FINANCING NUCLEAR WASTE DISPOSAL

Staff Working Paper

May 1981

The Congress of the United States
Congressional Budget Office

PREFACE

Although the nuclear age is more than three decades old, nearly all of the country's high-level commercial radioactive waste remains in temporary storage. Further delay in establishing a radioactive waste disposal system may limit the future use of nuclear power. On the other hand, moving too quickly on any particular strategy may create unnecessary hazards. The Office of Technology Assessment (OTA) is studying radioactive waste management and disposal strategies in response to increasing Congressional and public concern. The Congressional Budget Office (CBO) has worked with OTA in analyzing the federal role in financing nuclear waste disposal programs. This paper addresses the issues involved in distributing the costs of nuclear waste disposal and the options available to the federal government for collecting fees and managing the revenues. In keeping with CBO's mandate to provide objective analysis, this working paper offers no recommendations.

The report was prepared by Barry J. Holt of the Natural Resources and Commerce Division, under the supervision of Raymond C. Scheppach. Deborah L. Vogt and Dorleen Dove typed the numerous drafts, and Patricia H. Johnston edited the manuscript.

Alice M. Rivlin
Director

May 1981

CONTENTS

SUMMARY

Every year, one-fourth to one-third of the fuel that powers nuclear generators must be replaced. Although reusable uranium and plutonium could be recovered from this "spent" fuel through a technique called reprocessing, commercial reprocessing efforts have to date been technically and economically unsuccessful. Furthermore, once separated, the plutonium could be diverted for nuclear weapons use. Consequently, as part of the U.S. nuclear nonproliferation policy, the Carter Administration indefinitely deferred commercial reprocessing. Thus, commercial spent fuel has become high-level radioactive waste which must be safely managed.

The Atomic Energy Act of 1959 (P.L. 83-703), which authorized the commercial development of nuclear energy, and Federal Regulation 10CFR50, require disposal of nuclear waste in a federally owned facility. Prior to final disposal, utilities are primarily responsible for storing the waste. Since spent fuel cannot be reprocessed and federal repositories will not be available for at least 10-15 years, utilities face storage capacity constraints, which could force some reactor shutdowns.

The 97th Congress will likely consider legislation both to provide federal storage facilities to alleviate utility capacity constraints and to hasten repository development. While the federal responsibility for final disposal is clearly established, the role the federal government will play in providing storage facilities and in financing nuclear waste disposal still needs to be determined. Only the disposal aspect is considered in this paper.

One major financing issue facing the Congress is deciding who shall pay for nuclear waste disposal. About 7,000 metric tons of commercial spent fuel currently rests in storage. An additional 20-40 metric tons moves into storage annually from each of the about 70 domestic operating power plants. The ultimate disposal of this waste is now estimated to cost about $100,000 per metric ton, which, if added to the consumer's average price of electricity, would result in an increase of about 2 percent. Nevertheless, only when utilities know the total costs of power production can they make investment decisions efficiently. Arranging payment of disposal costs, though, is complicated by timing factors. The primary benefits of electricity generation--and therefore, spent fuel production-- generally accrue to consumers near the time of power generation. The costs of disposal, however, are not borne until many years later, so any costs not accounted for and collected at the time of electricity generation will be transferred onto future consumers.

One possible role for the government, then, is to bridge this timing gap. By setting and collecting disposal fees and by managing the funds, the government could establish a more certain operating environment to allow better utility planning, assure an equitable and efficient distribution of the direct and indirect costs of nuclear waste disposal, and protect the federal budget from large, unanticipated expenditures. Decisions facing the Congress would then center on the mechanisms for collecting disposal fees and the budgetary treatment of such revenues.

FEE COLLECTION

Disposal fees could be established and collected at any one of various points in the nuclear fuel cycle--uranium enrichment, fuel fabrication, electricity generation, spent fuel removal from reactors, or delivery to the federal repository. Two primary options would impose either a mandatory tax-like assessment, based on projected fuel discharges, or a voluntary user-type fee, at the time of repository use. In choosing between the mandatory assessment or the user fee, the Congress will need to consider the degree of certainty each creates for utility planning and operation, and the assurance each provides for generating revenues sufficient to cover the total costs of disposal. In general, the voluntary, use-based fee would provide utilities with more operational discretion than a mandatory assessment. Concomitantly, the voluntary fee would provide the government with an unpredictable revenue stream and possibly insufficient revenues. On the other hand, a mandatory assessment would provide less utility discretion, but a more predictable revenue stream.

In either case, certainty for utilities and assurance of sufficient revenues are most sensitive to how and when adjustments in the fee are made. The greatest certainty for utilities--and the easiest passthrough of costs to consumers--would be achieved with a fee established as early as possible. Early fee collection, however, would provide less assurance to the federal government of sufficient revenues, since the estimated costs of the disposal program will remain highly uncertain until the facility nears completion.

To cover any additional costs, two approaches could be used. The first, a "reach-back" provision, would reassess previous users. Alternatively, the fee could be adjusted periodically, with the new rate charged to all users at the time it is imposed. Both methods would assure ultimate recovery of total costs. The periodically adjusted, one-time fee would provide some near-term planning certainty for utilities, but would make long-term planning difficult. A reach-back provision would leave utilities vulnerable to unanticipated costs. If, however, the government were to set limits on

the amount of later assessments, it could provide a more stable, long-term operating environment, while recognizing that the government might be responsible for some cost increases.

These adjustment mechanisms reflect the likelihood of initial underestimation of costs and future cost overruns. The probability of such problems arising might be reduced by using the high end of the range of cost estimates or by setting higher fees initially. This would, however, depend on a determination that cost overruns and unanticipated costs were a more likely or more serious problem than current overpayments. Thus, a high mandatory fee, with a federally limited reach-back provision, might provide utilities with a reasonably certain operating environment and assure an appropriate level of revenue generation.

FUNDING MECHANISMS

The Congress will also have to decide how to treat the fees within the federal budget. The budgetary treatment should provide certainty that the funds will be available and spent when needed, but allow for continued Congressional budgetary and policy control. The fees could be deposited in the general fund, or earmarked and deposited in a trust fund. Alternatively, a revolving fund could be established, which would recognize and treat the disposal program as a business-like operation.

The Congress maintains the highest level of control over federal funds that are not earmarked. Since such funds are subject to the annual appropriations process and its associated pressures, however, this method would provide little assurance that the funds would be spent for their intended use. Trust funds, on the other hand, could provide some insulation from the annual decision process, but in doing so take away some degree of Congressional control. Thus, a revolving fund, in which the receipts are earmarked, but without the restrictions of a trust agreement or statute, might provide an appropriate mix of Congressional control and security of funding.

CHAPTER I. INTRODUCTION

Although the commercial nuclear industry has been operating for nearly 30 years, questions concerning the disposition of its nuclear waste--both interim storage and ultimate disposal--remain unanswered. Decisions on waste disposal become increasingly pressing as the stocks of waste grow.

Most commercial high-level nuclear waste is produced by electric utilities, which must replace one-fourth to one-third of their enriched uranium fuel rods annually. While it is technically possible to reprocess this "spent" fuel to recover the useful uranium and plutonium, commercial attempts have to date been unsuccessful. Moreover, because plutonium is also a basic ingredient of nuclear weapons, President Carter indefinitely deferred commercial efforts as part of his nuclear weapons non-proliferation policy. Nor can utilities send the spent fuel to a disposal facility. Although the federal government is responsible for providing repositories, none is expected to be available for at least 15 years. Currently, then, utilities must continue to store the spent fuel at reactor sites in facilities that were intended only for short-term use. As reactors continue to generate electricity and produce spent fuel, utility storage capacity becomes strained, threatening continued reactor operation.

Although the Carter Administration proposed establishing a federal storage facility as early 1977, none has yet been built. The 97th Congress will likely consider legislation that will not only provide for federal storage facilities, but also would more clearly delineate the federal responsibility for the development and operation of final nuclear waste repositories. While some technical problems still have to be resolved, the Congress specifically must address the federal role in financing the nuclear waste disposal program. To do so, the Congress will need to consider alternatives that affect the distribution of waste management costs, collection of fees, and the federal budget.

Cost Distribution. The Congress must first decide who will pay the direct and indirect costs of nuclear waste disposal. Electricity consumers receive the primary and separable benefits of the commercial nuclear reactors that produce waste. Other groups, however--the nuclear industry, states, and communities--also have important stakes in disposal decisions and may be forced to bear some of the costs of disposal programs. The next chapter describes the background of the nuclear waste problem and discusses the cost distribution issues in more detail.

Fee Collection. Another decision facing the Congress concerns the choice of a method to collect fees. Fee collection is complicated by the time lag between waste production and its disposal. An ideally constructed fee mechanism should meet three objectives. First, it should ensure that the cost is paid by those consumers using the electricity at the time the waste is produced. Second, the fee rate should be relatively stable and established in advance of the time of collection, so that electric utilities can make the most efficient decisions. Third, the fee should be set at a level to ensure that it collects enough revenues to cover the direct and indirect costs of disposal, but not so high as to produce profits. Chapter III discusses and evaluates the alternative fee-collection options.

Budgetary Treatment of Revenues. Finally, utilities, consumers, and the public will want some assurance that the collected funds will be spent to provide safe and efficient waste disposal. The Congress can use the federal budget process to provide such security by insulating spending from political and budgetary pressures. At the same time, however, efforts to insulate the funds from political pressures are likely to reduce Congressional budget and policy control. Chapter IV describes and evaluates the federal budget options.

CHAPTER II. BACKGROUND

The nuclear fuel cycle begins in uranium mines, where ore containing uranium oxide is obtained. Milling facilities then extract the useful uranium oxide. The next few steps in the cycle chemically and physically convert this product into nuclear fuel rods for use in nuclear reactor cores. Fission reactions within these enriched fuel rods produce the heat that powers nuclear electric power plants. During power generation, however, accumulating fission products reduce the efficiency of these fuel rods. Therefore, one-third to one-fourth of these "spent" fuel rods must be replaced annually.

WASTE DISPOSAL PROBLEMS

Through the 1960s and early 1970s, government and industry planners assumed that this spent fuel would be stored at reactor sites for only about six months to cool and to allow the most intense, but short-lived, radioactivity to decay. It was then to be sent to a reprocessing facility, where the plutonium created by the fission process and the still-useful uranium would be chemically separated from the fission products for reuse in new fuel rods. The waste products from the reprocessing operation would be solidified and disposed of in a federally owned and operated geologic repository.

Commercial Reprocessing Efforts

This part of the nuclear fuel cycle--spent fuel reprocessing and waste disposal--was never fully developed. While the Department of Energy (DOE) currently owns and operates two reprocessing facilities in support of defense programs, commercial reprocessing efforts have been technically and economically unsuccessful. Nuclear Fuels Services, Inc., for example, operated a commercial facility in West Valley, New York, for six years. It closed in 1972 for technical modifications to control effluent releases more effectively, reduce worker radiation exposure, and increase capacity. Since the modifications were considered uneconomic, however, the plant remained closed. Another plant, constructed by General Electric near Morris, Illinois, encountered technical problems and never reprocessed any fuel. A third facility, Allied Nuclear Services' plant in Barnwell, South Carolina, was never completed.

A change in federal policy prevented further efforts. Because the plutonium recovered by reprocessing is not only a useful fuel but also can be

used in nuclear weapons, reprocessing could contribute to the proliferation of such weapons and to nuclear terrorism. Therefore, in 1977, President Carter indefinitely prohibited commercial reprocessing as part of his nuclear weapons nonproliferation policy. Even without this prohibition, whether or not reprocessing would be commercially viable remains unclear.

Federal Involvement in Disposal

The federal responsibility for nuclear waste disposal is an outgrowth of the long-standing connection between the federal government and nuclear technology. To avoid the spread of nuclear weapons capability after World War Two, the United States classified nuclear technologies--military and commercial--as secret. This policy was revamped in 1953, with the introduction of the Atoms-for-Peace program to encourage the peaceful development of nuclear energy through sharing knowledge of nuclear technology. At the same time the government has tried to stem the tide of nuclear weapons proliferation. Along with these international goals, the government has maintained its relationship with the U.S. nuclear industry by supporting research and development, and regulating other commercial activities.

Responsibility for the final disposition of nuclear waste has been lodged solely with the federal government because of the waste's hazardous nature. Various types of nuclear waste remain radioactive for periods of time ranging from several hundred years to several hundred thousand. Since it cannot be "disposed of" in the sense that a biodegradable product can, disposal must consist of permanent and isolated storage, generally in deep geologic formations. Therefore, when the Atomic Energy Act of 1954 (Public Law 83-703) authorized commercial development of nuclear energy, the federal government indicated it would control such potentially dangerous materials by mandating that disposal occur on federal land. In 1970, with Reglation 10CFR50, the federal government formally accepted full responsibility for providing a final repository.

Federal efforts to establish a repository have, however, been unsuccessful thus far. The Atomic Energy Commission's site for a full-scale demonstration facility in Lyons, Kansas, was abandoned in 1972 because of pressure from the state and technical problems. Four years later, the Federal National Waste Terminal Storage Program called for the development of six pilot-scale repositories, scheduled to begin operations in 1985. By 1979, this schedule had slipped by at least five years; and, in February 1980, President Carter announced that a full-scale repository would not be operational until the mid-1990s. Only two months later, however, DOE, in a position paper for the Nuclear Regulatory Commission's proceedings on

radioactive waste, indicated that a repository would be available sometime between 1997 and 2006.

Utility Planning Problems

Under current policy, spent fuel stored at reactor sites cannot be reprocessed, while at the same time the availability of federal storage and disposal facilities remains uncertain. As reactors continue producing spent fuel, the on-site storage capacity, intended only for short-term use, becomes filled. Some utilities can rerack the fuel rods in a more dense configuration to provide additional storage capacity. Others may be able to expand capacity through new construction. The storage capacity at some reactors, however, may be exhausted during the 1980s, with limited possibilities for capacity expansion. Exhausted storage capacity would force reactor shutdown, unless the spent fuel could be transferred to alternative facilities.

Some utilities, therefore, face difficult decisions concerning their options for spent fuel management in the face of great uncertainties. Since they do not know when federal storage or disposal facilities will be available, they do not know the appropriate time frame for evaluating their storage options. In addition to timing uncertainties, many costs are uncertain, and consequently, no fee for either temporary storage or final disposal has been established.

These uncertainties compound the already difficult planning problems associated with fuel mix selection and capital investment choices. Utilities must decide on the best ways to meet forecast electricity demand and to replace worn out equipment, while constrained by limited capital budgets. To provide new electricity production capacity, for example, many utilities are comparing the costs of coal-fired power plants to nuclear-powered generators. The capital costs of nuclear power plants are generally higher than those for coal-fired plants. The fuel costs, however, may tilt the comparison in the other direction. In addition, projecting future costs is very difficult because of the uncertainties of energy resource markets, environmental and safety regulations, and electricity demand. While the costs of waste storage and disposal may turn out to be small relative to the cost of generation, these costs and, perhaps even more, the uncertainties, affect utility decisions. These issues are discussed in the following section.

COSTS OF NUCLEAR WASTE DISPOSAL

Direct Costs of Disposal

A single 1,000 megawatt reactor generates between 30 and 40 metric tons of spent fuel annually. There are now about 7,000 metric tons of commercial spent fuel stored at reactor sites. About 5,000 metric tons of nuclear fuel currently powers the approximately 70 commercial reactors in this country. Although utility plans to build additional nuclear reactors are not entirely clear, current levels of production alone would result in at least 50,000 metric tons of spent fuel by the mid-1990s. Regardless of how utilities store spent fuel in the interim, it will all have to be moved to a federal repository eventually.

Since there is so little experience in dealing with nuclear waste disposal, its costs are very uncertain. There is no consensus on the proper disposal or regulatory requirements. In addition to the extensive evaluation of disposal methods and sites that must be made, basic technical and economic issues still have to be resolved. While the purpose of long-term disposal is to isolate nuclear waste from human activities, for example, there is still no clear decision on whether or not the disposed spent fuel should be retrievable. The current reprocessing prohibition, which effectively makes spent fuel waste, could be reversed, giving the spent fuel a positive resource value. Retrievability might also be desirable if unanticipated technical problems arose at disposal facilities.

The Office of Technology Assessment (OTA) estimates the direct cost of developing a geologic repository for 45,000 metric tons of waste, with supporting surface facilities, would likely be $3 to $4 billion in 1980 dollars. A facility of this size would provide the currently operating powerplants with waste disposal capacity for 15 to 20 years. Since the required development, including site screening, testing, construction, and licensing, would take close to 20 years, this cost estimate is very uncertain. A fee to cover these costs would probably be about $100,000 per metric ton, or the equivalent of about 1.0 mill (one-tenth of a cent) per kilowatt hour. If the fee cost was passed through completely, it would add about 2 percent to the average consumer's price of electricity.

Indirect Costs of Disposal

The direct costs of disposal programs represent only a part of the total price. States and local communities may require compensation to allow repository development within their jurisdictions. Most communities find the prospect of a local waste disposal facility unattractive. The benefits of such facilities--mostly in the form of jobs and economic growth--may not be enough in themselves to convince communities to accept repositories.

These communities, and those through which the waste is transported, may have to bear the cost of contingency planning. The threat alone of accidents may also represent a cost to these areas. While this cost may be primarily psychological, it could appear in the form of reduced property values and a smaller tax base.

Another related cost that is difficult to measure is the possible loss of states' autonomy resulting from federal actions. No state has volunteered to provide a repository site, and no such offer is expected. Nevertheless, the states do not want the federal government to dictate where the sites should be. In fact, a number of states have voted on referenda that would restrict the transportation and disposal of nuclear waste. While these measures have not been uniformly successful, they point to the growing concern over the waste issue and states' role in selecting disposal sites and regulating transportation of nuclear waste. Although determining the states' participation in disposal decisions is very important, the discussion concerning the political solutions remains outside the scope of this paper.

Distributing the Cost Burden

Carter Administration proposals and recent legislative initiatives assume that the full costs of disposal would be recovered through fees paid by the utilities and other users of the services. The costs would be borne ultimately by those people who benefit from the activities generating the wastes. Just as the costs of waste disposal go beyond the capital costs and standard operating expenses, the benefits of a disposal program are realized by various groups. The distinctions between the types of benefits are important to make, however, in determining an equitable distribution of costs.

The general public, for example, benefits from the safe disposal of spent fuel as well as the reprocessing prohibition. The right to an environment free of nuclear waste is properly vested in the public, however, and the private generation of nuclear waste places this right at risk. So, while some of the costs and benefits of spent fuel disposal are difficult to calculate, the primary and separable benefit of spent fuel production is realized by the consumers of the nuclear-generated electricity. Therefore, it may be reasonable to assess these consumers with the total cost of disposal.

The Costs of Uncertainty

For any government program, unresolved problems and policy changes often lead to additional costs. Such costs for disposal result primarily from

two factors. First, unanswered technical questions leave the costs of geologic disposal uncertain, and make utilities' planning difficult. Second, poor planning or mismanagement could cause even wider cost variations. While the current cost estimates could turn out to be too high, the reverse may be more likely. Consumers and stockholders may reasonably be expected to bear the additional costs resulting from technical problems or poor utility planning. On the other hand, the burden of increased costs resulting from poor government planning, management, or policy changes might appropriately be borne by the public.

It is difficult to pass on the cost of disposal for currently generated spent fuel to the consumer for several reasons. The costs of disposal are not incurred at or near the time of electricity generation. Public Utilities Commissions (PUCs) generally allow the passthrough of only those costs which are definite and certain to be paid. In order to charge the electricity consumer for the future treatment of the spent fuel, then, a fee must be established near the time of generation. A set fee which turns out to be inaccurate can create intergenerational transfers, whereas more flexible fees are not likely to be allowed by PUCs. The next chapter introduces and evaluates the fee collection alternatives.

CHAPTER III. DISPOSAL FEE COLLECTION

The exact nature of the fees to be imposed on the users of federal storage facilities and repositories depends in part on the role that such facilities play in the nuclear fuel cycle. For example, if all spent fuel were to be moved to federal storage for additional cooling prior to disposal, the fees for storage and disposal could be combined. On the other hand, if only some utilities were to use the federal storage facilities, a separate fee for disposal would be necessary. This analysis focuses on the collection of disposal fees, independent of possible storage charges.

OPTIONS

Two basic mechanisms would allow fee collection at any of the steps in the well-defined nuclear fuel cycle. The first, a mandatory assessment, would effectively tax a nuclear operation, relating such operation to the ultimate production of waste. This could be in the form of a surcharge on fuel rod manufacture, or a tax levied on electricity generation, for example. Alternatively, a user fee could be imposed on utilities at the time they dispose of their fuel. Such a fee would allow utilities to determine when disposal costs should be faced. These two options are evaluated in the next section by the criteria of certainty of costs for utilities, revenue sufficiency, and fee adjustment.

EVALUATION

Cost Certainty for Utilities

The way in which the disposal fee is collected determines the degree of certainty of its cost for utilities. While the cost of disposal may be only a small part of the annual cost of nuclear power, utilities need to compare carefully the total costs of alternative fuels in making investment decisions for new power plants. Further, the more certain are the charges, the more easily will Public Utility Commissions (PUCs) allow the charges to be passed through to the ratepayers. The fee's certainty is less sensitive, however, to its nature--tax-like or use-based--than it is to the timing of imposition and method of adjustment over time.

Fees to cover the costs can clearly best be determined at the time at which the costs are actually incurred, generally years after the spent fuel is generated. In order for the utilities to analyze investment decisions and for PUCs to allow the passthrough of costs to the current ratepayers, however, the fees would have to be paid, or at least established, much earlier. Thus, there is a direct tradeoff between the degree to which the fee can be imposed upon those consumers benefiting from the spent fuel generation and the risk of transferring part of the cost burden to future consumers. 1/

If a disposal fee were set and imposed at the fuel fabrication or electricity generation stage, for example, it could be considered an additional fuel cost. The various states, however, treat increases in fuel costs differently. Some have fuel adjustment clauses, with which the increases can be passed through to the ratepayers immediately without review by the state commissions. In those states without such clauses, increases may not be recoverable until after a commission rate review. Further, some fuel adjustment clauses only apply to oil and gas, and increases in the cost of nuclear fuel might be excluded. In any case, if the fee were imposed early in the fuel cycle, utilities could probably start to recover the costs relatively quickly. Setting a fee at such a time, well before the disposal costs are incurred, however, would increase the chances that it would be based on inaccurate cost estimates and, therefore, be set at an incorrect level. This is especially probable while the repositories are in the early stage of development. If the fee was set using the high end of the cost estimate range, it would be more apt to cover costs and thus lessen the probability of transferring costs to future ratepayers. This approach would depend on a determination that underestimation of costs is more likely or more serious than early over-collection of fees.

Imposing a fee much later in the fuel cycle would create other problems. While the level of the fee would probably more accurately reflect the correct costs, it would be very difficult to recover the fee from those consumers who benefited from the electricity generation that produced the spent fuel, and the cost would probably be transferred to future consumers. It might be possible for utilities to create reserve funds at the time of electricity generation to be used to pay a later-imposed fee. This method would, however encounter the same problem as an earlier-imposed fee, that is, its amount would have to be set at the time of collection from the ratepayers. Thus, the advantage of cost certainty in delaying fee imposition would be offset by the need for the utilities to charge an approximation of the fee to consumers much earlier to build the reserve account. Once the

---

1/ The spent fuel currently in storage poses this problem, since the users of the electricity associated with the waste were not charged for disposal. Thus, the costs have effectively been transferred to another group, either future consumers or taxpayers.

repository becomes fully operational, the costs will be better known, of course, and can be more accurately charged to utilities early in the fuel cycle.

Revenue Sufficiency

There are two aspects of revenue sufficiency. First, the fee collection mechanism must ensure that the full costs of the disposal program are eventually recovered. Second, the need for federal front-end funding and borrowing will be determined by the rate of revenue generation in relation to the rate of spending. In general, the fee collection mechanism must reflect the fact that any costs not paid for as the spent fuel is produced will be imposed upon someone in the future. Failure to provide for the total costs--including emergency funds and compensation to communities if necessary--would lead to intergenerational cost transfers, either through modified fees or government subsidies. Failure to generate a sufficient stream of revenues would create additional budgetary pressure if the federal government was forced to provide funds to meet any shortfall.

The Carter Administration plan, in which the disposal fee for those utilities also using federal storage facilities is tied to the storage fee, might introduce such timing problems. DOE apparently intends to rely on the disposal portion of the storage fee to provide for the advance funding necessary for the research and development phase of the disposal program. During the past few years, as more utilities have been providing for their own storage requirements, DOE has revised downward its projections for the use of federal storage facilities. Thus, the proposed tie between the storage facility use and the disposal fee leaves the revenue stream for disposal research and development uncertain. Since the timing of receipts from a voluntary user fee would depend on utility decisions, imposing an assessment type fee for disposal would probably provide the most assurance of a sufficient stream of revenues.

Fee Adjustment

Whether the fee is imposed as a mandatory assessment or as a user fee, some mechanism by which the fee can be adjusted must be devised to assure ultimate recovery of the total costs. Setting and collecting the fee as early as possible in the fuel cycle would most easily allow the utilities to both make sound investment decisions and recover the costs from the appropriate group of consumers. This type of cost certainty, however, provides the least assurance that the collected funds would reflect actual costs. The cost estimates for other long-term, capital-intensive projects

have often been low, and such underestimation of costs can result in insufficient total revenues.

There are two basic options that would allow the recovery of additional costs. The first, a "reach-back" provision, would allow the recovery of unanticipated costs in the future from the utilities that have previously paid for disposal services. The second, a periodic fee adjustment, would simply reestimate the fee for all future deliveries of radioactive waste to the disposal site, but not affect utilities with waste already there. Any reach-back provision would reintroduce the problems of uncertain fees and open-ended liabilities, since utilities would be liable for unanticipated assessments. A provision that periodically reevaluated and adjusted the fee, without retroactive adjustments, might be more acceptable to PUCs, since the short-term certainty would allow the passthrough of costs to consumers. In the face of a periodically changing fee, utilities might choose to deliver spent fuel early to avoid anticipated cost increases. This would not be a long-term problem, however, since these utilities would simply have to pay the higher fee for the next delivery. With either adjustment provision, though, later ratepayers would bear additional costs for services provided to former consumers. The specific equity concern raised by future ratepayers subsidizing earlier ones might, however, be reduced by using high initial cost estimates in setting a fee.

The financial risks of collecting insufficient revenues stem from three sources: technological problems, government policy changes, and inefficiency or poor management. Traditionally, industry has absorbed some of the costs of technical risks in any new venture. Since the federal government has created uncertainty by not building the promised repositories or promulgating regulations, there may be reason for the public to absorb cost escalation resulting from this inaction. Thus, the Congress may want to limit the extent to which utilities would have to pay the fee adjustments. Such limits might provide a more favorable and more certain operating environment for utilities and force the public to absorb excessive increases resulting from government action or inaction.

Operational inefficiency or poor planning can also cause cost escalation. Allowing DOE to recover the full costs for the operation of storage and disposal facilities would reduce the incentives to provide the services at minimum cost. Such inefficiency is not, however, restricted to government operations. For example, the fuel adjustment clauses now in effect allow public utilities to pass the rising costs of fuel through to the consumers without regulatory review. This has created a situation in which the utilities continue to rely on expensive oil, when the long-run costs to the consumer might be minimized by conversion of oil-fired boilers to allow the use of coal. Therefore, since the government is not uniquely inefficient, it

might not be fair to force the public to pay for the cost of all poor planning or inefficient management. A further consideration in nuclear fuel disposal is that some cost-cutting actions could jeopardize operational safety.

EVALUATION SUMMARY

Either the mandatory or voluntary user fees, coupled with an adjustment provision, could eventually provide enough revenues to cover the costs of nuclear waste disposal. Since a voluntary user fee would allow utilities a high degree of operational flexibility, though, the timing of the revenue stream would remain uncertain. This might tend to place pressure on the federal budget during repository development. On the other hand, while a mandatory assessment would reduce utilities' discretion, it would provide a more certain operating environment for both utilities and the government. Further, such planning certainty might be enhanced if coupled with a reach-back provision within set limits.

CHAPTER IV. FUNDING MECHANISMS

There are several ways in which the government could manage the revenues generated by disposal fees. If they were treated as general revenues, then spending for the disposal program might be subject to the annual cycle of budget decisions. Alternatively, a trust fund could be established, with the revenues automatically earmarked for the disposal program. A third option, the revolving fund, would treat the disposal program as a continuing cycle of businesslike operations. In choosing the mechanism to fund the disposal programs, the Congress will want to maintain budgetary and policy control while providing assurance to the nuclear industry, utilities, and the public that the collected fees will be applied to the safe disposal of nuclear spent fuel. The general characteristics of these options are discussed below, followed by an evaluation of their applicability to disposal funding problems.

OPTIONS

Direct Appropriations. In the annual budgetary cycle, the Congress appropriates funds that allow federal agencies to incur obligations and to make payments out of the Treasury. The most common form of budget authority is a one-year (annual) appropriation. Appropriations can also be made for a specified period exceeding one fiscal year, or an indefinite period of time, usually until certain objectives have been met.

Trust Fund. Funds collected and used by the federal government for carrying out specific purposes and programs according to the terms of a trust agreement or a statute are handled through trust funds. Such funds are administered by the government in a fiduciary capacity and are not available for the general purposes of the government. Trust fund surpluses are generally invested in government securities which pay interest to the fund.

Revolving Fund. The Congress can establish a revolving fund to finance a continuing cycle of operations in which expenditures generate receipts. Such funds can be set up so that the receipts are available for expenditure without further Congressional action. Only the net excess of expenditures over receipts is included in the budget as an expenditure. Temporary fund surpluses are also generally invested in interest-bearing government securities. Trust revolving funds, a special category of trust funds, are used to carry out a cycle of businesslike operations according to the terms of a trust agreement or statute.

These options entail varying degrees of Congressional control and provide different levels of funding stability. In order for the Congress to establish national policy goals and work towards them, it must maintain control over federal spending programs. The close control afforded by direct appropriations allows the Congress to effect policy changes quickly. This method may not, however, provide the assurance required by utilities, consumers, states, and communities that the disposal program will receive funds necessary to provide for the safe disposal of the nuclear waste. These tradeoffs are discussed in the next section.

EVALUATION

Security of Funds

While the Congress could provide directly appropriated funds essentially when they are needed, it might not be desirable to subject funds for disposal programs to this short-term decision process, even when full repayment is planned. Short-term budget constraints, which can affect the commitment of funds for any program, could reduce the credibility and success of disposal efforts. Pressure from a variety of sources could influence budget decisions, leaving expected appropriations vulnerable to cutbacks. This vulnerability could be reduced through the mechanisms of multiyear budgeting. For example, appropriations could be provided for use in one or more fiscal years beyond the year for which the appropriation is provided.

Revolving funds and trust funds could also reasonably assure the future availability of funds. While the Congress can control the spending of trust and revolving funds, receipts are credited to a specific account rather than to the general fund. A trust fund, or a trust revolving fund, would make the earmarking more formal, with a trust agreement or statute. A trust agreement, the major difference between a trust fund and a revolving fund, might indicate more of a commitment, although such agreements and statutes can be changed. Nevertheless, since fee collection would begin in the early years of repository development to provide funds in later years, the federal government would have to hold these funds in trust and could not use them for other purposes without changing the law. A revolving fund might be more appropriate if there were greater congruence between the rate of fund collection and spending, as may be the case after the disposal facilities are fully operational.

Congressional Budgetary Control

Direct appropriations afford the greatest level of Congressional control. The Congress decides annually the level of funds that it is willing to spend, and changes in policy are reflected relatively quickly in budget decisions. This feature does, however, conflict directly with the stability criterion discussed above.

With nuclear waste disposal, incremental decisionmaking, which can easily result in deferred action, might lead to substantial long-term costs. A trust fund might provide assurance for future funding and reduce the problems associated with incremental decisionmaking. This may, however, reduce budgetary control by the Congress, since trust funds are intended to be insulated from the annual review process. The Congress could maintain some degree of control by careful establishment of the trust fund, and by exercising its right to legislate changes as they are needed in the future. Further, since trust funds are to some degree isolated from the rest of the budget, they provide an opportunity for scrutiny.

Revolving funds theoretically allow greater Congressional control over spending than trust funds. While the receipts to a revolving fund are held in a specific account, there is no explicit trust agreement that prohibits using the money for other purposes. Thus, a revolving fund would provide less security than a trust fund, but somewhat more than annual appropriations.

EVALUATION SUMMARY

If disposal fees were collected and deposited in the Treasury's general fund, there is no assurance that the fees would be applied to their intended purpose. With this option, however, the Congress would maintain the greatest degree of budgetary control. Some assurance and stability for utilities' planning could be provided by advance budgeting. Depositing fee revenues into a trust fund, would place the federal government in a fiduciary capacity and provide written, although revocable, assurance that the money would be spent for its intended use. Removing these funds from the annual decision process, however, would limit Congressional control. Alternatively, a revolving fund might provide some assurance to utilities, consumers, and the public that the money will be available and spent for disposal services without severely limiting Congressional control.