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WASTES:

Waste System Transportation and Economic Simulation - Version II User's Guide

February 1986

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
Operated for the U.S. Department of Energy
by Battelle Memorial Institute**

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WASTES II:
WASTE SYSTEM TRANSPORTATION
AND ECONOMIC SIMULATION - VERSION II

USER'S GUIDE

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M. R. Shay
M. E. Buxbaum

February 1986

Prepared for
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EXECUTIVE SUMMARY

The development of the WASTES model was jointly sponsored by the Monitored Retrievable Storage (MRS) Program Office at Pacific Northwest Laboratory (PNL) and the Transportation Technology Center at Sandia National Laboratory. Enhancements to the WASTES model that resulted in the development of the WASTES II model were primarily sponsored by the MRS Program at PNL for use in analyzing the effects of various policy decisions, waste system logistics considerations, and facility operating schedules. The model was developed to provide detailed analyses beyond the capabilities of other available models. WASTES uses discrete event simulation techniques to model the generation of commercial spent nuclear fuel, the buildup of spent fuel inventories within the system, and the transportation requirements for the movement of radioactive waste throughout the system. The model is written in FORTRAN 77 as an extension to the SLAM commercial simulation language package (Pritsker and Pegden 1979).

In addition to the pool storage and dry storage located at the reactors, the WASTES model provides a choice of up to ten other storage facilities of four different types. The allowable types of facilities are federal interim storage (FIS), monitored retrievable storage (MRS), reprocessing plants, and repositories. Considerable flexibility is allowed for the user to specify priorities for fuel receipts and system constraints.

Reactor specific data for the WASTES model is based upon the DOE spent fuel data base, which is maintained by PNL. This information includes reactor location, reactor type and transportation access; historical and projected discharge data on the number of fuel assemblies; fuel weight expressed in metric tonnage (MTU), and the expected exposure for each discharge batch.

The simulation performed by WASTES may be controlled by a combination of source- and/or destination-controlled transfers that are requested by the code user. Source-controlled transfers can occur when a reactor pool violates its full core reserve (FCR) storage margin or when a reactor is decommissioned. The material requiring transfer would be shipped to facilities with available capacity. Destination-controlled transfers occur, in general, when the annual

capacity of a facility will not be completely met by FCR or decommissioning shipments and additional fuel must be scheduled from facilities with non-critical storage needs.

The user supplies shipping cask characteristics for truck or rail shipment casks. As part of the facility description, the user specifies which casks the facility can use. The user can then constrain cask use for that facility to only receiving or shipping. This information is then used in determining allowable source/destination pairs and in estimating the transportation system costs.

Shipments within the system can be user specified to occur optimally, or proximally. Optimized shipping can be used when exactly two destination facilities of the same facility type are open for receipt of fuel. Optimized shipping selects source/destination pairs so that the total shipping distance or total shipping costs in a given year are minimized when both facilities are fully utilized. Proximity shipping sequentially fills the closest facility to the source according to the shipment priorities without regard for the total annual shipments. This results in sub-optimal routing of waste material but can be used to approximate an optimal shipping strategy when more than two facilities of the same type are available to receive waste.

Reports generated by the WASTES model include: annual inventories of spent fuel in each facility, annual at-reactor dry-storage inventories and costs, annual reports on decommissioned reactor inventories, annual shipment summaries between facilities, characterization of fuel received at each facility and shipping summaries giving detail on shipping costs, number of required casks, and cask miles.

WASTES is currently able to analyze each of the commercial spent fuel logistics scenarios specified in the 1985 DOE Mission Plan (DOE 1985).

ACKNOWLEDGMENTS

The development of the WASTES model was jointly sponsored by the MRS Program Office at PNL and the Transportation Technology Center at Sandia National Laboratory. The initial model was documented in a report entitled WASTES: Waste System Transportation and Economic Simulation, and published as PNL5413. WASTES II contains significant enhancements to the earlier model. These enhancements were primarily funded by the MRS Program for use in their integrated system cost and logistics studies. Many individuals contributed to the preparation and publication of this report. The following listing acknowledges the contributions of those involved in this effort.

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1.0 INTRODUCTION

The development of the WASTES model was jointly sponsored by the Monitored Retrievable Storage (MRS) Program Office at Pacific Northwest Laboratory (PNL) and the Transportation Technology Center at Sandia National Laboratory. Enhancements to the WASTES model that resulted in the development of the WASTES II model were primarily sponsored by the MRS Program at PNL for use in analyzing the effects of various policy decisions, waste system logistics considerations, and facility operating schedules within the federal waste management system. The model provides extensive capabilities for simulating the response of the waste management system under a variety of configurations and operational philosophies. The model was developed to provide detailed analyses beyond the capabilities of other available models.

The WASTES model uses detailed spent fuel discharge projections as the basis for simulating the operation of various facilities within the waste management system. WASTES provides the user with detailed time-dependent information on system shipping and cask fleet requirements, facility inventories and receipt characteristics, and overall transportation costs. This information is necessary for analyzing the trade-offs associated with facility deployment and design, transportation requirements, and overall system risk and costs.

In this section, a brief overview is presented of the WASTES model and the ways in which the waste sources, processing/storage facilities, and transportation facilities are handled by the model. The transportation algorithms and computer requirements are also discussed.

1.1 DOCUMENT DESCRIPTION

This document is organized as follows: Introduction (Section 1.0), Model Description (Section 2.0), Input Data Set Descriptions (Section 3.0), Output Description (Section 4.0), Sample Input Card Files (Section 5.0), Sample Problems (Section 6.0), and References (Section 7.0).

The Introduction outlines the basic methodology used by WASTES to initiate transfers of fuel. The way in which the waste generation sources (reactors) and destination facilities (storage and reprocessing facilities and

repositories) are modeled is also discussed. Finally the ways in which waste material is moved in the system and the algorithms by which this movement is accomplished are briefly described.

The Model Description section contains a discussion of how the model operates. The ways in which the pools and dry storage located at reactor sites are modeled are described first. The way in which the FCR storage margin is maintained is then discussed. The use of the user specified centroid regions and the way in which transshipments occur between pools in a transshipment network are also discussed.

The use of SLAM time management and file maintenance routines is then discussed and is followed by explanations of the way in which the facilities in a waste management system are modeled and the purposes of each facility. A detailed view of the operation of the transportation algorithms, the algorithms used for developing transportation cost estimates, the leveled cask purchasing philosophy, and the techniques used for establishing heat generation rates are also discussed.

The Input Data Set Descriptions section reviews the input required to run WASTES. SLAM and WASTES input statements and the format of the two data files necessary to execute the model are also described.

The Output Description section of the document contains a summary of the reports generated by WASTES. WASTES generates reports on facility inventories, facility receipts characterized by incoming heat rate and transportation, and on transportation system characteristics and costs.

The Sample Input Card Files section contains sample input decks. Several waste management scenarios, a description of input cards required to specify the scenario, and a discussion of the action initiated by the various input cards are presented.

The Sample Problems section contains two sample problems and a discussion of the results obtained as well listings of input and output data set descriptions.

The seventh section, References, provides citations for the references used in this document.

1.2 METHODOLOGY

The WASTES model simulates a user defined system for nuclear waste transportation, storage, and disposal. Allowable non-reactor facility types for processing or disposing of nuclear wastes are reprocessing plants, federal interim storage (FIS), monitored retrievable storage (MRS), and repositories. The number of facilities of each type, their locations and capacities, and priorities for spent fuel acceptance are all specified by the user. The facilities that can be modeled and the interactions among these facilities are shown in Figure 1.1.

The model is written in FORTRAN 77 as an extension to the SLAM (Simulation Language for Alternative Modeling) commercial simulation package (Pritsker and Pegden 1979). SLAM is utilized in a discrete event mode to model the passage of spent fuel through the system.

The system is initiated with historical and projected individual reactor discharges of spent fuel as described in the reactor discharge data file or with data supplied by the user. The reactor discharge file contains deterministic information on the date (year/month) and quantity of spent fuel discharges. From this point, the model is controlled by a user specified combination of source- and destination-driven transfers.

Source-driven transfers occur when a reactor pool violates the FCR storage margin or when the reactor is decommissioned. At these times, WASTES checks destination facilities to see if they can accept material from the reactor pool of interest. A dry storage capability is assumed to exist for each reactor and is allowed to grow as necessary to contain spent fuel which cannot be shipped to another facility. WASTES will attempt to maintain the FCR margins in reactor pools if possible.

Destination-driven transfers occur when the annual receipt capacity of a facility will not be met by FCR or decommissioning shipments. An attempt is made in each calendar year to schedule enough shipments of spent fuel from facilities or reactors with eligible fuel to fill the annual receipt capacity of each destination facility.

FIGURE 1.1. Interactions Among Facilities in the Spent Fuel Logistics System

The following four sections describe in greater detail the waste generating model, the waste facilities model, the transportation model and the basic transportation scheme.

1.3 WASTE GENERATION SOURCE MODELS

The primary data for the WASTES program is contained in two files. The first contains site specific information for present and planned commercial reactors in the U.S. This file contains such information as the accessibility to rail transportation, the latitude and longitude of the site, the type of reactor, and the reactor's startup and decommissioning dates.

The second file describes the characteristics of fuel discharge batches and is sorted by time of reactor discharge. It contains information on the fuel exposure, batch size in number of assemblies, and weight in metric tons. This file determines the rate of arrival of material into the simulation as the program executes. Examples of both types of data files are provided in Appendix C.

1.4 WASTE FACILITY MODELS

The model accepts input statements which describe each of the major non-reactor facilities to be included in the simulation. Any combination of four types of these facilities (reprocessing, MRS, repositories and FIS) are allowed in the simulation up to a maximum of 10 facilities. Each of the four types of facilities have different operating characteristics. Reprocessing plants receive spent fuel and ship transuranic (TRU) wastes and high-level wastes (HLW). Operation of FIS facilities are limited in duration by law; therefore, FIS facilities are given priority in unloading to an MRS facility or repository. An MRS facility can simultaneously receive waste for storage and ship waste from storage to other facilities (typically repositories). A repository will typically only receive waste for permanent disposal. The WASTES code uses a major identifier (ID) and minor ID to uniquely identify the different facilities. The major facility IDs are 1, 2, 3 and 4 which stand, respectively, for reprocessing plants, MRS facilities, repositories, and FIS facilities. The minor ID is determined by the number of facilities of each major type.

Thus, if there are two repositories to be analyzed, the code would expect the facility IDs to be 3.1 and 3.2. The facilities are further identified by the location of the facility in latitude and longitude and by a facility title.

The user specifies an operations schedule for each facility which determines the facility's maximum storage capacity, its annual receiving rate, its maximum annual shipping rate, its annual sprint rate, and any changes of the age acceptance criteria. The sprint rate is defined as receipt capacity in excess of the nominal receipt rate that can be used to accept forced discharges from reactor pools (e.g., when FCR storage capacity is exceeded). The user also enters the minimum amount of time that material must remain at the facility and the minimum age since discharge for acceptance at each facility.

1.5 TRANSPORTATION MODEL

WASTES incorporates logic for handling both truck and rail transportation between reactor and facility sites and allows user specification to disable either mode in order to perform alternative analysis of the transportation costs. By default, the model will preferentially ship by rail if both sites have rail access.

The model also calculates total transportation costs incurred for shipping material by either legal weight truck or general freight rail transportation modes. Shipment quantities occur in multiples of the appropriate shipment cask capacities, except that WASTES will allow a single partially filled cask for the last shipment from each reactor.

The two types of shipment casks allowed in the model are truck and rail. Up to a total of ten different casks may be specified. At a minimum there must be at least one truck and one rail cask defined. The user specifies the following parameters for each cask: cask name, cask type (truck or rail), empty weight, the number of usable days/year, the turnaround time for loading or unloading (not the sum), the usable cask life in years, the daily rental rate for the cask, the capital cost, the annual operating and maintenance cost, and the number of PWR and BWR assemblies that the cask may contain.

1.6 BASIC TRANSPORTATION SCHEME

Within the WASTES model, material is selected on an age basis criterion with the oldest available material being the first shipped. Material will only be shipped if it meets the user-supplied minimum residence time for that facility.

The availability of destination facilities is determined by their remaining receiving capacity in a given year, whether a transportation cask can be used by both the source and destination, and whether or not the material meets the minimum age acceptance criteria for that facility.

The WASTES model contains two shipping algorithms that are user specifiable options. These are optimal and proximal assignment of source/destination pairs. Each major class of facility may be specified to be filled in a different manner. The optimal routing allows a true minimization of shipping distance or shipping cost (user option) to be performed while proximal routing performs a sub-optimal minimization. Descriptions of these algorithms follow:

1. Optimal Algorithm: This optimization algorithm is operational only when there are exactly two facilities of the destination facility type. For any other number of facilities the proximal algorithm is used. The optimal algorithm examines all material to be shipped to a given facility type within a calendar year. Each facility's receipt rate is met with material being allocated to source/destination pairs so that the total shipping miles are minimized in that year.
2. Proximal Algorithm: In this algorithm the distances from the source facility to the alternative destination facilities are determined at the time each material transfer is to occur. The closest facility that has the capacity to accept the material is chosen and the source/destination pair is determined immediately. Thus over a whole year, the results may not be minimum achievable costs.

This sub-optimal method can be chosen for any number of facilities of a given facility type. No allowance is made for material that will require shipment later in the year. In other words, the

proximity algorithm does not reallocate earlier shipment assignments to minimize a whole year's shipments.

1.7 COMPUTER REQUIREMENTS

Because of the large amount of memory required, the WASTES model requires a computer that allows virtual memory for most national simulations. The actual size of core required varies widely and is dependent upon the synergistic effects of the exact situation being modeled. To date, all work on WASTES has been done on DEC VAX 11/780s and a DEC MiroVAX II (virtual machines) operating under VMS.

The CPU time requirements for executing WASTES will vary widely with the number of reactors and discharges, the simulation desired (number of facilities, transportation algorithm, etc.), and the computer, operating system, and system resources used. Representative run times on those VAXes for a national multiple facility optimization are 20 to 30 CPU minutes.

2.0 MODEL DESCRIPTION

As previously mentioned, WASTES is a discrete event simulation model. A discrete event simulation model advances simulated time from one event to the next as the system status changes. This is significantly more efficient than a continuous simulation model that would advance simulated time by a step increment and look for activities that would modify the system status.

A general flow diagram of the model's execution is shown in Figure 2.1. As the model begins execution, the simulation to be run is set up and input card error checking is performed. An annual repetition then begins which continues until the final year of the simulation.

Each reactor discharge is a discrete event that occurs during the year at the time scheduled in the discharge data file. If, as a result of the discharge, the FCR storage margin of the pool is violated, the reactor ships or moves a sufficient amount of fuel to maintain the FCR margin.

After all discharges for the year have occurred, WASTES will then attempt to ship fuel from any decommissioned reactors that are past the user defined date for decommissioning priority. Following that step, destination facilities will attempt to solicit enough acceptable fuel to fill any unused annual receipt capacity the facility may have.

The following subsections describe the reactor site facilities, the use of SLAM, the storage/processing facilities, the possible flows of waste through the system, the possible methods of selecting source/destination pairs, the calculation of transportation costs, the calculation of levelized cask purchasing, and the way in which the heat rate of material moving through the system is calculated.

2.1 REACTOR SITE MODEL (POOLS AND DRY STORAGE)

The reactor pools and dry storage are modeled differently than the other facilities in the simulation because of their number, which is quite large, and their function, which is to serve as the sources of material coming into the simulation. Each reactor is modeled as a separate holding area. Up to

FIGURE 2.1. General Sequence of Events as WASTES Executes

600 reactors may be modeled in each simulation. The data defining the characteristics of each reactor are read into the simulation from a data file that is described in Section 3.4.

Two reactors may share pool and dry storage facilities. It is possible to specify the sharing of reactor pools in three ways. A Share Type 1 indicates that the pool is dedicated to the storage of one reactor's spent fuel (no sharing allowed). Two reactors sharing a common pool are specified by Share Type 2. In this case the available pool capacity equals the pool capacity less the largest of the two FCR margins. Two reactors sharing two pools are specified as a Share Type 3. The available pool capacity equals the sum of the pool capacities less the largest of the two FCR requirements. Share Types 2 or 3 require that the shared reactor ID be specified in the reactor site data file.

The FCR storage margin requirement is calculated as the maximum reracked capacity of the pool minus the number of assemblies in a full core. When a pool is filled to a point exceeding its FCR margin storage requirement, previously discharged batches are removed from the pool and transferred elsewhere. The pool's FCR storage margin is maintained by removing (by transferring to dry storage or shipping) previously discharged batches on an oldest-first basis until the spent fuel inventory is reduced to or below the available pool capacity. Full cask quantities are always loaded for shipment of material to other facilities or for placement in dry storage.

When batches are removed from a pool, they are transferred to a storage or processing facility or a repository if any of the facilities have both unused receiving capacity and storage capacity for that year and if the reactor has fuel that is acceptable to the facility. The facilities are scanned in a sequence that may be user specified. The default priorities treat reprocessing sites first, followed in order by repositories, MRS facilities, and FIS facilities. If allowed to default, multiple facilities within a class of facilities will attempt to receive waste according to the proximal transportation algorithm.

If the FCR storage margin cannot be maintained by transferring spent fuel to any of the other facilities, the simulation will attempt to transship

the discharge to another reactor pool, if transshipment is allowed. If transshipment is not allowed or if the transshipment is refused, the excess material is placed in dry storage. Transshipment of spent fuel will only be refused if receipt of the transshipped material would violate the FCR margin of each possible receiving facility. The assumption is that dry storage can grow as needed to meet any storage requirements so that fuel can always be removed from pools as required.

Transshipment can be user-specified to occur 1) within a utility, 2) within a state, or 3) within a user-specified transshipment network (specified in the reactor site data file). If the reactor is placed in a transshipment network, it is allowed to transship to all other reactor pools in the same network. Transshipment of material will occur to the pool within the transshipment network having the largest available capacity.

WASTES also provides for a user-specified centroid region which allows waste sources to be clustered at a given point source (the centroid). In this way, the spent fuel generated within a geographic area can be identified. Up to 21 centroid regions may be specified. The centroid specification does not affect the execution of the WASTES and is used only in reporting results.

Reactor pools, along with any associated dry storage, are the only facilities that are considered to be decommissioned by WASTES. The shut-down date specified in the reactor site data file is used in conjunction with a user supplied decommissioning lag time to determine when fuel from the decommissioned reactor is eligible for shipment. Decommissioned reactors receive a lower shipping priority than other reactors that can transship waste to maintain their FCR margin, but are given priority over other shipments needed to satisfy destination facility requirements.

2.2 USE OF SLAM TO MODEL REACTOR BATCHES

SLAM is a general purpose simulation language that is used in the WASTES model in a discrete event mode to maintain a calendar (time clock) for all activities being modeled and to maintain ordered queues of spent fuel at each

reactor and facility. SLAM can be requested to generate statistics on the number of batches located in each of the facilities and in each of the reactor pools.

To model a single reactor discharge (batch), the data that describe the fuel batch or sub-batch are read from the reactor discharge data file. The data are stored as a single information packet by WASTES.

The simulated discharge of fuel by reactors is initiated by SLAM when the simulated time reaches the time specified on the batch data record, which was read from the reactor discharge data file. The event that invokes reactor discharge logic is scheduled from data in the discharge data record itself.

As each batch or sub-batch is discharged, it is transferred into an internal SLAM file which represents the reactor pool used by the site. The information contained in each packet is described below.

Fuel Batch Information Packet

1. Time of reactor batch discharge (yr, mo).
2. ID of facility where currently stored.
3. Number of assemblies.
4. Average amount of fuel in each assembly (MTU/assembly).
5. Average discharge exposure (MWd/MTU).
6. Unique number to identify individual batches.
7. Current heat rate (KW/MTU).
8. Time of arrival at facility where the batch is currently stored.
9. ID of the reactor from which discharged.
10. Waste Type (PWR, BWR).

Those elements that may change during the simulation are numbered 2, 3, 7, and 8. Note that item number 3 may change if a batch is subdivided. When subdivision occurs, a new sub-batch is created and the size of the original batch is reduced. Subdivision is necessary if only part of a batch can be handled by a facility.

The information passed to the SLAM file management routines includes a pointer to this information packet and the time at which the batch is discharged. Thus, a maximum of only two SLAM-defined attributes (time and the

pointer) are required on the SLAM input card. When the simulation time clock reaches the time of discharge for this batch, SLAM returns the information in the packet to the routine that models reactor discharges. This routine uses SLAM procedures to store the batch in the pool indicated in the data packet. It then decrements the unused pool capacity and determines whether the available pool capacity for the reactor pool has been violated. If the pool capacity has been violated, the oldest fuel batches are either removed from the pool and transferred to storage facilities if any are open; transshipped if transshipment is allowed; or moved to on-site, ex-pool storage (i.e., a local dry storage area). If the pool capacity has not been violated, simulation continues.

2.3 NON-REACTOR FACILITIES MODELED

There are six classes of facilities that can be included in a WASTES simulation: reactor pools; at-reactor, ex-pool storage (dry storage); MRS facilities; repositories; FIS facilities; and reprocessing plants. Each of these facilities is viewed as a separate holding facility with its own unique characteristics.

The MRS facilities generally perform more functions than the other non-reactor facilities because they receive, store, and ship materials. Repositories are similar except that they generally do not unload material and may have different acceptance criteria. FIS facilities are also similar to MRS facilities but are much more constrained as to application and do not solicit material. Reprocessing facilities are currently modeled in exactly the same manner as MRS facilities, although WASTES does allow for material transformations to be incorporated in the future.

The common features that must be defined for facilities other than reactor pools and dry storage facilities include:

- total storage capacity (MTU)
- nominal annual receiving rate (MTU/yr)
- annual removal rate (MTU/yr)
- minimum age imposed on incoming material (yr)

- minimum facility residence time (yr)
- annual sprint rate (receipt capacity, which is in addition to the nominal loading rate and is reserved for forced discharges and fuel from decommissioned reactors)
- facility prioritization (listing facilities or groups of facilities from which a particular facility will preferentially receive waste.

Facilities are started up by specifying non-zero annual receipt rates and total storage capacities for the year of startup. Any of the features listed and defined above may be modified on an annual basis. An explicitly defined facility shutdown may be achieved by specifying zero annual acceptance and removal rates. Alternatively, a facility may be shut down by dynamically achieving its maximum total storage capacity (a repository) or by unloading all of its total storage capacity (reactor storage, FIS facility, MRS facility, reprocessing plant).

The logic employed to model operation of the non-reactor-site facilities is different from the logic used to model individual reactor sites. Non-reactor-site facilities are controlled by their respective annual receipt rates. In a given year, part or all of the annual receipt capacity may be filled by FCR shipments or by shipments from reactors undergoing decommissioning. An attempt is made to fill the unused receipt capacity of each operating non-reactor-site facility by examining all other facilities, including reactor pools and dry storage, to determine if they contain any material that qualifies for transfer. These qualifications include minimum age for acceptance at the soliciting facility, the identification of a shipping cask type acceptable to both the source and destination, and a minimum residence time requirement at the previous site. To schedule shipments between the facilities, the soliciting facilities are scanned by priorities which may be user specified. If default priorities are used, reprocessing sites have the highest priority, followed in order by repositories, MRS facilities, and FIS facilities. If allowed to default, multiple facilities within a class of facilities will attempt to fill according to the proximal algorithm.

Repositories represent the end point for disposal of waste in the system. They can accept material from any of the other types of facilities, but

normally will not ship material to any other facility (although user options permit such shipments to be modeled).

MRS facilities can accept material from any of the other types of facilities, including repositories if necessary. Material stored in the MRS can be shipped to repositories or reprocessing facilities.

FIS facilities are similar to MRS facilities in that they receive, store, and ship waste material. However, FIS facilities are temporary sites provided by the federal government and are limited to receiving fuel only from individual reactor pools having FCR storage margin shortfalls. They do not solicit material as do the other storage/processing facilities but may ship material to all the other facilities. Generally FIS facilities have the highest priority for offloading to other facility types.

Reprocessing plants are currently modeled as generic storage facilities. There are currently no special transformations done to material that is shipped to these sites, although WASTES does allow for transformations to be incorporated in the future. Reprocessing plants can accept material from individual reactor sites, FIS facilities, and MRS facilities. Reprocessing plants can ship material to MRS facilities and repositories.

2.4 TRANSPORTATION ALGORITHM

In this section, the possible flows of waste through the system and the methods by which source/destination pairs can be selected as discussed.

2.4.1 Overview

Figure 1.1 gives an overall view of the possible flows of spent fuel through the system.

For a shipment to occur, a shipping cask link must exist between the source and the destination. The use of a specific cask type may be constrained by either the shipping facilities' limitations or the receiving facilities' limitations. A total of 10 casks may be described in each simulation. By default, all reactors with rail access are assigned an R1 cask, which is designated to be both a shipping and receiving cask. All reactors are assumed to be able to handle a T1 truck cask.

Shipment quantities are calculated by means of integer casking, which means that the number of assemblies shipped occurs in multiples of the appropriate shipping cask capacity. Thus, slightly more than the minimum required number of assemblies may be shipped to fill the last required cask.

Source-driven transfers will occur when a reactor would violate its FCR storage margin or when a reactor has been given decommissioning priority. The model will first attempt to ship such discharges to one of the user defined facilities.

If no facilities are defined or no facility can accept the shipment, the model will then attempt to transship the discharge to another reactor pool if transshipment is allowed. If transshipment is not allowed, the material will be placed into dry storage at the reactor site except in the case of reactors being decommissioned where the material will remain in the pool.

User specified destination driven transfers occur when the annual capacity of a facility will not be met by FCR or by decommissioning shipments. An attempt is made in each calendar year to schedule enough shipments of spent fuel from facilities with non-critical storage capacity to fill the annual receipt rate of each destination facility.

If default priorities are used, the model attempts to place the material in the reprocessing facilities first, then the repositories, then the MRS facilities, and finally in the FIS facilities. If more than one facility in a class of facilities exists, the default priority is to fill the facilities within the class according to the proximity algorithm. Fuel selection occurs on an oldest first basis subject to various user constraints (cask links, residence time at previous facility, age of fuel, etc.)

2.4.2 Source/Destination Pair Assignments

Two shipping algorithms are available for either optimal or proximal selection of source/destination pairs. Each major class of facility may be specified to be filled in a different manner. The optimal routing allows a true minimization of shipping distance or of shipping costs to be performed where proximal routing performs a sub-optimal minimization. Descriptions of these algorithms follow.

1. Optimal Algorithm: In general, for multiple facilities, it is necessary to solve a set of simultaneous equations to minimize the transportation costs or total number of miles over which nuclear fuel is transported. If exactly two facilities are receiving waste, the distance or costs can be minimized by preferentially sending those shipments that would incur the greatest savings (or least cost) by shipment to the first facility, to the first facility. This technique is used by WASTES to optimize the allocation of shipments to minimize transportation cost or distance. Thus with WASTES, optimization can only take place for two facilities. The optimizing algorithm examines all material to be shipped to the specified facility type within a calendar year and creates an ordered list of shipments based on the difference in distances or the difference in costs to the two facilities from the source facility. This list is periodically scanned and material transfers are allocated so that the first facility's receipt rate is met with material from source/destination pairs so that the total shipping miles or shipping cost is minimized for each year. It should be noted that if insufficient material is available (in a given year) to meet the annual receipt rates of both facilities, the facility with the lowest user specified facility ID number is filled first as specified above.
2. Proximal Algorithm: The proximal algorithm does not result in the globally optimum routing of material, but it can be used to approximate an optimal shipping strategy when more than two facilities exist. The algorithm determines the distances from the source to the possible destination facilities at the time each material transfer is to occur. The closest facility that has the capacity to accept the material is chosen and the final source/destination pair is determined immediately.

No allowance is made for material that will require shipment later in the year and that may result in a reduction in the total shipping distance. The proximity algorithm does not reallocate earlier shipment assignments to minimize the impact of this situation.

2.4.3 Transportation Costing

The transportation costs calculated in the WASTES model are the costs that would be incurred for shipping spent fuel by either legal-weight truck or general-freight rail modes of transport. The costs for safeguards and security charges are also estimated. In addition, the estimated cask transport time for each shipment is calculated.

The equations utilized in calculating these costs were derived from curve-fitting techniques using data from research currently ongoing at PNL to determine the costs for shipping spent fuel and/or nuclear waste materials. The equations are based on both the distance traveled and the weight for each shipment. Separate equations are given for both truck and rail shipments for one-way distances less than and/or greater than 1000 miles. In addition, the equations provide an estimate of the safeguards and security charges that would be incurred for each shipment. All costs are reported in 1984 dollars. The equations used are shown below:

Legal-Weight Truck

One-Way Mileage Less than 1000 Miles

$$\begin{aligned}\text{Shipping Cost (\$)} &= [1.493 + .0033*DIS]*FWT \\ &+ [0.428 + .0034*DIS]*EWT\end{aligned}$$

One-Way Mileage Greater than 1000 Miles

$$\begin{aligned}\text{Shipping Cost (\$)} &= [.0049*DIS - 0.16]*FWT \\ &+ [.0040*DIS - 0.19]*EWT\end{aligned}$$

For All Mileages

$$\text{Safeguards/Security Cost (\$)} = [7.93*DIS^{**} - 0.1855]*DIS$$

General-Freight Rail

One-Way Mileage Less than 1000 Miles

$$\text{Shipping Cost (\$)} = 1.053 * ([2.32 + 0.0067*DIS]*FWT + [2.15 + 0.0063*DIS]*EWT)$$

One-Way Mileage Greater than 1000 Miles

$$\text{Shipping Cost (\$)} = 1.053 * ([5.07 + 0.0040*DIS]*FWT + [4.72 + 0.0037*DIS]*EWT)$$

For All Mileages

$$\text{Safeguards/Security Cost (\$)} = [291.65*DIS^{**}(-0.5987)]*DIS$$

Where

DIS = One-way mileage

FWT = Loaded weight of cask (cwt)

EWT = Empty weight of cask (cwt)

The number of days that a cask will be utilized for each individual shipment is also estimated. The lease costs are then calculated by multiplying the total number of days that each cask is utilized by the daily lease charge for that cask type.

The number of cask-days utilized for a shipment is a function of the transit speed and the cask turnaround time. Again, data from ongoing PNL research were used.

Truck Speed = 840 miles/day

Rail Speed = minimum of 40 miles/day and $(4.02 * DIS^{**} 0.48)$

Where

DIS = One-way mileage (miles)

The total number of cask-days utilized for a given shipment is calculated as shown below:

$$\text{Cask-Days} = [(2 * \text{DIS}) / \text{SPEED}] + 2 * \text{TATIME}$$

Where

DIS = one-way mileage (miles)

SPEED = transit speed (miles/day)

TATIME = average turn-around time at each facility (days)

WASTES contains a table look-up routine for reading a user-supplied table of shipping distances from reactor sites to facilities and from facility to facility. Facility locations in the look-up table are specified by their latitude and longitude. For each facility specified in the input stream, WASTES will attempt to find a matching latitude/longitude (in degrees) in the look-up table. If no reactor is found, WASTES will use a great-circle algorithm to estimate the transportation distance. This algorithm uses a multiplier of great circle distances to estimate actual transportation distances. Separate multipliers are used for truck and rail distances. These multipliers were derived by regressing actual miles for multiple sites against the great-circle distance between the sites. For truck shipments, a multiple of 1.15 is used, and for rail shipments, the multiplier is 1.33. Before each simulation begins, WASTES prints an informational message that tells which method was used to estimate the transportation distances.

Total shipping costs are reported on Table 9 of the WASTES output according to the following four costing scenarios: minimum lease, required lease, maximum purchase, and levelized purchase.

The costs reported under the minimum-lease scenario assume that shipping casks can be leased for the exact number of cask-days required. The costs reported under the required-lease scenario assume that each cask that is required must be leased for the entire year. The formulas for calculating the lease costs follow:

Minimum-Lease Cost = CSKDYS * DLYRATE

Required-Lease Cost = ICSKREQ * DYSYR * DLYRATE

Where: CSKDYS = the number of cask-days required in each calendar year
DLYRATE = the daily cask-lease rate (dollars/day, user supplied on cask card)
ICSKREQ = integer number of casks required (e.g., if 5.63 casks are needed, ICSKREQ = 6)
DYSYR = the number of days/year the cask can be used (user supplied on cask card)

The costs reported under the maximum-purchase scenario are generated on the basis of having as many casks available in each year as WASTES calculates are needed (casks available from previous years minus casks retired plus new purchases required). In times of decreasing facility acceptance of fuel, use of this method will result in under-utilization of the available casks.

The costs reported under the levelized-purchase scenario are calculated in accordance with the levelized-cask purchasing algorithm described in the next section.

2.4.4 Levelized-Cask Purchasing

Although WASTES only reports transportation fleet requirements, it is recognized that an actual dispatching model would purchase casks based on future cask requirements and thus probably purchase fewer casks to meet peak demand. The levelized-cask purchasing algorithm and report gives the user a first order approximation of a cask purchase/replacement methodology in which the peak requirements in a given year may be transferred into an earlier year. The methodology acts as a levelizer by moving cask requirements from years having peak requirements to prior years having minimum requirements. The levelized-cask algorithm does not affect the WASTES simulation but is useful in estimating a levelized-cask purchase scenario.

The algorithm examines the cask requirements that were previously calculated on an annual basis and compares the number of casks required in a given year with the total number of casks available. If the required number of casks exceeds the number of casks available, additional casks are purchased in that year. If the required number of casks are less than the number of

casks available, the excess cask capacity is used to preship fuel to offset new cask purchases in the next year. The algorithm allows up to 10 percent of the combined annual receipt rate of the non-reactor facilities in the next year to be preshipped to offset new cask purchases.

The algorithm ensures that a cask will be available only during its prescribed lifetime (user input). Once a cask has reached the end of its lifetime, it is either replaced (new purchase) or retired.

2.4.5 Multi-Cask Rail Shipment Modelling

WASTES provides the ability for users to model multi-cask rail shipments from MRS facilities to downstream facilities (e.g., repositories). The facility(ies) receiving the multi-cask shipments cannot be specified to be filled according to the optimized shipping algorithm. The rail shipping casks used on the train must be compatible with the MRS facility and the destination facility. This compatibility is accomplished by designating the cask to be used as a shipping cask for the MRS facility and as a receiving cask for the destination facility and by not assigning the cask to any other facilities or reactors. Shipping costs are calculated the same as for single cask shipments. Security and surcharges costs are the same for the entire train as for a single shipping cask. The user may elect to apply a dollar-per-mile charge to the train shipping costs. The user may also elect to apply a speed multiplier to train shipments instead of using the speed of a single rail cask shipment. The user must also supply a train turnaround time.

2.5 HEAT-RATE CALCULATIONS

Heat-rate characterizations of receipts, shipments, and inventories are generated by the WASTES model. For this reason it is necessary to keep the current heat rate as part of the information on each batch. Heat rate is calculated for each batch as it is moved to the next facility for storage. If the user requests fuel characterization, heat rates of material in facility inventories are recalculated annually. The heat rate is dependent upon the age, exposure and waste type of the batch. The exposure and waste type are constant for the batches; the age is available at the time of transfer or the year in which the facility inventory is being characterized.

The WASTES model uses a second order interpolation/extrapolation of tabular data for the heat rate calculations during the simulation. The data values were generated by runs of the ORIGEN-2 code (Croff 1980) for PWR and BWR reactors for exposures of 10,000, 20,000, 30,000, and 40,000 MWd/MTU for decay times up to 50 years after discharge (Libby and Holter 1984). For decay times less than 1 year or for exposures less than 10,000 MWd/MTU, the closest border value is returned. For exposures or decay times outside the range covered by the tabular data, the heat value is extrapolated.

3.0 INPUT DATA SET DESCRIPTIONS

In this section, the input cards for SLAM and WASTES and the reactor site and discharge data files are described.

3.1 SLAM INPUT STATEMENTS

To execute WASTES, four SLAM control cards must be included in the run stream. Section I of Appendix A provides a complete description and syntax for each of the cards. The cards must be provided in the order in which they are listed in Appendix A. An abbreviated description of each of the cards follows.

GEN	The GEN card provides general information concerning the simulation being run and is used in titling the output.
LIMITS	The LIMITS card is used to specify integer limits on SLAM files.
INITIALIZE	The INITIALIZE card is used to specify start and end dates of the simulation.
FIN	The FIN card denotes an end to all SLAM input cards.

3.2 WASTES INPUT STATEMENTS

The input processor is designed to allow the user to input directives into the model in any order desired after the FIN card of the SLAM input stream. The input is organized as a set of cards (lines) identified by a unique key word. There are 32 different keyword cards.

Section II of Appendix A provides complete descriptions, syntax, and the defaults for each of the 32 cards. An abbreviated description of each card follows.

AGEAT	The AGEAT card allows the user to specify the number of years the spent fuel must remain at a facility before it can be moved to another facility.
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AGETO	The AGETO card allows the user to specify how old the spent fuel must be to be acceptable at a facility.
ALTPRI	The ALTPRI card allows the user to alter the priorities that are used when a facility simultaneously looks at other locations from which to accept spent fuel.
CAPACITY	The CAPACITY card allows the user to specify annual changes in the nominal receiving rate, shipping rate, maximum capacity, and age acceptance criteria.
CASK	The CASK card describes the attributes associated with each type of shipping cask.
CHARACTERIZE	The CHARACTERIZE card allows the user to obtain detailed characterizations of fuel inventories and shipments.
COSTREPORT	The COSTREPORT card allows the user to request detailed reports of dry storage requirements/costs.
DATAFILE	The DATAFILE card describes to the model the location of the data files.
DATASET	The DATASET card allows the user to specify the default pairs of data files with a single keyword.
DECOM	The DECOM card allows the user to specify the lag time between reactor shutdown and the beginning of fuel shipping priority for reactors being decommissioned.
DECOMAGE	The DECOMAGE card allows the user to specify how old the spent fuel from reactors being decommissioned must be to be acceptable at a facility. If present, this card overrides the action of the AGETO card.
DISCHARGE	The DISCHARGE card allows the user to explicitly specify a discharge event. This action is typically only done internally when reading the reactor discharge data file.
DISCOUNT	The DISCOUNT card allows the user to determine the base year for discounting of transportation costs, if any, and to input the discount rate.

DRYTYPE	The DRYTYPE card allows the user to specify the type of dry storage canister and the number of PWR and BWR assemblies it can contain.
EXECUTE	The EXECUTE card allows the user to prohibit the attempted execution by SLAM. This option is useful to allow SLAM and WASTES to perform error checking on the input card file without beginning execution.
FACSPEC	The FACSPEC cards are used to describe the locations, titles and cask usage of the various destination facilities in the system.
FCRAGE	The FCRAGE card allows the user to specify how old the spent fuel from forced discharges must be to be acceptable at a facility.
FCRFRAC	The FCRFRAC card allows the user to specify what portion of the FCR margin is to be maintained.
FILLORDER	The FILLORDER card allows the user to specify the order in which the classes of facilities will be filled.
FUELSTOP	The FUELSTOP card allows the user to stop the acceptance of newly discharged fuel after a certain number of years or a certain number of MTU.
MSHIP	The MSHIP card allows the user to model multi-cask rail shipments from an MRS facility to downstream facilities.
NOTRXIDS	The NOTRXIDS card tells the system which reactors will be excluded from the analysis.
PREVENT	The PREVENT card allows the user to prohibit age checking on reactor initiated discharges (FCR margin and decommissioning).
PRIOR	The PRIOR card allows the user to specify the sequential priority in which a facility looks at other facilities.
QSTATS	The QSTATS card allows the user to print the SLAM Summary Report at the end of the simulation.

REACTORS	The REACTORS card specifies which reactors will be considered in the analysis.
RUNTYPE	The RUNTYPE card allows the user to specify whether facility selection for transportation will be done optimally or proximally.
RXCASKS	The RXCASKS card allows the user to assign shipping/receiving casks to reactors.
TMODE	The TMODE card specifies whether rail or truck transportation will be used from the reactors.
SPEED	The SPEED card allows the user to apply a multiplier to the WASTES calculated truck and rail speeds.
TSHIP	The TSHIP card is used to tell the model what type of transshipment is to be allowed and when it is to begin and end.

3.3 REACTOR SITE DATA

The reactor site data file provides the site specific data for each reactor present in the simulation. It is read in fixed format. The file must be organized in order of ascending reactor identification (ID) number.

The parameters that are read from the file are: reactor ID number, reactor type (PWR, BWR), type of pool sharing, shared reactor ID (pool sharing), nominal pool capacity, maximum pool capacity, North American Electric Reliability Council (NERC) region, FCR margin storage requirement, utility ID number, state in which reactor is located, start up year and month, shut down year, latitude, longitude, rail or truck access indicator, user defined transshipment network, and a user specified centroid region. For additional information on transshipment, sharing of reactor pools, and centroid regions see Section 2.1.

Table 3.1 provides the format and descriptors for each of these parameters as used in the reactor site data file. Figure 3.1 shows the NERC regions and the region identifications (ID) as used in WASTES.

TABLE 3.1. Reactor Site Data File Description

<u>Field</u>	<u>Format</u>	<u>Description</u>
1	I3	Reactor identification number
2	I2	Reactor type [1=PWR; 2=BWR]
3	I2	Type of pool sharing [1=no sharing, 2=two reactors and one pool, 3=two reactors and two pools; See Section 2.1]
4	I4	Reactor identification number that identifies with whom the pool is shared if pool sharing is allowed.
5	I5	Nominal pool capacity
6	I5	Maximum pool capacity (reracked)
7	I2	North American Electric Reliability Council (NERC) Region
8	I4	Full core reserve margin storage requirement
9	I3	Utility identification number
10	A3	State in which reactor is located
11	I5	Year of reactor startup
12	1X,I2	Month of reactor startup
13	I5	Year of reactor shutdown
14	F7.2	Latitude (degrees, minutes)
15	F7.2	Longitude (degrees, minutes)
16	1X,I1	Rail access indicator [0=truck,1=rail]
17	I5	User defined transshipment network. Reactors with the same number are in the same transshipment network.
18	I3	Centroid region user specified. See Section 2.1 for more information.

- 1 ECAR - EAST CENTRAL AREA RELIABILITY COORDINATION AGREEMENT
- 2 MAIN - MID-AMERICAN INTERPOOL NETWORK
- 3 MAAC - MID-ATLANTIC AREA COUNCIL
- 4 MAPP - MID-CONTINENT AREA POWER POOL
- 5 NPCC - NORTHEAST POWER COORDINATING COUNCIL
- 6 SERC - SOUTHEASTERN ELECTRIC RELIABILITY COUNCIL
- 7 SWPP - SOUTHWEST POWER POOL
- 8 ERCOT - ELECTRIC RELIABILITY COUNCIL OF TEXAS
- 9 WSCC - WESTERN SYSTEMS COORDINATING COUNCIL

FIGURE 3.1. North American Electric Reliability Council Regions
With Region IDs as Used in Wastes

3.4 REACTOR DISCHARGE DATA

The reactor discharge data file provides the characteristics of each batch of spent fuel discharged in the simulation. It is read in fixed format. The file must be listed in ascending order of time of discharge (i.e., from first to last).

The parameters that are read from the file are: ID number of discharging reactor, the year and month of discharge, the number of assemblies discharged, the number of MTU discharged, and the historical/expected discharge exposure of the spent fuel in MWd/MTU.

Table 3.2 provides the format of each of the parameters read from the reactor discharge data file.

TABLE 3.2. Reactor Discharge Data File Description

<u>Field</u>	<u>Format</u>	<u>Description</u>
1	I3	Identification number of discharging reactor
2	I5	Year of discharge
3	1X,I2	Month of discharge
4	I4	Number of assemblies discharged in batch
5	F7.2	Amount of material in MTU
6	I6	Exposure of the material expressed as MWd/MTU

4.0 OUTPUT DESCRIPTIONS

WASTES generates detailed reports on the facility inventories; the facility receipts characterized by incoming heat rate, age, and transportation; and the transportation system characteristics and costs.

Prior to producing these reports, WASTES echoes the SLAM and WASTES input card descriptions. Immediately after each set of input card descriptions, any errors that were detected are flagged with an informational error message. Following this are a variety of statements specifying options in effect for the given run and summary tables of the various inputs.

WASTES will print informational messages as the simulation progresses under the banner INTERMEDIATE RESULTS. At a minimum, these results will consist of one printed line per year detailing the number of pools with dry storage. Warning and notification messages from internal WASTES checks will also be printed in this section of the output. The reports described in the following sections of this chapter are generated by WASTES upon completion of the simulation. The reports are generated as tables that are numbered 1 through 12.

4.1 INVENTORY AND SHIPPING SUMMARIES

Table 1 provides the annual inventory (by year), of assemblies and MTU at reactor pools, dry storage (at reactor site), and at each waste management facility. Table 1 also shows the sum of all of these inventories that provides an annual total of the amount of fuel accepted into the simulation up to that point. Table 2 contains a summary table for each facility that details shipments from that facility to all other facilities.

4.2 FACILITY RECEIPT CHARACTERIZATIONS

Receipts of spent fuel for every facility are characterized on an annual basis by heat generation rate and by its mode of transportation.

The Table 3 series segregates the MTUs values of the spent fuel arriving at each facility into seven discrete fuel age and seven discrete estimated heat generation rate intervals. The seven age categories are broken into years as follows: 0-5, 5-8, 8-10, 10-12, 12-15, 15-20 and >20 years. The heat

generation intervals begin at a generation rate of less than 0.5 KW/MTU and increase to greater than 2.5 KW/MTU in intervals of 0.5 KW/MTU. Additionally, the minimum, average and maximum values are reported for both fuel age and heat generation rate annually. The average fuel exposure (burnup) in each year is also reported.

The Table 4 series provides annual details on the characteristics of the transportation system arrivals at each facility. This information includes the total number of truck and rail shipments as well as the total metric tonnage shipped from each facility. The incoming truck and rail shipments are further subdivided into the number of shipments carrying PWR and BWR fuel by transportation type (Truck-PWR, Truck-BWR, Rail-PWR, Rail-BWR).

4.3 TRANSPORTATION SYSTEM CHARACTERIZATIONS

The Table 5 series reports, by facility, the cost of shipping spent fuel to that facility. Additionally, cask requirements (number of casks and cask busy days) are separated in terms of transportation modes (truck and rail) and are reported on an annual basis.

Table 6 summarizes the facility-to-facility shipping costs on a unit cost basis (\$/kg). Tables 7 and 8, respectively, provide information on the maximum- and levelized-fleet purchase requirements. The number of shipments by cask type; the number of miles by cask type; and the number of casks available, purchased, and retired each year are identified. Additionally, estimates of the costs associated with purchasing and maintaining this fleet are provided.

Table 9 provides transportation costs broken down into the categories of shipping, security/surcharge, lease, purchase, and maintenance costs for four shipping scenarios. The shipping scenarios are: minimum lease, required lease, maximum purchase and levelized purchase. The costing methodology represented by these shipping scenarios was discussed in Section 2.4.3.

The Table 10 series characterizes shipments in user-specified aggregates (centroids). Table 10.01 provides details on the number of cask shipments by centroid while table 10.02 provides information on the average age and exposure of spent fuel as it is shipped from each centroid.

4.4 DRY STORAGE COST REPORTS

The costs associated with dry storage are reported in the Table 11 series. These costs are calculated in accordance with the methods described by Merrill and Fletcher (1983). Table 11.01 is a summary table reporting capital, operating and maintenance, and decommissioning costs for all dry storage sites (PWR and BWR). Additionally, the report gives the number of active dry storage yards (reactors) and the active number of dry storage casks. Table 11.02 and Table 11.03, respectively, provide the same information separately for PWR and BWR storage casks.

4.5 POST PROCESSOR OUTPUT FILES

There are two output files written by WASTES that are particularly noteworthy. The first of these files provides a detailed summary of dry storage requirements while the second provides a computer-usable summary of the information contained in the printed output file. This file also contains the output generated when the characterize option is used.

The dry storage summary file is written to FORTRAN unit 80. For every year in which dry storage occurred, the following information is written for each reactor having dry storage capability: the reactor ID, the number of MTU in dry storage, the number of assemblies in dry storage, the available pool capacity for the reactor, and the latitude and longitude of the reactor. Following the annual listing of reactors, the total number of assemblies and MTU for all reactors is then reported.

The condensed version of the .PRT file intended for use by post processors is written to FORTRAN unit 1. After providing some preliminary information on the cask capacities, cask and facility names, a condensation of the information contained in the .PRT file is written. Preceding each section is a banner line containing the major and minor table IDs, the number of lines following in the section, and the FORTRAN format for use in reading the table.

Following the Table 12 information are two tables that provide information on the number of cask miles and shipments by cask type and facility. Following generation of the Table 12 series, information concerning characterization of fuel is generated, if requested.

5.0 SAMPLE INPUT CARD FILES

This section is divided into two parts: 1) a general section illustrating the use of WASTES input cards to model relatively simple straightforward systems and 2) a section for advanced users covering uses of WASTES to model more complex systems. The second section will generally require a greater understanding of the code and its capabilities.

To be meaningful, the examples must approximate commercial waste management system parameters under contemplation at this time. The examples depicted in this section are shown solely to expose new users to the capabilities of the WASTES model and do not represent endorsement by PNL or DOE.

The examples are presented in the form of a problem statement, the input cards required to model the situation, and a discussion of the effects of the input cards.

The required SLAM input cards are the same for all of the following examples and are listed below.

```
GEN,ANALYST NAME,EXAMPLE SLAM CARDS,11/01/85;  
LIM,649,2,80000;  
INIT,1962,2020;  
FIN.
```

The only changes the user would desire to make in these cards are the ending year of the simulation (2020 used). The initial year of the simulation must be the year of the first discharge. That year is 1962 for all of the data files used by PNL.

5.1 GENERAL INPUT CARD EXAMPLES

Example 1

Problem Statement: Model a single repository opening in 1998 with a loading rate of 3000 MTU/year. Use current-technology truck and rail casks. Allow reactors being decommissioned to have priority over repository-solicited

fuel two years after each individual reactor shuts down. Use the middle case growth projections of the 1984 utility spent-fuel data base (Heeb, Libby, and Holter 1985).

```
FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R1,T1
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,2.0
CAPACITY,1998.,3.1,70000.,3000.,0,0
EXECUTE,YES
```

Discussion: The resulting fuel shipping priorities are 1) FCR, 2) reactors being decommissioned, and 3) facility-solicited fuel. The oldest fuel will be selected in each case: 1) the oldest fuel in the pool of the reactor having an FCR shipment, 2) the oldest fuel at the reactor being decommissioned, and 3) the oldest fuel in the system. All fuel is eligible since there are no limitations on the age of the fuel or the residence time at a previous facility, and shipping cask compatibility exists between each reactor and the repository.

Example 2

Problem Statement: Begin accepting fuel at the repository according to a ramped buildup: 400 MTU in 1998, 900 MTU in 2001, 1800 MTU in 2002 and 3000 MTU in 2003. Allow spent fuel to be transshipped among reactors within utilities. Require that fuel remain in dry storage for 1 year and at a repository for 100 years before unloading. Set an age acceptance limit of 10 years for all fuel except for fuel from reactors being decommissioned which may ship 5-year-old fuel.

```
FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R1,T1
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,2.0
```

```

TSHIP,1,1962                ; enable transshipment
AGEAT,0,0,100,0,0,1         ; set age for time of residence
AGETO,0,0,10,0,0,0          ; set min age for acceptance
DECOMAGE,0,0,5,0,0,0        ; set different acceptance age for decom rx
CAPACITY,1998.,3.1,70000.,400.,0,0
CAPACITY,2001.,3.1,70000.,900.,0,0      ; establish receipt rate ramp up
CAPACITY,2002.,3.1,70000.,1800.,0,0
CAPACITY,2003.,3.1,70000.,3000.,0,0
EXECUTE,YES

```

Discussion: Fuel movements will occur according to the same priorities as in the preceding example. The repository will accept fuel at a slower rate. The age limitations will make some fuel unavailable for shipment. Allowing transshipment within utilities will significantly reduce at-reactor dry storage requirements (approximately 1000 MTU).

Example 3

Problem Statement: Add a second repository that accepts spent fuel on the following ramped-up schedule: 1800 MTU in 2002 and 3000 MTU in 2003. Stop acceptance of fuel into the simulation after a total of 120,000 MTU has been accepted. Do not allow utilities to transship among reactors after the first repository opens. Determine reactor/repository shipping-pair assignments so that shipping distance is minimized.

```

FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R1,T1
FACSPEC,3.2,40.10,79.54,REPOSITORY #2,R1,T1 ; add a second repository
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,2.0
FUELSTOP,120000.            ; stop fuel acceptance after 120,000. MTU
TSHIP,1,1962
TSHIP,0,1998                ; turn transshipment off
RUNTYPE,REPOS,0D            ; optimize distance in filling repositories

```

```

AGEAT,0,0,100,0,0,1
AGETO,0,0,10,0,0,0
DECOMAGE,0,0,5,0,0,0
CAPACITY,1998.,3.1,70000.,400.,0,0
CAPACITY,2001.,3.1,70000.,900.,0,0
CAPACITY,2002.,3.1,70000.,1800.,0,0
CAPACITY,2003.,3.1,70000.,3000.,0,0
CAPACITY,2002.,3.2,70000.,1800.,0,0      ; set acceptance rate for new
CAPACITY,2003.,3.2,70000.,3000.,0,0      ; repository
EXECUTE,YES

```

Discussion: The FUELSTOP card will stop the acceptance of new fuel into the system after 120,000 MTU has been received. By specifying a TSHIP type of 0, transshipment is turned off. With exactly two facilities of one type open for acceptance of fuel, filling can be accomplished such a way as to minimize shipping distance.

Example 4

Problem Statement: Force western reactors to ship to western repository.

```

FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R1,T1,R2,T2 ; force west rx to w repos
FACSPEC,3.2,40.10,79.54,REPOSITORY #2,R1,T1
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
CASK,T2,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2      ; define
CASK,R2,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14 ; special casks
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,2.0
FUELSTOP,120000.
TSHIP,1,1962
TSHIP,0,1998
RXCASKS,R2,T2,5,6,7,119,120,121,128,155,159,160,161,173,174 ;assign special
RXCASKS,R2,T2,179,180,195,196,198,306,314,315,323,340,346,347 ;casks to
RXCASKS,R2,T2,353,369,378,379,385,514,515,530,531,545      ;western reactors

```

```

RUNTYPE,REPOS,0D
AGEAT,0,0,100,0,0,1
AGETO,0,0,10,0,0,0
DECOMAGE,0,0,5,0,0,0
CAPACITY,1998.,3.1,70000.,400.,0,0
CAPACITY,2001.,3.1,70000.,900.,0,0
CAPACITY,2002.,3.1,70000.,1800.,0,0
CAPACITY,2003.,3.1,70000.,3000.,0,0
CAPACITY,2002.,3.2,70000.,1800.,0,0
CAPACITY,2003.,3.2,70000.,3000.,0,0
EXECUTE,YES

```

Discussion: By assigning R2 and T2 casks to western reactors, default reactor cask assignments do not occur. The only casks then available to the western reactors for shipping are the R2 and T2 casks. By assigning the R2 and T2 casks to the western repository, the only shipping cask link available to the western reactors is to the western repository. Note that the R2 and T2 casks are the same as the R1 and T1 casks except for the name. The cask requirements and levelized-cask purchases are based on each cask type (name) individually. In this simulation, the sum of the cask requirements for the two truck and two rail casks will most likely be greater than the requirements for truck and rail casks in the previous run.

Example 5

Problem Statement: Add an MRS facility to the system. Establish cask compatibility links so that all eastern reactors ship to the MRS facility while all western reactors ship to the western repository. Allow the MRS facility to ship to either repository. Force the MRS facility to unload reactor dry storage first. Begin accepting fuel at the MRS facility according to the following ramped buildup: 1998 - accept 1800 MTU, 1999 - accept 1800 MTU and unload 1800 MTU, 2000 - accept 3000 MTU and unload 3000 MTU.

```

FACSPEC,2.1,39.06,84.12,MRS #1,R1<,T1<,R3>      ; load MRS from rx
FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R3,R2,T2 ; load from MRS + W rx
FACSPEC,3.2,40.10,79.54,REPOSITORY #2,R3        ; load only from MRS

```

```

CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
CASK,T2,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R2,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
CASK,R3,R,258000.0,300.0,1.25,15.0,1389.00,2.75E6,1.25E5,28,63 ;big MRS cask
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,2.0
PRIOR,2.0,6.0 ; force MRS to take dry storage first
FUELSTOP,120000.
FILLORDER,REPRO,MRS,REPOS,FIS ; set filling order of facilities.
TSHIP,1,1962
TSHIP,0,1998
RXCASKS,R2,T2,5,6,7,119,120,121,128,155,159,160,161,173,174
RXCASKS,R2,T2,179,180,195,196,198,306,314,315,323,340,346,347
RXCASKS,R2,T2,353,369,378,379,385,514,515,530,531,545
RUNTYPE,REPOS,P ; change repository routing to proximal
AGEAT,0,0,100,0,0,1
AGETO,0,0,10,0,0,0
DECOMAGE,0,0,5,0,0,0
CAPACITY,1998.,2.1,30000.,1800.,0,0 ; start up MRS
CAPACITY,1999.,2.1,30000.,1800.,1800.,0
CAPACITY,2000.,2.1,30000.,3000.,3000.,0
CAPACITY,1998.,3.1,70000.,400.,0,0
CAPACITY,2001.,3.1,70000.,900.,0,0
CAPACITY,2002.,3.1,70000.,1800.,0,0
CAPACITY,2003.,3.1,70000.,3000.,0,0
CAPACITY,2002.,3.2,70000.,1800.,0,0
CAPACITY,2003.,3.2,70000.,3000.,0,0
EXECUTE,YES

```

Discussion: This problem introduces the designation of loading and unloading casks. Cask usage at the MRS facility is defined so that the R1 and T1 casks can only be received at the MRS facility and the R3 cask can only be shipped from the MRS facility. The R3 cask used for shipments from

the MRS facility is a special large capacity cask. The PRIOR card forces the MRS facility to first solicit fuel from reactor dry storage rather than simply taking the oldest fuel in the system. The FILLORDER card is necessary to override the default facility filling order for systems that model an integral MRS facility so that the MRS facility is filled before the repositories. This is required to avoid a one year disjoint lag in the filling of the repositories. In that all shipments that can go to either repository originate from the same point (the MRS facility), the optimized run type is not meaningful and will increase execution time. The repository run type has then been specified as proximal which will improve execution efficiency.

5.2 INPUT CARD EXAMPLES FOR THE ADVANCED USER

Example 6

Problem Statement: Modify the Example 5 waste management system so that the MRS facility and eastern repository compete for fuel from reactors on an optimized cost basis. Force the western repository to receive shipments only from western reactors and the MRS facility.

```
FACSPEC,2.1,39.06,84.12,MRS #1,R1<,T1<,R3>
FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R3,R2,T2 ; load from w rx and MRS
FACSPEC,2.2,40.10,79.54,REPOSITORY #2,R1<,T1< ; load only from Reactors
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
CASK,T2,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R2,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
CASK,R3,R,258000.0,300.0,1.25,15.0,1389.00,2.75E6,1.25E5,28,63
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,2.0
PRIOR,2.0,6.0
FUELSTOP,120000.
FILLORDER,REPRO,MRS,REPOS,FIS
TSHIP,1,1962
TSHIP,0,1998
```

```

RXCASKS,R2,T2,5,6,7,119,120,121,128,155,159,160,161,173,174
RXCASKS,R2,T2,179,180,195,196,198,306,314,315,323,340,346,347
RXCASKS,R2,T2,353,369,378,379,385,514,515,530,531,545
RUNTYPE,MRS,OC      ; fill MRSs according to optimized cost algorithm
AGEAT,0,0,100,0,0,1
AGETO,0,0,10,0,0,0
DECOMAGE,0,0,5,0,0,0
CAPACITY,1998.,2.1,30000.,1800.,0,0
CAPACITY,1999.,2.1,30000.,1800.,1800.,0
CAPACITY,2000.,2.1,30000.,3000.,3000.,0
CAPACITY,1998.,3.1,70000.,400.,0,0
CAPACITY,2001.,3.1,70000.,900.,0,0
CAPACITY,2002.,3.1,70000.,1800.,0,0
CAPACITY,2003.,3.1,70000.,3000.,0,0
CAPACITY,2002.,2.2,70000.,1800.,0,0
CAPACITY,2003.,2.2,70000.,3000.,0,0
EXECUTE,YES

```

Discussion: WASTES does not allow for two facilities of different types to be optimized. The input cards shown above trick the code by modeling the second repository as an MRS facility. WASTES keys off of the facility ID to determine what type of facility is being specified. The title is used only in generating the output reports. Since the second repository (modeled as MRS 2.2) has only loading casks and no unloading capacity, it can not ship spent fuel.

Example 7

Problem Description: In 1998, open a repository that accepts 3000 MTU/yr of the oldest fuel available from reactor pools and dry storage.

```

FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R1,T1
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL

```


CAPACITY,1998.,3.1,70000.,3000.,0,-3000
EXECUTE,YES

Discussion: Sprint capacity is defined as capacity in excess of nominal receipt capacity that is reserved for FCR margin discharges and decommissioning reactors. This capacity is added to the annual receipt capacity of the destination facility during the times of the year in which FCR and decommissioning discharges occur. By specifying a negative sprint capacity equal to the annual capacity, the repository has no capacity to accept FCR or decommissioning discharges but has its full capacity of 3000 MTU/yr with which to solicit the oldest fuel in the system.

Example 8

Problem Statement: Begin accepting 10-year-old fuel at the repository according to the following ramped buildup: 400 MTU in 1998, 900 MTU in 2001, 1800 MTU in 2002, and 3000 MTU in 2003. Accept additional fuel as required to prevent any increase in dry storage even if this means the repositories age acceptance criteria must be violated. Do not give reactors being decommissioned priority (accept only FCR and oldest fuel).

FACSPEC,3.1,36.50,116.27,REPOSITORY #1,R1,T1
CASK,T1,T,47500.0,300.0,1.5,15.0,516.00,1.E6,0.75E5,1,2
CASK,R1,R,180000.0,300.0,2.5,15.0,1263.00,2.5E6,1.25E5,7,14
DATAFILE,DISDAT,DATA:EIAMID.DIS
DATAFILE,RXINFO,DATA:EIAMID.RXL
DECOM,100.0 ; don't give decommissioning rx priority
AGETO,0,0,10,0,0,0 ; 10 age acceptance criteria
PREVENT,YES ; don't perform age checking on FCR discharge
CAPACITY,1998.,3.1,70000.,400.,0,70000.
CAPACITY,2001.,3.1,70000.,900.,0,70000.
CAPACITY,2002.,3.1,70000.,1800.,0,70000.
CAPACITY,2003.,3.1,70000.,3000.,0,70000.
EXECUTE,YES

Discussion: By specifying a lag time of 100 years before giving decommissioning reactors priority, no priority is given to reactors being decommissioned. By specifying a prevent command, age checking for FCR and for discharges from reactors being decommissioned is disabled. In this case, when a FCR discharge occurs, the oldest fuel at the reactor will be shipped whether or not it meets age acceptance requirements. The specification of a large positive sprint at the repository will give the repository ample capacity to accept all forced discharges. In years in which the nominal receipt capacity is not totally filled with forced discharges, the facility will attempt to fill the annual receipt capacity with the oldest fuel in the system.

6.0 SAMPLE PROBLEMS

To execute WASTES, logical units are allocated as shown in Table 6.1. The assignments for the reactor and discharge data files are made inside WASTES and do not require external assignments. The file noted as summary data contains formatted information selected from the output file. The centroid information file contains formatted information on material moving into and out of the user specified centroid regions. The dry storage file contains formatted inventories of material located in dry storage. The heat files contain information on material stored by heat class in each facility.

The following sample problems illustrate two simulations having different complexities and different philosophies in describing the model. For clarity, both sample problems modeled a simplified three-reactor system. The system parameters were chosen to illustrate the model performance and do not necessarily constitute realistic values. Problem 1 is a simplistic example that uses default input parameters when possible. Problem 2 is more complex and uses user input parameters whenever possible. Input data and output file listings are provided for both problems.

6.1 SAMPLE PROBLEM 1

Sample problem 1 is a three-reactor/single-repository simulation where default input parameters are used whenever possible. Only six WASTES input cards are read to perform the analysis; however, the resulting scenario is considerably more complex than might be expected. This example illustrates the extensive use of default values available to the user.

Default values request that all reactors in the data file be analyzed and that the lag time between shutdown of the reactor and reactor decommissioning be one year. No sharing of reactor pools is specified (reactor site data file), and transshipment between reactor pools is not allowed (default specification). The default specification for dry storage is a metal dry storage cask having a capacity of 24 PWR or 52 BWR assemblies.

TABLE 6.1. File Usage

Logical Unit Number	Assignment
1	Post Processor Data File
2	Scratch File
3	Scratch File
5	Input File
6	Output File
7	Scratch File
9	Centroid Data File
10	Discharge Data File
11	Reactor Data File
15	Scratch File
16	Scratch File
.	.
.	.
.	.
59	Scratch File
70	Bi-Annual Reactor Shipments (assemblies)
80	Dry Storage Inventory
81	Facility 1 Heat/Age Inventory
82	Facility 2 Heat/Age Inventory
83	Facility 3 Heat/Age Inventory
.	.
.	.
.	.
90	Facility 10 Heat/Age Inventory
95	Annual Reactor Shipments (assemblies)
96	Bi-Annual Reactor Shipments (mtu)
97	Scratch File
98	File for MRS cost model
99	Shipment Log File for SIMAN model

NOTE: FORTRAN units not listed above are unused.

Default values also request that rail transportation be used whenever possible and that truck transportation be used otherwise. The shipping casks are to be leased (also a default specification). The descriptions of the casks are specified to establish the capacities, lifetime, weight, costs to purchase, lease conditions, cask maintenance requirements, and several other cask parameters. Shipping is to proceed in a sequential manner based on the facility ID (default specification).

A minimum spent-fuel age of five years for repository acceptance is specified. The repository opened in 1981 with an ultimate capacity of 1407 MTU and an annual receipt rate of 323 MTU. In an attempt to fill its annual receipt rate every year, the repository is to be filled first from FCR storage margin requirement discharges and then from solicited non-critical material from each reactor (pool and dry).

The analysis also uses default values to specify that execution will be attempted, that queue statistics on SLAM files will not be printed, and that age checking will not be prevented. Discounting of transportation costs is not to be performed.

An examination of the results shows that 5640 MTU of material were accepted into the simulation, that the repository filled to ultimate capacity in 1992, that 1116 MTU of material required dry storage, and that the remainder of the material was still stored in reactor pools. Additionally, a considerable amount of information was generated on the heat characteristics of the material in storage, the methods used to transport the waste, and the costs of the transportation.

The input files (reactor site, discharge, and input cards) and resulting output are shown in Appendix C. The format of the input files is discussed in Section 3.0.

6.2 SAMPLE PROBLEM 2

Sample problem 2 is a more complex simulation that models three reactors, a single MRS facility, and two repositories. Explicitly defined inputs are

used to a large extent. The reactor site and discharge data files are the same as those used in Sample Problem 1. The scenario modeled in this simulation is described below.

The analysis requests that reactors 1 through 3 be included in the simulation and that the lag time between shutdown of the reactor and reactor decommissioning be two years. Reactor pools are not to be shared, however transshipment of material within a utility is allowed. If dry storage is required at a reactor, a transportable dry storage cask having a capacity of 12 PWR or 32 BWR assemblies is specified.

The analysis also requests that rail transportation be used whenever possible and that truck transportation be used otherwise. Optimization of transportation to the repositories is requested.

The analysis specifies that spent fuel must be 5 years old to be placed in the MRS facility and 10 years old to be placed in the repository. Additionally, the fuel must remain in the MRS facility for 5 years before it can be discharged and must remain in a repository for at least 100 years before it can possibly be discharged. All of the storage/processing facilities opened in 1981. Both repositories (essentially) have maximum capacities of 703 MTU and annual receipt rates of 161 MTU. The MRS facility is specified to have a maximum capacity of 500 MTU, an annual receipt rate of 100 MTU, an annual removal rate of 100 MTU, and an annual incremental sprint rate of 50 MTU.

The priorities for filling the repositories are specified, in respective order, to be pools, dry storage and the MRS facility. By default, the MRS facility can only be filled from the pools and dry storage.

The analysis also specified that discounting of transportation-cost cash flows is to be performed in 1981 dollars at a discount rate of 10 percent. Age checking is not prevented and SLAM queue statistics are not to be printed. Execution of the simulation is to be attempted.

An examination of the results shows that 5640 MTU of material was accepted into the simulation and that repository 1 filled to capacity in 1998 while repository 2 filled to capacity in 1999. The MRS facility also filled to capacity in 1998. The amount of material in dry storage was reduced to 520 MTU

and that in the pools was reduced to 3183 MTU. Again, considerable information on the heat characteristics of the material in storage and the transportation methods used was generated.

The input card file and the resulting output are also shown in Appendix C. The reactor site and discharge data files are the same as those used in Sample Problem 1.

7.0 REFERENCES

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APPENDIX A

INPUT CARD DESCRIPTIONS

APPENDIX A

INPUT CARD DESCRIPTIONS

SECTION I: SLAM INPUT CARD DESCRIPTIONS

GEN The GEN card provides general information concerning the simulation being run and is used in titling the output. The card is expected to have the following form:

GEN, ANALYSTS NAME, PROJECT NAME, MONTH/DAY/YEAR;

The ANALYSTS NAME and the PROJECT NAME are both alphanumeric and must contain 20 characters or less. The MONTH, DAY, and YEAR are entered as integers separated by slashes.

LIMITS The LIMITS card is used to specify integer limits on SLAM files. The card is expected to have the following form:

LIM, 649, 2, 80000;

The number 649 is currently the largest SLAM file number allowed (allows a maximum of 600 reactors to be simulated). Numbers smaller than 649 may be used if less reactors are to be simulated. The minimum number used in this field must equal the highest reactor ID + 2*(number of specified facilities + 2) + 11. Note: SLAM source code must be modified to allow specifications larger than 100. The number 2 must be entered here and represents the number of attributes per entity allowed (contains time values and pointers). The number 80000 is the maximum number of entities allowed in all SLAM files (batches + subbatches).

INITIALIZE The INITIALIZE card is used to specify start and end dates of the simulation. It is expected to have the following form:

INIT, TTBE, TTFIN;

TTBE is the beginning year of the simulation. TTFIN is the ending year of the simulation. Note: TTBE must be the year in which the first discharge occurs. TTFIN must be at least one year greater than the desired ending year of the simulation.

FIN

The FIN card denotes an end to all SLAM input cards. It is expected to have the following format:

FIN;

SECTION II: WASTES INPUT CARD DESCRIPTIONS

<u>Card Type</u>	<u>Description</u>
AGEAT	<p>The AGEAT card allows the user to specify the number of years the spent fuel must remain at a facility before it can be moved to another facility. The card is expected to have the following form:</p> <p style="text-align: center;">AGEAT,p1,p2,p3,p4,p5,p6</p> <p>Where</p> <p>p1 is the number of years spent fuel must remain in the reprocessing plants.</p> <p>p2 is the number of years spent fuel must remain in the MRS plants.</p> <p>p3 is the number of years spent fuel must remain in the repository plants.</p> <p>p4 is the number of years spent fuel must remain in the FIS plants.</p> <p>p5 is the number of years spent fuel must remain in the pools.</p> <p>p6 is the number of years spent fuel must remain in dry storage.</p> <p>Default is: AGEAT,0,0,0,0,0,0</p>
AGETO	<p>The AGETO card allows the user to specify how old the spent fuel must be to be acceptable at a facility. The card is expected to have the following form:</p> <p style="text-align: center;">AGETO,p1,p2,p3,p4,p5,p6</p> <p>Where</p> <p>p1 is the age the spent fuel must be to enter the reprocessing plants (years).</p> <p>p2 is the age the spent fuel must be to enter the MRS facilities (years).</p> <p>p3 is the age the spent fuel must be to enter the repositories (years).</p>

- p4 is the age the spent fuel must be to enter the FIS facilities (years).
- p5 is the age the spent fuel must be to enter the pools (year).
- p6 is the age the spent fuel must be to enter dry storage (years).

Default is: AGETO,0,0,0,0,0,0

ALTPRI

The ALTPRI card allows the user to change the alternate priorities with which a facility looks at other locations from which to accept spent fuel. The oldest fuel contained in any of the facilities who have an alternate priority will be selected. This results in "simultaneous" selection of fuel. The card is expected to have the following form:

ALTPRI,year,facid,p1,p2,...,p10

Where

facid is the facility ID whose searching priority is to be changed.

p1 is the ID of the first facility to be searched after the priority facilities have been searched.

p2,..,p10 same as p1

Default is: Source/Destination pair assignments are made in conformance with other input cards and WASTES logic. See Section 2.2 for more details.

CAPACITY

The CAPACITY card allows the user to specify when a plant is opening or closing or changing its annual receipt rate, annual removal rate, maximum capacity, or making annual changes in the age acceptance criteria. The card is expected to have the following form:

CAPACITY,time,facid,p1,p2,...,p5

Where

time is the year in which the event is to be scheduled.

facid is the facility ID for which the event is to be scheduled. This can be generic like 3.0 to apply to all repositories or unique like 2.2 to apply to the second MRS facility only.

p1 is the maximum capacity of the facility (MTU).

p2 is the facilities annual receipt rate (MTU).

p3 is the facilities annual removal rate (MTU).

p4 is the facilities annual sprint rate (used to accept forced discharges) (MTU).

p5 if p5 is less than 0.0, p5 is the required age for fuel to be acceptable to this facility.

if p5 is = 0.0, there is no change in the selection criteria.

There is no default capacity specification.

CASK

The CASK card describes the attributes associated with each type of shipping cask. The card is expected to have the following form:

CASK,n,m,w,d,t,l,r,c,o,i,j

n is the cask name, typically R1...Rn for rail casks and T1...Tn for truck casks

m must be R for rail casks, T for truck casks

w is the empty weight of the casks (lbs).

d is the number of days/year that the cask can be used.

t is the turnaround time on one end for the cask (days).

l is the number of years the cask can be used (cannot be a fractional year - must be an integer number of years).

r is the daily rental rate for the cask (\$).

c is the actual purchase price for the cask (\$).

o is the annual operating and maintenance cost for the cask(\$).

i is the number of PWR assemblies the cask can carry.

j is the number of BWR assemblies the cask can carry.

Defaults are: None. At a minimum, an R1 and a T1 cask card must be supplied.

CHARACTERIZE The CHARACTERIZE card allows the user to generate detailed reports of reactor inventories, reactor shipments, facility inventories, and shipments from facilities to facilities. These reports are written to FORTRAN unit 1 at the end of the file. The card is expected to have the following form:

CHARACTERIZE,x

Where

x Should be either YES or NO.

Default is: CHARACTERIZE,NO

NOTE !!! - IF CHARACTERIZATION IS REQUESTED, EXECUTION TIMES WILL INCREASE BY A FACTOR OF BETWEEN 2 AND 10.

COSTREPORT The COSTREPORT card allows the user to request detailed reports of dry storage requirements/costs. The card is expected to have the form:

COSTREPORT,x

Where

x Should be either YES or NO.

Default is: COSTREPORT,NO

DATAFILE The DATAFILE card describes to the model the location of the data files. The card is expected to have the following form:

DATAFILE,ft,fn

Where

ft must be one of the following:

DISDAT for the discharge data file.

RXINFO for the reactor site data file.

fn is the actual name of the file.

Default is: None. A pair of DATAFILE cards or a DATASET card must be provided.

DATASET

The DATASET card allows the user to specify pre-established pairs of data files with a single keyword. The card is expected to have the following form:

DATASET,type,file

Where

type must be REACTORS

NNOC which uses files NNOC.RXL NNOC.DIS

EIAMID which uses files EIAMID.RXL EIAMID.DIS

UTIL84 which uses files UTIL84.RXL UTIL84.DIS

TEST which uses files UTILVER.RXL UTILVER.DIS

USER datafile cards must be supplied by user.

Default is: None. A DATASET card or a pair of DATAFILE cards must be provided.

DECOM

The DECOM card allows the user to specify the lag time between reactor shutdown and the beginning of fuel shipping priority for decommissioning reactors. The card is expected to have the following form:

DECOM,t

Where

t is the decommissioning lag time in years.

Default is: DECOM,0.0

DECOMAGE

The DECOMAGE card allows the user to specify how old spent fuel from decommissioning reactors must be to be acceptable at a facility. The card is expected to have the following form: If present, this card will override the action of the AGETO card for decommissioning reactors. The card is expected to have the following form:

DECOMAGE,p1,p2,p3,p4,p5,p6

Where

p1 is the age the spent fuel must be to enter the reprocessing plants (years).

p2 is the age the spent fuel must be to enter the MRS facilities (years).

p3 is the age the spent fuel must be to enter the repositories (years).

p4 is the age the spent fuel must be to enter the FIS facilities (years).

p5 is the age the spent fuel must be to enter the pools.

p6 is the age the spent fuel must be to enter dry storage (years).

Default is: The values used on the AGETO card.

DISCHARGE The DISCHARGE card allows the user to explicitly specify that a discharge event is to occur. The information necessary is the same as that read from the discharge data file. The card is expected to have the following form:

DISCHARGE,time,rxid,p1,p2,p3,p4,p5

Where

time is the year in which the event is to be scheduled.

rxid is the real reactor ID for which the discharge is to be scheduled.

p1 is the year of the discharge.

p2 is the month of the discharge.

p3 is the number of assemblies being discharged.

p4 is the number of MTU being discharged.

p5 is the exposure of the fuel being discharged (MWd/MTU).

There is no default discharge specification.

DISCOUNT The DISCOUNT card allows the user to determine the base year for discounting of transportation costs, if any, and to input the discount rate. The card is expected to have the following form:

DISCOUNT,yyyy,r

Where

yyyy is the year on which discounting is to be based.

r is the discount rate in percent.

Default is: DISCOUNT,1984,0.0

DRYTYPE

The DRYTYPE card allows the user to specify the type of dry storage canisters and the number of PWR and BWR assemblies that it can contain. The card is expected to have the following form:

DRYTYPE,n,k,l

Where

n indicates one of the following:

- 1 metal cask.
- 2 transportable cask.
- 3 water basin storage.
- 4 drywell storage.
- 5 concrete cask.
- 6 vault storage.

k is the number of PWR assemblies the cask will hold.

l is the number of BWR assemblies the cask will hold.

Default is: DRYTYPE,1,24,52

EXECUTE

The EXECUTE card allows the user to prohibit the attempted execution by SLAM. This is useful in allowing the user to run the error processor to check the input and not begin execution. The card is expected to have the following form:

EXECUTE,x

Where

x Should be either YES or NO.

Default is: EXECUTE,YES

FACSPEC

The FACSPEC cards are used to describe the location, name, and cask usage of various facilities in the waste management system. Ten facilities may be modelled in an analysis. The card is expected to have the following form:

FACSPEC,x.x,lat,long,title,c1,c2,...,cn

Where

x.x is the facility ID, i.e., 2.1 would be the first MRS facility, 1.2 would be the second reprocessing facility, 3.1 would be the first repository, and 4.1 would be the first FIS facility.

lat is the latitude of the facility (deg.min).

long is the longitude of the facility (deg.min).

title is the title heading of the facility (17 char).

c1 ... cn is a list of the cask names that are acceptable to the facility. If a simple cask name is given, the cask may be used for either loading or unloading the facility. If a < symbol immediately follows the cask name, the cask is available for loading the facility only. If a > symbol immediately follows the cask name, the cask is available for unloading the facility only.

Default is: There is no default facility.

FCRAGE

The FCRAGE card allows the user to specify how old spent fuel from forced discharge events must be to be acceptable at a facility. If present, the action of the AGETO card will be overridden for FCR margin discharges. The card is expected to have the following form:

FCRAGE,p1,p2,p3,p4,p5,p6

Where

p1 is the age the spent fuel must be to enter the reprocessing plants (years).

p2 is the age the spent fuel must be to enter the MRS facilities (years).

p3 is the age the spent fuel must be to enter the repositories (years).

p4 is the age the spent fuel must be to enter the FIS facilities (years).

p5 is the age the spent fuel must be to enter the pools (year).

p6 is the age the spent fuel must be to enter dry storage (years).

Default is: The values used on the AGETO card.

FCRFRAC

The FCRFRAC allows the user to determine what portion of the FCR margin is to be maintained. The card is expected to have the following form:

FCRFRAC,t,x

Where

t = the year in which the FCR fraction is to be changed.

x = the fraction/multiple of FCR to be maintained.

Default is: FCRFRAC, Beginning Year of Simulation, 1.

FILLORDER

The FILLORDER card allows the user to specify the order in which the classes of facilities attempt to fill. The card is expected to have the following form:

FILLORDER,c11,c12,c13,c14

Where

c11,c12,c13,c14 must be one of the following. Each class designator must be used exactly once.

REPRO

MRS

REPOS

FIS

Default is: FILLORDER,REPRO,REPOS,MRS,FIS

FUELSTOP

The FUELSTOP card allows the user to stop the simulations acceptance of newly discharged fuel after a set year is reached or after a set number of MTU is reached. The card is expected to have the following form:

FUELSTOP,x

Where:

if x is less than 2200, the xth year is the last year in which fuel will be accepted.

if x is greater than 2200, x is the number of MTU of fuel which will be accepted by the model.

Default is: All fuel is accepted up to the end date of the simulation.

MSHIP

The MSHIP card allows the user to model multi-cask rail shipments from an MRS facility to downstream facilities. The card is expected to have the following form:

MSHIP,n,m,d,s,t

Where:

n = name of rail cask to be used for multi-cask shipments. The cask must be assigned to both the MRS and the destination facility.

m = number of rail shipping casks in the shipment.

d = dollar/mile multiplier (one way miles times this value is added to the shipping costs).

s = speed multiplier applied to calculated rail transportation speed.

t = train turnaround time.

Default is: No multi-cask rail shipments.

NOTRXIDS

The NOTRXIDS card tells the system which reactors will be excluded in the analysis. The card is expected to have the following form.

NOTRXIDS,p1,p2,p3,...,pn

Where

p1 is the first reactor ID in a range pair or simply a reactor ID. If p1 is the ID of a single reactor, it must be positive. If p1 is the first reactor ID in a range pair, it must be positive, if p1 is the last ID in a range pair, it must be negative. E.G., NOTRXIDS,1,3,5,-20,100 would ask for reactors 1,3,5 through 20, and 100 to be excluded from the analysis.

Default is: No reactor exclusions

PREVENT The PREVENT card allows the user to prohibit the age checking that normally takes place for source facility initiated events (FCR discharges and decommissioning). If age checking is specified to be prevented, all other age specifications (AGETO FCRAGE, DECOMAGE, or CAPACITY cards) will be overridden. The card is expected to have the following form:

PREVENT,x

Where
x should be either YES or NO.
Default is: PREVENT,NO

PRIOR The PRIOR card allows the user to specify the sequential order in which a facility looks to other facilities for fuel if soliciting or receipt capacity if shipping. The card is expected to have the following form:

PRIOR,time,facid,p1,p2,...,p5

Where

time = the year in which the event is to be scheduled.

facid = the facility ID for which the event is to be scheduled. This can be a generic ID like 3.0 to apply to all repositories or a unique ID like 2.2 to apply to the second MRS facility only.

If a zero is used as an ID for one of the fields P1-S, the ALTPRI will be used to select a facility.

p1 = the ID of the first facility to be considered.

p2 = the ID of the second facility to be considered.

p3-p5 etc.

Default priorities are FIS and those specified under the ALTPRI card.

QSTATS The QSTATS card allows the user to print the SLAM Summary Report at the end of the simulation. This eliminates a rather long and usually undesired list of the file statistics. The card is expected to have the following form:

QSTATS,x

Where

x should be either YES or NO.

Default is: QSTATS,NO

REACTORS

The REACTORS card tells the system which reactors will be considered in the analysis. The card is expected to have the following form:

REACTORS,p1,p2,p3,...,pn

Where

p1 is the first reactor ID in a range pair or simply a reactor ID. If p1 is the ID of a single reactor, it must be positive. If p1 is the first reactor ID in a range pair, it must be positive, if p1 is the last ID in a range pair, it must be negative. E.G., REACTORS,1,3,5,-20,100 would ask for reactors 1,3,5 through 20, and 100 to be used in the analysis.

Default is: REACTORS,1,-550

RUNTYPE

The RUNTYPE card allows the user to specify whether the facilities will be filled optimally or proximally. In an optimized run, the two facilities are filled in such a manner that the first facility of the pair is filled as much as possible with the available material and the second facility will take the remainder of the material, if any, so that the transportation miles or transportation costs (user option) are minimized in a given year. In a proximity run, the facilities will simply take the material in such a manner that the material is accepted by the nearest facility. There may be one RUNTYPE card for each major facility ID. The card is expected to have the following form:

RUNTYPE,factype,opt

Where

factype is the facility type and must be one of the following:

REPRO for reprocessing facilities.

MRS for monitored retrievable storage

REPOS for repository facilities
FIS for Federal Interim Storage
opt is the desired type of processing and must be
one of the following:

OC for optimized cost processing
O or Od for optimized distance processing
PROXIMITY or P for proximity processing

Default is: Proximity processing for all facility types.

RXCASKS

The RXCASKS card allows the user to assign shipping casks to particular reactors. The card is expected to have the following form:

RXCASKS,clst1,rlst1,clst2,rlst2,clst3,rlst3,...

Where

clstn is a list of up to 3 cask names for which cask cards are specified.

rlstn is a list of reactor IDs to which the preceding casks will be assigned. The reactor ids may be individual or may provide a range in the same manner as the REACTORS card.

SPEED

The SPEED card allows the user to modify the truck and rail transportation speeds used by WASTES. The calculated speeds are multiplied by the factors on the speed card. The card is expected to have the following form:

SPEED,tfac,rfac

Where:

tfac is the truck speed multiplication factor. This factor must be a real number greater than 0 and less than or equal to 10.

rfac is the rail speed multiplication factor. This factor must be a real number greater than 0 and less than or equal to 10.

Default is: SPEED,1.0,1.0

TMODE The TMODE card tells the system what the transportation mode for the different reactors will be. The card is expected to have the following form:

TMODE,x

Where

x must be one of the following:

TRUCK - tells the system that the analysis will only use truck access to the reactors.

TRAIN or RAIL - tells the system that the analysis will only use train access to the reactors.

TAT - tells the system that the analysis will use either train or truck access to the reactors based on the reactor site data file. In actuality, TAT may be any alphabetic string as the model only looks for truck, train, or rail.

Defaults is: TAT

TSHIP The TSHIP card is used to tell the model what type of transshipment is to be allowed and when it is to begin/end. The card is expected to have the following form:

TSHIP,N,Y

Where

N is one of the following:

0 indicates no transshipping.

1 indicates transshipping within utility.

2 indicates transshipping within a state.

3 indicates user specified type of transshipping.

Y is the year in which transshipment is to begin or end.

Default is: TSHIP,0,Beginning Year of Simulation

APPENDIX B

WASTES INPUT CARD DEFAULT SUMMARY

APPENDIX B

WASTES INPUT CARD DEFAULT SUMMARY

AGEAT,0,0,0,0,0,0

AGETO,0,0,0,0,0,0

ALTPRI - see Section 2.3 for shipping priorities.

CAPACITY - there is no capacity default.

CASK - there is no default, a truck and a rail cask must always be described.

CHARACTERIZE,NO

COSTREPORT,NO

DATAFILE - there is no default, a pair of data file cards or a dataset card must be provided.

DATASET - there is no default, a pair of data file cards or a dataset card must be provided.

DECOM,0.

DECOMAGE - default is the values provided on the AGETO card. If no AGETO card is present, all values will be 0.

DISCHARGE - there are no default discharges.

DISCOUNT,1984.,0.

DRYTYPE,1,24,52

EXECUTE,YES

FACSPEC - There are no default facilities.

FCRAGE - default is the values provided on the AGETO card. If no AGETO card is present, all values will be 0.

FCRFRAC,1.0

FILLORDER,REPRO,REPOS,MRS,FIS

FUELSTOP - all fuel is accepted up to the end date of the simulation.

MSHIP - no multi-cask rail shipping.

NOTRXIDS - no reactor exclusions.

PREVENT,NO

PRIOR - see Section 2.3 for shipping priorities.

QSTATS,NO

REACTORS - all reactors are included.

RUNTYPE - proximity processing for all facility types.

RXCASKS - all reactors are assigned an R1,T1 cask. There are no default cask assignments for facilities.

TMODE - both truck and rail transportation are used to reactors with preference given to rail.

TSHIP - transshipment will not occur.

APPENDIX C

SAMPLE PROBLEMS

APPENDIX C.1

DATA FILES

DATA:UTILVER.DIS VERSION #1

1	1981	2	60	60.00	35750	.00
1	1982	3	60	60.00	35750	.00
1	1983	4	60	60.00	35750	.00
2	1984	2	198	198.00	28000	.00
1	1984	5	60	60.00	35750	.00
3	1985	2	65	65.00	33000	.00
2	1985	3	198	198.00	28000	.00
1	1985	6	60	60.00	35750	.00
3	1986	3	65	65.00	33000	.00
2	1986	4	198	198.00	28000	.00
1	1986	7	60	60.00	35750	.00
3	1987	4	65	65.00	33000	.00
2	1987	5	198	198.00	28000	.00
1	1987	8	60	60.00	35750	.00
3	1988	5	65	65.00	33000	.00
2	1988	6	198	198.00	28000	.00
1	1988	9	60	60.00	35750	.00
3	1989	6	65	65.00	33000	.00
2	1989	7	198	198.00	28000	.00
1	1989	10	60	60.00	35750	.00
3	1990	7	65	65.00	33000	.00
2	1990	8	198	198.00	28000	.00
1	1990	11	60	60.00	35750	.00
3	1991	8	65	65.00	33000	.00
2	1991	9	198	198.00	28000	.00
1	1991	12	60	60.00	35750	.00
3	1992	9	65	65.00	33000	.00
2	1992	10	198	198.00	28000	.00
1	1993	1	60	60.00	35750	.00
3	1993	10	65	65.00	33000	.00
2	1993	11	198	198.00	28000	.00
1	1994	2	60	60.00	35750	.00
3	1994	11	65	65.00	33000	.00
2	1994	12	198	198.00	28000	.00
1	1995	3	60	60.00	35750	.00
3	1995	12	65	65.00	33000	.00
2	1996	1	198	198.00	28000	.00
1	1996	4	193	193.00	35750	.00
3	1997	1	65	65.00	33000	.00
2	1997	2	198	198.00	28000	.00
3	1998	2	65	65.00	33000	.00
2	1998	3	198	198.00	28000	.00
3	1999	3	65	65.00	33000	.00
2	1999	4	732	732.00	28000	.00
3	2000	4	193	193.00	33000	.00

DATA:UTILVER.RXL VERSION #2

1	1	1	0	493	493	9	193	1	CA	1980	1	2001	38.20	121.10	1	1	20
2	2	1	0	2712	2712	6	732	2	AL	1983	1	2001	31.13	85.06	1	2	12
3	1	1	0	1296	1296	5	193	1	ME	1984	1	2001	43.57	69.42	0	1	7

APPENDIX C.2

SAMPLE PROBLEM 1

C.7

DEVELOPED FOR THE U. S. DEPARTMENT OF ENERGY UNDER CONTRACT DE-AC06-76RL0 1830
FUNDING PROVIDED BY: 1) MONITORED RETRIEVABLE STORAGE PROGRAM
2) DOE - TRANSPORTATION TECHNOLOGY CENTER (SANDIA)
TECHNICAL PROGRAMMING SUPPORT PROVIDED BY BOEING COMPUTER SERVICES RICHLAND, INC.

THIS CODE WAS DEVELOPED UNDER THE SPONSORSHIP OF AN AGENCY OF THE U. S. GOVERNMENT. NEITHER THE UNITED STATES GOVERNMENT NOR ANY AGENCY, NOR ANY EMPLOYEE OF ANY AGENCY, EXPORTS, IMPORTS, OR ASSURES ANY LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS OR USEFULNESS OF ANY INFORMATION, APPARATUS, PRODUCT, OR PROCESS DISCLOSED, OR REPRESENTS THAT ITS USE SHOULD NOT INFRINGE ON PRIVATELY OWNED RIGHTS.

```
1 GEN,ANALYST NAME,SAMPLE #1,1/06/86,  
2 LIN,20,2,80000,  
3 INIT,1981,2001;  
4 FIN;
```

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

INPUT CARDS READ FOR THIS RUN ARE:

CARD
NUMBER CARD CONTENTS

1 FACSPEC, 2, 1, 46, 30, 119, 30, REPOS #1, R1, T1
2 DATAFILE, DISORI, DATA:UTILVER, DIS
3 DATAFILE, RXINFO, DATA:UTILVER, RXL
4 CASK, T1, 1, 47500.00, 300, 1, 5, 15, 0, 1800, 00, 1, 468, 0, 7565, 2, 5
5 CASK, R1, 1, 160000.00, 300, 1, 2, 15, 0, 1800, 00, 5, 368, 1, 2565, 7, 18
6 CAPACITY, 1981, 3, 1, 1407, 523, 0, 0, 5

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

INPUT ERROR SUMMARY.

A TOTAL OF 6 CARDS WERE READ.
A TOTAL OF 0 CARDS WERE SKIPPED.
A TOTAL OF 0 ERRORS WERE DETECTED.

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

SYNOPSIS OF INPUT.

BASIC FACILITY DATA FOR THIS RUN: (1=>REPRO, 2=>ARS, 3=>REPOS, 4=>FIS, 5=>NPPOOL, 6=>NDRY)

FACILITY LATITUDE LONGITUDE FACILITY TITLE
3, 1 46, 30 119, 30 REPOS #1

FACILITY TYPE 3 WILL BE PROCESSED ON A SEQUENTIAL BASIS.

DISCOUNTING BASED ON 1984 DOLLARS AT 0.00%.

NO COST REPORTS REQUESTED FOR THIS RUN.

THIS RUN USES TRAIN ACCESS TO REACTORS IF AVAILABLE, ELSE, TRUCK ACCESS IS USED.

FUEL DISCHARGES WILL NOT BE ACCEPTED AFTER YEAR 2001.00

FUEL DISCHARGES WILL NOT BE ACCEPTED AFTER A TOTAL OF 10000000.00 MTU

LAG TIME FOR DECOMMISSIONING SHUT DOWN REACTOR POOLS IS: 1.

TRANSHIPMENT TYPE 0 WILL BE USED.

DRY STORAGE TYPE 1 WILL BE USED.

INPUT DATA FILES ARE:

>>>> NOTE <<< TRUCK SHIPPING DISTANCE FILE NOT FOUND

>>>> NOTE <<< RAIL SHIPPING DISTANCE FILE NOT FOUND

REACTOR INFORMATION FILE IS: DATA:UTILVER, RXL

FIRST RECORD IS: DATA:UTILVER, RXL VERSION #2

DISCHARGE DATA FILE IS: DATA:UTILVER, DIS

FIRST RECORD IS: DATA:UTILVER, DIS VERSION #1

FACILITIES WILL INITIALLY ATTEMPT TO FILL IN THE FOLLOWING ORDER

REPRO REPOS ARS FIS

THIS ORDER MAY LATER BE MODIFIED BY THE ACTION OF PRIOR AND ALTPRI EVENTS.

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

CASK USE AT FACILITIES

PAID SHIPPING CASKS

RECEIVING CASKS

3, 1 R1 T1

CASK ASSIGNMENT FOR REACTOR IDS PROCESSED:

ID T1 R1 ID T1 R1 ID T1 R1 ID T1 R1 ID T1 R1 ID T1 R1 ID T1 R1

1 2 1 2 2 1 3 1 0

CASK ATTRIBUTES:

CASK TYPE	EMPTY WEIGHT (LBS)	ACTIVE DAYS PER YEAR	TURN AROUND TIME(DAYS)	CASK LIFE YEARS	DAILY LEASE RATE(\$)	PURCHASE PRICE (\$-MILLIONS)	O & M COSTS (\$-MILLIONS)
T1	47500.00	300.00	1.50	15.	800.00	1.400000	0.075000
R1	160000.00	300.00	2.50	18.	1800.00	5.300000	0.125000

WASTE TYPE - CASK TYPE SCENARIO.

WASTE TYPE	UNITS / CASK TYPE
1	T1 7
2	R1 18

DATE OF RUN. 1/10/86 (14 16 29)

FILE CONSTRAINTS

	REPRD	HRS	REPDS	FIS	POOLS	DRY STORE
MINIMUM AGE AT TO ACCEPT AT NEXT FACILITY	0	0.	0	0.	0	0
MINIMUM AGE FOR ACCEPTANCE TO	0.	0	0	0	0	0
MINIMUM AGE FOR (ECON TO SHIP	0	0	0	0	0	0
MINIMUM AGE FOR FOR TO SHIP	0.	0.	0	0.	0	0

SLAM SUMMARY REPORT WILL NOT BE PRINTED

PROJECT TITLE. SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

SCHEDULED INPUT EVENTS

NUMBER OF CAPACITY		CARDS READ					I
CAPACITY TIME	EVENT	EVENTS TO FACILITY ID	BE SCHEDULED MAXIMUM CAPACITY	ANNUAL LOADING CAPACITY	ANNUAL UNLOADING CAPACITY	ANNUAL SPRINT CAPACITY	AGE CONSTRAINT OR HEAT
1981	3	3 10	1407 00	323 00	0 00	0 00	-5 00

SHIPPING DISTANCES DETERMINED AS FOLLOWS

REACTOR SHIPPING DISTANCES TO REPOS M1 WILL BE CALCULATED GREAT CIRCLE DISTANCES

PROJECT TITLE	SAMPLE #1
1. PROJECT TITLE	2. SAMPLE #1
3. PROJECT TITLE	4. SAMPLE #1
5. PROJECT TITLE	6. SAMPLE #1
7. PROJECT TITLE	8. SAMPLE #1
9. PROJECT TITLE	10. SAMPLE #1
11. PROJECT TITLE	12. SAMPLE #1
13. PROJECT TITLE	14. SAMPLE #1
15. PROJECT TITLE	16. SAMPLE #1
17. PROJECT TITLE	18. SAMPLE #1
19. PROJECT TITLE	20. SAMPLE #1
21. PROJECT TITLE	22. SAMPLE #1
23. PROJECT TITLE	24. SAMPLE #1
25. PROJECT TITLE	26. SAMPLE #1
27. PROJECT TITLE	28. SAMPLE #1
29. PROJECT TITLE	30. SAMPLE #1
31. PROJECT TITLE	32. SAMPLE #1
33. PROJECT TITLE	34. SAMPLE #1
35. PROJECT TITLE	36. SAMPLE #1
37. PROJECT TITLE	38. SAMPLE #1
39. PROJECT TITLE	40. SAMPLE #1
41. PROJECT TITLE	42. SAMPLE #1
43. PROJECT TITLE	44. SAMPLE #1
45. PROJECT TITLE	46. SAMPLE #1
47. PROJECT TITLE	48. SAMPLE #1
49. PROJECT TITLE	50. SAMPLE #1
51. PROJECT TITLE	52. SAMPLE #1
53. PROJECT TITLE	54. SAMPLE #1
55. PROJECT TITLE	56. SAMPLE #1
57. PROJECT TITLE	58. SAMPLE #1
59. PROJECT TITLE	60. SAMPLE #1
61. PROJECT TITLE	62. SAMPLE #1
63. PROJECT TITLE	64. SAMPLE #1
65. PROJECT TITLE	66. SAMPLE #1
67. PROJECT TITLE	68. SAMPLE #1
69. PROJECT TITLE	70. SAMPLE #1
71. PROJECT TITLE	72. SAMPLE #1
73. PROJECT TITLE	74. SAMPLE #1
75. PROJECT TITLE	76. SAMPLE #1
77. PROJECT TITLE	78. SAMPLE #1
79. PROJECT TITLE	80. SAMPLE #1
81. PROJECT TITLE	82. SAMPLE #1
83. PROJECT TITLE	84. SAMPLE #1
85. PROJECT TITLE	86. SAMPLE #1
87. PROJECT TITLE	88. SAMPLE #1
89. PROJECT TITLE	90. SAMPLE #1
91. PROJECT TITLE	92. SAMPLE #1
93. PROJECT TITLE	94. SAMPLE #1
95. PROJECT TITLE	96. SAMPLE #1
97. PROJECT TITLE	98. SAMPLE #1
99. PROJECT TITLE	100. SAMPLE #1

DATE OF RUN. 1/10/86 (14 16.29)

PRIOR ARRAY CONTENTS BY FACILITY.

[illegible]

HLTPRI ARRAY CONTENTS BY FACILITY.

HELPR1 ARRAY CONTENTS BY FACILITY.

##INTERMEDIATE RESULTS##

FOR YEAR	1981	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1982	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1983	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1984	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1985	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1986	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1987	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1988	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1989	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1990	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1991	00	NUMBER OF POOLS	W/ DRY STORNE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1992	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1993	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1994	00	NUMBER OF POOLS	W/ DRY STORAGE	15	H NUMBER INCREASING	=	I NUMBER OF DECREASING	15	O
FOR YEAR	1995	00	NUMBER OF POOLS	W/ DRY STORAGE	15	O NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1996	00	NUMBER OF POOLS	W/ DRY STORAGE	15	I NUMBER INCREASING	=	I NUMBER OF DECREASING	15	O
FOR YEAR	1997	00	NUMBER OF POOLS	W/ DRY STORAGE	15	I NUMBER INCREASING	=	I NUMBER OF DECREASING	15	O
FOR YEAR	1998	00	NUMBER OF POOLS	W/ DRY STORAGE	15	I NUMBER INCREASING	=	O NUMBER OF DECREASING	15	O
FOR YEAR	1999	00	NUMBER OF POOLS	W/ DRY STORAGE	15	I NUMBER INCREASING	=	I NUMBER OF DECREASING	15	O
FOR YEAR	2000	00	NUMBER OF POOLS	W/ DRY STORAGE	15	I NUMBER INCREASING	=	I NUMBER OF DECREASING	15	O

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

DRY STORAGE INVENTORIES MONITORED DURING EXECUTION.
INTEGER DRY STORAGE CASING CONFIRMED.

SHIPMENTS FROM REACTORS MONITORED DURING EXECUTION.
INTEGER CASK SHIPPING CONFIRMED.

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

TOTAL MATERIAL ACCEPTED INTO SYSTEM:
NUMBER OF ASSEMBLIES = 5640. MT'S MATERIAL = 5640.0

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

YEAR	I.O. INVENTORY OF REACTOR POOL		SPENT FUEL BY YEAR DRY STORAGE		REPOS #1		TOTAL	
	ASSEMB	MT	ASSEMB	MT	ASSEMB	MT	ASSEMB	MT
1987	60.	60.0	0.	0.0	0.	0.0	60.	60.0
1988	120.	120.0	0.	0.0	0.	0.0	120.	120.0
1989	180.	180.0	0.	0.0	0.	0.0	180.	180.0
1990	438.	438.0	0.	0.0	0.	0.0	438.	438.0
1991	761.	761.0	0.	0.0	0.	0.0	761.	761.0
1992	1021.	1021.0	0.	0.0	63.	63.0	1084.	1084.0
1993	1281.	1281.0	0.	0.0	126.	126.0	1407.	1407.0
1994	1548.	1548.0	0.	0.0	182.	182.0	1730.	1730.0
1995	1610.	1610.0	0.	0.0	443.	443.0	2053.	2053.0
1996	1613.	1613.0	0.	0.0	763.	763.0	2376.	2376.0
1997	1811.	1811.0	0.	0.0	1088.	1088.0	2899.	2899.0
1998	1554.	1554.0	0.	0.0	1408.	1408.0	2962.	2962.0
1999	1677.	1677.0	0.	0.0	1408.	1408.0	3285.	3285.0
1994	2128.	2128.0	72.	72.0	1408.	1408.0	3608.	3608.0
1995	2205.	2205.0	120.	120.0	1408.	1408.0	3733.	3733.0
1996	2380.	2380.0	336.	336.0	1408.	1408.0	4124.	4124.0
1997	2543.	2543.0	336.	336.0	1408.	1408.0	4387.	4387.0
1998	2568.	2568.0	336.	336.0	1408.	1408.0	4650.	4650.0
1999	2923.	2923.0	1116.	1116.0	1408.	1408.0	5447.	5447.0
2000	3116.	3116.0	1116.	1116.0	1408.	1408.0	5640.	5640.0

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

YEAR	I.O. INVENTORY OF SPENT FUEL AT DECOMMISSIONED REACTORS								FUEL SHIPPED FROM DECOMMISSIONED REACTORS (MTU)						
	FUEL REMAINING AT DECOMMISSIONED REACTORS (MTU)				FUEL SHIPPED FROM DECOMMISSIONED REACTORS (MTU)				FUEL SHIPPED FROM DECOMMISSIONED REACTORS (MTU)						
YEAR	POOL	DRY	# RX	POOL	DRY	# RX	POOL	DRY	# RX	POOL	DRY	# RX	POOL	DRY	# RX
1981	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED.

PRIORITY GIVEN TO DECOMMISSIONED REACTORS AFTER 0. YEARS

PROJECT TITLE SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 2 01 SPENT FUEL SHIPPED FROM REACTOR POOL
 YEAR REACTOR POOL DRY STORAGE REPOS #1
 ASSEMB MT ASSEMB MT ASSEMB MT ASSEMB MT
 1981 0 0 0 0 0 0 0 0
 1982 0 0 0 0 0 0 0 0
 NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED
 1986 0 0 0 0 63 63 63 63
 1987 0 0 0 0 63 63 63 63
 1988 0 0 0 0 56 56 56 56
 1989 0 0 0 0 281 281 281 281
 1990 0 0 0 0 320 320 320 320
 1991 0 0 0 0 320 320 320 320
 1992 0 0 0 0 320 320 320 320
 1993 0 0 0 0 0 0 0 0
 1994 0 0 72 72 0 0 72 72
 1995 0 0 48 48 0 0 48 48
 1996 0 0 218 218 0 0 218 218
 1997 0 0 0 0 0 0 0 0
 1998 0 0 0 0 0 0 0 0
 1999 0 0 780 780 0 0 780 780
 2000 0 0 0 0 0 0 0 0

PROJECT TITLE SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 2 03 SPENT FUEL SHIPPED FROM REPOS #1 (FACILITY # 3 1) TO
 YEAR REACTOR POOL DRY STORAGE REPOS #1
 ASSEMB MT ASSEMB MT ASSEMB MT ASSEMB MT
 1981 0 0 0 0 0 0 0 0
 1982 0 0 0 0 0 0 0 0
 NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED

PROJECT TITLE SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 2 02 SPENT FUEL SHIPPED FROM DRY STORAGE
 YEAR REACTOR POOL DRY STORAGE REPOS #1
 ASSEMB MT ASSEMB MT ASSEMB MT ASSEMB MT
 1981 0 0 0 0 0 0 0 0
 1982 0 0 0 0 0 0 0 0
 NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED

PROJECT TITLE: SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 3 01 CHARACTERISTICS OF SPENT FUEL RECEIVED AT OTHER REACTOR POOL
 RECEIPTS, BY AGE (MTU)
 > 0 5 8 10 12 15 20
 < 5 8 10 12 15 20 MIN AVG MAX > 0 0 5 1 0 RECEIPTS BY HEAT (MTU)
 YEAR : 1 2 1 5 2 0 2 5 MIN AVG MAX EXP
 TOTAL 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0

DATE OF RUN 1/10/86 (14 16 29)

TABLE 3 O₂ CHARACTERISTICS OF SPENT FUEL RECEIVED AT DRY STORAGE

YEAR		RECEIPTS, BY REE (NTU)										RECEIPTS, BY HEAT (NTU)									
		0	5	8	10	12	15	20	MIN	AVG	MAX	0	5	10	12	15	20	MIN	AVG	MAX	AVG EXP
1954	12	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1955	12	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1956	12	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1957	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1958	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1959	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1960	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1961	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1962	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1963	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1964	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1965	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1966	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1967	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1968	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1969	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1970	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1971	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1972	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1973	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1974	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1975	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1976	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1977	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1978	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1979	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1980	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1981	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1982	15	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	168	354	358	198	0	0	0	0	0	0	0	594	186	0	188	72	96				

DATE OF RUN: 1/10/86 (14,16 29)

TABLE 3.03 CHARACTERISTICS OF SPENT FUEL RECEIVED AT REPOS #1

YEAR	RECEIPTS, BY AREA (20)										RECEIPTS, BY HEAT (25)										1					
	0	5	8	10	12	15	18	20	MIN	AVG	MAX	0	5	10	12	15	18	20	MIN	AVG		MAX				
1986	3	60	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	60	3	0	74	76	14	26
1987	2	17	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	17	2	0	74	76	14	26
1988	2	54	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	54	2	0	74	76	14	26
1989	2	266	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	266	2	0	74	76	14	26
1990	4	318	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	318	4	0	74	76	14	26
1991	4	321	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	321	4	0	74	76	14	26
1992	1	319	0	0	0	0	0	0	4	3	4	0	0	0	0	0	0	0	0	319	1	0	74	76	14	26
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED																										
TOTAL	23	1385	0	0	0	0	0	0	0	0	0	0	0	0	594	327	466	21	0	0	0	0	0	0	0	0

DATE OF RUN 1/10/86 (14 16 29)

TABLE 4.01 TRANSPORTATION CHARACTERIZATION SUMMARY FOR SPENT FUEL SHIPPED TO REACTOR POOL

[illegible][illegible][illegible]

DATE OF RUN 1/10/86 (14 16 29)

TABLE 4.02 TRANSPORTATION CHARACTERIZATION SUMMARY FOR SPENT FUEL SHIPPED TO DRY STORAGE

[illegible]

TOTALS FOR	DRY STORAGE
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TOTAL	TRUCK PWR 0 /	SHIPMENTS BHR 0	% PWR 0 0	RAIL PWR 0 /	SHIPMENTS BHR 0	% PWR 0 0	TOTAL TRUCK 0 /	NUMBER OF RAIL 0	SHIPMENTS 0	TOTAL 0	% TRUCK 0 0
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PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

TABLE 4.03 TRANSPORTATION CHARACTERIZATION SUMMARY FOR SPENT FUEL SHIPPED TO REPOS #1 (FACILITY # 3.1)											
YEAR	TRUCK SHIP. P/R	SHIP. B/R	RAIL SHIP. P/R	SHIP. B/R	NUMBER OF SHIP. TRUCK / RAIL	TOTAL X(TRUCK)	NT'S RECEIVED P/R	B/R	X(P/R)	TOTAL	NT'S SHIPPED FROM FACILITY P/R
1986	0./	0.	0.0	0.	100.0	0./	0.	0.	0.0	0.0	0./
1987	0./	0.	0.0	0.	100.0	0./	0.	0.	0.0	0.0	0./
1988	0./	0.	0.0	0.	100.0	0./	0.	0.	0.0	0.0	0./
1989	0./	0.	0.0	0.	100.0	0./	0.	0.	0.0	0.0	0./
1990	33./	0.	100.0	0.	42.1	33./	19.	52.	63.5	122./	198.
1991	32./	0.	100.0	0.	45.0	32./	20.	52.	61.5	122./	198.
1992	31./	0.	100.0	0.	42.1	31./	19.	52.	63.5	122./	198.
1993	0./	0.	0.0	0.	0.0	0./	0.	0.	0.0	0.0	0./
1994	0./	0.	0.0	0.	0.0	0./	0.	0.	0.0	0.0	0./

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED.

TOTALS FOR REPOS #1

TRUCK SHIPMENTS	X	RAIL SHIPMENTS	X	TOTAL NUMBER OF SHIPMENTS	X
TRUCK	P/R	RAIL	P/R	TRUCK	P/R
98./	0.	60./	44.	98./	104.
100.0	57.7	104.	48.5		

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

TABLE 5.02 SHIPPING FLEET REQUIREMENTS FOR SPENT FUEL SHIPPED TO DRY STORAGE (FACILITY # 3.1)					
YEAR	SHIPPING COSTS(\$)*10**6	X(Truck)	BUSY DAYS*10**3	X(Truck)	NO. OF CASES REQ. TRUCK / RAIL
TOTAL TRUCK BUSY DAYS =	0.00				
TOTAL RAIL BUSY DAYS =	0.00				

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

TABLE 5.01 SHIPPING FLEET REQUIREMENTS FOR SPENT FUEL SHIPPED TO REACTOR POOL (FACILITY # 3.1)					
YEAR	SHIPPING COSTS(\$)*10**6	X(Truck)	BUSY DAYS*10**3	X(Truck)	NO. OF CASES REQ. TRUCK / RAIL
TOTAL TRUCK BUSY DAYS =	0.00				
TOTAL RAIL BUSY DAYS =	0.00				

PROJECT TITLE: SAMPLE #1

DATE OF RUN: 1/10/86 (14:16:29)

TABLE 5.03 SHIPPING FLEET REQUIREMENTS FOR SPENT FUEL SHIPPED TO REPOS #1 (FACILITY # 3.1)					
YEAR	SHIPPING COSTS(\$)*10**6	X(Truck)	BUSY DAYS*10**3	X(Truck)	NO. OF CASES REQ. TRUCK / RAIL
1986	0.0000 /	0.0	0.000 /	0.188	0.0
1987	0.0000 /	0.2661	0.0	0.188	0.0
1988	0.0000 /	0.2384	0.0	0.188	0.0
1989	0.0000 /	1.0009	0.0	0.581	0.0
1990	0.5627 /	0.3714	38.7	0.315	36.0
1991	0.5458 /	1.0009	35.3	0.308	34.5
1992	0.5627 /	0.3714	38.7	0.315	36.0
1993	0.0000 /	0.0000	0.0	0.000 /	0.000
1994	0.0000 /	0.0000	0.0	0.000 /	0.000

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED.

SUB-T	1.6713 /	4.7122	28.2	NT'S OF P/R =	616.000	NT'S OF B/R =	792.000	43.75 X(P/R)
TOTAL	6.3845			TOTAL NT'S =	1408.000	AVG. COST =	4.53 (\$/KG)	
TOTAL TRUCK BUSY DAYS =	935.37							
TOTAL RAIL BUSY DAYS =	2620.52							

DATE OF RUN: 1/10/85 (14:16 29)

TABLE 5.04 SUMMARY TABLE															
HIPPING COSTS(\$)*104#				% (TRUCK)		BUSY DAYS*10##2		% (TRUCK)		NO. OF CASES REQ		% (TRUCK)		CORR LEASE COST (\$ MILLIONS)	
YEAR	TRUCK / RAIL				TRUCK / RAIL			TRUCK / RAIL			TRUCK / RAIL				
1968	0 0000 /	0 2559	0 0		0 000 /	0 186	0 0			0 /			0 000000 /	0	5 90000
1967	0 0000 /	0 2881	0 0		0 000 /	0 186	0 0			0 /	1		0 000000 /	0	5 40000
1968	0 0000 /	0 2364	0 0		0 000 /	0 185	0 0			0 /	0		0 000000 /	0	5 40000
1969	0 0000 /	0 0008	0 0		0 000 /	0 58	0 0			0 /	0		0 000000 /	0	5 40000
1990	0 5627 /	0 9714	36 7		0 315 /	0 560	36 0			2 /	2	50 0	0 480000 /	1	1 080000
1991	0 958 /	1 0009	36 7		0 315 /	0 561	36 0			2 /	2	50 0	0 480000 /	1	1 080000
1992	0 5627 /	0 9718	36 7		0 315 /	0 560	36 0			2 /	2	50 0	0 480000 /	1	1 080000
1993	0 0000 /	0 0000	0 0		0 000 /	0 000	0 0			0 /	0		0 000000 /	0	0 00000
1994	0 0000 /	0 0000	0 0		0 000 /	0 000	0 0			0 /	0		0 000000 /	0	0 00000
SUR T 1 6713 / 4 7133 26 2 NT'S OF PUR = 616 000 NT'S OF BLK = 782 000 43 75 % (PUR) 1 490000 / 5 94000															
TOTAL 1 3845 TOTAL NT'S = 1408 000 / AVG COST = 4 53 (476) TOTAL LEASE COST = 7 390000															
M/L LEASE COST 5 24 198 000 INCLUDING RESHIPMENT															
NT 5 BY RAIL = 1212 000 INCLUDING RESHIPMENT															
AVG ANNUAL NT 5 / (TRUCK CASE YEAR) = 32 367															
ANNUAL NT 5 / (RAIL CASE YEAR) = 110 182															

DATE OF RUN 1/10/86 (14 16 29)

TABLE 6.00 FACILITY TO FACILITY SHIPPING COST (\$/KG)			
	POOL	DRY	3 I
POOL	0.00	0.00	4.53
DRY	0.00	0.00	0.00
3 I	0.00	0.00	0.00

DATE OF RUN 1/10/88 (14 16 29)

TABLE 7 00 MAXIMUM FLEET PURCHASE REQUIREMENTS AND COST

TABLE 1-3-3 SUMMARY OF CASKS PURCHASED									
YEAR	CASK NAME	# OF SHIPMENTS	CASK MILES	# CASKS PURCHASED	# CASKS RETIRED	# CASKS AVAILABLE	PURCHASE COST (\$ MILLIONS)	MAINT COST (\$ MILLIONS)	TOTAL COST (\$ MILLIONS)
1986	TI	0	0	0	0	1	0 000000	0 000000	0 000000
	RI	9	6849	1	0	0	5 300000	0 125000	5 425000
1987	TI	0	0	0	0	1	0 000000	0 000000	0 000000
	RI	9	6849	0	0	0	0 000000	0 125000	0 125000
1988	TI	0	0	0	0	0	0 000000	0 000000	0 000000
	RI	8	6088	0	0	1	0 000000	0 125000	0 125000
1989	TI	0	0	0	0	0	0 000000	0 000000	0 000000
	RI	20	37761	1	0	0	5 250000	0 250000	5 500000
1990	TI	33	90708	2	0	2	2 800000	0 150000	2 950000
	RI	19	37000	0	0	2	0 000000	0 250000	0 250000
1991	TI	32	98959	0	0	2	0 000000	0 150000	0 150000
	RI	20	37761	0	0	2	0 000000	0 250000	0 250000
1992	TI	33	90708	0	0	2	0 000000	0 150000	0 150000
	RI	19	37000	0	0	2	0 000000	0 250000	0 250000
CASK SUB TOTAL	TI	98	269375	2	0	2	2 800000	0 450000	3 250000
	RI	104	189308	2	0	0	10 800000	1 375000	11 175000
GRAND TOTAL		202	436683	4	0		13 400000	1 825000	15 225000
AVG TI UTILIZATION FOR MAXIMUM PURCHASE = 155 89 DAYS/YR AVG RI UTILIZATION FOR MAXIMUM PURCHASE = 256 41 DAYS/YR									

DATE OF RUN 1/10/86 (14 16 29)

TABLE 8-00 LEVELIZED FLEET PURCHASE REQUIREMENTS AND COST

YEAR	CASK NAME	# OF SHIMENTS	CASK HILES	# CASKS PURCHASED	# CASKS RETIRED	# CASKS AVAILABLE	PURCHASE COST (\$ MILLIONS)	MAINT COST (\$ MILLIONS)	TOTAL COST (\$ MILLIONS)
1986	T1	N/A	N/A	0	0	0	0 000000	0 000000	0 000000
	R1	N/A	N/A	1	0	1	5 300000	0 125000	5 425000
1987	T1	N/A	N/A	0	0	0	0 000000	0 000000	0 000000
	R1	N/A	N/A	0	0	1	0 000000	0 125000	0 125000
1988	T1	N/A	N/A	0	0	0	0 000000	0 000000	0 000000
	R1	N/A	N/A	0	0	1	0 000000	0 125000	0 125000
1989	T1	N/A	N/A	0	0	0	0 000000	0 000000	0 000000
	R1	N/A	N/A	1	0	2	5 300000	0 250000	5 550000
1990	T1	N/A	N/A	2	0	2	2 800000	0 150000	2 950000
	R1	N/A	N/A	0	0	0	0 250000	0 000000	0 250000
1991	T1	N/A	N/A	0	0	0	0 000000	0 150000	0 150000
	R1	N/A	N/A	0	0	2	0 000000	0 250000	0 250000
1992	T1	N/A	N/A	0	0	0	0 000000	0 150000	0 150000
	R1	N/A	N/A	0	0	2	0 000000	0 250000	0 250000
CASK SUB TOTAL	T1	N/A	N/A	2	0	2	2 800000	0 450000	3 250000
	R1	N/A	N/A	2	0	4	10 800000	1 375000	11 875000
GRAND TOTAL	T1	N/A	N/A	4	0	4	13 400000	1 825000	15 225000
AVG T1 UTILIZATION FOR MAXIMUM PURCHASE - 155.89 DAYS/YR AVG R1 UTILIZATION FOR MAXIMUM PURCHASE - 125.00 DAYS/YR									

PROJECT TITLE SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 9 00 TRANSPORTATION COST SUMMARY BY CATEGORY

	OPTION			
	MINIMUM LEASE COST / \$/KG (\$ MILLIONS)	REQUIRED LEASE COST / \$/KG (\$ MILLIONS)	MAXIMUM PURCHASE COST / \$/KG (\$ MILLIONS)	LEVELIZED PURCHASE COST / \$/KG (\$ MILLIONS)
SHIPPING COST				
I1	1 179585 / 8 02	1 179585 / 8 02	1 179585 / 8 02	1 179585 / 8 02
R1	4 151837 / 3 43	4 151837 / 3 43	4 151837 / 3 43	4 151837 / 3 43
SECURITY/ SURCHARGE				
I1	0 491667 / 2 51	0 491667 / 2 51	0 491667 / 2 51	0 491667 / 2 51
R1	0 561459 / 0 46	0 561459 / 0 46	0 561459 / 0 46	0 561459 / 0 46
LEASE COST				
I1	0 748295 / 3 82	1 440000 / 7 35	0 000000 / 0 00	0 000000 / 0 00
R1	5 078928 / 4 18	5 940000 / 4 80	0 000000 / 0 00	0 000000 / 0 00
PURCHASE COST				
I1	0 000000 / 0 00	0 000000 / 0 00	2 800000 / 14 28	2 800000 / 14 29
R1	0 000000 / 0 00	0 000000 / 0 00	10 800000 / 8 75	10 800000 / 8 75
MAINTENANCE COST				
I1	0 000000 / 0 00	0 000000 / 0 00	0 450000 / 2 30	0 450000 / 2 30
R1	0 000000 / 0 00	0 000000 / 0 00	1 375000 / 1 13	1 375000 / 1 13
SUB TOTAL				
I1	2 419547 / 12 34	2 111252 / 15 87	4 921252 / 25 11	4 921252 / 25 11
R1	8 790223 / 8 08	10 853295 / 8 79	16 888295 / 13 77	16 888295 / 13 77
TOTAL	12 209770 / 8 67	13 784547 / 9 78	21 809548 / 15 35	21 809548 / 15 35

PROJECT TITLE SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 10 02 CHARACTERISTICS OF FUEL SHIPPED BY CENTROID (YEARS / MID/KG)

CENTROID NUMBER	TRANS MODE	REPOS #1 AGE /	EXP
1	TRUCK	0 0 /	0 00
2	RAIL	0 0 /	0 00
3	TRUCK	0 0 /	0 00
4	RAIL	0 0 /	0 00
5	TRUCK	0 0 /	0 00
6	RAIL	0 0 /	0 00
7	TRUCK	5 8 /	35 00
8	RAIL	0 0 /	0 00
9	TRUCK	0 0 /	0 00
10	RAIL	0 0 /	0 00
11	TRUCK	0 0 /	0 00
12	RAIL	0 0 /	0 00
13	TRUCK	5 8 /	28 00
14	RAIL	0 0 /	0 00
15	TRUCK	0 0 /	0 00
16	RAIL	0 0 /	0 00
17	TRUCK	0 0 /	0 00
18	RAIL	0 0 /	0 00
19	TRUCK	0 0 /	0 00
20	RAIL	0 0 /	0 00
21	TRUCK	5 4 /	35 75
	RAIL	0 0 /	0 00

PROJECT TITLE SAMPLE #1

DATE OF RUN 1/10/86 (14 16 29)

TABLE 10 01 CHARACTERISTICS OF CRACK SHIPMENTS BY CENTROID FOR EACH FACILITY

CENTROID NUMBER	TRANS MODE	REPOS #1 CRACK MILES / RECEIPTS
1	TRUCK	0 / 0
2	RAIL	0 / 0
3	TRUCK	0 / 0
4	RAIL	0 / 0
5	TRUCK	0 / 0
6	RAIL	0 / 0
7	TRUCK	269375 / 98
8	RAIL	0 / 0
9	TRUCK	0 / 0
10	RAIL	0 / 0
11	TRUCK	0 / 0
12	RAIL	0 / 0
13	TRUCK	123648 / 44
14	RAIL	0 / 0
15	TRUCK	0 / 0
16	RAIL	0 / 0
17	TRUCK	0 / 0
18	RAIL	0 / 0
19	TRUCK	0 / 0
20	RAIL	45662 / 60
21	TRUCK	0 / 0
	RAIL	0 / 0
TOTAL	TRUCK	269375
TOTAL	RAIL	123648
TOTAL		438693

APPENDIX C.3

SAMPLE PROBLEM 2

C.19

DEVELOPED FOR THE U. S. DEPARTMENT OF ENERGY UNDER CONTRACT DE-AC06-76RL0 1830
FUNDING PROVIDED BY: 1) MONITORED RETRIEVABLE STORAGE PROGRAM
2) DOE - TRANSPORTATION TECHNOLOGY CENTER (SANDIA)
TECHNICAL PROGRAMMING SUPPORT PROVIDED BY BOEING COMPUTER SERVICES RICHLAND, INC.

THIS CODE WAS DEVELOPED UNDER THE SPONSORSHIP OF AN AGENCY OF THE U. S. GOVERNMENT. NEITHER THE UNITED STATES GOVERNMENT NOR ANY AGENCY NOR ANY OF ITS EMPLOYEES, EXPRESSLY OR IMPLIED, ASSUME ANY LEGAL LIABILITY OR RESPONSIBILITY FOR THE ACCURACY, COMPLETENESS OR USEFULNESS OF ANY INFORMATION, APPARATUS, PRODUCT, OR PROCESS DISCLOSED, OR REPRESENTS THAT ITS USE WOULD NOT INFRINGE ON PRIVATELY OWNED RIGHTS.

```

1 GEN, ANALYST NAME, SAMPLE #2, 1/08/86;
2 LTH, 20, 2, 80000;
3 INIT, 1981, 2001;
4 FIN;

```

PRITSKER AND ASSOCIATES, INC.
P.O. BOX 2413
WEST LAFAYETTE, INDIANA 47906

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:10:43)

INPUT CARDS READ FOR THIS RUN ARE:

CARD NUMBER	CARD CONTENTS
1	FACSPEC:2,1,38.06,84.12,MRS #1,R1,T1
2	FACSPEC:3,1,46.30,119.30,REPOS #1,R1,T1
3	FACSPEC:3,2,34.00,82.00,REPOS #2,R1,T1
4	DISCOUNT,1981,10.
5	COSTREPORT,YES
6	THROE,TAND1
7	CASK,1,1,48650.00,300.0,1.5,15.0,800.00,1.1E6,0.75E5,1.2
8	CASK,R1,8,180000.00,300.0,2.5,15.0,1800.00,5.3E6,1.25E5,7.18
9	DATAFILE,DISORT,DATA:UTILVER.DIS
10	DATAFILE,RXINFO,DATA:UTILVER.RXL
11	REACTORS,1,-3
12	DECOM,2,0
13	TSNIP,1,1981
14	RUNTYPE,REPOS,0
15	ACERT,0,5,100,0,0,0
16	ACE10,0,5,10,0,0,0
17	CAPACITY,1981,2,1,500.0,100.0,100.0,50.0,-5
18	CAPACITY,1981,3,1,7.03E2,1.61E2,0.0,-10
19	CAPACITY,1981,3,2,7.04E2,1.62E2,0.0,-10
20	DRYTYPE,2,24,5E
21	PREVENT,H0
22	PRIOR,1981,3,0,5,0,6,0,2,0
23	EXECUTE,YES

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:10:43)

INPUT ERROR SUMMARY.

A TOTAL OF 23 CARDS WERE READ.
A TOTAL OF 0 CARDS WERE SKIPPED.
A TOTAL OF 0 ERRORS WERE DETECTED.

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:10:43)

SYNOPSIS OF INPUT.

BASIC FACILITY DATA FOR THIS RUN: (1=>REPRO,2=>MRS,3=>REPOS,4=>FIS,5=>MPOOL,6=>MDRY

FACILITY	LATITUDE	LONGITUDE	FACILITY TITLE
2,1	38.06	84.12	MRS #1
3,1	46.30	119.30	REPOS #1
3,2	34.00	82.00	REPOS #2

FACILITY TYPE 2 WILL BE PROCESSED ON A SEQUENTIAL BASIS.

FACILITY TYPE 3 WILL BE PROCESSED ON A 0 BASIS.

DISCOUNTING BASED ON 1981 DOLLARS AT 0.10%.

COST REPORTS REQUESTED FOR THIS RUN.

THIS RUN USES TRAIN ACCESS TO REACTORS IF AVAILABLE, ELSE, TRUCK ACCESS IS USED.

FUEL DISCHARGES WILL NOT BE ACCEPTED AFTER YEAR 2001.00

FUEL DISCHARGES WILL NOT BE ACCEPTED AFTER A TOTAL OF 10000000. MTU

LAG TIME FOR DECOMMISSIONING SHUT DOWN REACTOR POOLS IS: 2.

TRANSHIPMENT TYPE 1 WILL BE USED.

DRY STORAGE TYPE 2 WILL BE USED.

INPUT DATA FILES ARE:

NOTE <<< TRUCK SHIPPING DISTANCE FILE NOT FOUND

NOTE <<< RAIL SHIPPING DISTANCE FILE NOT FOUND

REACTOR INFORMATION FILE IS: DATA:UTILVER.RXL

FIRST RECORD IS: DATA:UTILVER.RXL VERSION #2

DISCHARGE DATA FILE IS: DATA:UTILVER.DIS

FIRST RECORD IS: DATA:UTILVER.DIS VERSION #1

FACILITIES WILL INITIALLY ATTEMPT TO FILL IN THE FOLLOWING ORDER

REPRO REPOS MRS FIS

THIS ORDER MAY LATER BE MODIFIED BY THE ACTION OF PRIOR AND ALTPRI EVENTS.

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:10:43)

CASK USE AT FACILITIES

REACTOR SHIPPING CASKS

RECEIVING CASKS
R1 T1
R1 T1
R1 T1

CASK ASSIGNMENT FOR REACTOR IDS PROCESSED:

ID	T1	R1	ID	T1	R1	ID	T1	R1	ID	T1	R1	ID	T1	R1	ID	T1	R1
1	2	1	2	1	0												

CASK ATTRIBUTES:

CASK TYPE	EMPTY WEIGHT (LBS)	ACTIVE DAYS PER YEAR	TURN AROUND TIME (DAYS)	CASK LIFE YEARS	DAILY LEASE RATE (\$)	PURCHASE PRICE (\$-BILLIONS)	O & M COSTS (\$-BILLIONS)
T1	48650.00	300.00	1.50	15.	800.00	1.100000	0.075000
R1	180000.00	300.00	2.50	15.	1800.00	5.300000	0.125000

WASTE TYPE - CASK TYPE SCENARIO.

WASTE TYPE	UNITS / CASK TYPE
1	7
2	10

DATE OF RUN. 1/10/88 (14.18 43)

AGE CONSTRAINTS

	REPRO	HRS	REPOS	FIS	POOLS	DRY STORE
MINIMUM AGE AT TO ACCEPT AT NEXT FACILITY	0	5.	100	0	0	0
MINIMUM AGE FOR ACCEPTANCE TO	0	5.	10	0.	0	0
MINIMUM AGE FOR DECOM TO SHIP	0	5.	10	0	0	0
MINIMUM AGE FOR FOR TO SHIP	0	5.	10	0.	0	0

SLAM SUMMARY REPORT WILL NOT BE PRINTED.

DATE OF RUN 1/10/86 (14 18 43)

SCHEDULED INPUT EVENTS

NUMBER OF CAPACITY CARDS READ. 3

CAPACITY TIME	EVENT	EVENTS TO FACILITY ID	BE SCHEDULED ARE MAXIMUM CAPACITY	ANNUAL LOADING CAPACITY	ANNUAL UNLOADING CAPACITY	ANNUAL SPRINT CAPACITY	AGE CONSTRAINT OR HEAT
1981.	3	2 10	500 00	100 00	100 00	50 00	-5 00
1981	3	2 10	703 00	161 00	0 00	0 00	-10 00
1981	3	3 20	704 00	162 00	0 00	0 00	-10 00

NUMBER OF PRIOR	CARDS READ	
-----------------	------------	--

PRIOR TIME	EVENT	EVENTS TO FACILITY ID	BE SCHEDULED ARE. SEARCH PRIORITY				
1981	4	3 00	5 00	6 00	2 00	0 00	0 00

SHIPPING DISTANCES DETERMINED AS FOLLOWS

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REACTOR SHIPPING DISTANCES TO NRS MI          WILL BE CALCULATED GREAT CIRCLE DISTANCES
REACTOR SHIPPING DISTANCES TO REPOS MI        WILL BE CALCULATED GREAT CIRCLE DISTANCES
DR YEAR 1990 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1990 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1991 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1992 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1993 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1994 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1995 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1996 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1997 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1998 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1999 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 2000 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
*** FACILITIES TYPE 3 ARE CHANGING FROM OPTIMIZED PROCESSING TO PROXIMITY PROCESSING
FOR YEAR 1997 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1998 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 1999 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0
FOR YEAR 2000 00 NUMBER OF POOLS 4/ DRY STORAGE IS 0 NUMBER INCREASING = 0 NUMBER OF DECREASING IS 0

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DATE OF RUN. 1/10/88 (14-18.43)

PRIOR ARRAY CONTENTS BY FACILITY:

[illegible]

ALTPR) ARRAY CONTENTS BY FACILITY:

[illegible]

DATE OF RUN 1/10/86 (14 18 43)

DRY STORAGE INVENTORIES MONITORED DURING EXECUTION
INTEGER DRY STORAGE CASKING CONFIRMED

SHIPMENTS FROM REACTORS MONITORED DURING EXECUTION
INTEGER CASK SHIPPING CONFIRMED

PROJECT TITLE SAMPLE #2

DATE OF RUN 1/10/86 (14:18 43)

TOTAL MATERIAL ACCEPTED INTO SYSTEM
NUMBER OF ASSEMBLIES 5640 NT'S MATERIAL = 5640 0

PROJECT TITLE SAMPLE #2

DATE OF RUN 1/10/86 (14:18 43)

YEAR	REACTOR POOL		SPENT FUEL BY YEAR		DRY STORAGE		REPOS #1		REPOS #2		TOTAL	
	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT
1981	60	60	0	0	0	0	0	0	0	0	60	60
1982	120	120	0	0	0	0	0	0	0	0	120	120
1983	180	180	0	0	0	0	0	0	0	0	180	180
1984	438	438	0	0	0	0	0	0	0	0	438	438
1985	761	761	0	0	0	0	0	0	0	0	761	761
1986	1021	1021	0	0	63	63	0	0	0	0	1084	1084
1987	1281	1281	0	0	128	128	0	0	0	0	1407	1407
1988	1548	1548	0	0	182	182	0	0	0	0	1730	1730
1989	1772	1772	0	0	281	281	0	0	0	0	2053	2053
1990	1995	1995	0	0	381	381	0	0	0	0	2376	2376
1991	2218	2218	0	0	418	418	63	63	0	0	2699	2699
1992	2731	2731	0	0	445	445	126	126	0	0	2962	2962
1993	2665	2665	0	0	438	438	182	182	0	0	3285	3285
1994	2925	2925	0	0	402	402	281	281	161	161	3508	3508
1995	2701	2701	0	0	426	426	445	445	225	225	3732	3732
1996	2784	2784	0	0	411	411	604	604	4124	4124	4124	4124
1997	2698	2698	0	0	497	497	705	705	487	487	4387	4387
1998	2796	2796	0	0	500	500	705	705	849	849	4650	4650
1999	3219	3219	520	520	500	500	705	705	704	704	5447	5447
2000	3211	3211	520	520	500	500	705	705	704	704	5640	5640

PROJECT TITLE SAMPLE #2

DATE OF RUN 1/10/86 (14:18 43)

TABLE 1 INVENTORY OF SPENT FUEL AT DECOMMISSIONED REACTORS

YEAR	FUEL REMAINING AT DECOMMISSIONED REACTORS (NTU)				FUEL SHIPPED FROM DECOMMISSIONED REACTORS (NTU)			
	AGE < 2	AGE < 3	AGE < 4	AGE < 5	AGE < 2	AGE < 3	AGE < 4	AGE < 5
1981	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED

PRIORITY GIVEN TO DECOMMISSIONED REACTORS AFTER 2 YEARS

PROJECT TITLE SAMPLE #2

DATE OF RUN 1/10/86 (14:18 43)

YEAR	REACTOR POOL		SPENT FUEL SHIPPED FROM REACTOR POOL		DRY STORAGE		REPOS #1		REPOS #2		TOTAL	
	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	63	63	0	0	0	0	63	63
1987	0	0	0	0	63	63	0	0	0	0	63	63
1988	0	0	0	0	56	56	0	0	0	0	56	56
1989	0	0	0	0	99	99	0	0	0	0	99	99
1990	0	0	0	0	100	100	0	0	0	0	100	100
1991	0	0	0	0	100	100	0	0	0	0	100	100
1992	0	0	0	0	80	80	0	0	0	0	80	80
1993	7	7	0	0	43	43	0	0	0	0	50	50
1994	0	0	0	0	63	63	0	0	0	0	63	63
1995	0	0	0	0	95	95	164	164	90	90	349	349
1996	110	110	0	0	77	77	159	159	72	72	418	418
1997	0	0	0	0	88	88	101	101	182	182	369	369
1998	0	0	0	0	3	3	0	0	182	182	185	185
1999	0	0	520	520	0	0	0	0	54	54	574	574
2000	0	0	0	0	0	0	0	0	1	1	1	1

DATE OF RUN 1/10/86 (14 18 43)

PROJECT TITLE	SAMPLE #2

DATE OF RUN 1/10/86 (14 18 43)

TABLE YEAR	2 04 SPENT FUEL		SHIPPED FROM REPOS		#1		(FACILITY # 3 1) TO		REPOS #2		TOTAL	
	ASSEMB	POOL	ASSEMB	STORAGE	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT	ASSEMB	NT
1981	0	0	0	0	0	0	0	0	0	0	0	0
1982	0	0	0	0	0	0	0	0	0	0	0	0
NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED												

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 3 01 CHARACTERISTICS OF SPENT FUEL RECEIVED AT OTHER REACTOR POOL

YEAR	RECEIPTS, BY AGE (MTU)						RECEIPTS, BY HEAT (MTU)										MIN	AVG	MAX	AVG EXP
	< 5	5	8	10	12	15	20	< 0.5	0.5	1.0	1.2	1.5	2.0	2.5	2.5	2.5				
1983	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.9	22.8	22.8	38.
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1985	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	110	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	110	22.8	22.8	38.
1987	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED.																				
TOTAL	117	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	117			

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 3 02 CHARACTERISTICS OF SPENT FUEL RECEIVED AT DRY STORAGE

YEAR	RECEIPTS, BY AGE (MTU)						RECEIPTS, BY HEAT (MTU)										MIN	AVG	MAX	AVG EXP
	< 5	5	8	10	12	15	20	< 0.5	0.5	1.0	1.2	1.5	2.0	2.5	2.5	2.5				
1983	0	160	360	0	0	0	0	0	7.8	8.7	8.8	0	0	0	0	0	0	94.0	99.1	104.28
1984	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	0	160	360	0	0	0	0	0	360	160	0	0	0	0	0	0	0	94.0	99.1	104.28

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 3 03 CHARACTERISTICS OF SPENT FUEL RECEIVED AT HRS #1

YEAR	RECEIPTS, BY AGE (MTU)						RECEIPTS, BY HEAT (MTU)										MIN	AVG	MAX	AVG EXP
	< 5	5	8	10	12	15	20	< 0.5	0.5	1.0	1.2	1.5	2.0	2.5	2.5	2.5				
1983	3	60	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1984	6	57	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1985	2	24	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1986	1	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1987	1	38	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1988	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1989	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.74	1.76	2.14
TOTAL	37	696	211	0	0	0	0	0	0	108	208	12	578	37	0	0	0			

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 3 04 CHARACTERISTICS OF SPENT FUEL RECEIVED AT REPOS #1

YEAR	RECEIPTS, BY AGE (MTU)						RECEIPTS, BY HEAT (MTU)										MIN	AVG	MAX	AVG EXP
	< 5	5	8	10	12	15	20	< 0.5	0.5	1.0	1.2	1.5	2.0	2.5	2.5	2.5				
1983	0	0	3	60	0	0	0	0	8.8	10.9	10.9	0	0	0	0	0	0	1.19	1.19	1.24
1984	0	0	8	57	0	0	0	0	8.7	10.7	10.7	0	0	0	0	0	0	1.19	1.19	1.24
1985	0	0	2	54	0	0	0	0	8.7	10.7	10.7	0	0	0	0	0	0	1.19	1.19	1.24
1986	0	0	0	0	0	0	0	0	8.8	10.9	10.9	0	0	0	0	0	0	1.19	1.19	1.24
1987	0	0	0	0	0	0	0	0	10.8	10.9	10.9	0	0	0	0	0	0	1.19	1.19	1.24
1988	0	0	0	0	0	0	0	0	10.7	10.8	10.8	0	0	0	0	0	0	1.19	1.19	1.24
1989	0	0	0	0	0	0	0	0	10.7	10.7	10.7	0	0	0	0	0	0	1.19	1.19	1.24
1990	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1991	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1992	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1993	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1994	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1995	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1996	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1997	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1998	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
1999	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.19	1.19	1.24
TOTAL	0	0	18	689	0	0	0	0	0	308	388	11	0	0	0	0	0			

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 3.05 CHARACTERISTICS OF SPENT FUEL RECEIVED AT REPOS #2

YEAR	RECEIPTS, BY AGE (MTU)						RECEIPTS, BY HEAT (MTU)										AVG EXP
	>= 0 < 5	5 8	8 10	10 12	12 15	15 20	MIN	AVG	MAX	>= 0 < 0.5	0.5 1.0	1.0 1.2	1.2 1.5	1.5 2.0	2.0 2.5	2.5 3.0	
1986	0	0	0	181	0	0	0	10.8	11.0	11.9	0	126	35	0	0	0	30.
1987	0	0	0	128	38	0	0	10.5	11.3	12.8	0	108	41	0	0	0	30.
1988	0	0	0	182	0	0	0	10.7	10.7	10.7	0	182	0	0	0	0	28.
1989	0	0	0	182	0	0	0	10.8	10.8	10.8	0	182	0	0	0	0	28.
1990	0	0	36	18	0	0	0	9.8	10.1	10.8	0	54	0	0	0	0	28.
1991	0	0	0	1	0	0	0	11.8	11.6	11.8	0	0	0	0	0	0	33.
2000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.
TOTAL	0	0	36	632	36	0	0	0	612	77	15	0	0	0	0	0	0.

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 4.02 TRANSPORTATION CHARACTERIZATION SUMMARY FOR SPENT FUEL SHIPPED TO DRY STORAGE

YEAR	TRUCK SHIP. X(PAIR)		RAIL SHIP. X(PAIR)		NUMBER OF SHIP.		MT'S RECEIVED X(PAIR)		TOTAL		MT'S SHIPPED FROM FACILITY	
	PAIR / BAR	X(PAIR)	PAIR / BAR	X(PAIR)	TRUCK / RAIL	TOTAL X(TRK)	PAIR / BAR	X(PAIR)	TRUCK / RAIL	TOTAL	PAIR / BAR	X(PAIR)
1989	0./	0.	0./	0.	0./	0.	0./	0.	0./	520.	0./	0.
2000	0./	0.	0./	0.	0./	0.	0./	0.	0./	0.	0./	0.
TOTALS FOR DRY STORAGE	0./	0.	0./	0.	0./	0.	0./	0.	0./	520.	0./	0.
TOTAL	0./	0.	0./	0.	0./	0.	0./	0.	0./	520.	0./	0.

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

YEAR	TRUCK SHIP. X(PAIR)		RAIL SHIP. X(PAIR)		NUMBER OF SHIP.		MT'S RECEIVED X(PAIR)		TOTAL		MT'S SHIPPED FROM FACILITY	
	PAIR / BAR	X(PAIR)	PAIR / BAR	X(PAIR)	TRUCK / RAIL	TOTAL X(TRK)	PAIR / BAR	X(PAIR)	TRUCK / RAIL	TOTAL	PAIR / BAR	X(PAIR)
1986	0./	0.	0./	0.	0./	0.	0./	0.	0./	63.00	0./	0.
1987	0./	0.	0./	0.	0./	0.	0./	0.	0./	63.00	0./	0.
1988	0./	0.	0./	0.	0./	0.	0./	0.	0./	56.00	0./	0.
1989	0./	0.	0./	0.	0./	0.	0./	0.	0./	99.00	0./	0.
1990	0./	0.	0./	0.	0./	0.	0./	0.	0./	100.00	0./	0.
1991	0./	0.	0./	0.	0./	0.	0./	0.	0./	80.00	0./	0.
1992	0./	0.	0./	0.	0./	0.	0./	0.	0./	80.00	0./	0.
1993	0./	0.	0./	0.	0./	0.	0./	0.	0./	56.00	0./	0.
1994	0./	0.	0./	0.	0./	0.	0./	0.	0./	83.00	0./	0.
1995	0./	0.	0./	0.	0./	0.	0./	0.	0./	348.00	0./	0.
1996	110./	0.	0./	0.	110./	0.	110./	0.	110./	418.00	0./	0.
1997	0./	0.	0./	0.	0./	0.	0./	0.	0./	249.00	0./	0.
1998	0./	0.	0./	0.	0./	0.	0./	0.	0./	185.00	0./	0.
1999	0./	0.	0./	0.	0./	0.	0./	0.	0./	84.00	0./	0.
2000	0./	0.	0./	0.	0./	0.	0./	0.	0./	1.00	0./	0.
TOTALS FOR REACTOR POOL	0./	0.	0./	0.	0./	0.	0./	0.	0./	100.00	0./	0.
TOTAL	117./	0.	0./	0.	117./	0.	117./	0.	117./	100.00	0./	0.

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

YEAR	TRUCK SHIP. X(PAIR)		RAIL SHIP. X(PAIR)		NUMBER OF SHIP.		MT'S RECEIVED X(PAIR)		TOTAL		MT'S SHIPPED FROM FACILITY	
	PAIR / BAR	X(PAIR)	PAIR / BAR	X(PAIR)	TRUCK / RAIL	TOTAL X(TRK)	PAIR / BAR	X(PAIR)	TRUCK / RAIL	TOTAL	PAIR / BAR	X(PAIR)
1986	0./	0.	0./	0.	0./	0.	0./	0.	0./	63.00	0./	0.
1987	0./	0.	0./	0.	0./	0.	0./	0.	0./	63.00	0./	0.
1988	0./	0.	0./	0.	0./	0.	0./	0.	0./	56.00	0./	0.
1989	0./	0.	0./	0.	0./	0.	0./	0.	0./	99.00	0./	0.
1990	0./	0.	0./	0.	0./	0.	0./	0.	0./	100.00	0./	0.
1991	0./	0.	0./	0.	0./	0.	0./	0.	0./	80.00	0./	0.
1992	0./	0.	0./	0.	0./	0.	0./	0.	0./	80.00	0./	0.
1993	0./	0.	0./	0.	0./	0.	0./	0.	0./	56.00	0./	0.
1994	0./	0.	0./	0.	0./	0.	0./	0.	0./	83.00	0./	0.
1995	32./	0.	0./	0.	32./	0.	32./	0.	32./	348.00	0./	0.
1996	0./	0.	0./	0.	0./	0.	0./	0.	0./	418.00	0./	0.
1997	68./	0.	0./	0.	68./	0.	68./	0.	68./	249.00	0./	0.
1998	3./	0.	0./	0.	3./	0.	3./	0.	3./	185.00	0./	0.
1999	0./	0.	0./	0.	0./	0.	0./	0.	0./	84.00	0./	0.
2000	0./	0.	0./	0.	0./	0.	0./	0.	0./	1.00	0./	0.
TOTALS FOR NRS #1	0./	0.	0./	0.	0./	0.	0./	0.	0./	100.00	0./	0.
TOTAL	112./	0.	0./	0.	112./	0.	112./	0.	112./	100.00	0./	0.

PROJECT TITLE: SAMPLE #2

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DATE OF RUN: 1/10/86 (14:18:43)

TABLE 4.04 TRANSPORTATION CHARACTERIZATION SUMMARY FOR SPENT FUEL SHIPPED TO REPOS #1											
YEAR	TRUCK SHIP PHR / BUR	RAIL SHIP PHR / BUR	NUMBER OF SHIP TRUCK / RAIL	TOTAL	NT'S RECEIVED PHR / BUR	NT'S SHIPPED FROM FACILITY PHR / BUR	TOTAL	NT'S RECEIVED PHR / BUR	NT'S SHIPPED FROM FACILITY PHR / BUR	TOTAL	NT'S RECEIVED PHR / BUR
1991	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1992	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1993	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1994	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1995	56 / 0	100 / 0	0 / 5	56	56 / 0	0 / 5	56	56 / 0	0 / 5	56	56 / 0
1996	33 / 0	100 / 0	0 / 2	33	33 / 0	0 / 2	33	33 / 0	0 / 2	33	33 / 0
1997	65 / 0	100 / 0	0 / 2	65	65 / 0	0 / 2	65	65 / 0	0 / 2	65	65 / 0
1998	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1999	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED

TOTALS FOR REPOS #1

TRUCK SHIPMENTS PHR / BUR	RAIL SHIPMENTS PHR / BUR	TOTAL NUMBER OF SHIPMENTS	TOTAL TRUCK	TOTAL RAIL
154 / 0	35 / 17	154 / 52	208	74.8

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 4.05 TRANSPORTATION CHARACTERIZATION SUMMARY FOR SPENT FUEL SHIPPED TO REPOS #2											
YEAR	TRUCK SHIP PHR / BUR	RAIL SHIP PHR / BUR	NUMBER OF SHIP TRUCK / RAIL	TOTAL	NT'S RECEIVED PHR / BUR	NT'S SHIPPED FROM FACILITY PHR / BUR	TOTAL	NT'S RECEIVED PHR / BUR	NT'S SHIPPED FROM FACILITY PHR / BUR	TOTAL	NT'S RECEIVED PHR / BUR
1995	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1996	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1997	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1998	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
1999	0 / 0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0	0 / 0	0	0 / 0
2000	1 / 0	100 / 0	0 / 0	1	1 / 0	0 / 0	1	1 / 0	0 / 0	1	1 / 0

TOTALS FOR REPOS #2

TRUCK SHIPMENTS PHR / BUR	RAIL SHIPMENTS PHR / BUR	TOTAL NUMBER OF SHIPMENTS	TOTAL TRUCK	TOTAL RAIL
1 / 0	13 / 34	1 / 47	48	2.1

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 5.01 SHIPPING FLEET REQUIREMENTS FOR											
YEAR	SHIPPING COSTS(\$1000000)	% (TRUCK)	BUSY DAYS(1000000)	% (TRUCK)	SPENT FUEL SHIPPED TO TRUCK / RAIL	REACTOR POOL TRUCK / RAIL	NO. OF CASKS REQ TRUCK / RAIL	% (TRUCK)	SPENT FUEL SHIPPED TO TRUCK / RAIL	REACTOR POOL TRUCK / RAIL	% (TRUCK)
1993	0.1323	0.0000	100.0	0.072	0.0000	100.0	1 / 0	0.0000	0.0000	100.0	0.0000
1994	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1995	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1996	2.0785	0.0000	100.0	1.132	0.0000	100.0	4 / 0	0.0000	0.0000	100.0	0.0000
1997	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1998	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED

SUB T 2 2107 / 0.0000 100.0 - NT 3 OF PHR = 117.000, NT'S OF BUR = 0.000, 100.00 % (PHR)

TOTAL 2 2107 / 0.0000 100.0 - TOTAL NT'S = 117.000, AVG COST = 18.90 (\$/KG)

TOTAL TRUCK BUSY DAYS = 1204.12

TOTAL RAIL BUSY DAYS = 0.00

PROJECT TITLE: SAMPLE #2

DATE OF RUN: 1/10/86 (14:18:43)

TABLE 5.02 SHIPPING FLEET REQUIREMENTS FOR											
YEAR	SHIPPING COSTS(\$1000000)	% (TRUCK)	BUSY DAYS(1000000)	% (TRUCK)	SPENT FUEL SHIPPED TO TRUCK / RAIL	DRY STORAGE TRUCK / RAIL	NO. OF CASKS REQ TRUCK / RAIL	% (TRUCK)	SPENT FUEL SHIPPED TO TRUCK / RAIL	DRY STORAGE TRUCK / RAIL	% (TRUCK)
1995	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1996	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1997	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1998	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
1999	0.0000	0.0000	0.0	0.000	0.0000	0.0	0 / 0	0.0000	0.0000	0.0	0.0000
2000	1 / 0	100 / 0	0 / 0	0 / 0	1 / 0	0 / 0	1 / 0	100 / 0	1 / 0	0 / 0	0 / 0

TOTAL TRUCK BUSY DAYS = 0.00

TOTAL RAIL BUSY DAYS = 0.00

PROJECT TITLE SAMPLE #2 DATE OF RUN 1/10/86 (14 18 43)

TABLE 5 03 SHIPPING FLEET REQUIREMENTS FOR	SHIPPING COSTS(\$)*10**6	%(TRUCK)	BUSY DAYS*10**3	TRUCK / RAIL	SPENT FUEL SHIPPED TO	REPOS #1	NO OF CASKS REQ	%(TRUCK)	(FACILITY # 2 1)
YEAR	TRUCK / RAIL				TRUCK / RAIL				
1986	0 0000 / 0 5409	0 0	0 000 / 0 314	0 0	0 / 2	0 0	0 0	0 0	
1987	0 0000 / 0 5412	0 0	0 000 / 0 314	0 0	0 / 2	0 0	0 0	0 0	
1988	0 0000 / 0 4808	0 0	0 000 / 0 279	0 0	0 / 2	0 0	0 0	0 0	
1989	0 0000 / 0 6023	0 0	0 000 / 0 355	0 0	0 / 2	0 0	0 0	0 0	
1990	0 0491 / 0 5423	8 4	0 042 / 0 320	11 8	1 / 2	33 3	0 0	0 0	
1991	0 0082 / 0 6022	1 0	0 005 / 0 355	1 5	0 / 2	33 3	0 0	0 0	
1992	0 0000 / 0 1511	0 0	0 000 / 0 102	0 0	0 / 2	0 0	0 0	0 0	
1993	0 0000 / 0 4212	0 0	0 000 / 0 244	0 0	0 / 2	0 0	0 0	0 0	
1994	0 0000 / 0 5408	0 0	0 000 / 0 314	0 0	0 / 2	0 0	0 0	0 0	
1995	0 1987 / 0 5408	26 9	0 188 / 0 314	34 8	1 / 2	33 3	0 0	0 0	
1996	0 0000 / 0 8616	0 0	0 000 / 0 384	0 0	0 / 2	0 0	0 0	0 0	
1997	0 4223 / 0 3046	83 2	0 357 / 0 200	84 6	1 / 2	66 7	0 0	0 0	
1998	0 0188 / 0 0000	100 0	0 018 / 0 000	100 0	1 / 2	100 0	0 0	0 0	
1999	0 0000 / 0 0000	0 0	0 000 / 0 000	0 0	0 / 2	0 0	0 0	0 0	
2000	0 0000 / 0 0000	0 0	0 000 / 0 000	0 0	0 / 2	0 0	0 0	0 0	

SUB T 0 6055 / 5 6577 10 9 RT'S OF PHR = 728 000 , RT'S OF BUR = 218 000 , 77 12 %(PHR)
 TOTAL 6 3532 , TOTAL RT'S = 944 000 , AVG COST = 6 73 (\$/KG)

TOTAL TRUCK BUSY DAYS = 587 55
 TOTAL RAIL BUSY DAYS = 3317 83

PROJECT TITLE SAMPLE #2 DATE OF RUN 1/10/86 (14 18 43)

TABLE 5 04 SHIPPING FLEET REQUIREMENTS FOR	SHIPPING COSTS(\$)*10**6	%(TRUCK)	BUSY DAYS*10**3	TRUCK / RAIL	SPENT FUEL SHIPPED TO	REPOS #1	NO OF CASKS REQ	%(TRUCK)	(FACILITY # 3 1)
YEAR	TRUCK / RAIL				TRUCK / RAIL				
1986	0 0000 / 0 5170	0 0	0 000 / 0 305	0 0	0 / 2	0 0	0 0	0 0	
1987	0 0000 / 0 5173	0 0	0 000 / 0 305	0 0	0 / 2	0 0	0 0	0 0	
1988	0 0000 / 0 4598	0 0	0 000 / 0 271	0 0	0 / 2	0 0	0 0	0 0	
1989	0 0000 / 0 6197	0 0	0 000 / 0 372	0 0	0 / 2	0 0	0 0	0 0	
1990	0 0543 / 0 4009	70 4	0 534 / 0 215	71 3	1 / 2	88 7	0 0	0 0	
1991	0 5624 / 0 4677	54 8	0 315 / 0 251	55 8	1 / 2	66 7	0 0	0 0	
1992	1 1077 / 0 1338	83 2	0 620 / 0 072	88 8	1 / 2	75 0	0 0	0 0	
1993	0 0000 / 0 0000	0 0	0 000 / 0 000	0 0	0 / 2	0 0	0 0	0 0	
1994	0 0000 / 0 0000	0 0	0 000 / 0 000	0 0	0 / 2	0 0	0 0	0 0	

NO MORE CONSECUTIVE 0 VALUES WILL BE PRINTED

SUB T 2 6243 / 3 1358 45 8 RT'S OF PHR = 398 000 , RT'S OF BUR = 306 000 , 58 60 %(PHR)
 TOTAL 5 7802 , TOTAL RT'S = 705 000 , AVG COST = 6 17 (\$/KG)

TOTAL TRUCK BUSY DAYS = 1469 87
 TOTAL RAIL BUSY DAYS = 1780 81

PROJECT TITLE SAMPLE #2 DATE OF RUN 1/10/86 (14 18 43)

TABLE 5 05 SHIPPING FLEET REQUIREMENTS FOR	SHIPPING COSTS(\$)*10**6	%(TRUCK)	BUSY DAYS*10**3	TRUCK / RAIL	SPENT FUEL SHIPPED TO	REPOS #2	NO OF CASKS REQ	%(TRUCK)	(FACILITY # 3 2)
YEAR	TRUCK / RAIL				TRUCK / RAIL				
1986	0 0000 / 0 2632	0 0	0 000 / 0 200	0 0	0 / 1	0 0	0 0	0 0	
1987	0 0000 / 0 3122	0 0	0 000 / 0 238	0 0	0 / 1	0 0	0 0	0 0	
1988	0 0000 / 0 1822	0 0	0 000 / 0 139	0 0	0 / 1	0 0	0 0	0 0	
1989	0 0000 / 0 1822	0 0	0 000 / 0 139	0 0	0 / 1	0 0	0 0	0 0	
1990	0 0000 / 0 0827	0 0	0 000 / 0 048	0 0	0 / 1	0 0	0 0	0 0	
1991	0 0071 / 0 0000	100 0	0 008 / 0 000	100 0	1 / 0	100 0	0 0	100 0	

SUB T 0 0071 / 1 0007 0 7 RT'S OF PHR = 82 000 , RT'S OF BUR = 612 000 , 13 07 %(PHR)
 TOTAL 1 0077 , TOTAL RT'S = 704 000 , AVG COST = 1 43 (\$/KG)

TOTAL TRUCK BUSY DAYS = 5 81
 TOTAL RAIL BUSY DAYS = 763 27

PROJECT TITLE: SAMPLE #2 DATE OF RUN 1/10/86 (14 18 43)

TABLE 5 06 SUMMARY TABLE	SHIPPING COSTS(\$)*10**6	%(TRUCK)	BUSY DAYS*10**3	TRUCK / RAIL	SPENT FUEL SHIPPED TO	REPOS #1	NO OF CASKS REQ	%(TRUCK)	CORR LEASE COST (\$ MILLIONS)
YEAR	TRUCK / RAIL				TRUCK / RAIL				
1986	0 0000 / 0 5409	0 0	0 000 / 0 314	0 0	0 / 2	0 0	0 0	0 0	0 000000 / 1 080000
1987	0 0000 / 0 5412	0 0	0 000 / 0 314	0 0	0 / 2	0 0	0 0	0 0	0 000000 / 1 080000
1988	0 0000 / 0 4808	0 0	0 000 / 0 279	0 0	0 / 2	0 0	0 0	0 0	0 000000 / 0 540000
1989	0 0000 / 0 6023	0 0	0 000 / 0 355	0 0	0 / 2	0 0	0 0	0 0	0 000000 / 1 080000
1990	0 0497 / 0 5423	8 4	0 042 / 0 320	11 8	1 / 2	33 3	0 0	0 0	0 240000 / 1 080000
1991	0 0082 / 1 1192	0 8	0 005 / 0 660	0 8	0 / 2	25 0	0 0	0 0	0 240000 / 1 080000
1992	0 0005 / 0 6704	0 0	0 000 / 0 408	0 0	0 / 2	0 0	0 0	0 0	0 000000 / 1 080000
1993	0 1323 / 0 8908	13 1	0 072 / 0 515	12 3	1 / 2	33 3	0 0	0 0	0 240000 / 1 080000
1994	0 0000 / 1 1508	0 0	0 000 / 0 587	0 0	0 / 2	0 0	0 0	0 0	0 600000 / 1 080000
1995	1 1530 / 1 2047	48 9	0 702 / 0 730	49 0	1 / 2	50 0	0 0	0 0	0 720000 / 1 080000
1996	2 6408 / 1 4414	84 7	1 447 / 0 873	82 4	1 / 2	62 5	0 0	0 0	1 250000 / 1 080000
1997	1 5300 / 0 2455	81 5	0 977 / 0 232	80 8	1 / 2	80 0	0 0	0 0	0 960000 / 0 540000
1998	0 0188 / 0 1822	8 3	0 018 / 0 139	10 0	1 / 0	50 0	0 0	0 0	0 240000 / 0 540000
1999	0 0000 / 0 0807	0 0	0 000 / 0 048	0 0	0 / 1	0 0	0 0	0 0	0 000000 / 0 540000
2000	0 0071 / 0 0000	100 0	0 008 / 0 000	100 0	1 / 0	100 0	0 0	0 0	0 240000 / 0 000000

SUB T 5 5377 / 9 7942 36 1 RT'S OF PHR = 1338 000 , RT'S OF BUR = 1134 000 , 54 09 %(PHR)
 TOTAL 15 3318 , TOTAL RT'S = 2470 000 , AVG COST = 8 21 (\$/KG)

AVG LEASE COST = 7 75 (\$/KG)
 RT'S BY TRUCK = 284 000 , INCLUDING RESHIPMENT
 RT'S BY RAIL = 2086 000 , INCLUDING RESHIPMENT
 AVG ANNUAL RT'S / (TRUCK CASK YEAR) = 22 588
 AVG ANNUAL RT'S / (RAIL CASK YEAR) = 74 500

PROJECT TITLE: SAMPLE #2

DATE OF RUN 1/10/88 (14 10 43)

TABLE 6 00 FACILITY TO FACILITY SHIPPING COST (\$/KG)

	POOL	DRY	2 1	3 1	3 2
POOL	18 90	0 00	8 73	8 55	1 14
DRY	0 00	0 00	0 00	0 00	0 00
2 1	0 00	0 00	0 00	7 58	2 41
3 1	0 00	0 00	0 00	0 00	0 00
3 2	0 00	0 00	0 00	0 00	0 00

GRAND TOTAL

583

1281634

8

0

21 400000

7 475000

28 875000

AVG TI
AVG RIUTILIZATION FOR MAXIMUM PURCHASE
UTILIZATION FOR MAXIMUM PURCHASE99 00 DAYS/YR
146 80 DAYS/YR

PROJECT TITLE: SAMPLE #2

DATE OF RUN 1/10/88 (14 10 43)

TABLE 7 00 MAXIMUM FLEET PURCHASE REQUIREMENTS AND COST

YEAR	CASK NAME	# OF SHIPMENTS	CASK NILES	# CASKS PURCHASED	# CASKS RETIRED	# CASKS AVAILABLE	PURCHASE COST (\$ MILLIONS)	MAINT. COST (\$ MILLIONS)	TOTAL COST (\$ MILLIONS)
1986	T1	0	0	0	0	0	0 000000	0 000000	0 000000
	R1	8	23764	2	0	2	10 800000	0 250000	10 850000
1987	T1	0	0	0	0	0	0 000000	0 250000	0 250000
	R1	8	23764	0	0	2	0 000000	0 250000	0 250000
1988	T1	0	0	0	0	0	0 000000	0 000000	0 000000
	R1	8	21123	0	0	2	0 000000	0 250000	0 250000
1989	T1	0	0	0	0	0	0 000000	0 000000	0 000000
	R1	11	25223	0	0	2	0 000000	0 250000	0 250000
1990	T1	8	2547	1	0	1	1 100000	0 075000	1 175000
	R1	10	22583	0	0	2	0 000000	0 250000	0 250000
1991	T1	1	943	0	0	1	0 000000	0 075000	0 075000
	R1	20	47358	1	0	3	5 300000	0 375000	5 675000
1992	T1	0	0	0	0	1	0 000000	0 075000	0 075000
	R1	14	25784	0	0	3	0 000000	0 375000	0 375000
1993	T1	7	21437	0	0	1	0 000000	0 075000	0 075000
	R1	15	38158	0	0	3	0 000000	0 375000	0 375000
1994	T1	0	0	0	0	1	0 000000	0 075000	0 075000
	R1	20	50818	0	0	3	0 000000	0 375000	0 375000
1995	T1	88	184115	2	0	3	2 200000	0 225000	2 425000
	R1	27	45884	0	0	3	0 000000	0 375000	0 375000
1996	T1	143	427582	2	0	5	2 200000	0 375000	2 575000
	R1	32	55096	0	0	3	0 000000	0 375000	0 375000
1997	T1	133	242912	0	0	5	0 000000	0 375000	0 375000
	R1	12	9515	0	0	3	0 000000	0 375000	0 375000
1998	T1	3	2830	0	0	5	0 000000	0 375000	0 375000
	R1	8	3165	0	0	3	0 000000	0 375000	0 375000
1999	T1	0	0	0	0	5	0 000000	0 375000	0 375000
	R1	3	1055	0	0	3	0 000000	0 375000	0 375000
2000	T1	1	1094	0	0	5	0 000000	0 375000	0 375000
	R1	0	0	0	0	3	0 000000	0 375000	0 375000
CASK SUB TOTAL	T1	384	888361	5	0		5 500000	2 475000	7 975000
	R1	190	393273	3	0		15 900000	5 000000	20 900000

PROJECT TITLE: SAMPLE #2

DATE OF RUN 1/10/88 (14 10 43)

TABLE 8 00 LEVELIZED FLEET PURCHASE REQUIREMENTS AND COST

YEAR	CASK NAME	# OF SHIPMENTS	CASK NILES	# CASKS PURCHASED	# CASKS RETIRED	# CASKS AVAILABLE	PURCHASE COST (\$ MILLIONS)	MAINT. COST (\$ MILLIONS)	TOTAL COST (\$ MILLIONS)
1986	T1	0	0	0	0	0	0 000000	0 000000	0 000000
	R1	8	23764	2	0	2	10 800000	0 250000	10 850000
1987	T1	0	0	0	0	0	0 000000	0 250000	0 250000
	R1	8	23764	0	0	2	0 000000	0 250000	0 250000
1988	T1	0	0	0	0	0	0 000000	0 000000	0 000000
	R1	8	21123	0	0	2	0 000000	0 250000	0 250000
1989	T1	0	0	0	0	0	0 000000	0 000000	0 000000
	R1	11	25223	0	0	2	0 000000	0 250000	0 250000
1990	T1	8	2547	1	0	1	1 100000	0 075000	1 175000
	R1	10	22583	0	0	2	0 000000	0 250000	0 250000
1991	T1	1	943	0	0	1	0 000000	0 075000	0 075000
	R1	20	47358	1	0	3	5 300000	0 375000	5 675000
1992	T1	0	0	0	0	1	0 000000	0 075000	0 075000
	R1	14	25784	0	0	3	0 000000	0 375000	0 375000
1993	T1	7	21437	0	0	1	0 000000	0 075000	0 075000
	R1	15	38158	0	0	3	0 000000	0 375000	0 375000
1994	T1	0	0	0	0	1	0 000000	0 075000	0 075000
	R1	20	50818	0	0	3	0 000000	0 375000	0 375000
1995	T1	88	184115	2	0	3	2 200000	0 225000	2 425000
	R1	27	45884	0	0	3	0 000000	0 375000	0 375000
1996	T1	143	427582	2	0	5	2 200000	0 375000	2 575000
	R1	32	55096	0	0	3	0 000000	0 375000	0 375000
1997	T1	133	242912	0	0	5	0 000000	0 375000	0 375000
	R1	12	9515	0	0	3	0 000000	0 375000	0 375000
1998	T1	3	2830	0	0	5	0 000000	0 375000	0 375000
	R1	8	3165	0	0	3	0 000000	0 375000	0 375000
1999	T1	0	0	0	0	5	0 000000	0 375000	0 375000
	R1	3	1055	0	0	3	0 000000	0 375000	0 375000
2000	T1	1	1094	0	0	5	0 000000	0 375000	0 375000
	R1	0	0	0	0	3	0 000000	0 375000	0 375000
CASK SUB TOTAL	T1	384	888361	5	0		5 500000	2 425000	7 925000
	R1	190	393273	3	0		15 900000	4 625000	20 525000

GRAND TOTAL N/A N/A 8 2 21 400000 6 950000 28 350000
 AVG T1 UTILIZATION FOR MAXIMUM PURCHASE = 105 39 DAYS/YR
 AVG R1 UTILIZATION FOR MAXIMUM PURCHASE = 158 70 DAYS/YR

PROJECT TITLE SAMPLE #2 DATE OF RUN 1/10/86 (14 18 43)

TABLE 9-00 TRANSPORTATION COST SUMMARY BY CATEGORY

	MINIMUM LEASE		OPTION REQUIRED LEASE		MAXIMUM PURCHASE		LEVELIZED PURCHASE	
	COST (\$ MILLIONS)	/ \$/KG	COST (\$ MILLIONS)	/ \$/KG	COST (\$ MILLIONS)	/ \$/KG	COST (\$ MILLIONS)	/ \$/KG
SHIPPING COST								
T1	3 886516	/ 10 12	3 886516	/ 10 12	3 886516	/ 10 12	3 886516	/ 10 12
R1	8 833453	/ 4 14	8 833453	/ 4 14	8 833453	/ 4 14	8 833453	/ 4 14
SECURITY/ SURCHARGE								
T1	1 651158	/ 4 30	1 651158	/ 4 30	1 651158	/ 4 30	1 651158	/ 4 30
R1	1 160745	/ 0 58	1 160745	/ 0 58	1 160745	/ 0 58	1 160745	/ 0 58
LEASE COST								
T1	2 613717	/ 8 81	4 080000	/ 10 83	0 000000	/ 0 00	0 000000	/ 0 00
R1	10 568258	/ 5 07	15 120000	/ 7 25	0 000000	/ 0 00	0 000000	/ 0 00
PURCHASE COST								
T1	0 000000	/ 0 00	0 000000	/ 0 00	5 520000	/ 14 32	5 520000	/ 14 32
R1	0 000000	/ 0 00	0 000000	/ 0 00	15 800000	/ 7 82	15 800000	/ 7 82
MAINTENANCE COST								
T1	0 000000	/ 0 00	0 000000	/ 0 00	2 475000	/ 8 45	2 325000	/ 8 05
R1	0 000000	/ 0 00	0 000000	/ 0 00	6 000000	/ 2 40	4 825000	/ 2 22
SUB TOTAL								
T1	8 151389	/ 21 23	8 817673	/ 25 05	12 512673	/ 35 19	12 382673	/ 34 80
R1	20 383458	/ 9 78	24 914198	/ 11 94	30 694198	/ 14 71	30 319198	/ 14 53
TOTAL	28 514846	/ 11 54	34 531872	/ 13 98	44 206872	/ 17 90	43 681872	/ 17 68

PROJECT TITLE SAMPLE #2

DATE OF RUN 1/10/86 (14 18 43)

TABLE 10-01 CHARACTERISTICS OF CASK SHIPMENTS BY CENTROID FOR EACH FACILITY

CENTROID NUMBER	TRANS MODE	RMS #1 CASK HILES / RECEIPTS		REPOS #1 CASK HILES / RECEIPTS		REPOS #2 CASK HILES / RECEIPTS	
1	TRUCK	0	/	0	/	0	/
2	TRUCK	0	/	0	/	0	/
3	TRUCK	0	/	0	/	0	/
4	TRUCK	0	/	0	/	0	/
5	TRUCK	0	/	0	/	0	/
6	TRUCK	0	/	0	/	0	/
7	TRUCK	105651	/	112	/	154	/
8	TRUCK	0	/	0	/	0	/
9	TRUCK	0	/	0	/	0	/
10	TRUCK	0	/	0	/	0	/
11	TRUCK	0	/	0	/	0	/
12	TRUCK	8755	/	12	/	15	/
13	TRUCK	0	/	0	/	0	/
14	TRUCK	0	/	0	/	0	/
15	TRUCK	0	/	0	/	0	/
16	TRUCK	0	/	0	/	0	/
17	TRUCK	0	/	0	/	0	/
18	TRUCK	0	/	0	/	0	/
19	TRUCK	0	/	0	/	0	/
20	TRUCK	23235	/	88	/	0	/
21	TRUCK	0	/	0	/	0	/
TOTAL	TRUCK	105651	/	423303	/	1094	/
TOTAL	RAIL	241112	/	42152	/	10550	/
TOTAL		346764	/	465456	/	11644	/

PROJECT TITLE SAMPLE #2

DATE OF RUN 1/10/86 (14 18 43)

TABLE 10-02 CHARACTERISTICS OF FUEL SHIPPED BY CENTROID (YEARS / MJD/KG)

CENTROID NUMBER	TRANS MODE	RMS #1 AGE / EXP		REPOS #1 AGE / EXP		REPOS #2 AGE / EXP	
1	TRUCK	0 0	/	0 0	/	0 0	/
2	TRUCK	0 0	/	0 0	/	0 0	/
3	TRUCK	0 0	/	0 0	/	0 0	/
4	TRUCK	0 0	/	0 0	/	0 0	/
5	TRUCK	0 0	/	0 0	/	0 0	/
6	TRUCK	0 0	/	0 0	/	0 0	/
7	TRUCK	8 4	/	10 8	/	11 8	/
8	TRUCK	0 0	/	0 0	/	0 0	/
9	TRUCK	0 0	/	0 0	/	0 0	/
10	TRUCK	0 0	/	0 0	/	0 0	/
11	TRUCK	0 0	/	0 0	/	0 0	/
12	TRUCK	0 0	/	0 0	/	0 0	/
13	TRUCK	0 0	/	0 0	/	0 0	/
14	TRUCK	0 0	/	0 0	/	0 0	/
15	TRUCK	0 0	/	0 0	/	0 0	/
16	TRUCK	0 0	/	0 0	/	0 0	/
17	TRUCK	0 0	/	0 0	/	0 0	/
18	TRUCK	0 0	/	0 0	/	0 0	/
19	TRUCK	0 0	/	0 0	/	0 0	/
20	TRUCK	5 4	/	35 75	/	0 0	/
21	TRUCK	0 0	/	0 0	/	0 0	/

TABLE 11 01 CASH FLOWS FOR DRY STORAGE; CUMULATIVE TOTAL
ASSUMING NO CANNING OR CONSOLIDATION

YEAR	INVESTED IN YARDS	CAPITAL COSTS	TOTAL	OPERATION/MAINTENANCE RELATED TO YARDS	TOTAL	COST FOR YARDS	DECOMMISSIONING EQUIPMENT COSTS	TOTAL	ANNUAL TOTAL	DISCOUNTED ANNUAL	ACTIVE NUMBER OF YARDS CASKS	NUMBER OF ASSEMBLIES
1995	0 70	0 00	0 70	0 01	0 00	0 01	0 00	0 00	0 70	0 18	0	0
1996	0 17	0 00	0 17	0 01	0 00	0 01	0 00	0 00	0 18	0 04	0	0
1997	0 00	0 00	0 00	0 01	0 00	0 01	0 00	0 00	0 01	0 00	0	0
1998	1 93	15 02	16 95	0 17	0 00	0 17	0 00	0 00	17 11	3 38	0	0
1999	0 00	0 00	0 00	0 41	0 08	0 49	0 00	0 00	0 49	0 08	1	10
2000	0 00	0 00	0 00	0 41	0 00	0 42	0 00	0 00	0 42	0 07	1	10
TOTAL	2 78	15 02	17 81	1 02	0 08	1 10	0 00	0 00	18 91	3 77		
TRANS STORE BWR	COUNT	COST	MINIMUM	\$/KG	-	AVERAGE	\$/KG	-	MAXIMUM	\$/KG	LEVELIZED UNIT COST	
	1	18 91	520 00	36 36	18 91	520 00	36 36	18 91	520 00	36 36	MINIMUM AVERAGE MAXIMUM	40 32 40 32 40 32

TABLE 11 02 CASH FLOWS FOR DRY STORAGE TRANS STORE BWR
ASSUMING NO CANNING OR CONSOLIDATION

YEAR	INVESTED IN YARDS	CAPITAL COSTS	TOTAL	OPERATION/MAINTENANCE RELATED TO YARDS	TOTAL	COST FOR YARDS	DECOMMISSIONING EQUIPMENT COSTS	TOTAL	ANNUAL TOTAL	DISCOUNTED ANNUAL	ACTIVE NUMBER OF YARDS CASKS	NUMBER OF ASSEMBLIES
1995	0 70	0 00	0 70	0 01	0 00	0 01	0 00	0 00	0 70	0 18	0	0
1996	0 17	0 00	0 17	0 01	0 00	0 01	0 00	0 00	0 18	0 04	0	0
1997	0 00	0 00	0 00	0 01	0 00	0 01	0 00	0 00	0 01	0 00	0	0
1998	1 93	15 02	16 95	0 17	0 00	0 17	0 00	0 00	17 11	3 38	0	0
1999	0 00	0 00	0 00	0 41	0 08	0 49	0 00	0 00	0 49	0 08	1	10
2000	0 00	0 00	0 00	0 41	0 00	0 42	0 00	0 00	0 42	0 07	1	10
TOTAL	2 78	15 02	17 81	1 02	0 08	1 10	0 00	0 00	18 91	3 77		
TRANS STORE BWR	COUNT	COST	MINIMUM	\$/KG	-	AVERAGE	\$/KG	-	MAXIMUM	\$/KG	LEVELIZED UNIT COST	
	1	18 91	520 00	36 36	18 91	520 00	36 36	18 91	520 00	36 36	MINIMUM AVERAGE MAXIMUM	40 32 40 32 40 32

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