Master

Coal Mining Cost Model
Volume 2: Users' Guide for the Underground Coal Mining Cost Model

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ABSTRACT

The revised EPRI coal mining cost models represent a computerized process engineering approach to the analysis of production costs and mining requirements of either surface or underground mining projects. The models estimate all capital and operating costs typically associated with the preproduction and production phases of a coal mining project, and may be applied either to existing mines or to proposed mine openings.

The models are an updated and computerized version of the original EPRI Coal Mining Cost Models (EA-437, Vols. 1 and 2). In this updated version, data bases have been expanded and now reflect a mid-1980 base year for cost items. The process engineering costing procedure has been improved and an entirely new financial analysis procedure has been developed (P&L statement approach) offering many new financial options to the model user.

The discounted cash flow analysis component of the model solves for the coal value/ton (i.e., production cost/ton F.O.B. mine) or conversely predicts the rate of return on equity when sales revenue/ton is known. Two major financial options allow for the solution of costs in terms of constant or escalating dollars, and in terms of point value or uncertainty estimates. The uncertainty analysis procedure uses a Monte Carlo simulation technique for estimating cost results in terms of frequency distributions.

The models have been designed for use by a variety of technical disciplines ranging from resource planners to mining practicioners. The input parameters have, therefore, been structured to reflect varying degrees of familiarity with mining and cost analysis procedures.

Three levels of input parameters are used in the cost models, -required, default, and override categories. The required category identifies the min-

imum information required to initiate a model run. This category includes basic parameter information describing the physical, operating, and financial aspects of the project. The default category includes more detail or technical parameters which are assigned default values by the model. The override category lists those costs and other values calculated by the model, which may also be input by a model user when detail project information is available.

The models have been designed for use in either a batch or interactive processing mode. The models are documented in four volumes:

Volume 1 - Underground Coal Mining Cost Model
Volume 2 - Users Guide for the Underground Coal Mining Cost Model
Volume 3 - Surface Coal Mining Cost Model
Volume 4 - Users Guide for the Surface Coal Mining Cost Model

Volumes 1 and 3 describe the detail process engineering and financial analysis procedures employed in the underground and surface costing models. Volumes 2 and 4 provide computer application guidance and test cases for both the batch and interactive versions of both models.

EPRI PERSPECTIVE

PROJECT DESCRIPTION

Coal mining costs are key information for utilities using coal and for planners forecasting the future price of coal. Coal mining is a complex process whereby capital and labor are applied to coal reserves in the ground to produce a useful product: coal, ready for shipment to the consumer. In order to gain a better understanding of the factors influencing mining costs and to provide a systematic framework for estimating coal mining costs, a model was developed of the coal mining process. Separate models were developed for underground and surface mines.

These coal mine costing models were originally developed in 1976 and published by EPRI as Final Report EA-437, Coal Mining Cost Models. Volume 1 dealt with underground mines and Volume 2 with surface mines. (Both volumes are out of print.)

PROJECT OBJECTIVES

The objectives of this project under RP1009-2 were (1) to update the data bases in the original models, (2) to build in the capability to provide cost estimates as density functions through the use of Monte Carlo simulation, (3) to provide a more flexible discounted cash flow model, (4) to add the capability to estimate the cost of coal from existing mines, and (5) to computerize the model.

PROJECT RESULTS

A computerized model capable of making estimates of the cost of coal from new and existing coal mines is now available to electric utilities and others. As with any model, the quality of the output is dependent upon the quality of the input and, in the case of this model, upon the user's knowledge of coal mining. In no case are the models a substitute for the detailed geologic and engineering analysis

required prior to signing a large coal contract or opening a mine. EPRI plans to develop or adapt an engineering process model of coal preparation. It will then be integrated into these coal mine costing models. This work should be complete in late 1981.

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ACKNOWLEDGMENTS

The revised EPRI coal mining cost models were completed under the direction of Mr. George W. Toth who served as project manager and principal investigator.

Other staff members, making contributions to this project include Mr. John Annett, who provided computer systems development expertise and Ms. Sylvia Brock, also a systems specialist. Mining engineering support was provided by Mr. Landy Stinnett, who was co-author on the initial version of the coal models.

Testing and review of the completed models were carried out by several utility organizations during the latter part of the study. Mr. Nolan Barker and the staff of the Fossil Fuels Planning Branch of the Tennessee Valley Authority (TVA) deserve particular recognition for their comprehensive evaluation efforts and their many helpful suggestions for improvement to the models.

Mr. Thomas E. Browne, who served as the EPRI project manager, must also be recognized for his direction and constructive involvement throughout the model development effort.

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Section 1

INTRODUCTION

This users guide for the Underground Coal Mining Cost Model is designated Volume 2 of the Coal Mining Cost Model Report.

The purpose of the program described in this volume is to perform the calculational procedures required to analyze the cost and requirements of proposed coal mining projects in order to determine a value or range of values for either the coal value per ton (minimum acceptable selling price) or rate of return on equity. The program specifications are derived from Volume 1 of this report entitled Coal Mining Cost Model. This model utilizes an engineering process approach for determining primary requirements and costs, based on the characteristics of mine property and the underground mining methods to be used. Support requirements and associated costs are computed as a function of the primary requirements. These cost estimates are used to perform the financial analysis, which computes annual cash flow summaries, based on a profit and loss statement approach, to solve the coal value or rate of return.

The computerized implementation of the model incorporates a randomizing feature for performing an uncertainty analysis using a Monte Carlo technique. By invoking this option, designated input and data base values are randomly selected for each iteration of the model, and results are presented in terms of mean and standard deviation. Alternatively, the user may elect the option to have point value results generated by the program.

The program is designed for operation in either an interactive or batch mode. The interactive version, which provides a conversational interface between the user and the model, generates immediate results on the user's terminal. This capability facilitates the input procedures required and variation of model parameters to determine the subsequent effect on model results. The batch version, which can be submitted through an interactive terminal for off-line execution, is more suitable for high speed printing of the financial summary tables available.

This manual describes the use of the computerized underground model, the inputs required, the options available and the output produced. A detailed description of the model specifications implemented by the program is presented in Volume 1 of this report series.

Section 2

SUMMARY

The Underground Coal Mining Cost program consists of six integrated submodels which provide the basic functional capabilities summarized below.

1) Production Sizing

Determines the number of production sections/shift based on the seam characteristics, mining system, yearly design capacity, and working schedule. This information establishes a base line from which equipment, labor requirements and costs are derived.

2) Manpower Requirements and Costs

Compute both hourly and salaried personnel requirements and the corresponding costs.

3) Equipment and Construction

Determines major equipment requirements and capital costs for preproduction capital as well as production capital.

4) Supplies, Materials and Power Cost

The cost per ton of supplies, materials and power is computed as a function of labor productivity.

5) Preproduction Development

Total preproduction development cost is derived from the labor, supplies and power cost. In addition to the cost information, development time in both unit shifts and elapsed years, and the amount of coal produced during the development period are also calculated.

6) Financial Analysis

Using the costs generated by the previous submodels, total capital and operating costs, depreciation, salvage value and investment tax credits are computed on an annual basis and the discounted cash flow analysis is performed. The coal value/ton (or rate of return) solution can be approximated as the resulting present value approaches zero.

In addition to the basic functional capabilities, the code incorporates the following design features :

- The program may be used to solve either coal value/ton or rate of return on equity, at the option of the user.
- Either point value or uncertainty analysis can be performed; all uncertainty analysis results are presented in terms of mean and standard deviation.
- Financial analysis options allow selection of constant or escalating dollar analysis; discretionary expensing or amortization of major capital costs; and alternative depreciation methods.
- Output tables summarizing intermediate results of each submodel can be generated upon request.
- The program is written entirely in Fortran IV for the IBM 3033, and may be executed in either batch or interactive mode.
- In the interactive mode, a list of imput parameters used for any iteration for the uncertainty analysis may be generated upon request.
- Output tables representing results for any coal value/ton (or rate of return) for the uncertainty analysis may be printed.

Section 3

APPLICATION

PROGRAM DESCRIPTION

Two versions of the program have been developed to enhance acessibility of the model in various applications. The interactive version, facilitates the procedure for entering and varying parameter values utilized by the program, and provides immediate results on the user's terminal. The batch version offers the advantage of high speed printing at lower execution cost, and may be accessed when no interactive facilities are available. The two versions are necessary to accomodate variations in the data input procedure and format requirements for printing on two different output devices.

The program structure for both versions consists of the five procedural functions described below. These steps are executed sequentially for each iteration of the model.

1) Process Input Data

Upon initiation of the program, a minimum set of required input data, which define the mining system and the necessary physical, operating, and financial parameters, must be entered by the user. All other input parameters incorporated in the model are optional; values not specified by the user are assigned or evaluated by the program. These values remain in effect for all subsequent cases to be executed, until reassigned by the user or the program is reinitiated.

Two input procedures are incorporated into the interactive version. The required input procedure, which prompts the user for each of the required parameters is entered only once, upon program initiation. Prior to each iteration of the model, the optional input routine is entered, which allows the user to vary any or all input parameters used by the program, including required parameters entered initially. A partial or complete list of these parameters, indicating the current value assigned, is generated upon request from the user.

In the batch version, all input data is processed by one routine. Input is data directed, that is the user specifies both the variable name and numerical value for each parameter to be assigned, in a free-field format. The user is responsible for ensuring that all required input parameters are assigned in the first set of input data. A complete listing of input parameters is automatically generated for each case submitted.

Any number of cases may be submitted for a single run. After completion of all model calculations, control returns to this step to process the next set of input, until an end-of-file is detected.

2) Assign Randomized Variables

To allow for some uncertainty in input parameters which may not be known exactly, the user may specify designated parameters as a range of value (low and high) or as a mean and standard deviation. To further control these variables, the user may specify that equipment and construction parameters should be selected from within the low, high, or total range. Based on these restrictions, this routine will then assign parameter values, prior to each iteration of the model calculations.

For the point value analysis, values are determined as follows:

Cost Range Applicable	Range of Values	Mean/Std. Dev.
Low	$x = x_1 + 1/4(x_2 - x_1)$	$x = \bar{x} - s$
Total	$x = x_1 + 1/2(x_2 - x_1)$	$x = \bar{x}$
High	$x = x_1 + 3/4\ (x_2 - x_1)$	$x = \bar{x} + s$

Where x_1 = low value $\quad \bar{x}$ = mean

x_2 = high value $\quad s$ = standard deviation

For the uncertainty analysis, a standard pseudo random number generator is invoked to generate uniformly distributed numbers between 0 and 1. If a range of values (x_1 , x_2) has been specified, a value is assigned as follows:

$$x = x_1 + R\,(x_2 - x_1)$$

where R is a random number ϵ

$0 \le R \le .5$ for LOW cost range,

$0 \le R \le 1.0$ for TOTAL cost range,

and $.5 < R \le 1.0$ for HIGH cost range.

To implement this algorithm, if the random number generator produces a number R outside the range indicated, the complement (1.0 - R) is used.

If the mean and standard deviation ($\bar{x}$, s) have been specified, a random number is generated to represent the standard normal distribution function.

$$R = \int_{-\infty}^{z} \frac{1}{\sqrt{2\pi}}\, e^{-u2/2}\, du = P\,(Z \le z).$$

The deviation z is determined by table lookup of the distribution function and the parameter value is assigned as follows:

$$x = \bar{x} + z s$$

where $-2 \le z \le 0$ for LOW cost range,

$-2 \le z \le 2$ for TOTAL cost range,

$0 \le z \le 2$ for HIGH cost range.

Control returns to this step of the procedure to randomize imput variables prior to each iteration of the uncertainty analysis.

3) Perform Mining Submodel Calculations

Within this procedure, mining requirements and associated costs for the following five submodels are calculated.

- Production Sizing
- Manpower Requirements
- Equipment and Construction
- Supplies, Materials and Power Costs
- Preproduction Development

Complete specifications for the calculations performed by each of these submodels are presented in Volume 1 of this report and are not repeated here.

Costs derived from data base values established by the model are subjected to the same randomizing procedure described in step 2. Values of all parameters shown in the summary tables for these submodels are accumulated for each iteration of the uncertainty analysis. Upon completion of the specified number of iterations, n, the mean and standard deviation of each parameter is calculated as

$$\bar{x} = \frac{1}{n}\Sigma_i x_i$$

$$s = \frac{1}{n'}\left\{\Sigma x_i^2 - \frac{1}{n}(\Sigma x_i)^2\right\}^{\frac{1}{2}} .$$

This formulation for standard deviation minimizes the amount of storage required during processing.

The number of preproduction years calculated in submodel 5 reflects the uncertainty of the elements; i.e. this value can vary for each iteration of the

uncertainty analysis. Since this variable determines the total number of years in the project, a factor critical in performing the annual discounted cash flow analysis, any variation would produce misleading and inconsistent results. Therefore, the financial analysis is based on the first calculated value of the number of preproduction years, for all iterations of the uncertainty case.

4) Perform Financial Analysis

The first phase of the financial analysis structures the cost developed in the previous submodels for the following three categories:

- Total capital cost analysis
- Depreciation, salvage value, investment tax credit
- Operating cost analysis

The result of these analyses is the allocation and scheduling of all costs and expenses into the appropriate project year in a form amenable to the cash flow analysis. For each iteration of the program, output from each procedure is written to a temporary external file for subsequent generation of the corresponding summary report.

Using the annual costs established in the first phase, a cash flow statement of accounts can be generated for a given dollar value per ton of clean coal. Present value can then be calculated as a function of the annual net cash flow and rate of return.

The objective of this procedure is to solve for coal value or rate or return such that the present value of receipts equate to disbursements (PV = O). This is accomplished by the method of regula falsi (linear interpolation) which is formulated as

$$x_{n+1} = x_n - \frac{(x_n - x_{n-1})\, PV(x_n)}{PV(x_n) - PV(x_{n-1})}$$

Implementation of this algorithm requires two starting values and some convergence criteria, which have been chosen as follows:

	starting values	convergence
coal value:	$x_o = 25,\ x_1 = 50$	$\lvert PV(x_{n+1}) \rvert < 1000$, or $\lvert x_{n+1} - x_n \rvert < .01$
rate of return:	$x_o = 10\%,\ x_2 = 30\%$	$\lvert PV(x_{n+1}) \rvert < 1000$, or $\lvert x_{n+1} - x_n \rvert < .05\%$

To solve for coal value, function evaluation necessitates regeneration of the entire cash flow table for each iteration. However, to solve for rate of return, only the present value calculation must be reevaluated.

In solving for either variable, a maximum of 15 itererations is performed by the program. If the algorithm has not converged when this limit is reached, a message is printed indicating the current values of the variable and present value function, and the case is terminated. Summary tables are printed as requested, presenting the results accumulated to this stage.

The cash flow summary table is recorded on a temporary output file for each iteration for which a solution is found. These individual tables can be printed upon request, in addition to the table summarizing all iterations of the uncertainty case.

5) Print Output Tables

Upon completion of all model calculations, a summary table is printed presenting the coal value/ton or rate of return solution, some basic information regarding the mine situation under analysis, and for the uncertainty option, the cost values by probability ranges. Nine other output tables are available, as described in Section 4, to summarize the results of each of the submodels and each phase of the financial analysis. All of these tables are optional, and are printed only upon request by the user.

The interactive version of the program allows the user to optionally request output tables corresponding to any value of coal value/ton or (rate of return) calculated during the uncertainty analysis.

OPERATING ENVIRONMENT

The Underground Coal Mining Cost program has been implementd on the IBM 3033 computer system under the OS/VS2 operating environment. The code is written entirely in Fortran IV using the G1 level compiler and stored in load module form in an on-line program library.

The interactive version is accessed through TSO (Time Sharing Option) using an interactive terminal with keyboard and printer (or CRT). All input to and output from the program is directed through the user's terminal. The financial summary tables generated by the program have been designed for output on a full carriage length (132 character) terminal. These reports will not be formatted properly if printing is requested from a standard 80 character carriage length terminal.

User input to the batch version is entered in the standard system input SYSIN file, as illustrated in Section 4. All output from the program is directed to the printer assigned to SYSOUT.

Both versions of the program use temporary external files for storing report information during execution. These files are allocated when the program is initiated and are deleted upon termination.

CPU time to process one set of inputs for a typical uncertainty analysis is approximately .6 seconds under this operating environment. A maximum of 192K bytes of virtual storage is required for program execution.

DATA FILES

During batch execution of the Coal Mining Cost program, four temporary external data sets are allocated for storing the financial data presented in the printed summary tables. One unformatted data record containing this information is written to the appropriate data set, for each iteration of the program. Upon completion

of the model calculations for a given set of input, the requested output tables are generated by reading the corresponding data set. All file access is sequential. These files, as identified below, are allocated during execution, and deleted from the system upon termination of the program.

Temporary File Requirements
Batch Mode

Logical Unit	Content	Records Length	Format
16	Table VI - Total Capital Analysis	1628	VS
17	Table VII - Depreciation, Salvage Value, Investment Tax Credit	2916	VS
18	Table VIII- Direct Operating Cost	292	VS
19	Table IX — Cash Flow Summary Table	8644	VS

During interactive execution of the Coal Mining Cost program, six temporary external data sets are allocated for storing the financial data, input parameters and table output information for each iteration of the model. One unformatted data record containing this data is written to the appropriate data set, for each iteration of the program.

Temporary File Requirements
Interactive Mode

Logical Unit	Content	Records Length	Format
15	Input parameters for each iteration- Uncertainty Analysis only	64	VS
16	Table VI - Total Capital Analysis	1628	VS
17	Table VII - Depreciation, Salvage Value, Investment Tax Credit	2916	VS
18	Table VIII - Direct Operating Cost	292	VS
19	Table IX - Cash Flow Summary Table	8644	VS
20	Table I-V - Table Output for each iteration	148	VS

For a typical run of the uncertainty analysis, approximately 20 tracks of 3330 on-line disc storage is required. By storing this data externally, the amount of real memory alloted to the code is minimized, and no limitations are imposed on the number of iterations which may be requested.

Two permanent data sets must be maintained in on-line disc storage for execution of the interactive version. The command list (CLIST) contains the TSO commands used to allocate all data files required for execution and to invoke the program load module. The program itself is stored in a partitioned data set in load module form. Storage requirements for these data sets is approximately 23 tracks of 3330 disc pack.

CONVERSION CONSIDERATIONS

The Underground Coal Mining Cost program is a self-contained code written entirely in Fortran IV. External references are made only to mathematical functions provided by standard Fortran supplied procedures. To facilitate development and simplify subsequent operation of the code, certain IBM extensions to ANS Fortran (X 3.9 - 1966 standard) have been incorporated. Although these features are available on most computer systems, usage as noted below should be recognized and reviewed prior to converting the code to a different system.

- List directed I/O statements
  The interactive version uses this feature to read all numeric data which is processed by the input routine.
- NAMELIST input procedure
  The input routine in the batch version uses the NAMELIST statement for reading all numeric data, to simplify the input procedure and eliminate format requirements.
- END option in READ statement
  This option is implemented in the input routine of the batch version to automatically effect a transfer upon encountering an end-of-file on the user input SYSIN file.

- ENTRY statements

  The discounted cash flow subroutine used one alternate entry point to omit the initial cost calculations and regenerate the cash flow summary table, when solving for coal value/ton. A second alternate entry point is provided for repeating only present value function evaluations when solving for rate of return.

  In addition, subroutines TABLE 1, TABLE 2, TABLE 3, TABLE 4, TABLE 5, TABLE 6, TABLE 7, and TABLE 8 each contain an ENTRY statement for printing tables for any iteration of all uncertainty analysis.

- Statement number as actual argument in CALL

  Asterisk as dummy argument in subroutine

  The program driver, which calls all submodel calculational routines sequentially, makes two uses of this feature; Submodel 1, Production Sizing, uses an alternate return to terminate the case being processed, if zero production sections per shift have been computed, making further calculations impossible. Submodel 6, Financial Analysis, also uses an alternate return to terminate processing, if this iterative procedure fails to converge or provide a solution for any iteration.

Two further items external to the syntax and semantics of the code require consideration for the conversion effort: the random number generator will operate only on 32 bit machines; and the record format and size used for the temporary data files may not be compatible with the file management system implemented on many minicomputers.

Section 4

PROCEDURES AND REQUIREMENTS

INITIATION

To access the interactive version of the Coal Mining Cost program, the user must log on to TSO through an interactive terminal. Execution of the program load module is invoked from the user's terminal by entering an EXEC command to initiate the required command list (CLIST). This CLIST sets the appropriate TSO options, ensures that the input/output files are directed to the user's terminal, allocates the temporary external files, and calls the program into execution.

Contents of the CLIST used at a local installation are listed below.

```
00010 TERM LINESIZE(132)
00020 ATTR DCB15 LRECL(64) RECFM(V,S)
00030 ATTR DCB16 LRECL(1628) RECFM(V,S)
00040 ATTR DCB17 LRECL(6912) RECFM(V,S)
00050 ATTR DCB18 LRECL(292) RECFM(V,S)
00060 ATTR DCB19 LRECL(8644) RECFM(V,S)
00070 ATTR DCB20 LRECL(148) RECFM(V,S)
00080 ALLOC DA(*) F(FT05F001)
00090 ALLOC DA(*) F(FT06F001)
00100 ALLOC FILE(FT15F001) USING(DCB15) NEW
00110 ALLOC FILE(FT16F001) USING(DCB16) NEW
00120 ALLOC FILE(FT17F001) USING(DCB17) NEW
00130 ALLOC FILE(FT18F001) USING(DCB18) NEW
00140 ALLOC FILE(FT19F001) USING(DCB19) NEW
00150 ALLOC FILE(FT20F001) USING(DCB20) NEW
00160 CALL COALIB.LOAD(DEEPI)
00170 FREEALL
END OF DATA
```

The abbreviated form of the EXEC command used to invoke this CLIST is

EXEC DEEP.COAL.

After entering this command, the user will enter the input phase of the model which is described in the next section.

Upon termination of the program, the CLIST frees all files allocated to the user's terminals and returns the system to READY mode.

The batch version of the Coal Mining Cost program may be submitted through either an interactive terminal or a card input deck. The job submission shown below assumes that the program has been compiled and stored in an on-line program library.

```
LIST DEEP.CNTL

 DEEP.CNTL
      //        JOB
      //  EXEC  PGM=DEEP
      //STEPLIB DD DSN=B57I.COALIB.LOAD,DISP=OLD
      //FT16F001 DD DSN=B57I.DS16.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //           DCB=(RECFM=VS,LRECL=1628),SPACE=(TRK,(5,2))
      //FT17F001 DD DSN=B57I.DS17.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //           DCB=(RECFM=VS,LRECL=2916),SPACE=(TRK,(5,2))
      //FT18F001 DD DSN=B57I.DS18.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //           DCB=(RECFM=VS,LRECL=292),SPACE=(TRK,(5,2))
      //FT19F001 DD DSN=B57I.DS19.DATA,DISP=(NEW,DELETE),UNIT=PUBLIC,
      //           DCB=(RECFM=VS,LRECL=8644),SPACE=(TRK,(5,2))
      //FT06F001 DD SYSOUT=A
      //FT05F001 DD *

          (INSERT USER INPUT HERE)

      /*EOF
```

To execute this procedure, an installation dependent job statement must be provided and all JCL statements reviewed for compatibility and modified as necessary.

Any number of input data sets may be submitted for a single run. Processing continues until an end of file is detected on the SYSIN file. Content and format of the input data is discussed in the following section.

INPUT REQUIREMENTS

To facilitate operation of the computerized model, the amount of mandatory input data has been limited to only general information concerning the coal mining project. All other input parameters are assigned or calculated by the

program. To obtain greater flexability and user control, optional input parameters may be entered to override these values. Input parameters have therefore been categorized as follows.

Category 1 - Required input parameters
Category 2 - Optional input parameters (default assigned)
Category 3 - Parameters which override calculated values

The parameters included in each category, designated acronyms required for user reference and valid ranges of data values are presented in Tables 4-1, 4-2, and 4-3 respectively.

Category 1 is the minimum amount of information necessary to run the model. These data must be supplied by the user for the first case run by the program. Category 2 parameters are automatically assigned the default values, as noted in Table 4-2,, when the program is initiated. Category 3 parameters are calculated by the program based on the previous input and model formulation, unless otherwise specified by the user.

All parameters assigned on input remain in effect for the duration of the run, until the value is changed by the user or the program is reinitialized.

The program verifies that all input values are within the valid ranges indicated on each of the tables. The interactive version issues an error message and reentry request for each parameter which exceeds the acceptable range. In the batch version, error messages are issued for all invalid parameters which occured in one input set, the input summary list is generated and the case is terminated.

CATEGORY 1 - REQUIRED INPUT PARAMETERS

Table 4-1 presents a list of all possible required input parameters. Not all of these parameters will be required for every case, as noted below. However, if these conditions are altered for subsequent cases, the user is responsible for providing the necessary information.

Table 4-1

CATEGORY 1 - REQUIRED INPUT PARAMETERS

Parameter	Acronym	Data Type *	Valid Range	Notes
Physical				
Depth of seam (ft.)	DEPT	R	>0	(L,H) or $(\bar{x},s)$ **
Thickness of seam (ft.)	H	R	2.5-8.0	(L,H) or $(\bar{x},s)$
Operating				
Mining system	MINE	A	CONT,CONV,LONG	CONT-Continuous miner CONV-conventional LONG-longwall
Entry type	ENTR	A	SLOP,SHFT,DRFT	
Location of mine	LOC	A	EAST,MIDW,WEST	
Annual production (tons)	YDC	R	>0	
Production life (years)	LIFE	I	1-50	
Financial				
Type of analysis	TYPE	A	UNC,PV	
- equipment cost range	REQ	A	LOW,HIGH,TOT	UNC-uncertainty analysis
- construction cost range	RCON	A	LOW,HIGH,TOT	PV-point value analysis
Portion of initial capital borrowed (%)	DER	R	0-100	
Length of loan payback period (years)	LL	I	1-50	Required if DER>0
Debt servicing rate (%)	DSR	R	0-100	Required if DER>0
Project year	PYR	I		4 digit calendar year
Acquisition cost	AQC	R	>0	(L,H) or $(\bar{x},s)$ **
Dollar analysis	$A	A	CON,ESC	CON-constant dollar analysis ESC-escalation dollar analysis
Base year	BASE	I		Required for constant dollar analysis on y
Labor factor (%)	LF	R	0-100	For constant dollar analysis, enter cost update factors.
Supplies & materials factor (%)	SMF	R	0-100	
Power factor (%)	PF	R	0-100	
Production section factor (%)	PSF	R	0-100	For escalating dollar analysis, enter escalation factors
Haulage system factor (%)	HF	R	0-100	
Auxiliary equipment factor (%)	AF	R	0-100	
Construction factor (%)	CF	R	0-100	
Coal value/ton ($)	CVT	R	>0	Required to solve for rate of return
Escalation factor for CVT (%)	ECVT	R	0-100	Required for escalating dollar analysis only
Rate of return (%)	ROR	R	0-100	Required to solve for coal value/ton
Cost treatment	COST	A	EXP,DEF	EXP-expensed cost treatment DEF-differed cost treatment

* A-alphameric
R-real (decimal required)
I-integer value

** Randomized values are entered as a range (low value, high value) a mean and standard deviation $(\bar{x},s)$. Second value is ignored for point value analyses.

Table 4-2

CATEGORY 2 - OPTIONAL INPUT PARAMETERS

Parameter	Acronym	Data * Type	Valid Range	Default	Notes
Physical					
Seam gradient (degrees)	GRAD	R	0°, 6°	0°,6°	For PV analysis, midpoint is calculated. For UNC analysis, random value within range is selected
Roof conditions	ROOF	A	GOOD,POOR	GOOD,POOR	
Floor conditions	FLOO	A	HARD,RUTT,RTWT	HARD, RTWT	
Gas emission level	GAS	A	LOW, MOD, HIGH	LOW,HIGH	
Reject percentage	REJ	R	0-100	25,3-continuous 17,3-conventional 21,3-longwall	
Operating					
Shifts/day	S	I	1,2,3	2	
Days/year	Y	I	1-365	226	
Type of coal preparation	PREP	A	BREA,CORS,FINE	CORS	BREA-breaking (top sizing) CORS-coarse beneficiations FINE-fine beneficiation
Seam recovery (%)	REC	R	0-100	60,0-cont. & conv. 80,0-longwall	(L,H) or $(\bar{x},s)$**
Operator efficiency factor (%)	OEF	R	0-100	85,4	(L,H) or $(\bar{x},s)$**
Available face time (min)	AFT	R	0-1000	340,15	(L,H) or $(\bar{x},s)$**
Financial					
Indirect capital (%)	ICP	R	0-100	10	Percent of primary capital
Labor overhead (%)	OVHP	R	0-100	40	Percent of direct labor
Union welfare fund payments (per manhour)	UWRM	R	0-10	1.64	
Union welfare fund payments(per ton)	UWRT	R	0-10	1.385	
Royalty payment (%)	ROYP	R	0-100	12.5	
Royalty payment (per ton)	ROYT	R	0-10	0.	
Severance tax (%)	SEVP	R	0-100	0.	
Severance tax (per ton)	SEVT	R	0-100	0.	
State & Local tax (%)	STAX	R	0-100	2.0	
Depreciation Method					
Production section	DMP	A	SL,SY,DDB	SL	SL-straight line
Haulage system	DMH	A	SL,SY,DDB	SL	SY-sum of years digits
Auxiliary equipment	DMA	A	SL,SY,DDB	SL	DDB-double declining balance

* A-alphameric
R-real (decimal required)
I-integer value

** Randomized values are entered as a range (low value, high value) or mean and standard deviation $(\bar{x},s)$. Second value is ignored for point value analysis.

Table 4-3

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

Parameter	Acronym	Data Type*	Valid Range	Notes
Operating				
Tons per machine shift	TPMS	R	>0	(L,H) or $(\bar{x},s)$**
# of production sections/shift	NSPS	I	1-12 cont,conv. 1-2 longwell	
Hourly labor requirements	HLR	R	>0	
Salaried personnel requirements	SPR	R	>0	
Development time (years)	DY	R	1-10	
Coal produced during development (tons)	CD	R	>0	
Financial				
Depreciable life for				assigned values:
production section equipment	DLP	I	1-20	12 - S=1
haulage system equipment	DLH	I	1-20	10 - S=2
auxiliary equipment	DLA	I	1-20	8 - S=3
Hourly labor cost/year	HLC	R	>0	
Salaried personnel cost/year	SPC	R	>0	
Supplies & materials cost/ton	SMCT	R	>0	
Power cost/ton	PCT	R	>0	
Annual operating cost	AOC	R	>0	
Exploration cost	EXPL	R	>0	(L,H) or $(\bar{x},s)$**
Mine abandonment cost	ABND	R	>0	(L,H) or $(\bar{x},s)$**
Working capital	WC	R	>0	(L,H) or $(\bar{x},s)$**
Initial production section cost	PSC	R	>0	(L,H) or $(\bar{x},s)$** equipment range REQ applies
Initial haulage system cost	HSC	R	>0	(L,H) or $(\bar{x},s)$** equipment range REQ applies
Initial auxiliary equipment cost	AEC	R	>0	(L,H) or $(\bar{x},s)$** equipment range REQ applies
Preparation plant & unit train loading	PPC	R	>0	(L,H) or $(\bar{x},s)$** construction range RCON applies
Control Variables				
Number of iterations	NIT	I	1-100	default 1 - PV analysis 20 - UNC analysis
Print tables	PRNT	I	1-9	array contains list of tables, by number to be printed
Print IX	P9	I	0,1	P9=1 indicate Table IX is printed for each uncertainty iteration
Point value data base costs	PVD	I	0,1	PVD = 1 indicates point value data base costs will be used for uncertainty analysis
Point value Category 2 costs	PV_2	I	0,1	PV_2 = 1 indicates point value (or mean) values for Category 2 inputs will be used for uncertainty analysis

* A - alphameric
R - real (decimal required)
I - integer value

** Randomized values are entered as a range (low value, high value) or mean and standard deviation ($\bar{x}$, s).

- If the portion of capital borrowed is zero (DER=0), the debt servicing rate (DSR) and the length of loan payback period (LL) need not be entered for the batch version; prompting messages are suppressed for the interactive version. All three parameters must be assigned if debt occurs in succeeding cases.

- Applicable cost ranges for equipment and construction (REQ,RCON) default to TOT for the batch version; values must be assigned for the interactive version.

- BASE year is required for the constant dollar analysis only. If this value is not set for succeeding cases which change from escalating to constant, 1980 is assigned to BASE.

- Coal value/ton and rate of return are mutually exclusive parameters; only one parameter may be assigned by the user. In the batch version, to change this selection for subsequent cases, the user must set the original variable assigned to zero. This is done automatically in the interactive version.

- The escalation factor for coal value (ECVT) is required for the escalating dollar analysis only.

- All update factors must be assigned for the interactive version. These factors default to zero for the batch version.

For the constant dollar analysis, these factors are used to update the corresponding costs from the 1980 data base values stored in the program to the base year specified by the user. For the escalating dollar analysis, these values represent escalation factors which are applied to the appropriate costs for each year of the project.

When solving for rate of return, the user must specify the coal value/ton. This value should be entered in terms of 1980 dollars for the escalating dollar analysis. For the constant dollar analysis, this amount should be in terms of base year dollars.

Input parameters which may be randomized for the uncertainty analysis are indicated in Table 4-1. For the point value case, only a single value (the first value entered) is used by the program.

The applicable cost ranges for equipment and construction (REQ, RCON) apply only to the designated input parameters in Category 3 and to the corresponding costs calculated within the program.

CATEGORY 2 - OPTIONAL INPUT PARAMETERS (DEFAULT ASSIGNED)

All input parameters listed in Table 4-2 are optional. These parameters assume the default values indicated, unless otherwise specified by the user.

Rates for royalty payments are expressed as a cost/ton (ROYT) or as a percentage of sales revenue (ROYP). Both variables should not be assigned. If both variables have assumed nonzero values, the rate per ton, ROYT, is used by the program.

Similarly, the state and local severance tax rate may be expressed as a cost per ton (SEVT) or as a percentage of gross profit (SEVP). If both values have been assigned a nonzero value by the user, the percentage value, SEVP, calculation is used by the program.

Roof, floor, gas and gradient conditions, which are used to determine the tons per machine shift (TPMS) in submodel 1, may assume ranges of values for either the point value or the uncertainty analysis. Two values of TPMS are calculated, corresponding to the best and worst conditions specified.

For the point value analysis, the midpoint of these two values is used for the remainder of the model calculations. For the uncertainty analysis, a random value within the calculated range is selected.

All other parameters which may be randomized, as indicated in Table apply to the uncertainty analysis only. The point value case selects the first value entered for all model calculations.

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

With the exception of depreciable life, all input parameters in this category, as presented in Table 4-3, are initialized to zero to indicate values should be calculated by the program. To override the program calculations, the user assigns a nonzero value to the appropriate parameter. After a parameter has been assigned for a previous case, it must be reset to zero by the user to resume calculation by the program.

Depreciable life of production section, haulage system, and auxiliary equipment is determined from the number of shifts per day. These three parameters may be overridden individually by the user. Once this option has been exercised, the user assigned values remain in effect for all subsequent cases. However, if this option has not been exercised, these values are reset whenever the shifts/day parameter is assigned.

The tons per machine shift (TPMS) and the number of shift production sections (NSPS) are mutually exclusive parameters and should not both have user assigned values simultaneously. Should this situation occur, the value of TPMS takes precedence, and NSPS is recalculated as a function of TPMS.

For the longwall mining system, the model assumes five continuous miner units for each longwall unit. To override the tons per machine shift (TPMS) calculation for the longwall case, the user enters the total tonnage per shift

for both longwall and continuous sections. The program calculates the tonnage per shift for the longwall units as specified in the model, and derives the tons per shift for each continuous section based on these two values.

The production section, haulage system, and auxiliary equipment costs (PSC, HSC, AEC) and the preparation plant construction cost (PPC) can be specified as ranges for either the point value or uncertainty analysis. Values are assigned based on the applicable cost ranges for equipment and construction. All other parameters, which indicate randomized values are allowed, assume a single value (the first value entered) for the point value case.

CONTROL VARIABLES

Five additional parameters provide further user control over the program functions. The number of iterations performed by the uncertainty analysis (NIT=20 default) may be overridden by the user. At least six iterations are required to properly calculate the mean delta variance.

The printing of nine output tables summarizing the results of each submodel, is requested by assigning the appropriate table numbers to the PRNT parameter. The cash flow summary tables generated for each iteration of the uncertainty analysis may be printed by setting the P9 parameter.

The variables PVD and PV_2 allow the user to specify whether point values or random vlaues should be used for data base costs and Category 2 input parameters, respectively, when performing the uncertainty analysis.

BATCH INPUT FORMAT

The batch input data set consists of two types of input. The first type contains all alphameric parameters to be assigned which must be formatted on the first three lines of each input set. The second type consists of a namelist, which is used to enter all parameters which are assigned numeric values.

Table 4-4 presents a list of all alphameric parameters and the corresponding input format required. The program default values can be specified by leaving

the indicated parameter position blank. However, all three input records are required; i.e., to assign default values to all optional parameters in the third record, a blank line must be entered.

The required input format is summarized below.

Column	1	6	11	16	21	26
line 1	TYPE	$A	COST	REQ	RCON	
line 2	MINE	ENTR	LOC	DMP	DMH	DMA
line 3	ROOF	FLOO	GAS	PREP		

This group of input is followed by a namelist, which is used to enter parameters from all three categories to be assigned numerical values, in the form

$ DATA

    symbolic name = constant

$ END

The following format rules apply.

- The first entry in the input group must be $DATA, beginning in column 2.
- The symbolic name must be a valid parameter name as listed in Tables 4-1, 4-2, and 4-3.
- The constant must be a value in the indicated range. Integer variables must not contain a decimal. Two values are assigned to randomized parameters by separating the entries by a comma (,).
- Parameter assignments are separated by commas. The column locations and order of entry is not significant.
- The end of a data group is signaled by $END, entered in column 2 of the input line.

Table 4-4

BATCH INPUT
ALPHAMERIC INPUT FORMAT

Acromym	Category	Description	Line	Column	Format
TYPE	1	Type of analysis (PV,UNC)	1	1	A4
$A	1	Dollar analysis (CON, ESC)	1	6	A4
COST	1	Cost treatment (DEF,EXP)	1	11	A4
REQ	1*	Equipment cost range applicable (LOW, TOT, HIGH)	1	16	A4
RCON	1*	Construction cost range applicable (LOW, TOT, HIGH)	1	21	A4
MINE	1	Mining system (CONT, CONV, LONG)	2	1	A4
ENTR	1	Type of entry	2	6	A4
LOC	1	Location of mine	2	11	A4
DMP	2	Depreciation method-prod. section	2	16	A4
DMH	2	" " -haulage system	2	21	A4
DMA	2	" " -auxiliary equip	2	26	A4
ROOF	2	Roof conditions	3	1	A4
FLOO	2	Floor conditions	3	6	A4
GAS	2	Gas emission level	3	11	A4
PREP	2	Type of coal preparation	3	16	A4

* default TOT

Parameters to be randomized are assigned two values to specify a range (low value, high value) or a mean and standard deviation ($\bar{x}$, s). The order of entry is significant, since the program compares these two values to determine the usage intended. If the first value is greater, a mean and standard deviation is assumed, e.g.,

DEPT = 500,50

is interpreted as a mean depth of 500', with standard deviation of 50'. If the second value is greater, a range of values is assumed, e.g.,

DEPT = 500,600

results in the program assigning random values between 500' and 600'.

The entire input data set is verified by the program prior to performing any model calculations. Any erroneous parameter codes, or data values assigned which exceed the indicated valid ranges result in error messages issued by the program for each invalid usage. The input summary listing is printed and the program proceeds with the next case.

Any number of cases may be submitted for a single run. The user is responsible for ensuring that all required input is assigned for the first case. Input entered via the namelist remains in effect until the program is terminated; therefore, for subsequent runs, only the parameters to be changed need be entered.

Sample input illustrating two cases submitted for the batch version is shown below.

```
//GO.FT05F001 DD *
UNC  CON  DEF  LOW  LOW
CONT SHAFTEAST      SY   DDB
GOOD
 $DATA
     PRINT=1,2,3,4,5,6,7,8,9,
     YDC=1000000.,  LIFE=15,  DER=50., DSR=10., LL=7,  PYR=1980,
     CVT=25.,    LF=6., SMF=6., PF=6., PSF=8., HF=8., HF=8.,
     CF=9., DEPT=500.,600., H=6.,6.5, ECVT=6., AUC=1500000.
 $END
UNC  ESC  DEF  LOW  LOW
CONT SHAFTEAST      SY   DDB
GOOD
 $DATA
 $END
/*EOF
```

The second case to be run changes the dollar analysis from constant to escalating. All other parameters are held constant. Note that although no namelist parameters are entered for the second case, the delimiters $DATA and $END are still required.

INTERACTIVE INPUT FORMAT

All input is entered from an interactive terminal in a free field format. Values assigned to parameters are entered individually, with two exceptions. For the uncertainty analysis, two values must be entered for parameters to be randomized, either a range (low value, high value) or mean and standard deviation. These two values are entered on one line, separated by blanks or commas, in the order indicated. The PRNT parameter represents an array of values itemizing which of the nine output tables are to be printed. These values are also separated by blanks or commas and followed by a slash (/)e.g.,

PRNT: 1 2 4 /

indicates only Tables I, II and IV are to be printed. The slash signifies to the program that only these three numbers are to be read; the full array size of nine entries is not required. If the trailing slash is omitted, the program hangs in a wait state for the full array of input. Should this occur, enter the slash followed by a carriage return to resume processing.

Sample dialogs between the user and the program in the required input section are shown in Figures 4-1 and 4-2.

For the first procedure two values are requested for the randomized parameters, since an uncertainty analysis has been specified. The seam thickness is entered as a range of values between 5' and 6' (5 < 6). The depth of seam is assigned a mean of 500' and standard deviation of 50 (500 > 50).

The second procedure, shown in Figure 4-2, specifies a point value analysis; hence, single values for all input parameters are requested. For the constant

```
EX DEEP

                      UNDERGROUND COAL MINING COST MODEL
*********************************************************************

ENTER MINING SYSTEM  (CONT,CONV,LONG)
CONV

ENTER MINE ENTRY TYPE  (SLOPE,SHAFT,DRIFT)
SHAFT

ENTER LOCATION OF MINE  (EAST,MIDW,WEST)
MIDW

ENTER TYPE OF ANALYSIS (PV-POINT VALUE, UNC-UNCERTAINTY)
UNC

ENTER COST RANGE APPLICABLE  (LOW,HIGH,TOT)
- EQUIPMENT
TOT
- CONSTRUCTION
HIGH

ENTER THICKNESS OF SEAM (2.5-8 FT)  (LOW,HIGH OR MEAN,STD DEV)
5 6

ENTER DEPTH OF SEAM (FT)  (LOW,HIGH OR MEAN,STD DEV)
500,50

ENTER ANNUAL PRODUCTION (TONS)
750000

ENTER PRODUCTION LIFE  (1-50 YEARS)
25

ENTER FIRST CALENDAR YEAR OF PROJECT
1979

ENTER TYPE OF DOLLAR ANALYSIS  (CON,ESC)
ESC

ENTER ESCALATION FACTORS FOR
LABOR
5
SUPP & MAT
2
POWER
2
PROD SECT
2
HAULAGE
4
AUXILIARY
4
CONST
6
```

SAMPLE INTERACTIVE DIALOGUE

Figure 4-1[1]

```
ENTER PORTION OF CAPITAL BORROWED (%)
50

ENTER DEBT SERVICING RATE (%)
10

ENTER LENGTH OF LOAN PAYBACK PERIOD (YEARS)
10

ENTER COAL VALUE/TON  (ENTER 0 IF CALCULATED)
0

ENTER ESCALATION FACTOR FOR COAL VALUE
6

ENTER RATE OF RETURN (%)
20

ENTER ACQUISITION COST  (LOW,HIGH OR MEAN,STD DEV)
100000,0

** INITIAL INPUT SEQUENCE COMPLETE **

** OPTIONAL INPUT SECTION **

TO CHANGE A PARAMETER VALUE ENTER THE CODE FOR THE PARAMETER
YOU WILL THEN BE PROMPTED FOR A NEW VALUE
TO OBTAIN A LIST OF OPTIONS ENTER "LIST" IN PLACE OF CODE
TO TERMINATE INPUT ENTER "END" IN PLACE OF CODE

ENTER PARAMETER CODE, "END", OR "LIST"
DEF
DEF  =   85.0,4.0E+00  ENTER NEW VALUE -
75,5

ENTER PARAMETER CODE, "END", OR "LIST"
ROYT
ROYT =    0.  ENTER NEW VALUE -
.65

ENTER PARAMETER CODE, "END", OR "LIST"
ROYP
ROYP =   13.  ENTER NEW VALUE -
0

ENTER PARAMETER CODE, "END", OR "LIST"
PRNT
PRNT =  0
ENTER NEW VALUES  (ENTER "/" AFTER LAST VALUE)
1 2 3 4 5/

ENTER PARAMETER CODE, "END", OR "LIST"
END
```

SAMPLE INTERACTIVE DIALOGUE

Figure 4-1(2)

```
                    UNDERGROUND COAL MINING COST MODEL
********************************************************************************

ENTER MINING SYSTEM  (CONT,CONV,LONG)
CONT

ENTER MINE ENTRY TYPE  (SLOPE,SHAFT,DRIFT)
SLOPE

ENTER LOCATION OF MINE  (EAST,MIDW,WEST)
EAST

ENTER TYPE OF ANALYSIS (PV-POINT VALUE, UNC-UNCERTAINTY)
PV

ENTER COST RANGE APPLICABLE  (LOW,HIGH,TOT)
- EQUIPMENT
LOW
- CONSTRUCTION
LOW

ENTER THICKNESS OF SEAM  (2.5-8 FT)
4

ENTER DEPTH OF SEAM (FT)
600

ENTER ANNUAL PRODUCTION (TONS)
500000

ENTER PRODUCTION LIFE  (1-50 YEARS)
20

ENTER FIRST CALENDAR YEAR OF PROJECT
1980

ENTER TYPE OF DOLLAR ANALYSIS  (CON,ESC)
CON

ENTER BASE YEAR
1980

ENTER COST UPDATE FACTORS FOR
LABOR
5
SUPP & MAT
2
POWER
5
PROD SECT
3
HAULAGE
3
AUXILIARY
3
CONST
5

ENTER PORTION OF CAPITAL BORROWED (%)
0

ENTER COAL VALUE/TON  (ENTER 0 IF CALCULATED)
25

ENTER ACQUISITON COST
100000

** INITIAL INPUT SEQUENCE COMPLETE **
```

SAMPLE INTERACTIVE DIALOGUE

Figure 4-2

dollar analysis, the program prompts the user for the base year. Note that since the portion of capital borrowed is zero, prompting messages for debt servicing rate and loan payback period has been suppressed.

The optional input section of the program is entered prior to each iteration of the model. In this section, the user has access to all input parameters used by the program, including the required input entered initially. No individual prompting messages are issued by this section of the program. The user must enter the appropriate parameter code to select the parameter to be changed. A full listing of all available parameters, the corresponding codes used for identification, and the current values assigned is presented in Figure 4-3.

Upon entering this section, the user is first given some simple instructions, and then asked to enter either a code name for a parameter, or a "LIST" or "END command. To change a parameter value, the user enters the appropriate parameter code, which is checked by the program for validity. If the code is not valid, a message is printed and the user asked to reenter the code. If a valid code is entered, the program prints the current value of that parameter and then asks the user to enter a new value. The program compares the new value against the corresponding allowable range. If the value entered is out of range, a message is printed indicating the valid range and the user is asked to reenter. If the value is accepted by the model, the program asks for the next command. The optional input procedure is illustrated in Figure 4-1 (2).

The "LIST" command produces the full listing of current input parameters, as illustrated in Figure 4-3. This listing reflects the input data entered for the required parameters and the default values assigned by the program for the optional parameters.

```
ENTER PARAMETER CODE, "END", OR "LIST"
LIST
```

SUMMARY OF INPUT PARAMETERS

CONTROL VARIABLES

NUMBER OF ITERATIONS	NIT		1
PRINT TABLES	PRNT	0	
POINT VALUE DATA BASE COSTS (0-NO,1-YES)	PVD		1
POINT VALUE CATEGORY INPUTS (0-NO,1-YES)	PV2		1

CATEGORY 1 - REQUIRED INPUT PARAMETERS

PHYSICAL	ACRONYM		
DEPTH OF SEAM (FT)	DEPT	600.	0.
THICKNESS OF SEAM (FT)	H	4.	0.
OPERATING			
MINING SYSTEM	MINE	CONT	
ENTRY TYPE	ENTR	SLOP	
LOCATION OF MINE	LOC	EAST	
ANNUAL PRODUCTION (TONS)	YDC	500000.	
PRODUCTION LIFE (YEARS)	LIFE	20	
FINANCIAL			
LENGTH OF LOAN PAYBACK PERIOD (YEARS)	LL	7	
PORTION OF INITIAL CAPITAL BORROWED (%)	DER	50.0	
DEBT SERVICING RATE (%)	DSR	10.0	
PROJECT YEAR	PYR	1980	
ACQUISITION COST	AQC	100000.	0.
TYPE OF ANALYSIS	TYPE	PV	
COST RANGE APPLICABLE			
- EQUIPMENT	REQ	LOW	
- CONSTRUCTION	RCON	LOW	
CONSTANT DOLLAR ANALYSIS ($A) - UPDATE FACTORS			
- BASE YEAR	BASE	1980	
- LABOR	LF	5.00	
- SUPPLIES & MATERIALS	SMF	5.00	
- POWER	PF	5.00	
- PRODUCTION SECTION	PSF	5.00	
- HAULAGE SYSTEM	HF	5.00	
- AUXILIARY EQUIPMENT	AF	5.00	
- CONSTRUCTION	CF	9.00	
COAL VALUE/TON	CVT	25.00	
ESCALATION FOR CVT	ECVT	0.0	
DEFERRED COST TREATMENT	COST		

OPTIONAL INPUT LISTING

Figure 4-3(1)

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
SEAM GRADIENT (DEGREES)	GRAD	0.	6.
ROOF CONDITIONS	ROOF	GOOD	POOR
FLOOR CONDITIONS	FLOO	HARD	RTWT
GAS EMISSION LEVEL	GAS	LOW	HIGH
REJECT PERCENTAGE	REJ	25.	3.
OPERATING			
SHIFTS/DAY	S	2	
DAYS/YEAR	Y	226	
TYPE OF COAL PREPARATION	PREP	CORS	
SEAM RECOVERY	REC	60.	0.
OPERATOR EFFICIENCY	OEF	85.	4.
AVAILABLE FACE TIME	AFT	340.	15.
FINANCIAL			
INDIRECT CAPITAL (%)	ICP	10.00	
LABOR OVERHEAD (%)	OVHP	40.00	
UNION WELFARE FUND PAYMENTS (PER MANHOUR)	UWRM	1.64	
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.39	
ROYALTY PAYMENT (PERCENTAGE)	ROYP	12.50	
ROYALTY PAYMENT (PER TON)	ROYT	0.0	
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0	
SEVERANCE TAX (PER TON)	SEVT	0.0	
STATE & LOCAL TAX	STAX	2.00	
DEPRECIATION METHOD			
- PRODUCTION SECTION EQUIPMENT	DMP	SL	
- HAULAGE SYSTEM	DMH	SL	
- AUXILIARY EQUIPMENT	DMA	SL	

OPTIONAL INPUT LISTING

Figure 4-3(2)

```
CATEGORY 3  -  PARAMETERS WHICH OVERRIDE CALCULATED VALUES

    OPERATING
    ---------
        TONS PER MACHINE SHIFT                          TPMS        0.    0.
        # OF PRODUCTION SECTIONS/SHIFT                  NOPS         0
        HOURLY LABOR REQUIREMENTS                       HLR         0.
        SALARIED PERSONNEL REQUIREMENTS                 SPR         0.
        DEVELOPMENT TIME (YEARS)                        DY          0.
        COAL PRODUCED DURING DEVELOPMENT (TONS)         CD          0.

    FINANCIAL
    ---------

        DEPRECIABLE LIFE
             - PRODUCTION SECTION EQUIPMENT             DLP         10
             - HAULAGE SYSTEM                           DLH         10
             - AUXILIARY EQUIPMENT                      DLA         10
        HOURLY LABOR COST/YEAR                          HLC         0.
        SALARIED PERSONNEL COST/YEAR                    SPC         0.
        SUPPLIES & MATERIALS COST/TON                   SMCT        0.
        POWER COST/TON                                  PCT         0.
        ANNUAL OPERATING COST                           AOC         0.
        INITIAL PRODUCTION SECTION COST                 PSC         0.    0.
        INITIAL HAULAGE SYSTEM COST                     HSC         0.    0.
        INITIAL AUXILIARY EQUIPMENT COST                AEC         0.    0.
        PREPARATION PLANT & UNIT TRAIN LOADING          PREP        0.    0.
        EXPLORATION COST                                EXPL        0.    0.
        MINE ABANDONMENT COST                           ABND        0.    0.
        WORKING CAPITAL                                 WC          0.    0.

ENTER PARAMETER CODE, "END", OR "LIST"
```

OPTIONAL INPUT LISTING

Figure 4-3(3)

A partial listing can be produced by entering LISTn where n is an integer from 1 to 3 which indicates the section to be listed. This command lists the parameters within a designated category as follows:

LIST 1	Category 1	- Required input parameters
LIST 2	Category 2	- Optional parameters (default assigned)
LIST 3	Category 3	- Parameters which override calculated values.

Control variables are printed only when a full listing is requested.

The "END" command is used to terminate the optional input section and proceed with the model calculations.

Optionally, the user may request a listing of input parameters for any iteration of the uncertainty analysis in the interactive mode by inputting the proper response to the user terminal messages.

OUTPUT DESCRIPTION

All output generated by the Coal Mining Cost Model is directed to the user's terminal by the interactive version, and to an offline printer for the batch version. For each case performed by the program, a summary table is printed showing the solution obtained by the code (either coal value/ton or rate of return), some basic information regarding the mining situation under analysis, and for the uncertainty case, the probability of occurrence for a range of values.

Nine other output tables are available for printing upon request by the user. These tables summarize the intermediate results of eachof the submodels and each phase of the financial analysis, as described below. For the uncertainty case, the mean and standard deviation is shown for all output parameters. Samples of all possible program output are shown in the test cases presented in Section 5.

In the interactive mode the user may request tables to be printed for any iteration of the uncertainty analysis by responding to the terminal messages.

Table 1 - Production Sizing

This table summarizes the production section requirements determined by the type of mining system and seam characteristics or derived from the overriding optional user assigned parameters, if appropriate.

Table II - Manpower Requirements

The total manpower requirements, both hourly and salaried, and the associated costs are computed as a function of the number of production sections per day. The total manpower requirements include production section labor, support labor, and preparation plant personnel, if appropriate. The cost per ton shown in this table indicates the cost attributed to the payroll components.

Table III- Equipment and Construction

Equipment and construction costs are summarized for both preproduction and production phases of the mining operation. Preproduction costs refer to expenditures for items during construction and development. The production phase refers to the time period which begins when the last production unit is entered into the mine and terminates at the end of mine life.

Table IV- Supplies, Materials and Power

The cost/ton of supplies, materials and power as shown in this table is calculated as a function of labor cost per ton, unless overriding values are assigned by the user.

Table V - Preproduction Development

The preproduction development costs reflect the total costs incurred during the period in which the production sections are being entered into the mine. The

development time and amount of coal produced during development time and amount of coal produced during development for the mining system under study is also shown here. The total construction plus development time, which is used to determine the number of years in the project, is fixed on the first iteration of the model.

Table VI - Total Capital Analysis

This table presents an annual breakdown of all costs incurred in both the initial and deferred cost category. Initial capital refers to capital expenditures incurred prior to the first year of full production. Deferred capital refers to capital expenses incurred after full production begins. The calendar year and relative project year in which each cost is incurred is also shown on the table. All costs have been escalating dollar option has been requested.

Tabel VII - Depreciation, Salvage Value, Investment Tax Credit

This table itemizes the depreciation charge, salvage value, and investment tax credit applicable in each year of the project life, for the following four capital cost categories: production section equipment, haulage system, auxiliary equipment and entry haulage system. The depreciation method, depreciable life, and salvage value percentage corresponding to each of the cost categories is also shown. If the escalating dollar option has been exercised, costs listed in the table are the escalated dollar values.

Table VIII - Direct Operating Costs

The annual costs listed in this table are for labor, labor overhead charges, supplies and materials, power, union welfare and insurance. In the constant dollar option, all operating costs remain constant for the entire production phase of the project. In the escalating dollar case, a weighted escalation factor is applied to the insurance costs. All other costs are escalated by the designated user input factors.

Table IX - Cash Flow Summary Table

This table presents the results of the annual discounted cash flow analysis which culminates in the present value evaluation. Each of the 36 cashflow line items, as described in the model definition, are printed for each year of the project life. The cash flow table generated for each iteration of the uncertainty analysis may be printed upon request.

ERROR AND RECOVERY

Several types of errors can occur in the operation of the system. These can be broken down into the following categories, with the appropriate recovery procedures noted for each type.

- Invalid Names in Data Entry

The batch version uses a data directed input procedure, which assigns an input value to the appropriate variable name. Invalid names cause a system error message to occur. Although processing continues, the remainder of the NAMELIST input is ignored and therefore, input parameters will not be set as requested. Verify that all variable names conform to those established in the input list summary and resubmit. The interactive version issues an error message and reentry request to allow on-line correction of the invalid parameter name.

- Invalid Data

Valid ranges for all input data are defined in Section 4.2. During the data editing procedure, the program verifies that all input data conform to these requirements. Erroneous entries are identified with an appropriate message indicating the valid range. The interactive version provides for on-line correction. In the batch version, the case is terminated, and must be resubmitted by the user after correcting the invalid entry.

- Program Interruption

The command list which involves the interactive version allocates the temporary files required for processing to the user's terminal. Upon normal termination of the program, these files are freed before returning the system to the READY mode. If this procedure is interrupted by the user by hitting BREAK during program execution, the user must enter a FREEALL command prior to reinititating the program procedure.

- Convert Illegal Character

This message is issued by the system during execution of the interactive program, if an alphameric character is entered when the program expects a numerical value. The "standard fixup taken" is to set the requested parameter to zero. Connect this entry by reassigning the value in the optional input section.

- Production Sections Calculated

This message is issued by Submodel 1 when the number of production sections per shift becomes zero, which prohibits further model calculations. This situation is not strictly an error in the operation of the program, but may indicate the mine is too small for application of this model. Verify that all input parameters have been received correctly by the code by reviewing the input listing.

- No Convergence

This message is issued by the financial model to indicate no solution can be obtained for the current case. Again, this situation is not necessarily due to invalid operation of the code. Imposing more restrictive limitations on the range of randomized variables may yield a solution. Also verify that input parameters have been correctly assigned.

Section 5

SAMPLE TEST CASES

On the following pages of this section two test cases have been included to illustrate the usage of the computerized model and to assist in program validation. For the first case, a terminal session has been reproduced in its entirety to demonstrate the interactive version of the program. The second case illustrates all of the output tables available as generated by the batch version of the program.

TEST CASE 1

Case 1 solves for coal value per ton using the uncertainty analysis for the longwall mining system, to illustrate the required input entered by the user in response to program prompting. In the optional input section, several parameters which were assigned default values by the program are overriden, and printing of the first five tables is requested.

```
EX DEEP

                        UNDERGROUND COAL MINING COST MODEL
*******************************************************************************

ENTER MINING SYSTEM  (CONT,CONV,LONG)
LONG

ENTER MINE ENTRY TYPE  (SLOPE,SHAFT,DRIFT)
SHAFT

ENTER LOCATION OF MINE  (EAST,MIDW,WEST)
WEST

ENTER TYPE OF ANALYSIS (PV-POINT VALUE, UNC-UNCERTAINTY)
UNC

ENTER COST RANGE APPLICABLE  (LOW,HIGH,TOT)
- EQUIPMENT
LOW
- CONSTRUCTION
TOT

ENTER THICKNESS OF SEAM (2.5-8 FT)  (LOW,HIGH OR MEAN,STD DEV)
5 6

ENTER DEPTH OF SEAM (FT)  (LOW,HIGH OR MEAN,STD DEV)
500 0

ENTER ANNUAL PRODUCTION (TONS)
1500000

ENTER PRODUCTION LIFE  (1-50 YEARS)
20

ENTER FIRST CALENDAR YEAR OF PROJECT
1980

ENTER TYPE OF DOLLAR ANALYSIS  (CON,ESC)
CON

ENTER BASE YEAR
1980

ENTER COST UPDATE FACTORS FOR
LABOR
0
SUPP & MAT
0
POWER
5
PROD SECT
5
HAULAGE
5
AUXILIARY
2
CONST
2
```

```
ENTER PORTION OF CAPITAL BORROWED (%)
60

ENTER DEBT SERVICING RATE (%)
10

ENTER LENGTH OF LOAN PAYBACK PERIOD (YEARS)
10

ENTER COAL VALUE/TON  (ENTER 0 IF CALCULATED)
0

ENTER RATE OF RETURN (%)
18

ENTER ACQUISITION COST  (LOW,HIGH OR MEAN,STD DEV)
100000 0

** INITIAL INPUT SEQUENCE COMPLETE **

** OPTIONAL INPUT SECTION **

TO CHANGE A PARAMETER VALUE ENTER THE CODE FOR THE PARAMETER
YOU WILL THEN BE PROMPTED FOR A NEW VALUE
TO OBTAIN A LIST OF OPTIONS ENTER "LIST" IN PLACE OF CODE
TO TERMINATE INPUT ENTER "END" IN PLACE OF CODE

ENTER PARAMETER CODE, "END", OR "LIST"
ROOF
ROOF = GOOD,POOR ENTER FIRST VALUE -
GOOD
ENTER SECOND VALUE


ENTER PARAMETER CODE, "END", OR "LIST"
FLOO
FLOO = HARD,RTWT ENTER FIRST VALUE -
RTWT
ENTER SECOND VALUE


ENTER PARAMETER CODE, "END", OR "LIST"
GAS
GAS  = LOW ,HIGH ENTER FIRST VALUE -
LOW
ENTER SECOND VALUE


ENTER PARAMETER CODE, "END", OR "LIST"
PRNT
PRNT =  0
ENTER NEW VALUES  (ENTER "/" AFTER LAST VALUE)
1 2 3 4 5/

ENTER PARAMETER CODE, "END", OR "LIST"
LIST
```

SUMMARY OF INPUT PARAMETERS

CONTROL VARIABLES

NUMBER OF ITERATIONS	NIT	20	
PRINT TABLES	PRNT	1 2 3 4 5	
PRINT IX FOR EACH ITERATIONS	P9	0	
POINT VALUE DATA BASE COSTS (0-NO,1-YES)	PVD	1	
POINT VALUE CATEGORY INPUTS (0-NO,1-YES)	PV2	1	

CATEGORY 1 - REQUIRED INPUT PARAMETERS

PHYSICAL	ACRONYM		
DEPTH OF SEAM (FT)	DEPT	500.	0.
THICKNESS OF SEAM (FT)	H	5.	6.
OPERATING			
MINING SYSTEM	MINE	LONG	
ENTRY TYPE	ENTR	SHFT	
LOCATION OF MINE	LOC	WEST	
ANNUAL PRODUCTION (TONS)	YIC	1500000.	
PRODUCTION LIFE (YEARS)	LIFE	20	
FINANCIAL			
LENGTH OF LOAN PAYBACK PERIOD (YEARS)	LL	10	
PORTION OF INITIAL CAPITAL BORROWED (%)	DER	60.0	
DEBT SERVICING RATE (%)	DSR	10.0	
PROJECT YEAR	PYR	1980	
ACQUISITION COST	AQC	1000000.	0.
TYPE OF ANALYSIS	TYPE	UNC	
COST RANGE APPLICABLE			
- EQUIPMENT	REQ	LOW	
- CONSTRUCTION	RCON	TOT	
CONSTANT DOLLAR ANALYSIS ($A) - UPDATE FACTORS			
- BASE YEAR	BASE	1980	
- LABOR	LF	0.0	
- SUPPLIES & MATERIALS	SMF	0.0	
- POWER	PF	5.00	
- PRODUCTION SECTION	PSF	5.00	
- HAULAGE SYSTEM	HF	5.00	
- AUXILIARY EQUIPMENT	AF	2.00	
- CONSTRUCTION	CF	2.00	
ESCALATION FOR OUT	ECUT	0.0	
RATE OF RETURN	ROR	16.00	
DEFERRED COST TREATMENT	COST		

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
SEAM GRADIENT (DEGREES)	GRAD	0.	6.
ROOF CONDITIONS	ROOF	GOOD	
FLOOR CONDITIONS	FLOO	FTWT	
GAS EMISSION LEVEL	GAS	LOW	
REJECT PERCENTAGE	REJ	21.	3.
OPERATING			
SHIFTS/DAY	S	2	
DAYS/YEAR	Y	226	
TYPE OF COAL PREPARATION	PREP	CORS	
SEAM RECOVERY	REC	80.	0.
OPERATOR EFFICIENCY	OEF	85.	4.
AVAILABLE FACE TIME	AFT	340.	15.
FINANCIAL			
INDIRECT CAPITAL (%)	ICP	10.00	
LABOR OVERHEAD (%)	OVHP	40.00	
UNION WELFARE FUND PAYMENTS (PER MANHOUR)	UWRM	1.64	
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.39	
ROYALTY PAYMENT (PERCENTAGE)	ROYP	8.00	
ROYALTY PAYMENT (PER TON)	ROYT	0.0	
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0	
SEVERANCE TAX (PER TON)	SEVT	0.0	
STATE & LOCAL TAX	STAX	2.00	
DEPRECIATION METHOD			
- PRODUCTION SECTION EQUIPMENT	DMP	SL	
- HAULAGE SYSTEM	DMH	SL	
- AUXILIARY EQUIPMENT	DMA	SL	

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

OPERATING

TONS PER MACHINE SHIFT	TPMS	0.	0.
# OF PRODUCTION SECTIONS/SHIFT	NSPS	0	
HOURLY LABOR REQUIREMENTS	HLR	0.	
SALARIED PERSONNEL REQUIREMENTS	SPR	0.	
DEVELOPMENT TIME (YEARS)	DY	0.	
COAL PRODUCED DURING DEVELOPMENT (TONS)	CD	0.	

FINANCIAL

DEPRECIABLE LIFE			
- PRODUCTION SECTION EQUIPMENT	DLP	10	
- HAULAGE SYSTEM	DLH	10	
- AUXILIARY EQUIPMENT	DLA	10	
HOURLY LABOR COST/YEAR	HLC	0.	
SALARIED PERSONNEL COST/YEAR	SPC	0.	
SUPPLIES & MATERIALS COST/TON	SMCT	0.	
POWER COST/TON	PCT	0.	
ANNUAL OPERATING COST	AOC	0.	
INITIAL PRODUCTION SECTION COST	PSC	0.	0.
INITIAL HAULAGE SYSTEM COST	HSC	0.	0.
INITIAL AUXILIARY EQUIPMENT COST	AEC	0.	0.
PREPARATION PLANT & UNIT TRAIN LOADING	PREP	0.	0.
EXPLORATION COST	EXPL	0.	0.
MINE ABANDONMENT COST	ABND	0.	0.
WORKING CAPITAL	WC	0.	0.

ENTER PARAMETER CODE, "END", OR "LIST"
END

OPTIONAL INPUT COMPLETED

UNCERTAINTY ANALYSIS

ITERATION	COAL VALUE/TON
1	27.37
2	28.97
3	30.12
4	28.05
5	28.80
6	31.62
7	27.57
8	27.29
9	28.43
10	31.61
11	29.00
12	31.51
13	32.21
14	29.08
15	34.17
16	30.01
17	32.66
18	34.56
19	29.77
20	29.11

CONSTANT DOLLAR CASE - UNCERTAINTY OPTION

	MEAN	STD DEV
COAL VALUE/TON	30.49	2.19
MEAN DELTA VARIANCE	-0.18 -	0.25
PROJECT START YEAR	1980	
FULL PRODUCTION YEARS	1986 - 2006	
ANNUAL PRODUCTION LEVEL	987865.	
VALUE/TON ESCALATION FACTOR	0.0	
RATE OF RETURN ON EQUITY (%)	18.00	
CAPITALIZATION		
- DEBT (%)	60.00	
- EQUITY (%)	40.00	
DEBT SERVICING PERCENTAGE	10.00	
# OF ITERATIONS	20	

PROBABILITY OF OCCURRANCE	RANGE OF VALUES
95%	26.19 - 34.79
90%	26.89 - 34.09
85%	27.34 - 33.64
80%	27.69 - 33.29
70%	28.22 - 32.77
60%	28.66 - 32.33

I PRODUCTION SIZING

	MEAN	STD DEV
ACTUAL RAW COAL PRODUCTION	1858203.	74575.
SHIFT OUTPUT PER PRODUCTION SECTION	2784.	165.
NO. PRODUCTION SECTIONS PER SHIFT	1.	
ACTUAL TONS OF CLEAN COAL PRODUCED	957868.	76319.

==========

II MANPOWER REQUIREMENTS

(1980 DOLLARS)

	MEAN	STD DEV
HOURLY LABOR		
HOURLY LABOR REQUIREMENTS/DAY	202.	0.
HOURLY LABOR REQUIREMENTS PER SHIFT PRODUCTION SECTION	17.	0.
DIRECT LABOR COST PER SHIFT PRODUCTION SECTION ($)	1399.	3.
DIRECT ANNUAL HOURLY LABOR COST ($)	3683424.	1996.
TOTAL ANNUAL UNION WELFARE COST ($)	1965523.	105780.
SALARIED PERSONNEL		
ANNUAL REQUIREMENTS	45.	0.
DIRECT ANNUAL COSTS ($)	1327495.	3606.
TOTAL MANPOWER		
DIRECT COSTS ($)	5010914.	10033.
PRODUCTIVITY PER MANDAY	17.73	1.37

III EQUIPMENT AND CONSTRUCTION COSTS
(1980 DOLLARS)

	MEAN	STD DEV
PRODUCTION EQUIPMENT		
PRODUCTION SECTION COSTS	12379456.	3664.
PREPRODUCTION HAULAGE SYSTEM COSTS	2142473.	3831.
PRODUCTION PHASE HAULAGE SYSTEM COSTS	623589.	63807.
AUXILIARY EQUIPMENT COSTS	156355.	302.
SITE PREPARATION AND CONSTRUCTION		
PREPRODUCTION VENTILATION CONSTRUCTION	3726003.	9595.
PRODUCTION PHASE VENTILATION CONSTRUCTIO	1514968.	145637.
MINE ENTRY CONSTRUCTION	2744994.	5552.
ENTRY HOIST SYSTEM	630000.	114.
PREPARATION PLANT CONSTRUCTION	3607960.	363841.
OTHER SURFACE CONSTRUCTION	1980000.	0.
EXPLORATION		
TOTAL COST OF EXPLORATION	875024.	34465.
MINE ABANDONMENT		
TOTAL COST OF ABANDONMENT	160000.	0.

IV SUPPLIES, MATERIALS & POWER COST
(1980 DOLLARS)

	MEAN	STD DEV
SUPPLIES & MATERIALS		
COST/TON OF CLEAN COAL	4.41	0.34
ANNUAL COST	4331384.	10322.
POWER		
COST/TON OF CLEAN COAL	0.48	0.03
ANNUAL COST	467715.	8448.
TOTAL		
SUPPLIES, MATERIAL AND POWER COST/TON	4.89	0.36
ANNUAL COST(SUPP., MAT., & POWER)	4799097.	18203.

U PREPRODUCTION DEVELOPMENT
(1980 DOLLARS)

	MEAN	STD DEV
DIRECT DEVELOPMENT COSTS		
LABOR	12616578.	581953.
SUPPLIES, MATERIALS	7760252.	254827.
POWER	702299.	17559.
PAYROLL OVERHEAD	5046627.	232873.
UMW WELFARE FUND	3678302.	117602.
TOTAL COSTS	29803968.	1074502.
OTHER DATA		
DEVELOPMENT TIME (YEARS)	3.79	0.15
DEVELOPMENT TIME (UNIT SHIFTS)	5427.	272.
COAL PRODUCED DURING DEVELOPMENT	1766504.	100947.
TOTAL CONSTRUCTION & DEVELOPMENT TIME	6	

==========

DO YOU WISH TO SEE A SUMMARY OF INPUT PARAMETERS FOR ANY ITERATION ? (YES/NO)
NO

DO YOU WISH TO SEE TABLES PRODUCED FOR ANY ITERATION ? (YES/NO)
NO

DO YOU WISH TO CONTINUE? (YES/NO)
NO

*** NORMAL TERMINATION ***
READY

TEST CASE 2 and 3

The output shown on the following pages were generated by the batch version of the program using the input data set shown below.

```
UNC  CON  DEF  LOW  LOW
CONT SHAFTEAST       SY    DDB
GOOD
 $DATA
     PRINT=1,2,3,4,5,6,7,8,9,
     YDC=1000000.,  LIFE=15,  DER=50.,DSR=10., LL=7,  PYR=1980,
     ROR=15., LF=6., SMF=6., PF=6., PSF=8., AF=8.,  HF=8., CF=9.,
     NSPS=8,PSC=9000000.,HSC=2000000.,PVD=0,
     BASE=1980, DEPT=500., 600.,  H=6., 6.5,  ECVT=9., AQC=1500000.
 $END
```

This input data set requests an uncertainty analysis to solve for coal value per ton, using the constant dollar analysis. All nine output tables have been printed.

A second input data sets performs a point value analysis to solve for the rate of return on equity. All other namelist parameters remain in effect for this second case run by the program. The results of this alternative analysis are also provided, following the output for the first data set.

```
PV   ESC  DEF  LOW  LOW
CONT SHAFTEAST       SY    DDB
GOOD
 $DATA
     PRINT=1,2,3,4,5,6,7,8,9,
     YDC=1000000.,  LIFE=15,  DER=50.,DSR=10., LL=7,  PYR=1980,
      LF=6., SMF=6., PF=6., PSF=8., AF=8.,  HF=8., CF=9.,
     NSPS=8,PSC=9000000.,HSC=2000000.,CVT=28.,
     BASE=1980, DEPT=500.,  H=6.,  ECVT=9., AQC=1500000.
 $END
```

TEST CASE 2
Underground Model

SUMMARY OF INPUT PARAMETERS

CATEGORY 1 - REQUIRED INPUT PARAMETERS

PHYSICAL	ACRONYM		
DEPTH OF SEAM (FT)	DEPT	500.	600.
THICKNESS OF SEAM (FT)	H	6.	7.
OPERATING			
MINING SYSTEM	MINE	CONT	
ENTRY TYPE	ENTR	SHFT	
LOCATION OF MINE	LOC	EAST	
ANNUAL PRODUCTION (TONS)	YDC	1000000.	
PRODUCTION LIFE (YEARS)	LIFE	15	
FINANCIAL			
LENGTH OF LOAN PAYBACK PERIOD (YEARS)	LL	7	
PORTION OF INITIAL CAPITAL BORROWED (%)	DER	50.0	
DEBT SERVICING RATE (%)	DSR	10.0	
PROJECT YEAR	PYR	1980	
ACQUISITION COST	AQC	1500000.	0.
TYPE OF ANALYSIS	TYPE	UNC	
COST RANGE APPLICABLE			
- EQUIPMENT	REQ	LOW	
- CONSTRUCTION	RCON	LOW	
CONSTANT DOLLAR ANALYSIS - UPDATE FACTORS			
- BASE YEAR	BASE	1980	
- LABOR	LF	6.00	
- SUPPLIES & MATERIALS	SMF	6.00	
- POWER	PF	6.00	
- PRODUCTION SECTION	PSF	8.00	
- HAULAGE SYSTEM	HF	8.00	
- AUXILIARY EQUIPMENT	AF	8.00	
- CONSTRUCTION	CF	9.00	
ESCALATION FOR CVT	ECVT	9.00	
RATE OF RETURN	ROR	15.00	
DEFERRED COST TREATMENT	COST		

SUMMARY OF INPUT PARAMETERS

(CONT.)

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
SEAM GRADIENT (DEGREES)	GRAD	0.	6.
ROOF CONDITIONS	ROOF	GOOD	
FLOOR CONDITIONS	FLOO	HARD	RTWT
GAS EMISSION LEVEL	GAS	LOW	HIGH
REJECT PERCENTAGE	REJ	25.	3.
OPERATING			
SHIFTS/DAY	S	2	
DAYS/YEAR	Y	226	
TYPE OF COAL PREPARATION		CORS	
SEAM RECOVERY	REC	60.	0.
OPERATOR EFFICIENCY	OEF	85.	4.
AVAILABLE FACE TIME	AFT	340.	15.
FINANCIAL			
INDIRECT CAPITAL (%)	ICP	10.00	
LABOR OVERHEAD (%)	OVHP	40.00	
UNION WELFARE FUND PAYMENTS (PER MANHOUR)	UWRM	1.64	
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.39	
ROYALTY PAYMENT (PERCENTAGE)	ROYP	8.00	
ROYALTY PAYMENT (PER TON)	ROYT	0.0	
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0	
SEVERANCE TAX (PER TON)	SEVT	0.0	
STATE & LOCAL TAX	STAX	2.00	
DEPRECIATION METHOD			
- PRODUCTION SECTION EQUIPMENT	DMP	SL	
- HAULAGE SYSTEM	DMH	SY	
- AUXILIARY EQUIPMENT	DMA	DDB	

SUMMARY OF INPUT PARAMETERS

(CONT.)

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

OPERATING			
TONS PER MACHINE SHIFT	TPMS	0.	0.
# OF PRODUCTION SECTIONS/SHIFT	NSPS	8	
HOURLY LABOR REQUIREMENTS	HLR	0.	
SALARIED PERSONNEL REQUIREMENTS	SPR	0.	
DEVELOPMENT TIME (YEARS)	DY	0.	
COAL PRODUCED DURING DEVELOPMENT (TONS)	CD	0.	
FINANCIAL			
DEPRECIABLE LIFE			
- PRODUCTION SECTION EQUIPMENT	DLP	10	
- HAULAGE SYSTEM	DLH	10	
- AUXILIARY EQUIPMENT	DLA	10	
HOURLY LABOR COST/YEAR	HLC	0.	
SALARIED PERSONNEL COST/YEAR	SPC	0.	
SUPPLIES & MATERIALS COST/TON	SMCT	0.	
POWER COST/TON	PCT	0.	
ANNUAL OPERATING COST	AOC	0.	
INITIAL PRODUCTION SECTION COST	PSC	9000000.	0.
INITIAL HAULAGE SYSTEM COST	HSC	2000000.	0.
INITIAL AUXILIARY EQUIPMENT COST	AEC	0.	0.
PREPARATION PLANT & UNIT TRAIN LOADING	PPC	0.	0.
EXPLORATION COST	EXPL	0.	0.
MINE ABANDONMENT COST	ABND	0.	0.
WORKING CAPITAL	WC	0.	0.
CONTROL VARIABLES			
NUMBER OF ITERATIONS	NIT	20	
PRINT TABLES	PRNT	1 2 3 4 5 6 7 8 9	
PRINT IX FOR EACH ITERATION	P9	0	
POINT VALUE DATA BASE COSTS (0-NO,1-YES)	PVD	0	
POINT VALUE CATEGORY 2 INPUTS (0-NO,1-YES)	PV2	1	

UNCERTAINTY ANALYSIS

ITERATION	COAL VALUE/TON
1	29.47
2	40.04
3	37.07
4	41.64
5	36.81
6	40.78
7	28.81
8	31.92
9	40.23
10	36.78
11	35.62
12	39.89
13	40.41
14	33.45
15	28.36
16	36.85
17	32.88
18	33.90
19	39.03
20	36.65

CONSTANT DOLLAR CASE - UNCERTAINTY OPTION

	MEAN	STD DEV
COAL VALUE/TON	36.03	4.04
MEAN DELTA VARIANCE	-0.10	- 0.20
PROJECT START YEAR	1980	
FULL PRODUCTION YEARS	1986 - 2001	
ANNUAL PRODUCTION LEVEL	999996.	
VALUE/TON ESCALATION FACTOR	0.09	
RATE OF RETURN ON EQUITY (%)	15.00	
CAPITALIZATION		
- DEBT (%)	50.00	
- EQUITY (%)	50.00	
DEBT SERVICING PERCENTAGE	10.00	
# OF ITERATIONS	20	

PROBABILITY OF OCCURRANCE	RANGE OF VALUES
95%	28.09 - 43.97
90%	29.38 - 42.67
85%	30.21 - 41.85
80%	30.86 - 41.20
70%	31.83 - 40.23
60%	32.64 - 39.42

I PRODUCTION SIZING

	MEAN	STD DEV
ACTUAL RAW COAL PRODUCTION	1333330.	2099.
SHIFT OUTPUT PER PRODUCTION SECTION	369.	1.
NO. PRODUCTION SECTIONS PER SHIFT	8.	
ACTUAL TONS OF CLEAN COAL PRODUCED	999996.	2503.

II MANPOWER REQUIREMENTS

(1980 DOLLARS)

	MEAN	STD DEV
HOURLY LABOR		
HOURLY LABOR REQUIREMENTS/DAY	274.	42.
HOURLY LABOR REQUIREMENTS PER SHIFT PRODUCTION SECTION	18.	3.
DIRECT LABOR COST PER SHIFT PRODUCTION SECTION ($)	1423.	213.
DIRECT ANNUAL HOURLY LABOR COST ($)	4998659.	771077.
TOTAL ANNUAL UNION WELFARE COST ($)	2196155.	125210.
SALARIED PERSONNEL		
ANNUAL REQUIREMENTS	57.	13.
DIRECT ANNUAL COSTS ($)	1674494.	372577.
TOTAL MANPOWER		
DIRECT COSTS ($)	6673157.	1143625.
PRODUCTIVITY PER MANDAY	13.82	3.

III EQUIPMENT AND CONSTRUCTION COSTS

(1980 DOLLARS)

	MEAN	STD DEV
PRODUCTION EQUIPMENT		
PRODUCTION SECTION COSTS	9000000.	3664.
PREPRODUCTION HAULAGE SYSTEM COSTS	2000000.	458.
PRODUCTION PHASE HAULAGE SYSTEM COSTS	2198332.	55947.
AUXILIARY EQUIPMENT COSTS	2878581.	77441.
SITE PREPARATION AND CONSTRUCTION		
PREPRODUCTION VENTILATION CONSTRUCTION	2382412.	140923.
PRODUCTION PHASE VENTILATION CONSTRUCTION	6053657.	209991.
MINE ENTRY CONSTRUCTION	2894366.	252196.
ENTRY HOIST SYSTEM	630000.	114.
PREPARATION PLANT CONSTRUCTION	3795352.	283284.
OTHER SURFACE CONSTRUCTION	1620277.	170849.
EXPLORATION		
TOTAL COST OF EXPLORATION	125248.	5776.
MINE ABANDONMENT		
TOTAL COST OF ABANDONMENT	160000.	0.

IV SUPPLIES, MATERIALS & POWER COST

(1980 DOLLARS)

	MEAN	STD DEV
SUPPLIES & MATERIALS		
COST/TON OF CLEAN COAL	6.66	1.08
ANNUAL COST	6659858.	1081617.
POWER		
COST/TON OF CLEAN COAL	0.67	0.09
ANNUAL COST	666301.	91671.
TOTAL		
SUPPLIES, MATERIAL AND POWER COST/TON	7.33	1.17
ANNUAL COST(SUPP., MAT., & POWER)	7326159.	1173282.

V PREPRODUCTION DEVELOPMENT

(1980 DOLLARS)

	MEAN	STD DEV
DIRECT DEVELOPMENT COSTS		
LABOR	10293554.	1915035.
SUPPLIES, MATERIALS	5025518.	818312.
POWER	426072.	60439.
PAYROLL OVERHEAD	4117415.	766044.
UMW WELFARE FUND	1885144.	130452.
TOTAL COSTS	21747648.	3688002.
OTHER DATA		
DEVELOPMENT TIME (YEARS)	3.06	0.05
DEVELOPMENT TIME (UNIT SHIFTS)	3638.	71.
COAL PRODUCED DURING DEVELOPMENT	754618.	14739.
TOTAL CONSTRUCTION & DEVELOPMENT TIME	6	

VI TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST	
				MEAN	STD DEV
INITIAL CAPITAL					
ACQUISITION COST	1980	1		1500000.	793.
PRODUCTION SECTION EQUIPMENT	1983	4	8.0%	3000000.	916.
	1984	5		3000000.	916.
	1985	6		3000000.	916.
HAULAGE SYSTEM	1983	4	8.0%	666666.	909.
	1984	5		666666.	909.
	1985	6		666666.	909.
AUXILIARY EQUIPMENT	1983	4	8.0%	959528.	25794.
	1984	5		959528.	25794.
	1985	6		959528.	25794.
EXPLORATION COSTS	1980	1		125248.	5776.
SITE PREPARATION & CONSTRUCTION					
- VENTILATION CONSTRUCTION	1980	1	9.0%	397069.	23478.
	1981	2		397069.	23478.
	1982	3		397069.	23478.
	1983	4		397069.	23478.
	1984	5		397069.	23478.
	1985	6		397069.	23478.
- MINE ENTRIES CONSTRUCTION	1983	4	9.0%	2894366.	252196.
- PREPARATION PLANT	1982	3	9.0%	1897675.	141632.
	1983	4		1897675.	141632.
- OTHER SURFACE CONSTRUCTION	1980	1	9.0%	270047.	28472.
	1981	2		270047.	28472.
	1982	3		270047.	28472.
	1983	4		270047.	28472.
	1984	5		270047.	28472.
	1985	6		270047.	28472.
INDIRECT CAPITAL	1980	1	9.0%	66712.	3147.
	1981	2		66712.	3147.
	1982	3		256479.	15329.
	1983	4		1008534.	28192.
	1984	5		529331.	4390.
	1985	6		529331.	4390.

VI TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST	
				MEAN	STD DEV
PREPRODUCTION DEVELOPMENT	1983	4	6.0%	7249231.	1229243.
	1984	5		7249231.	1229243.
	1985	6		7249231.	1229243.
ENTRY HAULAGE SYSTEM	1982	3	8.0%	630000.	114.
ACCRUED INTEREST	1986	7		9576734.	575934.
			TOTAL	60607764.	2963925.

VI TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST	
				MEAN	STD DEV
DEFERRED CAPITAL					
WORKING CAPITAL	1986	7		5725262.	806072.
REPLACEMENTS					
- PRODUCTION SECTION EQUIPMENT	1993	14	8.0%	3000000.	916.
	1994	15		3000000.	916.
	1995	16		3000000.	916.
- HAULAGE SYSTEM	1993	14	8.0%	666666.	909.
	1994	15		666666.	909.
	1995	16		666666.	909.
- AUXILIARY EQUIPMENT	1993	14	8.0%	959528.	25794.
	1994	15		959528.	25794.
	1995	16		959528.	25794.
- ENTRY HAULAGE SYSTEM	1992	13	8.0%	630000.	114.
ADDITIONS					
- HAULAGE SYSTEM	1986	7	8.0%	314048.	7971.
	1987	8		314048.	7971.
	1988	9		314048.	7971.
	1989	10		314048.	7971.
	1990	11		314048.	7971.
	1991	12		314048.	7971.
	1992	13		314048.	7971.
	1993	14		314048.	7971.
	1994	15		314048.	7971.
	1995	16		314048.	7971.
	1996	17		314048.	7971.
	1997	18		314048.	7971.
	1998	19		314048.	7971.
	1999	20		314048.	7971.
	2000	21		314048.	7971.
ADDITIONAL CONSTRUCTION					
- VENTILATION CONSTRUCTION	1987	8	9.0%	201788.	7002.
	1989	10		201788.	7002.
	1991	12		201788.	7002.
	1993	14		201788.	7002.
	1995	16		201788.	7002.
	1997	18		201788.	7002.
	1999	20		201788.	7002.

VI TOTAL CAPITAL ANALYSIS

(1980 DOLLARS)

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	COST UPDATE FACTOR	CAPITAL COST	
				MEAN	STD DEV
MINE ABANDONMENT	2001	21	9.0%	160000.	0.
			TOTAL	26517081.	824597.

VII DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE MEAN/STD DEV	SALVAGE VALUE %	SALVAGE VALUE MEAN/STD DEV	INVESTMENT TAX CREDIT MEAN/STD DEV
PRODUCTION SECTION EQ.	STRAIGHT LINE	10	1983	269999. 606.	10.0		300000. 198.
			1984	539999. 872.			300000. 198.
			1985	809999. 985.			300000. 198.
			1986	809999. 985.			
			1987	809999. 985.			
			1988	809999. 985.			
			1989	809999. 985.			
			1990	809999. 985.			
			1991	809999. 985.			
			1992	809999. 985.			
			1993	809999. 985.		300000. 198.	300000. 198.
			1994	809999. 985.		300000. 198.	199999. 523.
			1995	809999. 985.		300000. 198.	199999. 523.
			1996	809999. 985.			
			1997	809999. 985.			
			1998	809999. 985.			
			1999	809999. 985.			
			2000	809999. 985.		3330000. 793.	
HAULAGE SYSTEM	DOUBLE DECLINING BALANCE	10	1983	133333. 236.	5.0		66667. 140.
			1984	239999. 655.			66667. 140.

VII DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
			1985	325333.			66667.
				324.			140.
			1986	323076.			31405.
				1654.			797.
			1987	321270.			31405.
				2906.			797.
			1988	319826.			31405.
				3920.			797.
			1989	318670.			31405.
				4725.			797.
			1990	317745.			31405.
				5380.			797.
			1991	317006.			31405.
				5895.			797.
			1992	316414.			31405.
				6313.			797.
			1993	434958.		71583.	98071.
				6652.		167.	823.
			1994	529792.		71583.	65381.
				6935.		167.	548.
			1995	605660.		71583.	65381.
				7149.		167.	548.
			1996	540593.		33721.	10468.
				7145.		856.	266.
			1997	488540.		33721.	10468.
				7135.		856.	266.
			1998	446898.		33721.	
				7134.		856.	
			1999	413583.		33721.	
				7127.		856.	
			2000	386932.		1581446.	
				7133.		29479.	
AUXILIARY EQUIPMENT	SUM OF YEARS DIGITS	10	1983	165736.	5.0		95953.
				4457.			2582.
			1984	314900.			95953.
				8458.			2582.
			1985	447489.			95953.
				12016.			2582.
			1986	397768.			
				10682.			
			1987	348047.			
				9351.			

VII DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
			1988	298326.			
				8011.			
			1989	248605.			
				6681.			
			1990	198884.			
				5343.			
			1991	149163.			
				4011.			
			1992	99442.			
				2673.			
			1993	215457.		47976.	95953.
				5797.		1287.	2582.
			1994	331473.		47976.	63968.
				8902.		1287.	1722.
			1995	447489.		47976.	63968.
				12016.		1287.	1722.
			1996	397768.			
				10682.			
			1997	348047.			
				9351.			
			1998	298326.			
				8011.			
			1999	248605.			
				6681.			
			2000	198884.		458830.	
				5343.		12320.	
ENTRY HAULAGE SYSTEM	DOUBLE DECLINING BALANCE	10	1982	125999.	5.0		63000.
				367.			61.
			1983	100800.			
				64.			
			1984	80640.			
				0.			
			1985	64512.			
				28.			
			1986	51610.			
				54.			
			1987	41288.			
				60.			
			1988	33030.			
				23.			
			1989	26424.			
				40.			

VII DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

(1980 DOLLARS)

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
			1990	21139.			
				30.			
			1991	16911.			
				34.			
			1992	125999.		67646.	63000.
				367.		134.	61.
			1993	100800.			
				64.			
			1994	80640.			
				0.			
			1995	64512.			
				28.			
			1996	51610.			
				54.			
			1997	41288.			
				60.			
			1998	33030.			
				23.			
			1999	26424.			
				40.			
			2000	21139.		84557.	
				30.		99.	

VIII DIRECT OPERATION COSTS

(1980 DOLLARS)

CALENDAR YEAR	LABOR	LABOR OVERHEAD	SUPPLIES & MATERIALS	POWER COST	UMW COST	INSURANCE	TOTAL
	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV	MEAN/STD DEV
1986	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1987	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1988	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1989	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1990	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1991	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1992	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1993	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1994	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1995	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1996	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1997	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1998	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
1999	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.
2000	6673157.	2669258.	6659858.	666301.	2196155.	504020.	19368704.
	1143625.	457469.	1081617.	91671.	125210.	9181.	2901659.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
	RELATIVE YEAR OF FULL PRODUCTION:	-6	-5	-4	-3	-2	-1	1	2
101	COAL VALUE/TON	0.0	0.0	0.0	0.0	36.03	36.03	36.03	36.03
		0.0	0.0	0.0	0.0	4.04	4.04	4.04	4.04
102	ANNUAL PRODUCTION CLEAN COAL	0.	0.	0.	0.	377309.	377309.	999996.	999996.
		0.	0.	0.	0.	7382.	7382.	2503.	2503.
103	ANNUAL SALES REVENUE	0.	0.	0.	0.	13594560.	13594560.	36029232.	36029232.
		0.	0.	0.	0.	1545745.	1545745.	4039346.	4039346.
104	ANNUAL OPERATING COSTS	0.	0.	0.	0.	0.	0.	19368704.	19368704.
		0.	0.	0.	0.	0.	0.	2901659.	2901659.
105	GROSS PROFIT	0.	0.	0.	0.	13594560.	13594560.	16660531.	16660531.
		0.	0.	0.	0.	1545745.	1545745.	1148722.	1148722.
	OTHER COSTS AND DEDUCTIONS								
106	AMORTIZATION	0.	0.	0.	0.	0.	0.	2326473.	2340887.
		0.	0.	0.	0.	0.	0.	255876.	256022.
107	DEPRECIATION	0.	0.	125999.	669869.	1175537.	1647328.	1582448.	1520600.
		0.	0.	367.	4525.	8662.	12564.	11140.	10080.
108	EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	125248.	0.	0.	0.	0.	0.	-125248.	0.
		5776.	0.	0.	0.	0.	0.	5776.	0.
109	ROYALTY PAYMENTS	0.	0.	0.	0.	1087562.	1087562.	2882337.	2882337.
		0.	0.	0.	0.	123674.	123674.	323150.	323150.
110	LOAN INTEREST	0.	0.	0.	0.	0.	0.	3509216.	3139321.
		0.	0.	0.	0.	0.	0.	249281.	222977.
111	MISCELLANEOUS	0.	0.	0.	0.	245251.	245251.	649999.	649999.
		0.	0.	0.	0.	4803.	4803.	648.	648.
112	NET INCOME BEFORE TAXES	-125248.	0.	-125999.	-669869.	11086207.	10614413.	5835301.	6127383.
		5776.	0.	367.	4525.	1421560.	1421737.	328211.	351512.
113	STATE & LOCAL INCOME TAXES	0.	0.	0.	0.	221724.	212288.	116706.	122547.
		0.	0.	0.	0.	28434.	28437.	6569.	7033.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
RELATIVE YEAR OF FULL PRODUCTION:	-6	-5	-4	-3	-2	-1	1	2
LINE CASHFLOW LINE ITEMS								
114 DEPLETION ALLOWANCE	0.	0.	0.	0.	1250697.	1250697.	2859291.	2993030.
	0.	0.	0.	0.	142222.	142222.	160926.	188497.
115 TAX LOSS CARRIED FORWARD	0.	125248.	125248.	251247.	921117.	0.	0.	0.
	0.	5776.	5776.	5789.	7332.	0.	0.	0.
116 NET INCOME SUBJECT TO FEDERAL TAXATION	0.	0.	0.	0.	8692666.	9151425.	2859293.	3011801.
	0.	0.	0.	0.	1248632.	1251109.	160913.	157609.
117 FEDERAL TAXES	0.	0.	0.	0.	3979373.	4190402.	1296024.	1366178.
	0.	0.	0.	0.	574397.	575535.	74024.	72497.
118 INVESTMENT TAX CREDIT	0.	0.	0.	0.	988238.	462619.	31405.	31405.
	0.	0.	0.	0.	5534.	2655.	797.	797.
119 NET FEDERAL TAXES PAID	0.	0.	0.	0.	2991131.	3727781.	1264620.	1334773.
	0.	0.	0.	0.	574690.	575681.	74032.	72517.
120 NET PROFIT	0.	0.	0.	0.	5701526.	5423638.	1594674.	1677027.
	0.	0.	0.	0.	674048.	675490.	86875.	85121.
121 ADDITIONAL INCOME	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
ADJUSTED NET								
122 ADDBACK OF NONCASH COSTS	125248.	125248.	251247.	921117.	3347350.	2898029.	4632531.	4431288.
	5776.	5776.	5789.	7332.	144966.	142252.	240736.	239621.
123 LOAN PRINCIPAL PAYMENT	0.	0.	0.	0.	0.	0.	3698956.	4068852.
	0.	0.	0.	0.	0.	0.	262729.	289023.
124 NET CASH INFLOW FROM OPERATIONS	0.	0.	0.	0.	9048884.	8321668.	2528248.	2039464.
	0.	0.	0.	0.	818284.	817228.	76974.	55149.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:	1980	1981	1982	1983	1984	1985	1986	1987
	RELATIVE YEAR OF FULL PRODUCTION:	-6	-5	-4	-3	-2	-1	1	2
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	1500000.	0.	0.	0.	0.	0.	0.	0.
		793.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	125248.	0.	0.	0.	0.	0.	0.	0.
		5776.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	7249231.	7249231.	7249231.	0.	0.
		0.	0.	0.	1229243.	1229243.	1229243.	0.	0.
128	CONSTRUCTION	3561480.	667116.	2564790.	2564790.	667116.	667116.	0.	201788.
		252521.	31462.	153285.	153285.	31462.	31462.	0.	7002.
129	EQUIPMENT	0.	0.	630000.	4626188.	4626188.	4626188.	314048.	314048.
		0.	0.	114.	26968.	26968.	26968.	7971.	7971.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	9576734.	0.
		0.	0.	0.	0.	0.	0.	575934.	0.
131	INDIRECT CAPITAL	66712.	66712.	256479.	1008534.	529331.	529331.	0.	0.
		3147.	3147.	15329.	28192.	4390.	4390.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	0.	0.	5725262.	0.
		0.	0.	0.	0.	0.	0.	806072.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	5253440.	733828.	3451268.	15448729.	13071870.	13071870.	6039309.	515837.
		254957.	34609.	168640.	1208311.	1235142.	1235142.	806169.	13479.
134	AMOUNT FUNDED FROM EQUITY	2626717.	366914.	1725634.	7724372.	6535932.	6535932.	6039309.	515837.
		127507.	17309.	84304.	603993.	617600.	617600.	806169.	13479.
135	AMOUNT FUNDED FROM LOANS	2626718.	366914.	1725634.	7724373.	6535932.	6535932.	0.	0.
		127496.	17310.	84313.	603995.	617604.	617604.	0.	0.
136	ANNUAL NET CASHFLOW	-2626717.	-366914.	-1725634.	-7724372.	2512945.	1785736.	-3511056.	1523627.
		127507.	17309.	84304.	603993.	210950.	209895.	745788.	47469.

1X CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
RELATIVE YEAR OF FULL PRODUCTION:	3	4	5	6	7	8	9	10
LINE CASHFLOW LINE ITEMS								
101 COAL VALUE/TON	36.03	36.03	36.03	36.03	36.03	36.03	36.03	36.03
	4.04	4.04	4.04	4.04	4.04	4.04	4.04	4.04
102 ANNUAL PRODUCTION CLEAN COAL	999996.	999996.	999996.	999996.	999996.	999996.	999996.	999996.
	2503.	2503.	2503.	2503.	2503.	2503.	2503.	2503.
103 ANNUAL SALES REVENUE	36029232.	36029232.	36029232.	36029232.	36029232.	36029232.	36029232.	36029232.
	4039346.	4039346.	4039346.	4039346.	4039346.	4039346.	4039346.	4039346.
104 ANNUAL OPERATING COSTS	19368704.	19368704.	19368704.	19368704.	19368704.	19368704.	19368704.	19368704.
	2901659.	2901659.	2901659.	2901659.	2901659.	2901659.	2901659.	2901659.
105 GROSS PROFIT	16660531.	16660531.	16660531.	16660531.	16660531.	16660531.	16660531.	16660531.
	1148722.	1148722.	1148722.	1148722.	1148722.	1148722.	1148722.	1148722.
OTHER COSTS AND DEDUCTIONS								
106 AMORTIZATION	2340887.	2357700.	2357700.	2377879.	2377879.	2403104.	2403104.	2436732.
	256022.	256225.	256225.	256434.	256434.	256689.	256689.	257085.
107 DEPRECIATION	1461177.	1403694.	1347764.	1293076.	1351851.	1561210.	1751900.	1927656.
	9179.	8500.	7778.	7338.	7234.	9130.	11558.	14057.
108 EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.	0.
	0.	0.	0.	0.	0.	0.	0.	0.
109 ROYALTY PAYMENTS	2882337.	2882337.	2882337.	2882337.	2882337.	2882337.	2882337.	2882337.
	323150.	323150.	323150.	323150.	323150.	323150.	323150.	323150.
110 LOAN INTEREST	2732434.	2284860.	1792528.	1250965.	655246.	16065.	0.	0.
	194099.	162298.	127333.	88858.	46534.	12521.	0.	0.
111 MISCELLANEOUS	649999.	649999.	649999.	649999.	649999.	649999.	649999.	649999.
	648.	648.	648.	648.	648.	648.	648.	648.
112 NET INCOME BEFORE TAXES	6593692.	7081935.	7630196.	8206272.	8743217.	9147817.	8973189.	8763806.
	380311.	411824.	446747.	484906.	527182.	561898.	573084.	572579.
113 STATE & LOCAL INCOME TAXES	131874.	141638.	152604.	164125.	174864.	182956.	179463.	175276.
	7611.	8241.	8936.	9701.	10546.	11241.	11466.	11456.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1988	1989	1990	1991	1992	1993	1994	1995
	CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
	RELATIVE YEAR OF FULL PRODUCTION:	3	4	5	6	7	8	9	10
114	DEPLETION ALLOWANCE	3181713.	3305080.	3314691.	3314691.	3314691.	3314691.	3314691.	3314691.
		266944.	360399.	371605.	371605.	371605.	371605.	371605.	371605.
115	TAX LOSS CARRIED FORWARD	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
116	NET INCOME SUBJECT TO FEDERAL TAXATION	3280097.	3635209.	4162899.	4727452.	5253660.	5650165.	5479032.	5273832.
		126343.	86119.	102943.	131745.	167556.	198051.	207637.	206884.
117	FEDERAL TAXES	1489593.	1652945.	1895681.	2155374.	2397431.	2579822.	2501100.	2406710.
		58142.	39616.	47375.	60706.	77129.	91188.	95596.	95215.
118	INVESTMENT TAX CREDIT	31405.	31405.	31405.	31405.	94405.	494024.	329349.	329349.
		797.	797.	797.	797.	827.	2726.	1830.	1830.
119	NET FEDERAL TAXES PAID	1458189.	1621539.	1864276.	2123969.	2303024.	2085799.	2171752.	2077360.
		58088.	39791.	47592.	60884.	77344.	90704.	95311.	95009.
120	NET PROFIT	1821909.	2013668.	2298617.	2603477.	2950628.	3564362.	3307276.	3196468.
		68223.	46417.	55511.	71046.	90425.	107540.	112443.	112011.
121	ADDITIONAL INCOME	0.	0.	0.	0.	67646.	419559.	419559.	419559.
		0.	0.	0.	0.	134.	1397.	1397.	1397.
	ADJUSTED NET								
122	ADDBACK OF NONCASH COSTS	4298546.	4125428.	3871728.	3600512.	3415361.	7279013.	7469701.	7679088.
		260647.	289240.	278216.	260495.	240928.	626543.	626461.	626766.
123	LOAN PRINCIPAL PAYMENT	4475739.	4923314.	5415646.	5957211.	6552930.	146048.	0.	0.
		317897.	349649.	384622.	423086.	465408.	113831.	0.	0.
124	NET CASH INFLOW FROM OPERATIONS	1644717.	1215786.	754706.	246784.	26759.	11116890.	11196544.	11295120.
		46090.	60103.	85657.	117904.	58111.	621492.	728194.	728411.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1988	1989	1990	1991	1992	1993	1994	1995
	CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
	RELATIVE YEAR OF FULL PRODUCTION:	3	4	5	6	7	8	9	10
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
128	CONSTRUCTION	0.	201788.	0.	201788.	0.	201788.	0.	201788.
		0.	7002.	0.	7002.	0.	7002.	0.	7002.
129	EQUIPMENT	314048.	314048.	314048.	314048.	944046.	4940238.	4940238.	4940238.
		7971.	7971.	7971.	7971.	8238.	27416.	27416.	27416.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
131	INDIRECT CAPITAL	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	314048.	515837.	314048.	515837.	944046.	5142024.	4940238.	5142024.
		7971.	13479.	7971.	13479.	8238.	29394.	27416.	29394.
134	AMOUNT FUNDED FROM EQUITY	314048.	515837.	314048.	515837.	944046.	5142024.	4940238.	5142024.
		7971.	13479.	7971.	13479.	8238.	29394.	27416.	29394.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	146048.	0.	0.	0.
		0.	0.	0.	0.	113831.	0.	0.	0.
136	ANNUAL NET CASHFLOW	1330668.	699952.	440657.	-269052.	-917288.	5974860.	6256298.	6153090.
		40153.	55006.	82004.	116145.	56941.	618866.	728997.	726813.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	CALENDAR YEAR OF PROJECT: 1996	1997	1998	1999	2000	TOTAL
		RELATIVE YEAR OF FULL PRODUCTION: 11	12	13	14	15	
101	COAL VALUE/TON	36.03	36.03	36.03	36.03	36.03	
		4.04	4.04	4.04	4.04	4.04	
102	ANNUAL PRODUCTION						
	CLEAN COAL	999996.	999996.	999996.	999996.	999996.	15754557.
		2503.	2503.	2503.	2503.	2503.	0.
103	ANNUAL SALES REVENUE	36029232.	36029232.	36029232.	36029232.	36029232.	567627008.
		4039346.	4039346.	4039346.	4039346.	4039346.	0.
104	ANNUAL OPERATING COSTS	19368704.	19368704.	19368704.	19368704.	19368704.	290530560.
		2901659.	2901659.	2901659.	2901659.	2901659.	0.
105	GROSS PROFIT	16660531.	16660531.	16660531.	16660531.	16660531.	277096960.
		1148722.	1148722.	1148722.	1148722.	1148722.	0.
	OTHER COSTS AND DEDUCTIONS						
106	AMORTIZATION	2436732.	2487180.	2487180.	2588074.	2748074.	36469504.
		257085.	257634.	257634.	258783.	258788.	0.
107	DEPRECIATION	1799965.	1687869.	1588248.	1498608.	1416949.	26811696.
		12951.	11825.	10897.	9747.	9295.	0.
108	EXPENSED PREPRODUCTION						
	EXPLORATION, CONSTRUCTION	0.	0.	0.	0.	0.	0.
		0.	0.	0.	0.	0.	0.
109	ROYALTY PAYMENTS	2882337.	2882337.	2882337.	2882337.	2882337.	45410160.
		323150.	323150.	323150.	323150.	323150.	0.
110	LOAN INTEREST	0.	0.	0.	0.	0.	15380635.
		0.	0.	0.	0.	0.	0.
111	MISCELLANEOUS	649999.	649999.	649999.	649999.	649999.	10240486.
		648.	648.	648.	648.	648.	0.
112	NET INCOME BEFORE TAXES	8891496.	8953145.	9052765.	9041512.	8963171.	142784272.
		572635.	572135.	572189.	571142.	571170.	0.
113	STATE & LOCAL INCOME TAXES	177830.	179063.	181055.	180830.	179263.	2874102.
		11457.	11446.	11447.	11425.	11428.	0.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

CALENDAR YEAR OF PROJECT:	1996	1997	1998	1999	2000	
RELATIVE YEAR OF FULL PRODUCTION:	11	12	13	14	15	
LINE CASHFLOW LINE ITEMS						
114 DEPLETION ALLOWANCE	3314691.	3314691.	3314691.	3314691.	3314691.	51302064.
	371605.	371605.	371605.	371605.	371605.	0.
115 TAX LOSS CARRIED FORWARD	0.	0.	0.	0.	0.	1422859.
	0.	0.	0.	0.	0.	0.
116 NET INCOME SUBJECT TO FEDERAL TAXATION	5398968.	5459388.	5557015.	5545987.	5469211.	88607968.
	207150.	207000.	207332.	207059.	207356.	0.
117 FEDERAL TAXES	2464274.	2492063.	2536974.	2531900.	2496584.	40432336.
	95305.	95359.	95432.	95324.	95428.	0.
118 INVESTMENT TAX CREDIT	10468.	10468.	0.	0.	0.	2907342.
	266.	266.	0.	0.	0.	0.
119 NET FEDERAL TAXES PAID	2453804.	2481597.	2536974.	2531900.	2496584.	37524992.
	95406.	95340.	95432.	95324.	95428.	0.
120 NET PROFIT	2945161.	2977787.	3020037.	3014081.	2972620.	51082864.
	111830.	111792.	111994.	111868.	112096.	0.
121 ADDITIONAL INCOME	33721.	33721.	33721.	33721.	5454831.	6916033.
	856.	856.	856.	856.	31794.	0.
ADJUSTED NET						
122 ADDBACK OF NONCASH COSTS	7551399.	7489748.	7390128.	7401381.	7479723.	95783760.
	626792.	627489.	627523.	628853.	628914.	0.
123 LOAN PRINCIPAL PAYMENT	0.	0.	0.	0.	0.	35238640.
	0.	0.	0.	0.	0.	0.
124 NET CASH INFLOW FROM OPERATIONS	10530284.	10501260.	10443891.	10449188.	15907174.	117267264.
	728336.	728614.	728610.	729177.	728450.	0.

IX CASH FLOW SUMMARY TABLE

(1980 DOLLARS)

LINE	CASHFLOW LINE ITEMS	1996	1997	1998	1999	2000	
	CALENDAR YEAR OF PROJECT:	1996	1997	1998	1999	2000	
	RELATIVE YEAR OF FULL PRODUCTION:	11	12	13	14	15	
	CAPITAL EXPENDITURES FOR YEAR						
125	ACQUISITION	0.	0.	0.	0.	0.	1500000.
		0.	0.	0.	0.	0.	0.
126	EXPLORATION	0.	0.	0.	0.	0.	125248.
		0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	0.	0.	21747680.
		0.	0.	0.	0.	0.	0.
128	CONSTRUCTION	0.	201788.	0.	201788.	160000.	12264921.
		0.	7002.	0.	7002.	0.	0.
129	EQUIPMENT	314048.	314048.	314048.	314048.	314048.	33727712.
		7971.	7971.	7971.	7971.	7971.	0.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	9576734.
		0.	0.	0.	0.	0.	0.
131	INDIRECT CAPITAL	0.	0.	0.	0.	0.	2457095.
		0.	0.	0.	0.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	-5725262.	0.
		0.	0.	0.	0.	806072.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	314048.	515837.	314048.	515837.	-5251216.	71822592.
		7971.	13479.	7971.	13479.	806033.	0.
134	AMOUNT FUNDED FROM EQUITY	314048.	515837.	314048.	515837.	-5251216.	46307104.
		7971.	13479.	7971.	13479.	806033.	0.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	0.	25661520.
		0.	0.	0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	10216236.	9985424.	10129841.	9933351.	21158336.	70959968.
		728895.	726837.	729182.	727403.	1530326.	0.

TEST CASE 3
Underground Model

SUMMARY OF INPUT PARAMETERS

CATEGORY 1 - REQUIRED INPUT PARAMETERS

PHYSICAL	ACRONYM		
DEPTH OF SEAM (FT)	DEPT	500.	0.
THICKNESS OF SEAM (FT)	H	6.	0.
OPERATING			
MINING SYSTEM	MINE	CONT	
ENTRY TYPE	ENTR	SHFT	
LOCATION OF MINE	LOC	EAST	
ANNUAL PRODUCTION (TONS)	YDC	1000000.	
PRODUCTION LIFE (YEARS)	LIFE	15	
FINANCIAL			
LENGTH OF LOAN PAYBACK PERIOD (YEARS)	LL	7	
PORTION OF INITIAL CAPITAL BORROWED (%)	DER	50.0	
DEBT SERVICING RATE (%)	DSR	10.0	
PROJECT YEAR	PYR	1980	
ACQUISITION COST	AQC	1500000.	0.
TYPE OF ANALYSIS	TYPE	PV	
COST RANGE APPLICABLE			
- EQUIPMENT	REQ	LOW	
- CONSTRUCTION	RCON	LOW	
ESCALATING DOLLAR ANALYSIS - ESCALATION FACTORS			
- LABOR	LF	6.00	
- SUPPLIES & MATERIALS	SMF	6.00	
- POWER	PF	6.00	
- PRODUCTION SECTION	PSF	8.00	
- HAULAGE SYSTEM	HF	8.00	
- AUXILIARY EQUIPMENT	AF	8.00	
- CONSTRUCTION	CF	9.00	
COAL VALUE/TON	CVT	28.00	
ESCALATION FOR CVT	ECVT	9.00	
DEFERRED COST TREATMENT	COST		

SUMMARY OF INPUT PARAMETERS
(CONT.)

CATEGORY 2 - OPTIONAL PARAMETERS (DEFAULT ASSIGNED)

PHYSICAL	ACRONYM		
SEAM GRADIENT (DEGREES)	GRAD	0.	6.
ROOF CONDITIONS	ROOF	GOOD	
FLOOR CONDITIONS	FLOO	HARD	RTWT
GAS EMISSION LEVEL	GAS	LOW	HIGH
REJECT PERCENTAGE	REJ	25.	3.
OPERATING			
SHIFTS/DAY	S	2	
DAYS/YEAR	Y	226	
TYPE OF COAL PREPARATION		CORS	
SEAM RECOVERY	REC	60.	0.
OPERATOR EFFICIENCY	OEF	85.	4.
AVAILABLE FACE TIME	AFT	340.	15.
FINANCIAL			
INDIRECT CAPITAL (%)	ICP	10.00	
LABOR OVERHEAD (%)	OVHP	40.00	
UNION WELFARE FUND PAYMENTS (PER MANHOUR)	UWRM	1.64	
UNION WELFARE FUND PAYMENTS (PER TON)	UWRT	1.39	
ROYALTY PAYMENT (PERCENTAGE)	ROYP	8.00	
ROYALTY PAYMENT (PER TON)	ROYT	0.0	
SEVERANCE TAX (PERCENTAGE)	SEVP	0.0	
SEVERANCE TAX (PER TON)	SEVT	0.0	
STATE & LOCAL TAX	STAX	2.00	
DEPRECIATION METHOD			
- PRODUCTION SECTION EQUIPMENT	DMP	SL	
- HAULAGE SYSTEM	DMH	SY	
- AUXILIARY EQUIPMENT	DMA	DDB	

SUMMARY OF INPUT PARAMETERS

(CONT.)

CATEGORY 3 - PARAMETERS WHICH OVERRIDE CALCULATED VALUES

OPERATING			
TONS PER MACHINE SHIFT	TPMS	0.	0.
# OF PRODUCTION SECTIONS/SHIFT	NSPS	8	
HOURLY LABOR REQUIREMENTS	HLR	0.	
SALARIED PERSONNEL REQUIREMENTS	SPR	0.	
DEVELOPMENT TIME (YEARS)	DY	0.	
COAL PRODUCED DURING DEVELOPMENT (TONS)	CD	0.	
FINANCIAL			
DEPRECIABLE LIFE			
- PRODUCTION SECTION EQUIPMENT	DLP	10	
- HAULAGE SYSTEM	DLH	10	
- AUXILIARY EQUIPMENT	DLA	10	
HOURLY LABOR COST/YEAR	HLC	0.	
SALARIED PERSONNEL COST/YEAR	SPC	0.	
SUPPLIES & MATERIALS COST/TON	SMCT	0.	
POWER COST/TON	PCT	0.	
ANNUAL OPERATING COST	AOC	0.	
INITIAL PRODUCTION SECTION COST	PSC	9000000.	0.
INITIAL HAULAGE SYSTEM COST	HSC	2000000.	0.
INITIAL AUXILIARY EQUIPMENT COST	AEC	0.	0.
PREPARATION PLANT & UNIT TRAIN LOADING	PPC	0.	0.
EXPLORATION COST	EXPL	0.	0.
MINE ABANDONMENT COST	ABND	0.	0.
WORKING CAPITAL	WC	0.	0.
CONTROL VARIABLES			
NUMBER OF ITERATIONS	NIT	1	
PRINT TABLES	PRNT	1 2 3 4 5 6 7 8 9	
PRINT IX FOR EACH ITERATION	P9	0	
POINT VALUE DATA BASE COSTS (0-NO,1-YES)	PVD	1	
POINT VALUE CATEGORY 2 INPUTS (0-NO,1-YES)	PV2	1	

ESCALATING DOLLAR CASE - POINT VALUE OPTION

RATE OF RETURN ON EQUITY	30.15
PROJECT START YEAR	1980
FULL PRODUCTION YEARS	1986 - 2001
ANNUAL PRODUCTION LEVEL	999999.
COAL VALUE/TON	28.00
VALUE/TON ESCALATION FACTOR	0.09
CAPITALIZATION	
- DEBT (%)	50.00
- EQUITY (%)	50.00
DEBT SERVICING PERCENTAGE	10.00

I PRODUCTION SIZING

ACTUAL RAW COAL PRODUCTION	1333332.
SHIFT OUTPUT PER PRODUCTION SECTION	369.
NO. PRODUCTION SECTIONS PER SHIFT	8.
ACTUAL TONS OF CLEAN COAL PRODUCED	999999.

II MANPOWER REQUIREMENTS

(1980 DOLLARS)

HOURLY LABOR

HOURLY LABOR REQUIREMENTS/DAY	264.
HOURLY LABOR REQUIREMENTS PER SHIFT PRODUCTION SECTION	17.
DIRECT LABOR COST PER SHIFT PRODUCTION SECTION ($)	1376.
DIRECT ANNUAL HOURLY LABOR COST ($)	4829998.
TOTAL ANNUAL UNION WELFARE COST ($)	2168790.

SALARIED PERSONNEL

ANNUAL REQUIREMENTS	54.
DIRECT ANNUAL COSTS ($)	1593000.

TOTAL MANPOWER

DIRECT COSTS ($)	6422998.
PRODUCTIVITY PER MANDAY	13.90

III EQUIPMENT AND CONSTRUCTION COSTS

(1980 DOLLARS)

PRODUCTION EQUIPMENT	
PRODUCTION SECTION COSTS	6750000.
PREPRODUCTION HAULAGE SYSTEM COSTS	1500000.
PRODUCTION PHASE HAULAGE SYSTEM COSTS	2281483.
AUXILIARY EQUIPMENT COSTS	2879768.
SITE PREPARATION AND CONSTRUCTION	
PREPRODUCTION VENTILATION CONSTRUCTION	2144711.
PRODUCTION PHASE VENTILATION CONSTRUCTION	6001716.
MINE ENTRY CONSTRUCTION	2470499.
ENTRY HOIST SYSTEM	630000.
PREPARATION PLANT CONSTRUCTION	3576161.
OTHER SURFACE CONSTRUCTION	1695000.
EXPLORATION	
TOTAL COST OF EXPLORATION	118371.
MINE ABANDONMENT	
TOTAL COST OF ABANDONMENT	160000.

IV SUPPLIES, MATERIALS & POWER COST

(1980 DOLLARS)

SUPPLIES & MATERIALS

COST/TON OF CLEAN COAL	6.43
ANNUAL COST	6425605.

POWER

COST/TON OF CLEAN COAL	0.65
ANNUAL COST	646446.

TOTAL

SUPPLIES, MATERIAL AND POWER COST/TON	7.07
ANNUAL COST(SUPP., MAT., & POWER)	7072051.

V PREPRODUCTION DEVELOPMENT

(1980 DOLLARS)

DIRECT DEVELOPMENT COSTS

LABOR	9625780.
SUPPLIES, MATERIALS	4710678.
POWER	401281.
PAYROLL OVERHEAD	3850310.
UMW WELFARE FUND	1804685.
TOTAL COSTS	20392720.

OTHER DATA

DEVELOPMENT TIME (YEARS)	2.99
DEVELOPMENT TIME (UNIT SHIFTS)	3535.
COAL PRODUCED DURING DEVELOPMENT	733110.
TOTAL CONSTRUCTION & DEVELOPMENT TIME	6

VI TOTAL CAPITAL ANALYSIS

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	ESCALATION FACTOR	CAPITAL COST
INITIAL CAPITAL				
ACQUISITION COST	1980	1		1500000.
PRODUCTION SECTION EQUIPMENT	1983	4	8.0%	2834348.
	1984	5		3061095.
	1985	6		3305982.
HAULAGE SYSTEM	1983	4	8.0%	629855.
	1984	5		680243.
	1985	6		734663.
AUXILIARY EQUIPMENT	1983	4	8.0%	1209224.
	1984	5		1305961.
	1985	6		1410437.
EXPLORATION COSTS	1980	1		118371.
SITE PREPARATION & CONSTRUCTION				
- VENTILATION CONSTRUCTION	1980	1	9.0%	357452.
	1981	2		389622.
	1982	3		424688.
	1983	4		462909.
	1984	5		504571.
	1985	6		549982.
- MINE ENTRIES CONSTRUCTION	1983	4	9.0%	3199357.
- PREPARATION PLANT	1982	3	9.0%	2124414.
	1983	4		2315609.
- OTHER SURFACE CONSTRUCTION	1980	1	9.0%	282500.
	1981	2		307925.
	1982	3		335638.
	1983	4		365845.
	1984	5		398770.
	1985	6		434659.
INDIRECT CAPITAL	1980	1	9.0%	63995.
	1981	2		69755.
	1982	3		288474.
	1983	4		1101714.
	1984	5		595064.
	1985	6		643572.

VI TOTAL CAPITAL ANALYSIS

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	ESCALATION FACTOR	CAPITAL COST
PREPRODUCTION DEVELOPMENT	1983	4	6.0%	8096000.
	1984	5		8581755.
	1985	6		9096655.
ENTRY HAULAGE SYSTEM	1982	3	8.0%	793617.
ACCRUED INTEREST	1986	7		10578010.
			TOTAL	69152732.

VI TOTAL CAPITAL ANALYSIS

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	ESCALATION FACTOR	CAPITAL COST
DEFERRED CAPITAL				
WORKING CAPITAL	1986	7		7796232.
REPLACEMENTS				
- PRODUCTION SECTION EQUIPMENT	1993	14	8.0%	6119109.
	1994	15		6608636.
	1995	16		7137326.
- HAULAGE SYSTEM	1993	14	8.0%	1359802.
	1994	15		1468586.
	1995	16		1586072.
- AUXILIARY EQUIPMENT	1993	14	8.0%	2610609.
	1994	15		2819455.
	1995	16		3045010.
- ENTRY HAULAGE SYSTEM	1992	13	8.0%	1713350.
ADDITIONS				
- HAULAGE SYSTEM	1986	7	8.0%	558578.
	1987	8		603264.
	1988	9		651525.
	1989	10		703647.
	1990	11		759939.
	1991	12		820734.
	1992	13		886392.
	1993	14		957304.
	1994	15		1033888.
	1995	16		1116598.
	1996	17		1205925.
	1997	18		1302398.
	1998	19		1406589.
	1999	20		1519116.
	2000	21		1640645.
ADDITIONAL CONSTRUCTION				
- VENTILATION CONSTRUCTION	1987	8	9.0%	365710.
	1989	10		434499.
	1991	12		516227.
	1993	14		613329.
	1995	16		728695.
	1997	18		865761.
	1999	20		1028608.

VI TOTAL CAPITAL ANALYSIS

CAPITAL COST CATEGORY	CALENDAR YR INCURRED	PROJECT YR INCURRED	ESCALATION FACTOR	CAPITAL COST
MINE ABANDONMENT	2001	21	9.0%	977389.
			TOTAL	62960946.

VII DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
PRODUCTION SECTION EQ.	STRAIGHT LINE	10	1983	255091.	10.0		283435.
			1984	530590.			306110.
			1985	828128.			330598.
			1986	828128.			
			1987	828128.			
			1988	828128.			
			1989	828128.			
			1990	828128.			
			1991	828128.			
			1992	828128.			
			1993	1123756.		283435.	611911.
			1994	1443035.		306110.	440576.
			1995	1787855.		330598.	475822.
			1996	1787855.			
			1997	1787855.			
			1998	1787855.			
			1999	1787855.			
			2000	1787855.		7441705.	
HAULAGE SYSTEM	DOUBLE DECLINING BALANCE	10	1983	125971.	5.0		62986.
			1984	236825.			68024.
			1985	336393.			73466.
			1986	380830.			55858.
			1987	425317.			60326.
			1988	470558.			65153.
			1989	517176.			70365.
			1990	565729.			75994.
			1991	616730.			82073.
			1992	670662.			88639.
			1993	986424.		67630.	231711.
			1994	1275026.		73041.	166832.
			1995	1544777.		78884.	180178.
			1996	1465010.		59977.	40198.
			1997	1419533.		64775.	43413.
			1998	1402952.		69957.	
			1999	1411074.		75553.	
			2000	1440668.		5844272.	
AUXILIARY EQUIPMENT	SUM OF YEARS DIGITS	10	1983	208866.	5.0		120922.

VII DEPRECIATION, SALVAGE VALUE, INVESTMENT TAX CREDIT

CAPITAL COST CATEGORY	DEPRECIATION METHOD	DEPRECIABLE LIFE	CALENDAR YEAR	DEPRECIATION CHARGE	SALVAGE VALUE %	SALVAGE VALUE	INVESTMENT TAX CREDIT
			1984	413554.			130596.
			1985	613731.			141044.
			1986	545925.			
			1987	478119.			
			1988	410313.			
			1989	342506.			
			1990	274700.			
			1991	206894.			
			1992	139088.			
			1993	522205.		60461.	261061.
			1994	917190.		65298.	187964.
			1995	1324991.		70522.	203001.
			1996	1178604.			
			1997	1032217.			
			1998	885829.			
			1999	739441.			
			2000	593054.		1377180.	
ENTRY HAULAGE SYSTEM	DOUBLE DECLINING BALANCE	10	1982	158723.	5.0		79362.
			1983	126979.			
			1984	101583.			
			1985	81266.			
			1986	65013.			
			1987	52011.			
			1988	41608.			
			1989	33287.			
			1990	26629.			
			1991	21303.			
			1992	342670.		85214.	171335.
			1993	274136.			
			1994	219309.			
			1995	175447.			
			1996	140358.			
			1997	112286.			
			1998	89829.			
			1999	71863.			
			2000	57491.		229962.	

VIII DIRECT OPERATION COSTS

CALENDAR YEAR	LABOR	LABOR OVERHEAD	SUPPLIES & MATERIALS	POWER COST	UMW COST	INSURANCE	TOTAL
1986	9111089.	3644434.	9114787.	916991.	3076451.	914554.	26778272.
1987	9657749.	3863098.	9661669.	972010.	3261036.	990004.	28405536.
1988	10237208.	4094881.	10241363.	1030330.	3456696.	1071678.	30132112.
1989	10851435.	4340571.	10855839.	1092148.	3664095.	1160090.	31964128.
1990	11502515.	4601002.	11507183.	1157676.	3883938.	1255796.	33908048.
1991	12192659.	4877059.	12197607.	1227135.	4116972.	1359398.	35970768.
1992	12924212.	5169679.	12929456.	1300762.	4363988.	1471547.	38159584.
1993	13699657.	5479856.	13705216.	1378807.	4625824.	1592948.	40482256.
1994	14521629.	5808644.	14527521.	1461534.	4903370.	1724365.	42946992.
1995	15392918.	6157159.	15399164.	1549225.	5197569.	1866624.	45562592.
1996	16316484.	6526585.	16323105.	1642177.	5509420.	2020619.	48338320.
1997	17295456.	6918176.	17302480.	1740706.	5839982.	2187319.	51284048.
1998	18333168.	7333262.	18340608.	1845147.	6190377.	2367771.	54410240.
1999	19433136.	7773253.	19441024.	1955854.	6561796.	2563110.	57728080.
2000	20599104.	8239644.	20607472.	2073204.	6955500.	2774565.	61249408.

IX CASH FLOW SUMMARY TABLE

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:								
	RELATIVE YEAR OF FULL PRODUCTION:	-6	-5	-4	-3	-2	-1	1	2
101	COAL VALUE/TON	0.0	0.0	0.0	0.0	39.52	43.08	46.96	51.18
102	ANNUAL PRODUCTION CLEAN COAL	0.	0.	0.	0.	366555.	366555.	999999.	999999.
103	ANNUAL SALES REVENUE	0.	0.	0.	0.	14487752.	15791629.	46958432.	51184640.
104	ANNUAL OPERATING COSTS	0.	0.	0.	0.	0.	0.	26778272.	28405536.
105	GROSS PROFIT	0.	0.	0.	0.	14487752.	15791629.	20180160.	22779104.
	OTHER COSTS AND DEDUCTIONS								
106	AMORTIZATION	0.	0.	0.	0.	0.	0.	2732724.	2758846.
107	DEPRECIATION	0.	0.	158723.	716907.	1282552.	1859517.	1819894.	1783572.
108	EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	118371.	0.	0.	0.	0.	0.	-118371.	0.
109	ROYALTY PAYMENTS	0.	0.	0.	0.	1159019.	1263330.	3756673.	4094770.
110	LOAN INTEREST	0.	0.	0.	0.	0.	0.	3986532.	3566325.
111	MISCELLANEOUS	0.	0.	0.	0.	238261.	238261.	649999.	649999.
112	NET INCOME BEFORE TAXES	-118371.	0.	-158723.	-716907.	11807921.	12430522.	7352709.	9925592.
113	STATE & LOCAL INCOME TAXES	0.	0.	0.	0.	236158.	248610.	147054.	198512.
114	DEPLETION ALLOWANCE	0.	0.	0.	0.	1332873.	1452830.	3602827.	4708986.
115	TAX LOSS CARRIED FORWARD	0.	118371.	118371.	277094.	994001.	0.	0.	0.
116	NET INCOME SUBJECT TO FEDERAL TAXATION	0.	0.	0.	0.	9244888.	10729082.	3602828.	5018095.
117	FEDERAL TAXES	0.	0.	0.	0.	4233398.	4916127.	1638050.	2289073.
118	INVESTMENT TAX CREDIT	0.	0.	0.	0.	1051434.	545108.	55858.	60326.

IX CASH FLOW SUMMARY TABLE

LINE	CASHFLOW LINE ITEMS	1980	1981	1982	1983	1984	1985	1986	1987
	CALENDAR YEAR OF PROJECT:								
	RELATIVE YEAR OF FULL PRODUCTION:	-6	-5	-4	-3	-2	-1	1	2
119	NET FEDERAL TAXES PAID	0.	0.	0.	0.	3181963.	4371018.	1582192.	2228746.
120	NET PROFIT	0.	0.	0.	0.	6062925.	6358064.	2020636.	2789349.
121	ADDITIONAL INCOME	0.	0.	0.	0.	0.	0.	0.	0.
	ADJUSTED NET								
122	ADDBACK OF NONCASH COSTS	118371.	118371.	277094.	994001.	3609426.	3312347.	5918142.	7358125.
123	LOAN PRINCIPAL PAYMENT	0.	0.	0.	0.	0.	0.	4202078.	4622285.
124	NET CASH INFLOW FROM OPERATIONS	0.	0.	0.	0.	9672351.	9670411.	3736700.	5525189.
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	1500000.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	118371.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	8096000.	8581755.	9096655.	0.	0.
128	CONSTRUCTION	3839308.	697547.	2884739.	3144363.	903341.	984641.	0.	365710.
129	EQUIPMENT	0.	0.	793617.	4673427.	5047299.	5451081.	558578.	603264.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	10578010.	0.
131	INDIRECT CAPITAL	63995.	69755.	288474.	1101714.	595064.	643572.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	0.	0.	7796232.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	5521673.	767302.	3966829.	17015504.	15127459.	16175949.	8354809.	968974.
134	AMOUNT FUNDED FROM EQUITY	2760836.	383651.	1983414.	8507750.	7563728.	8087973.	8354809.	968974.
135	AMOUNT FUNDED FROM LOANS	2760836.	383651.	1983414.	8507753.	7563730.	8087975.	0.	0.
136	ANNUAL NET CASHFLOW	-2760836.	-383651.	-1983414.	-8507750.	2108623.	1582438.	-4618109.	4556215.

IX CASH FLOW SUMMARY TABLE

CALENDAR YEAR OF PROJECT:	1988	1989	1990	1991	1992	1993	1994	1995
RELATIVE YEAR OF FULL PRODUCTION:	3	4	5	6	7	8	9	10
LINE CASHFLOW LINE ITEMS								
101 COAL VALUE/TON	55.79	60.81	66.29	72.25	78.75	85.84	93.57	101.99
102 ANNUAL PRODUCTION CLEAN COAL	999999.	999999.	999999.	999999.	999999.	999999.	999999.	999999.
103 ANNUAL SALES REVENUE	55791200.	60812336.	66285392.	72251024.	78753552.	85841280.	93566912.	101987856.
104 ANNUAL OPERATING COSTS	30132112.	31964128.	33908048.	35970768.	38159584.	40482256.	42946992.	45562592.
105 GROSS PROFIT	25659088.	28848208.	32377344.	36280256.	40593968.	45359024.	50619920.	56425264.
OTHER COSTS AND DEDUCTIONS								
106 AMORTIZATION	2758846.	2795054.	2795054.	2846676.	2846676.	2923342.	2923342.	3044791.
107 DEPRECIATION	1750606.	1721096.	1695185.	1673053.	1980546.	2906519.	3854558.	4833070.
108 EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	0.	0.	0.	0.	0.	0.	0.	0.
109 ROYALTY PAYMENTS	4463295.	4864985.	5302830.	5780080.	6300282.	6867300.	7485351.	8159026.
110 LOAN INTEREST	3104096.	2595643.	2036346.	1421120.	744372.	0.	0.	0.
111 MISCELLANEOUS	649999.	649999.	649999.	649999.	649999.	649999.	649999.	649999.
112 NET INCOME BEFORE TAXES	12932246.	16221431.	19897920.	23909328.	28072080.	32011856.	35706656.	39738368.
113 STATE & LOCAL INCOME TAXES	258645.	324428.	397958.	478186.	561441.	640237.	714133.	794767.
114 DEPLETION ALLOWANCE	5132791.	5594735.	6098257.	6647095.	7245328.	7897398.	8608157.	9382883.
115 TAX LOSS CARRIED FORWARD	0.	0.	0.	0.	0.	0.	0.	0.
116 NET INCOME SUBJECT TO FEDERAL TAXATION	7540811.	10302268.	13401705.	16784032.	20265296.	23474208.	26384352.	29560704.
117 FEDERAL TAXES	3449522.	4719793.	6145534.	7701404.	9302785.	10778885.	12117551.	13578673.
118 INVESTMENT TAX CREDIT	65153.	70365.	75994.	82073.	259974.	1104682.	795371.	859000.

IX CASH FLOW SUMMARY TABLE

LINE	CASHFLOW LINE ITEMS	1988	1989	1990	1991	1992	1993	1994	1995
	CALENDAR YEAR OF PROJECT:								
	RELATIVE YEAR OF FULL PRODUCTION:	3	4	5	6	7	8	9	10
119	NET FEDERAL TAXES PAID	3384369.	4649428.	6069540.	7619330.	9042810.	9674203.	11322180.	12719672.
120	NET PROFIT	4156442.	5652840.	7332165.	9164702.	11222486.	13800005.	15062172.	16841024.
121	ADDITIONAL INCOME	0.	0.	0.	0.	85214.	411526.	444448.	480004.
	ADJUSTED NET								
122	ADDBACK OF NONCASH COSTS	8649004.	10100376.	10588496.	11166824.	12072550.	13727259.	15386057.	17260736.
123	LOAN PRINCIPAL PAYMENT	5084514.	5592967.	6152264.	6767490.	7444238.	0.	0.	0.
124	NET CASH INFLOW FROM OPERATIONS	7720932.	10160249.	11768392.	13564030.	15936002.	27938784.	30892672.	34581760.
	CAPITAL EXPENDITURES FOR YEAR								
125	ACQUISITION	0.	0.	0.	0.	0.	0.	0.	0.
126	EXPLORATION	0.	0.	0.	0.	0.	0.	0.	0.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	0.	0.	0.	0.	0.
128	CONSTRUCTION	0.	434499.	0.	516227.	0.	613329.	0.	728695.
129	EQUIPMENT	651525.	703647.	759939.	820734.	2599742.	11046823.	11930564.	12885006.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	0.	0.	0.
131	INDIRECT CAPITAL	0.	0.	0.	0.	0.	0.	0.	0.
132	WORKING CAPITAL	0.	0.	0.	0.	0.	0.	0.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	651525.	1138146.	759939.	1336961.	2599742.	11660151.	11930564.	13613700.
134	AMOUNT FUNDED FROM EQUITY	651525.	1138146.	759939.	1336961.	2599742.	11660151.	11930564.	13613700.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	0.	0.	0.	0.
136	ANNUAL NET CASHFLOW	7069406.	9022103.	11008453.	12227069.	13336260.	16278633.	18962096.	20968048.

IX CASH FLOW SUMMARY TABLE

CALENDAR YEAR OF PROJECT:	1996	1997	1998	1999	2000	
RELATIVE YEAR OF FULL PRODUCTION:	11	12	13	14	15	TOTAL
LINE CASHFLOW LINE ITEMS						
101 COAL VALUE/TON	111.17	121.17	132.08	143.96	156.92	
102 ANNUAL PRODUCTION CLEAN COAL	999999.	999999.	999999.	999999.	999999.	15733094.
103 ANNUAL SALES REVENUE	111166656.	121171568.	132076896.	143963696.	156920288.	1409009920.
104 ANNUAL OPERATING COSTS	48338320.	51284048.	54410240.	57728680.	61249408.	627319552.
105 GROSS PROFIT	62828336.	69887520.	77666656.	86235616.	95670880.	781690112.
OTHER COSTS AND DEDUCTIONS						
106 AMORTIZATION	3044791.	3261231.	3261231.	3775535.	4752923.	46520960.
107 DEPRECIATION	4571826.	4351890.	4166463.	4010233.	3879066.	49015200.
108 EXPENSED PREPRODUCTION EXPLORATION, CONSTRUCTION	0.	0.	0.	0.	0.	0.
109 ROYALTY PAYMENTS	8893330.	9693723.	10566149.	11517093.	12553620.	112720784.
110 LOAN INTEREST	0.	0.	0.	0.	0.	17454432.
111 MISCELLANEOUS	649999.	649999.	649999.	649999.	649999.	10226506.
112 NET INCOME BEFORE TAXES	45668400.	51930704.	59022832.	66282784.	73835296.	545752064.
113 STATE & LOCAL INCOME TAXES	913368.	1038614.	1180456.	1325655.	1476705.	10934923.
114 DEPLETION ALLOWANCE	10227333.	11147786.	12151076.	13244662.	14436669.	128911616.
115 TAX LOSS CARRIED FORWARD	0.	0.	0.	0.	0.	1507836.
116 NET INCOME SUBJECT TO FEDERAL TAXATION	34527696.	39744304.	45691296.	51712464.	57921920.	405905408.
117 FEDERAL TAXES	15863489.	18263104.	20998720.	23768464.	26624816.	186389328.
118 INVESTMENT TAX CREDIT	40198.	43413.	0.	0.	0.	5108943.

IX CASH FLOW SUMMARY TABLE

LINE	CASHFLOW LINE ITEMS	1996	1997	1998	1999	2000	
	CALENDAR YEAR OF PROJECT:	1996	1997	1998	1999	2000	
	RELATIVE YEAR OF FULL PRODUCTION:	11	12	13	14	15	
119	NET FEDERAL TAXES PAID	15823291.	18219680.	20998720.	23768464.	26624816.	181280368.
120	NET PROFIT	18704400.	21524624.	24692576.	27944000.	31297104.	224625440.
121	ADDITIONAL INCOME	59977.	64775.	69957.	75553.	14893119.	16584570.
	ADJUSTED NET						
122	ADDBACK OF NONCASH COSTS	17843936.	18760896.	19578768.	21030416.	23068656.	220939792.
123	LOAN PRINCIPAL PAYMENT	0.	0.	0.	0.	0.	39865808.
124	NET CASH INFLOW FROM OPERATIONS	36608304.	40350288.	44341296.	49049968.	69258864.	420775680.
	CAPITAL EXPENDITURES FOR YEAR						
125	ACQUISITION	0.	0.	0.	0.	0.	1500000.
126	EXPLORATION	0.	0.	0.	0.	0.	118371.
127	PREPRODUCTION DEVELOPMENT	0.	0.	0.	0.	0.	25774400.
128	CONSTRUCTION	0.	865761.	0.	1028608.	977389.	17984128.
129	EQUIPMENT	1205925.	1302398.	1406589.	1519116.	1640645.	65599792.
130	ACCRUED INTEREST	0.	0.	0.	0.	0.	10578010.
131	INDIRECT CAPITAL	0.	0.	0.	0.	0.	2762573.
132	WORKING CAPITAL	0.	0.	0.	0.	-7796232.	0.
133	TOTAL ANNUAL CAPITAL EXPENDITURE	1205925.	2168158.	1406589.	2547724.	-5178199.	113739280.
134	AMOUNT FUNDED FROM EQUITY	1205925.	2168158.	1406589.	2547724.	-5178199.	84451936.
135	AMOUNT FUNDED FROM LOANS	0.	0.	0.	0.	0.	29287344.
136	ANNUAL NET CASHFLOW	35402368.	38182128.	42934704.	46502240.	74437056.	336323840.