DETERMINATION OF ECONOMIC SHELF LIFE OF SPENT NUCLEAR FUEL

by

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In the course of pursuing a college education some individuals elect to continue their academic endeavor by seeking a masters or doctorial degree. A major requirement found in most graduate degree programs is the successful completion of a thesis or dissertation. The section in these studies that many individuals consider the most unimportant is the acknowledgment page(s). This writer considers this section to be the most important since what is shared in this section by this author to the reader far outweights the importance of the results of this particular thesis.

This author, when he arrived at VPI & SU (Sept., 1977) to commence his graduate studies, was no different than any other average graduate student found in any institution of higher education in this country. He was: strongly career oriented; seeking a job that would be a major stepping stone in his professional career and that would provide him with many desirable material things; earnestly desiring to impress his peers and contemporaries with his intelligence, maturity and open-mindedness; truly believing that he knew what was wrong with this world, this country,

and this college and truly believing that he possessed the answers to some of these problems; and thoroughly convinced that the solution to these problems lied in the proper application of an engineering thought methodology. To make it more clear and concise to the reader, this individual was clearly living his life for the things of this world. This attitude continued into the 3 rd quarter of the 77-78 academic school year.

Then a major thing happened to this individual. He came to know, accept and openly proclaim that Jesus Christ is the Son of God and the Lord of his life. Before being baptized for a second time at the age of 23, this individual was a slave to sin resulting in eternal death. After being baptized he became a willing slave to Jesus Christ being freed from the bondage of sin and being sealed with the Holy Spirit. Before, this individual was dead but now he has received the gift of eternal life by the grace of God through his Son, Jesus Christ, the Lord of my life.

I believe and claim this in faith. Praise to Lord Jesus, the living and absolute Lord of all that exists.

The author wishes to express his deepest appreciation to the Holy Spirit, who guided this author in the research, compilation and oral defense of this thesis. Also thanks and appreciation are due to

and for their continued support and input in the work presented here. I dedicate this work to the Lord of my life as a mark in time which signifies the beginning of my true walk with him.

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I. INTRODUCTION

The nuclear fuel cycle is composed of the services and industries necessary to generate electricity from the controlled fissioning of uranium atoms. The most visible portion of this fuel cycle to the public is the nuclear power plant. In the nuclear power plant, uranium atoms are fissioned in the reactor vessel, and the resulting energy is then converted into electricity by means of various plant components. After the nuclear reactor has generated a certain amount of heat from the controlled fissioning of the uranium atoms, the spent fuel is removed and stored in spent fuel basins on the reactor site. A major problem facing the nuclear industry is the determination of the final disposition of the spent nuclear fuel being discharged from operating nuclear power plants. This study will address a portion of this problem.

The primary motivation behind this study is the determination of the constituents of value in spent nuclear fuel. The bulk of this study is concerned with the selection and evaluation of the valuable fission products. In the literature, Rohrmann and Dix[1,2] attempt to specify potential uses of specific fission products, the objective

here is to re-examine and update the uses and determine the potential economic value of these applications. The potential value of the fission products is in turn integrated into an economic time dependent analysis of the recycling of spent nuclear fuel. The economic model balances the value of the constituents as they reside in the spent nuclear fuel against the cost of acquiring them as separate useful products. This study will include an examination of possible revenues from spent fuel constituents, the consequences to the nation and the utilities of the beneficial utilization of valuable fission products, and the relative advantages of reprocessing and no reprocessing.

Four key results of this study are: (1) a re-examination of the value of recycling materials other than uranium and plutonium, namely cesium-137, 134, rhodium, palladium and xenon is justified; (2) the magnitude of the net profits obtainable from the recycling of spent nuclear fuel are tied primarily to burnup and the decision to recycle fission products; (3) for fission product recycle, any burnup yields a net positive value with the greater values being at high burnups; and (4) under no fission product recycle with only spent uranium and plutonium recycle, it is marginally profitable or unprofitable to recycle spent nuclear fuel. The

utilization of cesium-137, 134 in the treatment of municipal sludge can reduce the importation of oil by 47.92 million U. S. barrels annually for the United States.

II. BACKGROUND

Despite the existing controversies over the adviseability of such a course, nuclear energy will be used to help meet United States energy demands.[3] In the nuclear fuel cycle uranium ore is mined and enriched in uranium-235 content from 0.711% to 2 to 3%. The uranium is then formed into fuel pellets and placed into a cladded rod. The cladded rods are then grouped together into a fuel assembly and placed into a pressure vessel in a nuclear power plant. After a certain amount of electricity has been generated from the controlled fissioning of uranium atoms the spent fuel assemblies are then off-loaded into a spent fuel basin. Much of the controversy over the nuclear fuel cycle relates to the responsible management of the spent nuclear fuel off-loaded annually from commerical light water reactors. Questions concerning the economies and safety of spent fuel reprocessing have been confounded by emotional concerns about nuclear materials diversion and proliferation of nuclear weapons. Consequently, an interim moratorium on spent fuel reprocessing has been imposed to permit a re-examination of the alternate methods for dealing with the spent fuel. Six classes of closure alternatives for

the nuclear fuel cycle are presently under consideration. They are: recycle, fuel rejuvination, extended burnup, tandem, throwaway, and thorium cycles.[4] Each of these classses has defineable sub-classes. For example, under recycle, the alternatives of coprocessing, partial reprocessing, full reprocessing without plutonium recycle, and full reprocessing with plutonium recycle are all under consideration. Each of these alternatives includes the chemical processing of the spent fuel to separate recycleable materials from wastes. Each includes an implied management of the wastes.

This study will examine the desirability of the recycle mode for spent fuel by the utilization of an economic time dependent model of a spent fuel assembly. BWR(Boiling Water Reactor) and PWR(Pressurized Water Reactor) spent fuel assemblies are modeled at five different burnup levels. Burnup is a measure of the amount of heat extracted from a fuel assembly while it resides in the pressure vessel of a nuclear power plant. Fresh fuel assemblies containing uranium (UO_2 assembly) and a mixture of uranium and plutonium (MOX assembly) are examined. The uranium assemblies are modeled under 4 sub-classes of recycling. They are: (1) spent uranium recycle, (2) spent uranium recycle with fission product sales, (3)

spent uranium and plutonium recycle, and (4) spent uranium and plutonium recycle with fission product sales. The MOX assemblies are modeled under 2 sub-classes of recycling. They are uranium and plutonium recycle, and uranium and plutonium recycle with fission product sales.

A compilation of abbreviations utilized in this study are displayed in appendix 3. For a more thorough description of the nuclear fuel cycle under a recycle mode of full reprocessing the reader is referred to appendix 2.

III. Model Development

This chapter presents the development of a model of the cash flows that occur in the management of spent nuclear fuel under an assumed reprocessing activity. The model represents the revenues that are obtained from the sale of constituent isotopes of the spent fuel and the costs of storing the spent fuel after reactor discharge, transporting the spent fuel, chemically processing the spent fuel to separate the revenue producing isotopes, and fabrication of the isotopes into useable items. The cash flows are described in terms of their time of occurrance as measured from the date of reactor discharge. The cash flows are discounted as appropriate and are measured relative to real increases in material values. The revenues realized by the reprocessing of spent fuel are assumed to be accessible to the public utility.

While many of the values of the constituents of the spent fuel appear promising, their values must be balanced against the costs of obtaining them. The procurement costs for the elements in the spent fuel include chemical processing, spent fuel storage and transportation, and fabrication costs. The model development relies upon the

following notation:

$I = (i)$ = the index set corresponding to the various constituent elements;

$T = (t)$ = the index set representing the time interval since reactor discharge;

$S_i(t)$ = the quantity of element (or isotope) i in a spent fuel assembly in time period t;

$R_i(t)$ = the unit value of element i at time t;

$Q(t)$ = the per unit fixed portion of the reprocessing and procurement cost at time t;

$P_i(t)$ = the per unit variable portion of the element procurement cost associated with element i at time t; and

$H(t)$ = the per unit spent fuel holding cost in period t.

Note that $Q(t)$ includes transportation and materials handling costs and that $P_i(t)$ includes any fabrication or special processing costs. Under these definitions, the net worth of spent fuel reprocessed t time periods after discharge from a reactor is given by:

$$f(t) = \sum_{i-1}^{N} (R_i(t) - P_i(t))S_i(t) - \sum_{j=0}^{t-1} \sum_{i=1}^{N} S_i(j)H(j)$$

$$- Q(t) \sum_{i=1}^{N} S_i(t) \quad . \qquad (1)$$

In this equation the first term, $R_i(t)$, represents the value of component i, (positive or negative value), that resides in the spent fuel. The second term, $P_i(t)$, represents reprocessing and special chemical separation costs for component i. $S_i(t)$ is the amount of component i in the spent fuel at time t. The fourth term, H(j), is the per-unit spent fuel storage cost and Q(t) is the transportation and handling cost of the spent fuel. This equation can be stated more compactly as:

$$f(t) = \sum_{i-1}^{N} ((R_i(t) - P_i(t) - Q(t))S_i(t) - \sum_{j=0}^{t-1} S_i(j)H(j)) \qquad (2)$$

The quantities $S_i(t)$ changes over time as a result of radioactive decay so that the quantity of element i as a function of time is given by:

$$S_i(t+1) = A_i S_i(t) \quad \forall i,t \qquad (3)$$

where A_i is the decay/growth coefficient. At the same time conservation of mass requires that:

$$\sum_{i=1}^{N} S_i(t) = M \quad \forall t \tag{4}$$

where M is the total mass of the spent fuel.. Finally, equation (3) can be restated as:

$$S_i(t) = A_i^t S_i(0) \tag{5}$$

which makes the quantity of element i in the spent fuel a direct function of time. Note that all constituents of the spent fuel must be included in this equation. Some constituents will be aggregated into a waste for which revenue is negative. The waste carrries an associated disposal cost. All calculations are in terms of constant 1975 dollars. Thus, equation (2) is a general model of the cash flows associated with spent fuel management. Model parameter definitions can reflect any cost scenario. The model is used to investigate the values of four specific types of fuel assemblies. These types are: (1) BWR-UO_2, boiling water reactor assembly containing uranium enriched in uranium-235 content from 0.711% to 2.6%; (2) BWR-MOX, boiling water reactor

assembly containing natural uranium and recycled plutonium; (3) PWR-UO_2, pressurized water reactor containing uranium enriched in uranium-235 content from 0.711% to 3.2%; and (4) PWR-MOX, pressurized water reactor containing natural uranium and recycled plutonium. The original compositions of these various assemblies is established in chapter 4. The composition of these assemblies after their removal from the reactor core is determined by using ORIGEN, an isotope generation and depletion computer code developed by Oak Ridge National Laboratories. ORIGEN is discussed in detail in appendix 4 of this thesis. The model is applied to the case of the four types of spent fuel assemblies that are generated from 1977 to 1990 under various recycle modes. In each case, the model solution is obtained by the utilization of a FORTRAN computer program.

The model results are examined and are also included in a computation of the total cash flows specific to a fuel assembly. This is accomplished by combining results with consideration of the value of the energy liberated using the fuel assembly while it is in the reactor core and the purchase price of the assembly. Using this total cash flow, the net return on investment for the fuel assembly can be computed as a function of in core

fuel management, of spent fuel management, and of the disposition alternative choosen. The rate of return is computed as:

$$R.O.I.I. = \frac{f(t) + \begin{pmatrix}\text{total value of energy liberated}\\ \text{from assembly while it is in the}\\ \text{reactor core}\end{pmatrix}}{(\text{cost of purchasing the assembly})} \qquad (6)$$

where R.O.I.I. (t) is the return on investment index, and f(t) is obtained from equation (2). The total value of energy liberated from the assembly while it is in the reactor core and the cost of purchasing the assembly are discussed in chapter 8.

IV. MODEL APPLICATION

In this chapter the original composition of a mixed oxide assembly (MOX) and a uranium assembly (UO_2) is established. Output from ORIGEN, which is used as input for the economic model, is discussed here also.

A. MOX and UO_2 Fuel Composition

It is important to note that the total uranium-235 requirements for both BWR and PWR reactors are approximately the same. This appears reasonable since a BWR core, which is 33% larger than a PWR core, has an average uranium enrichment of 2.6% while a PWR has an average uranium enrichment of 3.2%. Since the fissile-uranium-atom loading in a reactor core is essentially the same for both types of reactors at the same power rating, it is reasonable to assume that the fissile plutonium-atom loading in a MOX core is approximately the same for a PWR and BWR.[5] The use of this assumption to calculate the buildup of cesium, strontium, xenon, krypton, rhodium, palladium, ruthenium, americium, curium, cerium, promethium, and technetium by utilizing ORIGEN will introduce a very

small error.[6]

In this thesis, the model MOX LWR fuel assembly defined in GESMO is taken as representative of MOX fuel and is therefore used in the analysis.[7] The model MOX reactor is a 1000 Mw(e) BWR with a thermal efficiency of 32.6% and a plant load factor of 80%. The reactor will receive fresh MOX fuel that contains plutonium in the amount of an average of 1.8% of its heavy metal. This value of plutonium content will permit the reactor to meet GESMO environmental-impact standards. GESMO establishes an equilibrium condition for plutonium recycle. This condition can be achieved for a reactor in 3 to 4 years after it is converted to plutonium recycle. The equilibrium condition for recycled plutonium signifies a fixed isotopic composition for plutonium in virtually all new MOX fuel assemblies. The composition of old plutonium, which has been recycled more than once, is maintained by mixing new plutonium with it which has never been recycled. By the appropriate mixing of virgin and multirecycled plutonium, isotopic concentrations of this fuel will be maintained at the GESMO model plutonium-recycle level. The level of plutonium isotopic composition, Table 1, can be maintained in this manner by utilizing the large inventory of accumulated spent fuel.[8]

Table 1 Pu Recycle Model BWR, Calculated Pu Composition

Isotope of Plutonium	% Composition
238	3.4
239	41.7
240	29.2
241	15.2
242	10.4
Pu_f*	57.0

*$Pu_f = {}^{239}Pu + {}^{241}Pu$

In this thesis, all new MOX assemblies are assumed to have a composition of 1.8% of their heavy metal as plutonium. This plutonium has the isotopic composition displayed in Table 1. The geometry and size of MOX fuel assemblies are the same as UO_2 fuel assemblies. The MOX fuel assemblies are assumed to contain natural unenriched uranium. Standard UO_2 assemblies for a BWR and PWR are displayed in Table 2.[9] The standard PWR assembly is a product of Westinghouse and the standard BWR assembly is manufactured by General Electric.

Table 2 Description of Typical LWR Assemblies

Characteristics	PWR	BWR
Overall length (m)	4.059	.4.470
Fuel element length (m)	3.851	4.064
Cross-section (cm)	21.4 x 21.4	13.9 x 13.9
Fuel element OD (cm)	0.950	1.252
Fuel element array	17 x 17	8 x 8
Fuel assembly weight (kg)	668.6	279
Uranium/assembly (kg)	461.4	188.7
Zircaloy/assembly (kg)	129.7	56.7
Hardware/assembly (kg)	15.5	8.2
Total metal/assembly (kg)	145.2	64.9
U-235	3.21	2.73

B. Analysis of ORIGEN [10] Output

An examination of ORIGEN output data in Tables 3 and 4 reveals a number of important factors that pertain to the economic value of various constituents in PWR/BWR-UO_2 spent fuel assemblies.

As the burnup increases the amount of spent uranium and the weight fraction of uranium-235 in that spent uranium decreases. This implies that uranium based spent fuel value decreases with increasing burnup. For a standard PWR-UO_2 assembly, spent uranium decreases below natural uranium in U-235 content at 33,000 MWD/MT-HM and 25,000 MWD/MT-HM for a BWR-UO_2 assembly.

Maximum Pu-239 production occurs at 40,000 to 50,000 MWD/MT-HM for a PWR-UO_2 assembly and at 33,000 to 40,000 MWD/MT-HM for a BWR-UO_2 assembly. Maximum Pu-241 production occurs at burnups in excess of 50,000 MWD/MT-HM for PWR/BWR-UO_2 spent fuel assemblies. It is important to note that Pu-239 has a half life of 24,390 years and that Pu-241 has a half life of 15 years. Thus, if plutonium were stored for a few years it would essentially retain its original Pu-239 mass but the Pu-241 would decay with a 15 year half life. The Pu-241 is the only fissile plutonium isotope which is subject to a major penalty as

Table 3 Composition of a PWR-UO_2 Spent Fuel Assembly

	AMOUNT OF SUBSTANCE FOR VARIOUS BURNUPS IN A PWR-UO_2 SPENT FUEL ASSEMBLY				
SUBSTANCE OF INTEREST	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
URANIUM KGS.	453.	447.	440.	436.	430.
U-235 WEIGHT FRACTION	.02198	.01459	.00789	.00544	.00305
PLUTONIUM-241 GRAMS	52.7	230.	485.	582.	663.
PLUTONIUM-239 GRAMS	1690.	2230.	2390.	2400.	2400.
CESIUM-137 CURIES	14800.	29900.	49700.	60500.	76100.
CESIUM-134 CURIES	10700.	42400.	115000.	167000.	253000.
RHODIUM GRAMS	65.8	123.	179.	200.	222.
PALLADIUM GRAMS	104.	300.	660.	894.	1260.
XENON GRAMS	693.	1460.	2510.	3080.	3920.

Table 4 Composition of a BWR-UO_2 Spent Fuel Assembly

SUBSTANCE OF INTEREST	AMOUNT OF SUBSTANCE FOR VARIOUS BURNUPS IN A BWR-UO_2 SPENT FUEL ASSEMBLY				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
URANIUM KGS.	184.	181.	178.	177.	175.
U-235 WEIGHT FRACTION	.01679	.01049	.005314	.003548	.001926
PLUTONIUM-241 GRAMS	30.1	117.	219.	251.	276.
PLUTONIUM-239 GRAMS	745.	938.	982.	982.	977.
CESIUM-137 CURIES	5970.	12200.	20200.	24600.	30900.
CESIUM-134 CURIES	4520.	17700.	46600.	66600.	98800.
RHODIUM GRAMS	27.2	50.6	71.9	79.6	87.4
PALLADIUM GRAMS	50.6	145.	310.	415.	577.
XENON GRAMS	279.	595.	1020.	1260.	1600.

a function of storage times. As burnup increases the per cent content of Pu-241 in fissile plutonium increases. Thus, as the burnup of a discharged spent fuel assembly is increased, its total fissile plutonium content is increased but an increasingly larger per cent of its fissile plutonium content is Pu-241. This makes the UO_2 spent fuel assembly more sensitive to a loss of fissile plutonium value due to prolonged storage for high burnups as opposed to low burnups over the plausible burnup range of 10,000 to 50,000 MWD/MT-HM. Aged plutonium in MOX assemblies contains americium, a product of Pu-241 decay. Americium is a neutron aborber and additional fissile plutonium must be added in order to compensate for the reactivity loss due to americium buildup.

At low burnups of 10,000 MWD/MT-HM, Cs-137 is produced in greater quantities than Cs-134 and at burnups in excess of 10,000 MWD/MT-HM the reverse is true. It is important to note that Cs-137 has a half-life of 30.1 years and that Cs-134 has a half life of 2.06 years. Thus, as the burnup of the discharged UO_2 spent fuel assembly is increased, it becomes increasingly more sensitive to a loss of revenues from the Cs-137,134 mixture. This occurs because Cs-134 constitutes 42% of the Cs-134,137 mixture at 10,000 MWD/MT-HM compared to

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Table 5 Composition of a PWR-MOX Spent Fuel Assembly

	AMOUNT OF SUBSTANCE FOR VARIOUS BURNUPS IN A PWR-MOX SPENT FUEL ASSEMBLY				
SUBSTANCE OF INTEREST	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
URANIUM KGS.	448.	444.	438.	434.	429.
U-235 WEIGHT FRACTION	.004776	.002950	.001429	.00094	.000506
PLUTONIUM-241 GRAMS	1170.	1020.	845.	792.	753.
PLUTONIUM-239 GRAMS	2810.	2580.	2470.	2440.	2400.
CESIUM-137 CURIES	15500.	31000.	51000.	61800.	76900.
CESIUM-134 CURIES	11700.	48000.	128000.	182000.	264000.
RHODIUM GRAMS	93.4	157.	204.	218.	231.
PALLADIUM GRAMS	304.	652.	1150.	1430.	1850.
XENON GRAMS	722.	1520.	2580.	3160.	3980.

Table 6 Compsition of a BWR-MOX Spent Fuel Assembly

	AMOUNT OF SUBSTANCE FOR VARIOUS BURNUPS IN A BWR-MOX SPENT FUEL ASSEMBLY				
SUBSTANCE OF INTEREST	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
URANIUM KGS.	183.	181.	178.	177.	175.
U-235 WEIGHT FRACTION	.004781	.002934	.001433	.000938	.000507
PLUTONIUM-241 GRAMS	464.	411.	342.	322.	306.
PLUTONIUM-239 GRAMS	1150.	1050.	1010.	999.	984.
CESIUM-137 CURIES	6200.	12500.	20600.	24900.	31000.
CESIUM-134 CURIES	4330.	18100.	48000.	68000.	98900.
RHODIUM GRAMS	37.7	63.4	81.6	86.9	91.6
PALLADIUM GRAMS	123.	267.	471.	590.	762.
XENON GRAMS	287.	610.	1040.	1270.	1610.

Figures 1 and 2 display the U-235 and fissile plutonium content for a UO_2 assembly as a function of burnup. An examination of these curves indicates that higher nuclear fuel values for spent uranium are found in the 10,000 to 20,000 burnups range as opposed to the 30,000 to 50,000 MWD/MT-HM burnup range. At low burnups, spent fuel value exists in the form of depleted uranium and additional value is found in the fissile plutonium. At burnups in excess of 30,000 MWD/MT-HM, an increase in spent fuel value is realized in the form of increased amounts of fissile plutonium and a decrease in spent fuel value is incurred by the further depletion of uranium in U-235 content.

As the burnup increases the amount of palladium, rhodium, xenon and cesium-137,134 increases for MOX and UO_2 assemblies. Thus, the maximum fission product and fissile plutonium value can be found at the upper end of the 10,000 to 50,000 MWD/MT-HM burnup range while maximum spent uranium value can be found at the lower end of this range for a UO_2 spent fuel assembly. While maximum fission product cesium value is found at the upper end of the plausible burnup range for MOX and UO_2 assemblies, maximum sensitivity to losses in Cs-137,134 value occur at these burnup values.

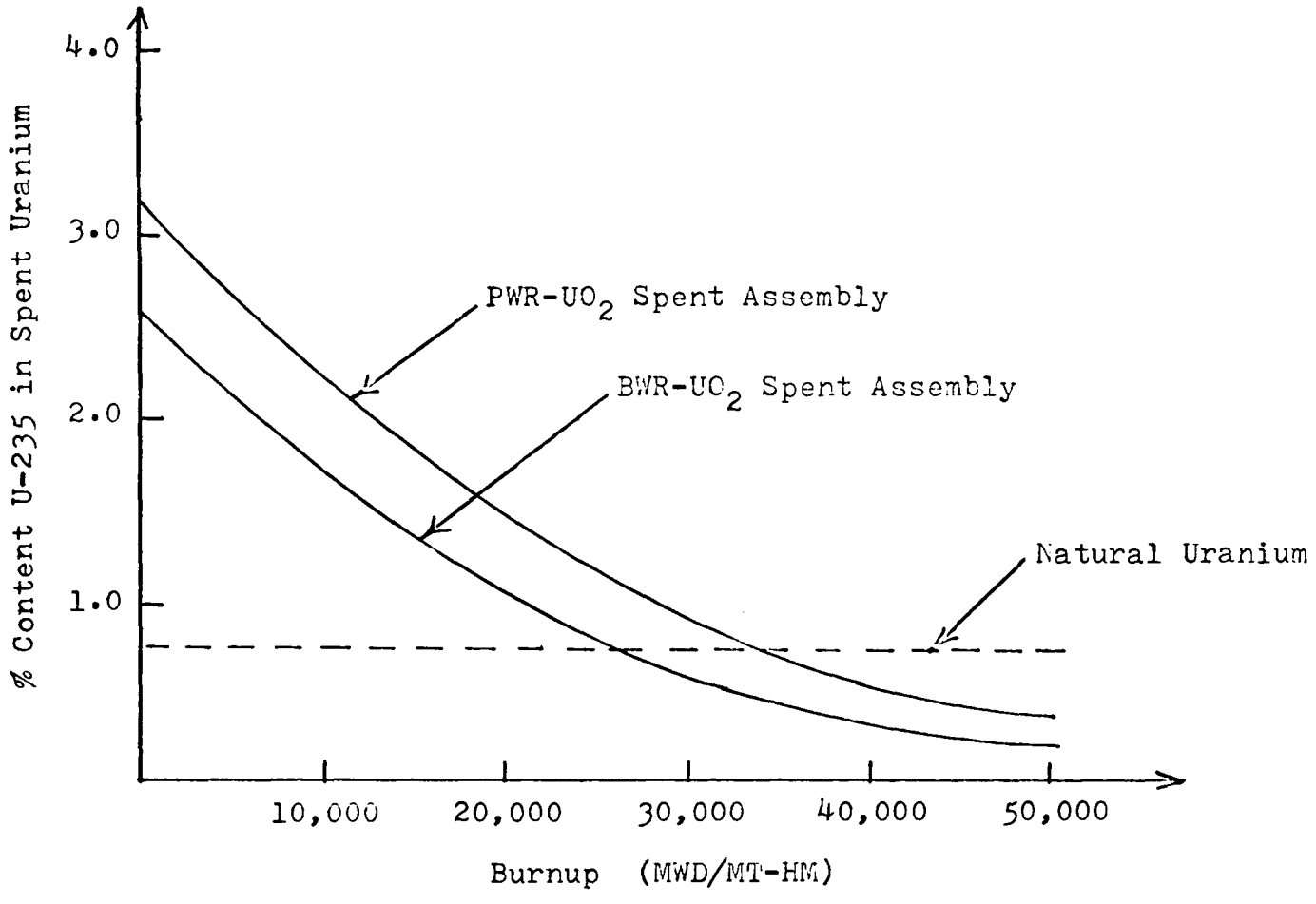


Figure 1 U-235 Content in Spent Uranium

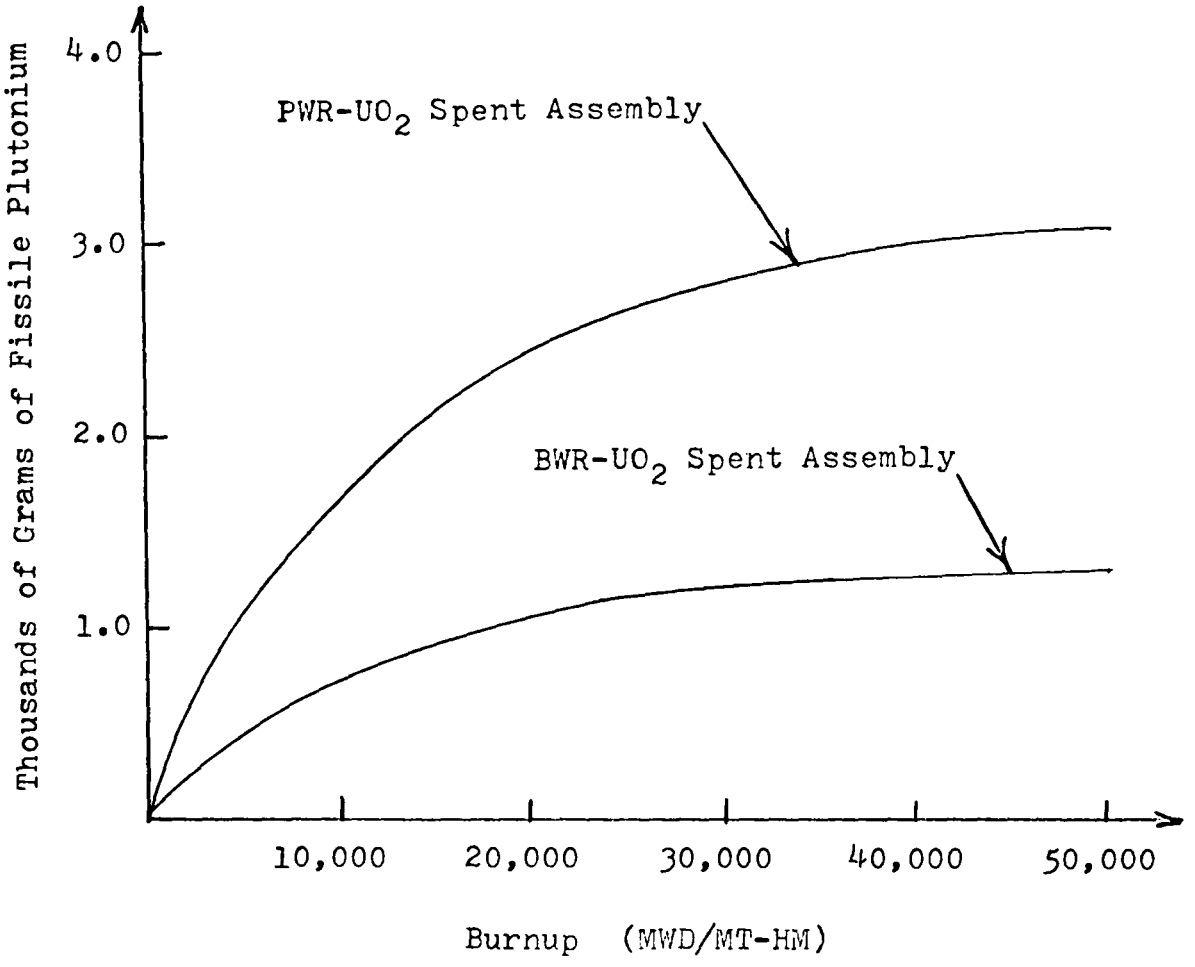


Figure 2 Fissile Plutonium Content in Spent Uranium

A similar statement can be made for the value of fissile plutonium. At higher burnups the per cent of Pu-241 in the fissile plutonium mixture increases for UO_2 assemblies. Thus, fissile plutonium residing within spent UO_2 assemblies, which have undergone a high burnup, exhibit a similar sensitivity to losses in value due to radioactive decay of Pu-241, which has a half life of 16 years. Thus, low burnup UO_2 assemblies possess nuclear fuel and fission product values which have a low sensitivity to losses as a result of extended storage of spent fuel. The opposite is true for UO_2 assemblies possessing high burnups.

The maximum value of various constitutents with relation to burnup in MOX spent fuel assemblies warrants close examination since the relationship is not always similar to spent UO_2 assemblies. At low burnups spent uranium and fissile plutonium value are at a maximum and reach a minimum at the upper end of the plausible burnup range of 10,000 to 50,000 MWD/MT-HM. This is in contrast to a UO_2 spent fuel assembly where maximum spent uranium value occurs at low burnups and maximum plutonium value occurs at high burnups. In a MOX spent fuel assembly Pu-241 content in fissile plutonium reaches a

maximum at low burnups and a minimum at high burnups. Thus, the maximum sensitivity of fissile plutonium to losses in its value due to decay occur at low burnups for MOX assemblies and high burnups for UO_2 assemblies. Maximum sensitivity of Cs-137,134 to losses in its value due to decay occur at high burnups for MOX and UO_2 spent fuel assemblies.

Conclusions made from Tables 3, 4, 5 and 6 and Figures 1 and 2, can be summarized as follows: (1) maximum nuclear fuel value for depleted uranium and plutonium in a spent MOX fuel assembly occur at the lower portion of the plausible burnup range; (2) maximum nuclear fuel value for depleted uranium in a spent UO_2 assembly occurs at the lower end of the burnup range while the maximum plutonium value for a spent UO_2 assembly occurs at the upper portion of the plausible burnup range; (3) both MOX and UO_2 spent fuel assemblies display a high sensitivity to Cs-137,134 value losses due to the high percentage of Cs-134 in this mixture at high burnups; and (4) fissile plutonium displays a high sensitivity to value losses due to the high percentage of Pu-241 in this mixture at high burnups for a UO_2 spent fuel assembly and at low burnups for a MOX spent fuel assembly. The ORIGEN output in Tables 15, 16, 17 and 18

is used as input data for the economic time dependent model that is discussed in chapter 3.

V. VALUE OF RECYCLABLE FUEL CONSTITUENTS IN SPENT FUEL

In this chapter the value of spent uranium and plutonium is established. The value of both of these constituents is based upon savings in natural uranium and separative work requirements for the enrichment plant.

A. Spent Uranium

Spent uranium contains various amounts of uranium-235 as opposed to natural uranium which contains 0.711% uranium-235. The percentage of U-235 depends upon burnup as shown by the output data of ORIGEN in Tables 15 and 17.

The recycling of spent uranium to the diffusion enrichment plant will permit savings in natural uranium feed utilization and enrichment requirements. Separative work is measured in SWU (separative work units). A SWU is a measure of the physical work necessary to separate a uranium feed stream into a product stream enriched in U-235 and a waste stream depleted in U-235. In order to compute the value of spent uranium, it is necessary to determine its equivalence to natural uranium. This is

accomplished by determining how much feed and separative work are required to produce material that is identical to spent uranium in U-235 content. To do this, four basic equations are used. These are:

$$SWU = P \cdot V(X_p) + W \cdot V(X_w) - F \cdot V(X_f) \ , \qquad (7)$$

the quantity of separative work used;

$$V(X) = (2X-1) \cdot Ln(X/(1-X)) \ , \qquad (8)$$

where V(X) is a value fucntion;

$$F \cdot X_f = P \cdot X_p + W \cdot X_w \ , \qquad (9)$$

fissile balance equation; and

$$F = P + W \ , \qquad (10)$$

a mass balance equation; where

SWU = separative work units, (kgs.);

P = amount of product, (kgs.);

W = amount of tails, (kgs.);

F = amount of feed, (kgs.);

X_p = assay of uranium-235 in the enriched product, weight fraction;

X_f = assay of uranium-235 in the feed stream, weight fraction; and

X_w = assay of uranium-235 in the tails stream, weight fraction.[11]

Equation 7 is the SWU equation for a gaseous diffusion cascade enrichment plant. Equation 8 is a dimensionless function called a value function. Equations 9 and 10 are mass conservation equations. Combining these four equations yields:[12]

$$SWU/P = V(X_p) - V(X_w) - (F/P)\cdot(V(X_f) - V(X_w)) \quad . \quad (11)$$

The value of the enriched uranium in the fuel discharged from a reactor is the value of the feed and separative work that would be required to produce an equal quantity at the same enrichment. This value is computed by:

$$Z = (C_s(SWU/P) + C_f(F/P) - C_c)\cdot(1-N_1-N_2) \quad , \quad (12)$$

where

C_s = unit cost of SWU, ($/kg.);

C_f = unit cost of uranium feed, ($/kg.);

C_c = unit cost of conversion of uranium to UF_6, ($/kg.);

Z = price of enriched product, ($/kg.);

N_1 = loss during reprocessing, (0.005); and

N_2 = loss during fabrication, (0.003).[13]

Substituting equations 7, 8, 9, and 10 into equation 12 yields:

$$Z = (C_s((2X_p-1)\cdot Ln(X_p/(1-X_p)) - (2X_w-1)\cdot Ln(X_w/(1-X_w))$$

$$- ((X_p-X_w)/(X_f-X_w))\cdot((2X_f-1)\cdot Ln(X_f/(1-X_f))$$

$$- (2X_w-1)\cdot Ln(X_w/(1-X_w)))) + C_f\cdot((X_p-X_w)/(X_f-X_w))$$

$$- C_c)\cdot(1-N_1-N_2) \qquad (13)$$

where

X_f = 0.00711,

X_w = 0.0025, and

X_p = uranium-235 weight fraction in the spent uranium contained in the fuel discharged from a nuclear reactor.

Losses during fuel fabrication and reprocessing with UF_6 conversion costs are included in equation 18. Thus,

equation 13 represents the value of spent uranium in dollars per kilogram.

The effects of uranium-233, a desirable isotope for fuel and uranium-236, a neutron poison, in spent uranium are ignored. The diffusion plant is assumed to have a basic tendency to decrease the uranium-236 content while having virtually no effect on the uranium-233 content in spent reactor fuel.

An examination of equation 13 indicates that the costs of natural feed, SWU, and conversion are unknown. The cost of conversion is discussed in chapter 7. Since SWU prices are a function of time, a projection of SWU for the years 1976 to 2000 must be obtained. This thesis utilizes a projection, shown in Figure 3, of a linear 5% annual increase in SWU cost.[14] This same projection was employed by Allied-General Nuclear Services in their Nuclear Fuel Cycle Closure Alternatives study.[15]

The projection of uranium prices as a function of time is open to a great deal of speculation. In a study entitled Benefit Analysis of Reprocessing and Recycling of Light Water Reactor Fuel, ERDA-76/121, projections are established for cumulative short tons of U_3O_8 mined versus dollars per pound of U_3O_8, (Figure 4), and cumulative requirements for U_3O_8 as a function of time,

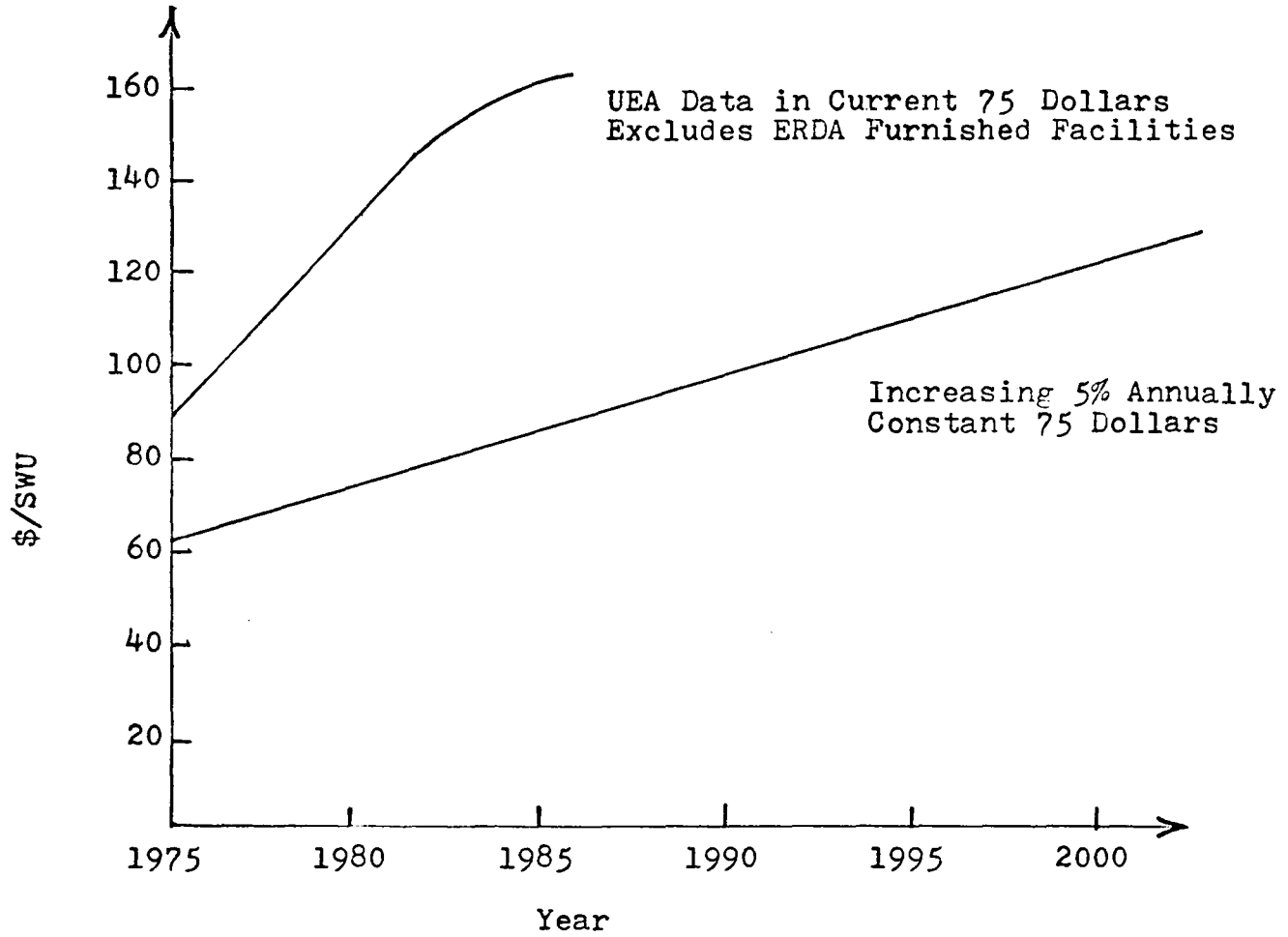


Figure 3 Cost of SWU as a Function of Time

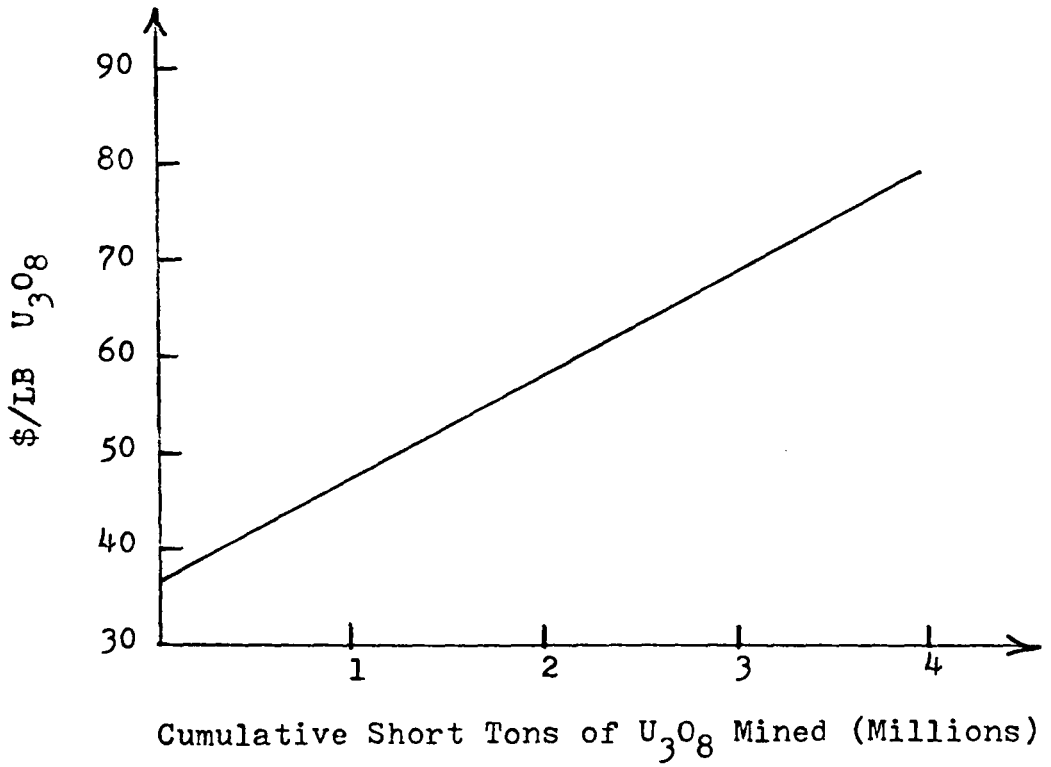


Figure 4 Uranium Price Schedule

(Figure 5).[16] Figure 5 is based upon the assumption of an installed nuclear generating capacity of 500 Gw(e) by the year 2000 in the United States. By combining these two projections, a schedule of uranium prices as a function of time can be estimated. This new projection, shown in Figure 6, defines uranium prices at 35 dollars and 39 dollars per pound of U_3O_8 for 1976 and 1986, respectively.

Another projection of uranium prices is based on two surveys of average U_3O_8 prices reported under contracted deliveries.[17] Surveys performed by ERDA, (Figure 7), found uranium prices which ranged from 11 dollars to 16 dollars per pound and 16 to 24 dollars per pound for the years 1976 to 1985, inclusive. An examination of the two surveys indicates that a major jump occurred for the price of contracted uranium deliveries between 1/1/76 and 1/1/77. It is very likely that a similar jump will occur for following annual surveys.

GESMO,[18] an ERDA study on mixed oxide fuel use, states:

> "By most estimates the low price uranium is not generating the cash flow necessary to provide for the expansion required to support a growing demand. Hence a sharp increase in

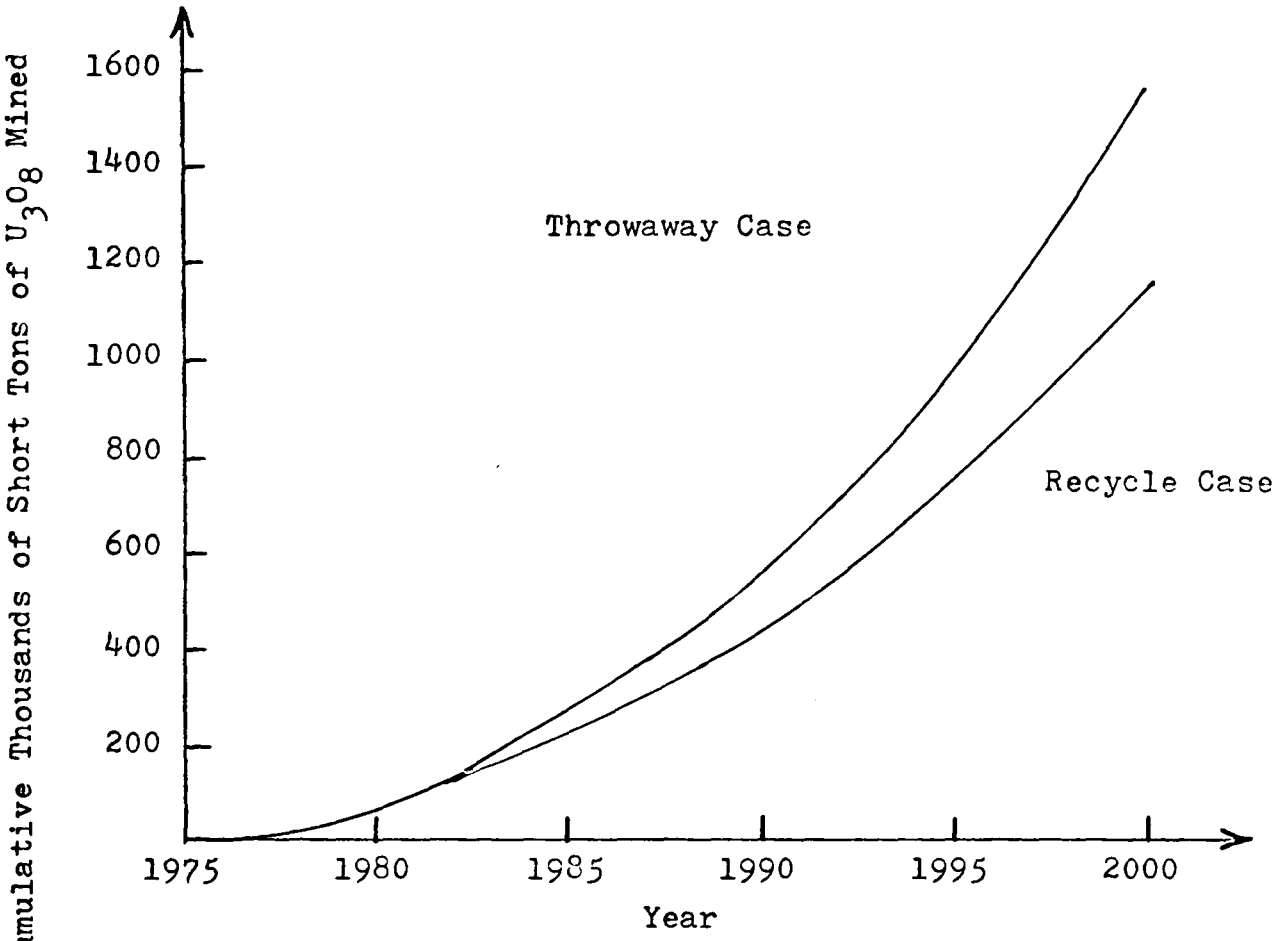


Figure 5 Uranium Demand as a Function of Time

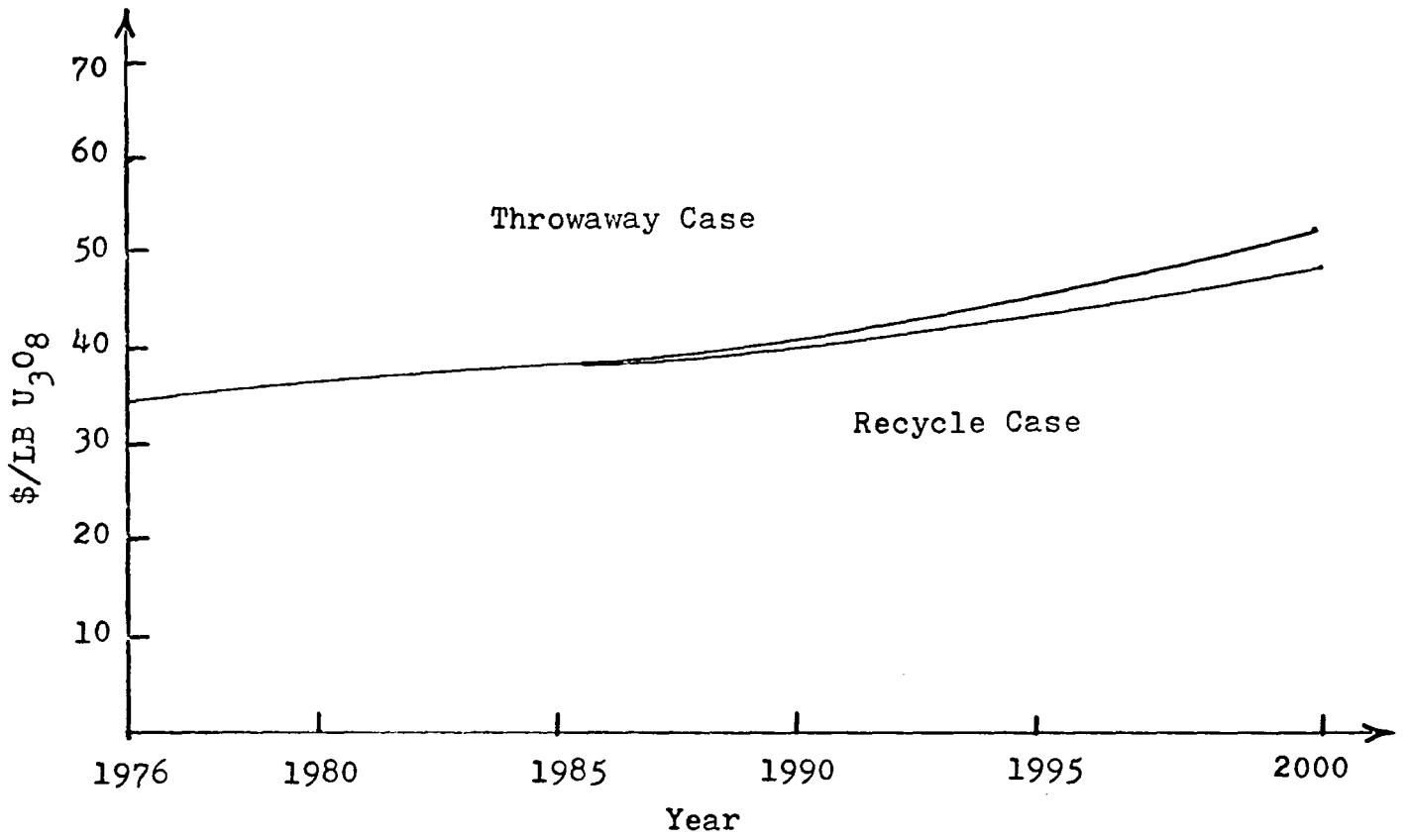


Figure 6 Cost of U_3O_8 as a Function of Time

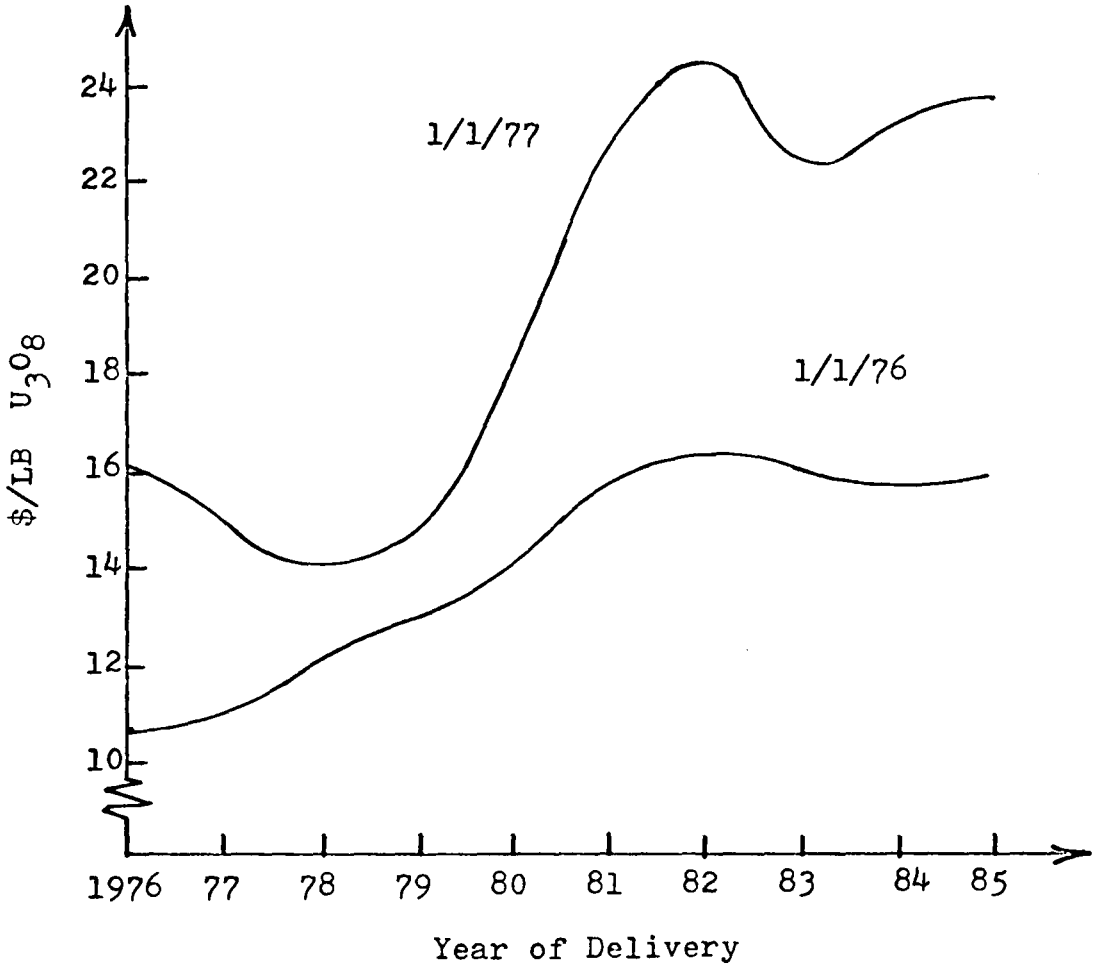


Figure 7 Uranium Price Survey

> prices is needed to support the required exploration and construction of new mine/mill complexes."

In GESMO, uranium price is permitted to vary from 14 to 56 dollars per pound with 28 dollars being the reference value.

Based on the jump between the 76 and 77 surveys for contracted uranium deliveries and the above quote, the projection of uranium prices obtained from figures 2 and 3 from ERDA-76/121 is used. This projection of uranium prices, shown in figure 6, may be high but helps provide more future capital for required new mine/mill complexes.

B. Plutonium

Plutonium contained in spent fuel can be recycled back to a reactor in the form of mixed oxide (MOX) fuel. Plutonium is combined with natural, enriched, or depleted uranium in MOX fuel. The recycling of plutonium displaces some of the enriched uranium in the reactor fuel. This, in turn, results in a net savings in separative work and natural feed requirements for the gaseous diffusion plant. The GESMO study evaluates these savings for a PWR and BWR.[19] One gram of fissile plutonium in a PWR is equivalent to 0.1906 kgs. of separative work plus 0.180 kgs. of natural feed. One gram of fissile plutonium in a BWR is equivalent to 0.2037 kgs. of separative work plus 0.187 kgs. of natural feed. The GESMO equivalencies for plutonium are used here because recycling will provide actual savings in separative work and natural feed requirements for the gaseous diffusion plant since the plutonium will displace enriched uranium formerly required by a nuclear reactor.

VI. VALUE OF FISSION PRODUCTS RESIDING IN SPENT FUEL

In the fissioning of uranium-235 and plutonium-239, various fission fragments are produced. The fission reaction can be represented by

$$\text{Fuel} \longrightarrow \text{Fission Product A} + \text{Fission Product B} + \text{Energy.} \qquad (14)$$

This section deals with the establishment of a criteria which is used to select fission products for commerical sale. The commerical markets and uses, both actual and potential, of the valuable fission products are examined.

A. Discussion of Selection Criteria for Fission Product Extraction

In order to select the fission fragments, a selection criteria is required. Fission products chosen for commerical sale must have existing stable markets or a high potential for future, near term use. The fission products that are sold on the open market must be priced

so that they are economically competitive with production from alternative sources such as mining. In order to maximize the returns on the fission products sales, fission fragments that possess half lives in excess of one year should be chosen. The fission fragments under consideration must exist in sufficient quantities in reactor fuels in order to justify their extraction.

Figures 8 and 9 represent fission yields that occur for uranium-235 and plutonium-239, respectively.(20) The ordinate is the probability (expressed in per cent) that a fission product of a specific atomic mass number is produced in the fission event. Since two fragments are formed in every fission event, it is important to note that the total yield for all the mass numbers adds up to 200 per cent. An examination of the fission yield curves reveals the fact that a relatively small percentage of the fission products are produced with a yield greater than 1%. An approximate minimum of a 1% yield for a fission fragment is applied as a criteria for selection of an element for commerical sale.

Summarizing the above concepts, the selection criteria are:

(1) the fission products must have stable markets or a high potential for future use,

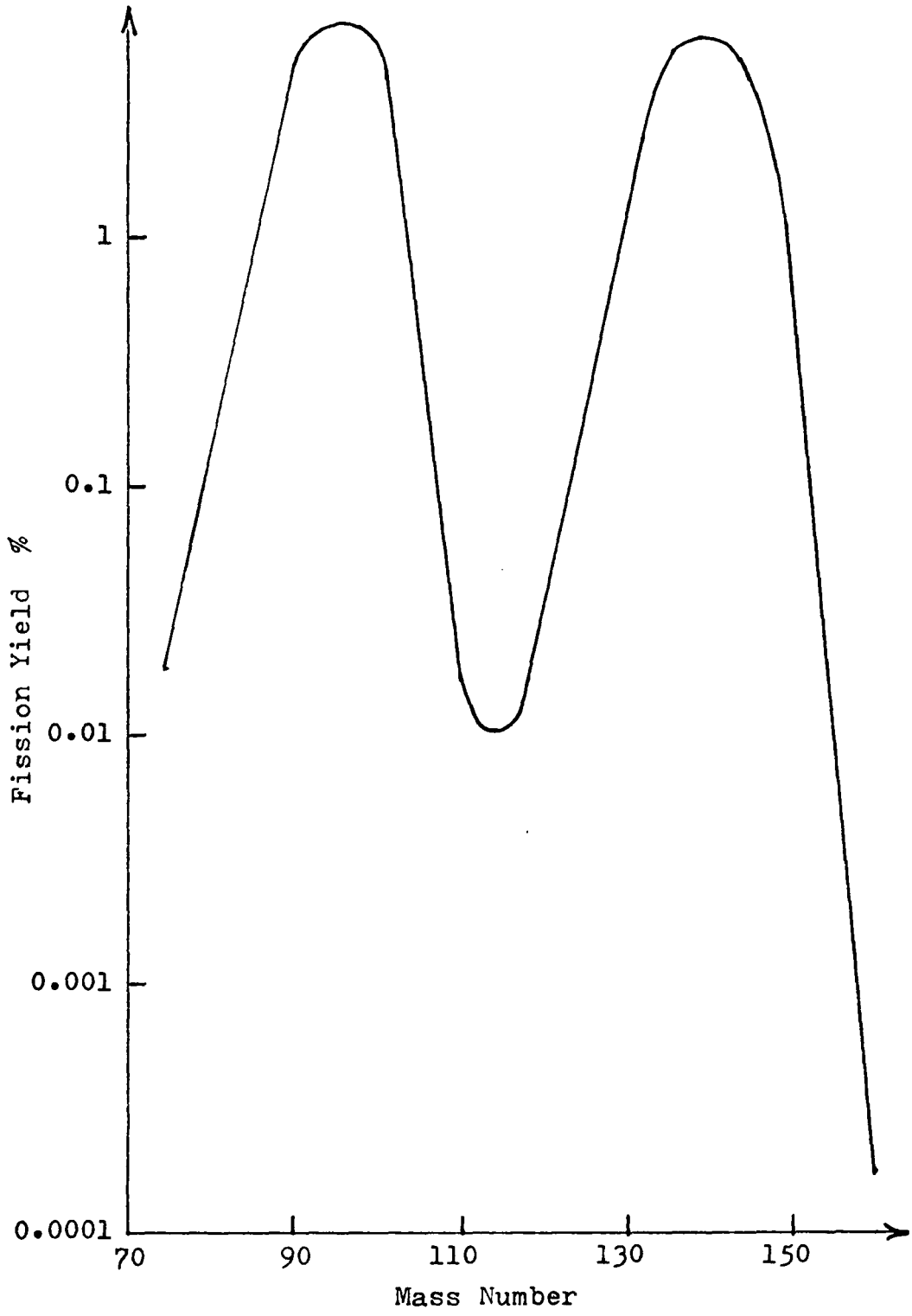


Figure 8 Thermal Fission Yield of Uranium-235

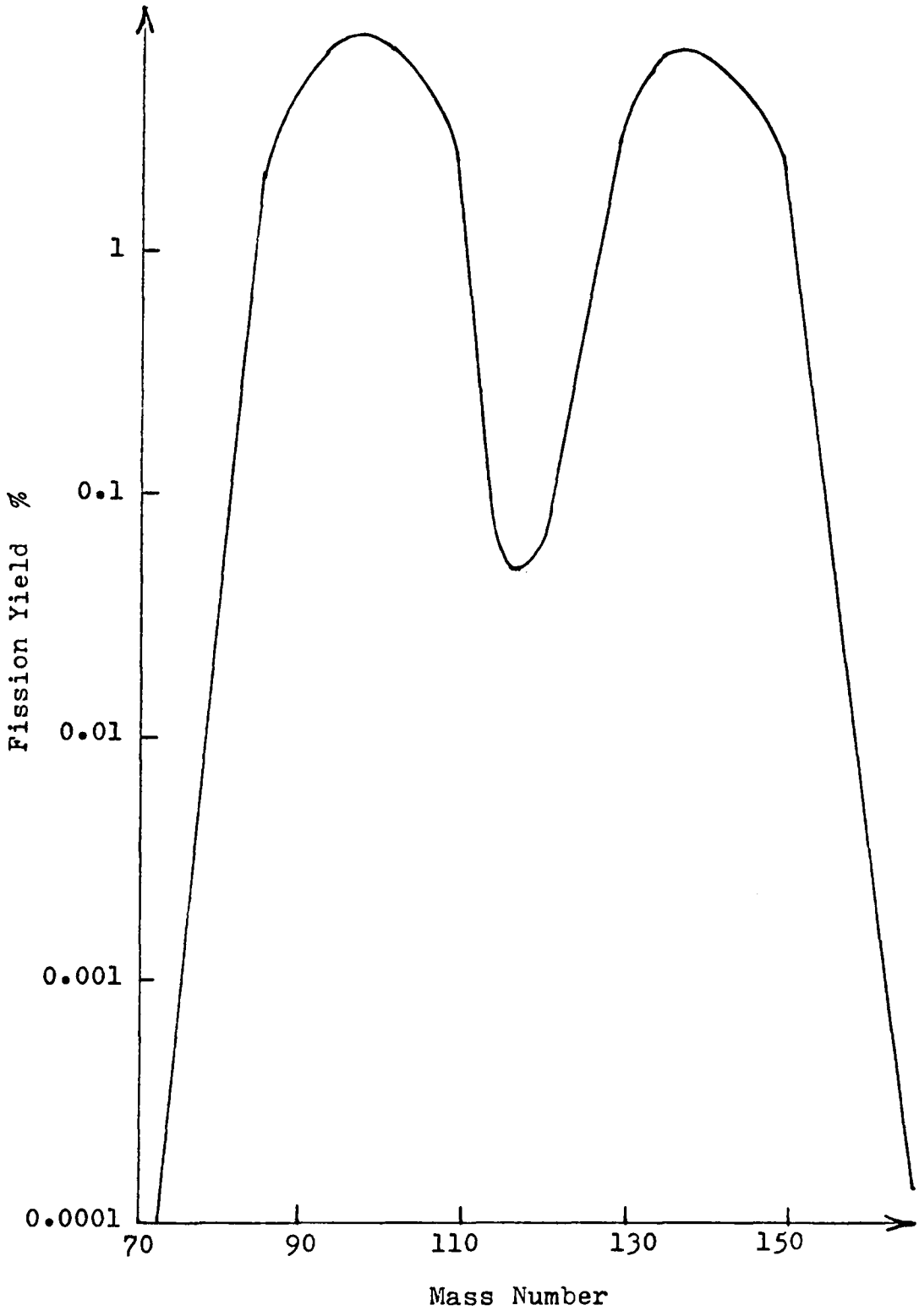


Figure 9 Thermal Fission Yield of Plutonium-239

(2) the fission fragments must be priced so as to be economically competitive with alternate sources such as mining,

(3) the by-roducts of fission should exist in yields greater than 1% and possess half lives in excess of one year.

Isotopic enrichment is not considered for the fission products. Using a criteria similar to the ones developed in this section, Rohrmann established eleven candidate fission products for possible commerical sale.[21] These are listed in Tables 7 and 8 along with pertinent information on the various fission fragments.[22] Each of these fission fragments is examined here in detail for possible extraction from nuclear wastes.

Table 7 Potentially Useful By-Product Elements Recoverable from Spent Nuclear Power Fuels

Element	Principal Isotopes of Interest	Estimate % of Isotope in Element	Half Life Years	Curies per Gram of Isotope
Krypton	^{85}Kr	6.5	10.74	397
Strontium	^{90}Sr	50	28.9	142
Technetium	^{99}Tc	100	2.13×10^{5}	0.017
Rhodium	^{103}Rh	100	Stable	Stable
Ruthenium	^{106}Ru	3.3	1.0	3375.
Palladium	^{107}Pd	16	"Stable" 7×10^{6} yrs	"Stable"
Xenon	All are Stable	100	Stable	Stable
Cesium	^{137}Cs	35	30.2	87
Promethium	^{147}Pm	100	2.62	929
Americium	^{241}Am	50	433	3.25
	^{243}Am	50	7370	0.2
Curium	^{244}Cm	100	17.85	82.1

Table 8 Potentially Useful By-Product Elements Recoverable from Spent Nuclear Power Fuels

Element	Prinicpal Isotopes of Interest	Concentration of Isotope in Power Reactor Fuels (Grams/Metric Ton) 25,000 MWD/MT Fuel	Average Production Rate Kg/1000 Mw Yr Electrical
Krypton	^{85}Kr	17	0.75
Strontium	^{90}Sr	411	18
Technetium	^{99}Tc	628	27.5
Rhodium	^{103}Rh	337	14.8
Ruthenium	^{106}Ru	1708	74.7
Palladium	^{107}Pd	875	40.2
Xenon	All are Stable	3990	174.6
Cesium	^{137}Cs	950	41.6
Promethium	^{147}Pm	66	2.9
Americium	^{241}Am	47	2.1
	^{243}Am	53.3	2.4
Curium	^{244}Cm	10.7	0.48

1. KRYPTON

Krypton is produced as a fission product and also exists in the air. It exists in the air in one part per million. Krypton is easily recovered from the gases which are released during spent-fuel dissolution. Its possible use as an activation source for phosphors along with a low-biological-health hazard and its property of being a non-reactive element warrant its consideration as a valuable fission product. Fission product and atmospheric krypton's composition by isotope are shown in Table 9.[23] Krypton-85 is the only long-lived isotope (10.7 year half-life) in fission product krypton. It emits a beta particle in virtually all of its disintegrations.

By utilizing the beta radiation produced during krypton-85 decay with a phosphor such as zinc sulfide, a highly reliable visible light can be generated.[24] A krypton-85 beta light source was demonstrated in the 1950's. A lighting application would require 4 to 60 curies of krypton-85. Total cumulative production of krypton-85 in the United States in LWR's is expected to reach 1 X 10^9 curies by the year 2000.

The disruption of such a light source would not

Table 9 Atmospheric and Fission Product Krypton Composition

Isotope	Fission Product Approximate % Composition	Atmospheric Approximate % Composition
78	----------	0.354
80	----------	2.27
82	0.2	11.56
83	11.0	11.55
84	31.0	56.90
85	6.0	-----
86	52.0	17.37

cause a release of electrical sparks.[25] A krypton-85 light source would have valuable applications around flammable or explosive substances where an electrical spark can mean almost certain death or great economic cost. Such a light source could also be used in situations where high reliability is an absolute necessity. Some of the applications of such a light source are: airports, hospitals, coal mines, natural gas facilities, petroleum refineries, oil storage facilities, and explosive chemical installations.

The main obstacle that prevents the utilization of a krypton-85 light source is the requirement that krypton be enriched in krypton-85 content from 6% to 36% weight.[26] This weight percent of isotope 85 in krypton is required for high intensity lighting situations. Until a low-cost method can be developed for isotopic enrichment, fission product krypton's most possible beneficial use will be unutilized. At present, its main uses are in leak detection, non-destructive testing in turbine blades, and fluid flow. Based upon this analysis, fission product krypton holds significant potential for future use but does not presently justify construction of a fission product separation faciltiy.

2. XENON

Xenon which is produced as a fission product also exists in the air. The composition of fission product and atmospheric xenon is presented in Table 10.[27] Fission fragment xenon is stable after 1 year of storage following discharge from a nuclear reactor. If krypton-85 release to the atmosphere is prohibited, then xenon and krypton will both be recovered at the same time due to their similarities. Based upon the larger volume of xenon, it would be logical to expect the xenon to be separated from the krypton in order to facilitate its economic and safe storage. The only cost preventing the sale of xenon would be the reduction of its krypton-85 content to acceptable levels. Existing cryogenic processing technology appears capable of meeting this requirement since xenon has been produced with a 99.93% purity.[28] Since the costs for the removal of xenon and krypton are performed based upon krypton-85 air pollution constraints, the only cost involved in the commerical marketing of xenon is its purification. According to C. A. Rohrmann, the production of fission product xenon utilizing the previously stated method can be made at about one dollar

Table 10 Atmospheric and Fission Product Xenon Composition

Isotope	Fission Product Approximate % Composition	Atmospheric Approximate % Composition
124	----------	0.096
126	----------	0.090
128	0.01	1.92
129	0.08	24.44
130	0.04	4.08
131	10.34	21.18
132	16.61	26.89
134	29.21	10.44
136	43.70	8.80

per liter, one-tenth the price of large volume atmospheric xenon sales (1971).[29] As of 1975, xenon is produced as a by-product of liquid-air manufacturing plants. The reduction in its price by 90% would permit the consideration of various applications which previously were unacceptable based upon xenon's high commerical market cost. Some possible applications are: wider use as an intense light source, human anesthesia, and electronic applications. Fission product xenon holds a high potential for future use and can be used as a possible justification for construction of a fission product separation facility.

3. STRONTIUM

Strontium is a fission product which contains roughly 50% strontium-90. This isotope possesses a half-life of 28.9 years. Its emission of energetic betas and gammas renders it useful as a long lived heat source in radioisotope thermoelectric generators.[30] Approximately 40 such United States radioisotope generators have been installed and have accumulated about 2,000,000 operating hours. They are used primarily for remote land or undersea locations where high reliability for a power source is required and where extreme cost and difficulty is incurred during periodic refueling of conventional fossil-fueled power sources. Radiostrontium electric generators, which have an electrical efficiency of 5%, are used as marine navigation aids in unmanned lighthouses in Britain, Sweden, Denmark and the Soviet Union. They are manufactured in the United States by Teledyne Energy Systems (1975). The process of precipitation and solvent extraction has been successfully used to separate and purify fission product strontium. Its primary use is unique and can not be replaced by other technologies but demand is not adequate to provide justification for construction of a fission product separation facility.

4. CERIUM, CURIUM AND PROMETHIUM

Cerium, curium and promethium hold potential uses as a heat source in nuclear generators.[31] Cerium-144 has a half-life of 0.78 years and a specific power of 25.6 watts per gram. Promethium-147 possesses a half-life of 2.62 years and a specific power of 0.33 watts per gram. Curium-144 has a half-life of 17.85 years and a specific power of 2.84 watts per gram. A lack of a clearly defined demand for nuclear isotopic generators minimizes the desirability of extracting cerium, promethium, and curium from fission product wastes.

5. AMERICIUM

Americium, which is primarily isotope 241 after one year of storage, is produced form the beta decay of plutonium-241 and 243. Americium's main use is in smoke detectors.[32] Approximately 12,000 persons die from smoke and fire each year in the United States. The use of americium in smoke detectors which could save numerous lives provides a strong secondary argument for the construction of a fission product separation facility. With more and more states requiring the installation of smoke detectors in all new and eventually old homes, an adequate demand will exist for americium for the forseeable future.

6. PLATINUM GROUP METALS

The occurance of fission-product rhodium, ruthenium, and palladium provide strong justification for the construction of a fission product separation facility. All three elements, which are platinum metals, can be found in nature. These three fission products have strong and growing markets and are considered essential to the economy of any industrialized nation. In order to understand the advantages of extracting these three platinum metals from nuclear waste, the natural sources of these elements in the world today must first be examined. Each metal must then be examined individually for its existing and potential economic value.

Platinum, the predominant metal, and in lesser amounts palladium, ruthenium, rhodium, irridium, and osmium comprise the platinum group metals.(33) Platinum is the most abundant metal in this group followed in descending order by the others. The most abundant sources of these metals are the South African mines. The three producers of the platinum metals are South Africa, Russia and Canada. An extensive survey of the literature pertaining to the platinum metals mining

industry reveals no new major sources of these metals. The order of concentrations of the various platinum metals in Russian and Canadian mines are not the same as in South Africa mines. The platinum group metals always occur together and are usually concentrated in mafic igneous rock. In all three countries, the concentrations of these metals are approximately a fraction of an an ounce per ton of mine ore. South African mining operations differ from Russian and Canadian operations in that the Rustenburg mines of South Africa are worked primarily for the platinum metals while yielding by-products of copper and nickel. International Nickel and Falconbridge mines in Canada and the Russian mines are worked primarily for their contents of nickel and copper while yielding the platinum metals as by-products. Thus, only South Africa can meet the growing demand for platinum metals since the by-product production of these metals by Russia and Canada is basically inflexible. Russia, which enters and withdraws from the platinum metals market sporadically, is an unreliable supplier of these metals.

An examination of South African platinum metals mining is warranted since South Africa is the only major and sole primary producer of these metals in the world.(34) The Rustenburg mines constitute two main mines which

together extend more than eighteen miles from one end to another and to a depth of the limits of practical mining, approximately 2,500 feet. The South Africans have increased their platinum metals production capability by over 400% from 1964 to 1969. They produce approximately 1,200,000 ounces of platinum metals and, as of 1973, provide at least 60% of the western's world's needs for these metals. South African reserves of the platinum metals are estimated at 5.6 billion grams while the entire world's consumption will be approximately 6.2 billion grams by the year 2000.[35,36] South African ores have a composition of platinum metals that is about 72% platinum, 25% palladium and 3% ruthenium, rhodium, osmium and iridium. The refining and concentration of the platinum metals is performed under controlled conditions in large electrically heated furnances and requires a large complex of supporting machinery.

The fact that South Africa is the only primary and major supplier of platinum metals in the world creates an uneasy situation. South Africa's apartheid policy combined with recent rioting by blacks suggests an unstable future for that country. With the growth of the human rights issue, accelerated by the Carter Administration, the possibility of a trade embargo between the United

States and South Africa increases daily. On July 27, 1977, the European Economic Common Market signed an agreement in Brussels which established a unified European policy against the apartheid system of South Africa. The anti-apartheid agreement reportedly includes an economic boycott and an arms embargo against South Africa. Congress in the 1960's enacted a similar embargo on imported Rhodesian chrome because of that country's white-supremist policies.

Since some of the platinum-group metals can be replaced by one another in various applications, demand for platinum can be partially fulfilled by metals such as palladium, rhodium or ruthenium. Therefore, a fission product separation facility that can extract these three platinum metals can not only reduce American imports of these metals but can replace other platinum metals as they become scarcer. Extracting rhodium, palladium and ruthenium from nuclear wastes also provides the United States with a stable future supply of these important elements. This, in turn, reduces the cash outflow of dollars, which was 503 million dollars in 1974, due to the importation of platinum metals by the United States.(37) Thus, the justification for the extraction of these three elements from nuclear waste

can be based upon: their critical importance to the United States; the creation of a stable source of supply; the development of a new supply of platinum metals which will be of immense value when the world's only major supplier, South Africa, depletes its reserves completely in the 1990's; and the reduction in the outflow of American dollars. It is appropriate to analyze rhodium, palladium and ruthenium individually for their market values, existing and potential markets, and their varied uses in order to substantiate the claim that they serve a vital purpose in the growth of an industrialized nation.

a. RHODIUM

The primary uses of rhodium are in high temperature environments and in situations where metals must exhibit a high resistance to corrosion. Rhodium consumption by various industries in the United States from 1968 to 1974, inclusive is presented in Figure 10.[38] An analysis of this graph reveals the fact that the chemical industry is the largest consumer of rhodium.

It primary use in the production of chemicals occurs in nitric acid plants.[39] Rhodium is used to improve the operating lifetime of a platinum catalyst in the ammonia oxidation process which occurs in a nitric acid production plant. This metal is used in the form of a gauze which is 90% platinum and 10% rhodium. A modern nitric acid facility with a output capacity of 1.1×10^5 tons/yr. requires 20 kgs. of gauze for its operations and a similar amount in storage for replenishment of depleted gauzes. Approximately 80% of the entire free world production of nitric acid which exceeds 20×10^6 tons/yr. is utilized in the production of ammonia nitrate fertilizers. Demand for nitrate fertilizers is growing steadily since its use is directly tied to world

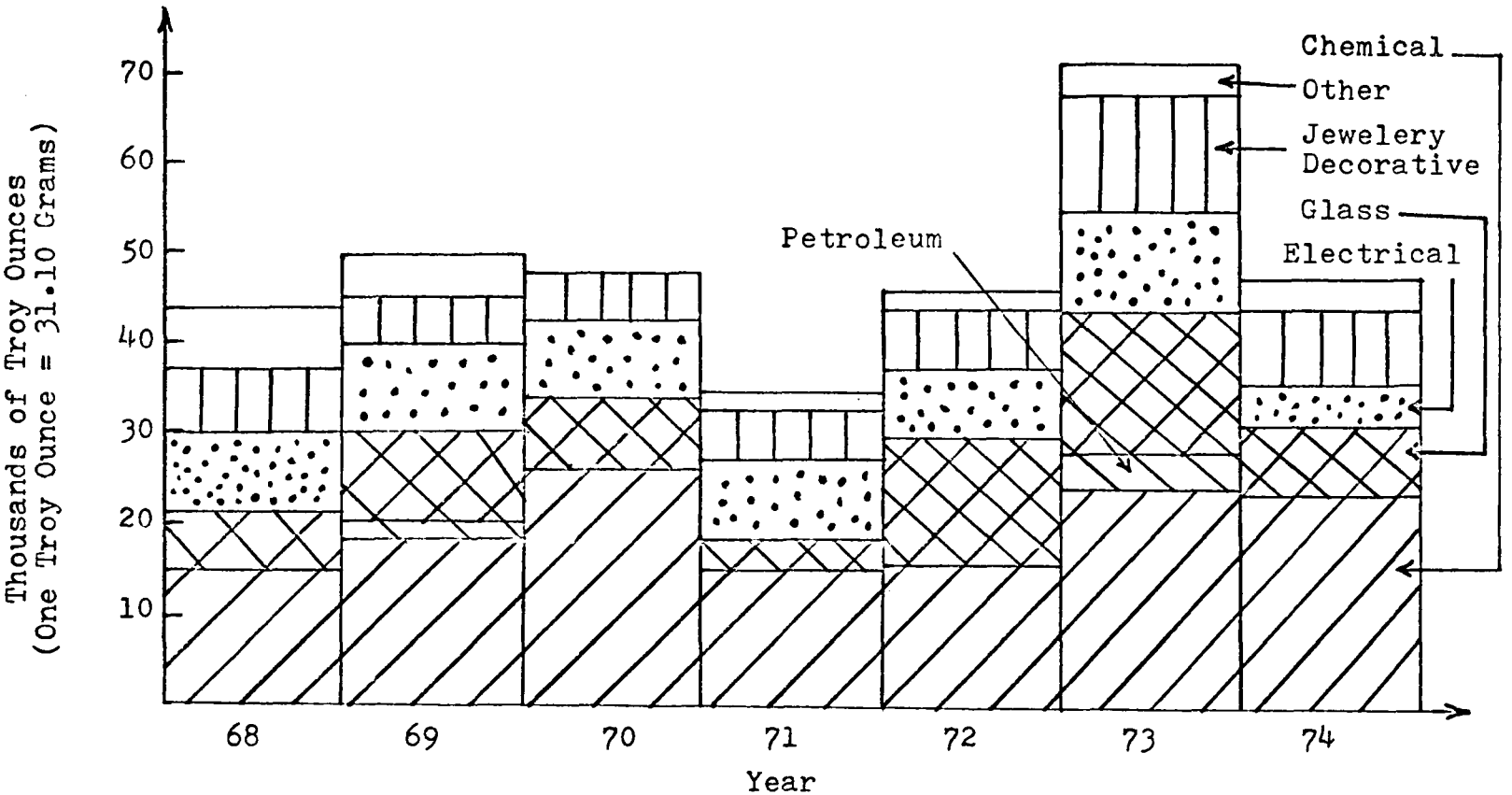


Figure 10 Rhodium Consumption in the United States by Type of Industry

food production and crop yields which is, in turn, indirectly tied to the growth of human population on a global basis.

Approximately 3 to 4% of the total cost of the manufacture of nitric acid can be attributed to the continual but small loss of the platinum-rhodium gauze in the harsh high-temperature conditions found in the plant.(40) The development by West Germany of "palladium-gold alloy woven wire catchment gauzes" which are to be used immediately below the platinum-rhodium gauzes in nitric acid plants will serve to reduce mostly the platinum and to a much lesser degree the rhodium losses.(41) The palladium-gold gauzes will be removed periodically and refined to recover the lost platinum.

The use of rhodium in nitric acid plants in order to reduce platinum metal losses, helps maintain low nitric acid costs which in turn creates relatively low cost nitrate fertilizers. The use of low priced fertilizers will in turn tend to maintain food production costs at reasonable levels. Thus, a stable and low cost source of rhodium is important to the continued expansion of the production of relatively low cost agricultural goods for a growing population of human beings. Alternative methods for the production of nitric acid which do not depend upon

"precious metal catalyzed ammonia oxidation" processes, such as air arc or synthetic urea of cyanamide, are costly to use and do not possess comparable economies of scale.[42] Thus, nitric acid production will continue to be a major consumer of rhodium.

The three major remaining consuming industries of rhodium are the glass, electrical and jewelery industries. In the electrical industry, rhodium is used in the form of an electrodeposit as a surface for sliding contacts in equipment such as generator slip rings.[43] A 10% rhodium-90% platinum mixture is used in the fabrication of brushings which are utilized in the manufacture of glass fibre.[44] This metal also has a major use in the jewelery industry since it hardly ever tarnishes, possesses high hardness, and is white.[45]

Figure 11 displays rhodium consumption in the United States from 1968 to 1974, inclusive.[46,47] The graph represents a noneratic increasing rhodium consumption by the United States. Figure 12, which displays rhodium free-market prices in constant 1975 dollars, exhibits a downward trend in rhodium prices during the late 1960's but a corresponding rise in free-market prices during the mid 1970's.[48] It is important to note that domestic production of rhodium ceased in the United States in

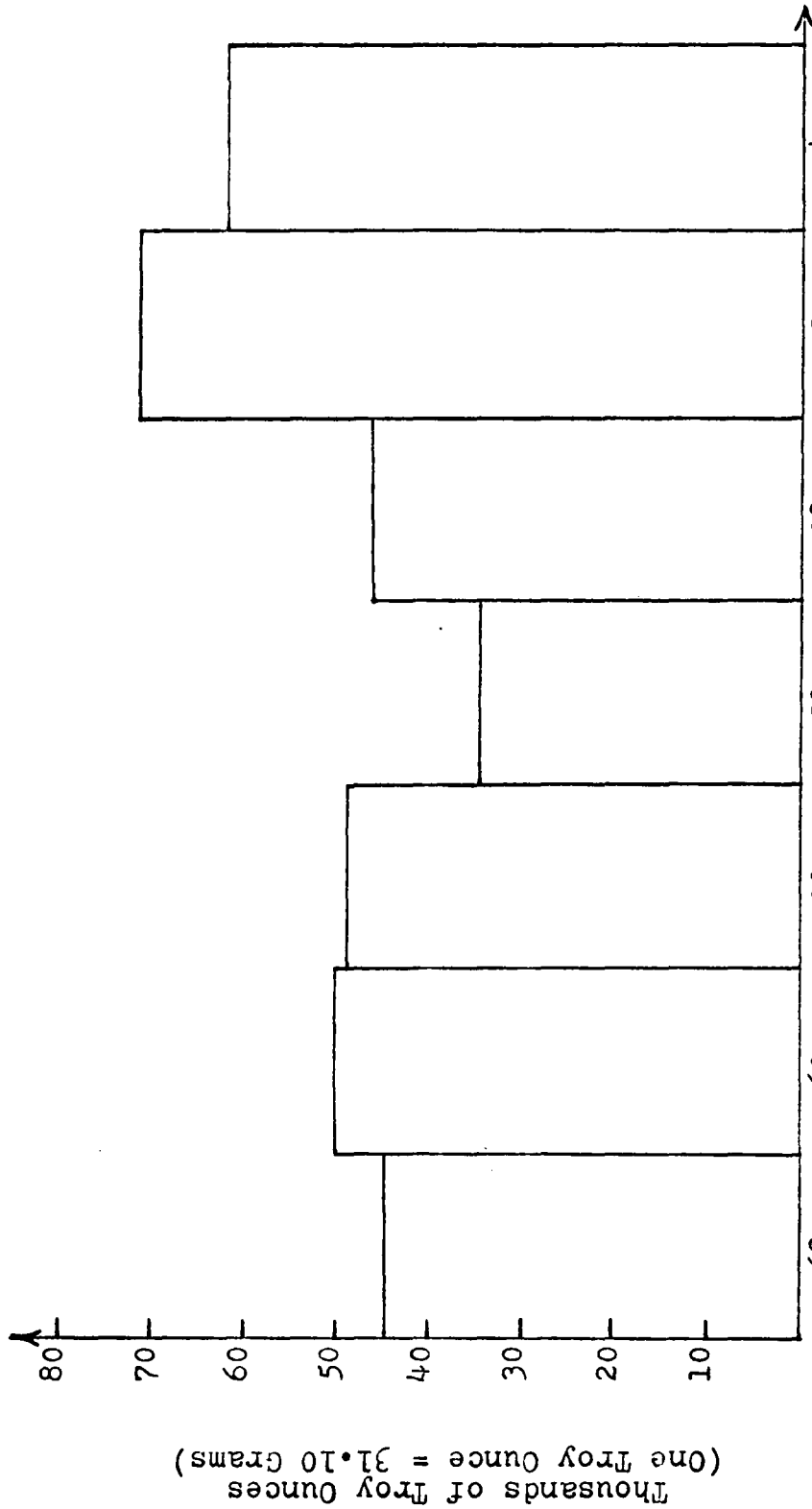


Figure 11 Rhodium Consumption in the United States

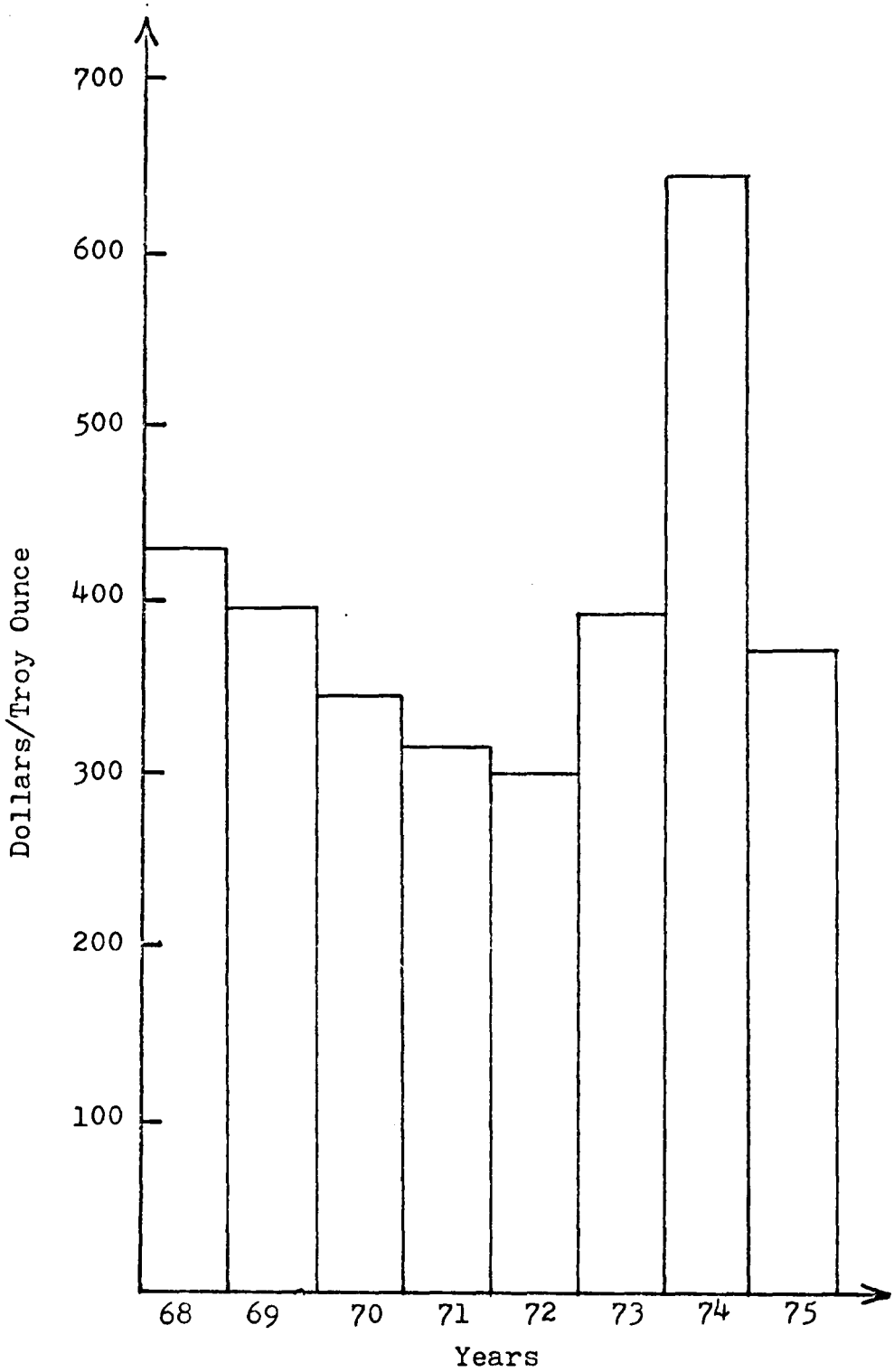


Figure 12 Rhodium Free Market Value (Constant 1975 Dollars)

1967.[49] In a paper, by George P. Dix of the United States Energy Research and Development Administration a projection of rhodium consumption by the United States (Figure 13),from 1973 to the year 2000 was presented in 1977.[50]

Fission product rhodium contains eleven isotopes of which only one is stable, rhodium-103. The vast majority of the rhodium is composed of isotopes which possess half-lives ranging from 0.9 seconds to a maximum of 35.5 hours. The formation of rhodium-102 with half-lives of 3 years and 207 days and rhodium-101 with half-lives of 3 years and 4.47 days prevents the unrestricted use of fission product rhodium after one year of storage. Based upon the rarity of the formation of rhodium-103 and rhodium-101 and their low activity in nuclear wastes, (100 microcuries per gram of rhodium), its use in controlled applications is possible.[51] Rhodium, (radioactive), has been successfully used as part of the platinum catalyst employed in nitric acid production plants with no measurable contamination of the product nitric acid.[52] Fission-product rhodium can only be used in situations if it is first stored for 20 to 25 years. If the United States were to initiate a rhodium retrieval from nuclear waste program during the late 1970's, a new supply of

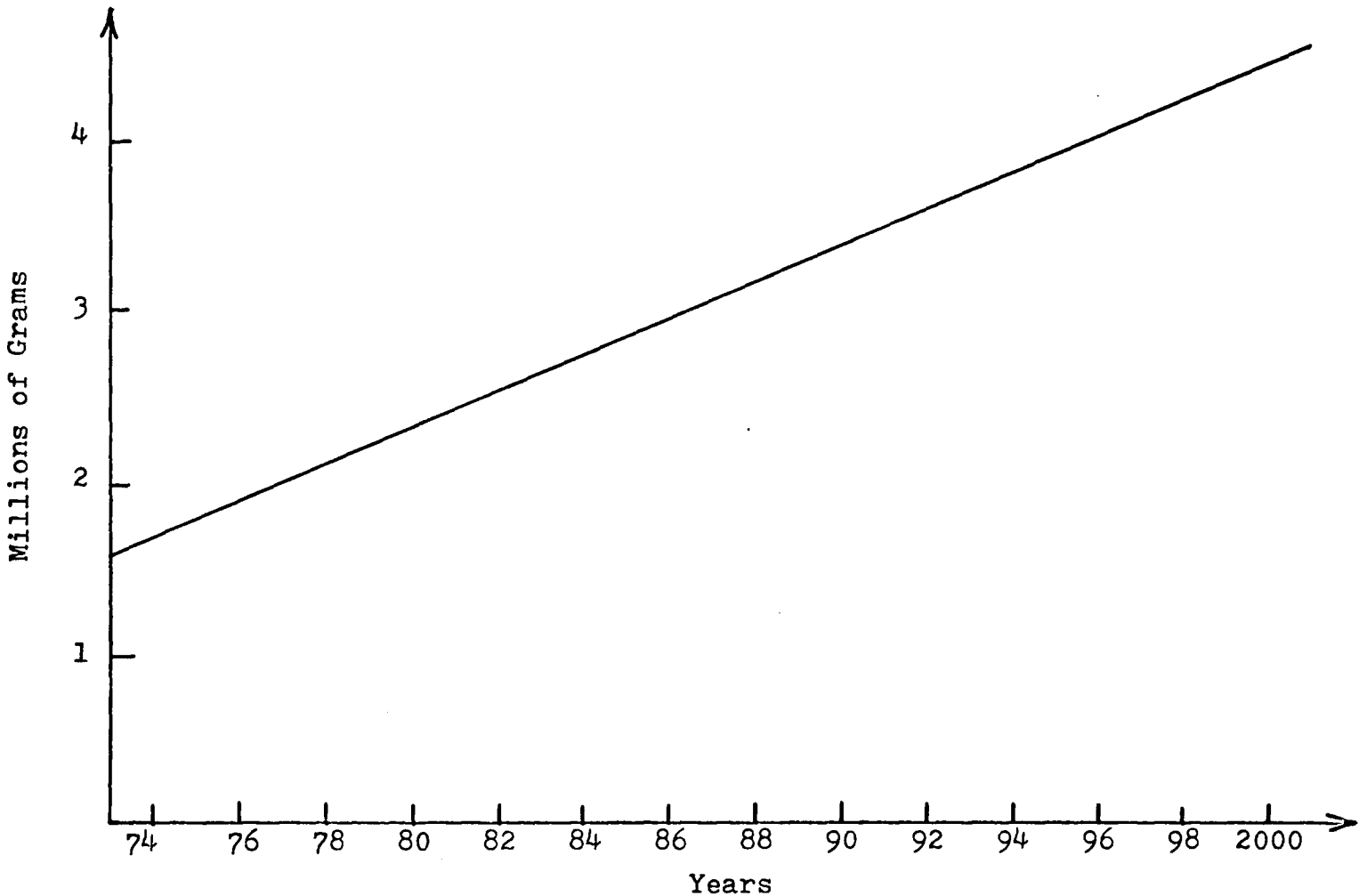


Figure 13 Projection Rhodium Demand, 1973-2000 (Cumulative Demand, 87. x 10^6 Grams, 1973-2000), United States

rhodium for unrestricted use would become available to this country during the 1990's. This at first, might appear to be unattractive but it should be remembered that South Africa, which is the only primary supplier of this metal, will deplete its reserves of the platinum metals in the late 1990's.

b. PALLADIUM

Palladium is used as an alloying agent, as a corrosion resistant material, and as a chemical catalyst. Palladium consumption by type from 1968 to 1973 in the United States is shown in Figure 14.(53) An examination of this graph reveals that the electrical industry is the largest consumer of palladium. Its primary use in the electrical field is found in the communications industry as contact points for low-voltage telephone relay switching gears.(54) The implementation of solid-state electronic switching in the telecommunications industry during 1976 has caused a substantial decrease in the industry demand for palladium.

The chemical industry is the second largest consumer of palladium.(55) It is used as a hydrogenation catalyst in the purification of hydrogen. Uses also exist in the pharmaceutical and dye-stuff industries. It is important to note that palladium can be substituted for platinum in a number of situations, particularly in petroleum refinement. (56)

Platinum-palladium catalysts are being used in increasing frequency in controlling the emission of

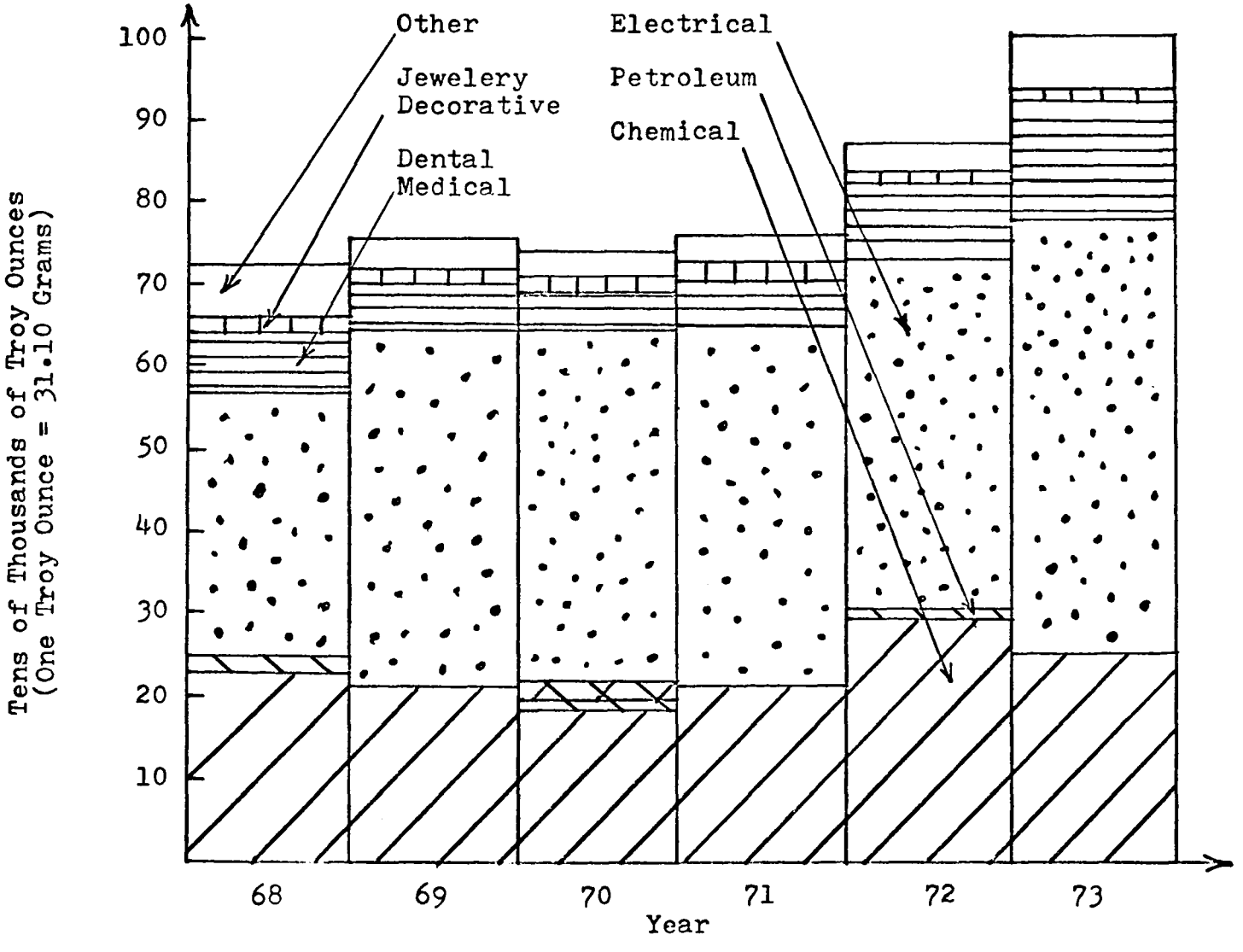


Figure 14 Palladium Consumption in the United States by Industrial Type

undesirable gases in the chemical, printing, textile, and automobile industries.[57] This new major use of palladium as a catalyst in the control of automobile emissions is serving to nullify the effect of the loss of the telecommunications market. The quantity of the platinum metal in catalytic converters in automobiles is extremely small. It is important to note that the presence of lead in gasoline permanently neutralizes the platinum catalyst.

The oil companies previously produce high-octance gasoline by the addition of tetra-ethyl lead. Since the combination of leaded gasoline and catalytic converters is unacceptable, the petroleum industry has had to use another method of maintaining the octane rating of its gasoline. The automobile industry has reduced the octane requirement for new cars, thus reducing the magnitude of the oil companies' problem. The only route available to oil refineries is the increased usage of bimetallic catalysts such as platinum-palladium or platinum-rhodium in catalytic reforming in order to maintain an acceptable octane rating for gasoline without the use of lead additives. Thus, with the use of catalytic converters containing platinum-palladium there will be an associated increase in demand for these

metals by the oil companies.

Ford of America was the first to initiate the use of platinum-palladium catalysts in catalytic converters in its 1974 model cars sold in California in order to meet that state's automobile emission standards. Both Ford and General Motors in the United States announced that they would install catalytic converters in virtually every 1975 model car. The converters improved the gas mileage of the 1975 models relative to the 1973 model cars.(58)

During 1976 concern arose over the concept that while the platinum catalysts reduced carbon monoxide and hydrocarbons emissions, they would expose the public to low levels of new pollutants such as sulphuric acid and various particles. The Environmental Protection Agency plans to rewrite the 1980's emission standards to include sulphates discharged from automobiles. In 1975 the major producers of catalytic converters announced the development of a new type of converter that would meet 1977 hydrocarbons and carbon monoxide EPA emission levels while reducing sulphate and nitrogen oxide emissions to acceptable levels.(59) The new converter contains a "three-way catalyst" which is platinum-palladium.

As of 1976, the use of catalytic converters utilizing

platinum-palladium is firmly established in the United States and will continue so into the 1980's and 1990's.(60) The Japanese Automobile Manufacturing Association has established that it will install similar converters on its cars.(61) European manufacturers are expected to adopt similar measures. With the high likelihood of the establishment of emission levels for motorcycles made in Japan and the United States, converters will have to be installed on the majority of these motor vehicles also. Future air quality is tied directly to the availability of palladium and platinum in the United States and the world. The concept of the use of the platinum metals to maintain acceptable air quality in the industrialized nations of the world appears to be an acceptable interim solution to air pollution.

Figures 15 and 16 display palladium imports by the United States and Japan, respectively.(62,63) An examination of both of these graphs reveals an increasing demand for palladium by both countries in the 1970's. Figure 17 displays palladium free-market value in constant 1975 dollars.(64) This figure also exhibits an increasing trend in the value of palladium in the 1970's. All indications are that palladium possesses strong and growing markets despite the loss of the telecommunications

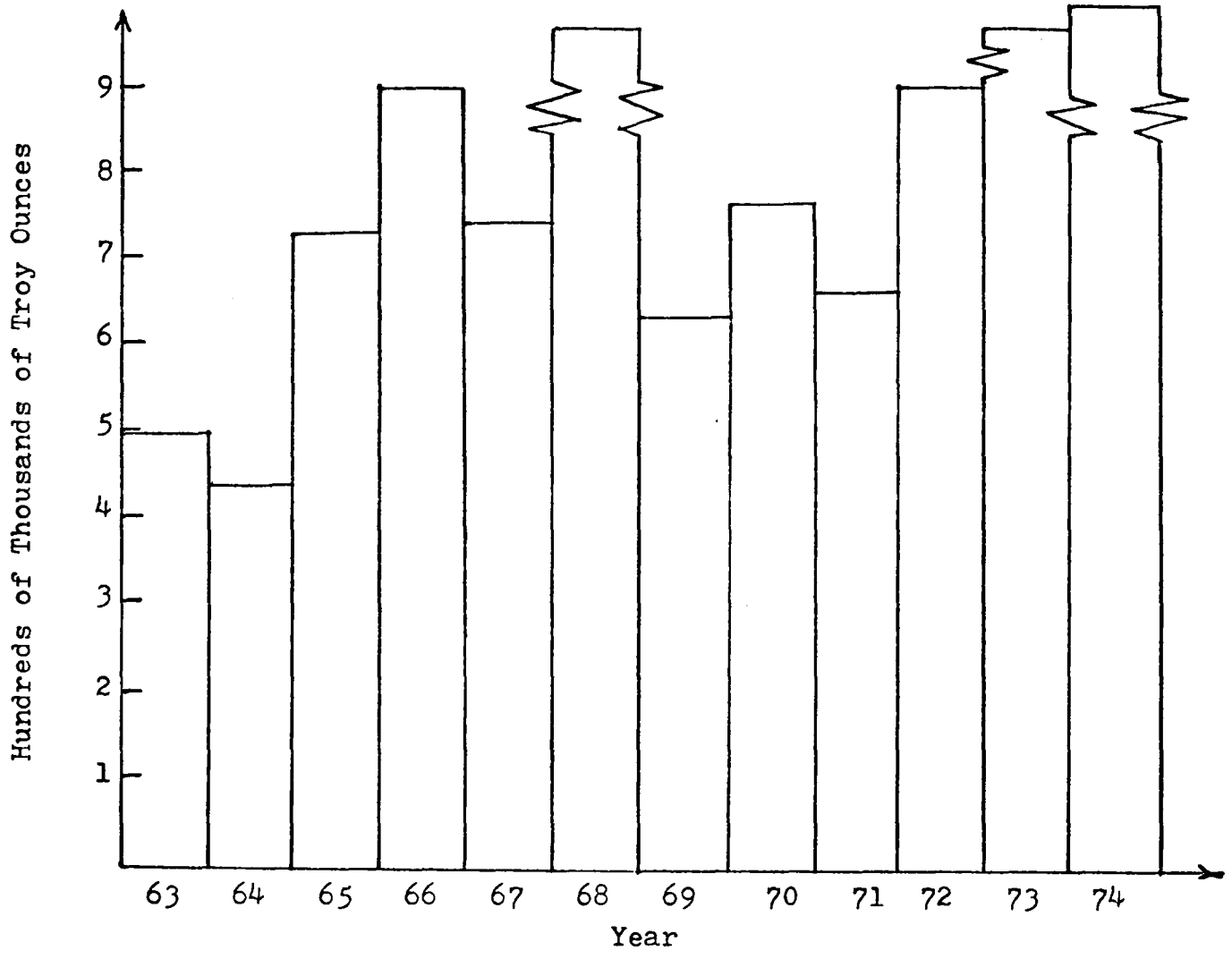


Figure 15 Palladium Imports by the United States

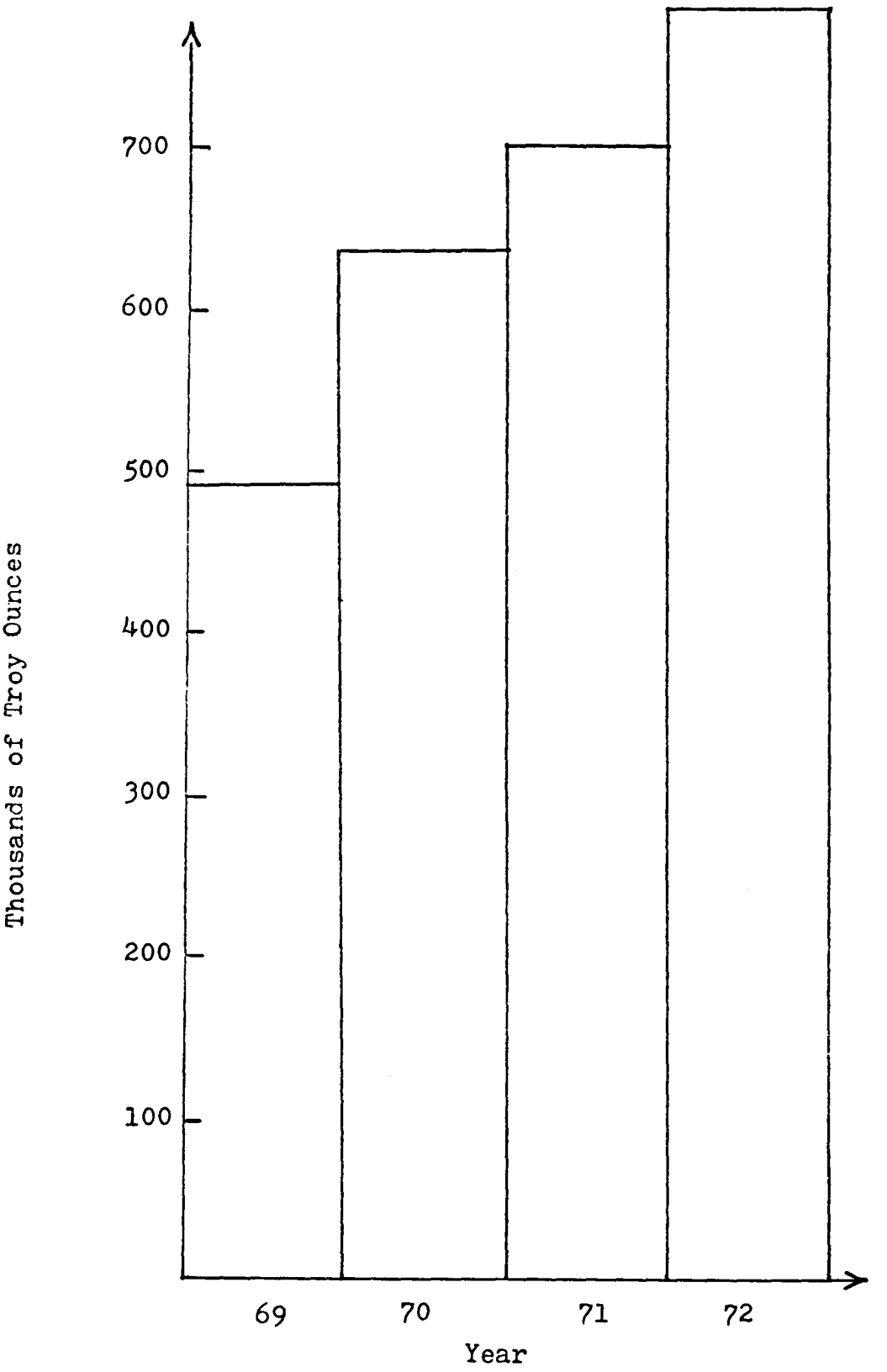


Figure 16 Palladium Imports by Japan

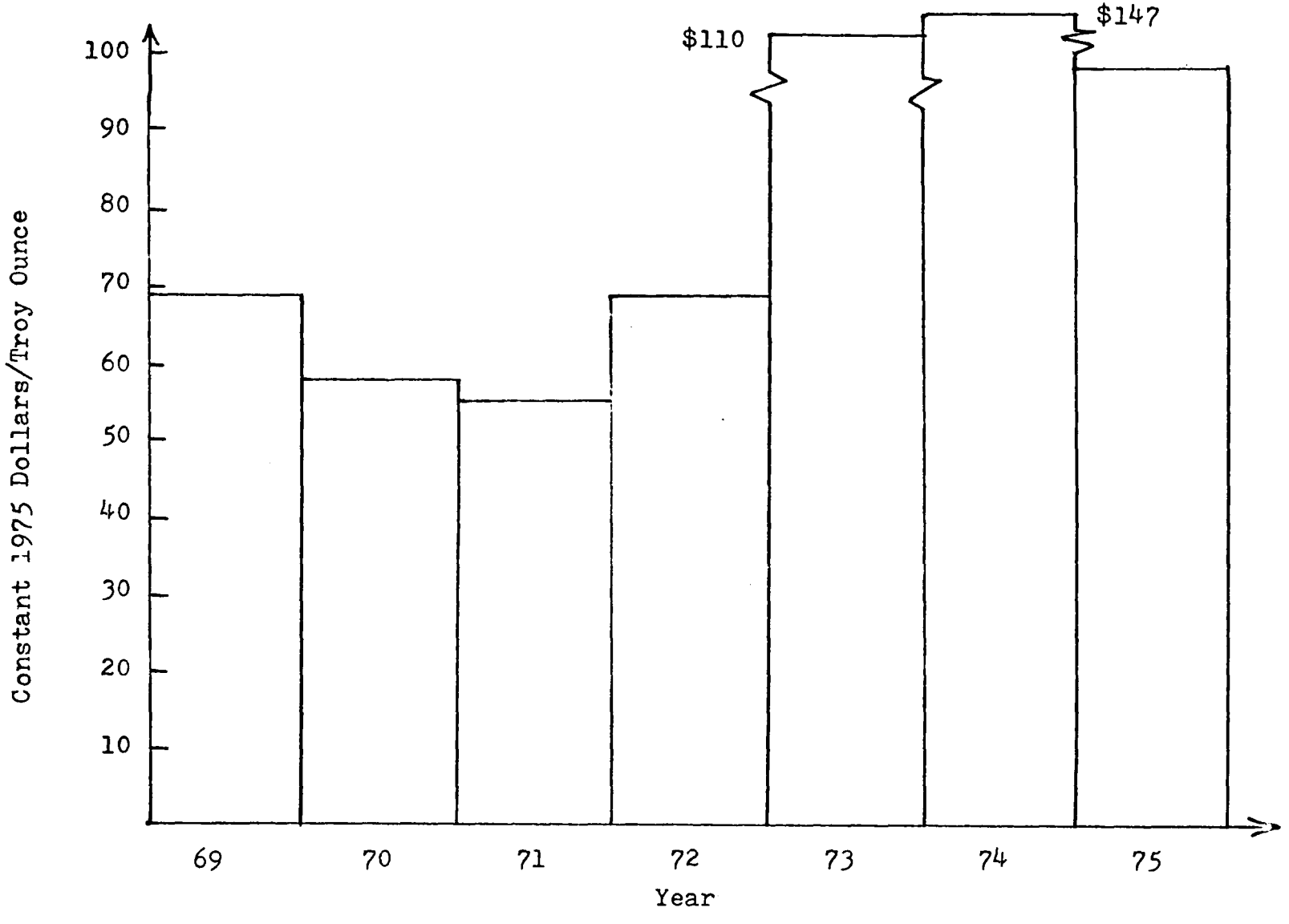


Figure 17 Palladium Free Market Value

industry as a consumer. A projection of palladium consumption by the United States has been developed by Dix, (Figure 18).[65]

Fission product palladium contains palladium-107 which is the only long-lived isotope possessing a half-life of 6.5×10^6 years. Palladium-107 decays by the process of beta emission with a low energy of 0.035 Mev. Based on Rohrmann's findings "the activity in the solid material which has been recovered experimentally was not detectable by the usual instruments."[66] Dix suggests that fission product palladium can be used in restricted applications.[67] Since the palladium utilized in automobile catalytic converters is encased in a metal container, its use in such applications is acceptable. It is important to note that domestic natural sources of palladium are virtually nonexistant in the United States.[68] One possible source of palladium can be from recycled catalytic converters. Whether this is possible or not depends upon the cost of recycling and the ability to revitalize the catalyst.

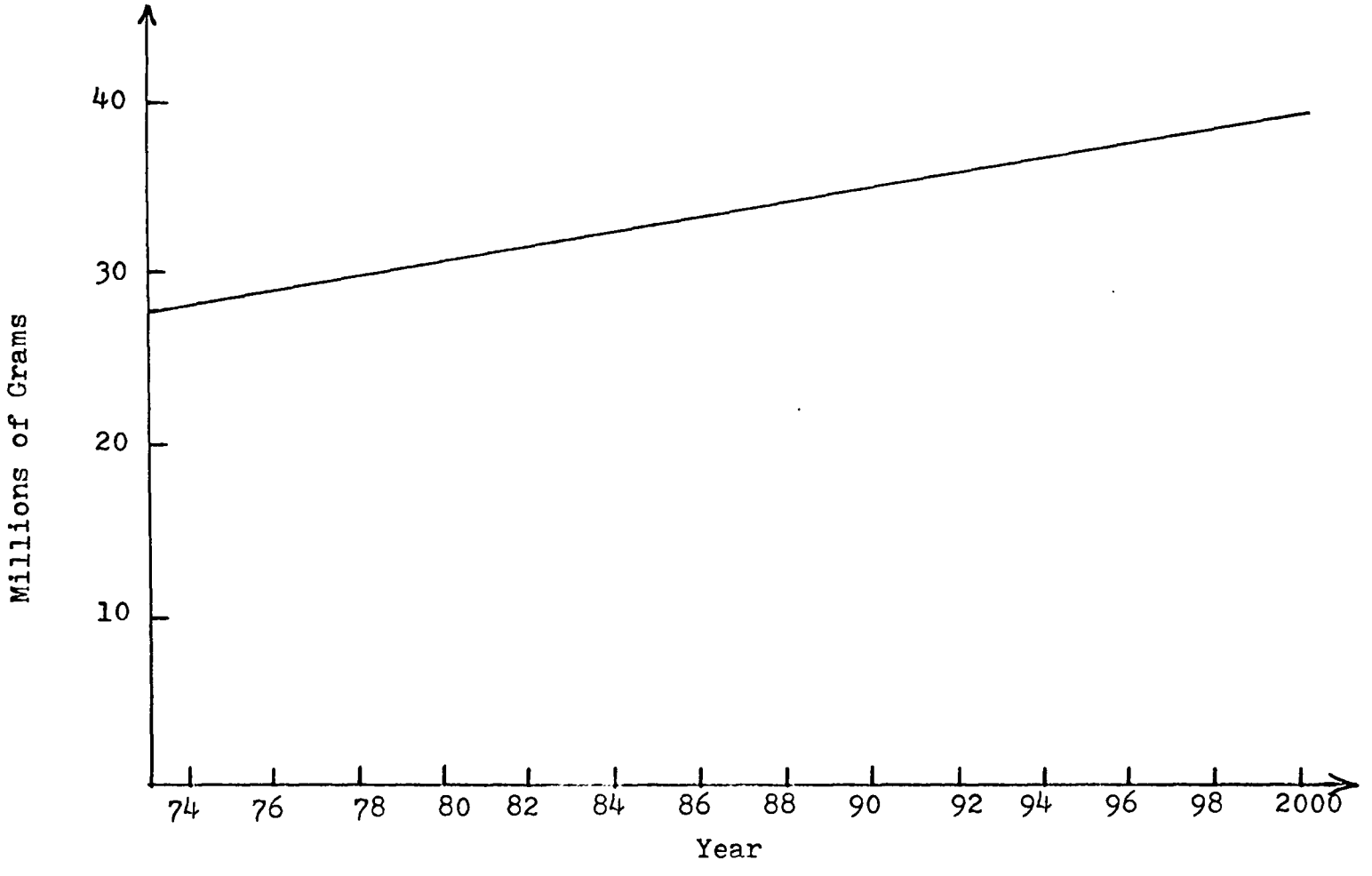


Figure 18 Projection Palladium Demand, 1973-2000 (Cumulative Demand, 1 Billion Grams, 1973-2000), United States

c. RUTHENIUM

Ruthenium consumption by type for the United States is depicted in Figure 19.[69] An examination of this graph reveals the fact that the chemical and electrical industry are the major consumers of ruthenium. The chemical industry utilizes ruthenium as a dioxide coating on titanium for electrolytic electrodes which are employed in the production of chlorine.[70] Strong growth has occurred in the electrical industry's demand for this metal. It is used as a resistive glaze in thick film electronic circuits.[71] Figure 20, which displays ruthenium consumption by the United States from 1968 to 1974, shows a consistent growing demand during the 1970's.[72] Figure 21, which depicts the free market value of ruthenium, displays a declining constant 1975 do dollar value of this metal.[73] Ruthenium demand growth is consistent and strong but ruthenium displays an inability to increase in price above the inflation rate.

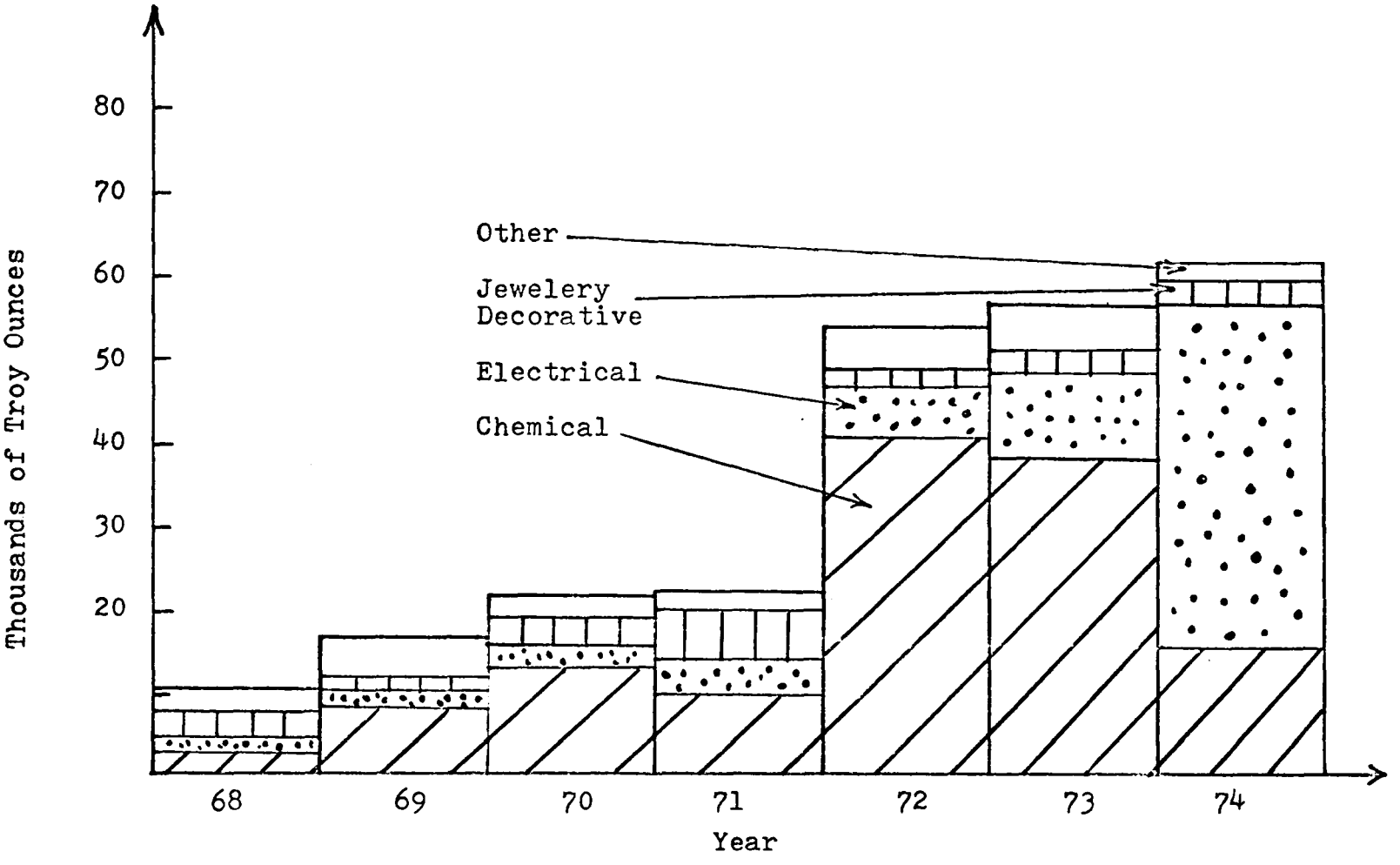


Figure 19 Ruthenium Consumption in the United States by Industrial Type

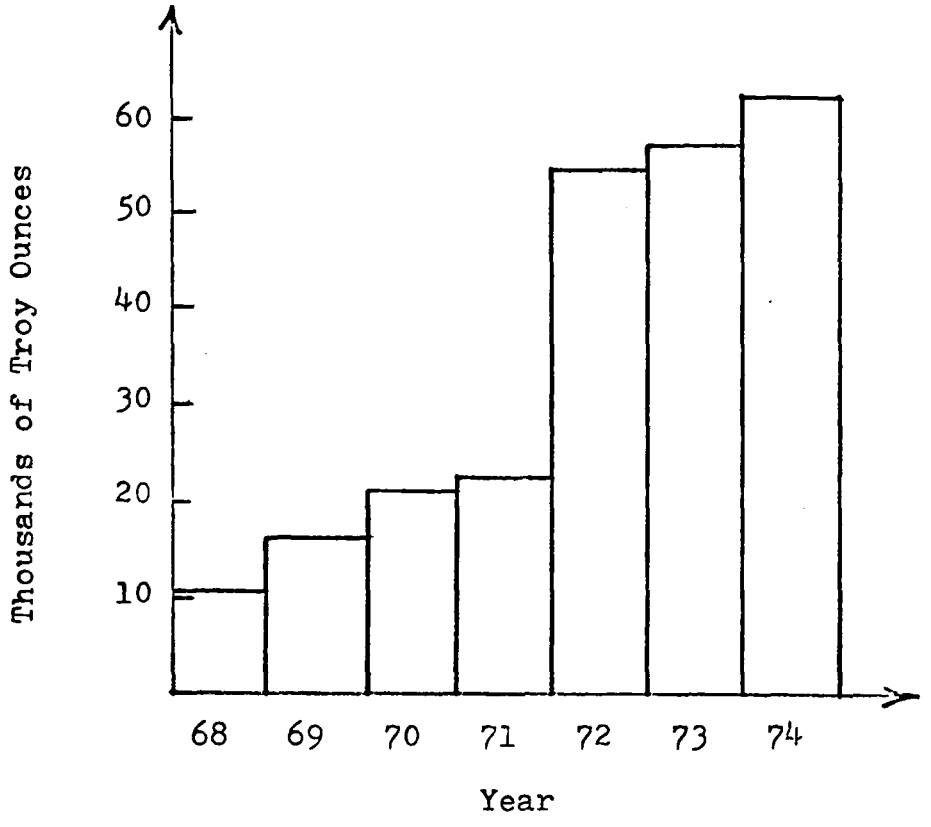


Figure 20 Ruthenium Consumption by the United States

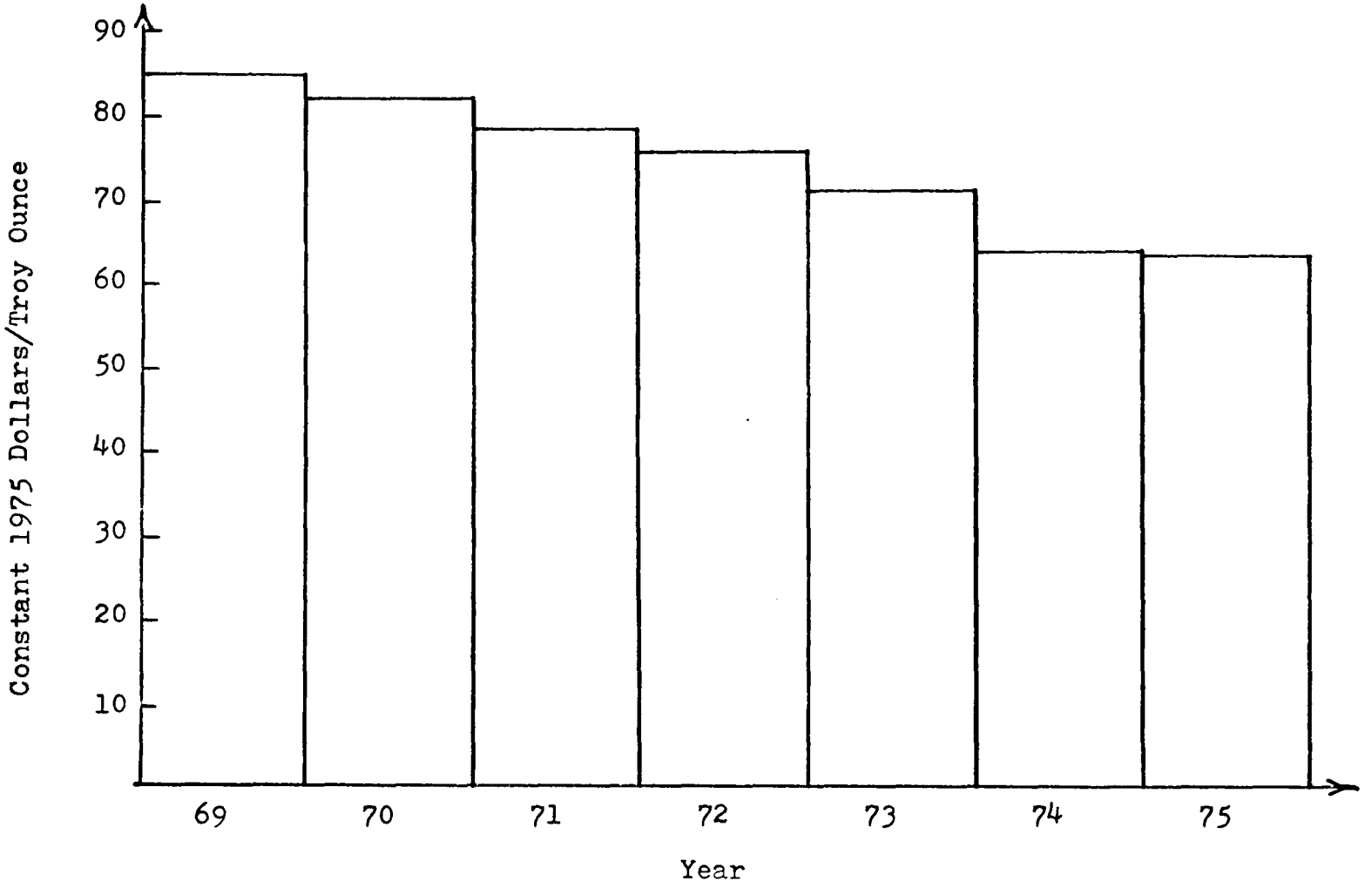


Figure 21 Ruthenium Free Market Value

7. TECHNETIUM

Technetium, with an atomic number of 43, is not a stable element. Technetium-99 with a half-life of 2.13×10^5 years is found in nuclear waste. It decays by emitting a beta particle of 0.292 Mev. Because of its low activity, it can be utilized only in restricted applications. The only major use that can be seen for this element is in the replacement of costly and rare rhenium.

As of 1965, total annual world production of rhenium reached five metric tons.(74) Rhenium is acquired as a by-product of molybdenum mining operations. It is found in concentrations of the highest value of 50 parts per million. It has a market value of 700 dollars per pound as of 1960.(75) Rhenium is: "(a) the most refractory of the metals which can be precipitated from aqueous solution, (b) superior to tungsten in wet resistance to attack resulting from transfer by water, and (c) a good thermoelectric material possessing a low contact resistance which does not form stable carbides."(76)

Rhenium has applications in fields such as electronics, incandescent heating, electrical contacts,

catalysis, and high temperature measurement. Thermocouples utilizing rhenium have functioned adequately up to temperatures of 2600°C.[77] The brightest prospect for its use lies in electrical contacts. Rhenium has superior qualities compared to those of tungsten when used in electrical contacts. Experimental data has demonstrated that tungsten's conductivity is thoroughly disrupted at 700°C while rhenium shows an extremely small change in its contact resistance value at temperatures up to 1000°C.[78] This enhances the reliability and performance of electronic parts. Rhenium is also used as an alloy filler wire when welding molybdenum and tungsten. Rhenium's high corrosion resistance offers many possible applications if its price could be reduced. Fission product technetium and rhenium resemble one another closely in their chemical properties.[79] Technetium can replace rhenium in situations where the applications are restricted.

8. CESIUM

Fission product cesium contains two isotopes of interest. They are cesium-137, which possesses a half-life of 30.1 years and decays by gamma emission with an energy of 1.173 Mev, and cesium-134, which possesses a half-life of 2.06 years and decays by emission of a number of energetic gammas. Cesium produced as nuclear waste has two potential major widespread uses. They are the use of cesium-137 and 134 for large-scale radiation treatment of foods and feeds and the treatment of municipal sludge and compost.

The use of fission product cesium in food irradiation helps prevent the spoilage of food. Approximately 50% of the food produced today is lost to pests and another 25% of this food is loss post-harvest.(80) Thus, only 25% of the food produced in the world reaches the consumer. Some of this loss can be prevented by the thorough defestation and inactivation of desease causing organisms by irradiation. Mankind is attempting to achieve this objective by the use of pesticides. It is estimated that 1.9 billion kilograms of pesticide will be utilized in the world this year (1977) or about one pound of pesticide

for every human being on earth.[81] It is important to realize that some of these chemicals are nonbiodegradable. This implies that man is poisoning his water supply on this earth by the continual and increasing use of these chemicals. Some of these pesticides are undoubtedly ingested through the food chain by human beings and represent a potential health hazard.

In August of 1977, the federal government revealed that half of the 75 workers at a Dow Chemical plant in Arkansas where pesticide DBCP is manufactured have a sterility problem.[82] DBCP or dibromochloropropane is used to kill worms and pests. This chemical has been in use for over 20 years. The effects of this pesticide on farmers who use it has not yet been determined.

The irradiation of food offers many benefits. They are: the sterilizing process can be performed through any container material, the irradiation process produces no major rise in the food temperature, foods of varying thickness can be adequately sterilized, the actual defestation and inactivation of dangerous organisms can be accomplished immediately, and various benefical effects occur with the irradiation of a number of foods. A dose of 20 to 150 krad has been shown to improve the baking properties of wheat flour.[83] Irradiated fish brings a

higher price than frozen fish because of consumer preference.[84] An examination of the available literature supports the concept that vitamin losses due to the irradiation of food are no greater than other comparable processes.[85] Irradiation leaves no residue in the food in contrast to chemical methods.

The high cost of energy has created a resurgence in the irradiation of foods. Figure 22 displays the various countries that have cleared specific irradiated foods for distribution within their national boundaries as of 1973.[86] The rather large increase in interest amongst nations concerning food irradiation can be attributed to an increasing concern about chemicals in foods and the environment, high energy costs associated with refrigeration and storage, and the desire to curb world hunger through reduction of global food losses.

The amount of radiation necessary to make a specific food safe for human consumption is based on the type of organism that must be inactivated.[87] A 300 to 500 krad dose is required for immediate insect fatality. Viruses, such as foot and mouth disease, require up to a 2 Mrad dose. This has virtually prevented the use of radiation in treating uncooked fresh meat. At high doses such as 2 Mrads, fresh meat develops a scorched flavor. The

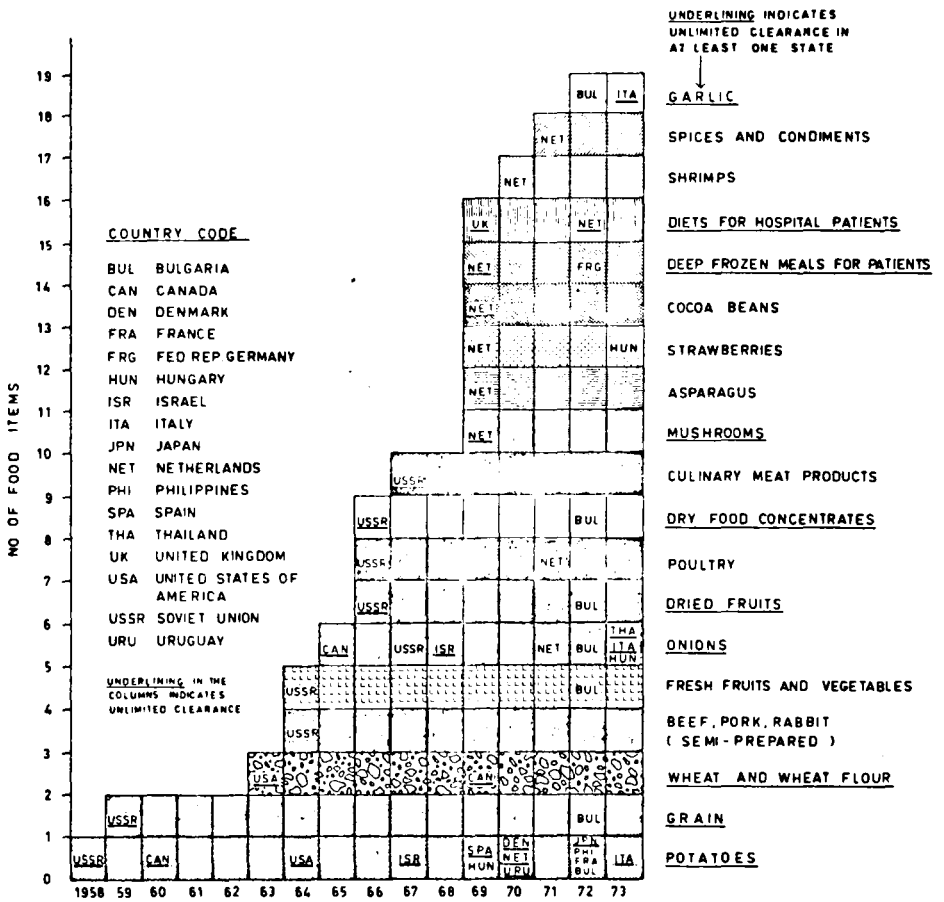


Figure 22 Irradiated Foods Cleared in One or More Countries as of December 1973, with Dates of First Clearance

irradiation of food at low temperature (-40 to -200°C) can reduce irradiation off-flavor in beef to low enough levels to make it acceptable to consumers. The use of a low temperature environment during irradiation can improve texture and reduce vitamin destruction thus making it more attractive than the use of chemicals. Radiation-sterilized meats in appropriate containers can be stored for years without refrigeration and retain their original wholesomeness if they are initially irradiated at low temperatures.

The amount of fission product cesium required in largescale food irradiation is difficult to predict. It is a function of the desired dwell time for the food in the plant, optimum configuration and dispersal or non-dispersal of radiation sources, shielding costs, and the ease of the replenishment of the source. The use of alternate radiation sources such as a machine source appears to be impracticable. Machine sources are complex, require skilled attention, and have a high energy consumption. Cobalt-60 appears to be the only possible competitor as a radiation source but it is produced primarily in special research reactors by special target loadings.

The utilization of fission product cesium in the

irradiation of food will help curb world hunger, reduce mans contact with and ingestion of potentially dangerous pesticides and chemicals, and permit the storage of food for prolonged periods of time.

A second major use of fission product cesium can be found in the treatment of municipal sludge and compost. Irradiation of municipal sludge has been proposed as an alternative to ocean disposal, incineration, landfill, and land application methods. In order to clearly understand this problem, sludge production in the United States must be understood and the various present alternatives for its treatment must be considered. The desirability of using cesium-137 and 134 for sludge irradiation can be established on the basis of an analysis of these existing alternatives.

In an average sewage treatment plant, one ton of dry sludge is generated per million gallons of waste water.(88) The United States generates 5 million dry tons of sludge each year from its 22,000 municipal treatment plants.(89) Approximately 350 of these treatment plants handle more than 10 million gallons per day.(90) The total amount of dry sludge generated in the United States from these municipal plants will increase by 80% due to PL 92-500, Water Pollution Control Act Amendments of 1972, which

requires secondary treatment.[91] Tables 11 and 12 show the ten largest municipal sludge producing cities in the United States and the breakdown of municipal sludge disposal processes as of 1977.[92]

Ocean dumping which is utilized by New York City, Los Angeles and Philadelphia, will be phased out by 1981. The major pollutants are heavy metals, organic pesticides, mercury, cadmium and chlorinated hydrocarbons. Incineration, which requires substantial energy, creates problems with particulate and mercury discharge into the atmosphere. Landfill operations offeraa serious threat to the quality of the ground water because of contaminants such as lead and mercury. Land application provides a benefical reuse of sludge.

Land application of treated municipal sludge as a soil additive and conditioner offers two major problems. Possible regrowth of the pathogenic agents is one problem but this can be handled adequately by a thorough treatment of the sludge. Another problem is the existence of heavy metals in the sludge. This can only be remedied by source control since a cost effective technology does not exist for the extraction of these metals from sludge.[93] It is important to note that in 1975 a full scale cobalt-60 irradiation plant was put into operation to

Table 11 Ten Largest Municipal Sludge Producing Cities in the United States

City	Quantity of Sludge (Dry Tons/Day)	Present Disposition
New York City (Metropolitan area)	230 (600)	Ocean/Landfill
Chicago	800	Land Applications Lagooning
Los Angeles	500	Ocean
Philadelphia (Metropolitan area)	140 (190)	Ocean
Detroit	160	Incineration
Houston	160	Land Applications
Baltimore	140	Land Applications Landfill, Lagooning
Dallas	120	Lagooning
Washington	400	Land Applications
Cleveland	200	Landfill, Incineration

Table 12 Breakdown of National Municipal Sludge Disposal Processes

Method	% Total Municipal Sludge
Ocean Disposal	15
Incineration	35
Landfill	25
Land Application, Cropland	20
Land Application, Other	5

treat sludge in Munich, West Germany.[94] The product was used successfully within the site as a soil conditioner.

The two major types of irradiation methods considered are wet thermoradiation and dry or compost irradiation.[95] The thermoradiation process involves the irradiation of sludge at an artifically elevated temperature. ERDA study 77-17 states that a 5 minute residence time at 55°C with a dose of 300 kilorads is sufficient to treat digested sludge. Figure 23 represents the cost per dry ton of sluge versus plant capacity for irradiation to 0.5 and 1 Mrad, pasteurization at 70°C for 30 minutes and for a thermoradiation process.[96] These cost curves are calculated based upon a 20 year amortization scheme at 5-7/8% interest, operating costs and cesium-137 being available at 10¢ per curie. Thermoradiation appears to be economically competitive with the existing pasteurization process. Compost irradiation involves the mixing of raw sludge with wood chips or other material and a settling mixing period of 21 days prior to the placement of the compost in 50 pound bags. The bags are then irradiated at ambient temperatures with a dose of 1 Mrad which is sufficient to render the sludge compost safe. The bags containing irradiated composted sludge can then be sold as a biologically safe feed supplement.

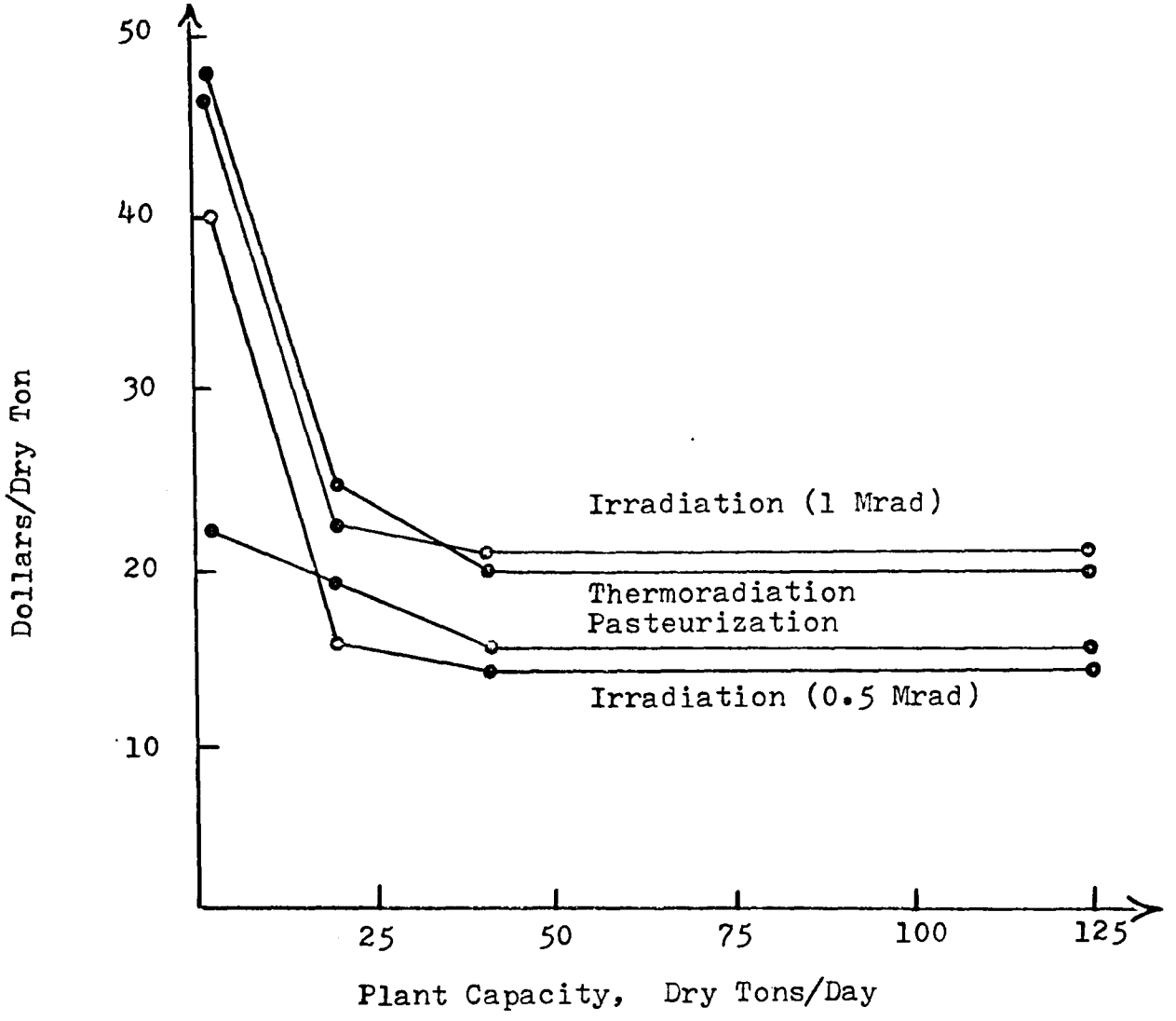


Figure 23 Cost of Pasteurization, Irradiation and Thermoradiation

Figure 24, represents cost per dry ton of sludge in a compost process utilizing the same assumptions used in Figure 21.[97] The dry irradiation process appears to be economically superior to irradiation, wet thermoradiation and pasteurization methods.

Marvin E. Morris of Sandia Laboratories conducted a study of municipal sludge irradiation. He established a correlation between cesium-137 required versus dry sludge product through the irradiator (tons/day) which is shown in Figure 25.[98] This figure was constructed using a 5 year replenishment cycle for the cesium-137. Based on ERDA 77-17, total annual municipal dry sludge production in the United States is expected to reach 9 million dry tons by the mid 1980's. Assuming that 7 million dry tons of this can be treated in compost sluge irradiators and that the average plant has a capacity of 170 dry tons/day requiring 25 megacuries, a total of 2,820 megacuries is required every 5 years. Blomeke projects that approximately 500 megacuries will be generated each year by the United States commerical nuclear industry in the mid 1970's.[99] Thus, compost sludge irradiation has the capability of utilizing all the nuclear industry's radioactive cesium.

It is estimated that 0.1 MBTU is saved for every

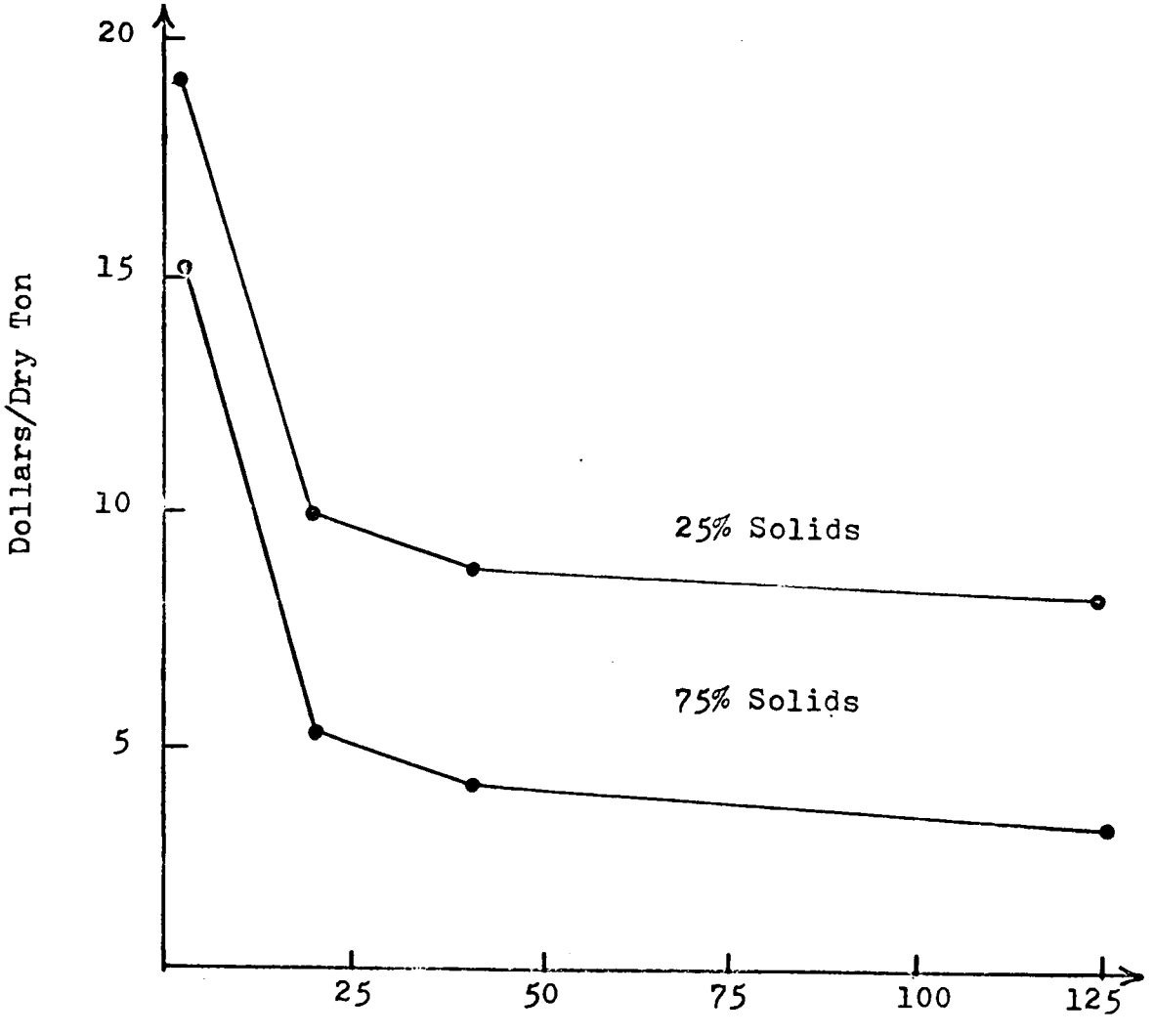


Figure 24 Dry Irradiation Costs

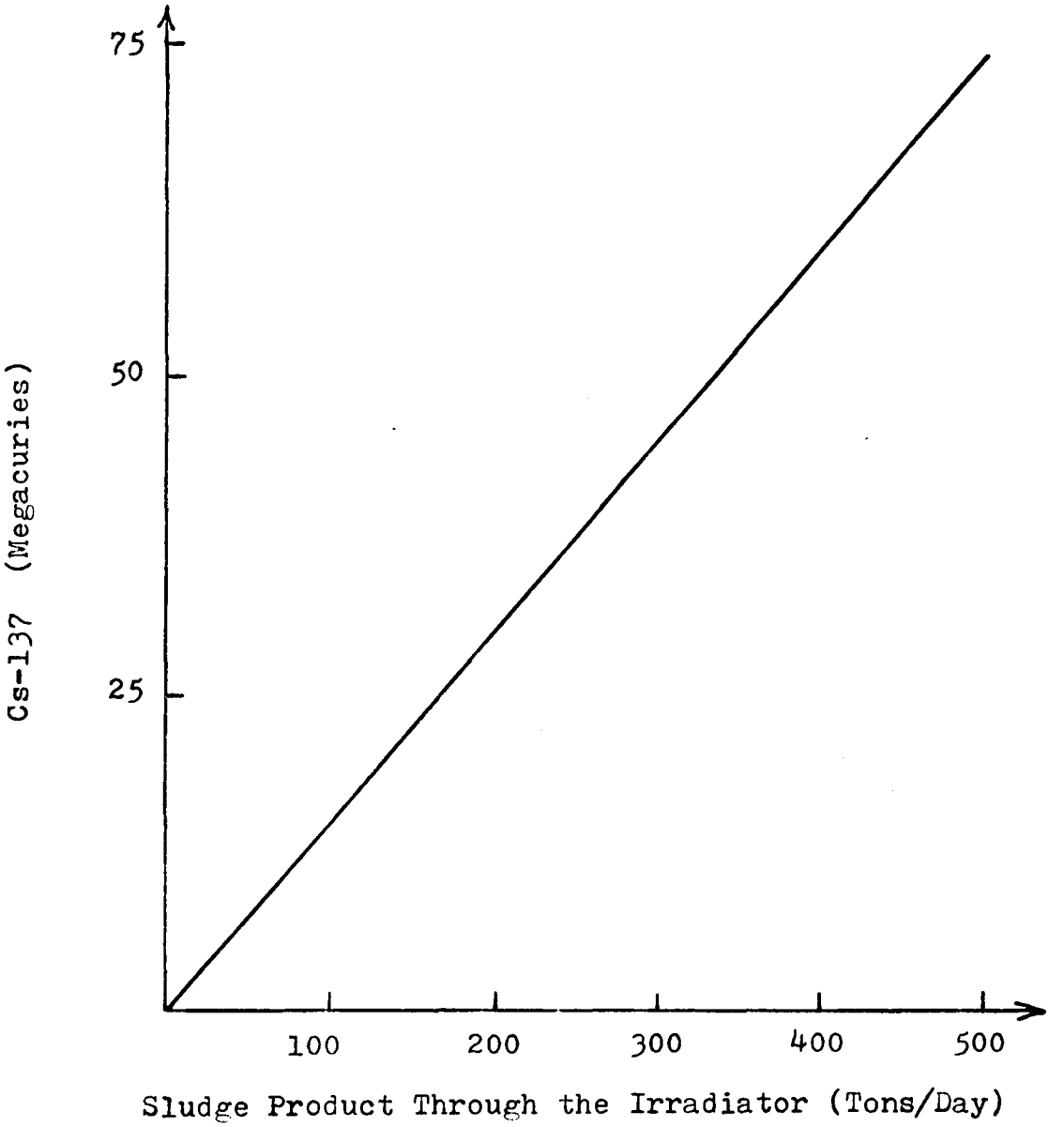


Figure 25 Cs-137 Requirements for a Sludge Irradiation Facility

curie of cesium utilized in the thermoradiation treatment of sludge.[100] Since dry irradiation does not involve the heating of the sluge to 55°C, a minimum savings of 0.1 MBTU/curie-yr. is realizable. The use of cesium-137 in irradiating 7 million dry tons of sludge annually would save 2.82×10^{14} BTU's every year. This amounts to a savings of 2.013×10^{9} gallons of no. 2 heating oil (2.013×10^{9} U.S. gallons = 47.92 million U. S. barrels). Taking the price of no. 2 heating oil at 48.5 cents per gallon, the use of radioactive cesium in sludge irradiation can reduce oil importation by 976 million dollars annually. Morris states in his study that all irradiation methods are comparable in cost to pasteurization when no interest is charged for the gamma source and its facility and when no interest charges are made on heating oil equipment for a pasteurization facility. This conclusion appears to be reasonable since a major amount of capital must be invested in a gamma source every five years as opposed to the incremental buying of oil for a pasteurization plant.

Once the harmful organisms in the sludge have been deactivated, this substance can then be sold as a fertilizer, animal feed supplement, or soil conditioner. The process cost and resale value of sludge which has been

treated by thermoradiation, unirradiated composting and irradiated composting is shown on Table 13.[101] Milorganite is a treated sludge which is sold as a fertilizer by the city of Milwaukee. Table 13 indicates the possibility of cities earning profit on municipal sludge disposal. This is a direct reversal of the present nightmarish atmosphere existing in municipalities which are presently desperately trying to find a cheap, environmentally acceptable mode of sludge disposal.

In conclusion, fission product cesium offers a primary potential motivation for separation of fission products for commerical sale. Fission product rhodium and palladium and xenon offer somewhat less compelling arguments for such a faciltiy. It is important to note that the value of cesium-137,134 based upon the amount of oil it displaces annually is $1.73/curie while cesium-137,134 is available from the government as an encapsulated heat source for 10¢/curie.

Table 13 Product Value, Treated Sludge

Treatment Process or Product Name	Use	Process Cost/ Dry Ton	Resale Value/ Dry Ton
Thermoradiated Sludge	Fertilizer (Natural)	$30-40	$25-30
	Supplement Animal Feed	40-50	100
Compost (Unirradiated)	Soil Amendment	30-50	10-15
Irradiated Compost	Soil Amendment (Commerical)	35-55	60-70
Milorganite	Soil Amendment (Commerical)	100	65

VII. INTENTIONAL PRODUCTION OF RADIOISOTOPES BY TARGET LOADING IN A COMMERICAL NUCLEAR POWER PLANT

The intentional production of radioisotopes by target loading in a public utility nuclear power plant will not be considered in this study. The relatively low neutron flux and the annual refueling cycle of commerical nuclear power plants precludes their use in intentional radioisotope production.

Based on Machurek and Fowler's work, many of the radioisotopes that experience the largest demand possess short half-lives and reach maximum activity in a target in a matter of weeks to months.[102] The short half-lives of these nuclides necessitate frequent deliveries to customers ranging from monthly to weekly supply periods. The annual refueling cycle of a nuclear power plant prevents the exploitation of the existing radioisotope market. The low neutron fluxes existing in public utility reactors as compared to that of specially designed reactors prevents the production of radioisotopes with a high specific activity which is required in medical and industrial applications.

The GE Vallecitcos Test Reactor is the largest

supplier of radioactive materials to the pharmaceutical industry.(103) It provides 12 primary radioisotopes to 200 pharmaceutical firms and hospitals in 20 countries. Some of the isotopes and their uses are: molybdenum-99 which is used to detect breast tumors, brain tumors, strokes, liver diseases and pulmonary disorders; xenon-133 gas for detecting lung diseases; cobalt-60 for cancer treatment; iron-59 for blood analysis; and, selenium-75 for pancreas imaging. T. J. Slosek, Marketing Manager-Irradiation Processing Product Operations at Vallecitcos, states that the number of licensed radioisotope users increases by 20% each year and that "one out of every three patients admitted to United States hospitals today are given a radioactive tracer as part of his or her medical diagnosis."(104)

The medical and industrial isotope market is well established and growing; but the design features of modern nuclear power plants reclude their use in the production of radioisotopes from intentionally inserted targets.

VIII. EVALUATION OF COST PARAMETERS

In this chapter the cost of various nuclear fuel cycle services is established. The cost of fission product separation is also estimated. The present attitude of ERDA towards the marketing of various fission products is discussed.

A. Cost of Various Nuclear Fuel Cycle Services[105]

In this section, the values of various cost parameters used in equation 1 are established. All values in this section are in terms of constant 1975 dollars and are taken from GESMO. The cost of all fuel cycle services discussed in this section are assumed to grow annually at a rate of 5% in terms of constant 1975 dollars.

The unit cost of the conversion of U_3O_8 to UF_6 is estimated to be \$3.50/kg.-uranium with a range of 3 to 4 dollars. This estimate is based upon a survey of various commerical contracts performed in GESMO which exhibit no more than a 10% deviation from \$3.50/kg.-uranium. Based upon this low variation in conversion cost, it is not varied in the analysis.

The cost of UO_2 fabrication is believed to range from 85 to 105 dollars per kg. of HM with a reference estimate of 95 dollars per kg. of HM. These figures cover the range of costs for PWR/BWR mix of fabricated fuel assemblies. The UO_2 fabrication cost range is representative of charges at the General Electric-Wilmington and Westinghouse-Columbia facilities.

Spent fuel storage costs are allowed to range from 2 to 10 dollars per kg.-HM-yr. with a reference estimate of 5 dollars per kg.-HM-yr. This estimate is for expanded reactor site storage pools. A central storage facility with long-term contracts from various public utilities would have costs ranging from 4 to 6 dollars per kg.-HM-yr.

Plutonium storage costs are believed to range from 1 to 3 dollars per gram-yr. with a reference cost of 2 dollars per gram-yr. This is based on plutonium being stored as PuO_2 with a utilization factor of 30% for the storage facility. With a 100% utilization factor, these storage costs vary from 0.30 to 1 dollar per gram-yr.

Mixed-oxide fabrication costs are varied from 150 to 300 dollars per kg.-HM with a best estimate of 200 dollars per kg.-HM. The primary reasons for such a large range in cost is the effect of largely undefined new safeguards requirements.

A reprocessing cost of 150 dollars per kg. of spent fuel is used as a reference estimate with a range of variation from 110 to 190 dollars per kg. of spent fuel.

For alternatives requiring reprocessing, waste disposal costs are varied from 30 to 70 dollars per kg. of spent fuel with $50 being the best estimate. This cost includes transportation of 1,000 miles from the reprocessor to an underground geologic disposal facility. When reprocessing is not an alternative, costs are estimated to range from $50 to $150 per kg. of spent fuel for salt-mine disposal facilities with a reference estimate of $100. In the no reprocessing case, the cost of transportation from the reactor to the disposal site is not included in the reprocessing cost.

Spent fuel transportation costs are varied from 10 to 20 dollars per kg.-HM while assuming a shipping distance of 1,000 miles. This range of values includes the use of special trains both ways.

Plutonium dioxide shippment costs are varied from 0.02 to 0.06 dollars per gram of plutonium with a reference estimate of 0.04. These costs are largely dependent on safeguards requirements such as a specially designed transport vehicle which is hijack-resistant, periodic communications capability from the transport to a

facility, and an armed escort.

In considering the no reycle option, the total cost of this option assuming disposal of the spent fuel assembly in a salt mine after 11 years of storage in a spent fuel pool is approximately $135,000. This cost is for a PWR assembly discharged in 1977 from a nuclear reactor core. The dollars are constant 1975 dollars with a real annual growth of 5% in the cost of fuel cycle services. This penalty indicates that reprocessing a typical spent fuel assembly is preferrable to a no recycle choice provided the total cost of throwaway option is greater than recycle at the 11 th year of storage.

As shown in Table 2, there are 461 and 188 kg. of heavy metal in a UO_2 PWR and BWR fuel assembly, respectively. MOX BWR fuel assemblies and MOX PWR fuel assemblies are assumed to contain the same amount of heavy metal as their UO_2 counterparts. In performing nuclear fuel cycle services charges calculations, it is assumed that the spent fuel assemblies have the same amount of heavy metal in them as when they were loaded into the reactor. The parameters in the model, their values and the range of variation in these values are compiled and displayed in Tables 14 and 15.

In order to calculate the value of the energy

liberated from the spent fuel assembly for use in equation 5, the cost of electricity as a function of time must be known. This cost is displayed in Table 16.[106] Table 17 contains the electric energy generated by a nuclear power plant from a PWR assembly as a function of burnup. Table 18 contains the value of the energy liberated from a PWR assembly as a function of burnup and as a function of the date at which the energy was obtained from the assembly.

Table 14 Cost Parameters of Model

Units	Reference Estimate	Range of Variation	Definition of Parameter
$/Kg-HM-Yr	5	2 to 10	Cost of Storage of Spent Fuel
$/Kg-HM	15	10 to 20	Cost of Shippment of Spent Fuel Assembly
$/Kg-HM	150	110 to 190	Cost of Reprocessing
$/Gr-Pu	0.04	0.02 to 0.06	Cost of Shippment of Plutonium
$/Kg-HM	200	150 to 300	MOX Fuel Fabrication Cost
$/Kg-HM	95	85 to 105	Uranium Fuel Fabrication Cost
$/Kg-HM	50	30 to 70	Cost of Fission Product Disposal, Recycle Mode, Transport Cost Included
$/Kg-HM	100	50 to 150	Cost of Disposal of Spent Fuel, No Recycle Transport Cost Excluded

Table 15 Cost Parameters of Model

Units	Reference Estimate	Range of Variation	Definition of Parameter
$/Kg	3.50	--------	Conversion Cost of Uranium to UF_6 Gas

Table 16 Electric Energy Cost, Residential Average, 1975 Dollars

Year	Revenue per Kwhr Cents
1974	3.45
1975	3.57
1976	3.65
1977	3.75
1978	3.81
1979	3.86
1980	3.91
1981	3.95
1982	3.99
1983	4.03
1984	4.07
1985	4.10
1986	4.13
1987	4.16
1990	4.22

Table 17 Electric Energy Generated as a Function of Burnup of a PWR Assembly

Electric Energy	Burnup				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
Kwhr*	3.65×10^7	7.30×10^7	12.05×10^7	14.60×10^7	18.26×10^7

*Thermodynamic plant efficiency ≈ 33%

Table 18 Value of Total Energy Liberated from a PWR Assembly as a Function of Burnup and Date, Constant 1975 Dollars

Years	Burnup				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
74-76	1.30×10^6	2.60×10^6	4.29×10^6	5.20×10^6	6.50×10^6
77-79	1.39×10^6	2.78×10^6	4.59×10^6	5.56×10^6	6.96×10^6
82-84	1.47×10^6	2.94×10^6	4.86×10^6	5.88×10^6	7.36×10^6
87-89	1.52×10^6	3.06×10^6	5.04×10^6	6.12×10^6	7.65×10^6

B. Cost of Fission Product Separation

This section of the thesis establishes the cost of fission product separation. Present government attitudes towards fission product separation are also discussed in this section.

As of 1977, the Oak Ridge Sales Office will sell cesium-137 as an encapsulated heat source to any licensed user for 10¢ per curie.[107] Assuming that 35% of the reactor waste cesium is isotope 137 and that Cs-137 has an activity of 87 curies per gram, cesium-137 equivalent to that of spent fuel is available today at $3.04 per gram. Taking the average of 1973, 74 and 75 free-market commerical prices for rhodium and palladium, the price of these platinum metals is $15.20 and $3.79 per gram, respectively. Both rhodium and palladium possess activities of less than 100 microcuries per gram as opposed to that of cesium with an activity of 30.45 curies per gram, (25,000 MWD/MT-HM fuel). The high heat generation by cesium as compared to that of palladium and rhodium and the wide differences in radioactivity tends to indicate that these two platinum metals can be recovered from reactor waste at lower costs than that of

cesium. However, since rhodium and palladium exist in a dilute solution containing numerous substances, platinum metal extraction from the fission products could be more costly than cesium extraction. It is reasonable to assume that the cost of rhodium or palladium extraction should not exceed $30/gram and would realistically fall in the range of $5 to $15 per gram.(108)

General Electric performed a plant engineering study in 1963 for the AEC which involved the conceptual design of an isotopes production plant to be located at the Hanford Nuclear Facilities.(109) This plant would produce 10 megacuries of strontium-90, 10 megacuries of Cs-137, 30 megacuries of promethium-147, and 100 megacuries of cerium-144 per year. These products were intended to be used in radioisotopic power applications. Assuming a 10% discount factor, the plant would cost approximately 55 million dollars to build today, (1977). This study gives a rough estimate of the amount of capital involved in the construction of a fission product separation facility.

ERDA is aware of the limited supply of palladium and rhodium and the rapid price escalation of these metals.(110) The United States government is presently involved in the flow charting of the separation of fission products from

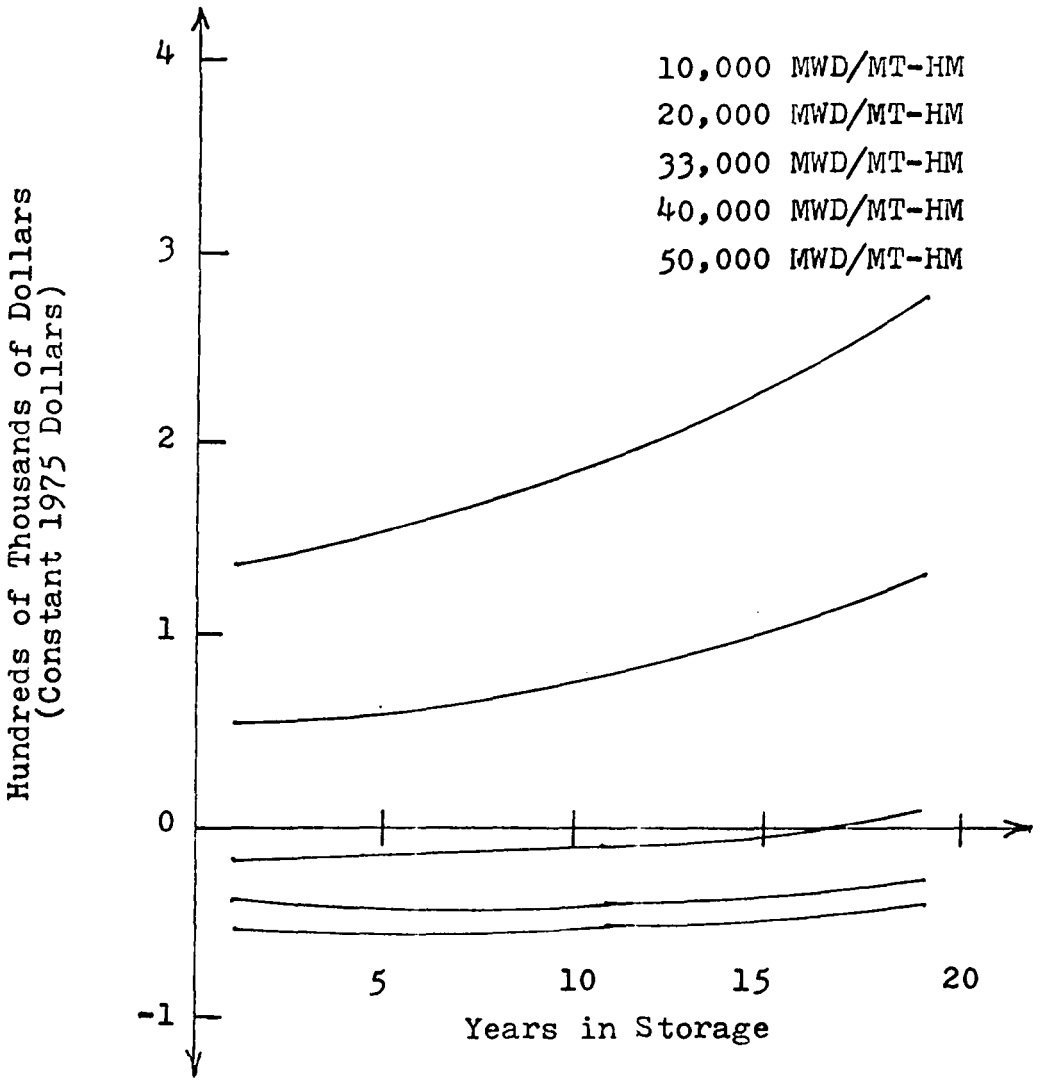
one another and the cost of extraction. ERDA has contracted with, (contract no. EY-77C-06-1013) EXXON Nuclear Company of Richland, Washington to perform a study entitled Study of the Separation and Recovery of Select Radioisotopes from Commerical Nuclear Fuel Wastes. The study will evaluate the cost of separation and extraction of cesium, strontium, cesium and strontium together, krypton, xenon, rhodium, palladium, ruthenium, the actinides, americium, curium, and plutonium from reactor waste. Strong interest has been expressed by ERDA, HEW, and EPA in the use of cesium-137 in the treatment of municipal sludge.(111) Thus, the extensive analysis of the marketability, uses, and potential uses of the fission products is justified.

In conclusion, fission products cesium, rhodium, palladium and xenon are assumed to be available from a fission roduct separation facility at an extraction cost of 10¢/curie, $10 per gram, $10 per gram and $1 per liter. The extraction cost of xenon is based upon C. A. Rohrmann's estimate discussed in chapter 6, section 2. The value of cesium, rhodium, palladium and xenon are assumed to be $1.73/curie, $15.20/gram, $3.79/gram and $10/liter. These values are established in this chapter and in chapter 6.

IX. RESULTS

This chapter contains a discussion of the results of the economic model. The results of the computer code are in appendix 1.

An examination of Table 36, PWR-UO_2 under plutonium and uranium recycle, supports a number of conclusions. Under uranium and plutonium recycle,a PWR-UO_2 spent fuel assembly with a burnup of 10,000 to 20,000 MWD/MT-HM tends to have higher economic worth than an assembly in the 33,000 to 50,000 MWD/MT-HM burnup range. This conclusion holds regardless of the year that the spent fuel assemblies are discharged from the core and regardless of their duration of storage prior to reprocessing. The conclusion is valid for BWR/PWR-UO_2 and MOX spent fuel assemblies under uranium recycle and uranium and plutonium recycle, and can be seen graphically by examining Figures 26 and 27. Based on the economic model, UO_2 spent fuel assemblies with a burnup of 10,000 to 50,000 MWD/MT-HM, Figure 26, usually increase in value. A UO_2 spent fuel assembly with a burnup of 50,000 MWD/MT-HM, Figure 26, begins initially with a negative worth and grows more negative, (negative slope on curve), until the 7 th year



Type of Assembly: PWR-UO_2

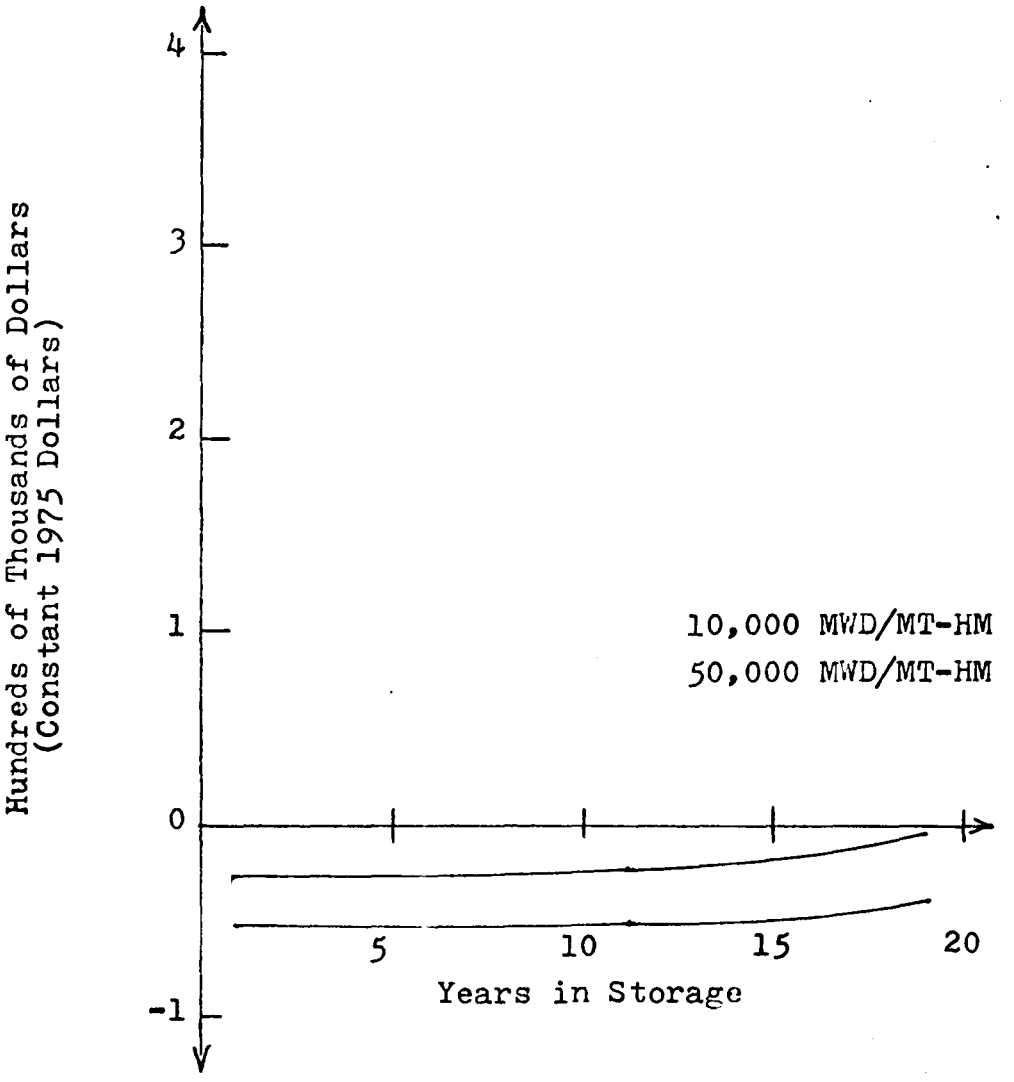
Date of Discharge from Core: 1977

Mode: Plutonium and Uranium Recycle

Figure 26 Net Worth of Spent Fuel PWR-UO_2 Assembly

of storage and then begins increasing in worth, (positive slope on curve). This concave shape for an economic net worth curve occurs for a number of different recycle modes and for various burnups and for different years of discharge from a core for a spent fuel assembly. PWR-MOX spent fuel assemblies of various burnups discharged in 1977 under uranium and plutonium recycle conditions are displayed in Figure 27. An analysis of Figure 27 reveals the fact that assemblies with low burnups have higher net worths than assemblies with high burnups. Both the 33,000 and 50,000 MWD/MT-HM MOX spent fuel assemblies display part of the same concave worth curve previously noticed in PWR-UO_2 spent fuel assembly economics.

The high economic worth of a UO_2 spent fuel assembly with a burnup of 10,000 to 20,000 MWD/MT-HM as opposed to the low economic worth of an assembly with a burnup of 33,000 to 50,000 MWD/MT-HM can be readily justified by examining Figures 28 and 29. Figure 28 represents the plutonium value as a function of burnup and storage time in a PWR-UO_2 assembly discharged in 1977 from a reactor core, and Figure 29 represents the uranium value as a function of burnup and storage time for the same type of assembly. An analysis of these curves indicates that the spent uranium in a given UO_2 spent fuel assembly has

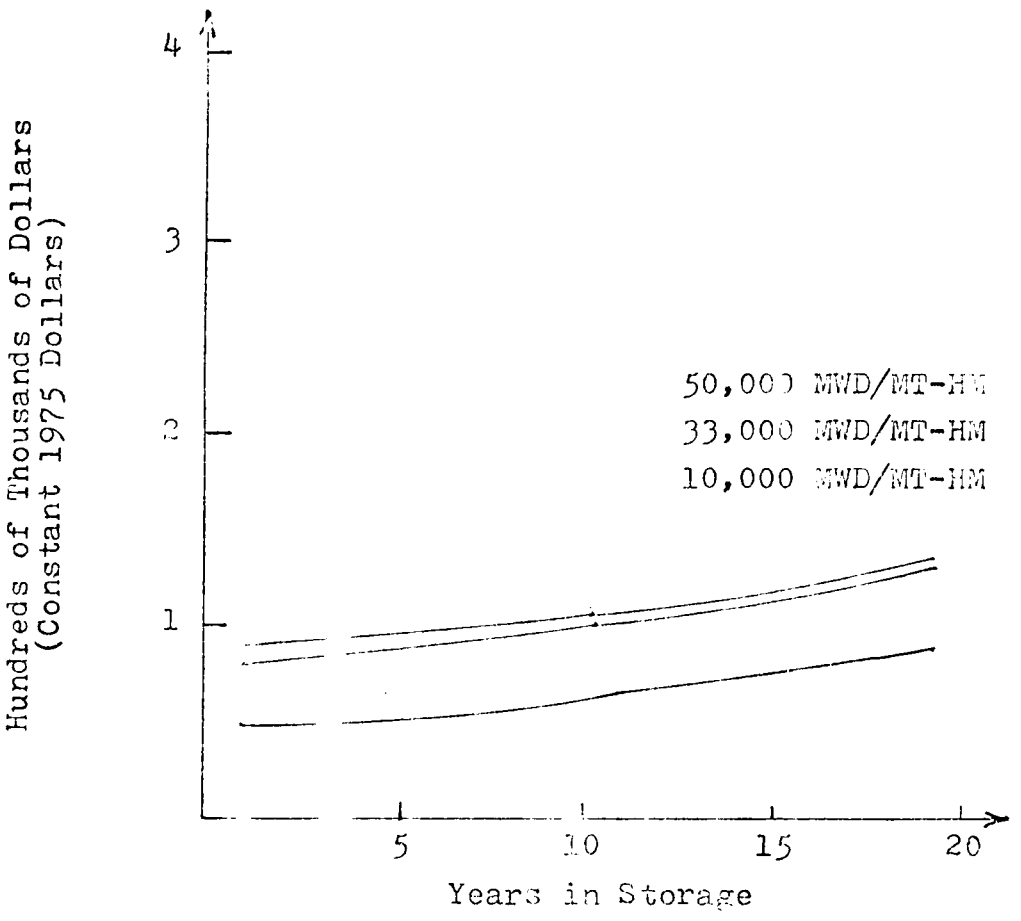


Type of Assembly: PWR-MOX

Date of Discharge from Core: 1977

Mode: Uranium and Plutonium Recycle

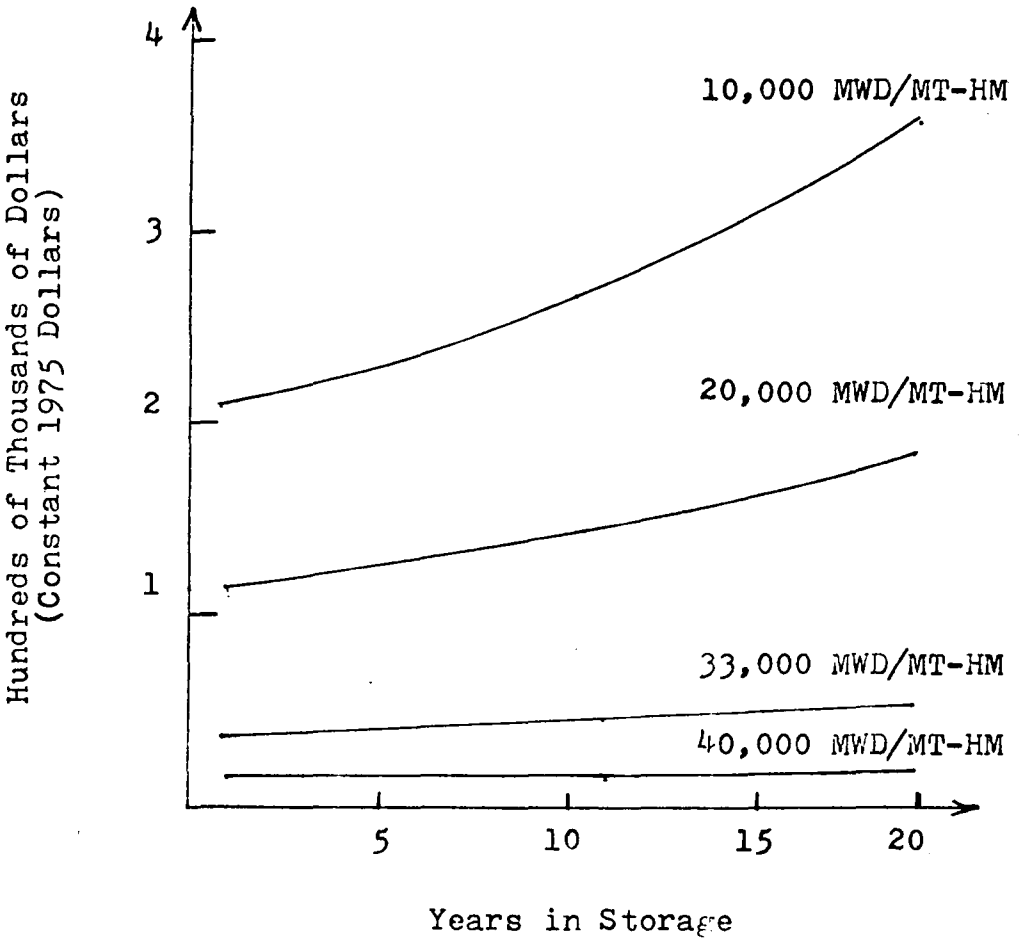
Figure 27 Net Worth of Spent Fuel PWR-MOX Assembly



Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1977

Figure 28 Fissile Plutonium Value in a PWR-UO_2 Spent Fuel Assembly



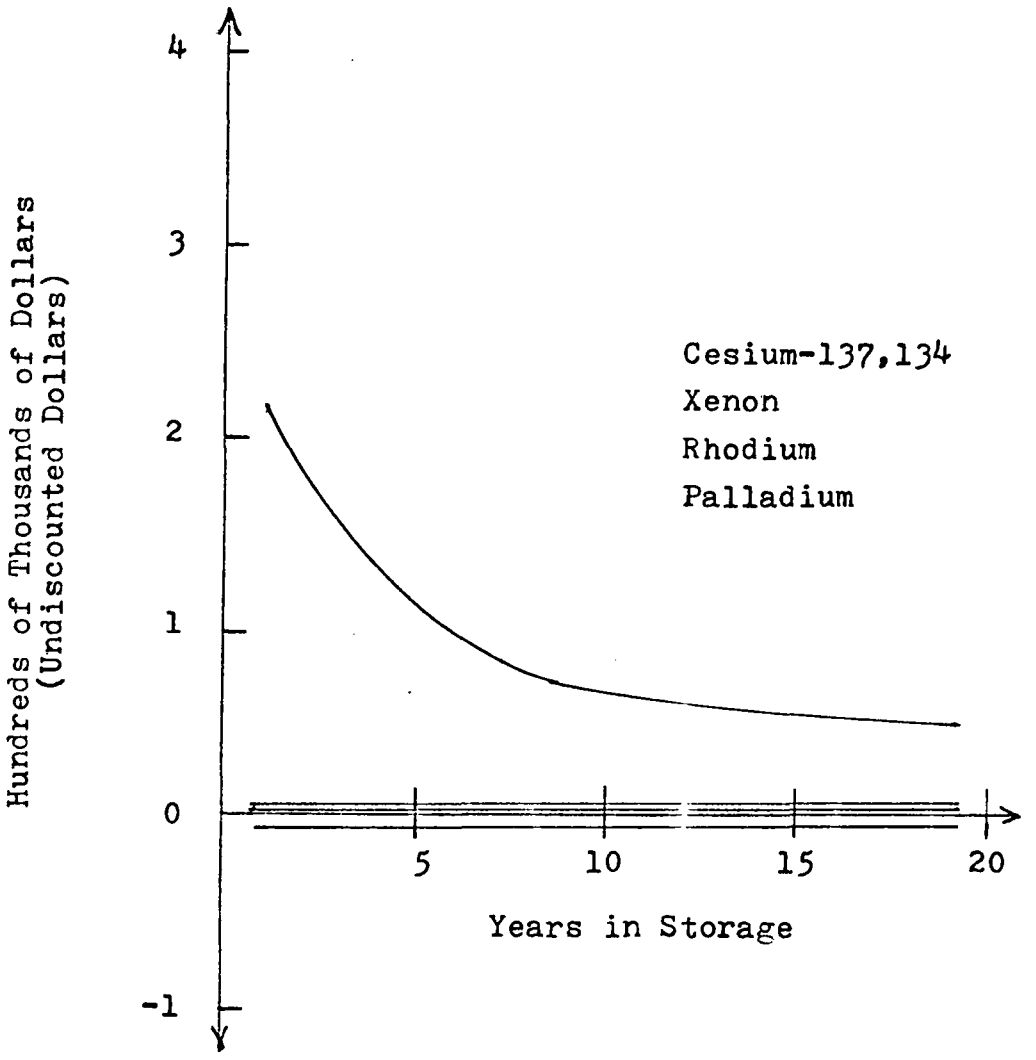
Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1977

Figure 29 Spent Uranium Value in a PWR-UO_2 Spent Fuel Assembly

greater value than the fissile plutonium. Thus, for each given incremental increase in burnup, the decrease in spent uranium value exceeds the increase in the plutonium value in that assembly. This in turn causes a decreasing economic worth of a spent fuel assembly as burnup is increased under uranium and plutonium recycle. An examination of the 10,000 MWD/MT-HM burnup curve on Figure 26 for spent uranium value clearly supports the high worth associated with such a spent fuel assembly on Table 36. The primary reason behind the high growth in spent uranium value is seen by studying Table 19. Table 19 displays spent uranium value in constant 1975 dollars. The price increase in the spent uranium in Table 19 is due solely to real growth in the value of uranium which is due to the increasing demand for a scarce natural resource. The magnitude of the increase in spent uranium value every five years increase considerably as this nation enters the last 15 years of the 20 th century. This in turn causes the concave shape of the net worth curve experienced by a number of spent fuel assemblies generated different years at different burnup levels.

The fission products rhodium, palladium and xenon are either marginally profitable or unprofitable for extraction and sale as shown in figure 30 for a UO_2



Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1977

Burnup: 33,000 MWD/MT-HM

Figure 30 Fission Products Net Worth in a PWR-UO_2 Spent Fuel Assembly

Table 19 . Value of Constituents in PWR-UO_2 Spent Fuel Assembly in Constant 1975 Dollars

CONSTITUENTS*	YEAR					
	1978	1980	1985	1990	1995	2000
SPENT URANIUM	$90.14/KG	93.37	98.78	107.09	118.14	134.85
$PU_{FISSILE}$	$27.85/GR	29.69	34.49	40.84	49.01	59.86
RHODIUM[1]	$15.20/GR	15.20	15.20	15.20	15.20	15.20
PALLADIUM[2]	$ 3.79/GR	3.79	3.79	3.79	3.79	3.79
CESIUM-137,134[3]	$1.73/CURIE	1.73	1.73	1.73	1.73	1.73
XENON[4]	$ 1.70/GR	1.70	1.70	1.70	1.70	1.70

[1]EXTRACTION COST ≈ $10.00/GR

[2]EXTRACTION COST ≈ $10.00/GR

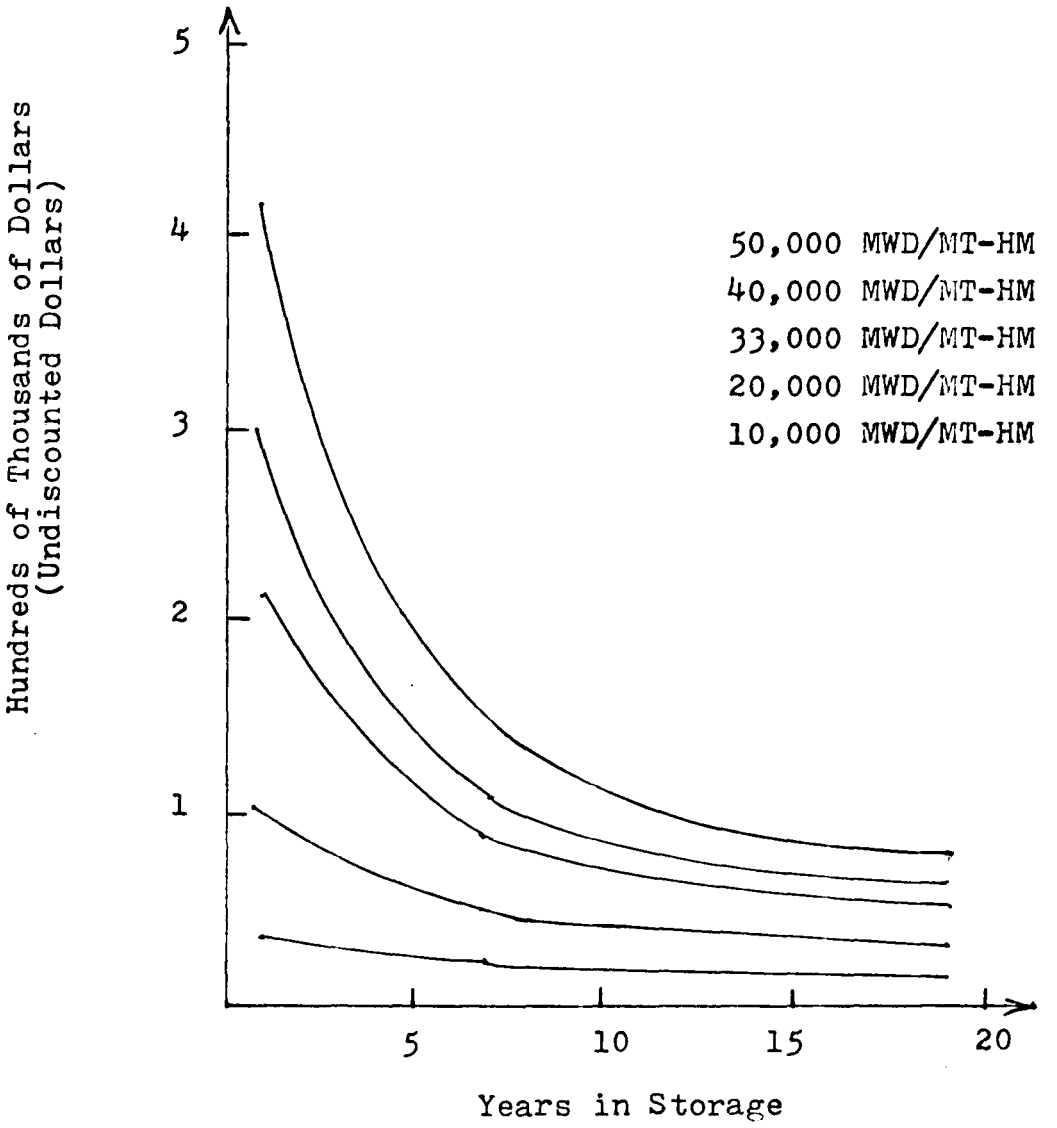
[3]EXTRACTION COST ≈ 10¢/CURIE

[4]EXTRACTION COST ≈ 17¢/GR

*PWR-UO_2 ASSEMBLY, BURNUP-33,000 MWD/MT-HM

assembly. This is true for MOX spent fuel assemblies also. The fission product possessing the highest total value in a UO_2 or MOX spent fuel assembly is Cs-137,134.

A comparison of Tables 36 and 37 supports a number of conclusions. Table 36 displays a PWR-UO_2 assembly discharged in 1977 under plutonium and uranium recycle and Table 37 displays the same assembly under plutonium and uranium recycle with fission product sales. An examination of these two tables reveals the fact that the spent fuel assembly from which fission products are marketed has its highest economic net worth initially at high burnups of 40,000 to 50,000 MWD/MT-HM. As the duration of storage of the spent fuel assembly increases, the high burnup assembly looses its economic worth quickly while the low burnup assembly retains its economic worth. This observation appears reasonable when Figure 31 is analyzed. Figure 28 supports the contention that high burnup assemblies are more sensitive to losses in Cs-137,134 value than assemblies of low burnup. Therefore, the sale of fission products shifts the initial maximum economic worth of an assembly from the low burnup range to the high burnup range; but after a few years of storage the maximum economic worth then reverts permanently to the low burnup range for spent fuel assemblies. This behavior



Type of Assembly: PWR-UO_2

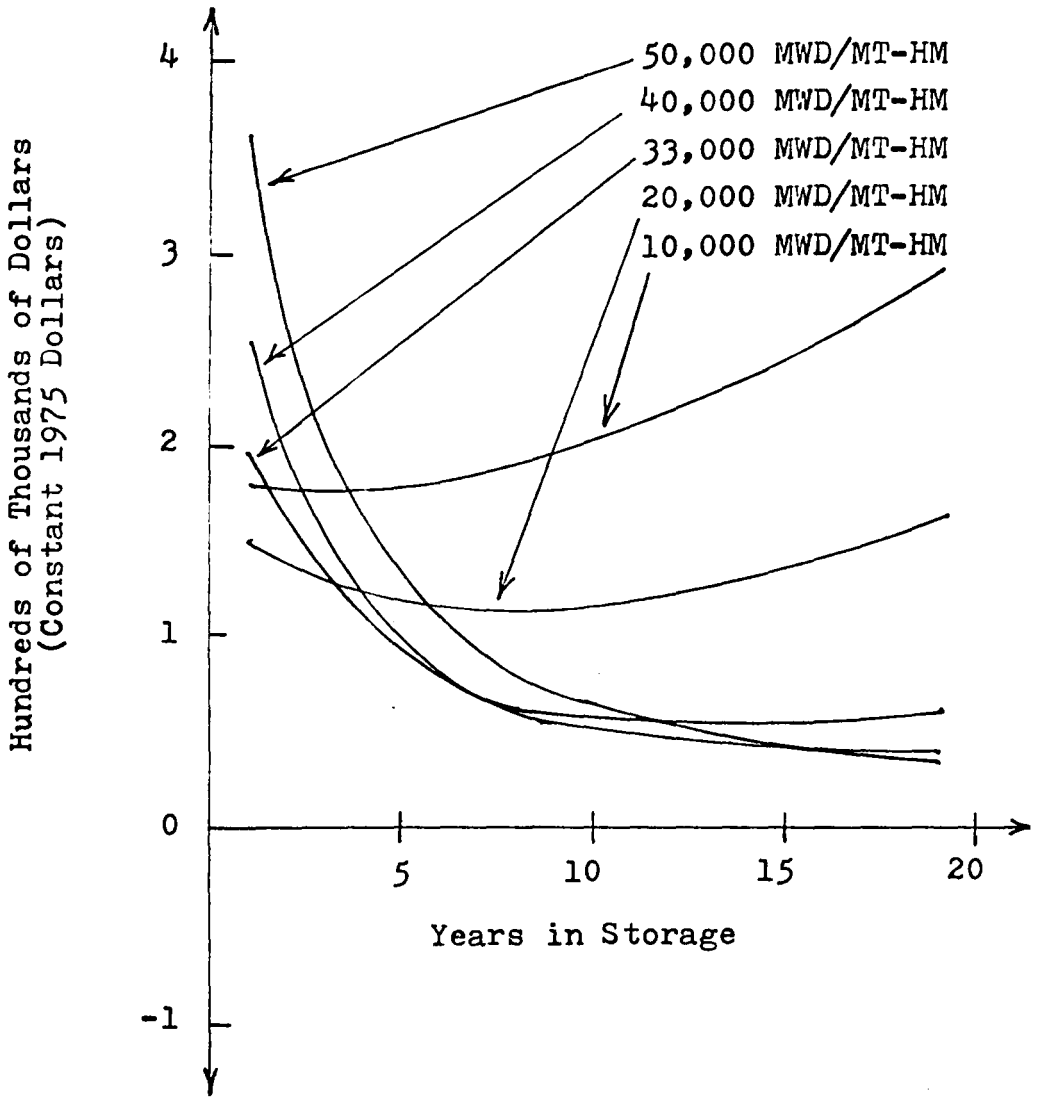
Date of Discharge from Core: 1977

Figure 31 Cesium Net Worth in a PWR-UO_2 Spent Fuel Assembly

holds for PWR-UO_2/MOX, Figures 32 and 33, and BWR-UO_2/MOX spent fuel assemblies. This effect becomes less pronounced as the assemblies are discharged in later years since the fission product worths are calculated in constant 1975 dollars with no real growth in fission product value as a function of time.

A sensitivity analysis was performed on the economic model. The results are shown in Tables 28 to 35, inclusive. An examination of these tables and an analysis of Tables 10 and 11 indicate the relative degree of sensitivity that the model has for changes in various parameters. Maximum model sensitivity is observed for uranium prices followed closely by SWU prices. Intermediate model sensitivity is observed for storage costs, followed in decreasing order of importance by MOX fabrication costs, reprocessing costs, and waste disposal costs. Low model sensitivity is observed for shipping costs of spent fuel and plutonium shipping costs.

Appendix 1 contains spent fuel economic worth charts based upon a 5% real growth in reprocessing, MOX fabrication, storage, shipping, and waste disposal costs. A similar economic analysis for 0% and 10% real growth in the fuel cycle services for a PWR-UO_2 assembly discharged in 1977 under plutonium and uranium recycle with fission

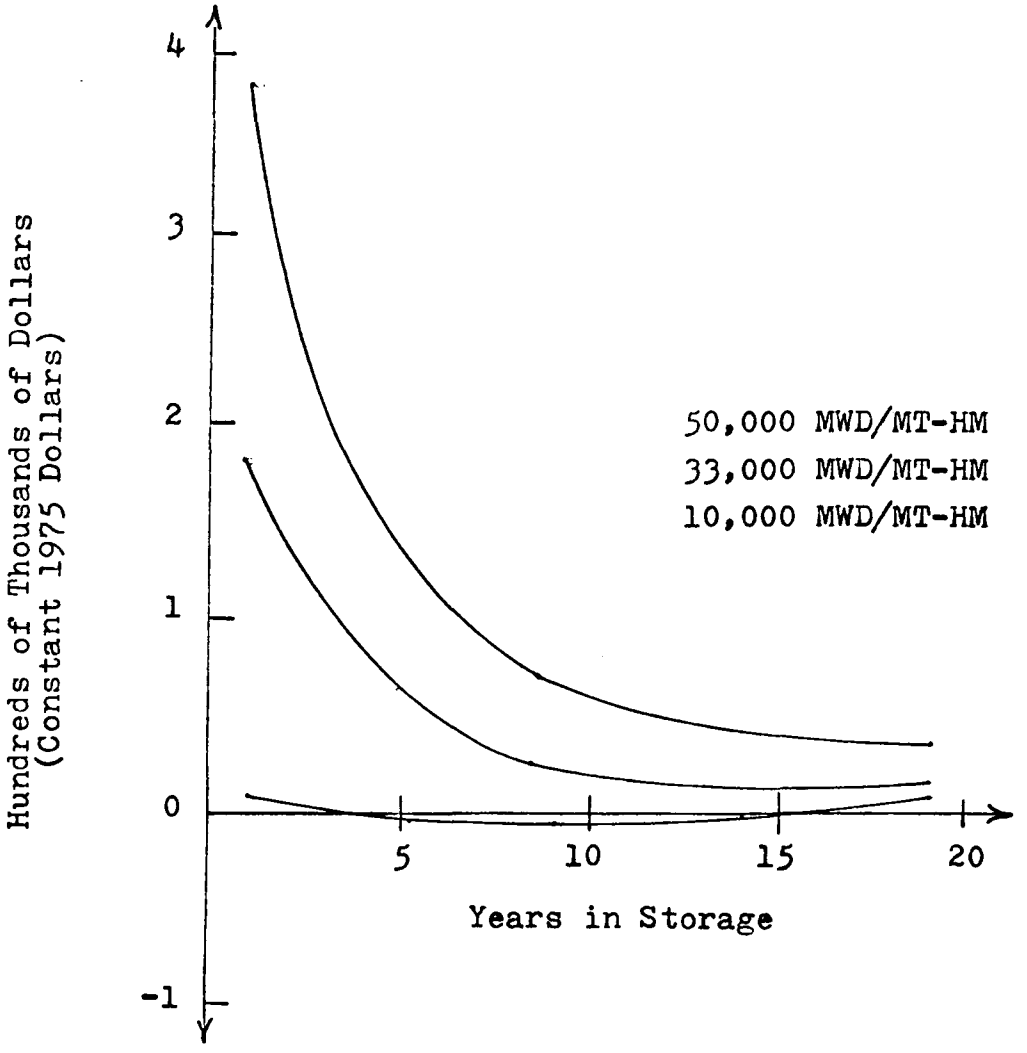


Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1977

Mode: Plutonium and Uranium Recycle with Fission Product Sales

Figure 32 Net Worth of Spent Fuel PWR-UO_2 Assembly



Type of Assembly: PWR-MOX

Date of Discharge from Core: 1977

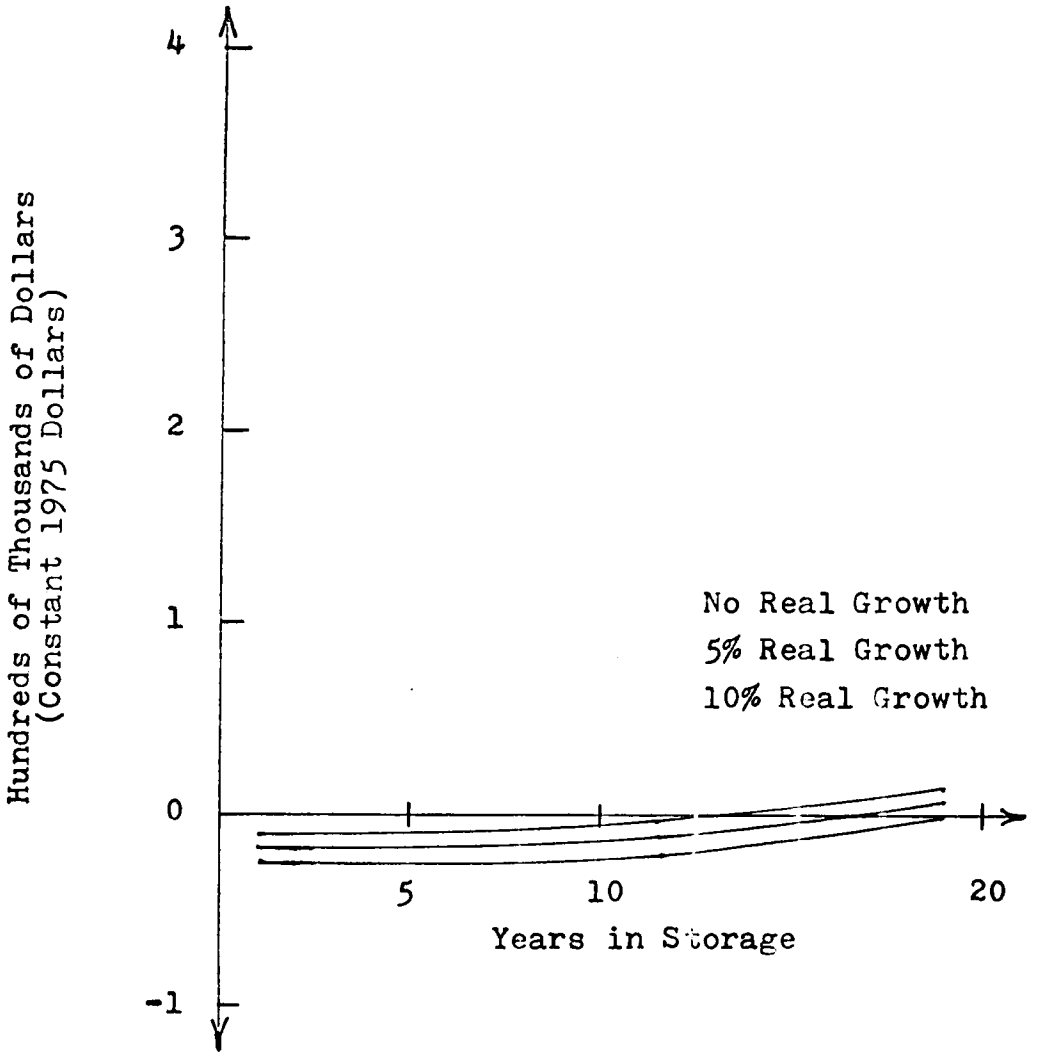
Mode: Uranium and Plutonium Recycle with Fission Product Sales

Figure 33 Net Worth of Spent Fuel PWR-MOX Assembly

product sales is also performed. The results are displayed in Figure 34. An analysis of Figure 34 reveals that a change in the real growth rate for fuel cycle services changes the value of the assembly in a predictable logical manner.

In the base case continued constant real growth for SWU prices and increasing real growth for uranium prices for all time spans are assumed. These assumptions are modified in order to ascertain the effects of limited growths in SWU and uranium prices on the economic net worth curves for a spent fuel assembly, (Figure 35). Case one permits uranium prices to level out at \$88.18/kg.-U_3O_8, constant 1975 dollars with only real growth, at 1988 and remain so till the year 2015. Case two permits SWU prices to level out at \$116.91/kg.-SWU, constant 1975 dollars with only real growth, at 1988 and remain constant. Case three is a combination of cases one and two. A PWR-UO_2 assembly discharged in 1977 under uranium and plutonium recycle is examined. The economic worth curve looses value when SWU prices level out in 1988 and when SWU and uranium prices level out in 1988.

Figures 36 and 37 display the return on investment index (R.O.I.I.) for a PWR assembly under plutonium and uranium recycle discharged from a core in 1977 and 1985,



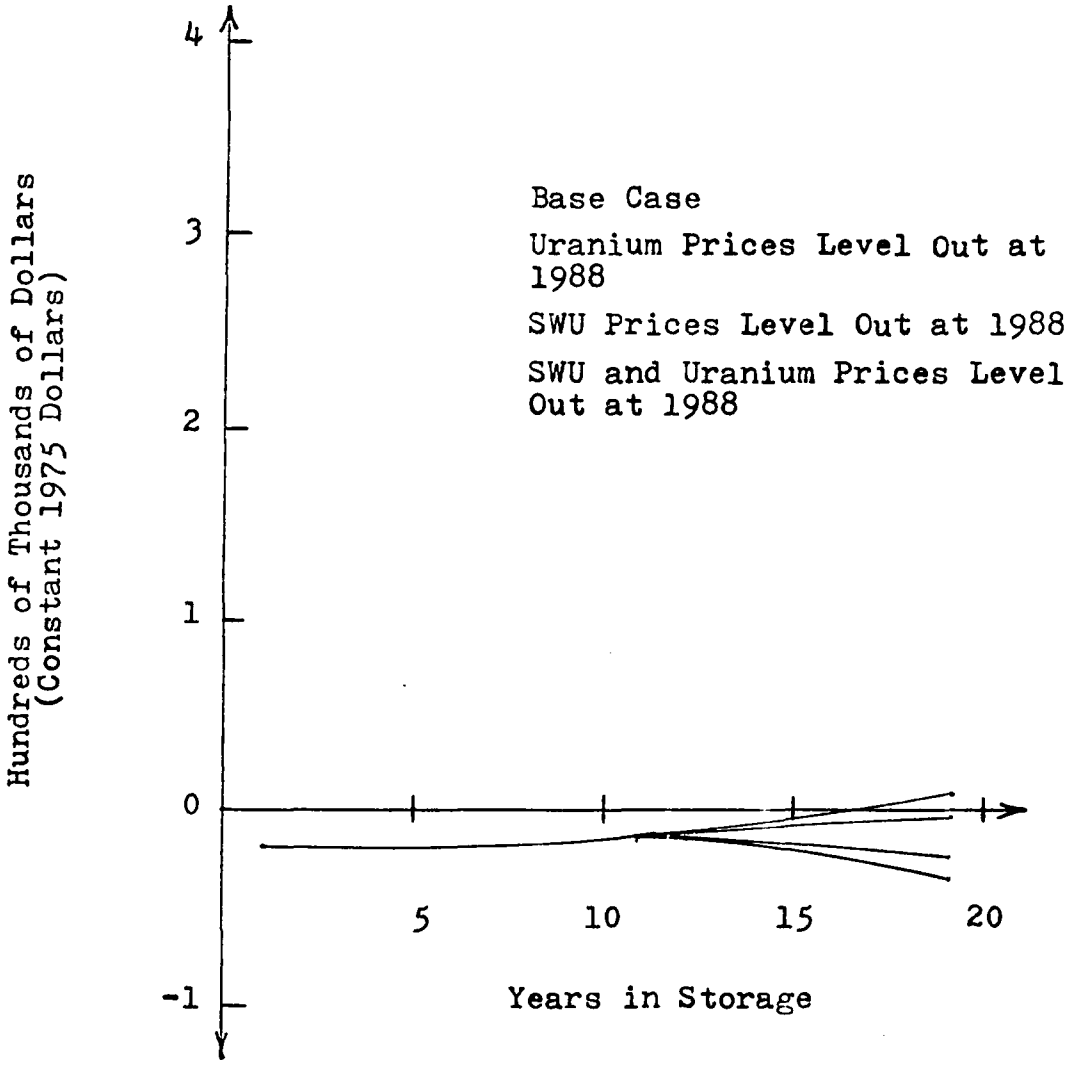
Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1977

Burnup: 33,000 MWD/MT-HM

Mode: Uranium and Plutonium Recycle

Figure 34 Examination of Various Real Growth Rates for Services in the Nuclear Fuel Cycle



Type of Assembly: PWR-UO_2

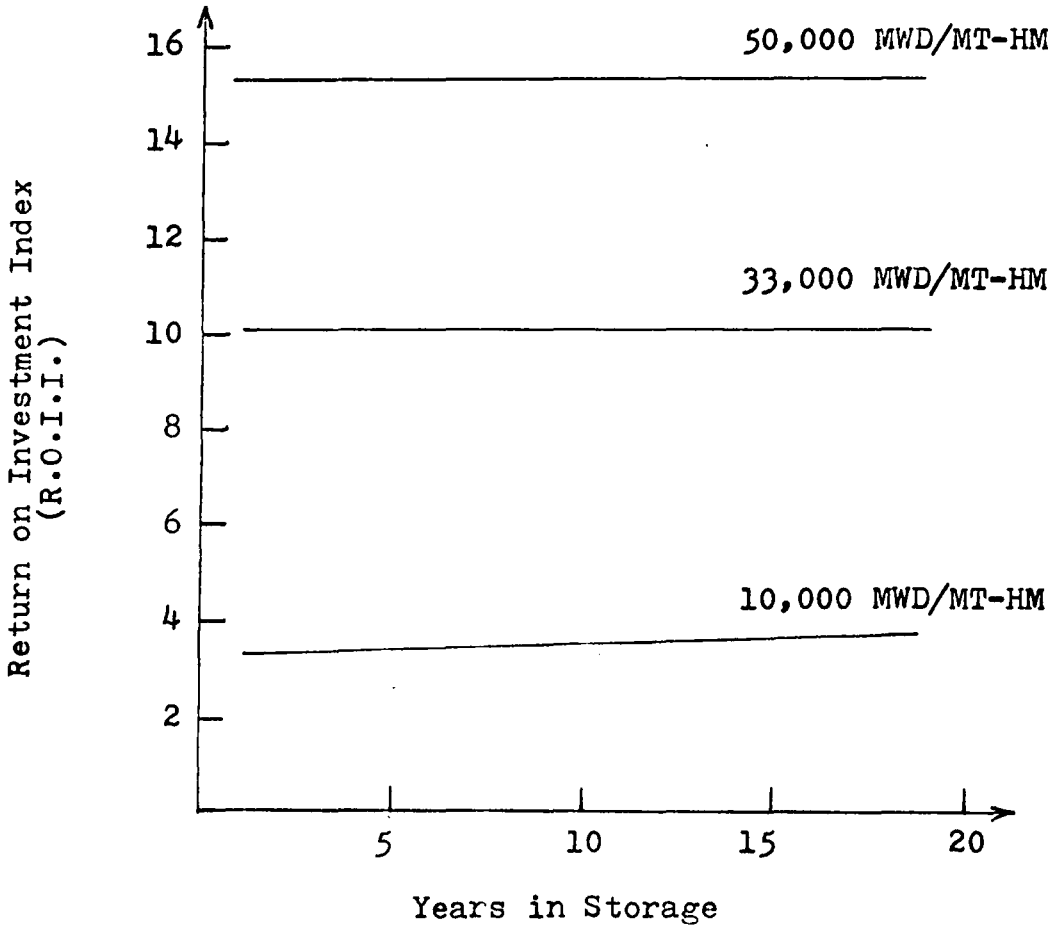
Date of Discharge from Core: 1977

Burnup: 33,000 MWD/MT-HM

Mode: Uranium and Plutonium Recycle

Figure 35 Comparison of Leveling Out of Uranium and SWU Price Real Growths at 1988

respectively. These curves clearly indicate that the public utility should burn their fuel assemblies to the highest level possible in order to maximize their total revenues from electricity sales and spent fuel recycling. These two figures indicate that the value of the electricity is more important than the value of the constituents when formulating a spent fuel management policy.

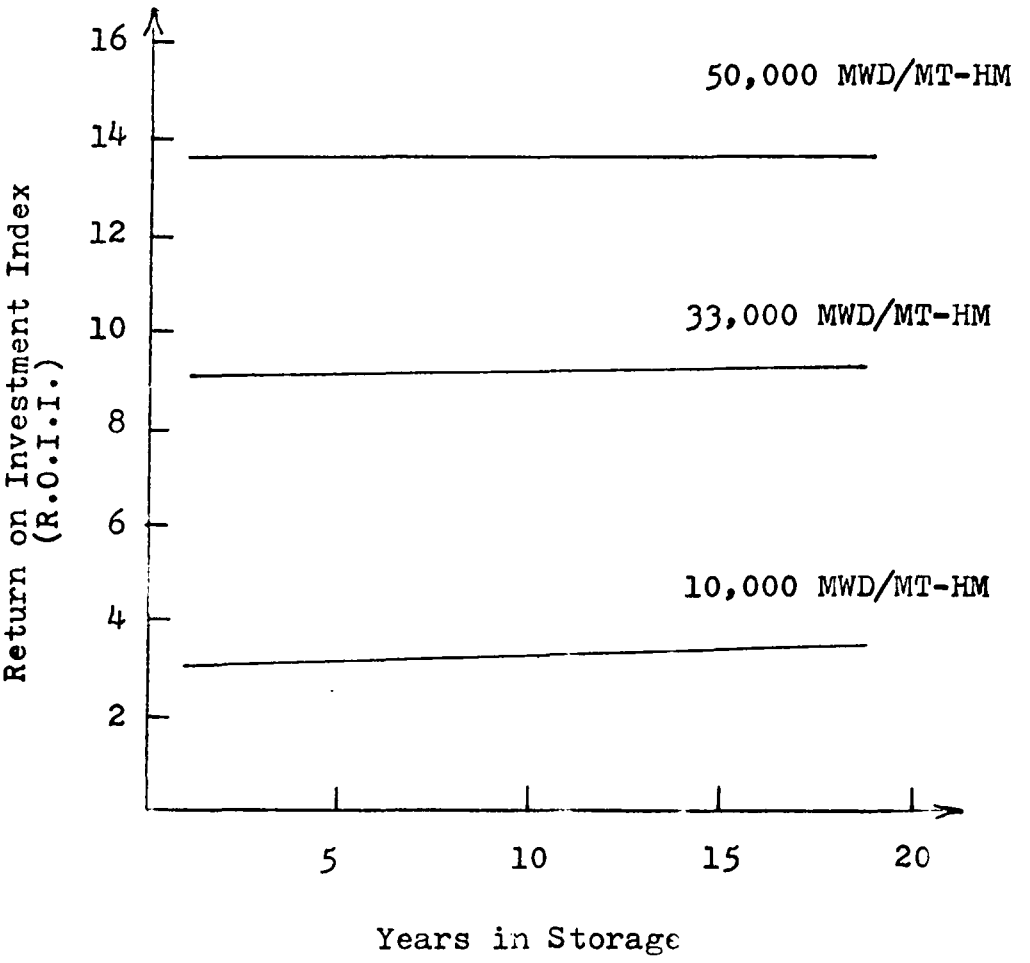


Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1977

Mode: Uranium and Plutonium Recycle

Figure 36 Return on Investment Index (R.O.I.I.) for a PWR-UO_2 Spent Fuel Assembly



Type of Assembly: PWR-UO_2

Date of Discharge from Core: 1985

Mode: Uranium and Plutonium Recycle

Figure 37 Return on Investment Index (R.O.I.I.) for a PWR-UO_2 Spent Fuel Assembly

X. CONCLUSIONS

Four major conclusions are drawen from this study. A re-examination of the value of recycling materials other than uranium and plutonium, namely cesium-137,134, rhodium, palladium and xenon is justified. The utilization of cesium-137,134 can reduce the annual importation of oil by 47.4 million barrels. The extraction of rhodium and palladium from the fission products can create a stable supply of these precious and rare metals. The magnitude of the net positive profit obtainable from the recycling of spent nuclear fuel are tied primarily to burnup and the decision to recycle fission products. Thirdly, under fission product recycle any burnup yields a net positive worth with the greatest worths being at high burnups. Fourthly, under no fission product recycle the recycling of spent uranium and plutonium is marginally profitable or unprofitable. The primary major conclusion of this study is that the fission products are not a liability but a major potential national asset in the age of ever increasing oil prices and increasing dependence on foreign oil.

XI. RECOMMENDATIONS FOR FUTURE WORK

Future work in the area of this study is justified based upon the high potential value of the fission products and the lack of agreeent in the government over a closure alternative for the nuclear fuel cycle.

The economic model should be re-solved on the computer using the fission product cost extraction data from the EXXON Nuclear Company study since EXXON's data is based upon a conceptual design effort. A more intense effort should also be directed at establishing fuel cycle service charges for various services. This can be done most realistically by examining French and British literature, since a complete operational fuel cycle exists in these countries. Care must be used in using British or French fuel cycle costs since these countries might have different regulations for services rendered in nuclear fuel cycle operations. The economic model should also be re-solved for various other closure alternatives such as fuel rejuvination, extended burnup, tandem and thorium cycles. This effort would reveal the economic incentives associated with various fuel cycle closure alternatives and help facilitate the choice by the government of a proper alternative.

The isotopic content of spent uranium should be examined more closely since it differs considerably from the isotopic content of natural uranium, (Figure 38). In this study the effect of the buildup of U-236 in spent uranium is ignored. U-236 is a neutron absorber and thus would require additional U-235 atoms to overcome this neutronic poison. It is important to note that U-236 does not occur in nature. The effects of recycled spent uranium on gaseous cascade diffusion and ultra-centrifuge plant enrichment operations should also be examined and incorporated into the economic model. The isotopic content of multirecycled spent uranium and its effect on enrichment operations and fissile atom requirements of a nuclear reactor should be examined.

The variation of the isotopic content of plutonium as a function of burnup deserves closer attention, (Figure 39). The quantity of neutronic poisons, such as Pu-240, 238 and 242 and fissile isotopes such as Pu-239 and 241 increase in spent fuel as burnup increases. In this study the buildup of the poisons is ignored and no attempt was made to assign plutonium a value based on the relative quantities of these various isotopes in plutonium. The economic model should be resolved using values of plutonium which reflect the concentration of the various

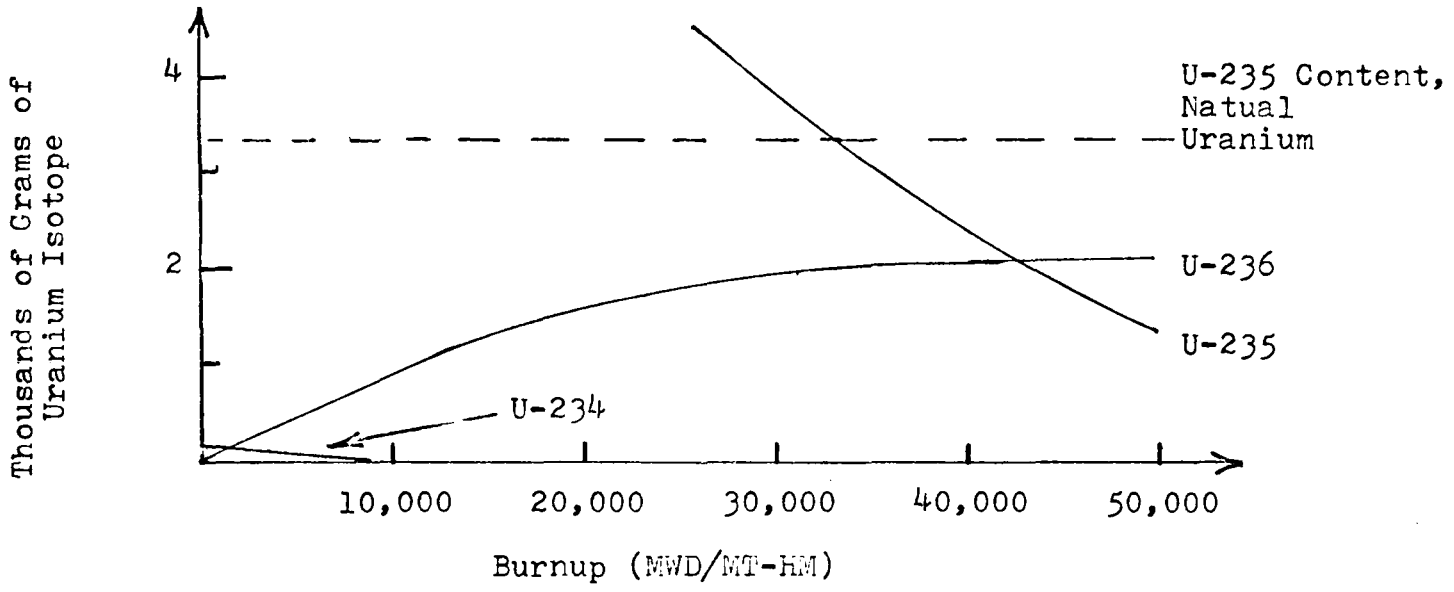


Figure 38 Uranium Isotopic Content in a Spent PWR-UO_2 Assembly

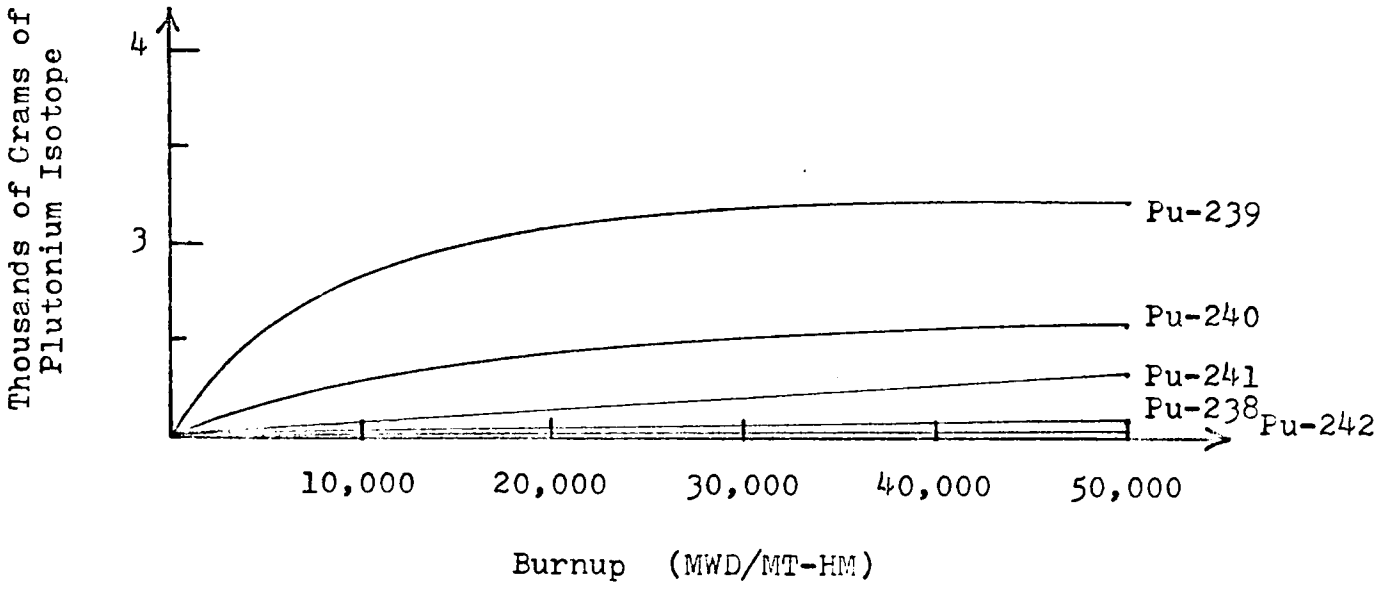


Figure 39 Plutonium Isotopic Content in Spent PWR-UO_2 Assembly

fissile/neutron absorber isotopes in plutonium. The composition of the multirecycled plutonium should be examined.

In conclusion, the future work in this area can be concentrated on 4 topics. They are: (1) economic modeling of various fuel cycle closure alternatives; (2) resolving the economic model with more reliable cost data; (3) greater effort in establishing the effects of recycled and multi-recycled spent uranium on various types of enrichment operations and nuclear power plant fissile atom requirements; and (4) the assignment of a value to recycled and multirecycled plutonium based upon the relative concentrations of its fissile/neutron aborber atoms.

Appendix 1

Tables from Economic Model

TABLE 20 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	15722.	-15727.	-37153.	-42379.	-43428.
2.0	16222.	-16138.	-38098.	-43395.	-44415.
3.0	16882.	-16473.	-39025.	-44406.	-45402.
4.0	17343.	-16930.	-40003.	-45439.	-46389.
5.0	17853.	-17373.	-40986.	-46476.	-47376.
6.0	18291.	-17870.	-41997.	-47525.	-48363.
7.0	18659.	-18420.	-43036.	-48588.	-49350.
8.0	19211.	-18885.	-44055.	-49647.	-50337.
9.0	20182.	-19135.	-45010.	-50684.	-51324.
10.0	21092.	-19435.	-45994.	-51735.	-52311.
11.0	22067.	-19716.	-46933.	-52792.	-53298.
12.0	23114.	-19980.	-47978.	-53854.	-54285.
13.0	24227.	-20225.	-48980.	-54922.	-55272.
14.0	25414.	-20450.	-49988.	-55997.	-56259.
15.0	27290.	-20318.	-50886.	-57034.	-57246.
16.0	28644.	-20496.	-51908.	-58122.	-58233.
17.0	30078.	-20654.	-52938.	-59217.	-59220.
18.0	32213.	-20452.	-53859.	-60207.	-60207.
19.0	34448.	-20220.	-54787.	-61194.	-61194.

TABLE 21 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	30398.	23741.	48234.	72877.	118683.
2.0	29192.	17060.	31205.	49030.	84029.
3.0	28569.	12103.	18525.	31374.	58549.
4.0	28054.	8213.	8912.	18149.	39669.
5.0	27807.	5193.	1541.	8126.	25541.
6.0	27649.	2737.	-4240.	401.	14836.
7.0	27539.	675.	-8881.	-5672.	6598.
8.0	27696.	-977.	-12660.	-10538.	140.
9.0	28334.	-2180.	-15763.	-14514.	-5034.
10.0	28958.	-3263.	-18453.	-17875.	-9277.
11.0	29579.	-4202.	-20827.	-20783.	-12846.
12.0	30500.	-5028.	-22970.	-23365.	-15926.
13.0	31405.	-5769.	-24949.	-25709.	-18647.
14.0	32399.	-6439.	-26807.	-27880.	-21107.
15.0	34094.	-6713.	-28459.	-29880.	-23372.
16.0	35275.	-7267.	-30164.	-31832.	-25493.
17.0	36545.	-7777.	-31823.	-33715.	-27505.
18.0	38523.	-7909.	-33329.	-35435.	-29434.
19.0	40606.	-7996.	-34809.	-37106.	-31300.

TABLE 22 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	30099.	3777.	-15021.	-19680.	-20378.
2.0	31300.	4253.	-15033.	-19760.	-20433.
3.0	32718.	4879.	-14946.	-19755.	-20407.
4.0	33902.	5333.	-14971.	-19835.	-20445.
5.0	35165.	5837.	-14962.	-19880.	-20446.
6.0	36355.	6284.	-14988.	-19946.	-20456.
7.0	37478.	6679.	-15046.	-20030.	-20470.
8.0	38852.	7246.	-14988.	-20013.	-20388.
9.0	40774.	8197.	-14681.	-19787.	-20118.
10.0	42642.	9103.	-14401.	-19574.	-19846.
11.0	44615.	10078.	-14074.	-19314.	-19523.
12.0	46704.	11128.	-13695.	-19003.	-19144.
13.0	48902.	12248.	-13268.	-18642.	-18710.
14.0	51220.	13446.	-12787.	-18227.	-18215.
15.0	54432.	15268.	-11907.	-17484.	-17428.
16.0	57018.	16640.	-11307.	-16950.	-16892.
17.0	59737.	18099.	-10647.	-16356.	-16109.
18.0	63369.	20192.	-9582.	-15358.	-15116.
19.0	67163.	22390.	-8445.	-14278.	-14045.

TABLE 23 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	44774.	43245.	70366.	95577.	141733.
2.0	44269.	37451.	54270.	72665.	108012.
3.0	44405.	33456.	42604.	56025.	83544.
4.0	44612.	30476.	33944.	43753.	65612.
5.0	45119.	28403.	27565.	34722.	52471.
6.0	45714.	26892.	22769.	27980.	42744.
7.0	46357.	25774.	19109.	22887.	35478.
8.0	47337.	25154.	16407.	19096.	30089.
9.0	48926.	25152.	14566.	16383.	26173.
10.0	50508.	25276.	13140.	14287.	23188.
11.0	52228.	25594.	12083.	12695.	20928.
12.0	54090.	26079.	11312.	11487.	19215.
13.0	56080.	26703.	10762.	10571.	17915.
14.0	58205.	27457.	10394.	9890.	16937.
15.0	61236.	28873.	10520.	9670.	16446.
16.0	63650.	29869.	10437.	9340.	15938.
17.0	66205.	30975.	10468.	9146.	15606.
18.0	69679.	32735.	10948.	9415.	15657.
19.0	73321.	34614.	11532.	9810.	15849.

TABLE 24 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-9211.	-16626.	-16594.	-19153.	-19715.
2.0	-9083.	-16605.	-18614.	-19185.	-19762.
3.0	-8843.	-16494.	-18549.	-19133.	-19727.
4.0	-8734.	-16462.	-18556.	-19150.	-19759.
5.0	-8585.	-16390.	-18524.	-19129.	-19753.
6.0	-8476.	-16331.	-18502.	-19118.	-19756.
7.0	-8403.	-16281.	-18488.	-19113.	-19765.
8.0	-8197.	-16123.	-18372.	-19009.	-19677.
9.0	-7706.	-15754.	-18057.	-18708.	-19396.
10.0	-7244.	-15388.	-17742.	-18408.	-19116.
11.0	-6729.	-14967.	-17375.	-18056.	-18783.
12.0	-6154.	-14485.	-16950.	-17646.	-18394.
13.0	-5523.	-13945.	-16467.	-17179.	-17950.
14.0	-4830.	-13341.	-15923.	-16652.	-17445.
15.0	-3687.	-12410.	-15071.	-15821.	-16642.
16.0	-2356.	-11666.	-14392.	-15160.	-16005.
17.0	-1955.	-10849.	-13642.	-14429.	-15300.
18.0	-600.	-9700.	-12579.	-13388.	-14291.
19.0	836.	-8469.	-11435.	-12269.	-13204.

TABLE 25 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	5609.	24098.	69556.	98922.	143762.
2.0	4085.	17703.	52976.	75587.	110012.
3.0	3080.	13083.	40942.	58652.	85527.
4.0	2237.	9600.	32048.	46194.	67581.
5.0	1645.	7033.	25507.	37047.	54431.
6.0	1167.	5085.	20622.	30249.	44698.
7.0	765.	3585.	16932.	25146.	37427.
8.0	578.	2523.	14213.	21369.	32037.
9.0	736.	1914.	12322.	18676.	28125.
10.0	908.	1477.	10885.	16625.	25143.
11.0	1167.	1223.	9832.	15093.	22889.
12.0	1511.	1124.	9080.	13958.	21181.
13.0	1929.	1153.	8562.	13128.	19888.
14.0	2425.	1299.	8237.	12542.	18917.
15.0	3381.	1811.	8313.	12396.	18438.
16.0	4035.	2168.	8299.	12180.	17938.
17.0	4766.	2621.	8406.	12112.	17615.
18.0	5953.	3425.	8872.	12413.	17679.
19.0	7236.	4328.	9451.	12838.	17885.

TABLE 26 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	105921.	10136.	-66830.	-90038.	-106338.
2.0	109186.	10524.	-68594.	-92335.	-108819.
3.0	113023.	11230.	-70247.	-94585.	-111295.
4.0	116229.	11514.	-72116.	-96965.	-113752.
5.0	119636.	11883.	-73978.	-99355.	-116172.
6.0	122842.	12090.	-75946.	-101816.	-118592.
7.0	125859.	12141.	-78017.	-104349.	-121013.
8.0	129534.	12552.	-79966.	-106830.	-123433.
9.0	134662.	13808.	-81584.	-109144.	-125853.
10.0	139636.	14921.	-83304.	-111532.	-128273.
11.0	144376.	16149.	-85017.	-113934.	-130694.
12.0	150416.	17507.	-86718.	-116347.	-133114.
13.0	156232.	18980.	-88415.	-118778.	-135534.
14.0	162357.	20585.	-90103.	-121224.	-137954.
15.0	170856.	23583.	-91232.	-123384.	-140375.
16.0	177665.	25483.	-92896.	-125861.	-142795.
17.0	184815.	27524.	-94556.	-128359.	-145215.
18.0	194383.	30981.	-95655.	-130574.	-147635.
19.0	204376.	34617.	-96737.	-132806.	-150056.

TABLE 27 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	142789.	108455.	147763.	202220.	310671.
2.0	141991.	93790.	106313.	142716.	222090.
3.0	142768.	83392.	75661.	98771.	157000.
4.0	143639.	75420.	52489.	65860.	108830.
5.0	145234.	69585.	34865.	40978.	72862.
6.0	147008.	65070.	21131.	21816.	45657.
7.0	148868.	61470.	10175.	6760.	24767.
8.0	151588.	59006.	1422.	-5232.	8432.
9.0	155909.	57951.	-5493.	-14879.	-4615.
10.0	160183.	57164.	-11420.	-23021.	-15283.
11.0	164805.	56791.	-16544.	-30032.	-24227.
12.0	169788.	56771.	-21076.	-36220.	-31917.
13.0	175093.	57030.	-25180.	-41816.	-38694.
14.0	180743.	57545.	-28960.	-46979.	-44801.
15.0	188794.	59546.	-31947.	-51523.	-50413.
16.0	195180.	60521.	-35293.	-56134.	-55657.
17.0	201923.	61694.	-38499.	-60578.	-60625.
18.0	211107.	64328.	-41040.	-64593.	-65382.
19.0	220719.	67179.	-43482.	-68512.	-69977.

TABLE 28 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP	:	33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY	:	PWR-URANIUM DIOXIDE
MODE	:	U AND PU RECYCLE
YEAR DISCHARGED FROM CORE	:	1977
PARAMETER UNDER EXAMINATION	:	URANIUM PRICES
PARAMETER VALUES LOW	:	75% OF REFERENCE
REFERENCE	:	SEE THESIS
HIGH	:	200 % OF REFERENCE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)		
	LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-38024.	-18071.	61743.
2.0	-37848.	-17689.	62947.
3.0	-37433.	-17013.	64665.
4.0	-37265.	-16694.	65589.
5.0	-37005.	-16281.	66613.
6.0	-36813.	-15990.	67304.
7.0	-36682.	-15812.	67669.
8.0	-36271.	-15294.	68611.
9.0	-35264.	-14019.	70961.
10.0	-34302.	-12842.	72998.
11.0	-33215.	-11539.	75167.
12.0	-31990.	-10093.	77492.
13.0	-30633.	-8518.	79941.
14.0	-29131.	-6797.	82542.
15.0	-26672.	-3849.	87444.
16.0	-24850.	-1803.	90385.
17.0	-22865.	404.	93481.
18.0	-19903.	3856.	98892.
19.0	-16749.	7503.	104507.

TABLE 29 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP	:	33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY	:	PWR-URANIUM DIOXIDE
MODE	:	U AND PU RECYCLE
YEAR DISCHARGED FROM CORE	:	1977
PARAMETER UNDER EXAMINATION	:	SWU PRICES
PARAMETER VALUES LOW	:	75% OF REFERENCE
REFERENCE	:	SEE THESIS
HIGH	:	200% OF REFERENCE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-28333.	-18071.	22978.
2.0	-28389.	-17689.	25112.
3.0	-28173.	-17013.	27627.
4.0	-28337.	-16694.	29877.
5.0	-28430.	-16281.	32315.
6.0	-28670.	-15990.	34733.
7.0	-29050.	-15812.	37143.
8.0	-29119.	-15294.	40003.
9.0	-28458.	-14019.	43738.
10.0	-27926.	-12842.	47496.
11.0	-27300.	-11539.	51508.
12.0	-26566.	-10093.	55798.
13.0	-25738.	-8518.	60358.
14.0	-24799.	-6797.	65214.
15.0	-22674.	-3849.	71452.
16.0	-21491.	-1803.	76951.
17.0	-20191.	404.	82784.
18.0	-17690.	3856.	90042.
19.0	-15043.	7503.	97684.

TABLE 30 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP		: 33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY		: PWR-URANIUM DIOXIDE
MODE		: U AND PU RECYCLE
YEAR DISCHARGED FROM CORE		: 1977
PARAMETER UNDER EXAMINATION		: STORAGE COST
PARAMETER VALUES	LOW	: $2.00/KG-HM-YR
	REFERENCE	: $5.00/KG-HM-YR
	HIGH	: $10.00/KG-HM-YR

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)		
	LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-16619.	-18071.	-20491.
2.0	-14785.	-17689.	-22529.
3.0	-12657.	-17013.	-24274.
4.0	-10385.	-16694.	-26375.
5.0	-9020.	-16281.	-28382.
6.0	-7277.	-15990.	-30511.
7.0	-5647.	-15812.	-32753.
8.0	-3677.	-15294.	-34656.
9.0	-949.	-14019.	-35801.
10.0	1680.	-12842.	-37044.
11.0	4435.	-11539.	-38161.
12.0	7332.	-10093.	-39136.
13.0	10360.	-8518.	-39982.
14.0	13534.	-6797.	-40680.
15.0	17934.	-3849.	-40153.
16.0	21432.	-1803.	-40527.
17.0	25091.	404.	-40740.
18.0	29995.	3856.	-39709.
19.0	35093.	7503.	-38482.

TABLE 31 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP		: 33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY		: PWR-URANIUM DIOXIDE
MODE		: U AND PU RECYCLE
YEAR DISCHARGED FROM CORE		: 1977
PARAMETER UNDER EXAMINATION		: SHIPPING COST
PARAMETER VALUES	LOW	: $10.00/KG-HM
	REFERENCE	: $15.00/KG-HM
	HIGH	: $20.00/KG-HM

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)		
	LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-15651.	-18071.	-20491.
2.0	-15269.	-17689.	-20109.
3.0	-14593.	-17013.	-19434.
4.0	-14274.	-16694.	-19114.
5.0	-13861.	-16281.	-18701.
6.0	-13569.	-15990.	-18410.
7.0	-13391.	-15812.	-18232.
8.0	-12874.	-15294.	-17715.
9.0	-11598.	-14019.	-16439.
10.0	-10421.	-12842.	-15262.
11.0	-9118.	-11539.	-13959.
12.0	-7673.	-10093.	-12514.
13.0	-6093.	-8518.	-10939.
14.0	-4376.	-6797.	-9217.
15.0	-1429.	-3849.	-6269.
16.0	617.	-1803.	-4223.
17.0	2824.	404.	-2016.
18.0	6276.	3856.	1436.
19.0	9923.	7503.	5082.

TABLE 32 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP		: 33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY		: PWR-URANIUM DIOXIDE
MODE		: U AND PU RECYCLE
YEAR DISCHARGED FROM CORE		: 1977
PARAMETER UNDER EXAMINATION		: REPROCESSING COST
PARAMETER VALUES	LOW	: $110.00/KG-HM
	REFERENCE	: $150.00/KG-HM
	HIGH	: $190.00/KG-HM

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)		
	LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	1291.	-18071.	-37433.
2.0	1673.	-17689.	-37051.
3.0	2349.	-17013.	-36375.
4.0	2668.	-16694.	-36056.
5.0	3081.	-16281.	-35643.
6.0	3372.	-15990.	-35352.
7.0	3550.	-15812.	-35174.
8.0	4068.	-15294.	-34656.
9.0	5343.	-14019.	-33381.
10.0	6520.	-12842.	-32204.
11.0	7823.	-11539.	-30901.
12.0	9269.	-10093.	-29455.
13.0	10844.	-8518.	-27880.
14.0	12565.	-6797.	-26159.
15.0	15513.	-3849.	-23211.
16.0	17559.	-1803.	-21165.
17.0	19766.	404.	-18958.
18.0	23218.	3856.	-15506.
19.0	26865.	7503.	-11859.

TABLE 33 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP	:	33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY	:	PWR-URANIUM DIOXIDE
MODE	:	U AND PU RECYCLE
YEAR DISCHARGED FROM CORE	:	1977
PARAMETER UNDER EXAMINATION	:	MOX FAB. COST
PARAMETER VALUES LOW	:	$150.00/KG-HM
REFERENCE	:	$200.00/KG-HM
HIGH	:	$300.00/KG-HM

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-3458.	-18071.	-47293.
2.0	-3133.	-17689.	-46702.
3.0	-2609.	-17013.	-45822.
4.0	-2338.	-16694.	-45307.
5.0	-2063.	-16281.	-44708.
6.0	-1865.	-15990.	-44238.
7.0	-1772.	-15812.	-43890.
8.0	-1336.	-15294.	-43210.
9.0	-138.	-14019.	-41780.
10.0	965.	-12842.	-40455.
11.0	2197.	-11539.	-39010.
12.0	3575.	-10093.	-37430.
13.0	5086.	-8518.	-35726.
14.0	6746.	-6797.	-33882.
15.0	9635.	-3649.	-30816.
16.0	11625.	-1803.	-28658.
17.0	13773.	404.	-26344.
18.0	17179.	3856.	-22790.
19.0	20777.	7503.	-19046.

TABLE 34 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP	:	33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY	:	PWR-URANIUM DIOXIDE
MODE	:	U AND PU RECYCLE
YEAR DISCHARGED FROM CORE	:	1977
PARAMETER UNDER EXAMINATION	:	WASTE DISPOSAL COST
PARAMETER VALUES LOW	:	$30.00/KG-HM
REFERENCE	:	$50.00/KG-HM
HIGH	:	$70.00/KG-HM

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-8390.	-18071.	-27752.
2.0	-8008.	-17689.	-27370.
3.0	-7332.	-17013.	-26694.
4.0	-7013.	-16694.	-26375.
5.0	-6600.	-16281.	-25962.
6.0	-6309.	-15990.	-25671.
7.0	-6131.	-15812.	-25493.
8.0	-5613.	-15294.	-24975.
9.0	-4338.	-14019.	-23700.
10.0	-3161.	-12842.	-22523.
11.0	-1858.	-11539.	-21220.
12.0	-412.	-10093.	-19774.
13.0	1163.	-8518.	-18199.
14.0	2884.	-6797.	-16478.
15.0	5832.	-3849.	-13530.
16.0	7678.	-1803.	-11484.
17.0	10035.	404.	-9277.
18.0	13537.	3856.	-5825.
19.0	17184.	7503.	-2178.

TABLE 35 SPENT FUEL WORTH SENSITIVITY ANALYSIS

BURNUP		: 33,000 MWD/MT-HM
TYPE OF FUEL ASSEMBLY		: PWR-URANIUM DIOXIDE
MODE		: U AND PU RECYCLE
YEAR DISCHARGED FROM CORE		: 1977
PARAMETER UNDER EXAMINATION		: PU SHIPPING COST
PARAMETER VALUES	LOW	: $0.02/GR-PU
	REFERENCE	: $0.04/GR-PU
	HIGH	: $0.06/GR-PU

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) LOW VALUE	REFERENCE VALUE	HIGH VALUE
1.0	-18131.	-18191.	-18251.
2.0	-17748.	-17808.	-17867.
3.0	-17072.	-17131.	-17191.
4.0	-16753.	-16811.	-16870.
5.0	-16339.	-16398.	-16456.
6.0	-16047.	-16105.	-16163.
7.0	-15869.	-15927.	-15984.
8.0	-15351.	-15409.	-15466.
9.0	-14075.	-14132.	-14189.
10.0	-12898.	-12955.	-13011.
11.0	-11595.	-11651.	-11708.
12.0	-10149.	-10205.	-10261.
13.0	-8574.	-8630.	-8686.
14.0	-6852.	-6908.	-6963.
15.0	-3904.	-3959.	-4015.
16.0	-1858.	-1913.	-1968.
17.0	349.	294.	240.
18.0	3802.	3747.	3692.
19.0	7448.	7394.	7339.

TABLE 36 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	135663.	51999.	-18071.	-39525.	-54504.
2.0	140425.	54374.	-17689.	-39662.	-54818.
3.0	145382.	57232.	-17013.	-39563.	-54939.
4.0	150631.	59555.	-16694.	-39745.	-55196.
5.0	155644.	62045.	-16291.	-39849.	-55329.
6.0	160455.	64366.	-15990.	-40044.	-55486.
7.0	165078.	66527.	-15812.	-40323.	-55657.
8.0	170505.	69245.	-15294.	-40330.	-55604.
9.0	177664.	73189.	-14019.	-39734.	-55110.
10.0	184681.	77002.	-12842.	-39211.	-54618.
11.0	192050.	81041.	-11539.	-38582.	-54007.
12.0	199811.	85332.	-10093.	-37836.	-53267.
13.0	207939.	89856.	-8518.	-36980.	-52400.
14.0	216474.	94642.	-6797.	-36002.	-51396.
15.0	227827.	101422.	-3849.	-34059.	-49705.
16.0	237263.	106786.	-1803.	-32811.	-48401.
17.0	247149.	112437.	404.	-31427.	-46940.
18.0	259920.	120123.	3856.	-29065.	-44777.
19.0	273232.	128157.	7503.	-26542.	-42437.

TABLE 37 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	172530.	150318.	196522.	252733.	362506.
2.0	173230.	137640.	157218.	195390.	276091.
3.0	175627.	129395.	128895.	153793.	213356.
4.0	178041.	123461.	107911.	123080.	167386.
5.0	181242.	119747.	92562.	100484.	133705.
6.0	184621.	117346.	81087.	83588.	108764.
7.0	188087.	115856.	72380.	70785.	90123.
8.0	192559.	115700.	66094.	61268.	76260.
9.0	198910.	117332.	62072.	54532.	66128.
10.0	205228.	119244.	59043.	49301.	58373.
11.0	211979.	121683.	56935.	45319.	52460.
12.0	219183.	124596.	55548.	42291.	47930.
13.0	226799.	127906.	54716.	39981.	44440.
14.0	234860.	131602.	54346.	38243.	41758.
15.0	245766.	137385.	55436.	37802.	40257.
16.0	254777.	141824.	55801.	36916.	38737.
17.0	264258.	146608.	56461.	36354.	37650.
18.0	276639.	153471.	58471.	36916.	37476.
19.0	289575.	160720.	60758.	37752.	37642.

TABLE 38 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-28115.	-45755.	-50490.	-51868.	-53188.
2.0	-27947.	-45824.	-50669.	-52077.	-53435.
3.0	-27515.	-45685.	-50651.	-52092.	-53492.
4.0	-27403.	-45736.	-50805.	-52274.	-53711.
5.0	-27204.	-45695.	-50870.	-52369.	-53844.
6.0	-27105.	-45689.	-50964.	-52490.	-54002.
7.0	-27097.	-45709.	-51079.	-52630.	-54179.
8.0	-26779.	-45478.	-50959.	-52540.	-54128.
9.0	-25786.	-44750.	-50371.	-51991.	-53630.
10.0	-24872.	-44033.	-49790.	-51448.	-53135.
11.0	-23837.	-43191.	-49089.	-50785.	-52523.
12.0	-22667.	-42210.	-48255.	-49990.	-51782.
13.0	-21371.	-41095.	-47292.	-49069.	-50915.
14.0	-19934.	-39833.	-46187.	-48007.	-49911.
15.0	-17434.	-37805.	-44361.	-46236.	-48211.
16.0	-15687.	-36223.	-42949.	-44870.	-46907.
17.0	-13782.	-34474.	-41376.	-43346.	-45448.
18.0	-10805.	-31945.	-39068.	-41099.	-43278.
19.0	-7645.	-29228.	-36579.	-38671.	-40932.

TABLE 39 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1977
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	9985.	58961.	178601.	256926.	374461.
2.0	5736.	41954.	134407.	194522.	284461.
3.0	2846.	29626.	102303.	149213.	219157.
4.0	428.	20326.	78587.	115901.	171323.
5.0	-1330.	13441.	61125.	91435.	136270.
6.0	-2775.	8195.	48077.	73250.	110333.
7.0	-4010.	4134.	38213.	59595.	90965.
8.0	-4714.	1200.	30897.	49452.	76574.
9.0	-4584.	-600.	25722.	42138.	66062.
10.0	-4413.	-1948.	21752.	36535.	58026.
11.0	-4034.	-2833.	18784.	32297.	51905.
12.0	-3453.	-3330.	16590.	29096.	47219.
13.0	-2697.	-3510.	14997.	26684.	43611.
14.0	-1760.	-3404.	13892.	24900.	40838.
15.0	269.	-2426.	13767.	24184.	39274.
16.0	1570.	-1816.	13421.	23333.	37697.
17.0	3049.	-977.	13383.	22843.	36563.
18.0	5617.	692.	14195.	23232.	36357.
19.0	8382.	2590.	15277.	23922.	36496.

TABLE 40 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	17209.	-15151.	-37111.	-42408.	-43428.
2.0	17869.	-15486.	-38038.	-43419.	-44415.
3.0	18330.	-15943.	-39016.	-44452.	-45402.
4.0	18840.	-16386.	-39999.	-45489.	-46389.
5.0	19278.	-16883.	-41010.	-46538.	-47376.
6.0	19646.	-17433.	-42049.	-47601.	-48363.
7.0	20198.	-17898.	-43068.	-48660.	-49350.
8.0	21169.	-18148.	-44023.	-49697.	-50337.
9.0	22079.	-18448.	-45007.	-50748.	-51324.
10.0	23054.	-18731.	-45996.	-51805.	-52311.
11.0	24101.	-18993.	-46991.	-52867.	-53298.
12.0	25214.	-19238.	-47993.	-53935.	-54285.
13.0	26401.	-19463.	-49001.	-55010.	-55272.
14.0	28277.	-19331.	-49899.	-56047.	-56259.
15.0	29631.	-19509.	-50921.	-57135.	-57246.
16.0	31065.	-19667.	-51951.	-58230.	-58233.
17.0	33200.	-19465.	-52872.	-59220.	-59220.
18.0	35435.	-19233.	-53800.	-60207.	-60207.
19.0	37765.	-18977.	-54738.	-61194.	-61194.

TABLE 41 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	31885.	24317.	48275.	72848.	118683.
2.0	30839.	17712.	31265.	49006.	84029.
3.0	30017.	12634.	18534.	31328.	58549.
4.0	29550.	8757.	8917.	18099.	39669.
5.0	29232.	5683.	1517.	8064.	25541.
6.0	29005.	3174.	-4292.	325.	14836.
7.0	29073.	1198.	-8914.	-5743.	6598.
8.0	29654.	-240.	-12627.	-10588.	140.
9.0	30231.	-1494.	-15760.	-14578.	-5034.
10.0	30919.	-2559.	-18455.	-17944.	-9277.
11.0	31714.	-3477.	-20834.	-20858.	-12846.
12.0	32600.	-4287.	-22985.	-23446.	-15926.
13.0	33579.	-5007.	-24971.	-25796.	-18647.
14.0	35262.	-5320.	-26718.	-27930.	-21107.
15.0	36434.	-5904.	-28494.	-29981.	-23372.
16.0	37696.	-6438.	-30207.	-31940.	-25493.
17.0	39667.	-6588.	-31756.	-33718.	-27505.
18.0	41745.	-6690.	-33270.	-35435.	-29434.
19.0	43923.	-6753.	-34760.	-37106.	-31300.

TABLE 42 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	32312.	5339.	-13861.	-18562.	-19213.
2.0	33730.	5965.	-13774.	-18556.	-19186.
3.0	34915.	6419.	-13799.	-18636.	-19225.
4.0	36177.	6923.	-13790.	-18681.	-19226.
5.0	37368.	7370.	-13816.	-18747.	-19236.
6.0	38490.	7764.	-13375.	-18832.	-19251.
7.0	39864.	8331.	-13813.	-18815.	-19170.
8.0	41786.	9282.	-13510.	-18589.	-18899.
9.0	43655.	10189.	-13230.	-18376.	-18627.
10.0	45627.	11163.	-12903.	-18116.	-18304.
11.0	47717.	12213.	-12524.	-17805.	-17925.
12.0	49914.	13333.	-12097.	-17444.	-17491.
13.0	52233.	14531.	-11616.	-17030.	-16996.
14.0	55445.	16354.	-10735.	-16285.	-16208.
15.0	58031.	17726.	-10135.	-15752.	-15582.
16.0	60749.	19184.	-9476.	-15158.	-14889.
17.0	64382.	21278.	-8410.	-14158.	-13895.
18.0	68175.	23476.	-7272.	-13078.	-12824.
19.0	72124.	25774.	-6067.	-11920.	-11676.

TABLE 43 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	46987.	44807.	71525.	96695.	142897.
2.0	46700.	39163.	55529.	73869.	109258.
3.0	46602.	34995.	43751.	57144.	84725.
4.0	46887.	32066.	35125.	44907.	66832.
5.0	47322.	29936.	28710.	35855.	53681.
6.0	47849.	28371.	23882.	29094.	43948.
7.0	48743.	27427.	20337.	24101.	36778.
8.0	50271.	27190.	17885.	20519.	31578.
9.0	51807.	27143.	16017.	17794.	27663.
10.0	53493.	27336.	14638.	15745.	24730.
11.0	55329.	27729.	13632.	14204.	22526.
12.0	57300.	28285.	12910.	13045.	20868.
13.0	59410.	28987.	12414.	12184.	19628.
14.0	62430.	30365.	12446.	11932.	18945.
15.0	64834.	31331.	12291.	11402.	18292.
16.0	67381.	32413.	12268.	11133.	17851.
17.0	70849.	34155.	12706.	11344.	17820.
18.0	74485.	36019.	13257.	11694.	17948.
19.0	78282.	37999.	13910.	12168.	18219.

TABLE 44 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-7706.	-15272.	-17339.	-17927.	-18518.
2.0	-7463.	-15160.	-17273.	-17873.	-18481.
3.0	-7354.	-15128.	-17280.	-17891.	-18513.
4.0	-7206.	-15056.	-17248.	-17870.	-18507.
5.0	-7098.	-14997.	-17227.	-17859.	-18511.
6.0	-7027.	-14949.	-17214.	-17856.	-18521.
7.0	-6822.	-14792.	-17099.	-17752.	-18434.
8.0	-6329.	-14422.	-16783.	-17451.	-18152.
9.0	-5867.	-14055.	-16468.	-17151.	-17872.
10.0	-5352.	-13634.	-16101.	-16798.	-17539.
11.0	-4777.	-13153.	-15675.	-16388.	-17150.
12.0	-4146.	-12613.	-15193.	-15922.	-16705.
13.0	-3453.	-12006.	-14649.	-15394.	-16201.
14.0	-2698.	-11076.	-13795.	-14562.	-15397.
15.0	-1477.	-10332.	-13116.	-13901.	-14760.
16.0	-577.	-9516.	-12367.	-13171.	-14056.
17.0	780.	-8365.	-11302.	-12129.	-13045.
18.0	2217.	-7133.	-10158.	-11009.	-11958.
19.0	3733.	-5819.	-8934.	-9810.	-10792.

TABLE 45 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	29,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	7114.	25452.	70810.	100149.	144959.
2.0	5705.	19148.	54317.	76898.	111293.
3.0	4569.	14450.	42211.	59894.	86740.
4.0	3764.	11006.	33357.	47474.	68833.
5.0	3132.	8425.	26804.	38317.	55673.
6.0	2617.	6467.	21910.	31511.	45932.
7.0	2347.	5074.	18322.	26507.	38759.
8.0	2446.	4225.	15803.	22927.	33561.
9.0	2575.	3613.	13910.	20234.	29649.
10.0	2801.	3231.	12527.	18235.	26720.
11.0	3119.	3037.	11532.	16761.	24522.
12.0	3519.	2996.	10837.	15682.	22870.
13.0	3999.	3090.	10380.	14913.	21637.
14.0	4946.	3564.	10365.	14632.	20965.
15.0	5590.	3889.	10272.	14315.	20320.
16.0	6314.	4318.	10323.	14169.	19888.
17.0	7500.	5105.	10746.	14412.	19870.
18.0	8775.	5992.	11292.	14792.	20013.
19.0	10133.	6978.	11952.	15297.	20297.

TABLE 46 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	111606.	12945.	-66173.	-89915.	-106399.
2.0	115443.	13650.	-67827.	-92165.	-108875.
3.0	118650.	13934.	-69695.	-94545.	-111332.
4.0	122056.	14303.	-71558.	-96935.	-113752.
5.0	125262.	14511.	-73525.	-99396.	-116172.
6.0	128279.	14561.	-75597.	-101928.	-118592.
7.0	131954.	14972.	-77546.	-104409.	-121013.
8.0	137083.	16228.	-79164.	-106724.	-123433.
9.0	142056.	17342.	-80884.	-109112.	-125353.
10.0	147297.	18569.	-82597.	-111514.	-128273.
11.0	152836.	19928.	-84297.	-113927.	-130694.
12.0	158652.	21400.	-85994.	-116357.	-133114.
13.0	164777.	23005.	-87683.	-118804.	-135534.
14.0	173276.	26003.	-88811.	-120964.	-137954.
15.0	180086.	27903.	-90476.	-123441.	-140375.
16.0	187235.	29944.	-92136.	-125939.	-142795.
17.0	196809.	33401.	-93234.	-128154.	-145215.
18.0	206796.	37037.	-94317.	-130385.	-147635.
19.0	217179.	40838.	-95393.	-132641.	-150056.

TABLE 47 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	148474.	111263.	148419.	202343.	310611.
2.0	148248.	96915.	107080.	142887.	222035.
3.0	148395.	86097.	76213.	98811.	156963.
4.0	149466.	78209.	53047.	65890.	108830.
5.0	150860.	72213.	35318.	40937.	72362.
6.0	152444.	67541.	21480.	21704.	45657.
7.0	154963.	64301.	10646.	6699.	24767.
8.0	159137.	62682.	2225.	-5126.	8432.
9.0	163302.	61484.	-4794.	-14846.	-4615.
10.0	167844.	60811.	-10712.	-23002.	-15283.
11.0	172766.	60570.	-15824.	-30025.	-24227.
12.0	178024.	60664.	-20353.	-36231.	-31917.
13.0	183638.	61055.	-24448.	-41842.	-38694.
14.0	191662.	62963.	-27669.	-46719.	-44801.
15.0	198024.	63866.	-31191.	-51580.	-50413.
16.0	204749.	64983.	-34532.	-56212.	-55657.
17.0	213918.	67571.	-37178.	-60372.	-60625.
18.0	223515.	70385.	-39702.	-64405.	-65382.
19.0	233522.	73401.	-42137.	-68347.	-69977.

TABLE 48 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	142836.	56973.	-14893.	-36790.	-51884.
2.0	148343.	59832.	-14215.	-36690.	-52002.
3.0	153093.	62154.	-13895.	-36871.	-52258.
4.0	158106.	64645.	-13482.	-36974.	-52392.
5.0	162916.	66965.	-13191.	-37170.	-52549.
6.0	167539.	69126.	-13015.	-37451.	-52722.
7.0	172966.	71844.	-12498.	-37458.	-52670.
8.0	180125.	75789.	-11221.	-36861.	-52174.
9.0	187142.	79602.	-10044.	-36337.	-51681.
10.0	194511.	83640.	-8740.	-35709.	-51070.
11.0	202272.	87931.	-7295.	-34962.	-50329.
12.0	210400.	92456.	-5720.	-34106.	-49463.
13.0	218936.	97242.	-3998.	-33128.	-48458.
14.0	230289.	104023.	-1048.	-31182.	-46765.
15.0	239724.	109386.	998.	-29934.	-45460.
16.0	249611.	115038.	3205.	-28551.	-44000.
17.0	262381.	122725.	6658.	-26187.	-41835.
18.0	275694.	130760.	10306.	-23661.	-39493.
19.0	289532.	139128.	14139.	-20982.	-36973.

TABLE 49 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	179753.	155292.	199700.	255468.	365126.
2.0	181148.	143098.	160691.	198362.	278908.
3.0	182838.	134317.	132013.	156485.	216036.
4.0	185515.	128551.	111122.	125851.	170190.
5.0	188514.	124668.	95652.	103163.	136486.
6.0	191705.	122106.	84062.	86181.	111528.
7.0	195975.	121173.	75694.	73650.	93110.
8.0	202179.	122243.	70167.	64737.	79690.
9.0	208388.	123744.	66047.	57929.	69557.
10.0	215058.	125882.	63144.	52803.	61921.
11.0	222201.	128574.	61178.	48940.	56138.
12.0	229772.	131720.	59921.	46021.	51734.
13.0	237797.	135292.	59237.	43834.	48382.
14.0	248675.	140982.	60095.	43063.	46389.
15.0	257663.	145349.	60283.	41927.	44502.
16.0	267125.	150076.	60808.	41176.	43138.
17.0	279490.	156895.	62715.	41595.	42755.
18.0	292413.	164107.	64921.	42319.	42760.
19.0	305874.	171691.	67395.	43312.	43106.

TABLE 50 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-24620.	-42614.	-47594.	-49043.	-50431.
2.0	-24183.	-42470.	-47572.	-49055.	-50485.
3.0	-24071.	-42520.	-47726.	-49236.	-50704.
4.0	-23870.	-42479.	-47790.	-49330.	-50836.
5.0	-23773.	-42474.	-47886.	-49453.	-50995.
6.0	-23763.	-42496.	-48003.	-49595.	-51174.
7.0	-23451.	-42267.	-47883.	-49505.	-51124.
8.0	-22456.	-41536.	-47294.	-48955.	-50624.
9.0	-21541.	-40818.	-46712.	-48411.	-50129.
10.0	-20505.	-39975.	-46010.	-47747.	-49516.
11.0	-19334.	-38994.	-45176.	-46953.	-48775.
12.0	-18038.	-37879.	-44212.	-46030.	-47908.
13.0	-16600.	-36617.	-43107.	-44969.	-46903.
14.0	-14096.	-34584.	-41277.	-43194.	-45200.
15.0	-12349.	-33002.	-39865.	-41829.	-43896.
16.0	-10445.	-31254.	-38294.	-40305.	-42437.
17.0	-7464.	-28722.	-35983.	-38055.	-40265.
18.0	-4300.	-26002.	-33490.	-35625.	-37917.
19.0	-959.	-23094.	-30817.	-33016.	-35392.

TABLE 51 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1978
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	13480.	62102.	181497.	259750.	377217.
2.0	9500.	45309.	137504.	197544.	287411.
3.0	6291.	32790.	105228.	152069.	221945.
4.0	3961.	23583.	81601.	118846.	174199.
5.0	2100.	16661.	64109.	94351.	139119.
6.0	562.	11388.	51038.	76145.	113161.
7.0	-364.	7576.	41409.	62720.	94019.
8.0	-392.	5142.	34562.	53037.	80079.
9.0	-338.	3332.	29381.	45718.	69563.
10.0	-46.	2109.	25532.	40235.	61645.
11.0	469.	1363.	22697.	36129.	55654.
12.0	1176.	1000.	20633.	33056.	51094.
13.0	2074.	968.	19181.	30784.	47623.
14.0	4078.	1846.	18802.	29712.	45549.
15.0	5354.	2376.	18262.	28592.	43589.
16.0	6812.	3152.	18076.	27898.	42168.
17.0	9363.	4775.	18777.	28134.	41746.
18.0	12122.	6636.	19773.	28705.	41718.
19.0	15068.	8725.	21039.	29577.	42036.

TABLE 52 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	18856.	-14499.	-37051.	-42432.	-43428.
2.0	19317.	-14956.	-38029.	-43465.	-44415.
3.0	19827.	-15399.	-39012.	-44502.	-45402.
4.0	20265.	-15896.	-40023.	-45551.	-46389.
5.0	20633.	-16446.	-41062.	-46614.	-47376.
6.0	21185.	-16911.	-42081.	-47673.	-48363.
7.0	22156.	-17161.	-43036.	-48710.	-49350.
8.0	23066.	-17461.	-44020.	-49761.	-50337.
9.0	24041.	-17744.	-45009.	-50818.	-51324.
10.0	25086.	-18006.	-46004.	-51880.	-52311.
11.0	26201.	-18251.	-47006.	-52948.	-53298.
12.0	27388.	-18476.	-48014.	-54023.	-54285.
13.0	29264.	-18344.	-48912.	-55060.	-55272.
14.0	30618.	-18522.	-49934.	-56148.	-56259.
15.0	32052.	-18680.	-50964.	-57243.	-57246.
16.0	34137.	-18478.	-51885.	-58233.	-58233.
17.0	36422.	-18246.	-52813.	-59220.	-59220.
18.0	38752.	-17990.	-53751.	-60207.	-60207.
19.0	41192.	-17703.	-54697.	-61194.	-61194.

TABLE 53 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	33531.	24969.	48335.	72824.	118683.
2.0	32287.	18242.	31274.	48960.	84029.
3.0	31514.	13177.	18538.	31278.	58549.
4.0	30975.	9247.	8893.	18037.	39669.
5.0	30588.	6120.	1465.	7988.	25541.
6.0	30544.	3697.	-4324.	254.	14836.
7.0	31035.	1935.	-8881.	-5794.	6598.
8.0	31551.	446.	-12624.	-10653.	140.
9.0	32193.	-790.	-15762.	-14648.	-5034.
10.0	32954.	-1833.	-18463.	-18019.	-9277.
11.0	33814.	-2735.	-20849.	-20940.	-12846.
12.0	34774.	-3525.	-23007.	-23534.	-15926.
13.0	36442.	-3888.	-24881.	-25847.	-18647.
14.0	37602.	-4511.	-26752.	-28031.	-21107.
15.0	38855.	-5075.	-28538.	-30089.	-23372.
16.0	40818.	-5248.	-30141.	-31943.	-25493.
17.0	42890.	-5369.	-31697.	-33718.	-27505.
18.0	45062.	-5447.	-33221.	-35435.	-29434.
19.0	47350.	-5479.	-34720.	-37106.	-31300.

TABLE 54 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	34744.	7056.	-12593.	-17347.	-17955.
2.0	35923.	7509.	-12618.	-17427.	-17994.
3.0	37191.	8013.	-12609.	-17472.	-17995.
4.0	38381.	8460.	-12636.	-17539.	-18005.
5.0	39504.	8854.	-12695.	-17624.	-18022.
6.0	40877.	9421.	-12639.	-17608.	-17941.
7.0	42800.	10372.	-12331.	-17382.	-17669.
8.0	44668.	11279.	-12050.	-17168.	-17397.
9.0	46641.	12253.	-11723.	-16908.	-17074.
10.0	48730.	13303.	-11344.	-16597.	-16695.
11.0	50928.	14423.	-10913.	-16236.	-16261.
12.0	53246.	15621.	-10437.	-15822.	-15766.
13.0	56459.	17444.	-9554.	-15076.	-14977.
14.0	59044.	18816.	-8955.	-14543.	-14352.
15.0	61763.	20274.	-8296.	-13949.	-13659.
16.0	65395.	22369.	-7223.	-12949.	-12664.
17.0	69139.	24567.	-6091.	-11868.	-11592.
18.0	73138.	26865.	-4885.	-10709.	-10443.
19.0	77263.	29279.	-3601.	-9464.	-9208.

TABLE 55 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	49419.	46524.	72794.	97910.	144156.
2.0	48893.	40707.	56685.	74999.	110451.
3.0	48878.	36590.	44941.	58308.	85956.
4.0	49091.	33603.	36280.	46049.	68053.
5.0	49458.	31420.	29832.	36978.	54896.
6.0	50236.	30028.	25118.	30318.	45259.
7.0	51679.	29468.	21824.	25535.	38279.
8.0	53153.	29186.	19345.	21941.	33079.
9.0	54793.	29207.	17524.	19262.	29216.
10.0	56596.	29476.	16196.	17264.	26339.
11.0	58540.	29939.	15239.	15772.	24191.
12.0	60632.	30573.	14571.	14667.	22593.
13.0	63636.	31900.	14476.	14138.	21648.
14.0	66029.	32827.	14226.	13574.	20891.
15.0	68566.	33860.	14131.	13205.	20216.
16.0	72027.	35598.	14515.	13341.	20076.
17.0	75657.	37444.	15025.	13634.	20123.
18.0	79447.	39408.	15645.	14063.	20330.
19.0	33421.	41503.	16376.	14623.	20687.

TABLE 56 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-6066.	-13809.	-15983.	-16601.	-17223.
2.0	-5957.	-13777.	-15990.	-16619.	-17255.
3.0	-5808.	-13705.	-15958.	-16598.	-17249.
4.0	-5702.	-13647.	-15938.	-16588.	-17254.
5.0	-5632.	-13600.	-15926.	-16586.	-17265.
6.0	-5427.	-13444.	-15811.	-16482.	-17178.
7.0	-4934.	-13073.	-15495.	-16181.	-16896.
8.0	-4472.	-12707.	-15180.	-15880.	-16615.
9.0	-3957.	-12285.	-14813.	-15528.	-16283.
10.0	-3382.	-11804.	-14387.	-15117.	-15894.
11.0	-2751.	-11264.	-13905.	-14651.	-15449.
12.0	-2057.	-10660.	-13361.	-14124.	-14944.
13.0	-911.	-9725.	-12505.	-13290.	-14139.
14.0	-80.	-8982.	-11827.	-12629.	-13503.
15.0	820.	-8166.	-11078.	-11899.	-12798.
16.0	2178.	-7014.	-10012.	-10857.	-11787.
17.0	3617.	-5781.	-8867.	-9736.	-10699.
18.0	5134.	-4466.	-7642.	-8536.	-9533.
19.0	6740.	-3059.	-6330.	-7250.	-8281.

TABLE 57 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	8755.	26915.	72166.	101474.	146254.
2.0	7212.	20531.	55599.	78153.	112519.
3.0	6115.	15873.	43533.	61187.	88004.
4.0	5269.	12415.	34666.	48756.	70086.
5.0	4599.	9823.	28105.	39591.	56918.
6.0	4216.	7971.	23313.	32885.	47276.
7.0	4234.	6792.	19926.	28078.	40297.
8.0	4303.	5940.	17405.	24498.	35098.
9.0	4485.	5383.	15566.	21857.	31238.
10.0	4771.	5061.	14240.	19916.	28366.
11.0	5145.	4926.	13303.	18497.	26223.
12.0	5607.	4949.	12569.	17480.	24531.
13.0	6542.	5373.	12524.	17017.	23698.
14.0	7174.	5658.	12333.	16564.	22859.
15.0	7887.	6056.	12310.	16317.	22282.
16.0	9068.	6819.	12678.	16483.	22156.
17.0	10337.	7689.	13182.	16805.	22217.
18.0	11691.	8660.	13808.	17265.	22438.
19.0	13140.	9737.	14557.	17853.	22809.

TABLE 58 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	117863.	16070.	-65407.	-89744.	-106454.
2.0	121070.	16354.	-67275.	-92124.	-108911.
3.0	124477.	16723.	-69138.	-94514.	-111332.
4.0	127683.	16931.	-71105.	-96975.	-113752.
5.0	130699.	16981.	-73176.	-99508.	-116172.
6.0	134374.	17393.	-75126.	-101989.	-118592.
7.0	139503.	18648.	-76743.	-104304.	-121013.
8.0	144476.	19762.	-78464.	-106692.	-123433.
9.0	149717.	20989.	-80177.	-109093.	-125853.
10.0	155257.	22348.	-81877.	-111506.	-128273.
11.0	161072.	23821.	-83574.	-113937.	-130694.
12.0	167197.	25425.	-85262.	-116383.	-133114.
13.0	175696.	28423.	-86391.	-118544.	-135534.
14.0	182506.	30323.	-88056.	-121021.	-137954.
15.0	189655.	32365.	-89716.	-123519.	-140375.
16.0	199229.	35821.	-90814.	-125733.	-142795.
17.0	209216.	39457.	-91897.	-127965.	-145215.
18.0	219600.	43259.	-92973.	-130221.	-147635.
19.0	230437.	47257.	-94032.	-132496.	-150056.

TABLE 59 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	154731.	114389.	149186.	202514.	310555.
2.0	153875.	99620.	107631.	142927.	221998.
3.0	154222.	88886.	76770.	98842.	156963.
4.0	155092.	80837.	53500.	65850.	108830.
5.0	156297.	74684.	35667.	40825.	72862.
6.0	158540.	70373.	21951.	21643.	45657.
7.0	162512.	67978.	11448.	6804.	24767.
8.0	166530.	66216.	2924.	-5094.	8432.
9.0	170963.	65132.	-4086.	-14828.	-4615.
10.0	175804.	64590.	-9992.	-22995.	-15283.
11.0	181001.	64463.	-15101.	-30035.	-24227.
12.0	186569.	64689.	-19621.	-36257.	-31917.
13.0	194557.	66473.	-23156.	-41582.	-38694.
14.0	200892.	67283.	-26913.	-46776.	-44801.
15.0	207594.	68328.	-30431.	-51657.	-50413.
16.0	216743.	70859.	-33211.	-56006.	-55657.
17.0	226325.	73628.	-35840.	-60184.	-60625.
18.0	236319.	76606.	-38358.	-64240.	-65382.
19.0	246780.	79820.	-40776.	-68202.	-69977.

TABLE 60 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	150806.	62440.	-11399.	-33794.	-49040.
2.0	155556.	64762.	-11079.	-33975.	-49297.
3.0	160569.	67253.	-10666.	-34078.	-49429.
4.0	165380.	69573.	-10375.	-34275.	-49587.
5.0	170002.	71733.	-10200.	-34558.	-49762.
6.0	175429.	74451.	-9684.	-34565.	-49711.
7.0	182588.	78396.	-8406.	-33967.	-49214.
8.0	189605.	82209.	-7228.	-33442.	-48720.
9.0	196974.	86248.	-5924.	-32813.	-48108.
10.0	204736.	90539.	-4478.	-32066.	-47367.
11.0	212863.	95064.	-2903.	-31210.	-46501.
12.0	221399.	99850.	-1181.	-30232.	-45496.
13.0	232752.	106632.	1771.	-28284.	-43799.
14.0	242188.	111996.	3817.	-27036.	-42495.
15.0	252074.	117647.	6023.	-25653.	-41035.
16.0	264845.	125335.	9478.	-23286.	-38868.
17.0	278158.	133370.	13128.	-20759.	-36524.
18.0	291996.	141740.	16962.	-18078.	-34002.
19.0	306429.	150492.	21011.	-15219.	-31284.

TABLE 61 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	187674.	160759.	203193.	258464.	367969.
2.0	188361.	148028.	163827.	201076.	281613.
3.0	190314.	139416.	135243.	159278.	218865.
4.0	192789.	133479.	114230.	128550.	172994.
5.0	195600.	129435.	98643.	105775.	139272.
6.0	199594.	127431.	87393.	89067.	114538.
7.0	205598.	127725.	79786.	77141.	96566.
8.0	211659.	128664.	74160.	68155.	83144.
9.0	218221.	130391.	70166.	61453.	73130.
10.0	225283.	132782.	67406.	56445.	65623.
11.0	232792.	135706.	65570.	52692.	59966.
12.0	240771.	139114.	64460.	49895.	55700.
13.0	251613.	144682.	65006.	48678.	53041.
14.0	260574.	148955.	64959.	47209.	50658.
15.0	270013.	153610.	65308.	46209.	48927.
16.0	282360.	160373.	67082.	46441.	48270.
17.0	295267.	167541.	69185.	47022.	48066.
18.0	308715.	175087.	71577.	47903.	48251.
19.0	322772.	183054.	74266.	49075.	48795.

TABLE 62 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-20308.	-39217.	-44462.	-45988.	-47450.
2.0	-20695.	-39267.	-44615.	-46169.	-47668.
3.0	-20494.	-39225.	-44680.	-46263.	-47800.
4.0	-20398.	-39221.	-44776.	-46386.	-47961.
5.0	-20397.	-39247.	-44895.	-46531.	-48141.
6.0	-20081.	-39019.	-44777.	-46442.	-48093.
7.0	-19083.	-38285.	-44185.	-45889.	-47590.
8.0	-18166.	-37566.	-43603.	-45344.	-47094.
9.0	-17130.	-36723.	-42900.	-44680.	-46481.
10.0	-15958.	-35741.	-42065.	-43885.	-45739.
11.0	-14662.	-34626.	-41102.	-42963.	-44872.
12.0	-13224.	-33364.	-39997.	-41901.	-43867.
13.0	-10714.	-31325.	-38162.	-40123.	-42161.
14.0	-8967.	-29744.	-36751.	-38758.	-40857.
15.0	-7064.	-27996.	-35179.	-37234.	-39398.
16.0	-4078.	-25460.	-32865.	-34981.	-37224.
17.0	-911.	-22737.	-30370.	-32549.	-34873.
18.0	2433.	-19826.	-27695.	-29938.	-32346.
19.0	5979.	-16706.	-24819.	-27128.	-29624.

TABLE 63 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1979
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	17292.	65499.	184629.	262805.	380199.
2.0	12983.	48511.	140461.	200430.	290228.
3.0	9868.	36085.	108274.	155043.	224848.
4.0	7433.	26841.	84616.	121790.	177074.
5.0	5477.	19889.	67100.	97273.	141973.
6.0	4249.	14865.	54265.	79299.	116243.
7.0	4005.	11558.	45107.	66336.	97553.
8.0	3899.	9112.	38253.	56647.	83603.
9.0	4073.	7428.	33193.	49449.	73211.
10.0	4500.	6344.	29477.	44097.	65422.
11.0	5141.	5732.	26771.	40118.	59556.
12.0	5989.	5516.	24849.	37185.	55134.
13.0	7961.	6261.	24126.	35630.	52365.
14.0	9206.	6686.	23328.	34149.	49891.
15.0	10639.	7382.	22948.	33186.	48087.
16.0	13179.	8946.	23504.	33222.	47381.
17.0	15920.	10760.	24389.	33640.	47138.
18.0	18855.	12812.	25568.	34392.	47289.
19.0	22006.	15112.	27038.	35465.	47805.

TABLE 64 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	20304.	-13969.	-37042.	-42478.	-43428.
2.0	20814.	-14412.	-38025.	-43515.	-44415.
3.0	21252.	-14909.	-39036.	-44564.	-45402.
4.0	21620.	-15459.	-40075.	-45627.	-46389.
5.0	22172.	-15924.	-41094.	-46686.	-47376.
6.0	23143.	-16174.	-42049.	-47723.	-48363.
7.0	24053.	-16474.	-43033.	-48774.	-49350.
8.0	25028.	-16757.	-44022.	-49831.	-50337.
9.0	26075.	-17019.	-45017.	-50893.	-51324.
10.0	27188.	-17264.	-46019.	-51961.	-52311.
11.0	28375.	-17489.	-47027.	-53036.	-53298.
12.0	30251.	-17357.	-47925.	-54073.	-54285.
13.0	31605.	-17535.	-48947.	-55161.	-55272.
14.0	33039.	-17693.	-49977.	-56256.	-56259.
15.0	35174.	-17491.	-50898.	-57246.	-57246.
16.0	37400.	-17259.	-51826.	-58233.	-58233.
17.0	39739.	-17003.	-52764.	-59220.	-59220.
18.0	42179.	-16716.	-53710.	-60207.	-60207.
19.0	44340.	-16612.	-54741.	-61194.	-61194.

TABLE 65 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	34980.	25499.	48344.	72778.	118683.
2.0	33783.	18785.	31278.	48910.	84029.
3.0	32939.	13667.	18515.	31216.	58549.
4.0	32331.	9684.	8841.	17961.	39669.
5.0	32127.	6642.	1433.	7916.	25541.
6.0	32502.	4434.	-4292.	203.	14836.
7.0	32933.	2621.	-8878.	-5858.	6598.
8.0	33512.	1150.	-12627.	-10722.	140.
9.0	34227.	-64.	-15770.	-14723.	-5034.
10.0	35054.	-1092.	-18478.	-18101.	-9277.
11.0	35988.	-1973.	-20871.	-21027.	-12846.
12.0	37037.	-2405.	-22917.	-23584.	-15926.
13.0	38782.	-3080.	-24916.	-25947.	-18647.
14.0	40023.	-3682.	-26796.	-28139.	-21107.
15.0	41977.	-3885.	-28471.	-30092.	-23372.
16.0	44041.	-4030.	-30082.	-31943.	-25493.
17.0	46206.	-4127.	-31648.	-33718.	-27505.
18.0	48489.	-4173.	-33180.	-35435.	-29434.
19.0	50498.	-4388.	-34764.	-37106.	-31300.

TABLE 66 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	36943.	8605.	-11428.	-16207.	-16751.
2.0	38206.	9109.	-11420.	-16252.	-16752.
3.0	39396.	9555.	-11447.	-16320.	-16763.
4.0	40519.	9948.	-11506.	-16406.	-16780.
5.0	41892.	10515.	-11450.	-16390.	-16700.
6.0	43815.	11467.	-11142.	-16163.	-16428.
7.0	45683.	12374.	-10861.	-15950.	-16156.
8.0	47656.	13348.	-10534.	-15690.	-15833.
9.0	49745.	14398.	-10156.	-15378.	-15454.
10.0	51942.	15518.	-9729.	-15018.	-15019.
11.0	54261.	16716.	-9248.	-14604.	-14525.
12.0	57473.	18540.	-8364.	-13857.	-13734.
13.0	60059.	19911.	-7765.	-13324.	-13109.
14.0	62778.	21370.	-7106.	-12730.	-12416.
15.0	66410.	23464.	-6038.	-11729.	-11421.
16.0	70204.	25663.	-4900.	-10647.	-10348.
17.0	74153.	27962.	-3693.	-9488.	-9198.
18.0	78278.	30375.	-2409.	-8243.	-7962.
19.0	82095.	32562.	-1261.	-7051.	-6782.

TABLE 67 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	51619.	48073.	73958.	99050.	145360.
2.0	51175.	42306.	57883.	76173.	111693.
3.0	51083.	38132.	46104.	59460.	87188.
4.0	51229.	35091.	37409.	47182.	69278.
5.0	51846.	33081.	31077.	38212.	56217.
6.0	53173.	32075.	26615.	31763.	46772.
7.0	54562.	31469.	23293.	26967.	39792.
8.0	56140.	31255.	20861.	23419.	34644.
9.0	57897.	31352.	19091.	20792.	30837.
10.0	59803.	31690.	17812.	18843.	28015.
11.0	61874.	32232.	16909.	17405.	25926.
12.0	64859.	33491.	16643.	16633.	24625.
13.0	67237.	34367.	16265.	15890.	23515.
14.0	69762.	35381.	16075.	15387.	22736.
15.0	73214.	37069.	16388.	15425.	22454.
16.0	76836.	38852.	16844.	15643.	22392.
17.0	80620.	40839.	17422.	16014.	22517.
18.0	84588.	42918.	18121.	16530.	22910.
19.0	88253.	44786.	18716.	17037.	23112.

TABLE 68 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-4539.	-12409.	-14686.	-15333.	-15984.
2.0	-4391.	-12337.	-14654.	-15312.	-15979.
3.0	-4285.	-12280.	-14635.	-15303.	-15984.
4.0	-4217.	-12235.	-14624.	-15302.	-15996.
5.0	-4014.	-12080.	-14510.	-15199.	-15910.
6.0	-3520.	-11708.	-14193.	-14897.	-15627.
7.0	-3058.	-11341.	-13878.	-14596.	-15346.
8.0	-2542.	-10920.	-13510.	-14244.	-15014.
9.0	-1967.	-10438.	-13085.	-13834.	-14624.
10.0	-1336.	-9898.	-12603.	-13368.	-14180.
11.0	-643.	-9294.	-12059.	-12840.	-13676.
12.0	506.	-8358.	-11202.	-12005.	-12869.
13.0	1336.	-7615.	-10524.	-11344.	-12233.
14.0	2236.	-6799.	-9775.	-10615.	-11529.
15.0	3595.	-5646.	-8708.	-9571.	-10516.
16.0	5036.	-4411.	-7562.	-8449.	-9427.
17.0	6554.	-3095.	-6336.	-7249.	-8260.
18.0	8162.	-1688.	-5023.	-5961.	-7007.
19.0	9622.	-347.	-3770.	-4732.	-5812.

TABLE 69 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	10281.	28315.	73463.	102742.	147492.
2.0	8777.	21971.	55936.	79459.	113796.
3.0	7637.	17297.	44857.	62481.	89269.
4.0	6753.	13828.	35980.	50042.	71343.
5.0	6216.	11343.	29521.	40977.	58274.
6.0	6124.	9708.	24931.	34470.	48826.
7.0	6111.	8525.	21542.	29662.	41847.
8.0	6233.	7727.	19075.	26134.	36700.
9.0	6476.	7230.	17294.	23551.	32897.
10.0	6816.	6967.	16024.	21666.	30079.
11.0	7253.	6896.	15149.	20308.	27997.
12.0	8171.	7251.	14828.	19599.	26707.
13.0	8788.	7483.	14506.	18963.	25604.
14.0	9490.	7841.	14385.	18579.	24833.
15.0	10663.	8576.	14681.	18645.	24564.
16.0	11926.	9423.	15129.	18891.	24517.
17.0	13274.	10375.	15713.	19292.	24655.
18.0	14719.	11438.	16428.	19840.	24963.
19.0	16022.	12450.	17117.	20375.	25278.

TABLE 70 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	123490.	18774.	-64855.	-89704.	-106491.
2.0	126897.	19144.	-66718.	-92094.	-108911.
3.0	130103.	19351.	-68685.	-94555.	-111332.
4.0	133119.	19402.	-70756.	-97088.	-113752.
5.0	136795.	19813.	-72706.	-99569.	-116172.
6.0	141923.	21069.	-74323.	-101884.	-118592.
7.0	146897.	22182.	-76044.	-104272.	-121013.
8.0	152137.	23410.	-77757.	-106673.	-123433.
9.0	157677.	24768.	-79457.	-109086.	-125853.
10.0	163493.	26241.	-81154.	-111517.	-128273.
11.0	169613.	27846.	-82842.	-113963.	-130694.
12.0	178116.	30843.	-83971.	-116123.	-133114.
13.0	184926.	32744.	-85635.	-118600.	-135534.
14.0	192075.	34785.	-87295.	-121099.	-137954.
15.0	201649.	38241.	-88394.	-123313.	-140375.
16.0	211637.	41877.	-89477.	-125545.	-142795.
17.0	222020.	45679.	-90553.	-127800.	-145215.
18.0	232857.	49678.	-91612.	-130075.	-147635.
19.0	242848.	53073.	-93008.	-132566.	-150056.

TABLE 71 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	160358.	117093.	149738.	202554.	310519.
2.0	159702.	102409.	108189.	142957.	221998.
3.0	159848.	91514.	77224.	98801.	156963.
4.0	160529.	83308.	53849.	65737.	108330.
5.0	162392.	77515.	36138.	40764.	72862.
6.0	166089.	74049.	22754.	21749.	45657.
7.0	169906.	71511.	12148.	6836.	24767.
8.0	174191.	69864.	3632.	-5075.	8432.
9.0	178923.	68911.	-3366.	-14820.	-4615.
10.0	184040.	68483.	-9269.	-23005.	-15283.
11.0	189547.	68488.	-14369.	-30061.	-24227.
12.0	197488.	70107.	-18330.	-35997.	-31917.
13.0	203787.	70794.	-22401.	-41639.	-38694.
14.0	210461.	71745.	-26153.	-46854.	-44801.
15.0	219588.	74204.	-29109.	-51452.	-50413.
16.0	229151.	76916.	-31873.	-55818.	-55657.
17.0	239129.	79849.	-34496.	-60019.	-60625.
18.0	249576.	83025.	-36997.	-64095.	-65382.
19.0	259190.	85635.	-39752.	-68272.	-69977.

TABLE 72 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	158021.	67379.	-8244.	-31057.	-46309.
2.0	163035.	69870.	-7631.	-31160.	-46442.
3.0	167845.	72190.	-7541.	-31357.	-46601.
4.0	172467.	74349.	-7367.	-31642.	-46777.
5.0	177894.	77067.	-6851.	-31650.	-46727.
6.0	185054.	81013.	-5572.	-31050.	-46228.
7.0	192071.	84826.	-4393.	-30525.	-45734.
8.0	199440.	88865.	-3089.	-29896.	-45121.
9.0	207201.	93156.	-1643.	-29148.	-44380.
10.0	215329.	97681.	-68.	-28292.	-43513.
11.0	223864.	102467.	1654.	-27314.	-42509.
12.0	235213.	109250.	4609.	-25362.	-40808.
13.0	244654.	114614.	6654.	-24115.	-39504.
14.0	254540.	120265.	8860.	-22732.	-38045.
15.0	267311.	127953.	12318.	-20363.	-35875.
16.0	280624.	135990.	15969.	-17834.	-33529.
17.0	294462.	144360.	19805.	-15152.	-31005.
18.0	308896.	153113.	23854.	-12291.	-28286.
19.0	322412.	161160.	27442.	-9776.	-25701.

TABLE 73 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	194889.	165698.	206349.	261201.	370700.
2.0	195839.	153136.	167076.	203891.	284467.
3.0	197590.	144353.	138368.	161999.	221694.
4.0	199377.	138256.	117238.	131183.	175804.
5.0	203492.	134769.	101992.	108683.	142307.
6.0	209219.	133993.	91505.	92582.	118022.
7.0	215080.	134155.	83798.	80583.	100046.
8.0	221494.	135319.	78299.	71702.	86743.
9.0	228447.	137299.	74447.	65118.	76858.
10.0	235376.	139923.	71817.	60219.	69477.
11.0	243794.	143109.	70127.	56588.	63958.
12.0	254590.	148514.	70250.	54764.	60388.
13.0	263515.	152664.	69889.	52847.	57336.
14.0	272926.	157225.	70003.	51513.	55109.
15.0	285250.	163916.	71602.	51498.	54087.
16.0	298139.	171028.	73572.	51893.	53609.
17.0	311571.	178530.	75861.	52630.	53585.
18.0	325614.	186461.	78469.	53690.	53967.
19.0	338755.	193722.	80698.	54517.	54378.

TABLE 74 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-17274.	-35974.	-41472.	-43072.	-44604.
2.0	-17072.	-35932.	-41536.	-43165.	-44736.
3.0	-16978.	-35930.	-41634.	-43289.	-44897.
4.0	-16980.	-35956.	-41755.	-43436.	-45080.
5.0	-16666.	-35731.	-41638.	-43348.	-45032.
6.0	-15664.	-34995.	-41044.	-42793.	-44528.
7.0	-14747.	-34275.	-40461.	-42248.	-44031.
8.0	-13709.	-33430.	-39758.	-41583.	-43417.
9.0	-12537.	-32448.	-38922.	-40788.	-42675.
10.0	-11240.	-31333.	-37958.	-39865.	-41808.
11.0	-9803.	-30071.	-36853.	-38803.	-40803.
12.0	-7286.	-28027.	-35015.	-37021.	-39092.
13.0	-5540.	-26446.	-33604.	-35656.	-37789.
14.0	-3638.	-24699.	-32033.	-34133.	-36331.
15.0	-647.	-22159.	-29715.	-31877.	-34153.
16.0	2524.	-19432.	-27218.	-29442.	-31800.
17.0	5871.	-16518.	-24540.	-26829.	-29271.
18.0	9420.	-13396.	-21661.	-24017.	-26546.
19.0	12606.	-10438.	-18932.	-21350.	-23962.

TABLE 75 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1980
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	20327.	68742.	187619.	265722.	383045.
2.0	16611.	51847.	143540.	203434.	293161.
3.0	13383.	39381.	111320.	158016.	227752.
4.0	10852.	30105.	87636.	124740.	179955.
5.0	9208.	23405.	70357.	100456.	145082.
6.0	8666.	18889.	57997.	82947.	119808.
7.0	8341.	15568.	48831.	69977.	101112.
8.0	8355.	13248.	42098.	60408.	87285.
9.0	8665.	11702.	37171.	53341.	77017.
10.0	9218.	10752.	33584.	48117.	69354.
11.0	10001.	10287.	31019.	44278.	63626.
12.0	11927.	10853.	29831.	42065.	59909.
13.0	13134.	11140.	28685.	40097.	56737.
14.0	14536.	11731.	28047.	38774.	54418.
15.0	17056.	13219.	28412.	38544.	53332.
16.0	19731.	14974.	29152.	38761.	52805.
17.0	22702.	16979.	30220.	39360.	52740.
18.0	25842.	19241.	31602.	40313.	53089.
19.0	28633.	21380.	32925.	41243.	53466.

TABLE 76 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	21801.	-13425.	-37038.	-42528.	-43428.
2.0	22239.	-13922.	-38049.	-43577.	-44415.
3.0	22607.	-14472.	-39088.	-44640.	-45402.
4.0	23159.	-14937.	-40107.	-45699.	-46389.
5.0	24130.	-15187.	-41062.	-46736.	-47376.
6.0	25040.	-15487.	-42046.	-47787.	-48363.
7.0	26015.	-15770.	-43035.	-48844.	-49350.
8.0	27062.	-16032.	-44030.	-49906.	-50337.
9.0	28175.	-16277.	-45032.	-50974.	-51324.
10.0	29362.	-16502.	-46040.	-52049.	-52311.
11.0	31238.	-16370.	-46938.	-53086.	-53298.
12.0	32592.	-16548.	-47960.	-54174.	-54285.
13.0	34026.	-16706.	-48990.	-55269.	-55272.
14.0	36161.	-16504.	-49911.	-56259.	-56259.
15.0	38396.	-16272.	-50839.	-57246.	-57246.
16.0	40726.	-16016.	-51777.	-58233.	-58233.
17.0	43166.	-15729.	-52723.	-59220.	-59220.
18.0	45327.	-15625.	-53754.	-60207.	-60207.
19.0	48986.	-14730.	-54528.	-61194.	-61194.

TABLE 77 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	36476.	26043.	48349.	72729.	118683.
2.0	35208.	19275.	31254.	48848.	84029.
3.0	34294.	14104.	18463.	31140.	58549.
4.0	33869.	10206.	8809.	17889.	39669.
5.0	34084.	7379.	1465.	7866.	25541.
6.0	34399.	5120.	-4289.	139.	14836.
7.0	34894.	3325.	-8881.	-5928.	6598.
8.0	35547.	1876.	-12634.	-10797.	140.
9.0	36327.	677.	-15785.	-14804.	-5034.
10.0	37223.	-330.	-18499.	-18188.	-9277.
11.0	38851.	-854.	-20781.	-21078.	-12846.
12.0	39977.	-1597.	-22952.	-23685.	-15926.
13.0	41203.	-2250.	-24960.	-26056.	-18647.
14.0	43145.	-2493.	-26730.	-28142.	-21107.
15.0	45199.	-2667.	-28412.	-30092.	-23372.
16.0	47357.	-2787.	-30033.	-31943.	-25493.
17.0	49633.	-2852.	-31607.	-33718.	-27505.
18.0	51637.	-3082.	-33225.	-35435.	-29434.
19.0	55144.	-2506.	-34551.	-37106.	-31300.

TABLE 78 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	39222.	10209.	-10220.	-15022.	-15497.
2.0	40412.	10656.	-10247.	-15090.	-15509.
3.0	41535.	11048.	-10308.	-15177.	-15527.
4.0	42908.	11615.	-10252.	-15162.	-15447.
5.0	44831.	12567.	-9944.	-14934.	-15174.
6.0	46699.	13474.	-9663.	-14720.	-14903.
7.0	48672.	14448.	-9336.	-14460.	-14580.
8.0	50761.	15498.	-8957.	-14149.	-14200.
9.0	52958.	16618.	-8530.	-13789.	-13766.
10.0	55277.	17816.	-8050.	-13374.	-13272.
11.0	58490.	19640.	-7165.	-12626.	-12479.
12.0	61075.	21012.	-6566.	-12093.	-11855.
13.0	63794.	22470.	-5907.	-11500.	-11162.
14.0	67427.	24565.	-4838.	-10498.	-10165.
15.0	71220.	26764.	-3699.	-9416.	-9092.
16.0	75169.	29063.	-2492.	-8256.	-7941.
17.0	79295.	31477.	-1207.	-7010.	-6705.
18.0	83111.	33663.	-59.	-5818.	-5525.
19.0	88850.	37191.	1940.	-4026.	-3742.

TABLE 79 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	53897.	49677.	75167.	100235.	146614.
2.0	53382.	43854.	59056.	77336.	112936.
3.0	53222.	39625.	47242.	60603.	88424.
4.0	53618.	36758.	38663.	48426.	70611.
5.0	54785.	35133.	32583.	39668.	57743.
6.0	56058.	34081.	28094.	33206.	48297.
7.0	57551.	33543.	24819.	28456.	41369.
8.0	59246.	33405.	22438.	24959.	36277.
9.0	61111.	33572.	20717.	22381.	32524.
10.0	63142.	33989.	19491.	20486.	29762.
11.0	66102.	35156.	18992.	19382.	27972.
12.0	68461.	35963.	18441.	18396.	26504.
13.0	70971.	36926.	18123.	17714.	25462.
14.0	74411.	38576.	18343.	17619.	24987.
15.0	78024.	40369.	18727.	17738.	24783.
16.0	81801.	42292.	19251.	18035.	24799.
17.0	85762.	44354.	19908.	18493.	25010.
18.0	89421.	46206.	20470.	18954.	25248.
19.0	95008.	49416.	21917.	20062.	26152.

TABLE 80 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-2954.	-10951.	-13335.	-14013.	-14694.
2.0	-2849.	-10895.	-13317.	-14004.	-14700.
3.0	-2783.	-10851.	-13307.	-14004.	-14714.
4.0	-2580.	-10697.	-13194.	-13902.	-14628.
5.0	-2085.	-10324.	-12876.	-13599.	-14345.
6.0	-1623.	-9957.	-12561.	-13299.	-14064.
7.0	-1107.	-9536.	-12193.	-12946.	-13731.
8.0	-532.	-9054.	-11768.	-12536.	-13342.
9.0	99.	-8514.	-11286.	-12070.	-12898.
10.0	792.	-7911.	-10742.	-11543.	-12393.
11.0	1943.	-6972.	-9883.	-10705.	-11585.
12.0	2773.	-6230.	-9205.	-10045.	-10949.
13.0	3672.	-5414.	-8457.	-9316.	-10245.
14.0	5033.	-4260.	-7389.	-8271.	-9232.
15.0	6475.	-3023.	-6241.	-7148.	-8141.
16.0	7995.	-1706.	-5015.	-5947.	-6974.
17.0	9603.	-298.	-3701.	-4659.	-5720.
18.0	11064.	1043.	-2448.	-3430.	-4525.
19.0	13470.	3053.	-562.	-1578.	-2717.

TABLE 81 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	11866.	29773.	74814.	104062.	148782.
2.0	10319.	23413.	58273.	80767.	115074.
3.0	9140.	18727.	46184.	63780.	90539.
4.0	8390.	15365.	37411.	51441.	72712.
5.0	8145.	13098.	31155.	42577.	59839.
6.0	8021.	11458.	26563.	36069.	50390.
7.0	8061.	10330.	23227.	31313.	43462.
8.0	8243.	9592.	20617.	27842.	38372.
9.0	8541.	9154.	19093.	25315.	34623.
10.0	8944.	8954.	17885.	23491.	31866.
11.0	9840.	9217.	17325.	22443.	30087.
12.0	10438.	9379.	16825.	21558.	28626.
13.0	11124.	9684.	16572.	20991.	27592.
14.0	12287.	10380.	16771.	20923.	27130.
15.0	13543.	11198.	17148.	21068.	26939.
16.0	14885.	12128.	17676.	21393.	26970.
17.0	16324.	13172.	18348.	21882.	27195.
18.0	17621.	14168.	19003.	22371.	27446.
19.0	19870.	15650.	20325.	23530.	28372.

TABLE 82 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	129317.	21564.	-64297.	-89674.	-106491.
2.0	132523.	21771.	-66265.	-92135.	-108911.
3.0	135540.	21822.	-68336.	-94668.	-111332.
4.0	139215.	22233.	-70285.	-97149.	-113752.
5.0	144343.	23489.	-71903.	-99463.	-116172.
6.0	149317.	24602.	-73623.	-101851.	-118592.
7.0	154557.	25830.	-75336.	-104253.	-121013.
8.0	160097.	27188.	-77037.	-106666.	-123433.
9.0	165913.	28661.	-78734.	-109097.	-125853.
10.0	172038.	30266.	-80422.	-111543.	-128273.
11.0	180537.	33264.	-81551.	-113703.	-130694.
12.0	187346.	35164.	-83215.	-116180.	-133114.
13.0	194496.	37205.	-84875.	-118678.	-135534.
14.0	204069.	40662.	-85974.	-120893.	-137954.
15.0	214057.	44298.	-87056.	-123125.	-140375.
16.0	224440.	48099.	-88132.	-125380.	-142795.
17.0	235278.	52098.	-89191.	-127655.	-145215.
18.0	245268.	55493.	-90588.	-130145.	-147635.
19.0	260376.	61933.	-90725.	-131975.	-150056.

TABLE 83 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	166185.	119883.	150295.	202584.	310519.
2.0	165328.	105037.	108642.	142916.	221998.
3.0	165285.	93985.	77573.	98688.	156963.
4.0	166625.	86139.	54320.	65676.	108330.
5.0	169941.	81191.	36941.	40869.	72862.
6.0	173482.	77583.	23453.	21781.	45657.
7.0	177566.	75159.	12855.	6855.	24767.
8.0	182151.	73643.	4352.	-5068.	8432.
9.0	187159.	72804.	-2643.	-14831.	-4615.
10.0	192585.	72508.	-8537.	-23031.	-15283.
11.0	200466.	73906.	-13077.	-29801.	-24227.
12.0	206718.	74428.	-17574.	-36054.	-31917.
13.0	213356.	75255.	-21640.	-41717.	-38694.
14.0	222455.	77621.	-24831.	-46648.	-44801.
15.0	231990.	80261.	-27771.	-51263.	-50413.
16.0	241955.	83137.	-30529.	-55653.	-55657.
17.0	252386.	86268.	-33134.	-59874.	-60625.
18.0	261987.	88841.	-35973.	-64165.	-65382.
19.0	276719.	94495.	-37469.	-67682.	-69977.

TABLE 84 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	165502.	72497.	-4976.	-28218.	-43427.
2.0	170312.	74816.	-4686.	-28416.	-43587.
3.0	174934.	76975.	-4514.	-28702.	-43766.
4.0	180361.	79692.	-3999.	-28711.	-43716.
5.0	187521.	83638.	-2718.	-28110.	-43216.
6.0	194533.	87452.	-1539.	-27584.	-42720.
7.0	201907.	91491.	-235.	-26954.	-42109.
8.0	209668.	95783.	1211.	-26206.	-41366.
9.0	217796.	100307.	2787.	-25350.	-40499.
10.0	226332.	105094.	4509.	-24372.	-39494.
11.0	237686.	111878.	7466.	-22417.	-37790.
12.0	247121.	117241.	9512.	-21170.	-36487.
13.0	257008.	122892.	11717.	-19787.	-35027.
14.0	269779.	130582.	15177.	-17417.	-32355.
15.0	283092.	138619.	18830.	-14886.	-30506.
16.0	296930.	146990.	22667.	-12201.	-27981.
17.0	311364.	155743.	26718.	-9339.	-25260.
18.0	324881.	163790.	30306.	-6824.	-22675.
19.0	344435.	176126.	36530.	-2250.	-18676.

TABLE 85 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	202370.	170815.	209617.	264040.	373582.
2.0	203117.	158082.	170220.	206635.	287322.
3.0	204680.	149138.	141395.	164654.	224529.
4.0	207771.	143598.	120606.	134114.	178865.
5.0	213119.	141341.	106125.	112223.	145819.
6.0	218704.	140432.	95537.	96048.	121529.
7.0	224916.	140820.	87957.	84154.	103672.
8.0	231722.	142237.	82599.	75391.	90498.
9.0	239042.	144450.	78877.	68916.	80739.
10.0	246879.	147336.	76394.	64140.	73496.
11.0	257615.	152520.	75939.	61484.	68677.
12.0	266493.	156505.	75153.	58957.	64710.
13.0	275869.	160942.	74952.	57174.	61813.
14.0	288165.	167541.	76319.	56828.	60299.
15.0	301031.	174582.	78114.	56976.	59456.
16.0	314445.	182028.	80270.	57526.	59157.
17.0	328473.	189914.	82775.	58442.	59331.
18.0	341599.	197138.	84921.	59156.	59578.
19.0	360778.	208688.	89786.	62044.	61403.

TABLE 86 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-13603.	-32597.	-38358.	-40034.	-41640.
2.0	-13510.	-32596.	-38457.	-40160.	-41803.
3.0	-13516.	-32627.	-38581.	-40309.	-41988.
4.0	-13204.	-32402.	-38465.	-40222.	-41941.
5.0	-12199.	-31663.	-37869.	-39665.	-41435.
6.0	-11280.	-30942.	-37285.	-39119.	-40937.
7.0	-10242.	-30097.	-36581.	-38454.	-40323.
8.0	-9069.	-29114.	-35745.	-37658.	-39580.
9.0	-7772.	-27999.	-34781.	-36735.	-38713.
10.0	-6334.	-26736.	-33676.	-35673.	-37708.
11.0	-3811.	-24687.	-31833.	-33887.	-35993.
12.0	-2066.	-23107.	-30422.	-32522.	-34690.
13.0	-164.	-21360.	-28851.	-31000.	-33232.
14.0	2631.	-18816.	-26531.	-28740.	-31052.
15.0	6007.	-16085.	-24030.	-26303.	-28696.
16.0	9357.	-13169.	-21349.	-23687.	-26165.
17.0	12910.	-10044.	-18469.	-20873.	-23438.
18.0	16095.	-7086.	-15739.	-18206.	-20854.
19.0	21526.	-2551.	-11524.	-14079.	-16839.

TABLE 87 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1981
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	24497.	72119.	190733.	268759.	386008.
2.0	20172.	55182.	146619.	206439.	296093.
3.0	16846.	42683.	114372.	160996.	230661.
4.0	14628.	33660.	90927.	127953.	183094.
5.0	13675.	27472.	74126.	104138.	148680.
6.0	13050.	22942.	61757.	86621.	123398.
7.0	12846.	19746.	52711.	73771.	104820.
8.0	12996.	17554.	46111.	64334.	91122.
9.0	13431.	16152.	41312.	57394.	80979.
10.0	14125.	15348.	37867.	52309.	73454.
11.0	15992.	15671.	36040.	49194.	68435.
12.0	17148.	15773.	34423.	46564.	64311.
13.0	18511.	16226.	33437.	44753.	61294.
14.0	21005.	17614.	33548.	44166.	59697.
15.0	23710.	19293.	34098.	44118.	58790.
16.0	26614.	21238.	35020.	44516.	58440.
17.0	29741.	23453.	36291.	45316.	58573.
18.0	32517.	25552.	37524.	46124.	58781.
19.0	37553.	29268.	40332.	48514.	60589.

TABLE 88 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	23226.	-12935.	-37062.	-42590.	-43428.
2.0	23594.	-13485.	-38101.	-43653.	-44415.
3.0	24146.	-13950.	-39120.	-44712.	-45402.
4.0	25117.	-14200.	-40075.	-45749.	-46389.
5.0	26027.	-14500.	-41059.	-46800.	-47376.
6.0	27002.	-14783.	-42048.	-47857.	-48363.
7.0	28049.	-15045.	-43043.	-48919.	-49350.
8.0	29162.	-15290.	-44045.	-49987.	-50337.
9.0	30349.	-15515.	-45053.	-51062.	-51324.
10.0	32225.	-15383.	-45951.	-52099.	-52311.
11.0	33579.	-15561.	-46973.	-53187.	-53298.
12.0	35013.	-15719.	-48003.	-54282.	-54285.
13.0	37148.	-15517.	-48924.	-55272.	-55272.
14.0	39383.	-15285.	-49852.	-56259.	-56259.
15.0	41713.	-15029.	-50790.	-57246.	-57246.
16.0	44153.	-14742.	-51736.	-58233.	-58233.
17.0	46314.	-14638.	-52767.	-59220.	-59220.
18.0	49973.	-13743.	-53541.	-60207.	-60207.
19.0	52757.	-13363.	-54519.	-61194.	-61194.

TABLE 89 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	37901.	26532.	48325.	72666.	118683.
2.0	36564.	19713.	31202.	48772.	84029.
3.0	35833.	14627.	18430.	31069.	58549.
4.0	35827.	10943.	8841.	17839.	39669.
5.0	35982.	8066.	1468.	7802.	25541.
6.0	36360.	5824.	-4291.	69.	14836.
7.0	36929.	4051.	-8888.	-6003.	6598.
8.0	37647.	2617.	-12649.	-10879.	140.
9.0	38502.	1439.	-15806.	-14892.	-5034.
10.0	40091.	789.	-18410.	-18239.	-9277.
11.0	41192.	-45.	-20816.	-21178.	-12846.
12.0	42398.	-768.	-22996.	-23793.	-15926.
13.0	44325.	-1061.	-24893.	-26058.	-18647.
14.0	46368.	-1274.	-26671.	-28142.	-21107.
15.0	48516.	-1424.	-28363.	-30092.	-23372.
16.0	50785.	-1513.	-29992.	-31943.	-25493.
17.0	52782.	-1762.	-31652.	-33718.	-27505.
18.0	56283.	-1200.	-33012.	-35435.	-29434.
19.0	58915.	-1139.	-34542.	-37106.	-31300.

TABLE 90 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	41430.	11761.	-9038.	-13848.	-14242.
2.0	42552.	12154.	-9100.	-13936.	-14261.
3.0	43925.	12720.	-9045.	-13922.	-14182.
4.0	45848.	13672.	-8735.	-13693.	-13909.
5.0	47716.	14579.	-8454.	-13480.	-13637.
6.0	49689.	15553.	-8127.	-13220.	-13314.
7.0	51778.	16603.	-7749.	-12908.	-12934.
8.0	53976.	17723.	-7322.	-12548.	-12500.
9.0	56294.	18921.	-6841.	-12134.	-12006.
10.0	59507.	20746.	-5955.	-11384.	-11212.
11.0	62093.	22118.	-5357.	-10852.	-10588.
12.0	64811.	23575.	-4698.	-10259.	-9895.
13.0	68444.	25671.	-3629.	-9256.	-8898.
14.0	72238.	27871.	-2489.	-8172.	-7823.
15.0	76187.	30170.	-1281.	-7012.	-6671.
16.0	80313.	32584.	5.	-5765.	-5435.
17.0	84129.	34770.	1152.	-4573.	-4254.
18.0	89868.	38299.	3153.	-2779.	-2469.
19.0	94553.	41075.	4686.	-1255.	-957.

TABLE 91 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	56105.	51229.	76348.	101408.	147369.
2.0	55522.	45351.	60203.	78489.	114183.
3.0	55612.	41296.	48506.	61859.	89769.
4.0	56558.	38815.	40180.	49895.	72149.
5.0	57671.	37145.	34072.	41122.	59281.
6.0	59048.	36160.	29629.	34707.	49886.
7.0	60658.	35699.	26406.	30008.	43014.
8.0	62461.	35631.	24074.	26560.	37977.
9.0	64447.	35876.	22406.	24036.	34285.
10.0	67373.	36919.	21585.	22477.	31822.
11.0	69706.	37634.	20800.	21157.	29864.
12.0	72197.	38527.	20309.	20231.	28464.
13.0	75622.	40127.	20402.	19958.	27727.
14.0	79223.	41882.	20692.	19945.	27330.
15.0	82990.	43775.	21146.	20142.	27203.
16.0	86944.	45813.	21748.	20525.	27306.
17.0	90597.	47647.	22268.	20929.	27460.
18.0	96178.	50842.	23683.	21993.	28303.
19.0	100711.	53299.	24663.	22833.	28937.

TABLE 92 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-1391.	-9491.	-11983.	-12691.	-13403.
2.0	-1327.	-9449.	-11975.	-12692.	-13418.
3.0	-1125.	-9296.	-11862.	-12591.	-13333.
4.0	-629.	-8922.	-11543.	-12287.	-13049.
5.0	-167.	-8555.	-11228.	-11986.	-12768.
6.0	349.	-8133.	-10860.	-11633.	-12435.
7.0	924.	-7652.	-10435.	-11223.	-12046.
8.0	1555.	-7112.	-9953.	-10757.	-11602.
9.0	2248.	-6508.	-9409.	-10230.	-11097.
10.0	3402.	-5568.	-8549.	-9391.	-10287.
11.0	4231.	-4825.	-7871.	-8732.	-9652.
12.0	5129.	-4010.	-7123.	-8003.	-8948.
13.0	6493.	-2854.	-6054.	-6956.	-7934.
14.0	7936.	-1617.	-4905.	-5832.	-6842.
15.0	9457.	-298.	-3677.	-4630.	-5673.
16.0	11067.	1111.	-2363.	-3341.	-4419.
17.0	12527.	2452.	-1110.	-2113.	-3224.
18.0	14937.	4465.	779.	-258.	-1414.
19.0	16831.	6167.	2377.	1312.	117.

TABLE 93 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	13429.	31233.	76166.	105384.	150074.
2.0	11842.	24859.	59615.	82080.	116356.
3.0	10797.	20282.	47629.	65194.	91920.
4.0	10341.	17140.	39061.	53057.	74291.
5.0	10064.	14868.	32803.	44190.	61416.
6.0	9992.	13282.	28264.	37734.	52019.
7.0	10093.	12214.	24985.	33036.	45147.
8.0	10330.	11535.	22632.	29621.	40112.
9.0	10690.	11160.	20969.	27154.	36424.
10.0	11554.	11297.	20079.	25642.	33972.
11.0	12127.	11364.	19337.	24417.	32020.
12.0	12794.	11598.	18906.	23601.	30627.
13.0	13945.	12244.	18976.	23351.	29904.
14.0	15190.	13023.	19255.	23362.	29520.
15.0	16524.	13923.	19711.	23586.	29407.
16.0	17957.	14945.	20328.	23999.	29524.
17.0	19247.	15922.	20939.	24428.	29691.
18.0	21495.	17590.	22230.	25543.	30556.
19.0	23231.	18963.	23264.	26419.	31207.

TABLE 94 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	134943.	24192.	-63844.	-89715.	-106491.
2.0	137960.	24242.	-65916.	-92247.	-108911.
3.0	141635.	24653.	-67865.	-94728.	-111332.
4.0	146764.	25909.	-69483.	-97043.	-113752.
5.0	151737.	27023.	-71203.	-99431.	-116172.
6.0	156978.	28250.	-72916.	-101833.	-118592.
7.0	162517.	29609.	-74616.	-104246.	-121013.
8.0	168333.	31081.	-76313.	-106676.	-123433.
9.0	174458.	32686.	-78002.	-109123.	-125853.
10.0	182957.	35684.	-79130.	-111283.	-128273.
11.0	189767.	37584.	-80795.	-113760.	-130694.
12.0	196916.	39625.	-82455.	-116258.	-133114.
13.0	206490.	43082.	-83553.	-118473.	-135534.
14.0	216477.	46718.	-84636.	-120704.	-137954.
15.0	226860.	50519.	-85712.	-122960.	-140375.
16.0	237698.	54518.	-86771.	-125235.	-142795.
17.0	247688.	57913.	-88168.	-127725.	-145215.
18.0	262797.	64353.	-88304.	-129555.	-147635.
19.0	275065.	68960.	-89326.	-131904.	-150056.

TABLE 95 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	171811.	122510.	150748.	202543.	310519.
2.0	170765.	107508.	108991.	142804.	221998.
3.0	171380.	96816.	78043.	98628.	156963.
4.0	174173.	89816.	55122.	65782.	108830.
5.0	177335.	84725.	37640.	40902.	72862.
6.0	181143.	81230.	24161.	21800.	45657.
7.0	185527.	78938.	13575.	6862.	24767.
8.0	190387.	77536.	5075.	-5079.	8432.
9.0	195704.	76829.	-1911.	-14857.	-4615.
10.0	203504.	77926.	-7246.	-22771.	-15283.
11.0	209696.	78226.	-12322.	-29858.	-24227.
12.0	216288.	78889.	-16814.	-36132.	-31917.
13.0	225351.	81132.	-20319.	-41511.	-38694.
14.0	234863.	83678.	-23493.	-46460.	-44801.
15.0	244799.	86482.	-26427.	-51099.	-50413.
16.0	255212.	89556.	-29168.	-55508.	-55657.
17.0	264797.	92083.	-32111.	-59944.	-60625.
18.0	279516.	97701.	-33689.	-63575.	-65382.
19.0	291407.	101522.	-36070.	-67611.	-69977.

TABLE 96 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	172782.	77452.	-1811.	-25451.	-40545.
2.0	177404.	79610.	-1640.	-25738.	-40726.
3.0	182830.	82327.	-1126.	-25748.	-40678.
4.0	189991.	86274.	156.	-25145.	-40175.
5.0	197008.	90088.	1335.	-24619.	-39679.
6.0	204377.	94127.	2640.	-23988.	-39066.
7.0	212138.	98419.	4087.	-23240.	-38324.
8.0	220266.	102944.	5662.	-22384.	-37456.
9.0	228802.	107730.	7384.	-21405.	-36452.
10.0	240156.	114515.	10345.	-19448.	-34744.
11.0	249591.	119879.	12390.	-18201.	-33441.
12.0	259478.	125529.	14595.	-16818.	-31982.
13.0	272249.	133220.	18056.	-14445.	-29807.
14.0	285563.	141258.	21711.	-11912.	-27455.
15.0	299401.	149630.	25550.	-9225.	-24928.
16.0	313835.	158384.	29602.	-6362.	-22205.
17.0	327351.	166431.	33190.	-3847.	-19621.
18.0	346907.	178768.	39419.	732.	-15616.
19.0	363229.	188729.	44143.	4156.	-12261.

TABLE 97 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	209650.	175771.	212781.	266807.	376464.
2.0	210209.	162876.	173266.	209313.	290183.
3.0	212576.	154490.	144782.	167608.	227617.
4.0	217400.	150180.	124761.	137680.	182407.
5.0	222605.	147790.	110179.	115714.	149355.
6.0	228542.	147107.	99717.	99644.	125184.
7.0	235147.	147748.	92278.	87868.	107456.
8.0	242320.	149398.	87050.	79214.	94408.
9.0	250048.	151872.	83475.	72861.	84787.
10.0	260703.	156757.	82229.	69064.	78246.
11.0	269521.	160521.	80863.	65701.	73026.
12.0	278850.	164793.	80236.	63308.	69215.
13.0	291110.	171270.	81291.	62516.	67033.
14.0	303948.	178218.	82854.	62333.	65698.
15.0	317339.	185593.	84835.	62636.	65034.
16.0	331349.	193422.	87206.	63365.	64933.
17.0	344460.	200601.	89247.	63934.	64969.
18.0	363626.	212116.	94034.	66713.	66637.
19.0	379571.	221292.	97399.	68450.	67818.

TABLE 98 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-9994.	-29220.	-35245.	-36997.	-38677.
2.0	-10003.	-29254.	-35372.	-37149.	-38864.
3.0	-9692.	-29030.	-35256.	-37063.	-38818.
4.0	-8684.	-28288.	-34658.	-36504.	-38310.
5.0	-7763.	-27567.	-34073.	-35957.	-37812.
6.0	-6724.	-26720.	-33368.	-35291.	-37197.
7.0	-5551.	-25737.	-32532.	-34495.	-36454.
8.0	-4254.	-24621.	-31568.	-33572.	-35586.
9.0	-2815.	-23359.	-30462.	-32510.	-34581.
10.0	-286.	-21304.	-28615.	-30719.	-32862.
11.0	1459.	-19724.	-27204.	-29354.	-31560.
12.0	3360.	-17978.	-25634.	-27832.	-30102.
13.0	6360.	-15430.	-23310.	-25570.	-27918.
14.0	9540.	-12695.	-20806.	-23129.	-25559.
15.0	12894.	-9775.	-18123.	-20511.	-23026.
16.0	16449.	-6647.	-15240.	-17695.	-20297.
17.0	19635.	-3690.	-12511.	-15028.	-17714.
18.0	25075.	854.	-8288.	-10994.	-13692.
19.0	29271.	4652.	-4760.	-7439.	-10334.

TABLE 99 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1982
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	23107.	75496.	193846.	271796.	388972.
2.0	23680.	58524.	149704.	209450.	299032.
3.0	20670.	46280.	117697.	164242.	233830.
4.0	19148.	37774.	94734.	131672.	186725.
5.0	18110.	31569.	77922.	107847.	152303.
6.0	17605.	27164.	65673.	90449.	127138.
7.0	17536.	24106.	56760.	77730.	108690.
8.0	17811.	22058.	50288.	68420.	95117.
9.0	18387.	20792.	45630.	61619.	85111.
10.0	20173.	20781.	42928.	57264.	78300.
11.0	21262.	20634.	40669.	53727.	72869.
12.0	22574.	20902.	39211.	51254.	68900.
13.0	25034.	22156.	38979.	50183.	66608.
14.0	27713.	23735.	39273.	49778.	65139.
15.0	30597.	25603.	40005.	49910.	64460.
16.0	33707.	27759.	41130.	50508.	64308.
17.0	36466.	29807.	42249.	51161.	64297.
18.0	41497.	33491.	44975.	53436.	65943.
19.0	45298.	36470.	47097.	55154.	67094.

TABLE 100 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	24581.	-12498.	-37114.	-42666.	-43428.
2.0	25133.	-12963.	-38133.	-43725.	-44415.
3.0	26104.	-13213.	-39088.	-44762.	-45402.
4.0	27014.	-13513.	-40072.	-45813.	-46389.
5.0	27989.	-13796.	-41061.	-46870.	-47376.
6.0	29036.	-14058.	-42056.	-47932.	-48363.
7.0	30149.	-14303.	-43058.	-49000.	-49350.
8.0	31336.	-14528.	-44066.	-50075.	-50337.
9.0	33212.	-14396.	-44964.	-51112.	-51324.
10.0	34566.	-14574.	-45986.	-52200.	-52311.
11.0	36000.	-14732.	-47016.	-53295.	-53298.
12.0	38135.	-14530.	-47937.	-54285.	-54285.
13.0	40370.	-14298.	-48865.	-55272.	-55272.
14.0	42700.	-14042.	-49803.	-56259.	-56259.
15.0	45140.	-13755.	-50749.	-57246.	-57246.
16.0	47301.	-13651.	-51780.	-58233.	-58233.
17.0	50960.	-12756.	-52554.	-59220.	-59220.
18.0	53744.	-12376.	-53532.	-60207.	-60207.
19.0	56680.	-11948.	-54517.	-61194.	-61194.

TABLE 101 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	39257.	26970.	48273.	72590.	118683.
2.0	38103.	20235.	31170.	48701.	84029.
3.0	37791.	15364.	18463.	31018.	58549.
4.0	37724.	11630.	8844.	17775.	39669.
5.0	37943.	8770.	1466.	7732.	25541.
6.0	38395.	6549.	-4299.	-6.	14836.
7.0	39029.	4792.	-8903.	-6084.	6598.
8.0	39821.	3379.	-12671.	-10966.	140.
9.0	41365.	2558.	-15717.	-14942.	-5034.
10.0	42431.	1598.	-18445.	-18339.	-9277.
11.0	43612.	784.	-20859.	-21287.	-12846.
12.0	45520.	422.	-22929.	-23796.	-15926.
13.0	47548.	158.	-24834.	-26058.	-18647.
14.0	49684.	-31.	-26622.	-28142.	-21107.
15.0	51943.	-150.	-28322.	-30092.	-23372.
16.0	53933.	-422.	-30036.	-31943.	-25493.
17.0	57428.	121.	-31439.	-33718.	-27505.
18.0	60054.	167.	-33003.	-35435.	-29434.
19.0	62838.	277.	-34539.	-37106.	-31300.

TABLE 102 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	43571.	13264.	-7881.	-12684.	-12982.
2.0	44944.	13830.	-7826.	-12670.	-12904.
3.0	46867.	14783.	-7517.	-12441.	-12630.
4.0	48735.	15690.	-7236.	-12227.	-12357.
5.0	50708.	16664.	-6909.	-11967.	-12034.
6.0	52797.	17714.	-6530.	-11655.	-11655.
7.0	54995.	18834.	-6103.	-11295.	-11221.
8.0	57313.	20032.	-5623.	-10881.	-10727.
9.0	60526.	21857.	-4736.	-10130.	-9931.
10.0	63112.	23229.	-4137.	-9598.	-9307.
11.0	65830.	24687.	-3479.	-9005.	-8615.
12.0	69463.	26783.	-2408.	-8001.	-7616.
13.0	73257.	28983.	-1263.	-6917.	-6541.
14.0	77206.	31282.	-59.	-5755.	-5388.
15.0	81332.	33697.	1227.	-4508.	-4151.
16.0	85149.	35883.	2375.	-3317.	-2971.
17.0	90888.	39413.	4378.	-1520.	-1184.
18.0	95573.	42189.	5911.	4.	329.
19.0	100496.	45121.	7549.	1641.	1953.

TABLE 103 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	58246.	52732.	77506.	102573.	149129.
2.0	57914.	47028.	61477.	79756.	115541.
3.0	58554.	43359.	50034.	63339.	91321.
4.0	59445.	40833.	41680.	51361.	73700.
5.0	60662.	39230.	35618.	42635.	60883.
6.0	62156.	38321.	31227.	36271.	51544.
7.0	63874.	37929.	28051.	31621.	44728.
8.0	65793.	37940.	25773.	28227.	39750.
9.0	68679.	38812.	24511.	26040.	36359.
10.0	70977.	39402.	23404.	24263.	33727.
11.0	73443.	40203.	22678.	23003.	31836.
12.0	76849.	41734.	22599.	22488.	30743.
13.0	80435.	43438.	22763.	22297.	30084.
14.0	84191.	45293.	23122.	22362.	29764.
15.0	88136.	47302.	23654.	22646.	29723.
16.0	91780.	49112.	24118.	22974.	29769.
17.0	97356.	52290.	25493.	23982.	30531.
18.0	101883.	54732.	26440.	24777.	31102.
19.0	106654.	57345.	27526.	25729.	31848.

TABLE 104 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	151.	-8027.	-10626.	-11364.	-12107.
2.0	351.	-7875.	-10514.	-11264.	-12023.
3.0	849.	-7500.	-10194.	-10959.	-11738.
4.0	1312.	-7133.	-9879.	-10658.	-11457.
5.0	1827.	-6711.	-9511.	-10305.	-11124.
6.0	2402.	-6229.	-9086.	-9895.	-10735.
7.0	3033.	-5690.	-8604.	-9429.	-10291.
8.0	3726.	-5086.	-8060.	-8902.	-9786.
9.0	4882.	-4144.	-7198.	-8062.	-8975.
10.0	5711.	-3402.	-6521.	-7402.	-8340.
11.0	6609.	-2587.	-5773.	-6674.	-7636.
12.0	7974.	-1429.	-4702.	-5626.	-6620.
13.0	9419.	-190.	-3552.	-4501.	-5528.
14.0	10941.	1130.	-2324.	-3298.	-4358.
15.0	12553.	2540.	-1008.	-2008.	-3103.
16.0	14012.	3880.	245.	-780.	-1908.
17.0	16427.	5897.	2137.	1078.	-95.
18.0	18321.	7600.	3735.	2648.	1436.
19.0	20338.	9421.	5449.	4332.	3079.

TABLE 105 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	14971.	32697.	77523.	106711.	151370.
2.0	13520.	26433.	61076.	83508.	117751.
3.0	12772.	22078.	49297.	66825.	93515.
4.0	12282.	18930.	40725.	54685.	75883.
5.0	12057.	16712.	34519.	45871.	63060.
6.0	12046.	15186.	30038.	39472.	53719.
7.0	12201.	14176.	26816.	34830.	46902.
8.0	12501.	13560.	24525.	31476.	41927.
9.0	13324.	13525.	23131.	29322.	38546.
10.0	13864.	13463.	22107.	27631.	35920.
11.0	14505.	13603.	21434.	26475.	34036.
12.0	15639.	14180.	21328.	25977.	32955.
13.0	16871.	14908.	21477.	25806.	32310.
14.0	18195.	15770.	21836.	25896.	32004.
15.0	19620.	16762.	22381.	26208.	31977.
16.0	20902.	17714.	22935.	26560.	32035.
17.0	23148.	19367.	24185.	27619.	32820.
18.0	24879.	20725.	25186.	28449.	33406.
19.0	26738.	22218.	26335.	29439.	34169.

TABLE 106 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	140380.	26662.	-63495.	-89827.	-106491.
2.0	144055.	27074.	-65445.	-92308.	-108911.
3.0	149184.	28329.	-67062.	-94623.	-111332.
4.0	154157.	29443.	-68783.	-97011.	-113752.
5.0	159398.	30670.	-70496.	-99412.	-116172.
6.0	164938.	32029.	-72196.	-101825.	-118592.
7.0	170753.	33502.	-73893.	-104256.	-121013.
8.0	176878.	35106.	-75581.	-106702.	-123433.
9.0	185377.	38104.	-76710.	-108863.	-125853.
10.0	192187.	40004.	-78375.	-111340.	-128273.
11.0	199336.	42046.	-80035.	-113838.	-130694.
12.0	208910.	45502.	-81133.	-116052.	-133114.
13.0	218897.	49138.	-82216.	-118284.	-135534.
14.0	229281.	52940.	-83292.	-120540.	-137954.
15.0	240118.	56938.	-84351.	-122815.	-140375.
16.0	250109.	60333.	-85747.	-125305.	-142795.
17.0	265217.	66773.	-85884.	-127135.	-145215.
18.0	277485.	71380.	-86905.	-129484.	-147635.
19.0	290365.	76263.	-87890.	-131849.	-150056.

TABLE 107 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	177248.	124981.	151097.	202431.	310519.
2.0	176860.	110339.	109462.	142743.	221998.
3.0	178929.	100492.	78846.	98733.	156963.
4.0	181567.	93349.	55822.	65814.	108830.
5.0	184996.	88373.	38348.	40920.	72862.
6.0	189103.	85009.	24881.	21807.	45657.
7.0	193762.	82831.	14299.	6852.	24767.
8.0	198932.	81561.	5807.	-5105.	8432.
9.0	206623.	82247.	-620.	-14597.	-4615.
10.0	212734.	82246.	-6490.	-22828.	-15283.
11.0	219265.	82688.	-11561.	-29936.	-24227.
12.0	228282.	84766.	-15492.	-35926.	-31917.
13.0	237758.	87188.	-18981.	-41323.	-38694.
14.0	247666.	89899.	-22149.	-46295.	-44801.
15.0	258057.	92901.	-25066.	-50953.	-50413.
16.0	267623.	95372.	-28144.	-55578.	-55657.
17.0	282326.	100943.	-29827.	-59354.	-60625.
18.0	294204.	104728.	-32291.	-63503.	-65382.
19.0	306707.	108825.	-34634.	-67554.	-69977.

TABLE 108 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	179876.	82255.	1254.	-22749.	-37657.
2.0	185302.	84972.	1768.	-22759.	-37610.
3.0	192462.	88919.	3051.	-22154.	-37105.
4.0	199480.	92734.	4231.	-21628.	-36608.
5.0	206849.	96773.	5537.	-20997.	-35995.
6.0	214610.	101065.	6983.	-20248.	-35252.
7.0	222738.	105590.	8559.	-19391.	-34385.
8.0	231274.	110376.	10281.	-18413.	-33380.
9.0	242628.	117163.	13244.	-16452.	-31668.
10.0	252064.	122526.	15289.	-15205.	-30365.
11.0	261950.	128177.	17494.	-13823.	-28907.
12.0	274722.	135868.	20958.	-11447.	-26729.
13.0	288035.	143907.	24614.	-8912.	-24375.
14.0	301874.	152280.	28455.	-6223.	-21845.
15.0	316308.	161035.	32508.	-3358.	-19120.
16.0	329824.	169081.	36096.	-844.	-16536.
17.0	349380.	181421.	42329.	3741.	-12526.
18.0	365702.	191382.	47054.	7166.	-9170.
19.0	382818.	201860.	52073.	10833.	-5557.

TABLE 109 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	216743.	180574.	215847.	269509.	379353.
2.0	218107.	168237.	176674.	212292.	293299.
3.0	222208.	161082.	148960.	171202.	231190.
4.0	226889.	156640.	128836.	141197.	185973.
5.0	232447.	154475.	114380.	119336.	153040.
6.0	238776.	154045.	104060.	103384.	128998.
7.0	245747.	154919.	96751.	91717.	111395.
8.0	253328.	156830.	91669.	83185.	98485.
9.0	263874.	161306.	89335.	77814.	89570.
10.0	272611.	164768.	87174.	73306.	82625.
11.0	281879.	168819.	85967.	70079.	77560.
12.0	294093.	175132.	86599.	68679.	74468.
13.0	306896.	181958.	87849.	68049.	72465.
14.0	320259.	189239.	89597.	68021.	71309.
15.0	334246.	196997.	91793.	68503.	70842.
16.0	347339.	204120.	93700.	68883.	70601.
17.0	366489.	215591.	98386.	71522.	72064.
18.0	382421.	224730.	101669.	73146.	73084.
19.0	399160.	234422.	105328.	75126.	74522.

TABLE 110 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-6438.	-25836.	-32125.	-33954.	-35707.
2.0	-6129.	-25614.	-32011.	-33869.	-35662.
3.0	-5117.	-24869.	-31409.	-33308.	-35152.
4.0	-4195.	-24146.	-30824.	-32760.	-34653.
5.0	-3155.	-23299.	-30118.	-32093.	-34037.
6.0	-1981.	-22315.	-29281.	-31296.	-33294.
7.0	-683.	-21198.	-28317.	-30373.	-32425.
8.0	755.	-19936.	-27212.	-29311.	-31420.
9.0	3291.	-17875.	-25359.	-27515.	-29697.
10.0	5035.	-16295.	-23949.	-26151.	-28395.
11.0	6936.	-14550.	-22379.	-24630.	-26938.
12.0	9941.	-11997.	-20051.	-22364.	-24751.
13.0	13125.	-9259.	-17544.	-19920.	-22389.
14.0	16483.	-6335.	-14858.	-17299.	-19853.
15.0	20042.	-3205.	-11973.	-14481.	-17122.
16.0	23228.	-248.	-9244.	-11814.	-14539.
17.0	28678.	4305.	-5014.	-7674.	-10511.
18.0	32875.	8105.	-1484.	-4217.	-7152.
19.0	37349.	12179.	2310.	-500.	-3536.

TABLE 111 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1983
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	31663.	78880.	196967.	274840.	391942.
2.0	27554.	62165.	153065.	212730.	302234.
3.0	25244.	50442.	121544.	167998.	237497.
4.0	23636.	41917.	98563.	135416.	190382.
5.0	22718.	35837.	81877.	111711.	156077.
6.0	22349.	31569.	69760.	94444.	131042.
7.0	22404.	28645.	60975.	81852.	112718.
8.0	22820.	26743.	54644.	72681.	99283.
9.0	24493.	26275.	50734.	66614.	89995.
10.0	25494.	25789.	47594.	61831.	82767.
11.0	26739.	25807.	45493.	58451.	77491.
12.0	29154.	26882.	44794.	56722.	74250.
13.0	31800.	28327.	44745.	55833.	72137.
14.0	34657.	30094.	45221.	55608.	70896.
15.0	37745.	32173.	46155.	55940.	70363.
16.0	40485.	34159.	47126.	56389.	70066.
17.0	45509.	37802.	49745.	58515.	71500.
18.0	49297.	40742.	51779.	60113.	72484.
19.0	53376.	43997.	54166.	62093.	73892.

TABLE 112 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	26120.	-11976.	-37146.	-42738.	-43428.
2.0	27091.	-12226.	-38101.	-43775.	-44415.
3.0	28001.	-12526.	-39085.	-44826.	-45402.
4.0	28976.	-12809.	-40074.	-45883.	-46389.
5.0	30023.	-13071.	-41069.	-46945.	-47376.
6.0	31136.	-13316.	-42071.	-48013.	-48363.
7.0	32323.	-13541.	-43079.	-49088.	-49350.
8.0	34199.	-13409.	-43977.	-50125.	-50337.
9.0	35553.	-13587.	-44999.	-51213.	-51324.
10.0	36987.	-13745.	-46029.	-52308.	-52311.
11.0	39122.	-13543.	-46950.	-53298.	-53298.
12.0	41357.	-13311.	-47878.	-54285.	-54285.
13.0	43687.	-13055.	-48816.	-55272.	-55272.
14.0	46127.	-12768.	-49762.	-56259.	-56259.
15.0	48288.	-12664.	-50793.	-57246.	-57246.
16.0	51947.	-11769.	-51567.	-58233.	-58233.
17.0	54731.	-11389.	-52545.	-59220.	-59220.
18.0	57667.	-10961.	-53530.	-60207.	-60207.
19.0	60762.	-10482.	-54521.	-61194.	-61194.

TABLE 113 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE : 1984
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	40796.	27492.	48241.	72519.	118683.
2.0	40061.	20972.	31202.	48650.	84029.
3.0	39688.	16050.	18466.	30954.	58549.
4.0	39686.	12334.	8842.	17705.	39669.
5.0	39978.	9495.	1458.	7657.	25541.
6.0	40495.	7291.	-4314.	-87.	14836.
7.0	41203.	5554.	-8925.	-6172.	6598.
8.0	42684.	4498.	-12581.	-11017.	140.
9.0	43705.	3367.	-15752.	-15043.	-5034.
10.0	44852.	2427.	-18488.	-18447.	-9277.
11.0	46734.	1973.	-20793.	-21290.	-12846.
12.0	48743.	1641.	-22870.	-23796.	-15926.
13.0	50864.	1400.	-24785.	-26058.	-18647.
14.0	53112.	1243.	-26581.	-28142.	-21107.
15.0	55092.	941.	-28367.	-30092.	-23372.
16.0	58579.	1460.	-29824.	-31943.	-25493.
17.0	61199.	1488.	-31430.	-33718.	-27505.
18.0	63977.	1582.	-33000.	-35435.	-29434.
19.0	66920.	1742.	-34544.	-37106.	-31300.

TABLE 114 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	45964.	14947.	-6597.	-11405.	-11612.
2.0	47887.	15900.	-6287.	-11176.	-11337.
3.0	49756.	16806.	-6006.	-10962.	-11064.
4.0	51728.	17781.	-5679.	-10701.	-10741.
5.0	53818.	18831.	-5300.	-10390.	-10362.
6.0	56015.	19951.	-4873.	-10030.	-9928.
7.0	58333.	21149.	-4393.	-9616.	-9434.
8.0	61547.	22975.	-3505.	-8863.	-8637.
9.0	64132.	24346.	-2906.	-8332.	-8013.
10.0	66851.	25804.	-2248.	-7739.	-7322.
11.0	70484.	27900.	-1177.	-6734.	-6321.
12.0	74278.	30101.	-35.	-5649.	-5244.
13.0	78227.	32401.	1174.	-4486.	-4091.
14.0	82353.	34816.	2461.	-3238.	-2853.
15.0	86170.	37002.	3608.	-2047.	-1673.
16.0	91909.	40533.	5613.	-249.	117.
17.0	96594.	43309.	7146.	1276.	1630.
18.0	101517.	46241.	8785.	2914.	3254.
19.0	106689.	49335.	10535.	4668.	4995.

TABLE 115 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	60640.	54415.	78789.	103851.	150499.
2.0	60857.	49098.	63016.	81249.	117108.
3.0	61443.	45383.	51545.	64819.	92886.
4.0	62439.	42924.	43237.	52887.	75317.
5.0	63772.	41397.	37227.	44212.	62555.
6.0	65374.	40558.	32883.	37896.	53272.
7.0	67213.	40244.	29762.	33300.	46514.
8.0	70032.	40882.	27891.	30245.	41840.
9.0	72285.	41301.	26341.	27838.	38277.
10.0	74716.	41976.	25293.	26122.	35712.
11.0	78097.	43416.	24980.	25275.	34130.
12.0	81663.	45052.	24972.	24840.	33115.
13.0	85405.	46857.	25204.	24727.	32533.
14.0	89338.	48827.	25642.	24879.	32299.
15.0	92973.	50607.	26035.	25107.	32201.
16.0	98541.	53762.	27357.	26042.	32857.
17.0	103062.	56186.	28262.	26779.	33344.
18.0	107827.	58784.	29315.	27686.	34026.
19.0	112846.	61560.	30512.	28756.	34890.

TABLE 116 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	1851.	-6433.	-9149.	-9921.	-10697.
2.0	2350.	-6058.	-8828.	-9615.	-10412.
3.0	2813.	-5690.	-8513.	-9314.	-10130.
4.0	3329.	-5268.	-8145.	-8961.	-9797.
5.0	3904.	-4787.	-7719.	-8551.	-9408.
6.0	4534.	-4247.	-7238.	-8085.	-8964.
7.0	5227.	-3644.	-6694.	-7558.	-8460.
8.0	6386.	-2699.	-5830.	-6716.	-7647.
9.0	7214.	-1957.	-5153.	-6057.	-7012.
10.0	8112.	-1143.	-4406.	-5329.	-6309.
11.0	9479.	17.	-3333.	-4280.	-5292.
12.0	10926.	1257.	-2182.	-3153.	-4198.
13.0	12449.	2578.	-953.	-1949.	-3027.
14.0	14062.	3990.	364.	-658.	-1772.
15.0	15521.	5330.	1617.	570.	-577.
16.0	17940.	7351.	3512.	2430.	1239.
17.0	19835.	9053.	5111.	4001.	2770.
18.0	21852.	10876.	6825.	5685.	4414.
19.0	23997.	12823.	8659.	7488.	6176.

TABLE 117 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	16672.	34291.	79000.	108154.	152780.
2.0	15519.	28250.	62762.	85157.	119362.
3.0	14736.	23888.	50979.	68470.	95123.
4.0	14299.	20794.	42459.	56382.	77542.
5.0	14134.	18636.	36311.	47625.	64775.
6.0	14178.	17168.	31886.	41282.	55489.
7.0	14395.	16222.	28726.	36700.	48733.
8.0	15162.	15948.	26755.	33662.	44067.
9.0	15656.	15711.	25225.	31327.	40509.
10.0	16265.	15722.	24221.	29704.	37950.
11.0	17376.	16206.	23874.	28869.	36380.
12.0	18591.	16866.	23848.	28450.	35378.
13.0	19902.	17676.	24077.	28358.	34810.
14.0	21316.	18630.	24524.	28535.	34590.
15.0	22589.	19551.	25005.	28786.	34504.
16.0	24831.	21184.	26202.	29770.	35182.
17.0	26556.	22523.	27159.	30541.	35686.
18.0	28410.	24001.	28275.	31486.	36384.
19.0	30397.	25620.	29546.	32596.	37265.

TABLE 118 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	146476.	29494.	-63025.	-89888.	-106491.
2.0	151604.	30750.	-64642.	-92203.	-108911.
3.0	156578.	31863.	-66363.	-94591.	-111332.
4.0	161818.	33091.	-68076.	-96992.	-113752.
5.0	167358.	34449.	-69776.	-99405.	-116172.
6.0	173174.	35922.	-71473.	-101836.	-118592.
7.0	179299.	37527.	-73161.	-104282.	-121013.
8.0	187797.	40524.	-74290.	-106442.	-123433.
9.0	194607.	42425.	-75954.	-108919.	-125853.
10.0	201756.	44466.	-77614.	-111418.	-128273.
11.0	211330.	47922.	-78713.	-113632.	-130694.
12.0	221318.	51558.	-79796.	-115864.	-133114.
13.0	231701.	55360.	-80872.	-118119.	-135534.
14.0	242538.	59359.	-81931.	-120394.	-137954.
15.0	252529.	62754.	-83327.	-122885.	-140375.
16.0	267637.	69193.	-83464.	-124715.	-142795.
17.0	279905.	73800.	-84485.	-127064.	-145215.
18.0	292785.	78683.	-85470.	-129427.	-147635.
19.0	306304.	83854.	-86416.	-131807.	-150056.

TABLE 119 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	183343.	127813.	151568.	202370.	310519.
2.0	184409.	114015.	110264.	142849.	221998.
3.0	186323.	104026.	79545.	98765.	156963.
4.0	189228.	96997.	56529.	65833.	108830.
5.0	192956.	92152.	39068.	40928.	72862.
6.0	197339.	88902.	25604.	21797.	45657.
7.0	202308.	86856.	15031.	6826.	24767.
8.0	209851.	86979.	7093.	-4845.	8432.
9.0	215853.	86567.	136.	-14654.	-4615.
10.0	222333.	86708.	-5730.	-22906.	-15283.
11.0	231259.	88565.	-10240.	-29730.	-24227.
12.0	240690.	90822.	-14154.	-35737.	-31917.
13.0	250562.	93410.	-17637.	-41158.	-38694.
14.0	260924.	96318.	-20788.	-46149.	-44801.
15.0	270468.	98717.	-24042.	-51023.	-50413.
16.0	285152.	104232.	-25860.	-54988.	-55657.
17.0	297014.	107971.	-28428.	-59282.	-60625.
18.0	309504.	112031.	-30855.	-63447.	-65382.
19.0	322646.	116416.	-33161.	-67513.	-69977.

TABLE 120 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

*ELAPSED TIME *IN YEARS *FROM TIME OF *DISCHARGE *FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	187776.	87627.	4684.	-19744.	-34511.
2.0	194937.	91576.	5969.	-19137.	-34004.
3.0	201954.	95390.	7150.	-18609.	-33507.
4.0	209323.	99430.	8456.	-17978.	-32893.
5.0	217085.	103722.	9903.	-17229.	-32150.
6.0	225212.	108247.	11479.	-16372.	-31282.
7.0	233748.	113033.	13201.	-15393.	-30277.
8.0	245103.	119821.	16167.	-13429.	-28561.
9.0	254538.	125185.	18211.	-12182.	-27259.
10.0	264425.	130835.	20416.	-10801.	-25801.
11.0	277197.	138528.	23882.	-8422.	-23620.
12.0	290511.	146568.	27541.	-5885.	-21263.
13.0	304349.	154941.	31383.	-3194.	-18731.
14.0	318783.	163696.	35438.	-327.	-16004.
15.0	332300.	171743.	39025.	2187.	-13420.
16.0	351856.	184085.	45263.	6777.	-9404.
17.0	368178.	194047.	49989.	10203.	-6046.
18.0	385294.	204524.	55008.	13871.	-2433.
19.0	403240.	215541.	60333.	17792.	1450.

TABLE 121 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	224644.	185946.	219277.	272514.	382498.
2.0	227742.	174841.	180876.	215914.	296905.
3.0	231699.	167553.	153058.	174747.	234788.
4.0	236733.	163336.	133060.	144847.	189689.
5.0	242682.	161424.	118746.	123104.	156885.
6.0	249378.	161227.	108555.	107260.	132968.
7.0	256757.	162362.	101392.	95715.	115503.
8.0	267157.	166275.	97555.	88169.	103303.
9.0	275785.	169327.	94302.	82084.	93980.
10.0	284972.	173077.	92301.	77711.	87190.
11.0	297126.	179170.	92355.	75480.	82847.
12.0	309882.	185832.	93182.	74242.	79934.
13.0	323210.	192991.	94617.	73767.	78109.
14.0	337169.	200656.	96581.	73918.	77150.
15.0	350239.	207706.	98310.	74049.	76542.
16.0	369371.	219123.	102866.	76504.	77734.
17.0	385287.	228217.	106046.	77984.	78544.
18.0	402013.	237872.	109623.	79851.	79920.
19.0	419583.	248104.	113589.	82086.	81529.

TABLE 122 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	-2511.	-22150.	-28726.	-30639.	-32472.
2.0	-1496.	-21402.	-28122.	-30075.	-31958.
3.0	-573.	-20677.	-27535.	-29526.	-31459.
4.0	468.	-19829.	-26829.	-28858.	-30843.
5.0	1643.	-18845.	-25992.	-28061.	-30098.
6.0	2941.	-17728.	-25027.	-27138.	-29230.
7.0	4380.	-16465.	-23921.	-26075.	-28225.
8.0	6923.	-14398.	-22063.	-24275.	-26497.
9.0	8667.	-12819.	-20654.	-22911.	-25195.
10.0	10567.	-11075.	-19085.	-21390.	-23739.
11.0	13577.	-8517.	-16753.	-19120.	-21548.
12.0	16766.	-5775.	-14242.	-16674.	-19183.
13.0	20128.	-2848.	-11553.	-14050.	-16645.
14.0	23691.	286.	-8665.	-11229.	-13912.
15.0	26876.	3243.	-5937.	-8563.	-11328.
16.0	32337.	7805.	-1699.	-4415.	-7293.
17.0	36536.	11606.	1832.	-957.	-3933.
18.0	41011.	15682.	5627.	2761.	-317.
19.0	45777.	20046.	9698.	6752.	3569.

TABLE 123 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1984
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	35589.	82566.	200365.	278155.	395177.
2.0	32187.	66377.	156954.	216524.	305938.
3.0	29788.	54633.	125418.	171780.	241190.
4.0	28299.	46233.	102562.	139317.	194192.
5.0	27516.	40291.	86003.	115743.	160016.
6.0	27271.	36156.	74014.	98603.	135105.
7.0	27467.	33378.	65370.	86150.	116919.
8.0	28987.	32280.	59792.	77717.	104206.
9.0	29869.	31331.	55439.	71218.	94497.
10.0	31025.	31010.	52457.	66592.	87423.
11.0	33380.	31840.	51120.	63961.	82880.
12.0	35980.	33105.	50603.	62412.	79818.
13.0	38802.	34738.	50735.	61703.	77882.
14.0	41864.	36716.	51414.	61677.	76837.
15.0	44579.	38621.	52191.	61858.	76157.
16.0	49594.	42212.	54671.	63788.	77311.
17.0	53367.	45103.	56592.	65232.	78078.
18.0	57433.	48320.	58890.	67091.	79319.
19.0	61804.	51864.	61554.	69345.	80997.

TABLE 124 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	28078.	-11239.	-37114.	-42788.	-43428.
2.0	28988.	-11539.	-38098.	-43839.	-44415.
3.0	29963.	-11822.	-39087.	-44896.	-45402.
4.0	31010.	-12084.	-40082.	-45958.	-46389.
5.0	32123.	-12329.	-41084.	-47026.	-47376.
6.0	33310.	-12554.	-42092.	-48101.	-48363.
7.0	35186.	-12422.	-42990.	-49138.	-49350.
8.0	36540.	-12600.	-44012.	-50226.	-50337.
9.0	37974.	-12758.	-45042.	-51321.	-51324.
10.0	40109.	-12556.	-45963.	-52311.	-52311.
11.0	42344.	-12324.	-46891.	-53298.	-53298.
12.0	44674.	-12068.	-47829.	-54285.	-54285.
13.0	47114.	-11781.	-48775.	-55272.	-55272.
14.0	49275.	-11677.	-49806.	-56259.	-56259.
15.0	52934.	-10782.	-50580.	-57246.	-57246.
16.0	55718.	-10402.	-51558.	-58233.	-58233.
17.0	58654.	-9974.	-52543.	-59220.	-59220.
18.0	61749.	-9495.	-53534.	-60207.	-60207.
19.0	65009.	-8964.	-54533.	-61194.	-61194.

TABLE 125 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	42754.	28229.	48273.	72469.	118683.
2.0	41958.	21659.	31205.	48586.	84029.
3.0	41650.	16754.	18463.	30884.	58549.
4.0	41720.	13059.	8834.	17630.	39669.
5.0	42078.	10237.	1443.	7576.	25541.
6.0	42669.	8053.	-4336.	-175.	14836.
7.0	44066.	6674.	-8835.	-6222.	6598.
8.0	45025.	5307.	-12616.	-11117.	140.
9.0	46126.	4196.	-15795.	-15151.	-5034.
10.0	47974.	3617.	-18422.	-18450.	-9277.
11.0	49957.	3192.	-20734.	-21290.	-12846.
12.0	52059.	2883.	-22821.	-23796.	-15926.
13.0	54292.	2675.	-24744.	-26058.	-18647.
14.0	56260.	2334.	-26625.	-28142.	-21107.
15.0	59738.	2823.	-28154.	-30092.	-23372.
16.0	62350.	2827.	-29814.	-31943.	-25493.
17.0	65122.	2903.	-31427.	-33718.	-27505.
18.0	68059.	3048.	-33005.	-35435.	-29434.
19.0	71167.	3260.	-34556.	-37106.	-31300.

TABLE 126 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	48909.	17023.	-5046.	-9897.	-10029.
2.0	50778.	17929.	-4765.	-9683.	-9757.
3.0	52750.	18904.	-4437.	-9423.	-9434.
4.0	54840.	19954.	-4059.	-9112.	-9054.
5.0	57037.	21073.	-3632.	-8752.	-8620.
6.0	59355.	22272.	-3152.	-8338.	-8127.
7.0	62569.	24098.	-2262.	-7584.	-7328.
8.0	65154.	25469.	-1664.	-7052.	-6704.
9.0	67373.	26927.	-1006.	-6460.	-6013.
10.0	71506.	29024.	65.	-5453.	-5012.
11.0	75300.	31225.	1209.	-4367.	-3934.
12.0	79249.	33525.	2418.	-3204.	-2780.
13.0	83376.	35941.	3706.	-1955.	-1541.
14.0	87192.	38127.	4853.	-764.	-361.
15.0	92932.	41659.	6860.	1037.	1432.
16.0	97617.	44435.	8394.	2562.	2945.
17.0	102540.	47367.	10033.	4199.	4570.
18.0	107711.	50462.	11783.	5954.	6311.
19.0	113142.	53727.	13648.	7833.	8175.

TABLE 127 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	63585.	56490.	80341.	105359.	152081.
2.0	63747.	51127.	64538.	82742.	118688.
3.0	64437.	47480.	53113.	66357.	94517.
4.0	65550.	45097.	44857.	54476.	77004.
5.0	66992.	43639.	38895.	45851.	64297.
6.0	68714.	42879.	34605.	39589.	55073.
7.0	71448.	43194.	31892.	35333.	48621.
8.0	73639.	43377.	29732.	32057.	43772.
9.0	76025.	43891.	28241.	29710.	40277.
10.0	79372.	45197.	27607.	28407.	38022.
11.0	82913.	46741.	27365.	27641.	36518.
12.0	86635.	48477.	27426.	27285.	35580.
13.0	90553.	50396.	27736.	27258.	35084.
14.0	94177.	52138.	28034.	27353.	34791.
15.0	99735.	55264.	29287.	28191.	35306.
16.0	104249.	57664.	30138.	28852.	35685.
17.0	109007.	60244.	31148.	29702.	36284.
18.0	114021.	63005.	32312.	30727.	37084.
19.0	119300.	65952.	33625.	31921.	38070.

TABLE 128 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	3876.	-4594.	-7444.	-8255.	-9070.
2.0	4339.	-4226.	-7129.	-7953.	-8788.
3.0	4855.	-3804.	-6761.	-7600.	-8455.
4.0	5430.	-3322.	-6335.	-7190.	-8066.
5.0	6060.	-2783.	-5854.	-6724.	-7622.
6.0	6752.	-2180.	-5310.	-6198.	-7118.
7.0	7914.	-1232.	-4444.	-5353.	-6303.
8.0	8742.	-491.	-3767.	-4695.	-5668.
9.0	9639.	322.	-3021.	-3967.	-4966.
10.0	11009.	1484.	-1946.	-2916.	-3947.
11.0	12457.	2726.	-794.	-1789.	-2852.
12.0	13982.	4049.	437.	-583.	-1680.
13.0	15596.	5461.	1755.	708.	-424.
14.0	17055.	6801.	3006.	1936.	771.
15.0	19479.	8826.	4905.	3800.	2589.
16.0	21374.	10529.	6504.	5371.	4121.
17.0	23392.	12352.	8219.	7055.	5766.
18.0	25537.	14300.	10054.	8859.	7527.
19.0	27815.	16380.	12015.	10788.	9413.

TABLE 129 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	18696.	36131.	80705.	109821.	154407.
2.0	17507.	30082.	64461.	86818.	120986.
3.0	16778.	25774.	52731.	70184.	96798.
4.0	16400.	22740.	44269.	58154.	79274.
5.0	16290.	20640.	38177.	49452.	66562.
6.0	16396.	19236.	33814.	43169.	57336.
7.0	17083.	18634.	30977.	38905.	50890.
8.0	17518.	18156.	28818.	35683.	46045.
9.0	18081.	17991.	27357.	33418.	42555.
10.0	19161.	18349.	26681.	32117.	40312.
11.0	20354.	18916.	26414.	31360.	38820.
12.0	21647.	19658.	26466.	31020.	37895.
13.0	23048.	20560.	26784.	31016.	37413.
14.0	24309.	21441.	27167.	31130.	37133.
15.0	26546.	23047.	28294.	32016.	37670.
16.0	28265.	24363.	29195.	32711.	38065.
17.0	30112.	25822.	30267.	33596.	38681.
18.0	32094.	27426.	31504.	34660.	39498.
19.0	34215.	29176.	32902.	35896.	40502.

TABLE 130 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	154024.	33170.	-62222.	-89782.	-106491.
2.0	153998.	34283.	-63942.	-92170.	-108911.
3.0	164238.	35511.	-65655.	-94572.	-111332.
4.0	169778.	36869.	-67356.	-96985.	-113752.
5.0	175594.	38342.	-69053.	-99416.	-116172.
6.0	181719.	39947.	-70741.	-101862.	-118592.
7.0	190218.	42945.	-71870.	-104022.	-121013.
8.0	197027.	44845.	-73534.	-106499.	-123433.
9.0	204177.	46886.	-75194.	-108997.	-125853.
10.0	213750.	50343.	-76293.	-111212.	-128273.
11.0	223738.	53979.	-77375.	-113444.	-130694.
12.0	234121.	57780.	-78451.	-115699.	-133114.
13.0	244959.	61779.	-79510.	-117974.	-135534.
14.0	254949.	65174.	-80907.	-120464.	-137954.
15.0	270057.	71614.	-81044.	-122294.	-140375.
16.0	282326.	76220.	-82065.	-124643.	-142795.
17.0	295205.	81103.	-83049.	-127007.	-145215.
18.0	308724.	86274.	-83996.	-129387.	-147635.
19.0	322912.	91746.	-84903.	-131783.	-150056.

TABLE 131 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	190892.	131489.	152371.	202476.	310519.
2.0	191903.	117549.	110964.	142881.	221998.
3.0	193983.	107674.	80253.	98784.	156963.
4.0	197188.	100776.	57249.	65840.	108830.
5.0	201192.	96045.	39791.	40917.	72862.
6.0	205885.	92927.	26336.	21771.	45657.
7.0	213227.	92274.	16322.	7086.	24767.
8.0	219081.	91299.	7854.	-4901.	8432.
9.0	225423.	91029.	896.	-14731.	-4615.
10.0	234298.	92585.	-4408.	-22701.	-15283.
11.0	243667.	94621.	-8902.	-29542.	-24227.
12.0	253493.	97044.	-12810.	-35573.	-31917.
13.0	263819.	99829.	-16275.	-41013.	-38694.
14.0	273335.	102134.	-19764.	-46219.	-44801.
15.0	287996.	107577.	-21759.	-50433.	-50413.
16.0	299840.	111259.	-24461.	-54916.	-55657.
17.0	312314.	115274.	-26993.	-59226.	-60625.
18.0	325443.	119622.	-29381.	-63406.	-65382.
19.0	339254.	124309.	-31648.	-67489.	-69977.

TABLE 132 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	197414.	94243.	8911.	-16091.	-30871.
2.0	204431.	98058.	10092.	-15563.	-30373.
3.0	211800.	102098.	11398.	-14931.	-29758.
4.0	219562.	106390.	12846.	-14181.	-29015.
5.0	227689.	110915.	14422.	-13324.	-28147.
6.0	236225.	115701.	16144.	-12346.	-27142.
7.0	247580.	122491.	19113.	-10377.	-25422.
8.0	257016.	127854.	21157.	-9131.	-24120.
9.0	266902.	133504.	23362.	-7750.	-22662.
10.0	279674.	141198.	26830.	-5369.	-20478.
11.0	292988.	149239.	30491.	-2829.	-18118.
12.0	306827.	157613.	34335.	-136.	-15584.
13.0	321261.	166369.	38391.	2733.	-12855.
14.0	334778.	174416.	41979.	5247.	-10271.
15.0	354335.	186760.	48221.	9843.	-6248.
16.0	370657.	196722.	52948.	13269.	-2890.
17.0	387773.	207200.	57967.	16938.	725.
18.0	405719.	218217.	63293.	20860.	4609.
19.0	424534.	229800.	68941.	25048.	8775.

TABLE 133 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	234281.	192562.	223503.	276167.	386138.
2.0	237236.	181324.	184999.	219489.	300536.
3.0	241546.	174261.	157306.	178425.	238537.
4.0	246971.	170296.	137450.	148644.	193567.
5.0	253287.	168617.	123265.	127008.	160888.
6.0	260391.	168681.	113221.	111287.	137108.
7.0	270590.	171820.	107305.	100731.	120358.
8.0	279070.	174308.	102545.	92467.	107745.
9.0	288148.	177647.	99452.	86516.	98576.
10.0	300221.	183440.	98715.	83143.	92513.
11.0	312917.	189881.	98964.	81073.	88349.
12.0	326199.	196877.	99976.	79991.	85613.
13.0	340122.	204420.	101626.	79694.	83985.
14.0	353164.	211376.	103121.	79492.	82882.
15.0	372274.	222723.	107506.	81704.	83713.
16.0	388172.	231760.	110551.	82996.	84248.
17.0	404882.	241370.	114024.	84719.	85315.
18.0	422438.	251565.	117908.	86841.	86862.
19.0	440877.	262362.	122196.	89342.	88853.

TABLE 134 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	2182.	-17885.	-24793.	-26803.	-28729.
2.0	3106.	-17160.	-24206.	-26253.	-28228.
3.0	4148.	-16311.	-23499.	-25585.	-27611.
4.0	5324.	-15325.	-22661.	-24787.	-26867.
5.0	6623.	-14208.	-21696.	-23864.	-25998.
6.0	8061.	-12945.	-20590.	-22801.	-24993.
7.0	10612.	-10872.	-18727.	-20996.	-23260.
8.0	12355.	-9293.	-17317.	-19632.	-21959.
9.0	14254.	-7549.	-15749.	-18112.	-20502.
10.0	17270.	-4987.	-13413.	-15838.	-18309.
11.0	20465.	-2240.	-10899.	-13388.	-15941.
12.0	23831.	691.	-8207.	-10762.	-13399.
13.0	27397.	3828.	-5316.	-7938.	-10664.
14.0	30582.	6784.	-2588.	-5272.	-8081.
15.0	36054.	11356.	1658.	-1117.	-4038.
16.0	40255.	15159.	5191.	2342.	-677.
17.0	44732.	19236.	8987.	6061.	2941.
18.0	49499.	23602.	13059.	10054.	6827.
19.0	54570.	28269.	17421.	14332.	10995.

TABLE 135 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1985
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	40282.	86831.	204298.	281990.	398920.
2.0	36789.	70619.	160970.	220346.	309668.
3.0	34510.	58999.	129454.	175720.	245037.
4.0	33155.	50737.	106731.	143389.	198168.
5.0	32496.	44927.	90299.	119940.	164116.
6.0	32391.	40939.	78451.	102939.	139342.
7.0	33700.	38971.	70565.	91229.	121883.
8.0	34420.	37385.	64538.	82359.	108744.
9.0	35457.	36601.	60344.	76017.	99190.
10.0	37729.	37098.	58129.	72144.	92853.
11.0	40268.	38118.	56974.	69693.	88488.
12.0	43045.	39570.	56638.	68324.	85602.
13.0	46071.	41413.	56972.	67815.	83863.
14.0	48755.	43214.	57491.	67634.	82668.
15.0	53757.	46734.	59785.	69304.	83447.
16.0	57512.	49565.	61560.	70545.	83928.
17.0	61564.	52733.	63746.	72250.	84952.
18.0	65921.	56239.	66322.	74384.	86462.
19.0	70597.	60088.	69277.	76926.	88424.

TABLE 136 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	29975.	-10552.	-37111.	-42852.	-43428.
2.0	30950.	-10835.	-38100.	-43909.	-44415.
3.0	31997.	-11097.	-39095.	-44971.	-45402.
4.0	33110.	-11342.	-40097.	-46039.	-46389.
5.0	34297.	-11567.	-41105.	-47114.	-47376.
6.0	36173.	-11435.	-42003.	-48151.	-48363.
7.0	37527.	-11613.	-43025.	-49239.	-49350.
8.0	38961.	-11771.	-44055.	-50334.	-50337.
9.0	41096.	-11569.	-44976.	-51324.	-51324.
10.0	43331.	-11337.	-45904.	-52311.	-52311.
11.0	45661.	-11081.	-46842.	-53298.	-53298.
12.0	48101.	-10794.	-47788.	-54285.	-54285.
13.0	50262.	-10690.	-48819.	-55272.	-55272.
14.0	53921.	-9795.	-49593.	-56259.	-56259.
15.0	56705.	-9415.	-50571.	-57246.	-57246.
16.0	59641.	-8987.	-51556.	-58233.	-58233.
17.0	62736.	-8508.	-52547.	-59220.	-59220.
18.0	65996.	-7977.	-53546.	-60207.	-60207.
19.0	69430.	-7392.	-54554.	-61194.	-61194.

TABLE 137 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	44651.	28916.	48276.	72404.	118683.
2.0	43919.	22362.	31203.	48516.	84029.
3.0	43684.	17480.	18456.	30809.	58549.
4.0	43820.	13801.	8819.	17549.	39669.
5.0	44252.	10999.	1422.	7488.	25541.
6.0	45532.	9172.	-4246.	-225.	14836.
7.0	46406.	7482.	-8370.	-6323.	6598.
8.0	47445.	6136.	-12660.	-11226.	140.
9.0	49248.	5386.	-15729.	-15154.	-5034.
10.0	51197.	4836.	-18363.	-18450.	-9277.
11.0	53274.	4435.	-20685.	-21290.	-12846.
12.0	55486.	4158.	-22780.	-23796.	-15926.
13.0	57440.	3765.	-24789.	-26058.	-18647.
14.0	60906.	4216.	-26412.	-28142.	-21107.
15.0	63509.	4190.	-28144.	-30092.	-23372.
16.0	66273.	4243.	-29812.	-31943.	-25493.
17.0	69203.	4369.	-31432.	-33718.	-27505.
18.0	72306.	4566.	-33017.	-35435.	-29434.
19.0	75588.	4833.	-34576.	-37106.	-31300.

TABLE 138 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	51801.	19059.	-3511.	-8391.	-8434.
2.0	53774.	20033.	-3184.	-8131.	-8111.
3.0	55863.	21083.	-2805.	-7819.	-7731.
4.0	58061.	22203.	-2379.	-7459.	-7298.
5.0	60379.	23401.	-1893.	-7045.	-6804.
6.0	63593.	25228.	-1007.	-6290.	-6004.
7.0	66178.	26599.	-409.	-5759.	-5380.
8.0	68897.	28057.	248.	-5167.	-4690.
9.0	72530.	30154.	1321.	-4159.	-3687.
10.0	76324.	32356.	2465.	-3072.	-2608.
11.0	80273.	34657.	3675.	-1908.	-1453.
12.0	84400.	37072.	4963.	-659.	-213.
13.0	88216.	39258.	6110.	532.	967.
14.0	93956.	42791.	8120.	2336.	2762.
15.0	98642.	45568.	9654.	3862.	4276.
16.0	103564.	48500.	11293.	5499.	5901.
17.0	108736.	51595.	13043.	7255.	7643.
18.0	114167.	54860.	14909.	9133.	9507.
19.0	119870.	58304.	16896.	11141.	11500.

TABLE 139 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	66477.	58526.	81875.	106866.	153676.
2.0	66744.	53231.	66119.	84295.	120334.
3.0	67550.	49659.	54745.	67961.	96219.
4.0	68771.	47346.	46537.	56129.	78760.
5.0	70333.	45967.	40628.	47557.	66113.
6.0	72951.	45836.	36749.	41636.	57196.
7.0	75057.	45695.	33745.	37158.	50568.
8.0	77381.	45964.	31644.	33942.	45787.
9.0	80682.	47109.	30568.	32011.	42604.
10.0	84190.	48528.	30006.	30789.	40426.
11.0	87886.	50173.	29832.	30100.	38999.
12.0	91785.	52024.	29971.	29831.	38146.
13.0	95394.	53714.	30141.	29746.	37591.
14.0	100941.	56802.	31301.	30453.	37914.
15.0	105445.	59173.	32080.	31016.	38150.
16.0	110196.	61729.	33037.	31790.	38641.
17.0	115203.	64472.	34158.	32757.	39357.
18.0	120477.	67403.	35438.	33905.	40280.
19.0	126028.	70529.	36873.	35229.	41395.

TABLE 140 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	5890.	-2739.	-5726.	-6575.	-7429.
2.0	6406.	-2317.	-5358.	-6222.	-7096.
3.0	6981.	-1835.	-4932.	-5811.	-6707.
4.0	7611.	-1296.	-4451.	-5346.	-6263.
5.0	8303.	-693.	-3908.	-4819.	-5759.
6.0	9468.	257.	-3039.	-3973.	-4942.
7.0	10296.	998.	-2363.	-3314.	-4308.
8.0	11192.	1811.	-1617.	-2587.	-3606.
9.0	12564.	2974.	-541.	-1535.	-2586.
10.0	14014.	4218.	613.	-406.	-1489.
11.0	15541.	5542.	1845.	800.	-317.
12.0	17156.	6956.	3164.	2093.	941.
13.0	18615.	8295.	4416.	3321.	2136.
14.0	21043.	10324.	6318.	5188.	3957.
15.0	22939.	12028.	7918.	6759.	5490.
16.0	24957.	13852.	9632.	8444.	7134.
17.0	27103.	15800.	11468.	10248.	8896.
18.0	29382.	17880.	13430.	12178.	10782.
19.0	31800.	20098.	15524.	14238.	12797.

TABLE 141 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	20710.	37985.	82423.	111500.	156048.
2.0	19575.	31991.	66232.	88550.	122678.
3.0	18904.	27742.	54559.	71973.	98546.
4.0	18582.	24766.	46154.	59998.	81077.
5.0	18534.	22730.	40123.	51357.	68425.
6.0	19112.	21673.	36085.	45394.	59512.
7.0	19464.	20863.	33058.	40944.	52885.
8.0	19963.	20457.	30968.	37791.	48108.
9.0	21006.	20642.	29838.	35849.	44935.
10.0	22167.	21083.	29240.	34627.	42770.
11.0	23437.	21732.	29053.	33949.	41355.
12.0	24821.	22565.	29194.	33696.	40517.
13.0	26067.	23394.	29445.	33628.	39973.
14.0	28297.	24964.	30478.	34381.	40319.
15.0	30007.	26250.	31306.	34975.	40570.
16.0	31848.	27685.	32323.	35784.	41077.
17.0	33823.	29270.	33516.	36789.	41811.
18.0	35939.	31005.	34880.	37979.	42752.
19.0	38200.	32894.	36411.	39346.	43886.

TABLE 142 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	161418.	36704.	-61522.	-89750.	-106491.
2.0	166659.	37931.	-63235.	-92152.	-108911.
3.0	172198.	39290.	-64935.	-94565.	-111332.
4.0	178014.	40762.	-66632.	-96995.	-113752.
5.0	184139.	42367.	-68321.	-99442.	-116172.
6.0	192638.	45365.	-69449.	-101602.	-118592.
7.0	199448.	47265.	-71114.	-104079.	-121013.
8.0	206597.	49306.	-72774.	-106577.	-123433.
9.0	216171.	52763.	-73872.	-108792.	-125853.
10.0	226158.	56399.	-74955.	-111023.	-128273.
11.0	236541.	60200.	-76031.	-113279.	-130694.
12.0	247379.	64199.	-77090.	-115554.	-133114.
13.0	257369.	67594.	-78487.	-118044.	-135534.
14.0	272478.	74034.	-78623.	-119874.	-137954.
15.0	284746.	78641.	-79645.	-122223.	-140375.
16.0	297625.	83523.	-80629.	-124587.	-142795.
17.0	311144.	88694.	-81576.	-126966.	-145215.
18.0	325332.	94167.	-82483.	-129363.	-147635.
19.0	340219.	99953.	-83350.	-131777.	-150056.

TABLE 143 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	198286.	135023.	153070.	202508.	310519.
2.0	199463.	121197.	111671.	142900.	221998.
3.0	201944.	111453.	80973.	98791.	156963.
4.0	205424.	104669.	57973.	65830.	108830.
5.0	209737.	100070.	40523.	40891.	72862.
6.0	216804.	98345.	27627.	22031.	45657.
7.0	222457.	96594.	17078.	7029.	24767.
8.0	228651.	95760.	8614.	-4979.	8432.
9.0	237417.	96906.	2218.	-14526.	-4615.
10.0	246705.	98641.	-3070.	-22512.	-15283.
11.0	256471.	100843.	-7558.	-29377.	-24227.
12.0	266751.	103463.	-11449.	-35427.	-31917.
13.0	276230.	105644.	-15252.	-41083.	-38694.
14.0	290363.	110994.	-17481.	-45629.	-44301.
15.0	302685.	114604.	-20360.	-50362.	-50413.
16.0	315140.	118562.	-23026.	-54860.	-55657.
17.0	328253.	122865.	-25519.	-59185.	-60625.
18.0	342051.	127514.	-27868.	-63382.	-65382.
19.0	356561.	132515.	-30094.	-67484.	-69977.

TABLE 144 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	206911.	100737.	13059.	-12487.	-27206.
2.0	214280.	104777.	14365.	-11854.	-26590.
3.0	222041.	109070.	15813.	-11104.	-25846.
4.0	230169.	113595.	17390.	-10247.	-24978.
5.0	238705.	118381.	19112.	-9268.	-23973.
6.0	250061.	125172.	22084.	-7296.	-22249.
7.0	259496.	130536.	24128.	-6050.	-20947.
8.0	269382.	136186.	26333.	-4669.	-19490.
9.0	282154.	143880.	29803.	-2285.	-17302.
10.0	295469.	151922.	33466.	258.	-14939.
11.0	309303.	160297.	37312.	2952.	-12403.
12.0	323742.	169054.	41370.	5823.	-9671.
13.0	337259.	177101.	44957.	8337.	-7088.
14.0	356816.	189447.	51204.	12939.	-3058.
15.0	373139.	199410.	55932.	16366.	301.
16.0	390255.	209888.	60952.	20036.	3917.
17.0	408201.	220906.	66279.	23959.	7802.
18.0	427016.	232488.	71927.	28148.	11968.
19.0	446740.	244661.	77910.	32614.	16431.

TABLE 145 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	243778.	199056.	227651.	279771.	389804.
2.0	247085.	188043.	189272.	223197.	304319.
3.0	251787.	181233.	161722.	182252.	242449.
4.0	257579.	177501.	141994.	152578.	197603.
5.0	264303.	176084.	127955.	131065.	165062.
6.0	274226.	178152.	119161.	116336.	142001.
7.0	282505.	179865.	112320.	105058.	124833.
8.0	291436.	182640.	107721.	96928.	112375.
9.0	303401.	188023.	105893.	91981.	103936.
10.0	316016.	194165.	105351.	88769.	98051.
11.0	329237.	200940.	105785.	86854.	94064.
12.0	343114.	208318.	107011.	85950.	91525.
13.0	356120.	215151.	108192.	85298.	89752.
14.0	375202.	226407.	112347.	87184.	90095.
15.0	391077.	235373.	115217.	88228.	90263.
16.0	407769.	244926.	118556.	89763.	91054.
17.0	425310.	255076.	122336.	91740.	92392.
18.0	443735.	265836.	126542.	94128.	94221.
19.0	463083.	277224.	131166.	96908.	96510.

TABLE 146 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	6845.	-13590.	-20833.	-22940.	-24959.
2.0	7888.	-12740.	-20126.	-22272.	-24342.
3.0	9065.	-11754.	-19287.	-21473.	-23597.
4.0	10364.	-10636.	-18321.	-20549.	-22728.
5.0	11803.	-9373.	-17216.	-19486.	-21722.
6.0	14361.	-7293.	-15347.	-17676.	-19985.
7.0	16104.	-5715.	-13938.	-16313.	-18684.
8.0	18002.	-3972.	-12370.	-14793.	-17228.
9.0	21024.	-1404.	-10030.	-12515.	-15030.
10.0	24223.	1347.	-7512.	-10062.	-12659.
11.0	27594.	4282.	-4817.	-7432.	-10114.
12.0	31164.	7422.	-1923.	-4606.	-7376.
13.0	34349.	10378.	805.	-1940.	-4794.
14.0	39833.	14961.	5059.	2223.	-744.
15.0	44036.	18765.	8593.	5683.	2619.
16.0	48515.	22844.	12391.	9404.	6238.
17.0	53283.	27211.	16464.	13397.	10125.
18.0	58355.	31880.	20827.	17677.	14294.
19.0	63746.	36866.	25494.	22257.	18759.

TABLE 147 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1986
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	44945.	91126.	208258.	285853.	402689.
2.0	41571.	75038.	164950.	224327.	313554.
3.0	39426.	63556.	133666.	179832.	249052.
4.0	38195.	55426.	111070.	147627.	202307.
5.0	37676.	49762.	94779.	124317.	168392.
6.0	38691.	46591.	83695.	108065.	144350.
7.0	39191.	44128.	75354.	95912.	126460.
8.0	40067.	42707.	69486.	87198.	113475.
9.0	42226.	42746.	66063.	81613.	104662.
10.0	44682.	43432.	64030.	77921.	98503.
11.0	47398.	44639.	63056.	75649.	94314.
12.0	50378.	46302.	62922.	74480.	91625.
13.0	53023.	47964.	63094.	73813.	89732.
14.0	58006.	51391.	65138.	75130.	90005.
15.0	61739.	54144.	66721.	76104.	90105.
16.0	65772.	57251.	68760.	77607.	90843.
17.0	70114.	60708.	71223.	79586.	92136.
18.0	74777.	64517.	74090.	82007.	93930.
19.0	79773.	68684.	77350.	84850.	96187.

TABLE 148 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	31937.	-9848.	-37113.	-42922.	-43428.
2.0	32984.	-10110.	-38108.	-43984.	-44415.
3.0	34097.	-10355.	-39110.	-45052.	-45402.
4.0	35284.	-10580.	-40118.	-46127.	-46389.
5.0	37160.	-10448.	-41016.	-47164.	-47376.
6.0	38514.	-10626.	-42038.	-48252.	-48363.
7.0	39948.	-10784.	-43068.	-49347.	-49350.
8.0	42083.	-10582.	-43989.	-50337.	-50337.
9.0	44318.	-10350.	-44917.	-51324.	-51324.
10.0	46648.	-10094.	-45855.	-52311.	-52311.
11.0	49088.	-9807.	-46801.	-53298.	-53298.
12.0	51249.	-9703.	-47832.	-54285.	-54285.
13.0	54908.	-8808.	-48606.	-55272.	-55272.
14.0	57692.	-8428.	-49584.	-56259.	-56259.
15.0	60628.	-8000.	-50569.	-57246.	-57246.
16.0	63723.	-7521.	-51560.	-58233.	-58233.
17.0	66983.	-6990.	-52559.	-59220.	-59220.
18.0	70417.	-6405.	-53567.	-60207.	-60207.
19.0	74032.	-5763.	-54583.	-61194.	-61194.

TABLE 149 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	46612.	29620.	48273.	72335.	118683.
2.0	45954.	23088.	31195.	48441.	84029.
3.0	45784.	18221.	18441.	30728.	58549.
4.0	45995.	14563.	8797.	17461.	39669.
5.0	47115.	12118.	1511.	7438.	25541.
6.0	47872.	9981.	-4281.	-326.	14836.
7.0	48827.	8311.	-8914.	-6431.	6598.
8.0	50567.	7326.	-12593.	-11229.	140.
9.0	52470.	6604.	-15670.	-15154.	-5034.
10.0	54513.	6078.	-18314.	-18450.	-9277.
11.0	56701.	5709.	-20644.	-21290.	-12846.
12.0	58635.	5248.	-22825.	-23796.	-15926.
13.0	62086.	5648.	-24576.	-26058.	-18647.
14.0	64677.	5583.	-26403.	-28142.	-21107.
15.0	67432.	5606.	-28142.	-30092.	-23372.
16.0	70355.	5708.	-29816.	-31943.	-25493.
17.0	73451.	5887.	-31444.	-33718.	-27505.
18.0	76727.	6138.	-33037.	-35435.	-29434.
19.0	80190.	6462.	-34606.	-37106.	-31300.

TABLE 150 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	54799.	21169.	-1918.	-6824.	-6772.
2.0	56889.	22219.	-1539.	-6512.	-6393.
3.0	59086.	23339.	-1113.	-6153.	-5959.
4.0	61404.	24537.	-633.	-5739.	-5466.
5.0	64618.	26365.	260.	-4982.	-4663.
6.0	67204.	27736.	858.	-4451.	-4041.
7.0	69922.	29193.	1515.	-3859.	-3350.
8.0	73556.	31291.	2589.	-2850.	-2346.
9.0	77350.	33493.	3733.	-1762.	-1266.
10.0	81299.	35794.	4945.	-597.	-110.
11.0	85426.	38210.	6234.	653.	1131.
12.0	89242.	40396.	7381.	1844.	2310.
13.0	94983.	43931.	9392.	3650.	4109.
14.0	99068.	46707.	10926.	5176.	5623.
15.0	104591.	49640.	12566.	6814.	7248.
16.0	109762.	52735.	14316.	8570.	8990.
17.0	115193.	56001.	16182.	10449.	10855.
18.0	120896.	59444.	18169.	12457.	12848.
19.0	126884.	63075.	20283.	14600.	14977.

TABLE 151 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	69475.	60637.	83469.	108433.	155338.
2.0	69858.	55417.	67764.	85913.	122052.
3.0	70773.	51915.	56438.	69628.	97991.
4.0	72114.	49680.	48283.	57849.	80592.
5.0	74573.	48931.	42787.	49620.	68254.
6.0	76562.	48343.	38614.	43476.	59159.
7.0	78801.	48289.	35669.	39057.	52598.
8.0	82040.	49199.	33985.	36258.	48131.
9.0	85502.	50448.	32980.	34408.	45025.
10.0	89165.	51967.	32486.	33264.	42924.
11.0	93038.	53726.	32390.	32662.	41583.
12.0	96628.	55348.	32388.	32333.	40670.
13.0	102160.	58387.	33423.	32864.	40733.
14.0	106653.	60718.	34107.	33293.	40775.
15.0	111394.	63245.	34993.	33968.	41122.
16.0	116393.	65964.	36060.	34860.	41730.
17.0	121661.	68877.	37297.	35951.	42570.
18.0	127206.	71987.	38699.	37229.	43621.
19.0	133042.	75300.	40261.	38688.	44871.

TABLE 152 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	7984.	-806.	-3935.	-4824.	-5719.
2.0	8559.	-325.	-3509.	-4414.	-5330.
3.0	9189.	214.	-3028.	-3949.	-4886.
4.0	9881.	817.	-2485.	-3422.	-4382.
5.0	11049.	1770.	-1614.	-2574.	-3563.
6.0	11876.	2510.	-938.	-1916.	-2929.
7.0	12772.	3323.	-193.	-1189.	-2228.
8.0	14146.	4488.	885.	-135.	-1206.
9.0	15598.	5734.	2040.	995.	-108.
10.0	17127.	7059.	3273.	2203.	1065.
11.0	18743.	8475.	4593.	3497.	2324.
12.0	20202.	9814.	5845.	4724.	3518.
13.0	22635.	11847.	7750.	6594.	5343.
14.0	24532.	13551.	9351.	8166.	6876.
15.0	26550.	15375.	11066.	9851.	8521.
16.0	28696.	17324.	12902.	11656.	10283.
17.0	30975.	19405.	14864.	13586.	12169.
18.0	33395.	21623.	16959.	15647.	14184.
19.0	35961.	23985.	19193.	17846.	16335.

TABLE 153 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	22804.	39918.	84214.	113251.	157758.
2.0	21728.	33983.	68080.	90358.	124444.
3.0	21112.	29792.	56463.	73836.	100367.
4.0	20852.	26879.	48119.	61921.	82958.
5.0	21279.	25193.	42417.	53602.	70620.
6.0	21519.	23926.	38186.	47451.	61524.
7.0	21940.	23188.	35227.	43070.	54965.
8.0	22921.	23135.	33470.	40243.	50508.
9.0	24040.	23402.	32419.	38380.	47413.
10.0	25279.	23924.	31901.	37236.	45324.
11.0	26640.	24664.	31801.	36645.	43996.
12.0	27866.	25422.	31874.	36327.	43094.
13.0	30087.	26945.	32780.	36901.	43180.
14.0	31786.	28191.	33511.	37360.	43237.
15.0	33618.	29597.	34454.	38067.	43601.
16.0	35586.	31158.	35592.	38996.	44226.
17.0	37696.	32875.	36913.	40126.	45084.
18.0	39952.	34748.	38409.	41448.	46154.
19.0	42361.	36782.	40080.	42953.	47425.

TABLE 154 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	169079.	40351.	-60815.	-89731.	-106491.
2.0	174619.	41710.	-62515.	-92144.	-108911.
3.0	180434.	43183.	-64212.	-94575.	-111332.
4.0	186559.	44787.	-65900.	-97021.	-113752.
5.0	195058.	47785.	-67029.	-99182.	-116172.
6.0	201868.	49685.	-68694.	-101659.	-118592.
7.0	209017.	51727.	-70354.	-104157.	-121013.
8.0	218591.	55183.	-71452.	-106371.	-123433.
9.0	228578.	58819.	-72535.	-108603.	-125853.
10.0	238962.	62621.	-73611.	-110859.	-128273.
11.0	249799.	66619.	-74670.	-113134.	-130694.
12.0	259790.	70014.	-76066.	-115624.	-133114.
13.0	274898.	76454.	-76203.	-117454.	-135534.
14.0	287166.	81061.	-77224.	-119803.	-137954.
15.0	300046.	85944.	-78209.	-122167.	-140375.
16.0	313564.	91115.	-79156.	-124546.	-142795.
17.0	327752.	96587.	-80063.	-126943.	-145215.
18.0	342639.	102373.	-80930.	-129357.	-147635.
19.0	358258.	108489.	-81755.	-131791.	-150056.

TABLE 155 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	205946.	138670.	153778.	202526.	310519.
2.0	207424.	124976.	112391.	142907.	221998.
3.0	210180.	115346.	81696.	98781.	156963.
4.0	213969.	108694.	58705.	65804.	108830.
5.0	220656.	105488.	41814.	41151.	72862.
6.0	226033.	102665.	28383.	21974.	45657.
7.0	232026.	101056.	17838.	6951.	24767.
8.0	240645.	101637.	9936.	-4774.	8432.
9.0	249825.	102962.	3556.	-14337.	-4615.
10.0	259509.	104863.	-1726.	-22347.	-15283.
11.0	269728.	107262.	-6197.	-29232.	-24227.
12.0	279161.	109278.	-10425.	-35497.	-31917.
13.0	293759.	114504.	-12968.	-40493.	-38694.
14.0	305552.	118021.	-16082.	-45558.	-44801.
15.0	317984.	121907.	-18924.	-50305.	-50413.
16.0	331079.	126153.	-21552.	-54819.	-55657.
17.0	344861.	130757.	-24006.	-59161.	-60625.
18.0	359358.	135721.	-26315.	-63376.	-65382.
19.0	374601.	141051.	-28499.	-67497.	-69977.

TABLE 156 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	216763.	107469.	17358.	-8746.	-23387.
2.0	224524.	111762.	18807.	-7996.	-22642.
3.0	232652.	116287.	20383.	-7139.	-21774.
4.0	241138.	121073.	22106.	-6160.	-20769.
5.0	252544.	127866.	25081.	-4184.	-19040.
6.0	261979.	133229.	27125.	-2938.	-17738.
7.0	271865.	138879.	29329.	-1558.	-16282.
8.0	284638.	146575.	32802.	830.	-14090.
9.0	297952.	154618.	36467.	3375.	-11725.
10.0	311791.	162994.	40315.	6072.	-9185.
11.0	326226.	171752.	44375.	8945.	-6452.
12.0	339743.	179798.	47962.	11459.	-3869.
13.0	359301.	192147.	54214.	16067.	168.
14.0	375623.	202110.	58943.	19495.	3529.
15.0	392739.	212589.	63964.	23166.	7146.
16.0	410685.	223607.	69291.	27090.	11031.
17.0	429501.	235190.	74940.	31279.	15199.
18.0	449225.	247363.	80924.	35746.	19662.
19.0	469902.	260155.	87259.	40505.	24436.

TABLE 157 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	253630.	205788.	231951.	283511.	393623.
2.0	257329.	195028.	193713.	227055.	308267.
3.0	262397.	188450.	166292.	186217.	246521.
4.0	268597.	184980.	146710.	156665.	201813.
5.0	278141.	185569.	133925.	136149.	169995.
6.0	286144.	186209.	124202.	120695.	146511.
7.0	294874.	188208.	117521.	109550.	129498.
8.0	306692.	193029.	114190.	102428.	117774.
9.0	319198.	198761.	112558.	97641.	109513.
10.0	332339.	205236.	112200.	94584.	103805.
11.0	346155.	212394.	112848.	92847.	100015.
12.0	359115.	219062.	113603.	91585.	97328.
13.0	378161.	230197.	117449.	93028.	97008.
14.0	394009.	239070.	120085.	93740.	96682.
15.0	410678.	248552.	123249.	95027.	97107.
16.0	428200.	258645.	126895.	96817.	98169.
17.0	446609.	269360.	130997.	99060.	99789.
18.0	465944.	280711.	135538.	101727.	101915.
19.0	486244.	292717.	140515.	104798.	104515.

TABLE 158 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	11690.	-9115.	-16707.	-18916.	-21032.
2.0	12868.	-8128.	-15868.	-18117.	-20286.
3.0	14168.	-7010.	-14902.	-17192.	-19417.
4.0	15606.	-5747.	-13796.	-16130.	-18411.
5.0	18173.	-3659.	-11921.	-14313.	-16669.
6.0	19915.	-2082.	-10513.	-12951.	-15368.
7.0	21813.	-340.	-8946.	-11432.	-13913.
8.0	24841.	2233.	-6601.	-9150.	-11711.
9.0	28046.	4990.	-4079.	-6692.	-9336.
10.0	31421.	7928.	-1381.	-4060.	-6789.
11.0	34995.	11072.	1516.	-1231.	-4048.
12.0	38179.	14028.	4244.	1434.	-1466.
13.0	43676.	18621.	8507.	5607.	2592.
14.0	47881.	22428.	12043.	9068.	5956.
15.0	52362.	26508.	15841.	12790.	9576.
16.0	57132.	30876.	19916.	16784.	13465.
17.0	62205.	35546.	24280.	21065.	17635.
18.0	67597.	40533.	28948.	25646.	22100.
19.0	73322.	45853.	33935.	30542.	26876.

TABLE 159 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1987
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	49791.	95601.	212384.	289878.	406617.
2.0	46551.	79650.	169208.	228482.	317610.
3.0	44529.	68300.	138051.	184113.	253232.
4.0	43438.	60315.	115595.	152046.	206623.
5.0	44047.	55476.	100074.	129490.	173446.
6.0	44245.	51802.	86528.	112789.	148967.
7.0	44900.	49503.	80346.	100793.	131231.
8.0	46905.	48912.	75255.	92842.	118991.
9.0	49248.	49140.	72014.	87436.	110356.
10.0	51880.	50013.	70162.	83923.	104373.
11.0	54798.	51430.	69388.	81850.	100380.
12.0	57393.	52908.	69089.	80520.	97535.
13.0	62350.	56207.	70796.	81360.	97118.
14.0	66054.	58858.	72122.	81975.	96705.
15.0	70065.	61886.	73969.	83210.	97062.
16.0	74389.	65283.	76286.	84987.	98069.
17.0	79037.	69043.	79039.	87254.	99646.
18.0	84019.	73171.	82211.	89976.	101735.
19.0	89349.	77671.	85791.	93135.	104304.

TABLE 160 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	33971.	-9123.	-37121.	-42997.	-43428.
2.0	35084.	-9368.	-38123.	-44065.	-44415.
3.0	36271.	-9593.	-39131.	-45140.	-45402.
4.0	38147.	-9461.	-40029.	-46177.	-46389.
5.0	39501.	-9639.	-41051.	-47265.	-47376.
6.0	40935.	-9797.	-42081.	-48360.	-48363.
7.0	43070.	-9595.	-43002.	-49350.	-49350.
8.0	45305.	-9363.	-43930.	-50337.	-50337.
9.0	47635.	-9107.	-44868.	-51324.	-51324.
10.0	50075.	-8820.	-45814.	-52311.	-52311.
11.0	52236.	-8716.	-46845.	-53298.	-53298.
12.0	55895.	-7821.	-47619.	-54285.	-54285.
13.0	58679.	-7441.	-48597.	-55272.	-55272.
14.0	61615.	-7013.	-49582.	-56259.	-56259.
15.0	64710.	-6534.	-50573.	-57246.	-57246.
16.0	67970.	-6003.	-51572.	-58233.	-58233.
17.0	71404.	-5418.	-52580.	-59220.	-59220.
18.0	75019.	-4776.	-53596.	-60207.	-60207.
19.0	78824.	-4075.	-54621.	-61194.	-61194.

TABLE 161 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	48647.	30345.	48266.	72260.	118683.
2.0	48054.	23830.	31180.	48360.	84029.
3.0	47958.	18983.	18419.	30640.	58549.
4.0	48858.	15682.	8887.	17411.	39669.
5.0	49455.	12927.	1476.	7337.	25541.
6.0	50293.	10810.	-4324.	-434.	14336.
7.0	51949.	9501.	-8847.	-6434.	6598.
8.0	53790.	8545.	-12534.	-11229.	140.
9.0	55787.	7847.	-15621.	-15154.	-5034.
10.0	57940.	7353.	-18273.	-18450.	-9277.
11.0	59849.	6800.	-20688.	-21290.	-12846.
12.0	63281.	7130.	-22612.	-23796.	-15926.
13.0	65857.	7015.	-24567.	-26058.	-18647.
14.0	68600.	6998.	-26400.	-28142.	-21107.
15.0	71513.	7071.	-28147.	-30092.	-23372.
16.0	74602.	7226.	-29829.	-31943.	-25493.
17.0	77872.	7459.	-31464.	-33718.	-27505.
18.0	81329.	7767.	-33066.	-35435.	-29434.
19.0	84982.	8150.	-34644.	-37106.	-31300.

TABLE 162 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	57916.	23362.	-260.	-5191.	-5038.
2.0	60113.	24482.	166.	-4831.	-4604.
3.0	62431.	25680.	646.	-4417.	-4111.
4.0	65646.	27509.	1540.	-3658.	-3306.
5.0	68231.	28880.	2138.	-3127.	-2684.
6.0	70949.	30337.	2795.	-2536.	-1994.
7.0	74583.	32435.	3870.	-1526.	-988.
8.0	78378.	34638.	5015.	-437.	93.
9.0	82327.	36940.	6228.	729.	1250.
10.0	86453.	39356.	7517.	1980.	2492.
11.0	90270.	41542.	8664.	3171.	3671.
12.0	96011.	45077.	10678.	4980.	5472.
13.0	100696.	47854.	12213.	6506.	6987.
14.0	105619.	50787.	13852.	8144.	8613.
15.0	110790.	53882.	15603.	9900.	10355.
16.0	116221.	57148.	17469.	11779.	12220.
17.0	121924.	60592.	19456.	13788.	14214.
18.0	127912.	64223.	21571.	15932.	16342.
19.0	134198.	68049.	23818.	18218.	18612.

TABLE 163 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	72591.	62830.	85127.	110066.	157073.
2.0	73083.	57680.	69469.	87594.	123840.
3.0	74118.	54256.	58197.	71363.	99840.
4.0	76356.	52652.	50456.	59930.	82752.
5.0	78185.	51446.	44665.	51475.	70233.
6.0	80308.	50944.	40551.	45390.	61205.
7.0	83462.	51531.	38025.	41390.	54960.
8.0	86862.	52545.	36411.	38672.	50570.
9.0	90479.	53894.	35475.	36899.	47541.
10.0	94319.	55528.	35058.	35841.	45526.
11.0	97883.	57058.	34821.	35179.	44123.
12.0	103396.	60029.	35686.	35469.	43831.
13.0	107874.	62310.	36243.	35720.	43611.
14.0	112603.	64798.	37034.	36262.	43765.
15.0	117593.	67487.	38030.	37054.	44229.
16.0	122853.	70377.	39213.	38070.	44960.
17.0	128392.	73469.	40572.	39290.	45929.
18.0	134222.	76766.	42100.	40704.	47115.
19.0	140356.	80273.	43795.	42306.	48506.

TABLE 164 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	10165.	1211.	-2066.	-2998.	-3935.
2.0	10795.	1750.	-1585.	-2532.	-3491.
3.0	11487.	2352.	-1042.	-2006.	-2987.
4.0	12658.	3308.	-169.	-1155.	-2166.
5.0	13484.	4048.	507.	-498.	-1533.
6.0	14379.	4859.	1252.	229.	-831.
7.0	15756.	6027.	2331.	1284.	192.
8.0	17210.	7275.	3488.	2416.	1291.
9.0	18741.	8602.	4722.	3625.	2466.
10.0	20359.	10018.	6043.	4920.	3725.
11.0	21817.	11357.	7295.	6147.	4919.
12.0	24255.	13395.	9204.	8021.	6748.
13.0	26153.	15100.	10805.	9593.	8281.
14.0	28172.	16924.	12521.	11279.	9926.
15.0	30318.	18874.	14357.	13084.	11689.
16.0	32598.	20955.	16319.	15014.	13575.
17.0	35018.	23173.	18415.	17075.	15591.
18.0	37584.	25536.	20649.	19274.	17742.
19.0	40304.	28051.	23030.	21618.	20035.

TABLE 165 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	24986.	41935.	86083.	115077.	159542.
2.0	23964.	36058.	70005.	92240.	126283.
3.0	23410.	31930.	58449.	75779.	102266.
4.0	23628.	29370.	50436.	64188.	85174.
5.0	23714.	27470.	44537.	55679.	72651.
6.0	24023.	26275.	40376.	49596.	63622.
7.0	24924.	25893.	37751.	45543.	57385.
8.0	25986.	25921.	36073.	42794.	53004.
9.0	27183.	26270.	35101.	41009.	49987.
10.0	28512.	26883.	34671.	39953.	47984.
11.0	29713.	27547.	34502.	39295.	46591.
12.0	31920.	29004.	35234.	39624.	46323.
13.0	33605.	30198.	35834.	39900.	46118.
14.0	35426.	31564.	36681.	40472.	46288.
15.0	37386.	33095.	37745.	41300.	46769.
16.0	39488.	34788.	39010.	42354.	47518.
17.0	41738.	36643.	40463.	43616.	48506.
18.0	44141.	38661.	42100.	45075.	49712.
19.0	46704.	40847.	43915.	46726.	51125.

TABLE 166 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	177039.	44130.	-60095.	-89724.	-106491.
2.0	182855.	45603.	-61792.	-92155.	-108911.
3.0	188980.	47208.	-63480.	-94601.	-111332.
4.0	197478.	50205.	-64609.	-96761.	-113752.
5.0	204288.	52106.	-66273.	-99238.	-116172.
6.0	211437.	54147.	-67933.	-101737.	-118592.
7.0	221011.	57603.	-69032.	-103951.	-121013.
8.0	230999.	61239.	-70115.	-106183.	-123433.
9.0	241382.	65041.	-71191.	-108438.	-125853.
10.0	252219.	69040.	-72250.	-110713.	-128273.
11.0	262210.	72435.	-73646.	-113204.	-130694.
12.0	277318.	78874.	-73783.	-115034.	-133114.
13.0	289586.	83481.	-74804.	-117383.	-135534.
14.0	302466.	88364.	-75789.	-119746.	-137954.
15.0	315985.	93535.	-76735.	-122126.	-140375.
16.0	330172.	99007.	-77643.	-124522.	-142795.
17.0	345059.	104793.	-78509.	-126937.	-145215.
18.0	360679.	110909.	-79334.	-129370.	-147635.
19.0	377064.	117367.	-80116.	-131825.	-150056.

TABLE 167 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	213906.	142449.	154498.	202534.	310519.
2.0	215660.	128869.	113115.	142897.	221998.
3.0	218725.	119371.	82428.	98755.	156963.
4.0	224883.	114112.	59996.	66064.	108830.
5.0	229886.	109808.	42570.	41094.	72862.
6.0	235603.	107127.	29143.	21896.	45657.
7.0	244020.	106932.	19160.	7157.	24767.
8.0	253053.	107694.	11274.	-4585.	8432.
9.0	262628.	109164.	4900.	-14173.	-4615.
10.0	272767.	111282.	-365.	-22202.	-15283.
11.0	282139.	113077.	-5173.	-29302.	-24227.
12.0	296690.	118138.	-8142.	-34907.	-31917.
13.0	308447.	121531.	-11569.	-40421.	-38694.
14.0	320852.	125324.	-14646.	-45502.	-44801.
15.0	333923.	129498.	-17450.	-50265.	-50413.
16.0	347687.	134045.	-20039.	-54795.	-55657.
17.0	362163.	138964.	-22453.	-59155.	-60625.
18.0	377398.	144257.	-24719.	-63390.	-65382.
19.0	393406.	149930.	-26860.	-67532.	-69977.

TABLE 168 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	227009.	114467.	21827.	-4855.	-19401.
2.0	235137.	118992.	23404.	-3998.	-18533.
3.0	243673.	123778.	25127.	-3019.	-17527.
4.0	255029.	130573.	28106.	-1038.	-15794.
5.0	264465.	135936.	30149.	207.	-14492.
6.0	274351.	141586.	32353.	1587.	-13036.
7.0	287124.	149283.	35829.	3978.	-10841.
8.0	300439.	157327.	39496.	6526.	-8473.
9.0	314278.	165704.	43346.	9225.	-5930.
10.0	328713.	174463.	47408.	12100.	-3194.
11.0	342229.	182509.	50995.	14614.	-611.
12.0	361788.	194860.	57252.	19228.	3433.
13.0	378110.	204824.	61981.	22658.	6795.
14.0	395227.	215303.	67003.	26329.	10413.
15.0	413173.	226321.	72332.	30254.	14299.
16.0	431988.	237904.	77981.	34444.	18468.
17.0	451713.	250078.	83965.	38912.	22932.
18.0	472389.	262870.	90301.	43671.	27706.
19.0	494062.	276309.	97005.	48735.	32806.

TABLE 169 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	263877.	212786.	236420.	287402.	397608.
2.0	267942.	202258.	198311.	231054.	312377.
3.0	273418.	195941.	171035.	190337.	250768.
4.0	282439.	194479.	152711.	161787.	206788.
5.0	290063.	193638.	138993.	140540.	174542.
6.0	298516.	194566.	129430.	125219.	151213.
7.0	310133.	198612.	124020.	115086.	134938.
8.0	322493.	203781.	120884.	108124.	123392.
9.0	335524.	209847.	119436.	103491.	115308.
10.0	349260.	216705.	119292.	100612.	109796.
11.0	362159.	223151.	119468.	98516.	105856.
12.0	381160.	234124.	122893.	99355.	104629.
13.0	396971.	242874.	125216.	99619.	103535.
14.0	413612.	252262.	128146.	100574.	103566.
15.0	431112.	262284.	131616.	102115.	104261.
16.0	449503.	272943.	135584.	104171.	105605.
17.0	468822.	284248.	140022.	106693.	107522.
18.0	489103.	296217.	144916.	109652.	109959.
19.0	510405.	308871.	150261.	113028.	112885.

TABLE 17D SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	16736.	-4445.	-12402.	-14716.	-16934.
2.0	18037.	-3327.	-11435.	-13791.	-16064.
3.0	19476.	-2064.	-10330.	-12729.	-15059.
4.0	22051.	32.	-8448.	-10906.	-13310.
5.0	23792.	1608.	-7040.	-9545.	-12010.
6.0	25689.	3350.	-5474.	-8026.	-10556.
7.0	28723.	5929.	-3125.	-5740.	-8350.
8.0	31934.	8690.	-599.	-3278.	-5971.
9.0	35314.	11633.	2104.	-642.	-3421.
10.0	38893.	14780.	5003.	2189.	-677.
11.0	42076.	17736.	7731.	4854.	1905.
12.0	47586.	22341.	12003.	9035.	5971.
13.0	51793.	26149.	15541.	12498.	9337.
14.0	56276.	30231.	19341.	16221.	12958.
15.0	61048.	34601.	23416.	20217.	16848.
16.0	66123.	39272.	27782.	24499.	21019.
17.0	71516.	44260.	32451.	29080.	25485.
18.0	77242.	49581.	37438.	33977.	30261.
19.0	83318.	55250.	42761.	39204.	35363.

TABLE 171 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1988
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	54837.	100271.	216690.	294077.	410715.
2.0	51719.	84451.	173640.	232808.	321832.
3.0	49837.	73247.	142624.	188577.	257590.
4.0	49882.	66094.	120943.	157269.	211724.
5.0	49666.	60744.	104955.	134259.	178104.
6.0	50019.	57234.	93567.	117715.	153780.
7.0	51811.	55772.	86167.	106485.	136794.
8.0	53999.	55368.	81257.	98713.	124731.
9.0	56517.	55783.	78196.	93486.	116271.
10.0	59352.	56865.	76545.	90172.	110484.
11.0	61879.	58094.	75603.	87936.	106333.
12.0	66799.	61220.	76849.	88121.	104972.
13.0	70467.	63735.	77829.	88251.	103863.
14.0	74449.	66661.	79420.	89128.	103707.
15.0	78751.	69979.	81544.	90637.	104333.
16.0	83380.	73678.	84151.	92702.	105623.
17.0	88347.	77757.	87210.	95269.	107496.
18.0	93664.	82218.	90701.	98308.	109896.
19.0	99345.	87068.	94617.	101798.	112791.

TABLE 172 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	36071.	-8381.	-37136.	-43078.	-43428.
2.0	37258.	-8606.	-38144.	-44153.	-44415.
3.0	39134.	-8474.	-39042.	-45190.	-45402.
4.0	40488.	-8652.	-40064.	-46278.	-46389.
5.0	41922.	-8810.	-41094.	-47373.	-47376.
6.0	44057.	-8608.	-42015.	-48363.	-48363.
7.0	46292.	-8376.	-42943.	-49350.	-49350.
8.0	48622.	-8120.	-43881.	-50337.	-50337.
9.0	51062.	-7833.	-44827.	-51324.	-51324.
10.0	53223.	-7729.	-45858.	-52311.	-52311.
11.0	56882.	-6834.	-46632.	-53298.	-53298.
12.0	59666.	-6454.	-47610.	-54285.	-54285.
13.0	62602.	-6026.	-48595.	-55272.	-55272.
14.0	65697.	-5547.	-49586.	-56259.	-56259.
15.0	68957.	-5016.	-50585.	-57246.	-57246.
16.0	72391.	-4431.	-51593.	-58233.	-58233.
17.0	76006.	-3789.	-52609.	-59220.	-59220.
18.0	79811.	-3088.	-53634.	-60207.	-60207.
19.0	83814.	-2325.	-54670.	-61194.	-61194.

TABLE 173 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	50747.	31087.	48251.	72178.	118683.
2.0	50228.	24592.	31159.	48272.	84029.
3.0	50822.	20102.	18509.	30590.	58549.
4.0	51198.	16491.	8852.	17310.	39669.
5.0	51876.	13756.	1433.	7229.	25541.
6.0	53415.	12000.	-4258.	-437.	14836.
7.0	55171.	10720.	-8788.	-6434.	6598.
8.0	57107.	9787.	-12485.	-11229.	140.
9.0	59214.	9121.	-15580.	-15154.	-5034.
10.0	61089.	8443.	-18317.	-18450.	-9277.
11.0	64495.	8682.	-20476.	-21290.	-12846.
12.0	67052.	8498.	-22603.	-23796.	-15926.
13.0	69780.	8430.	-24564.	-26058.	-18647.
14.0	72682.	8464.	-26405.	-28142.	-21107.
15.0	75761.	8589.	-28159.	-30092.	-23372.
16.0	79023.	8798.	-29849.	-31943.	-25493.
17.0	82474.	9088.	-31493.	-33718.	-27505.
18.0	86121.	9455.	-33105.	-35435.	-29434.
19.0	89972.	9900.	-34692.	-37106.	-31300.

TABLE 174 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	61142.	25632.	1459.	-3493.	-3231.
2.0	63460.	26830.	1939.	-3080.	-2738.
3.0	66675.	28660.	2835.	-2319.	-1932.
4.0	69260.	30031.	3432.	-1788.	-1310.
5.0	71978.	31487.	4088.	-1198.	-620.
6.0	75612.	33587.	5165.	-186.	387.
7.0	79407.	35790.	6311.	904.	1470.
8.0	83357.	38092.	7525.	2071.	2628.
9.0	87483.	40509.	8815.	3323.	3871.
10.0	91299.	42694.	9961.	4513.	5049.
11.0	97041.	46232.	11978.	6326.	6854.
12.0	101726.	49008.	13513.	7852.	8369.
13.0	106649.	51941.	15153.	9491.	9995.
14.0	111820.	55037.	16904.	11247.	11738.
15.0	117251.	58303.	18770.	13126.	13603.
16.0	122955.	61747.	20758.	15135.	15597.
17.0	128943.	65378.	22872.	17279.	17726.
18.0	135228.	69204.	25120.	19565.	19996.
19.0	141826.	73235.	27507.	22001.	22414.

TABLE 175 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	75818.	65100.	86846.	111763.	158879.
2.0	76430.	60028.	71242.	89345.	125706.
3.0	78362.	57236.	60385.	73461.	102019.
4.0	79970.	55174.	52348.	61799.	84748.
5.0	81933.	54054.	46615.	53404.	72297.
6.0	84971.	54194.	42922.	47740.	63586.
7.0	88286.	54886.	40466.	43820.	57418.
8.0	91841.	56000.	38920.	41180.	53105.
9.0	95635.	57463.	38062.	39493.	50161.
10.0	99165.	58867.	37502.	38374.	48083.
11.0	104654.	61748.	38135.	38334.	47305.
12.0	109112.	63960.	38520.	38341.	46728.
13.0	113827.	66397.	39184.	38705.	46619.
14.0	118805.	69048.	40085.	39364.	46890.
15.0	124055.	71908.	41197.	40280.	47477.
16.0	129586.	74976.	42502.	41425.	48337.
17.0	135410.	78254.	43988.	42781.	49440.
18.0	141538.	81747.	45649.	44338.	50768.
19.0	147984.	85459.	47484.	46089.	52308.

TABLE 176 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	12430.	3311.	-120.	-1095.	-2076.
2.0	13122.	3913.	422.	-569.	-1573.
3.0	14296.	4872.	1298.	284.	-749.
4.0	15122.	5611.	1973.	941.	-117.
5.0	16016.	6422.	2718.	1667.	584.
6.0	17395.	7592.	3799.	2724.	1609.
7.0	18852.	8842.	4958.	3857.	2710.
8.0	20384.	10170.	6193.	5068.	3886.
9.0	22004.	11588.	7516.	6363.	5146.
10.0	23461.	12927.	8766.	7590.	6340.
11.0	25905.	14969.	10680.	9468.	8172.
12.0	27804.	16675.	12281.	11040.	9706.
13.0	29824.	18500.	13997.	12727.	11351.
14.0	31970.	20450.	15834.	14532.	13115.
15.0	34251.	22531.	17797.	16463.	15001.
16.0	36671.	24750.	19893.	18524.	17017.
17.0	39237.	27113.	22127.	20724.	19168.
18.0	41957.	29628.	24508.	23068.	21462.
19.0	44839.	32302.	27042.	25563.	23905.

TABLE 177 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	27251.	44035.	88029.	116980.	161400.
2.0	26290.	38221.	72012.	94202.	128201.
3.0	26219.	34449.	60790.	78068.	104504.
4.0	26092.	31673.	52578.	66285.	87223.
5.0	26246.	29845.	46748.	57843.	74768.
6.0	27039.	29008.	42923.	52091.	66063.
7.0	28021.	28707.	40378.	48116.	59903.
8.0	29160.	28817.	38778.	45446.	55599.
9.0	30446.	29256.	37894.	43748.	52667.
10.0	31614.	29791.	37394.	42623.	50599.
11.0	33802.	31159.	37887.	42616.	49844.
12.0	35469.	32284.	38311.	42644.	49281.
13.0	37276.	33598.	39027.	43034.	49189.
14.0	39224.	35090.	39994.	43726.	49476.
15.0	41318.	36753.	41186.	44679.	50081.
16.0	43561.	38584.	42583.	45864.	50960.
17.0	45958.	40583.	44176.	47265.	52083.
18.0	48515.	42754.	45959.	48869.	53432.
19.0	51239.	45099.	47929.	50671.	54995.

TABLE 178 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	185275.	48023.	-59372.	-89735.	-106491.
2.0	191400.	49628.	-61060.	-92191.	-108911.
3.0	199899.	52626.	-62189.	-94341.	-111332.
4.0	206708.	54526.	-63853.	-96818.	-113752.
5.0	213858.	56567.	-65513.	-99316.	-116172.
6.0	223431.	60024.	-66612.	-101531.	-118592.
7.0	233419.	63660.	-67694.	-103763.	-121013.
8.0	243802.	67461.	-68770.	-106018.	-123433.
9.0	254640.	71460.	-69829.	-108293.	-125853.
10.0	264630.	74855.	-71226.	-110783.	-128273.
11.0	279738.	81295.	-71363.	-112613.	-130694.
12.0	292007.	85901.	-72384.	-114962.	-133114.
13.0	304886.	90784.	-73368.	-117326.	-135534.
14.0	318405.	95955.	-74315.	-119706.	-137954.
15.0	332593.	101427.	-75222.	-122102.	-140375.
16.0	347480.	107214.	-76089.	-124516.	-142795.
17.0	363099.	113329.	-76914.	-126950.	-145215.
18.0	379484.	119788.	-77696.	-129405.	-147635.
19.0	396671.	126606.	-78433.	-131882.	-150056.

TABLE 179 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	222142.	146342.	155221.	202523.	310519.
2.0	224205.	132894.	113847.	142871.	221998.
3.0	229644.	124789.	83720.	99015.	156963.
4.0	234118.	118432.	60752.	66007.	108830.
5.0	239455.	114269.	43330.	41017.	72362.
6.0	247597.	113004.	30465.	22102.	45657.
7.0	256428.	112989.	20497.	7345.	24767.
8.0	265856.	113915.	12618.	-4420.	8432.
9.0	275886.	115603.	6261.	-14027.	-4615.
10.0	285177.	117097.	659.	-22272.	-15283.
11.0	299667.	121937.	-2890.	-28712.	-24227.
12.0	311378.	125165.	-6743.	-34836.	-31917.
13.0	323747.	128834.	-10134.	-40365.	-38694.
14.0	336791.	132915.	-13172.	-45461.	-44801.
15.0	350531.	137390.	-15937.	-50241.	-50413.
16.0	364994.	142252.	-18486.	-54789.	-55657.
17.0	380208.	147499.	-20857.	-59169.	-60625.
18.0	396203.	153135.	-23081.	-63424.	-65382.
19.0	413013.	159168.	-25177.	-67588.	-69977.

TABLE 18C SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	237626.	121711.	26453.	-823.	-15253.
2.0	246162.	126497.	28176.	156.	-14247.
3.0	257518.	133293.	31159.	2141.	-12508.
4.0	266954.	138656.	33202.	3386.	-11207.
5.0	276840.	144306.	35405.	4766.	-9752.
6.0	289613.	152004.	38884.	7160.	-7553.
7.0	302928.	160050.	42554.	9711.	-5181.
8.0	315768.	168427.	46405.	12413.	-2636.
9.0	331203.	177187.	50469.	15290.	103.
10.0	344719.	185233.	54056.	17803.	2685.
11.0	364279.	197587.	60319.	22425.	6737.
12.0	380601.	207551.	65049.	25855.	10100.
13.0	397717.	218031.	70072.	29528.	13720.
14.0	415664.	229049.	75401.	33453.	17607.
15.0	434479.	240633.	81051.	37644.	21776.
16.0	454204.	252807.	87036.	42113.	26241.
17.0	474880.	265599.	93372.	46873.	31016.
18.0	496553.	279038.	100077.	51937.	36117.
19.0	519269.	293154.	107166.	57321.	41558.

TABLE 181 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	274493.	220030.	241046.	291435.	401757.
2.0	278967.	209763.	203082.	235208.	316662.
3.0	287264.	205456.	177067.	195497.	255786.
4.0	294363.	202562.	157807.	166211.	211374.
5.0	302438.	202008.	144249.	145099.	179283.
6.0	313779.	204984.	135960.	130792.	156696.
7.0	325937.	209379.	130745.	120819.	140599.
8.0	338822.	214882.	127793.	114011.	129229.
9.0	352449.	221330.	126559.	109556.	121341.
10.0	365267.	227476.	125941.	106315.	115676.
11.0	384208.	238230.	128792.	106326.	113204.
12.0	399973.	246815.	130691.	105982.	111297.
13.0	416578.	256081.	133307.	106489.	110560.
14.0	434050.	266009.	136544.	107698.	110761.
15.0	452418.	276596.	140336.	109506.	111738.
16.0	471718.	287845.	144639.	111840.	113379.
17.0	491989.	299769.	149429.	114654.	115606.
18.0	513272.	312386.	154691.	117918.	118370.
19.0	535612.	325717.	160421.	121614.	121637.

TABLE 182 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	21974.	416.	-7919.	-10344.	-12668.
2.0	23413.	1680.	-6813.	-9281.	-11662.
3.0	25998.	3783.	-4926.	-7453.	-9908.
4.0	27738.	5359.	-3518.	-6091.	-8608.
5.0	29634.	7100.	-1952.	-4573.	-7154.
6.0	32675.	9684.	402.	-2283.	-4944.
7.0	35892.	12451.	2932.	183.	-2561.
8.0	39277.	15398.	5638.	2822.	-7.
9.0	42860.	18549.	8541.	5657.	2739.
10.0	46043.	21505.	11268.	8322.	5321.
11.0	51567.	26121.	15550.	12512.	9396.
12.0	55776.	29931.	19089.	15977.	12763.
13.0	60261.	34015.	22891.	19701.	16385.
14.0	65035.	38387.	26968.	23698.	20276.
15.0	70111.	43059.	31335.	27980.	24448.
16.0	75506.	48049.	36004.	32563.	28915.
17.0	81233.	53370.	40993.	37461.	33692.
18.0	87310.	59041.	46316.	42689.	38794.
19.0	93753.	65077.	51990.	48263.	44238.

TABLE 183 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1989
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	60074.	105132.	221172.	298449.	414981.
2.0	57096.	89458.	178263.	237318.	326234.
3.0	56359.	79093.	148028.	193852.	262741.
4.0	55570.	71421.	125873.	162084.	216427.
5.0	55507.	66235.	110042.	139230.	182960.
6.0	57005.	63568.	99443.	123458.	159391.
7.0	58979.	62294.	92224.	112408.	142582.
8.0	61342.	62076.	87494.	104814.	130695.
9.0	64063.	62699.	84634.	99786.	122431.
10.0	66502.	63589.	82810.	96304.	116482.
11.0	71370.	66479.	83423.	95593.	113824.
12.0	74990.	68811.	83935.	95062.	111764.
13.0	78935.	71601.	85180.	95454.	110912.
14.0	83208.	74816.	87047.	96604.	111025.
15.0	87814.	78437.	89462.	98401.	111934.
16.0	92763.	82455.	92374.	100766.	113520.
17.0	98064.	86867.	95752.	103650.	115703.
18.0	103732.	91678.	99579.	107019.	118430.
19.0	109780.	96895.	103846.	110857.	121666.

TABLE 184 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	38245.	-7619.	-37157.	-43166.	-43428.
2.0	40121.	-7487.	-38055.	-44203.	-44415.
3.0	41475.	-7665.	-39077.	-45291.	-45402.
4.0	42909.	-7823.	-40107.	-46386.	-46389.
5.0	45044.	-7621.	-41028.	-47376.	-47376.
6.0	47279.	-7389.	-41956.	-48363.	-48363.
7.0	49609.	-7133.	-42894.	-49350.	-49350.
8.0	52049.	-6846.	-43840.	-50337.	-50337.
9.0	54210.	-6742.	-44871.	-51324.	-51324.
10.0	57369.	-5847.	-45645.	-52311.	-52311.
11.0	60653.	-5467.	-46623.	-53298.	-53298.
12.0	63589.	-5039.	-47608.	-54285.	-54285.
13.0	66684.	-4560.	-48599.	-55272.	-55272.
14.0	69944.	-4029.	-49598.	-56259.	-56259.
15.0	73378.	-3444.	-50606.	-57246.	-57246.
16.0	76993.	-2802.	-51622.	-58233.	-58233.
17.0	80798.	-2101.	-52647.	-59220.	-59220.
18.0	84801.	-1338.	-53683.	-60207.	-60207.
19.0	89011.	-510.	-54728.	-61194.	-61194.

TABLE 185 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	52921.	31849.	48229.	72091.	118683.
2.0	53091.	25711.	31248.	48222.	84029.
3.0	53162.	20911.	18474.	30489.	58549.
4.0	53619.	17320.	8809.	17202.	39669.
5.0	54998.	14945.	1499.	7226.	25541.
6.0	56638.	13218.	-4199.	-437.	14836.
7.0	58488.	11962.	-8739.	-6434.	6598.
8.0	60534.	11062.	-12444.	-11229.	140.
9.0	62363.	10212.	-15624.	-15154.	-5034.
10.0	65735.	10325.	-18104.	-18450.	-9277.
11.0	68266.	10049.	-20466.	-21290.	-12846.
12.0	70975.	9913.	-22600.	-23796.	-15926.
13.0	73861.	9896.	-24569.	-26058.	-18647.
14.0	76929.	9982.	-26417.	-28142.	-21107.
15.0	80181.	10161.	-28179.	-30092.	-23372.
16.0	83625.	10427.	-29878.	-31943.	-25493.
17.0	87265.	10776.	-31532.	-33718.	-27505.
18.0	91111.	11205.	-33153.	-35435.	-29434.
19.0	95169.	11714.	-34751.	-37106.	-31300.

TABLE 186 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	64491.	27988.	3246.	-1726.	-1348.
2.0	67706.	29819.	4144.	-963.	-539.
3.0	70291.	31190.	4741.	-433.	82.
4.0	73010.	32646.	5397.	159.	772.
5.0	76644.	34746.	6475.	1170.	1780.
6.0	80438.	36950.	7622.	2262.	2865.
7.0	84388.	39253.	8836.	3430.	4024.
8.0	88515.	41670.	10127.	4683.	5269.
9.0	92331.	43855.	11274.	5873.	6446.
10.0	98073.	47394.	13293.	7688.	8254.
11.0	102758.	50171.	14828.	9215.	9769.
12.0	107681.	53104.	16469.	10854.	11396.
13.0	112852.	56199.	18220.	12611.	13139.
14.0	118284.	59465.	20086.	14491.	15005.
15.0	123987.	62910.	22074.	16499.	16999.
16.0	129975.	66541.	24189.	18644.	19128.
17.0	136261.	70367.	26436.	20930.	21398.
18.0	142858.	74398.	28823.	23366.	23816.
19.0	149783.	78643.	31356.	25958.	26390.

TABLE 187 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : BWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	79167.	67456.	88633.	113531.	160763.
2.0	80676.	63017.	73447.	91462.	127905.
3.0	81978.	59766.	62291.	75347.	104033.
4.0	83720.	57789.	54312.	63746.	86830.
5.0	86598.	57312.	49002.	55772.	74698.
6.0	89797.	57557.	45379.	50188.	66064.
7.0	93268.	58348.	42991.	46346.	59972.
8.0	97000.	59577.	41523.	43791.	55744.
9.0	100483.	60810.	40521.	42043.	52737.
10.0	105938.	63566.	40834.	41549.	51288.
11.0	110371.	65687.	40985.	41224.	50221.
12.0	115065.	68055.	41476.	41344.	49755.
13.0	120030.	70655.	42250.	41824.	49764.
14.0	125268.	73476.	43267.	42608.	50157.
15.0	130790.	76515.	44501.	43653.	50873.
16.0	136606.	79770.	45932.	44934.	51868.
17.0	142728.	83244.	47552.	46432.	53113.
18.0	149168.	86941.	49353.	48138.	54589.
19.0	155940.	90867.	51334.	50046.	56285.

TABLE 188 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	14787.	5501.	1909.	888.	-139.
2.0	15965.	6463.	2788.	1744.	687.
3.0	16790.	7202.	3463.	2401.	1320.
4.0	17684.	8012.	4206.	3126.	2020.
5.0	19066.	9184.	5290.	4185.	3047.
6.0	20525.	10436.	6450.	5320.	4149.
7.0	22059.	11766.	7687.	6532.	5326.
8.0	23680.	13186.	9011.	7829.	6588.
9.0	25137.	14524.	10261.	9055.	7781.
10.0	27587.	16571.	12179.	10937.	9617.
11.0	29486.	18278.	13781.	12510.	11151.
12.0	31507.	20104.	15497.	14197.	12798.
13.0	33654.	22054.	17335.	16003.	14561.
14.0	35935.	24136.	19298.	17933.	16448.
15.0	38355.	26355.	21394.	19995.	18464.
16.0	40922.	28718.	23629.	22195.	20616.
17.0	43643.	31234.	26010.	24539.	22909.
18.0	46524.	33908.	28544.	27035.	25353.
19.0	49575.	36749.	31239.	29689.	27952.

TABLE 169 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : BWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	29608.	46225.	90058.	118964.	163338.
2.0	29134.	40771.	74378.	96516.	130461.
3.0	28713.	36779.	62954.	80185.	106573.
4.0	28655.	34074.	54811.	68470.	89360.
5.0	29296.	32607.	49320.	60361.	77230.
6.0	30168.	31852.	45574.	54687.	68602.
7.0	31227.	31632.	43107.	50791.	62519.
8.0	32456.	31832.	41596.	48207.	58302.
9.0	33579.	32192.	40639.	46440.	55302.
10.0	35739.	33436.	40806.	45970.	53876.
11.0	37382.	34468.	40988.	45658.	52823.
12.0	39171.	35712.	41527.	45800.	52373.
13.0	41106.	37152.	42364.	46310.	52398.
14.0	43189.	38776.	43458.	47127.	52810.
15.0	45423.	40576.	44782.	48212.	53544.
16.0	47812.	42552.	46319.	49535.	54559.
17.0	50363.	44704.	48059.	51080.	55825.
18.0	53082.	47033.	49994.	52836.	57323.
19.0	55975.	49546.	52125.	54797.	59042.

TABLE 190 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	25,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	193820.	52048.	-58640.	-89761.	-106491.
2.0	202319.	55046.	-59768.	-91921.	-108911.
3.0	209129.	56946.	-61433.	-94398.	-111332.
4.0	216278.	58987.	-63093.	-96896.	-113752.
5.0	225852.	62444.	-64191.	-99111.	-116172.
6.0	235839.	66080.	-65274.	-101342.	-118592.
7.0	246222.	69881.	-66350.	-103598.	-121013.
8.0	257060.	73880.	-67409.	-105873.	-123433.
9.0	267050.	77275.	-68806.	-108363.	-125853.
10.0	282159.	83715.	-68942.	-110193.	-128273.
11.0	294427.	88322.	-69964.	-112542.	-130694.
12.0	307306.	93204.	-70948.	-114906.	-133114.
13.0	320825.	98375.	-71895.	-117285.	-135534.
14.0	335013.	103848.	-72802.	-119682.	-137954.
15.0	349900.	109634.	-73669.	-122096.	-140375.
16.0	365519.	115749.	-74494.	-124530.	-142795.
17.0	381904.	122208.	-75276.	-126985.	-145215.
18.0	399091.	129026.	-76013.	-129461.	-147635.
19.0	417116.	136219.	-76704.	-131962.	-150056.

TABLE 191 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	230688.	150367.	155953.	202497.	310519.
2.0	235124.	138312.	115138.	143131.	221998.
3.0	238874.	129109.	84475.	98958.	156963.
4.0	243687.	122894.	61512.	65929.	108830.
5.0	251450.	120146.	44652.	41222.	72862.
6.0	260005.	119060.	31803.	22290.	45657.
7.0	269232.	119211.	21842.	7510.	24767.
8.0	279114.	120334.	13979.	-4275.	8432.
9.0	288296.	121418.	7285.	-14097.	-4615.
10.0	302706.	125957.	2942.	-21682.	-15283.
11.0	314356.	128964.	-1491.	-28640.	-24227.
12.0	326673.	132468.	-5307.	-34779.	-31917.
13.0	339686.	136426.	-8660.	-40324.	-38694.
14.0	353399.	140807.	-11659.	-45437.	-44801.
15.0	367839.	145597.	-14384.	-50235.	-50413.
16.0	383034.	150788.	-16890.	-54803.	-55657.
17.0	399013.	156378.	-19219.	-59203.	-60625.
18.0	415810.	162374.	-21398.	-63481.	-65382.
19.0	433459.	168781.	-23448.	-67668.	-69977.

TABLE 192 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	248654.	129230.	31255.	3367.	-10926.
2.0	260011.	136028.	34242.	5357.	-9182.
3.0	269446.	141390.	36285.	6602.	-7882.
4.0	279332.	147040.	38488.	7980.	-6427.
5.0	292105.	154740.	41969.	10378.	-4224.
6.0	305421.	162786.	45642.	12932.	-1848.
7.0	319261.	171165.	49495.	15637.	700.
8.0	333696.	179926.	53561.	18517.	3441.
9.0	347213.	187972.	57148.	21029.	6024.
10.0	366772.	200329.	63417.	25658.	10083.
11.0	383095.	210293.	68148.	29090.	13448.
12.0	400211.	220773.	73172.	32763.	17068.
13.0	418158.	231792.	78502.	36690.	20957.
14.0	436973.	243376.	84152.	40881.	25127.
15.0	456698.	255550.	90138.	45351.	29593.
16.0	477375.	268342.	96474.	50111.	34369.
17.0	499047.	281782.	103179.	55176.	39470.
18.0	521763.	295898.	110269.	60560.	44912.
19.0	545571.	310723.	117761.	66279.	50712.

TABLE 193 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : PWR-URANIUM DIOXIDE
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	285521.	227549.	245847.	295625.	406083.
2.0	292816.	219294.	209148.	240408.	321727.
3.0	299191.	213553.	182193.	199958.	260413.
4.0	306742.	210946.	163092.	170805.	216155.
5.0	317703.	212442.	150812.	150711.	184810.
6.0	329587.	215767.	142718.	136565.	162401.
7.0	342270.	220494.	137687.	126745.	146480.
8.0	355750.	226380.	134949.	120114.	135306.
9.0	368459.	232115.	133238.	115295.	127262.
10.0	387319.	242571.	135302.	114169.	123074.
11.0	403024.	250935.	136621.	112992.	119915.
12.0	419583.	260037.	138813.	112890.	118265.
13.0	437019.	269842.	141736.	113651.	117797.
14.0	455359.	280336.	145295.	115126.	118281.
15.0	474637.	291513.	149422.	117212.	119555.
16.0	494889.	303381.	154078.	119838.	121506.
17.0	516156.	315952.	159236.	122957.	124060.
18.0	538482.	329246.	164884.	126541.	127165.
19.0	561914.	343286.	171017.	130573.	130791.

TABLE 194 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS) 10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	27423.	5485.	-3245.	-5785.	-8219.
2.0	30017.	7597.	-1351.	-3951.	-6459.
3.0	31757.	9172.	56.	-2590.	-5159.
4.0	33651.	10912.	1621.	-1072.	-3706.
5.0	36700.	13503.	3981.	1224.	-1491.
6.0	39923.	16275.	6516.	3693.	895.
7.0	43313.	19227.	9225.	6336.	3453.
8.0	46901.	22382.	12131.	9174.	6202.
9.0	50083.	25337.	14858.	11839.	8784.
10.0	55621.	29966.	19151.	16038.	12868.
11.0	59833.	33778.	22692.	19505.	16236.
12.0	64320.	37864.	26495.	23230.	19860.
13.0	69096.	42237.	30573.	27228.	23752.
14.0	74174.	46911.	34941.	31512.	27925.
15.0	79570.	51902.	39612.	36096.	32393.
16.0	85298.	57224.	44601.	40994.	37171.
17.0	91376.	62896.	49925.	46223.	42274.
18.0	97820.	68933.	55599.	51798.	47718.
19.0	104649.	75354.	61641.	57737.	53519.

TABLE 195 SPENT FUEL WORTH

YEAR SPENT FUEL ASSEMBLY DISCHARGED FROM CORE: 1990
TYPE OF FUEL ASSEMBLY : PWR-MOX
MODE : URANIUM AND PLUTONIUM RECYCLE WITH FISSION PRODUCT SALES

ELAPSED TIME IN YEARS FROM TIME OF DISCHARGE FROM CORE	WORTH OF SPENT FUEL ASSEMBLY (CONST. 75 DOLLARS)				
	10,000 MWD/MT-HM	20,000 MWD/MT-HM	33,000 MWD/MT-HM	40,000 MWD/MT-HM	50,000 MWD/MT-HM
1.0	65523.	110201.	225846.	303009.	419430.
2.0	63700.	95375.	183725.	242649.	331438.
3.0	62118.	84482.	153010.	198716.	267489.
4.0	61482.	76974.	131013.	167104.	221329.
5.0	62573.	72638.	115976.	145027.	188623.
6.0	64252.	70159.	105557.	129433.	165230.
7.0	66401.	69070.	98517.	118561.	148596.
8.0	68965.	69061.	93987.	111165.	136904.
9.0	71286.	69487.	90951.	105967.	128475.
10.0	76080.	72051.	90693.	104021.	124029.
11.0	79636.	74136.	90564.	102586.	120665.
12.0	83534.	76744.	91340.	102316.	118862.
13.0	87770.	79823.	92862.	102981.	118278.
14.0	92347.	83341.	95020.	104419.	118674.
15.0	97273.	87280.	97739.	106516.	119879.
16.0	102555.	91631.	100971.	109198.	121776.
17.0	108207.	96393.	104684.	112412.	124285.
18.0	114242.	101570.	108862.	116129.	127353.
19.0	120676.	107172.	113497.	120330.	130948.

Appendix 2

Discussion of Nuclear Fuel Cycle

DISCUSSION OF NUCLEAR FUEL CYCLE

The nuclear fuel cycle is composed of a number of subcomponents. These subcomponents are: mining and milling; U_3O_8 conversion; enrichment; fuel fabrication; and nuclear reactor operation. The back end of the nuclear fuel cycle has two major options available to it. One involves the recycling of spent fuel back into the fuel cycle and the other involves disposal of the entire spent fuel assembly. A diagram of the nuclear fuel cycle is displayed in figure 40 .(112)

Uranium is first mined at U_3O_8 mining and milling sites (1,2). The U_3O_8 is then sent to a conversion plant where it is converted into a gas, UF_6 (3). The uranium hexafluoride is then used in a gaseous diffusior plant where the content of uranium-235 per unit volume of gas is increased from 0.72% to approximately 2 to 4% for commerical reactor use (4). The enriched UF_6 is then sent to a UO_2 fuel fabrication plant. In the fabrication plant the UF_6 gas is converted into UO_2 pellets and then the uranium pellets are placed inot a cladded fuel rod (5). The fuel rods are then grouped together into a fuel assembly for use in a Light Water Reactor (6).

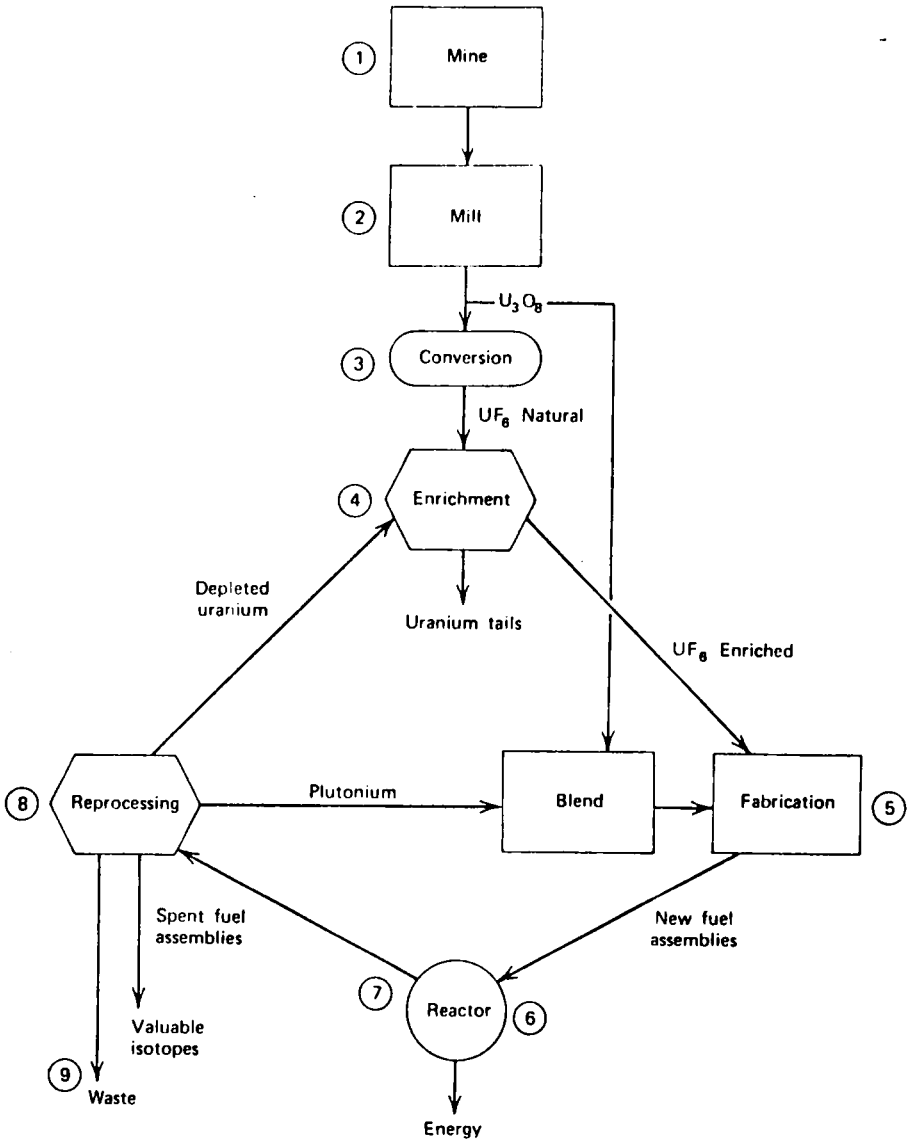


Figure 40 Fuel Cycle Flow Diagram for a Light Water Reactor

The two major types of LWR's presently in use in the United States are the Boiling Water Reactor(BWR) and the Pressurized Water Reactor (PWR). Approximately 764 and 202 fuel assemblies are contained in a BWR and PWR, respectively.[113] The fuel assemblies are placed in a nuclear reactor and the controlled fissioning of the fuel which in turn generates energy is initiated.

Reactors are typically refuelled annually. A PWR requires the replacement of 1/3 of the fuel assemblies in its core while a BWR, the portion is about 1/4. Discharged spent-fuel assemblies obtained during refueling are stored in a spent-fuel storage basin at the reactor site (7). The spent-fuel assemblies are radioactively hot and generate fission product decay heat. The decay heat necessitates the use of a cooling system for the spent-fuel basin. The irradiated spent-fuel assemblies contain spent uranium (depleted in U-235 content), plutonium, and several fission products. Each spent-fuel assembly must be cooled for six months prior to its removal from the basin in order to assure adequate safety during spent fuel transportation and possible reprocessing.

At present there exist several alternatives for the disposition of spent nuclear fuel. Two in particular characterize the choice. One alternative is to reprocess

the fuel assembly and separate the plutonium, uranium and fission products from one another (8,9). The spent uranium, which is approximately 1% uranium-235, can be sent to an enrichment plant where it can be combined with natural uranium material. Doing this yields a savings in separative work and in the natural feed requirements for the enrichment plant.

Plutonium is sent to a mixed-oxide (MOX) fabrication plant where fuel assemblies containing both plutonium and uranium can be manufactured. This fuel can then be inserted into the reactor. The fission products can be examined for their possible market values. Some of the fission products can be saved while the rest can be placed in some form of permanent storage.

A second spent-fuel disposition alternative is not to reprocess but to store the spent fuel assemblies for eleven years in spent fuel basins and then place them in a permanent storage environment thereby discarding them. The eleven year cooling time is required to allow for decay of the rate of heat generation.

Appendix 3

Compilation of Abbreviations

PWR- Pressurized Water Reactor

BWR-Boiling Water Reactor

UO_2-uranium dioxide

MOX-mixed oxide

SWU-separative work units

U-uranium

Pu-plutonium

UF_6-uranium hexaflouride

U_3O_8-uranium ore

ERDA-Energy Research and Development Administration

GESMO-Generic Environmental Impact Statement on the Use of Mixed Oxide Fuel

EPA-Environmental Protection Agency.

DBCP-dibromochloropropane

BTU-British thermal unit

MWD/MT-HM - megawatts (thermal) day/metric ton of heavy metal

HM- heavy metal

Appendix 4

Description of ORIGEN

DESCRIPTION OF ORIGEN (114)

ORIGEN is an isotope generation and depletion computer code developed by the Oak Ridge National Laboratories. This computer code simulates the nuclear fission process which occurs in the nuclear reactor core. ORIGEN requires as input the original fuel composition and quantity, burnup, and amounts and types of structural material in the core. The mathematical methods that are utilized by the program and its print out of information are discussed in this section.

A general expression for the formation and disappearance of a nuclide by means of nuclear transmutation and radioactive decay is:

$$\frac{dX_i}{dt} = \sum_{j=1}^{N} L_{ij} C_j X_j + F \sum_{k=1}^{N} f_{ik} A_k X_k - (C_i + FA_i) X_i \qquad (15)$$

for i = 1,...,N,

where

X_i = atoms density of nuclide "i",

C_i = radioactive disintegration constant for nuclide "i",

A_i = spectrum averaged neutron absorption cross section of nuclide "i",

L_{ij} = fraction of radioactive disintegrations by other nulcides which leads to species "i",

f_{ik} = fraction of neutron absorptions by other nuclides which leads to species "i",

F = position and energy averaged flux, and

N = number of nuclides which can lead to the formation of nuclide "i".

By assuming that the neutron flux is a parameter that varies slowly with time, F can be assumed constant over short time intervals. Equation 15 then becomes a set of homogeneous simultaneous first-order differential equations with constant coefficients. Equation 15 can be rewritten in matrix form as

$$\underset{\sim}{\dot{X}} = \underset{\approx}{A} \cdot \underset{\sim}{X} \qquad (16)$$

with a solution of

$$\underset{\sim}{X} = \exp(\underset{\approx}{A}t) \cdot \underset{\sim}{X}(0) \qquad (17)$$

where

$\underset{\sim}{X}(0)$ = vector of initial atom densities

$\underset{\approx}{A}$ = transition matrix containing rate coefficients for radioactive decay and neutron capture.

$EXP(\underset{\approx}{A}t)$ is the matrix exponential function which can be generated by utilizing

$$EXP(\underset{\approx}{A}t) = I + \underset{\approx}{A}t + \frac{(\underset{\approx}{A}t)^2}{2} + \cdots = \sum_{m=0} \frac{(\underset{\approx}{A}t)^m}{m} \quad . \quad (18)$$

As the norm of the transition matrix becomes smaller, fewer and fewer terms are needed in equation 18 in order to attain a desired fixed degree of accuracy. The norm of the transition matrix can be defined as

$$\left[A\right] = \min \left[\max_j \sum_i \left| a_{ij} \right| \; , \; \max_i \sum_j \left| a_{ij} \right| \right] \quad . \quad (19)$$

Since the transition matrix will contain the first-order rate constants for the formation of species "i" from species "j", a matrix containing isotopes with long half-lives corresponds to a small matrix norm and a matrix containing isotopes with short half-lives possesses a large matrix norm. Thus, the existence of many short half-lifed isotopes requires the summation of a large number of the terms in equation 18 . This is clearly unattractive from a computational time viewpoint. Thus,

in computations performed by ORIGEN, only the isotopes that are sufficiently long-lived that the norm of their transition matrix is less than 2 ln 1000 are solved using the matrix exponential methods. Short-lived isotopes are handled by an analytical solution of equation

A generalized solution of equation 15 is found in the form of the Batemann equations which is

$$N_i(t) = N_i(0)\ e^{-d_i t} + \sum_{k=1}^{i-1} N_k(0) \cdot \left[\sum_{j=k}^{i=1} \frac{EXP(-d_j t) - EXP(-d_i t)}{(d_i - d_j)} \cdot a_{j+1,j} \prod_{\substack{n=k \\ n=j}}^{i-1} \frac{a_{n+1,n}}{d_n - d_j} \right] \qquad (20)$$

where

$N_i(0)$ = amount of isotope "i" initially present,

$\prod_{n=k}^{i-1} a_{n+1,n}$ = product of $(a_{k+1,k},\ a_{k+2,k+1} \cdots a_{i,i-1})$ and,

$d_i = -a_{i,i}$.

Equation 20 according to Vondy, generates unreliable results when small values of d_i are encountered. A small d_i signifies a small number on the diagonal of the transition matrix or a long-lived isotope. When this condition occurs, the exponential transition matrix method is utilized. Thus, this problem is not encountered in ORIGEN. The Batemann equations and the transition matrix exponential method represent the two solution techniques utilized by ORIGEN.

ORIGEN produces a large quantity of output. The output contains information such as: tables showing properties of discharged fuel such as g-atoms, grams, curies, total beta-gamma watts, and gamma watts; a similar set of tables on the actinides, fission products, and structural materials during irradiation and after irradiation as a function of time. The program can handle 850 nuclides with a maximum of 3000 non-zero elements in the nuclear transmutation matrix. The program is a fortran - IV program originally written to be executed on an IBM 360. Large data files, on the order of 5,000 records, are provided for ORIGEN to utilize during execution. ORIGEN was developed by ORNL's Chemical Technology Division and represents a 2-year effort.

This program is used here because of its ease of accessibility, compatibility with Virginia Polytechnic Institute and State University computer facilities and the high reputation of ORNL.

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DETERMINATION OF ECONOMIC SHELF LIFE OF SPENT NUCLEAR FUEL

by

Kenneth Walter Korcz

(ABSTRACT)

The purpose of this study is to determine the constituents of value in spent nuclear fuel and integrate these results into an economic time dependent model of a spent fuel assembly. The value of the constituents in the spent fuel is balanced against the cost of the various nuclear fuel cycle services. BWR and PWR-UO_2/MOX spent fuel assemblies are modeled at 5 different burnups. The recycle modes that are examined are uranium recycle with and without fission product sales and uranium and plutonium recycle with and without fission product sales. UO_2 and MOX spent fuel assemblies discharged from a nuclear reactor from 1977 to 1990 are modeled for a period of 19 years.

Four key results of this study are: (1) a re-examination of the value of recycling materials other than uranium and plutonium, namely cesium-137, 134, rhodium, palladium and xenon is justified; (2) the

magnitude of the net profits obtainable from the recycling of spent nuclear fuel are tied primarily to burnup and the decision to sell fission products; (3) for fission product recycle, any burnup yields a net positive value with the greater values being at high burnups; and (4) under only spent uranium and plutonium recycle, it is marginally profitable or unprofitable to recycle spent nuclear fuel. The utilization of cesium-137, 134 in the treatment of municipal sludge can reduce the importation of oil by 47.92 million U. S. barrels annually for the United States.