. The initial cost of the facility was less than 50 million dollars. It is uncertain, at this time, whether the State of New York or the federal government will have to absorb these costs - the owner of the NFS facility, Getty Oil, appears exempt. 6/

The people of the State of Illinois fared much better. The GE company was issued a license to construct a reprocessing facility in Morris, Illinois. However, after completion it was determined that the plant was inoperable. After spending $65 million and never reprocessing an ounce of spent fuel, GE abandoned the facility.

Notwithstanding the experience of NFS, Allied-General Nuclear Services (AGNS), having received a construction permit from the AEC, invested some $250 million in a reprocessing plant at Barnwell, South Carolina. Even before President Carter made this investment futile by banning reprocessing, AGNS stated:

> It is reasonable to assume that any significant investment by industry in reprocessing facilities is not likely to occur until the GESMO issue is resolved and reprocessing can be demonstrated to be a viable business venture. Therefore, AGNS has been forced by reasons outside its control to conclude that under the existing circumstances it is proper that the government fund any significant investment beyond that already committed. 7/

AGNS is presently fighting for a governmental bail-out. The outcome is uncertain. At the same time, it appears that the citizens of South Carolina were saved the problems of those of New York and that a $250 million bail-out, no matter how reprehensive, would be less expensive than the subsequent cost of decommissioning.

For years the nuclear industry and the AEC proposed that they had a solution to the high level radioactive wastes. This was to bury the wastes in an abandoned salt mine in Lyons, Kansas. In 1971, the AEC announced that it would begin a large scale demonstration project at the Lyons mine. In the environmental statement on this project, the AEC baldly asserted:

> By establishing this facility, radioactive wastes of the type previously described [including high-level wastes] will be permanently isolated from man's biosphere, thus providing a direct and lasting benefit to the environment. No significant impact on the environment resulting from the construction or operation of the proposed repository is anticipated. 8/

Contrary to this assertion of the AEC, private citizens, scientists and organizations as well as state officials in Kansas argued that the Lyons site had not been adequately investigated and that it was probably not a good site. These private citizens and scientists were correct and within a short period the AEC abandoned the site and cancelled the project. Thus, even after over 15 years of study of the suitability of salt mine disposal in general and several years of investigation at the Lyons site in particular, a potentially serious failure in judgment occurred. It is questionable whether or not the AEC would have appreciated the potential hazards involved with the Lyons site if the citizens of Kansas had not spoken out.

After this fiasco, the AEC announced that it would build a Retrievable Surface Storage Facility (RSSF) which was to be suitable for a period of 100 years. Of course, this was just

an easy way out - one that passed the ultimate problem on to future generations.

In 1975, ERDA (the successor to the AEC) cancelled the RSSF project and started to examine a salt deposit near Carlsbad, New Mexico. This is the area selected for the WIPP Project. A favorable site was selected by the staff at Oak Ridge National Laboratory. About a year ago the project management was shifted to Sandia Laboratories. After two test holes, ERDA wanted to begin mining. Sandia insisted on a third test hole. It was drilled and it hit a brine solution containing hydrogen sulfide and methane. At Sandia's recommendation the site has been dropped. Sandia is now looking at a site in the same deposit only about 5-8 kilometers away.

The Magnitude of the Waste Problem

It is important to place the proposal for AFRs into perspective by examining the size of the nuclear waste problem. As we demonstrate below, the sheer mass of nuclear wastes which must be handled, and with AFRs which must be handled twice, is a critical factor in deciding whether to adopt the AFR as the interim storage solution.

Over the past several years, considerable attention has been focused on nuclear fuel reprocessing. President Carter, in his April 7, 1977 statement on nuclear power policy, stated

> . . .we will defer indefinitely the commercial reprocessing and recycling of the plutonium produced in the U.S. nuclear power programs. From our own experience we have concluded that a viable and economic nuclear power program

> can be sustained without such reprocessing and recycling. The plant at Barnwell, South Carolina, will receive neither federal encouragement nor funding for its completion as a reprocessing facility.

Even prior to this shift in U.S. policy, it was apparent to the U.S. nuclear industry and bureaucracies that commercial reprocessing plants were not going to be brought on line fast enough to handle the rapid increase in spent fuel discharges, particularly under the rather high nuclear energy growth projections of the Federal government and the industry. It was apparent then (and it is a reality today) that utilities urgently needed additional spent fuel storage capacity.

Because this bottleneck appeared at the reprocessing link in the back end of the nuclear fuel cycle, and because reprocessing was thought to buy time -- a decade -- before permanent disposal of the waste was required, little attention, until very recently, was given to the logistics problem at the final repository itself. A cursory look at this logistics problem suggests that this may be another Achilles' heel of the nuclear industry.

The nature of this problem can be illustrated by examining just one of the disposal requirements - the disposal of the spent fuel elements from commercial power reactors. Table I presents the consequences of two scenarios, each identified by the nuclear generating capacity in the year 2000. The 148 Gwe scenario represents the nuclear power capacity already committed, that is, existing reactors, plus those that have at least reached the limited work authorization or construction permit stages in the licensing process.

These would of course all be on line well before 2000. The 380 Gwe scenario is an Administration figure that is often linked to President Carter's 1977 National Energy Plan, although no figure for 2000 is presented in the Plan itself.

For both scenarios, the annual and cumulative spent fuel production in Metric Ton of Heavy Metal (MTHM) are presented for the years 1990 and 2000. Spent fuel is shipped today in trucks that are designed to carry about 0.5 MTHM per shipment, or railroad casks holding 4.5 MTHM. One-half a metric ton of heavy metal corresponds roughly to one PWR fuel assembly or 2.5 BWR assemblies. (About 60 PWR and 150 PWR assemblies are removed at each refueling.) Based on today's shipping capability, Table I also gives the annual and cumulative truck and rail shipments for the two scenarios. We use the DOE assumption that 90% of the spent fuel is shipped by rail. The total number of shipments, truck and rail, of course will increase if the percentage of rail shipment is less. In the unlikely extreme, if all shipments were by truck, the number of shipments would be 10 times larger than the truck shipments indicated by Table I.

TABLE I*

Assumed Nuclear Capacity in yr. 2000			Nuclear Growth Scenarios** 148 Gw	380 Gw
Annual spent fuel production (MTHM/yr.)				
	1990		3,700	4,200
	2000		3,500	8,100
Cumulative spent fuel production (MTHM)				
	1990		34,100	34,800
	2000		71,000	97,000
Annual shipments***				
	1990	truck	540	540
		rail	540	540
	2000	truck	740	1,200
		rail	740	1,200
Annual number of Assemblies****				
	1990		7,830	7,830
	2000		10,730	17,400
Cumulative truck shipments				
	1990	truck	3,360	3,360
		rail	3,360	3,360
	2000	truck	10,600	12,240
		rail	10,600	12,240
Cumulative number of Assemblies****	1990		49,000	49,000
	2000		154,000	177,000

* Data in this table taken from Report of Task Force for Review of Nuclear Waste Management, February 1978, Draft, U.S. Dept. of Energy, Directorate of Energy Research DOE/ER-0004/D.

** 148 Gw represents existing plants plus all plants that have proceeded beyond the limited work authorization or construction permit stages of licensing.

380 Gw is often referred to as the National Energy Plan reference projection.

*** Assumes 0.5 MT/shipment by truck; 4.5 MT/shipment by rail. Shipments - 90% by rail and 10% by truck. Spent fuel is assumed to be cooled for 5 years.

**** Assume a mix of 30% BWR and 70% PWR which equates to 1.3 fuel assemblies per truck. Assumes spent fuel cooled for 5 years.

The 1990 figures for both scenarios are about the same. If the lower values are used and it is assumed that the fuel assemblies are shipped after 5 years of cooling to a repository that operates 200 days/yr for 8 hrs/day, then the repository would have to handle 40 fuel assemblies/day or 5/hr - one every 12 minutes. If the repository operates 300 days/year, around the clock, then the corresponding load on the repository is one fuel assembly every hour.

The logistics problem is actually worse than the above would indicate. First, because it assumes that a permanent repository will be available before 1990 so that there is no backlog of spent fuel in 2000. Second, it assumes that only one repository is needed. Both assumptions are highly questionable if not flawed.

Presently, the DOE assumes that a geologic retrievable storage facility could be operational around 1988 at the earliest. This early schedule should not be taken too seriously. It doesn't reflect all the uncertainties in the project that could lead to further delays. The only major experimental facility now planned is the Waste Isolation Pilot Plant (WIPP) at Carlsbad, N.M. WIPP is designed to gather data to demonstrate the feasibility of radioactive waste disposal in bedded salt using waste generated by the military program. Although WIPP is scheduled to be available in 1985, it is unlikely to meet this timetable. It could possibly be made operational in the early 1990's time frame if its use is restricted to the

storage of transuranic (TRU) waste and a limited R&D program to collect data on high-level waste. This is reasonable because the TRU wastes are not hot thermally and thus it could be argued that heat loading would not challenge the long-term integrity of the repository. At a minimum, 5 to 10 years of data at WIPP will be essential to "confirm" the geologic concept. It is worth noting that the term "confirm" is rather meaningless as applied here since no one really knows what it takes to "confirm" the integrity of the repository in operational terms. This, of course, heightens the concern that the pressure now being applied to construct a repository will lead to an inadequate and potentially hazardous facility.

At the present time, no site has been selected for a commercial repository. Thus, this facility cannot come on line as early as WIPP. DOE has recently slipped the earliest data from 1985 to 1988 for operating the first commercial repository with a possible additional delay of 5 years. Judged by the history of the program, additional delays should be anticipated. Moreover, prudence requires that the initial rate of utilization of the facility should be much lower than its design rate. This lower initial rate is essential for the first 5 to 10 years (preferably much longer), while the integrity of the repository is being "demonstrated or confirmed." Consequently, for the purpose of assessing the logistics problem, it should be assumed that the full-scale operation of a facility to handle commercial spent fuel is unlikely to take place much before the year 2000. In fact, an earlier date represents an inappropriate and potentially hazardous action.

The logistics problem is worse if one is not simply trying to keep up, but also contemplates moving the backlog of spent fuel that would have built up in the years prior to start-up of the repository. Consider, for example, the 148 Gwe scenario and assume a 5 year spent fuel cooling period. If one further assumes that the backlog is to be moved in 10 years, beginning in 2000, then from Table I, it is seen that the annual truck and rail shipments would each be 1800 (i.e., 740 + 1060), or 18,000 in the extreme if all shipments are by truck. Under the previous assumptions including operating around the clock 300 days/year this would correspond to handling one fuel assembly every 15-20 minutes.

Next it should be noted that one repository for commercial spent fuel by the year 2000 may not suffice. The capacity of a repository is a function of the acreage of the mine floor and the spacing of the canisters of waste. The canister spacing is in turn governed by considerations related to both long-term geologic integrity of the mine and the shorter-term desire to retain an option to retrieve the waste. The long-term integrity depends in part on the cumulative heat generated by the fuel over the long-term. Retrievability is a function of the pillar strength and room closure rate and the latter is in turn dependent on the short-term heating effects, and therefore the age of the spent fuel when it is placed in the mine initially. None of these parameters are fixed at this time, thus, while several estimates of repository capacity have been made, these vary widely because of different assumptions related to the above parameters. For example, the California Energy Commission has assumed a spent fuel repository capacity of

35,000 MTHM.[9] The Geologic Projects Division at Sandia Laboratories has estimated a repository capacity for spent fuel of about 40,000 MTHM based on an assumed repository size of 2000 acres and a heat load constraint at time of emplacement of 23.5 Kw/acre.[10] The NRC has adopted this estimate for the purposes of estimating the land use requirements for disposal of radioactive waste in the S-3 proceeding.

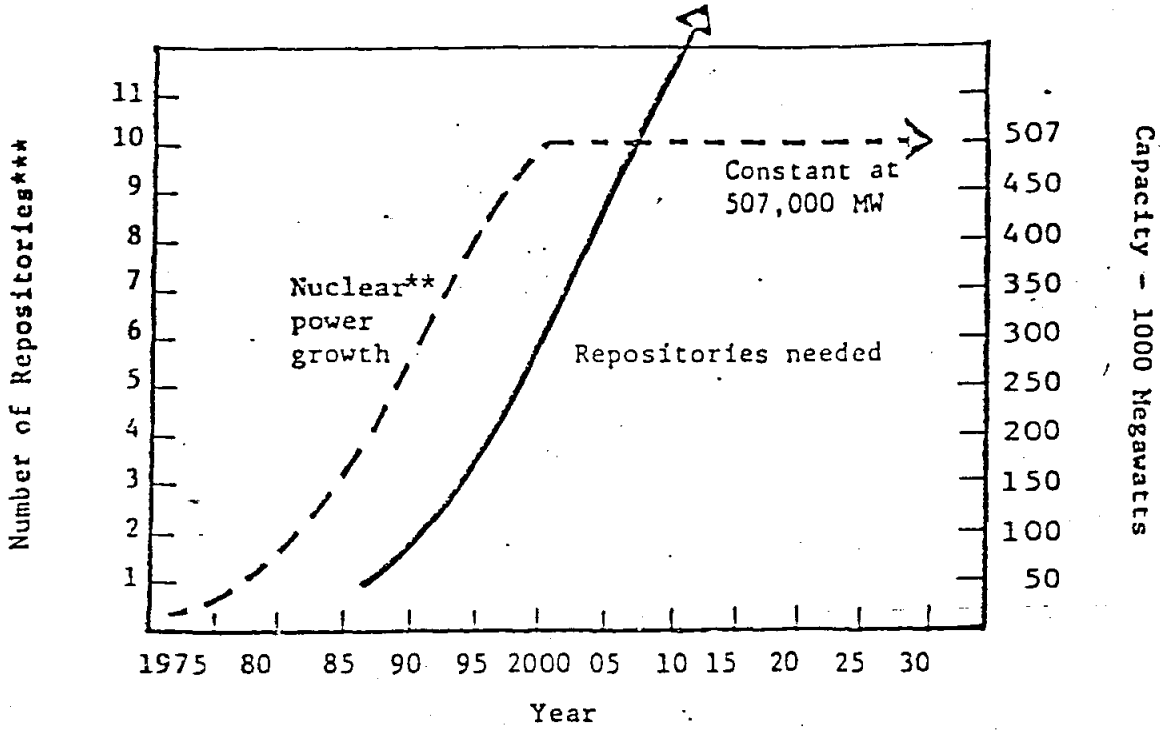
The DOE has calculated a repository capacity of 100,000 MTHM assuming spent fuel is cooled 5 or 10 years before being placed in a 2000 acre mine. This assumes that the initial heat loading is limited to 99 Kw/acre. This latter constraint assumes spent fuel retrievability is maintained for 5 years. If 25 years retrievability is desired, then the heat load constraint is reduced to 36 Kw/acre and the 2000 acre repository capacity is limited to 36,000 MTHM.[11]

As seen by comparing these capacity figures with the cumulative spent fuel production entries in Table I, the number of repositories prior to 2000, and the rate at which repositories will have to be licensed thereafter is strongly dependent not only on the nuclear growth rate, but also on a number of repository design parameters that are at present very uncertain.

Figure 1 is reproduced from a recent report of the California Energy Commission.[12] While it is based on a higher nuclear commitment (507 Gw instead of 380 Gw in 2000) it is interesting to note that under their assumptions a new repository is required every 2 to 3 years, a rate that would appear exceedingly difficult, if not impossible, to achieve. The 380 Gw projection leads to a new repository every 4 to 5 years - not much better.

Figure 1

NUMBER OF REPOSITORIES NEEDED TO CONTAIN HIGH-LEVEL WASTE FROM NUCLEAR REACTORS



The difficulties experienced to date in the search for an actual repository site should be viewed in the context of the number of repository sites that will have to be found. In the modest case of a nuclear commitment held constant at 507,000 MW capacity (the U.S. Nuclear Regulatory Commission's late 1976 low, no breeder forecast), a new repository would have to be opened every 2 - 3 years.

** From GESMO (NUREG-0002), Vol. 2, p. 111-30 (NRC's low, without breeder forecast.)

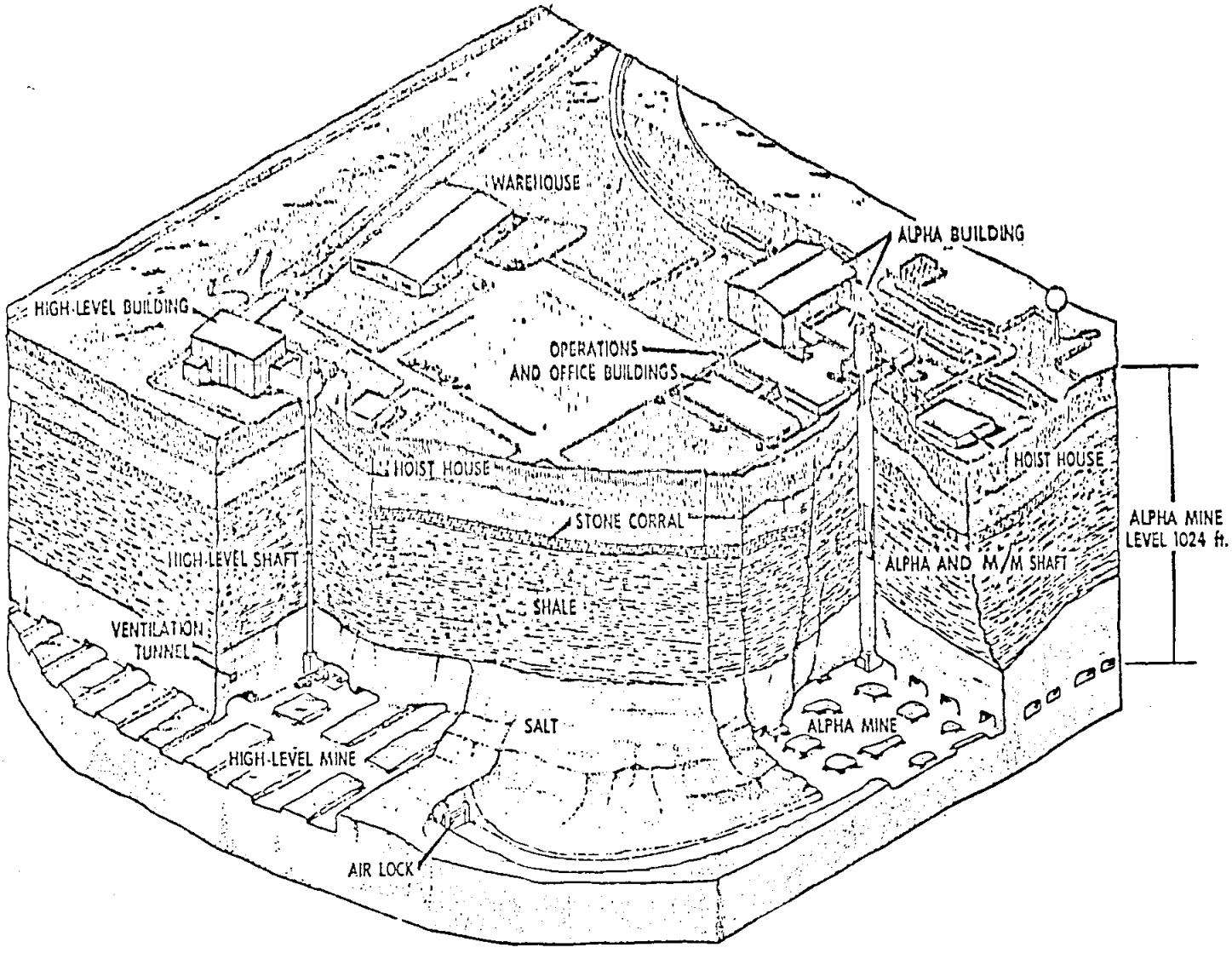
*** Based on repository capacity of 35,000 MT waste, and each 1000 MW reactor discharging 30 MTU per year

It is also instructive to examine conceptual diagrams of proposed high-level waste facilities for geologic disposal in order to appreciate the logistics problem. The old Lyons, Kansas, facility is depicted in Figure 2. This facility was scrapped in 1972. Interestingly, the design of this facility shows only one elevator shaft for handling high-level waste, all shipped by rail. Obvious concerns are whether geologic repositories of this type can be constructed and licensed fast enough and whether their respective high-level waste shafts and burial equipment can reasonably be expected to handle the equivalent of one fuel assembly every 15-20 minutes.

It is important to note that only the logistics of disposal of the spent fuel from commercial reactors was considered above. To this must be added the radioactive waste from the military program and those associated with the decommissioning of nuclear facilities and power reactors. After examining these problems, the GAO stated:

> The problems that nuclear related operations leave behind are increasing because of the expansion of nuclear technologies. All of those involved -- the Energy Research and Development Administration, the Nuclear Regulatory Commission, State Governments, and industry -- are partly to blame for what has happened.
>
> ERDA has accumulated a large number of excess facilities which will involve a monumental clean-up effort. At this point in time, it lacks the necessary information to even plan this task. It does not know the radiation and contamination problems at its facilities, the decommissioning methods that should be used, the corresponding costs, or priorities. ERDA has begun to gather this information at one of its reservations, but this is only the beginning.

Figure 2



FEDERAL REPOSITORY

> While elimination of these excess facilities is important, it is also important that ERDA begin to consider and plan for decommissioning in all future projects. This requires that decommissioning costs be recognized at the outset of a project.
>
> Similarly, NRC, which has responsibility on the commercial side, has not developed cost estimates, acceptable methods, or standards needed by industry to plan decommissioning or disposal of their facilities. NRC has not paid much attention to one of the biggest problems that may confront the public in the future -- this is, who will pay the cost of decommissioning nuclear power reactors. It has not made any plans or established any requirements for advanced accumulation of funds for decommissioning reactors or any facilities it licenses with the exception of uranium mills. 13/
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> * * * * * * * *
>
> Answers to basic questions are missing which preclude developing a strategy for solving a problem that we are losing ground on. 14/

No one can seriously doubt that nuclear wastes have been and continue to be one of the most serious environmental problems that we face. Their toxicity and sheer volume make it imperative that we approach the nuclear waste problem rationally. The serious political implications inherent in making any area of the country the permanent repository for nuclear wastes require that we deal with the waste problem openly and candidly. Nothing could be more damaging to a real solution to the nuclear waste problem than Congress slipping through a private interest-pressured rider to "solve" the waste problem.

Summary

Historically, when we have made early commitments on waste handling -- like NFS in New York -- we have overestimated benefits and underestimated costs. Pursuant to the National Environmental Policy Act, studies are now being prepared by DOE and NRC with respect to a number of possible interim solutions to the present problem of accumulating spent fuel. The AFR is but one of the possible solutions. In a recent letter to Congress, the Chairman of the President's Council on Environmental Quality stressed that completion of the ongoing NEPA studies prior to any commitment to a particular solution to the spent fuel problem is essential to avoid a violation of "NEPA's mandate that such decisions be reached only after a thorough consideration of their environmental effects as well as a consideration of reasonable alternatives."

The central problem with the AFR storage concept is that it is a blatant attempt on the part of the government to hide the nuclear waste problem without solving it. It is an attempt to appease the utilities and nuclear industry whose interest in the AFR concept is found in the expressions - "AFAR from site - AFAR from mind." With the waste problem out of sight and mind, the utilities will be able to more easily expand their nuclear generation capacity without the burden of having to explain to stockholders, utility commissions, and other state and local authorities how the waste problem will be managed.

When one realizes that it is just as easy, if not easier, to build a spent fuel storage facility 300 feet, rather than

300 miles from a reactor, then one must seriously question why anyone other than the utilities and the nuclear industry would promote the AFR storage concept. AFRs simply don't make sense.

There is ample room within the exclusion area at reactor sites for additional spent fuel storage, and the lifetime storage requirements at site with one to four reactors is not significantly different from what is contemplated for AFRs. AFRs on the other hand will introduce new sites of radioactive contamination and thus additional decommissioning problems. They will double the number of waste shipments and increase the shipping distance. Instead of shipping waste directly to the repository, the waste will be shipped first to an AFR and then to the repository. By the same token, AFRs increase the transportation hazards, the routine exposures, the chance of accidents and the occupational exposures. Nuclear waste management is a serious enough problem without adopting interim "solutions" which will exacerbate these siting and transportation problems.

But more importantly, AFRs potentially will buy an enormous political problem in the future. Regardless of whether the nuclear industry and government officials perceive the transportation hazards as real, it is clear from recent expressions of citizen concerns in New York and elsewhere that the public has a quite different perception. Once the final waste repository is completed, the public is likely to view the route from the AFRs to the repository as a radiation corridor carrying a thousand shipments per year and subjecting the population along the route to catastrophic dangers from accidents or intentional

malevolence. These are potential political problems, both undesirable and avoidable.

Even if these problems are overcome, there will likely be a strong desire not to fight the same political battle again. This could create biases toward ultimate storage of nuclear waste at or near the site of the AFRs. Such co-siting would also reduce transportation problems, thus creating further impetus for the AFR site as a permanent waste disposal site. Significantly, however, we are not now capable of selecting a site suitable for permanent waste disposal and, according to the United States Geological Survey, will not be capable for at least 10 years. By now building AFRs we are permanently biasing the choice of the ultimate disposal site. The choice of that site will be difficult enough without the added problems created by AFRs.

Conclusion

When Congress enacted NEPA, Senator Jackson eloquently defined the magnitude of the problems NEPA was intended to address:

> . . . the inadequacy of present knowledge, policies, and institutions for environmental management is reflected in our Nation's history, in our national attitudes, in our contemporary life. It touches every aspect of man's existence. It threatens, it degrades, and destroys the quality life which all men seek.
>
> We see increasing evidence of this inadequacy all around us: haphazard urban and suburban growth; crowding, congestion, and conditions

> within our central cities which result in civil unrest and detract from man's social and psychological well-being; the loss of valuable open spaces; inconsistent and often, incoherent rural and urban land-use policies; critical air and water pollution problems; diminishing recreational opportunity; continuing soil erosion; the degradation of unique eco-systems; needless deforestation; the decline and extinction of fish and wildlife species; faltering and poorly designed transportation systems; poor architectural design and ugliness in public and private structures; rising levels of noise; the continued proliferation of pesticides and chemicals without adequate consideration of the consequences; radiation hazards; thermal pollution; an increasingly ugly landscape cluttered with billboards, powerlines and junkyards; growing scarcity of essential resources; and many, many other environmental quality problems.
>
> A primary function of Government is to improve the institutional policy and the legal framework for dealing with these problems. [NEPA] as agreed to by the conference committee is an important step toward this end.

Proper handling of the problem of spent fuel storage is an important test of our ability and willingness to use NEPA to avoid the mistakes inherent in precipitous action.

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