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COSTEAM, An Industrial Steam Generation Cost Model—

Updated Users' Manual

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COSTEAM, An Industrial Steam Generation Cost Model—

Updated Users' Manual

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ABSTRACT

This updated version of the Users' Manual contains instructions for using the expanded and improved COSTEAM model. COSTEAM has three technology submodels at the end of Phase II development. The technology submodels address conventional coal, conventional oil and atmospheric fluidized bed combustion. The major changes from the previous version of the Users' Manual are the inclusion of the oil and atmospheric fluidized systems.

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1.0 COSTEAM Capabilities

COSTEAM is a tool for designers and managers who are faced with choosing among alternative systems for generating process steam, whether for new or replacement applications. Such a decision really requires a series of choices among overall system concepts, component characteristics, fuel types and financial assumptions, all of which are interdependent and affect the cost of steam to the industrial user.

COSTEAM IS AN INTERACTIVE COMPUTER MODEL. It takes the user's input on key characteristics of a proposed process steam generation facility, and computes its capital, operating and maintenance costs.

VERSATILITY AND SIMPLICITY OF OPERATION ARE MAJOR GOALS OF THE COSTEAM SYSTEM. As a user, you can work to almost any level of detail

necessary and appropriate to a given stage of planning. Since the values you specify are retained and used by the computer throughout each terminal session, you can set up a hypothetical steam generation system fixed in all characteristics but one or two of special interest to you. It is then quick and easy to obtain a series of results by changing only those one or two values between computer runs.

USING COSTEAM IS VERY SIMPLE. Once in contact with the computer, you will be presented a series of questions, asking you to type in basic operating values, then eliciting any additional detail you may wish to specify. Basic instructions are presented by the computer to assist in this procedure, although you may in some cases need to refer to tables contained in this document to select specific responses that the model can recognize.

The current version of COSTEAM contains costs of boiler systems using conventional coal, atmospheric fluidized bed combustion and conventional oil. You can use COSTEAM to compare the cost of producing steam using these technologies.

The structure and calculation methods of COSTEAM are not discussed in this guide, and need not be understood in order to use the model. However, you may consult the companion volume of this report, "COSTEAM Expansion and Improvements: Design of a Coal-Fired Atmospheric Fluidized Bed Submodel, an Oil-Fired Submodel, and Input/Output Improvements", MTR80W00048, which presents the design details

on COSTEAM, to obtain an idea of the model's relative precision, underlying assumptions, and limitations.

This Users' Manual reflects the capabilities of the COSTEAM model at the end of Phase II Development. It replaces the Phase I Users' Manual.*

* "COSTEAM, An Industrial Steam Generation Cost Model, Instructions for Using the Model", MTR79W00007-02, April 1979.

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2.0 COSTEAM Terminology

2.1 LEVELS OF PARAMETERS

Three levels of parameters have been defined for COSTEAM:

- GLOBAL LEVEL PARAMETERS
- SYSTEM LEVEL PARAMETERS
- COMPONENT LEVEL PARAMETERS

These reflect a hierarchy of detail - GLOBAL LEVEL parameters apply to all steam-generating systems in the model, SYSTEM LEVEL parameters are defined separately for each alternative system, and COMPONENT LEVEL parameters are specific to particular system components. Interaction with COSTEAM is governed by this hierarchy: you first specify GLOBAL LEVEL parameters, then SYSTEM LEVEL parameters, then COMPONENT LEVEL parameters. Since many of these are optional, you can work to whatever level of detail is sufficient for your purposes.

Figure 2.1 shows the hierarchy of system levels, and COSTEAM PARAMETERS associated with each level.

GLOBAL LEVEL PARAMETERS

- BASIC OPERATIONAL PARAMETERS
- ENVIRONMENTAL STANDARD
- ENVIRONMENTAL PARAMETERS
- GLOBAL PARAMETERS
- FUEL TYPE
- FUEL PARAMETERS

- BASIC OPERATIONAL PARAMETERS define the scale and major operating requirements of the system you want to test. They include such factors as steam demand, steam pressure and condensate return. You are required to assign appropriate numerical values to each of these parameters at the beginning of each COSTEAM session. Basic Operational Parameters are listed and defined in Tables 6-1, p.44 and 6-2, p. 45.
- ENVIRONMENTAL STANDARDS names can be selected from Table 6-3, p. 46. Note that each standard is defined in terms of limitations on SOx, NOx and particulate emissions. Each of these emission restrictions is an ENVIRONMENTAL PARAMETER.
- ENVIRONMENTAL PARAMETERS comprising each standard can be varied to suit your needs. Codes for these parameters are shown in Table 6-4, p. 46.

FIGURE 2.1
HIERARCHY OF COSTEAM PARAMETERS

- GLOBAL PARAMETERS are a specific subset of all Global Level parameters. Global Parameters include such factors as inflation rates, financial parameters, and material and disposal costs. These are listed and defined in Table 6-5, p. 45.
- FUEL TYPE is a coded (coal or oil) name selected from Table 6-6, p. 47 and Table 6-7, p. 48. Fuel moisture, sulfur, ash and heat content, and fuel price are automatically assigned with the selection of a Fuel Type. These factors are the FUEL PARAMETERS.
- FUEL PARAMETERS may be varied to suit your needs. Codes for Fuel Parameters are given in Table 6-8, p. 49 and 6-9, p. 49.

SYSTEM LEVEL PARAMETERS

- SYSTEM NAME
- VARIANT NAME
- SYSTEM PARAMETERS

- SYSTEM NAMES can be one of three choices: conventional coal-fired boiler, atmospheric fluidized bed boiler and conventional oil-fired boiler. The codes for these system names are given in Table 6-10, p. 52.
- VARIANT NAME describes system variants that differ from one another in certain major components. In the case of the conventional coal-fired system, two system variants are included: stoker and pulverized coal. For the atmospheric fluidized bed coal system the two variants are "vendor" and "theory", which use different capital cost data tables. The Variant Name must be specified by one of the coded entries defined in Table 6-11, p. 52.

- SYSTEM PARAMETERS are items other than System Name and Variant Name that apply to the system level of information. An example of a System Parameter is the "annual electricity cost for the plant". System Parameters are listed and defined in Table 6-12, p. 56. You need not assign the value for any System Parameter; values are either assumed or calculated by COSTEAM. Assumed values are shown in Table 6-12 next to the System Parameter code name. In the COSTEAM dialogue you will be asked if you want to change System Parameters. At that time you may specify your own value for any of the assumed System Parameters.

COMPONENT LEVEL PARAMETERS

- COMPONENT NAME
 - COMPONENT PARAMETERS
- COMPONENT NAME identifies predefined items of equipment that together make up a process steam generation system. These are given in Table 6-13, p. 66. They include components such as "Major Boiler Equipment", "Fuel Handling", and "Dry-Ash Handling". As may be seen in Table 6-13, each of these components consists of a number of individual equipment items, which are referenced by number. Component Names are only used for parameter identification and therefore never need respecification.
 - COMPONENT PARAMETERS are basically the results of the COSTEAM answers to your question, "How much does it cost?". Component

Parameters therefore include the primary capital and operating cost information of the equipment items in the steam plant.

The capital equipment cost of an Air Heater is an example of a Component Parameter. You need two codes to identify this or any other Component Parameter: a Component Name code and a Component Parameter code. As seen in Table 6-13, the Air Heater is part of the Major Boiler Equipment Component. The code for Component Name is shown there as BOILER. The Component Parameter code is CLOEQMT. The procedure for determining this latter code is given in Figure 6.1, p. 70.

There are several hundred Component Parameters in COSTEAM. The dual name identification procedure for Component Parameters greatly reduces the number of codes required. You will find the operation of COSTEAM to be greatly facilitated by understanding the identification procedure just discussed and presented in Figure 6.1.

2.2 MANDATORY VS. OPTIONAL PARAMETER ENTRY

In addition to LEVEL of information (Global, System or Component), parameters can be divided to reflect whether it is MANDATORY or OPTIONAL to enter a value for each. For example, it is mandatory to enter a value for each of the Basic Operational Parameters. It is mandatory to enter a Fuel Type. However, it is optional to enter values for Fuel Parameters, or Component Parameters.

This is possible because COSTEAM contains in its files typical values for each of the optional parameters. You can specify a different value for one or more of these parameters if you wish, or you can allow the program to use the typical values stored in its files.

The typical values assigned to each optional parameter are listed in the tables in Section 6.0.

An example of an optional parameter (Global) is Plant Life, abbreviated PLTLIFE. COSTEAM assumes for its calculations that the life of every facility is 30 years. If 30 years is consistent with your planning assumptions, you will not need to specify a value for PLTLIFE. If, instead, you want to evaluate facility costs over some other period of years, say 20 years, you would instruct the program to use that value instead of 30 for its calculations. It is important to understand that this new value, 20 years, will remain in effect throughout the current terminal session until you change it again, regardless of the number of COSTEAM runs during this session. For all other system users, the assumed value remains 30 years. When you return for your next terminal session, the computer would once again assume a 30-year plant life unless instructed otherwise. The entire set of typical values for optional parameters is protected in the same way from inadvertent alteration by COSTEAM users. Permanent changes can be made only by altering the permanent data files.

2.3 SUMMARY

Parameters are grouped in a hierarchy of three Levels: Global, System and Component. Within each of these levels, it is Mandatory that the user enter certain parameters, and Optional for other parameters. Table 2-1 shows how the eleven parameter categories are grouped according to Level, and Mandatory vs. Optional entry.

TABLE 2-1

PARAMETER LEVELS, MANDATORY VS. OPTIONAL ENTRY

	MANDATORY TO ENTER VALUE	OPTIONAL TO ENTER VALUE
GLOBAL LEVEL	Basic Operational Parameters Environmental Standard Fuel Type	Global Parameters Environmental Parameters Fuel Parameters
SYSTEM LEVEL	System Name Variant Name (if defined)	System Parameters
COMPONENT LEVEL		Component Name Component Parameters

3.0 COSTEAM Operation

Two procedures are described in this section: The BASIC COSTEAM PROCEDURE and MODIFICATION OF THE BASIC PROCEDURE.

3.1 BASIC COSTEAM PROCEDURE

The BASIC COSTEAM PROCEDURE is used when you agree with the values assigned to parameters by COSTEAM. Usually, you would start with the Basic COSTEAM procedure. It requires you to set values for only the mandatory parameters:

- BASIC OPERATIONAL PARAMETERS
- ENVIRONMENTAL STANDARD
- FUEL TYPE
- SYSTEM NAME
- VARIANT NAME

To carry out the Basic Procedure, you must be prepared to supply a value for each of the following parameters, requested in the following order:*

- STEAM DEMAND (LB/HR)
- STEAM PRESSURE (PSI)
- STEAM TEMPERATURE (DEGREES F.)
(if superheat is required)

Immediately after you specify steam pressure, COSTEAM will ask:

IS STEAM TO BE SUPERHEATED? (YES OR NO)

If you answer YES, the sequence will resume with a request for steam temperature. If you answer NO, the request for steam temperature will be skipped, and the sequence of requests will resume with the next parameter, condensate return.

- CONDENSATE RETURN (FRACTION)
- CONDENSATE RETURN TEMPERATURE (DEGREES F.)
- PLANT CAPACITY FACTOR
- REGION NAME
- START-UP YEAR
- RUN TITLE
- SYSTEM NAME
- VARIANT NAME (for conventional coal and AFB systems only)
- NAME OF FUEL
- NAME OF ENVIRONMENTAL STANDARD

*Permissible ranges for these parameters are given in Section 6.0.

COSTEAM asks a series of questions to prompt modification of the optional parameters. Each of these questions must be answered YES or NO. For example:

DO YOU WISH TO SPECIFY PARAMETERS FOR SYSTEM (system name)?
(YES OR NO) For the Basic Procedure, you answer NO to each such question. When the last question has been answered, the calculations will be carried out and the Standard Report generated with no further instructions from you. An example of the Basic COSTEAM Procedure is shown in Figure 3.1.

3.2 MODIFICATION OF THE BASIC PROCEDURE

MODIFICATION OF THE BASIC PROCEDURE occurs when you specify values for one or more of the parameters listed as optional:

- GLOBAL PARAMETERS
- ENVIRONMENTAL PARAMETERS
- FUEL PARAMETERS
- SYSTEM PARAMETERS
- COMPONENT PARAMETERS

COSTEAM invites modification of these at an appropriate point in the dialogue by asking:

DO YOU WISH TO SPECIFY PARAMETERS FOR (your fuel type)?
(YES OR NO)

DO YOU WISH TO SPECIFY PARAMETERS FOR (environmental
standard)? (YES OR NO)

DO YOU WISH TO SPECIFY PARAMETERS FOR SYSTEM (system
name)? (YES OR NO)

COSTEAM
 INDUSTRIAL COST OF STEAM MODEL
 PHASE 2 VERSION
 ENTER BASIC OPERATIONAL PARAMETERS
 ENTER STEAM DEMAND (LB/HR)
 ?
 200000
 ENTER STEAM PPESSURE (PSIG)
 ?
 250
 IS STEAM TO BE SUPERHEATED ? (YES OR NO)
 NO
 ENTER CONDENSATE RETURN (FRACTION)
 ?
 .4
 ENTER CONDENSATE RETURN TEMP. (DEGREES F.)
 ?
 180
 ENTER PLANT CAPACITY FACTOR
 ?
 .65
 ENTER REGION NAME
 CHICAGO
 ENTER START UP YEAR
 ?
 1983
 ENTER RUN TITLE
 SAMPLE
 ENTER SYSTEM NAME
 CONVCOAL
 ENTER VARIANT NAME FOR SYSTEM CONVCOAL
 PULVERIZ
 ENTER NAME OF FUEL
 COAL16
 DO YOU WISH TO SPECIFY PARAMETERS FOR COAL16 ? (YES OR NO)
 NO
 ENTER NAME OF ENVIPONMENTAL STANDARD
 ENVHIGH
 DO YOU WISH TO SPECIFY PARAMETERS FOR ENVHIGH ? (YES OR NO)
 NO
 DO YOU WISH TO SPECIFY PARAMETERS FOR SYSTEM CONVCOAL ? (YES OR NO)
 NO
 PROCESSING SYSTEM CONVCOAL
 PROCESSING COMPLETED

(SUMMARY REPORT PRINTED HERE)
 (See Figure 5.1)

DO YOU WANT TO PRINT SPECIFIC PAPAMETERS ? (YES OR NO)
 NO
 DO YOU WANT A REPORT TO BE WRITTEN ? (YES OR NO)
 NO
 ENTER REPORT NAME OR END
 END
 DO YOU WISH TO PROCESS ANOTHER SYSTEM ? (YES OR NO)
 NO

FIGURE 3.1
EXAMPLE COSTEAM RUN BASIC PROCEDURE

If you answer NO, as in the Basic Procedure, COSTEAM will move to the next subject in the dialogue. If you answer YES, additional questions will be posed to elicit the values you wish to specify. You will be asked for the code name of each parameter you wish to modify followed by a request for the value of that parameter. In most cases you will change parameter values by following a procedure similar to that described for a parameter query in Section 3.3 below. However, the exact procedure to be followed is shown in detail in Section 4.0 of this document. Certain system and component parameters are used to determine which equipment items are to be included in the plant. The specification of equipment items is discussed in Section 6.0.

3.3 PARAMETER QUERY

At the end of a COSTEAM calculation you have the choice of requesting the value of virtually any of the parameters used or calculated by COSTEAM. You will be asked:

DO YOU WANT TO PRINT SPECIFIC PARAMETERS? (YES OR NO)

If you answer YES, you will be asked to identify two code names for each parameter value you want to see. To simplify your work, the choices for the first code names are printed directly at the terminal. The second code name is found in Section 6.0 in the tables or figures which relate to the first code name.

For instance, if you want to determine the sulfur content of the coal used in the COSTEAM run, you will find the code name FUEL

among the list of code names printed at the terminal. In Section 6.0, Table 6-8 gives coal parameter codes. The desired code name is SULFUR. You will then type the two code words FUEL and SULFUR in the places shown and COSTEAM will immediately give you the requested value. The units of that value are shown in Table 6-8, p. 51.

For Component Parameter queries, the two code names are the Component Name code and the Component Parameter code discussed in Section 2.0.

3.4 DATA INPUT AND RESPONSE TO INPUT ERRORS

To enter data at the terminal, you need to type the desired response and push the RETURN key. In entering data, you may commit certain errors. The remaining of this Section discusses the procedures for handling these errors.

● TYPOGRAPHICAL ERRORS

If you detect these before the RETURN key is pushed, you can delete them and retype the correct entry. Consult your terminal manual for the method for deleting characters since it differs among computers.

If you discover the data entry error only after you have pushed the RETURN key, the current COSTEAM model has limited capability for reentry. You may choose to end the run prematurely in this case. The procedure for doing this is described later on in this Section.

● ERROR IN OVERRIDE VALUES

If you have made an error in entering a value to override the system's value, and have already pushed RETURN, you may reenter the parameter name and enter a new override value.

● ENTRIES OUTSIDE ALLOWABLE RANGE

As you can see from the COSTEAM tables, certain parameters are allowed to assume values only within a certain range. If you enter a value which is not within the permissible range, the message "INVALID - REENTER DATA" will appear at the terminal. In this case, simply reenter a correct value.

● INVALID SYSTEM NAME

If you have entered an invalid system name, the message "SYSTEM DOES NOT EXIST" will appear at the terminal. The message "ENTER SYSTEM NAME" to which you incorrectly responded will then reappear at the terminal. At that time, reenter the correct name.

● INVALID VARIANT NAME

If you have entered an invalid variant name, this message will appear at the terminal, "INVALID VARIANT NAME, VALID NAMES ARE", followed by a list of valid variant names. You need to enter the correct name at the end of this listing.

● INVALID FUEL OR ENVIRONMENTAL STANDARD NAME

In this case, the terminal will deliver the message:

"REENTER NAME OR ENTER END TO TERMINATE SESSION".

● INVALID COMPONENT OR PARAMETER NAME DURING PARAMETER QUERY

If you commit an error in specifying the component or parameter name, you will receive the message, "INVALID". Reenter a new component and parameter name.

● INVALID REPORT NAME

An incorrect entry of the report name will cause the terminal to print "INVALID REPORT NAME" and a list of valid report names. You need to enter the correct name at the end of this listing.

● WARNING MESSAGES

The COSTEAM technology submodels check certain input parameter values before costs are calculated. A warning message appears on the terminal screen if any of these parameter values are not within allowed limits or are inconsistent with one another. You can then enter CONTINUE to continue the run with the present values, CHANGE to change parameter values, or STOP to end the COSTEAM run.

● HOW TO END A RUN PREMATURELY

Under certain circumstances, you may want to end a run before it is fully accomplished. You may do so by entering END where any one of the following messages appears on the terminal:

- "ENTER REGION NAME"
- "ENTER SYSTEM NAME"
- "ENTER VARIANT FOR SYSTEM"

- "ENTER NAME OF FUEL"

- "ENTER NAME OF ENVIRONMENTAL STANDARD"

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4.0 COSTEAM User Key

This section provides a detailed introduction to the interactive use of COSTEAM. A step-by-step key is included, with explanation of each step, and references to Tables of Parameters in Section 6.0 to assist you in selecting appropriate answers to the questions COSTEAM will ask. This format simplifies instruction, but is also intended for continued use as a planning and reference tool.

INSTRUCTIONS FOR USING THE KEY

THE COSTEAM KEY consists of a series of numbered instructions and questions in the exact form and sequence they will appear at your terminal. Where specific coded answers are required, you will be referred to tables in Section 6.0.

To assist in directing flow, the pages of the key have been designated "sheets A-J". Computer statements made to you at the terminal are referenced by consecutive numbers, brought out in large type.

Arrows in the margin show where you are to make an entry. An explanation of the entry required is placed in parenthesis on the same line. In general, your entries should begin at the left margin of the terminal display. Numbers can be expressed with or without decimal point, up to 8 total characters. You do not enter unit designators, such as "lbs". These are assumed as part of the parameter definition. If you do not indicate a decimal point, the program will assume one after the last digit you enter.

TERMINAL DISPLAY INDICATED THUS

→ (Indicates where you type in a response.)

KEY TO COSTEAM OPERATING PROCEDURE

→ (Enter COSTEAM to begin procedure.)

EXECUTION BEGINS INDUSTRIAL COST OF STEAM MODEL

ENTER BASIC OPERATIONAL PARAMETERS

1 ENTER STEAM DEMAND (LB/HR)

→ (Enter your number here, see Table 6-1)

2 ENTER STEAM PRESSURE (PSIG)

→ (Enter your number here, see Table 6-1)

3 IS STEAM TO BE SUPERHEATED? (YES OR NO)

→ (Enter YES or NO)

If YES, go to line 4

*

If NO, go to line 5

4 ENTER STEAM TEMPERATURE (DEGREES F.)

→ (Enter your number here, see Table 6-1)

5 ENTER CONDENSATE RETURN (FRACTION)

→ (Enter your number here, see Table 6-1)

6 ENTER CONDENSATE RETURN TEMPERATURE (DEGREES F.)

→ (Enter your number here, see Table 6-1)

*In actual interaction with COSTEAM, the program goes automatically to the statement indicated when you type in YES or NO.

7 ENTER PLANT CAPACITY FACTOR

→ (Enter decimal fraction for your plant capacity factor.)

8 ENTER REGION NAME

→ (You must enter one of the city names listed below, which best represents your plant location.)

TABLE OF REGION NAMES

	NAME OF CITY	CODE TO ENTER
1	Atlanta, Ga.	ATLANTA
2	Baltimore, Md.	BALTMORE
3	Birmingham, Ala.	BIRMHAM
4	Boston, Mass.	BOSTON
5	Chicago, Ill.	CHICAGO
6	Cincinnati, Ohio	CINCINATI
7	Cleveland, Ohio	CLEVELAND
8	Dallas, Tex.	DALLAS
9	Denver, Colo.	DENVER
10	Detroit, Mich.	DETROIT
11	Kansas City, Mo.	KANCITY
12	Los Angeles, Calif.	LOSANG
13	Minneapolis, Minn.	MINNPLS
14	New Orleans, La.	NORLEANS
15	New York, N.Y.	NEWYORK
16	Philadelphia, Pa.	PHILLY
17	Pittsburgh, Pa.	PITTBURG
18	St. Louis, Mo.	STLOUIS
19	San Francisco, Calif.	SANFRAN
20	Seattle, Wash.	SEATTLE

9 ENTER START UP YEAR

→ (Enter planned four-digit start-up year)

10 ENTER RUN TITLE

→ (In your own words enter a title for this model run up to 80 characters long.)

11 ENTER SYSTEM NAME

→ (Enter one of the following.)

TYPE OF SYSTEM	CODE TO ENTER
Conventional Coal-fired Boiler	CONVCOAL
Atmospheric Fluidized Bed Boiler	AFBCOAL
Conventional Oil-Fired Boiler	CONVOIL

12 ENTER VARIANT NAME FOR SYSTEM (x)?

→ (Statement 12 will appear only if variants of selected system have been defined. If so, you must enter a proper code for a variant as defined in Table 6-11.)

13 ENTER NAME OF FUEL

→ (Enter proper code for fuel name picked from Table 6-6 and Table 6-7.)

14 DO YOU WISH TO SPECIFY PARAMETERS FOR
(fuel you named)? (YES OR NO)

→ (Enter YES or NO)

If NO, go to line 18

If YES, go to line 15

15 ENTER PARAMETER NAME

→ (Enter proper code for parameter picked from
Table 6-8 and Table 6-9.)

16 ENTER VALUE

→ (Enter the number you want used for this fuel
parameter.)

17 ENTER PARAMETER NAME OR END

→ (Enter the proper code and value for the next fuel
parameter you want to specify, as in the sequence of
lines 13 and 14. When you have entered the name and
value of each fuel parameter you want to specify,
enter END.)

18 ENTER NAME OF ENVIRONMENTAL STANDARD

→ (Enter proper code for the environmental standard you
want used in this computer run. The possible choices
are listed in Table 6-3.)

19 DO YOU WISH TO SPECIFY PARAMETERS FOR
(standard you named)? (YES OR NO)

→ (Enter YES or NO)

If NO, go to line 23.

If YES, go to line 20.

20 ENTER PARAMETER NAME

→ (Enter proper code for the first environmental parameter
you want to specify. This code is given in Table 6-4.)

21 ENTER VALUE

→ (Enter the number you want to be used for this parameter.)

22 ENTER PARAMETER NAME OR END

→ (Enter proper code and value for the next environmental
parameter you want to specify, as in the sequence of
lines 34 and 35. When all parameters are specified
to your satisfaction, enter END.)

23 DO YOU WISH TO SPECIFY PARAMETER VALUES FOR
SYSTEM (SYSTEM NAME)? (YES OR NO)

→ (Enter either YES or NO)

If NO, the computer will make its run
and display WARNING MESSAGES (if any)
or the standard SUMMARY REPORT. Go
to line 25, sheet G.

If YES, go to line 24, sheet F.

24 FOR EACH PARAMETER VALUE TO BE EXAMINED, ENTER TWO NAMES AS DESCRIBED BELOW.

THE FIRST NAME IDENTIFIES THE PARAMETER GROUP AND MUST BE SELECTED FROM THE FOLLOWING LIST:*

CONVCOAL	FUEL	ENVIRON	GLOBAL	MODEL
BOILER	INSTRUM	FUELHAND	GASCLEAN	DRYASH
WETASH	MECHANIC			

THE SECOND NAME IS THE PARAMETER NAME AND MUST BE SELECTED FROM LISTS GIVEN IN THE USER GUIDE.

ENTER 'END' TO TERMINATE REPORT.

ENTER NAMES IN EXACT POSITIONS INDICATED BELOW.

PARAM.	PARAM.
GROUP	NAME
.....	

(For each parameter for which you desire to specify a value, enter the group name defined above in the first column, and the proper code for the parameter name in the second column, beginning in each column with the first dotted space. The current parameter value will be displayed automatically and will be followed by a message. If the message is "CANNOT BE CHANGED" you will not be permitted to specify a new parameter value. If the message is "ENTER NEW VALUE OR CARRIAGE RETURN" you may specify a new value followed by a carriage return or you may simply give a carriage return without a new value to retain the old value. Enter "END" when you have changed all parameter values you require. The computer will then begin cost calculations.)

* The list which follows will vary according to the system specified for each run.

25 WARNING MESSAGES FOR SYSTEM (SYSTEM NAME)

(The warning messages are printed.)

IF YOU WISH TO CONTINUE PROCESSING, ENTER
'CONTINUE'.

IF YOU WISH TO CHANGE PARAMETER VALUES,
ENTER 'CHANGE'.

IF YOU WISH TO STOP PROCESSING ENTER 'STOP'.

→ (Enter CONTINUE, CHANGE or STOP)

If CONTINUE, go to line 26 below

If CHANGE, go to line 24, sheet F

If STOP, go to line 33, sheet J

(Statement 25 will appear only if errors are detected while processing the system. If you enter CONTINUE when there are errors the calculated results may be invalid.)

SUMMARY REPORT is displayed at the terminal.

26 DO YOU WANT TO PRINT SPECIFIC PARAMETERS? (YES OR NO)

→ (Enter YES or No)

If NO, go to line 28, sheet I

If YES, go to line 27, sheet H

27 FOR EACH PARAMETER VALUE TO BE EXAMINED, ENTER TWO NAMES AS DESCRIBED BELOW.

THE FIRST NAME IDENTIFIES THE PARAMETER GROUP AND MUST BE SELECTED FROM THE FOLLOWING LIST:*

CONVCOAL	FUEL	ENVIRON	GLOBAL	MODEL
BOILER	INSTRUM	FUELHAND	GASCLEAN	DRYASH
WETASH	MECHANIC			

THE SECOND NAME IS THE PARAMETER NAME AND MUST BE SELECTED FROM LISTS GIVEN IN THE USER GUIDE.

ENTER 'END' TO TERMINATE.

ENTER NAMES IN EXACT POSITIONS INDICATED BELOW.

PARAM.	PARAM.
GROUP	NAME
.....	

→ (For each parameter for which you desire the calculated value, enter the group name defined above in the first column, and the proper code for the parameter name in the second column, beginning in each column with the first dotted space. The value will be displayed automatically. Enter END when you have seen all the parameter values you require.)

*The list which follows will vary according to the system specified for each run.

28 DO YOU WANT A REPORT TO BE WRITTEN?
(YES OR NO)

→ (Enter YES or NO)

If NO, go to line 33, sheet J.

If YES, go to line 29.

29 STANDARD REPORT NAMES ARE:
'SUMMARY' 'SUMCAP' 'CAPITAL' 'MATERIAL' 'DESIGN'
'OPERATE' 'FINANCE' 'ERA'

SPECIAL REPORT NAMES ARE:

'ALLS' FOR ALL STANDARD REPORTS

'ALLP' FOR A REPORT OF ALL PARAMETERS

(NOT RECOMMENDED FOR TERMINAL PRINT)

'ALLU' FOR A REPORT OF ALL SYSTEM AND COMPONENT
PARAMETERS SPECIFIED BY USER

'ALL' FOR ALL REPORTS

(NOT RECOMMENDED FOR TERMINAL PRINT)

ENTER 'END' TO TERMINATE REPORTING

ENTER REPORT NAME OR END

→ (Enter one Report Name selected from list given above.

Examples of these reports are provided in Appendix A.

Note that selection of ALLP, all parameters, causes
automatic reporting of more than 1,000 parameter
values. ALLU reports values for the system and com-
ponent parameters to which you assigned values during
this run.)

30 IS REPORT TO BE WRITTEN AT TERMINAL OR PRINTER?
ENTER T FOR TERMINAL; P FOR PRINTER; TP FOR BOTH

→ (Enter T, P, or TP as defined above.)

If you enter T or TP, the report is displayed at
your terminal.

31 IS REPORT TO CONTAIN PARAMETER VALUES, NAMES,
OR BOTH?

ENTER VALUES, NAMES, OR BOTH

→ (Enter VALUES, NAMES, or BOTH)

If you enter VALUES, your reports will contain standard numerical results of COSTEAM calculations. If you enter NAMES, the report will contain no numerical results; rather, the code name for each parameter appearing in the report will be printed in the location where the numerical value would normally appear. If you enter BOTH, the reports will show both the code name and the numerical value for each parameter.

32 ENTER REPORT NAME OR END

→ (Enter the name and printout instructions for the next report you want to see, as in the sequence of lines 29 and 31. When you have produced all the reports you want, enter END.)

33 DO YOU WISH TO PROCESS ANOTHER SYSTEM?
(YES OR NO)

→ (Enter YES or NO)

If NO, the session is terminated, and you should log off or move to your next assignment.

If YES, go to line 34.

34 DO YOU WISH TO SPECIFY BASIC OPERATING
PARAMETERS? (YES OR NO)

→ (Enter YES or NO)

If YES, go to line 1, sheet A

If NO, go to line 10, sheet C

5.0 COSTEAM Reports

Figure 5.1 shows an example SUMMARY REPORT generated automatically with each COSTEAM run. Note that the report has a heading listing the basic assumptions specified for the particular COSTEAM run. This heading is followed by four sections of summary results: capital costs, operating costs, financial calculations, and environmental results. The format of this listing is fixed.

In addition to the Summary Report, you may select a number of reports to be printed either at the terminal or at a printer. Table 5-1 gives the names of each of these reports and a brief description of their contents. Appendix A contains sample pages of COSTEAM reports.

The tables and figures in Section 6.0 give a complete listing of the computer codes for each of the parameters used in COSTEAM. As an additional aid to this parameter code identification, you may

SUMMARY REPORT
PHASE 2 RESULTS IN 1980 DOLLARS

SYSTEM :	CONVCOAL	STEAM DEMAND :	200000. (LR/HR)
VARIANT :	PULVERIZ	STEAM PRESSURE :	250. (PSIG)
REGION :	CHICAGO	STEAM TEMPERATURE :	406. (DEGREE F.)
FUEL :	COALIC	CONDENSATE RETURN :	0.600 (FRACTION)
START UP YEAR :	1983	CONDENSATE TEMP :	180. (DEGREE F.)
ENVIRONMENTAL :	ENVHIGH	CAPACITY FACTOR :	0.6500 (FRACTION)
FIRING RATE :	240.0 MILLION BTUS PER HOUR		

SECTION 1	CAPITAL COSTS (1980 DOLLARS)	SECTION 2	OPERATING COSTS (1980 DOLLARS)
	CAPITAL COST		OPERATING COST
MAJOR BOILER EQUIPMENT	3713611.	FUEL COST	2449876.
MAJOR MECHANICAL EQUIPMENT	1618052.	OPERATING AND MAINTENANCE LABOR	378851.
BOILER INSTRUMENTATION	495432.	CONSUMABLES - H2O, ELEC. , CHEMICALS	314143.
COAL HANDLING EQUIPMENT	760547.	MAINTENANCE MATERIALS	335895.
FLUE GAS CLEANUP AND HANDLING	2028325.	WASTE DISPOSAL	161144.
DRY ASH HANDLING EQUIPMENT	358714.	INSURANCE COST	138606.
WET ASH HANDLING EQUIPMENT	244982.	TOTAL	3778463.
COMPONENT SUBTOTAL	9261662.		
ENGINEERING COST	926166.		
CONSTRUCTION MANAGEMENT	926166.		
CONTINGENCY COST	926166.		
INTEREST DURING CONSTRUCTION	1317071.		
COAL STOCKPILE	503389.		
WORKING CAPITAL	944616.		
TOTAL CAPITAL COSTS	14805236.		

FIGURE 5.1
EXAMPLE SUMMARY REPORT

SUMMARY REPORT
PHASE 2 RESULTS IN 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERTZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR	

SECTION 3 FINANCIAL CALCULATIONS (START-UP YR 5'5)

100 PERCENT
EQUITY FINANCING

TOT. CAPITAL COST AT START	19705728.
FIRST YEAR BEFORE TAX TOTAL COST	7935600.
FIRST YEAR AFTER TAX TOTAL COST	9928473.
ANNUALIZED AFTER TAX COST	16663719.
CAPITAL COST PER LB/HR PROCESS STEAM	98.53
FIRST YR BEFORE TAX COST/1000 LB STEAM	6.97
FIRST YR AFTER TAX COST/1000 LB STEAM	8.72
ANNUALIZE AFTER TAX COST/1000 LB STEAM	14.63

SECTION 4 ENVIRONMENTAL RESULTS -EQMT. MEETS REGS.

	ENVIRONMENTAL REGULATIONS	SYSTEM PERFORMANCE
PERCENT SO2 REMOVED	90.00	90.00
POUNDS SO2/MMBTU MAX. EMISSIONS	1.20	0.5852
NOX POUNDS/MMBTU	0.5000	0.5000
PARTICULATES POUNDS/MMBTU	0.0300	0.0300

FIGURE 5.1
EXAMPLE SUMMARY REPORT
(CONCLUDED)

TABLE 5-1
COSTEAM REPORTS

REPORT NAME	REPORT CONTENTS
<u>STANDARD REPORTS</u>	
SUMMARY	Summary of capital costs, operating costs, financial calculations, environmental results - (see Figure 5.1).
SUMCAP	Costs of purchased equipment, construction materials, construction materials, construction labor, rented equipment for each of the plant components.
CAPITAL	Costs of purchased equipment, total construction materials, total construction labor, rented equipment for each equipment item in each plant component.
MATERIAL	Costs of construction materials and labor for each equipment item in each plant component.
DESIGN	Coal characteristics, plant operating characteristics, capital costs of environmental-related items.
OPERATE	Detailed operating costs.
FINANCE	Parameters used in financial calculations, results of financial calculations.
ERA	Capital cost with equipment items grouped according to the Energy Regulatory Administration format.
<u>SPECIAL REPORTS</u>	
ALLS	This report request will cause all of the standard reports above to be printed.
ALLP	This report displays all the system and component parameters used and calculated in COSTEAM.
ALLU	This report displays all the system and component parameters specified by the user.
ALL	This report request will cause all standard and special reports to be printed.

ask COSTEAM to print all the reports with code names appearing above their values in the report. As an additional option for handy reference, you can print any report with only the code names appearing where the numerical values normally appear. For multiple runs and numerous changes, these code reference reports should be very useful.

The selection of all reports and report options is made by you in response to COSTEAM questions at the end of the COSTEAM dialogue.

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6.0 COSTEAM Tables

This section provides tabular listings and definitions of the Parameters used in COSTEAM. These are presented in two groups:

- GLOBAL LEVEL PARAMETERS
- SYSTEM AND COMPONENT LEVEL PARAMETERS

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GLOBAL LEVEL PARAMETERS

The Tables in this section give information on the code names and values for the Global Level Parameters used in COSTEAM. Included are the following:

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Table 6-1 Basic Operational Parameters	44
Table 6-2 Region Names	45
Table 6-3 Environmental Standards	46
Table 6-4 Environmental Parameter Codes	46
Table 6-5 Global Parameters	47
Table 6-6 Coal Names and Characteristics	49
Table 6-7 Oil Characteristics	50
Table 6-8 Coal Parameter Codes	51
Table 6-9 Oil Parameter Codes	51

TABLE 6-1

BASIC OPERATIONAL PARAMETERS¹

	<u>Range of Acceptable Value</u>
STEAM DEMAND (LB/HR)	50,000 - 500,000
STEAM PRESSURE (PSI)	100 - 1,000
STEAM TEMPERATURE ² (DEGREES F.)	220 - 1,000
CONDENSATE RETURN (FRACTION)	0.0 - 1.0
CONDENSATE RETURN TEMPERATURE (DEGREES F.)	70 - 250
PLANT CAPACITY FACTOR	0.0 - 1.0
REGION NAME	(from Table 6-2)
START UP YEAR	(≥ 1979)

¹These parameters are always user defined and have no code names.

²Required only if superheat is needed.

TABLE 6-2

REGION NAMES

NAME OF CITY	CODE TO ENTER
Atlanta, Ga.	ATLANTA
Baltimore, Md.	BALTMORE
Birmingham, Ala.	BIRMHAM
Boston, Mass.	BOSTON
Chicago, Ill.	CHICAGO
Cincinnati, Ohio	CINCNATI
Cleveland, Ohio	CLEVELAND
Dallas, Tex.	DALLAS
Denver, Colo.	DENVER
Detroit, Mich.	DETROIT
Kansas City, Mo.	KANCITY
Los Angeles, Calif.	LOSANG
Minneapolis, Minn.	MINNPLS
New Orleans, La.	NORLEANS
New York, N.Y.	NEWYORK
Philadelphia, Pa.	PHILLY
Pittsburg, Pa.	PITTBURG
St. Louis, Mo.	STLOUIS
San Francisco, Calif.	SANFRAN
Seattle, Wash.	SEATTLE

TABLE 6-3
ENVIRONMENTAL STANDARDS^a

Name of Standard	Code	Sulfur Dioxide (percent removal)	Nitrogen Oxide (lbs/MMBtu)	Particulates (lbs/MMBtu)
		SO2PCT	NOX	PART
MODERATE	ENVLOW	75 ^b	0.7	0.25
INTERME- DIATE	ENVMID	85 ^b	0.6	0.1
STRINGENT	ENVHIGH	90 ^b	0.5	0.03

^aSource: Ken Woodward, U.S. EPA Research Triangle Park, North Carolina. Phone Conversation November 8, 1978.

^bSubject to upper limit (ceiling) of SO2MAX lbs/MMBtu and lower limit (floor) of SO2MIN lbs/MMBtu. COSTEAM automatically tests percent removal against these upper and lower limits, and where required, readjusts percent removal to stay between these limits. Default values are 1.2 for SO2MAX, 0.2 for SO2MIN. For oil-fired boilers, the user must change SO2MAX to 0.3 for ENVHIGH.

TABLE 6-4
ENVIRONMENTAL PARAMETER CODES

NAME	CODE
Sulfur dioxide (percent removal)	SO2PCT
Sulfur dioxide ceiling (lbs/MMBtu)	SO2MAX
Sulfur dioxide floor (lbs/MMBtu)	SO2MIN
Nitrogen oxide (lbs/MMBtu)	NOX
Particulates (lbs/MMBtu)	PART

TABLE 6-5
GLOBAL PARAMETERS

NAME	CODE	ASSUMED VALUE
<u>Financial Parameters</u>		
Plant Lifetime (years)	PLTLIFE	30
Investment Tax Credit (fraction)	ITCRATE	.00
Interest Rate for Interest During Construction (fraction)	CONITER	.10
Income Tax Rate (fraction)	TAXRATE	.50
Discount Rate for Capital Recovery (fraction)	RATECAP	.15
Annual Rate for Insurance and Property Taxes (fraction of capital cost)	INSURATE	.01
Fraction of Annual O/M Costs Equalling the Working Capital	WCAPFAC	.25
<u>Inflation Parameters</u>		
Annual Escalation Rate for Primary Fuel (fraction)	ESCFUEL	.10
Annual Escalation Rate for O/M Materials and Consumables (fraction)	ESCOMAT	.08
Annual Escalation Rate for Capital Costs (fraction)	ESCCAP	.10
Annual Escalation Rate for O/M Labor Costs (fraction)	ESCOMLA	.08

TABLE 6-5 (Concluded)

GLOBAL PARAMETERS

NAME	CODE	ASSUMED VALUE
<u>O/M Parameters</u> (all these cost parameters escalate at ESCOMAT rate)		
Cost of Electricity (\$/KWH)	PELECT	.03
Cost of Wet Sludge Disposal (\$/ton) (applies to both wet ash and scrubber sludge)	PSLUDGE	7.50
Cost of Dry Waste Disposal (\$/ton) (applies to both ash, dry scrubber waste and AFB spent bed materials)	PASH	7.50
Cost of Water (\$/thousand gallon)	PWATER	.80
Cost of Limestone (\$/ton)	PLSTONE	10.00
Cost of Lime (\$/ton)	PLIME	52.00
Cost of Water Treatment Chemicals (\$/thousand gallon water)	PH2OCHEM	1.00
Active Fraction for Limestone	AFLSTONE	.95
Active Fraction for Lime	AFLIME	.99

TABLE 6-6
COAL NAMES AND CHARACTERISTICS^a

COAL CODE	REGION	STATE	COUNTY	BED		As Received Analysis				Assumed Regional Price 1980 ^c	
				NAME	BOM No.	MOISTURE %	ASH %	SULFUR %	Btu ^b per lb	\$/MMBtu	\$/TON
LOW SULFUR COALS											
COAL01	N. Appalachian	PA	Cambria	U. Kittan.	076	2.1	8.3	1.0	13,933	1.65 ^c	45.98
COAL02	C. Appalachian	WV	Kanawha	Stockton	103	2.6	7.9	0.7	13,499	2.00	54.00
COAL03	S. Appalachian	AL	Jefferson	Mary Lee	279	2.0	12.2	0.9	13,127	2.00	52.51
COAL04	E. Interior	IL	Franklin	No. 6	484	8.2	9.2	1.0	11,903	1.30	30.95
COAL05	W. Interior	OK	Haskell	U. Hartshore	880	4.4	11.3	0.7	12,965	1.30	33.71
COAL06	Gulf	TX	Milan	uncorrelated	799	26.6	9.9	1.0	8,071	1.30	20.98
COAL07	E. North Great Plains	ND	Mercer	uncorrelated	799	33.8	6.8	0.5	7,211	1.04	15.00
COAL08	W. North Great Plains	WY	Campbell	Roland		31.1	6.4	0.6	7,792	1.04	16.21
COAL09	Southwest	NM	San Juan	uncorrelated	799	10.2	8.9	0.7	11,353	1.04	23.62
HIGH SULFUR COALS											
COAL15	N. Appalachian	PA	Clearfield	M. Kittan.		3.5	10.3	2.0	13,234	1.65	43.67
COAL16	N. Appalachian	OH	Belmont	No. 8	036	3.6	10.1	3.7	12,646	1.65	41.73
COAL17	C. Appalachian	WV	Kanawha	Pitt.		2.8	6.2	1.8	13,554	2.00	54.22
COAL18	W. North Great Plains	MT	Carbon	Rosebud No.3	811	9.0	9.2	2.0	10,919	1.04	22.71
COAL19	S. Appalachian	AL	Jefferson	Jefferson	298	2.2	7.2	2.7	13,817	2.00	55.27
COAL20	Gulf	TX	Van Zandt	uncorrelated	799	27.2	4.8	0.5	7,535	1.30	19.59
COAL21	Southwest	AZ	Navajo	uncorrelated	799	11.0	13.4	0.8	10,063	1.04	20.93
COAL22	E. Interior	IL	Perry	No. 6	484	9.7	11.1	3.0	11,231	1.30	29.20
COAL23	E. Interior	KY	Hopkins	No. 9		5.6	10.3	3.9	12,087	1.30	31.43
COAL24	W. Interior	MO	Henry	Tebo	509	6.8	11.5	3.6	11,985	1.30	31.16
COAL25	W. Interior	IA	Monroe	Ford		13.8	14.0	2.8	9,973	1.30	25.93
COAL26	W. Interior	KS	Bourbon	Fleming		5.0	25.0	5.0	10,584	1.30	27.52

^aSource: U.S. ERDA Office of Program, Planning and Analysis (Fossil Energy), "Assessment of Fossil Energy Technology for Electric Power Generation," Vol. 1, 1977.

^bBTU/lb, as received.

^cSource: Adapted from "Final Report: Economic Considerations in Industrial Boiler Fuel Choice," ICF Incorporated Washington, D.C., June 1978. Estimates are highly generalized. Actual costs should be substituted where absolute estimates of operating costs are desired. Fuel price used by COSTEAM is \$/TON.

TABLE 6-7

OIL CHARACTERISTICS

<u>FUEL CODE</u>	<u>MOISTURE</u> <u>%</u>	<u>DENSITY</u> <u>LB/GAL</u>	<u>ASH</u> <u>%</u>	<u>SULFUR</u> <u>%</u>	<u>BTU/GAL</u>	<u>ASSUMED PRICE</u>	
						<u>\$MMBTU</u>	<u>\$/GAL</u>
OILNO6	.75	8.0	.12	2.0	147,000	3.84	0.56

Source: Applied Energy Sciences, Inc. for fuel description.
Oil price is from Oil and Gas Journal, February 1980.

TABLE 6-8

COAL PARAMETER CODES

NAME	CODE
Coal Btu Content (high heat value as received)	BTU
Coal Moisture Content (percent)	MOISTURE
Coal Ash Content (percent)	ASH
Coal Sulfur Content (percent)	SULFUR
Coal Price (\$/TON) (escalate at ESCFUEL rate)	PRICE

TABLE 6-9

OIL PARAMETER CODES

NAME	CODE
Oil Btu Content (Btu/gal), (high heat value)	BTU
Oil Moisture Content (percent)	MOISTURE
Oil Density (lb/gal)	DENSITY
Oil Ash Content (percent)	ASH
Oil Sulfur Content (percent)	SULFUR
Oil Price (\$/gal) (escalate at ESCFUEL rate)	PRICE

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SYSTEM AND COMPONENT LEVEL PARAMETERS

The tables and figures in this section give information on the code names and values for System and Component Level Parameters for all of the Systems used in COSTEAM. Included are the following:

	<u>Page</u>
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Table 6-13 System Components and Equipment Items	66
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TABLE 6-10

SYSTEM NAMES

NAME	CODE
Conventional Coal-Fired Boiler	CONVCOAL
Atmospheric Fluidized Bed Boiler	AFBCOAL
Conventional Oil-Fired Boiler	CONVOIL

TABLE 6-11

VARIANT NAMES FOR COAL SYSTEMS

CONVENTIONAL COAL SYSTEMS	
VARIANT NAME	CODE
Stoker-Fired Boiler	STOKER
Pulverized Coal-Fired Boiler	PULVERIZED
ATMOSPHERIC FLUIDIZED BED SYSTEM	
VARIANT NAME	CODE
Capital costs based on 1980 vendor data	VENDOR
Capital costs for major components based on estimates for a mature AFB industry	THEORY

System Parameters are presented in Table 6-12. In this computer format, the computer code names are given in alphabetical order in the first column entitled PARAMETER. Under each code name, a S, P, A or O indicates which systems use the parameter (Stoker Coal (S), Pulverized Coal (P), Atmospheric Fluidized Bed (A), or Conventional Oil-Fired (O) Boilers). The second column gives the assumed VALUE of that parameter where appropriate. If no value is given, that parameter is calculated in the program. If a single value is given, it is used for all systems. If different systems use different values, those values are indicated. An asterisk identifies parameters whose value may not be changed at the terminal. The next two columns give the parameter DESCRIPTION and the appropriate parameter UNITS. The last two columns give the FORTRAN variable name for the parameter and its COMMON storage location in the COSTEAM computer program.

TABLE 6-12

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	EQSIBAN VARIABLE	INDEX
ACASHDIS S,P,A,O		ANNUAL COST OF DRY ASH DISPOSAL AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACASH	1647
ACASSTO * S,P,A,O		ANNU. COST ASST. OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	ACOLAR(2)	1589
ACBOIH2O * S,P,A,O		ANNUAL COST OF BOILER MAKE-UP WATER AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACH2OB	1640
ACCONSUM * S,P,A,O		ANNUAL COST OF CONSUMABLES (ELEC. H2O, CHEMICALS, SOPRENT)	DOLLARS / YEAR	ACCONS	1505
ACDISP * S,P,A,O		ANNUAL COST OF ASH AND SLUDGE DISPOSAL	DOLLARS / YEAR	ACDISP	1676
ACELEC * S,P,A,O		ANNUAL COST OF ELECTRICITY	DOLLARS / YEAR	ACELEC	1666
ACEQOPER * S,P,A,O		ANNU. COST EQMT. OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	ACOLAR(4)	1591
ACFM S,P,A,O		FLUE GAS FLOW RATE ACTUAL CURIC FEET PER MINUTE	CUBIC FEET PER MINUTE	ACFM	1560
ACCOAL * S,P,A		ANNUAL COST OF COAL AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACCOAL	1663
ACH2OT S,P,A,O		ANNUAL COST OF MAKE-UP WATER AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACH2O	1662
ACINSUR * S,P,A,O		ANNUAL INSURANCE COST	DOLLARS / YEAR	ACINS	1504
ACLABORE * S,P,A,O		ANNU. COST UNSKILLED LABORERS REQUIRED FOR PLANT OPS. AND MAINTENANCE	DOLLARS PER HOUR	ACOLAR(6)	1593
ACMAINME * S,P,A,O		ANNU. COST MAINT. MECHANICS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	ACOLAR(3)	1590
ACOil S,P,A,O		ANNUAL COST OF OIL AT PLANT CAPACITY FACTOR		ACOil	1745
ACOMLAB * S,P,A,O		ANNUAL OPERATION AND MAINTENANCE COST FOR LABOR	DOLLARS / YEAR	ACOMLA	1502
ACOMMAT * S,P,A,O		ANNUAL OPERATION AND MAINTENANCE COST FOR MATERIALS	DOLLARS / YEAR	ACOMAT	1503
ACOPER * S,P,A,O		ANNUAL OPERATING COST EXCLUDING FUEL AND LABOR	DOLLARS / YEAR	ACWOFL	1506

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	EDSIBAN VARIABLE	INDEX
ACPLTSUP * S,P,A,O		ANN. COST PLT SUPERINTENDENTS REQUIRED FOR PLANT OPS. AND MAINTENANCE	DOLLARS PER HOUR	ACOLAB(5)	1592
ACREHEAT * S,P,O		ANNUAL COST OF STEAM (AT PLANT CAPACITY FACTOR) TO REHEAT FLUE GAS	DOLLARS PER YEAR	ACHFAT	1708
ACSLUDGE * S,P,O		ANNUAL COST OF SLUDGE AND WET ASH DISP. AT PLANT CAPACITY FACTOR	DOLLARS PER DAY	ACSLUD	1646
ACSROPER * S,P,A,O		ANN. COST SENIOR OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	ACOLAB(1)	1598
ACTOTAL * S,P,A,O		ANNUAL OPERATING COST = FUEL +CONS.+DEM MAINT & LAB +DISPOSAL +INSURANCE	DOLLARS	ACTOT	1697
ASHDAY * S,P,A,O		DRY ASH PRODUCED AT PLANT CAPACITY FACTOR	TONS PER DAY	DYASH	1612
ASHHOUR * S,P,A,O		ASH PRODUCED PER HOUR OF OPERATION AT PEAK CAPACITY	TONS / HOUR	TASHHR	1674
ASHREF * S,P,A,O	S,P,A=10.0 O=0.12	PERCENT ASH BY WEIGHT IN FUEL FOR REFERENCE COSTS	NONE	ASHREF	1507
ASHYEAR * S,P,A,O		ANNUAL PRODUCTION OF ASH AND PARTICULATES	TON / YEAR	ATASH	1498
AVGMATNF * S,P,A,O		AVERAGE FRACTION OF PLANT CAPITAL COST EQUAL TO ANNUAL MAINTENANCE COST	NONE	FMATNF	1683
BOH20DY * S,P,A,O		BOILER MAKE-UP WATER REQUIRED AT PLANT CAPACITY FACTOR	1000 GALLONS PER DAY	DYH20B	1605
BOH20HR * S,P,A,O		BOILER MAKE-UP WATER REQUIREMENT AT DEMAND CAPACITY	1000 GALLONS PER HOUR	HRH20B	1595
BOH20YR * S,P,A,O		BOILER MAKE-UP WATER REQUIRED AT PLANT CAPACITY FACTOR	1000 GALLONS PER YEAR	YRH20B	1620
BTUFIRED * S,P,A,O		FUEL FIRING RATE AT DEMAND LOAD	MILLION BTU FIRED / HOUR	BTUHHM	1497
BTUPRICE * S,P,A,O		FUEL PRICE IN \$/MMBTU CALCULATED FROM FUEL PRICE AND FUEL BTU	DOLLARS/MILLION BTU	CMHBTU	1705
BTUREF * S,P,A,O	S,P,A=12500. O=147000	HIGH HEAT VALUE OF REFERENCE FUEL FOR REFERENCE PLANT COSTS	OIL-BTU/GAL;COAL-BTU/LB	HMVREF	1508
CAPITAL * S,P,A,O		TOTAL CAPITAL COST (SUM OF COMPONENTS, ENG. , CONTINGENCY, CONSTR. MANAG. ETC.)	DOLLARS	CAPTOT	1486

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
CCONT * S,P,A,O		CONTINGENCY COST	DOLLARS	CCONT	1446
CCONTFAC S,P,A,O	S,P,A,O=.1	FRACTION OF CAPITAL COST AND ENGINEERING SERVICES FOR CONTINGENCY	NONE	CONTIN	1447
CENG * S,P,A,O		COST OF ENGINEERING SERVICES	DOLLARS	CENG	1445
CENGFAC S,P,A,O	S,P,A,O=.1	FRACTION OF TOTAL CAPITAL COST TO BE ADDED FOR ENGINEERING SERVICES	NONE	ENGSER	1444
CEXTRA S,P,A,O	S,P,A,O=0.	ADDITIONAL CAPITAL COST NOT CALCULATED IN MODEL (FOR USER INPUT)	DOLLARS	CEXTRA	1490
CMANAFAC S,P,A,O	S,P,A,O=.1	FRACTION OF TOTAL CAPITAL COST TO BE ADDED FOR CONSTRUCTION MANAGEMENT	NONE	CMANAG	1487
CMANAGE * S,P,A,O		COST OF CONSTRUCTION MANAGEMENT	DOLLARS	CMANAG	1488
COALDAY * S,P,A		FUEL REQUIRED PER DAY AT PLANT CAPACITY FACTOR	TONS PER DAY	DYCNAL	1604
COALHOUR * S,P,A		COAL CONSUMPTION RATE AT FULL DEMAND	TONS/HOUR	TCOALH	1450
COALMMBT * S,P,A		LBS OF COAL PER MILLION BTU FIRED	LBS	COALMM	1564
COALSTEA * S,P,A		POUNDS OF COAL PER POUND OF STEAM	NONE	COALLB	1453
COALYEAR * S,P,A		ANNUAL COAL CONSUMPTION	TONS/YEAR	ATCOAL	1451
CONSTINT * S,P,A,O		COST OF INTEREST DURING CONSTRUCTION	DOLLARS	CONINT	1530
CSASHDIS * S,P,A,O		COST OF DRY WASTE DISPOSAL PER 1000 LBS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSASH	1667
CSBOIH2O * S,P,A,O		COST OF BOILER MAKE-UP WATER PER 1000 LBS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSH2OR	1660
CSCOAL * S,P,A,O		COST OF COAL PER 1000 LBS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSCOAL	1659
CSCONSUM * S,P,A,O		COST OF CONSUMABLES PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSCONS	1571

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
CSOISP * S,P,A,0		COST OF WASTE DISPOSAL PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSOISP	1573
CSELETOT * S,P,A,0		TOTAL ELECTRICITY COST PER 1000 LBS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSELT	1674
CSH2OT * S,P,A,0		COST OF MAKE-UP WATER PER 1000 LBS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSH2OT	1662
CSINSUR * S,P,A,0		COST OF ANNUAL INSURANCE PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSINSU	1574
CSOIL * S,P,A,0		COST OF OIL PER 1000 LBS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSOIL	1746
CSOMLAB * S,P,A,0		COST OF OP. AND MAINT. LABOR PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSOMLA	1570
CSOMMAT * S,P,A,0		COST OF OP. AND MAINT. MATERIALS PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSOMMA	1572
CSREHEAT * S,P,0		COST OF REHEAT STEAM FOR FLUE GAS PER 1000 LBS OF PROCESS STEAM	\$ PER 1000 LBS STEAM	CSREAT	1707
CSSLUDGE * S,P,A,0		COST OF SLUDGE AND WET ASH DISP. PER 1000 LBS PROCESS STEAM	DOLLARS PER DAY	CSSLUD	1666
CSTOCK * S,P,A,0		COST OF FUEL STOCKPILE	DOLLARS	CSTOCK	1529
CSTOTOP * S,P,A,0		TOTAL OPERATING COSTS PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSTOOP	1575
CTOTAL * S,P,A,0		TOTAL CAPITAL COST (SUM OF COMPONENTS ONLY)	DOLLARS	TOTCOM	1448
ELECTOY * S,P,A,0		TOTAL ELECTRICITY CONSUMPTION AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER DAY	DYFLT	1619
ENTHALPY * S,P,A,0		ENTHALPY OF STEAM AT OPERATING TEMPERATURE AND PRESSURE	BTU/LB	HSTEAM	1443
ESPCOSTF * S,P,A,0	S,P,A,0=1.25	COST MULTIPLIER FOR ESP EQUIPMENT REMOVING MORE PART. THAN REF. ESP	NONE	FSPFAC	1538
ESPIND * S,P,A,0	S,P,A,0=1	INDICATOR IN REPORT OF PART. REMOVAL 1 = BAGHOUSE, 2 = ESP, 3 = NONE	NONE (= FESP + 1)	FSPIND	1562

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
FCYCLONE S,P,A,0	S,P,A,0=.75	FRACTION OF ASH PART. GOING UP FLUE REMOVED BY CYCLONE DUST COLLECTOR	NONE	FPCYCL	1531
FEEDTEMP S,P,A,0	S,P,A,0=70.	TEMPERATURE OF MAKE-UP WATER	DEGREES F.	FTEMP	1456
FGOS02 * S,P,0		SO2 RELEASED AFTER PASSING THROUGH FGD	LB / MILLION BTU FIRED	SO2OUT	1494
FLUETEMP S,P,A,0	S,P,A,0=340	TEMPERATURE OF FLUE GAS AFTER HEAT RECOVERY	DEGREES F.	FGTEMP	1565
FLUS02 * S,P,A,0		SO2 RELEASED UP FURNACE FLUE	LB / MILLION BTU FIRED	SO2ONE	1495
FMETA S,P,A,0	S,P,A,0=0	ASH HANDLING INDICATOR (0=DRY,1=WET,2=BOTH)	NONE	FMETA	1435
FWEYSCR S,P,A,0	S,P,A,0=1.25	COST MULTIPLIER FOR WET SCRUBBER EQMT. REMOVING MORE SO2 THAN PFF. SCRUBBER	NONE	SCWFAC	1534
H20TOTD * S,P,A,0		TOTAL MAKE-UP WATER REQUIRED AT PLANT CAPACITY FACTOR	1000 GALLONS PER DAY	DYH20T	1607
H20TOTHR * S,P,A,0		TOTAL MAKE-UP WATER REQUIRED PER HOUR AT PLANT CAPACITY FACTOR	1000 GALLONS PER HOUR	HPH20T	1603
H20TOTYR * S,P,A,0		TOTAL MAKE-UP WATER REQUIRED AT PLANT CAPACITY FACTOR	1000 GALLONS PER YEAR	YRH20T	1622
INLETTEM S,P,A,0	S,P,A,0=240	TEMPERATURE OF WATER AT BOILER INLET (AFTER DEAERATOR)	DEGREES F.	TBOILI	1557
KWHOUR * S,P,A,0		ELECTRICITY DEMAND PER HOUR OF OPERATION AT PEAK CAPACITY	KILOWATT / HOUR	EKW	1464
KWHTOTAL * S,P,A,0		ANNUAL ELECTRICITY CONSUMPTION	KILOWATT HOURS / YEAR	EKWH	1465
MOISTREF * S,P,A,0	S,P,A=2.2 0=0.75	PERCENT MOISTURE BY WEIGHT IN FUEL FOR PREFERENCE COSTS	NONE	WETREF	1510
NASSTOP S,P,A,0		NUMBER OF ASST. OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	NONE	OMEN(2)	1546
NEQOPER S,P,A,0		NUMBER OF EQMT. OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	NONE	OMEN(4)	1548
NLABORER S,P,A,0		NUMBER OF UNSKILLED LABORERS REQUIRED FOR PLANT OPS. AND MAINTENANCE	NONE	OMEN(6)	1550

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
NMAINMEC S,P,A,O		NUMBER OF MAINT. MECHANICS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	NONE	OMEN(3)	1547
NOXMMBTU * S,P,A,O		NOX EMISSIONS	LBS / MILLION BTU FIRED	OUTNOX	1548
NOXRATE * S,P,A,O		AVERAGE DAILY NOX RELEASE ASSUMING ENVIRONMENTAL STANDARD IS MET	LB / DAY	OPNOX	1493
NPLTSUPE S,P,A,O		NUMBER OF PLT SUPERINTENDENTS REQUIRED FOR PLANT OPS. AND MAINTENANCE	NONE	OMEN(5)	1549
NSROPER S,P,A,O		NUMBER OF SENIOR OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	NONE	OMEN(1)	1545
NTOTOMLA * S,P,A,O		TOTAL WORKERS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	NONE	TOTMEN	1546
OILDAY * O		FUEL REQUIRED PER DAY AT PLANT CAPACITY FACTOR	GAL/PER DAY	OYOIL	1742
OILHOURL * O		OIL CONSUMPTION RATE AT FULL DEMAND	GAL/HR	HROIL	1743
OILMMBTU * O		GALLONS OF OIL PER MILLION BTU FIRED	GAL/1000000BTU	OILMM	1741
OILSTEA * O		GALLONS OF OIL PER POUND OF STEAM	GALLONS PER POUND	OILGAL	1740
OILYEAR * O		ANNUAL OIL CONSUMPTION AT PLANT CAPACITY FACTOR	GALLONS PER YEAR	YROIL	1744
OMOVER S,P,A,O	S,P,A,O=1.4	OVERHEAD FACTOR FOR OPERATION AND MAINTENANCE LABOR	NONE	OMOVER	1501
PARMMBTU * S,P,A,O		PARTICULATE EMISSIONS	LBS / MILLION BTU FIRED	PAROUT	1539
PARTDAY * S,P,A,O		AVERAGE DAILY PARTICULATE RELEASE ASSUMING ENVIRONMENTAL STANDARD IS MET	LB / DAY	OPPART	1491
PARTFAC * S,P,A,O		FRACTION OF REMAINING PARTICULATES REMOVED FROM FLUE GAS	NONE	FPARCL	1495
PASSTOP S,P,A,O		WAGE OF ASST. OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	OWAGE(2)	1552
PEOOPER S,P,A,O		WAGE OF EOMT. OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	OWAGE(4)	1554

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER S,P,A,O	VALUE	DESCRIPTION	UNITS	EDRIBAN VARIABLE	INDEX
PLABORER S,P,A,O		WAGE OF UNSKILLED LABORERS REQUIRED FOR PLANT OPS. AND MAINTENANCE	DOLLARS PER HOUR	OWAGE(6)	1556
PLTCONST S,P,A,O	S,P,A=2. O=1.	PLANT CONSTRUCTION TIME	YEARS	TIMCON	1449
PMAINAVG S,P,A,O		AVERAGE WAGE OF WORKERS FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	AVWAGE	1587
PMAINMEC S,P,A,O		WAGE OF MAINT. MECHANICS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	OWAGE(3)	1553
PPLTSUPE S,P,A,O		WAGE OF PIT SUPERINTENDENTS REQUIRED FOR PLANT OPS. AND MAINTENANCE	DOLLARS PER HOUR	OWAGE(5)	1555
PSROPER S,P,A,O		WAGE OF SENIOR OPERATORS REQUIRED FOR PLANT OPERATIONS AND MAINTENANCE	DOLLARS PER HOUR	OWAGE(1)	1551
PTREHEAT S,P,O	S,P,O=1.5	ADDITIONAL STEAM FOR FLUE GAS REHEAT AFTER WET SCRUBBER (% OF DEMAND)	NONE	PTREHEAT	1706
REFFBAG * S,P,A	S,P,A=.95	FRACTION OF PARTICULATES REMOVED BY BAGHOUSE IN REFERENCE PLANT	NONE	REFREP	1535
REFFESP * S,P,A,O	S,P,A,O=.95	FRACTION OF PARTICULATES REMOVED BY ESP IN REFERENCE PLANT	NONE	REFEPC	1536
REFNOXLB * S,P,A	S,P,A=.4	NOX EMISSIONS BY REFERENCE PLANT	LBS / MILLION BTU FIRED	REFNOX	1542
REHEATDY S,P,O		AMOUNT OF STEAM PER DAY FOR REHEATING FLUE GAS	LBS OF STEAM	DYHEAT	1710
REHEATHR S,P,O		AMOUNT OF STEAM PER HOUR FOR REHEATING FLUE GAS	LBS OF STEAM	HRHEAT	1709
REHEATYR S,P,O		AMOUNT OF REHEAT STEAM PER YEAR FOR REHEATING FLUE GAS	LBS OF STEAM	YRHEAT	1711
RESO2PCT * S,P,O	S,P,O=75	PERCENT SO2 REMOVED BY SCRUBBER IN REFERENCE PLANT	NONE	REFSCR	1532
SCRUBIND * S,P,A,O		INDICATOR IN REPORT OF SCRUBBER TYPE 1 = WET, 2 = DRY, 3 = NONE	NONE (= FORTY + 1)	SCRUBT	1561
SIZEBOIL S,P,A,O		BOILER CAPACITY REQUIRED TO MEET STEAM DEMAND	LBS STEAM PER HOUR	BOILSZ	1544
SIZEMAX1 * S,P,A,O	S,P,A,O=179999	MAXIMUM BOILER SIZE FOR SMALL SIZES	LB/HR	SIZEL(1)	1432

TABLE 6-12 (Continued)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	EQUATION VARIABLE	INDEX
SIZEMAX2 * S,P,A,O	S,P,A,O=299999	MAXIMUM BOILER SIZE FOR INTERMEDIATE SIZES	LB/HR	SIZE1(2)	1433
SIZEMAX3 * S,P,A,O	S,P,A,O=500001	MAXIMUM BOILER SIZE FOR LARGE SIZES	LB/HR	SIZE1(3)	1434
SIZE1 * S,P,A,O	S,P,A,O=100000	REFERENCE BOILER SIZE FOR SMALL SIZES	LB/HR	SIZE(1)	1429
SIZE2 * S,P,A,O	S,P,A,O=200000	REFERENCE BOILER SIZE FOR INTERMEDIATE SIZES	LB/HR	SIZE(2)	1430
SIZE3 * S,P,A,O	S,P,A,O=400000	REFERENCE BOILER SIZE FOR LARGE SIZES	LB/HR	SIZE(3)	1431
SLTRANDY * S,P,O		SCRUBBER AND WET ASH SLUDGE PRODUCED AT PLANT CAPACITY FACTOR	TONS PER DAY	DYSLUD	1411
SLTRANYR * S,P,O		SCRUBBER AND WET ASH SLUDGE PRODUCED AT PLANT CAPACITY FACTOR	TONS PER YEAR	YRSLUD	1426
SLUDHOUR * S,P,O		SCRUBBER SLUDGE SOLIDS PRODUCED PER HOUR OF OPERATION AT PEAK CA	TONS / HOUR	TSLHR	1475
SLUDYEAR * S,P,O		ANNUAL PRODUCTION OF SCRUBBER SLUDGE SOLIDS	TON / YEAR	ATSLUD	1499
SLUGHR * S,P,A,O		SCRUBBER AND WET ASH SLUDGE PRODUCED AT DEMAND CAPACITY	TONS PER HOUR	HRSLUD	1599
SO2DAY * S,P,A,O		AVERAGE DAILY SULFUR RELEASE ASSUMING ENVIRONMENTAL STANDARD IS MET	LB / DAY	DPSO2	1492
SO2FAC * S,P,O		FRACTION OF SO2 REMOVED FROM FLUE GAS	NONE	FFGDCI	1479
SO2REM * S,P,A,O		PERCENT SO2 REMOVED TO MEET ENVIRONMENTAL CEILING	NONE	SO2REM	1496
SULHOUR * S,P,A,O		AMOUNT OF SULFUR LEAVING FURNACE FLUE PER HOUR OF OPERATION AT PEAK CAPACITY	TONS / HOUR	TSUHR	1480
SULREF * S,P,A,O	S,P,A=2.0 O=2.0	PERCENT SULFUR BY WEIGHT IN FUEL FOR REFERENCE COSTS	NONE	SULREF	1509
TRANIND * S,P,A,O		INDICATOR IN REPORT OF SLUDGE DISPOSAL 1=POND, 2 = Dewater & TRANSPORT	NONE (= FOEMA + 1)	TRANIN	1563
WAGEE * S,P,A,O	S,P,A,O=11	WAGE RATE OF ELECTRICAL CONSTR. LABOR ASSUMED IN TABLES	DOLLARS/HOUR	WAGE(3)	1442

TABLE 6-12 (Concluded)

SYSTEM PARAMETERS

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
WAGE ^M *	S,P,A,0=9	WAGE RATE OF MECHANICAL CONSTR. LABOR ASSUMED IN TABLES	DOLLARS/HOUR	WAGE(2)	1441
S,P,A,0					
WAGE ^U *	S,P,A,0=5	WAGE RATE OF UNSKILLED CONSTRUCTION LABOR ASSUMED IN TABLES	DOLLARS/HOUR	WAGE(1)	1440
S,P,A,0					
WORKCAP		WORKING CAPITAL	DOLLARS	WORKCA	1712
S,P,A,0					
ZERO *	S,P,A,0=0	USED IN PRINT ROUTINES TO PRINT A ZERO	NONE	ZERO	1799
S,P,A,0					

Table 6-13 shows the breakdown for all three boiler systems. Of importance to the identification of components by the computer are the:

- code names of the major subdivision blocks given adjacent to each title - e.g. BOILER.
- the number of the equipment item in each block - e.g. 10 identifies the Air Heater in the BOILER block.

These code names and numbers are used only in identifying output parameters.

Table 6-14 lists the capital cost codes. Figure 6.1 shows how the component name and parameter name are combined to specify a COSTEAM parameter. These names are used to query and change parameter values.

By overriding the default values of certain COSTEAM parameters, the user can alter the combination of equipment items comprising the plant. Table 6-15 lists those parameters. The first column of this table shows the variable names that the user must enter for equipment selection. The second column shows the systems for which these variables names are applicable. The third column indicates the override values to be entered by the user. The last column of Table 6-15 shows the results of the override action. Overriding a capital cost will replace the calculated capital cost with the value input by the user. If the user overrides the total capital cost with a value of zero, all capital costs for that item will be set to zero.

TABLE 6-13
SYSTEM COMPONENTS AND EQUIPMENT ITEMS

I. MAJOR BOILER EQUIPMENT	BOILER*
1. Tubes, drums, headers, casing access doors, window ash hopper, ash reinjection	SPAO
2. Burners, atomizers	P
3. Oil ignition system	PA
4. Pulverizers, primary air fans/drives, air seal system	P
5. Coal feeders, scales	P
6. Booster fan	A
7. Superheater ^H	SPAO
8. Sootblowers	SP
9. F.D. fan/drive	SPA
10. Air heater	SPA
11. Economizer	A
12. Spreader stoker	S
13. Direct-fired air heater	A
14. Coal scales	S

II. MECHANICAL EQUIPMENT	MECHANIC*
1. Desuperheater/reducing station ^H	SPAO
2. Feedwater softeners, dealkalizers, blowdown system, deaerators & accessories	SPAO
3. Boiler feed pumps/drives	SPAO
4. Feedwater heater	SPAO
5. Valves and piping	SPAO
6. Steam coil air preheater	SPAO
7. Utilities	SPAO
8. Building and supports, stairs, floors, siding, roofing, platforms	SPAO

III. BOILER INSTRUMENTS	INSTRUM*
1. Underfeed air	S
2. Feedwater control	SPAO
3. Overfeed air	S
4. Compressed air system	SPAO
5. Control room	SPA
6. Fuel control	SPA
7. Combustion control	PA
8. Burner management	PA
9. Control panel	O
10. Instrument installation	SPAO

IV. FUEL HANDLING AND STORAGE	FUELHAND*
1. Unloading hoppers, bins, bunkers, conveyors, crushers, bucket elevator	SPA
2. Coal silo	SPA
3. Rail spur	SPA
4. Coal yard and drain system	SPA
5. Car thawer	SPA
6. Fuel oil unloading station	O
7. Fuel oil tank and spill containment	O
8. Fuel oil heater	O
9. Pumping station	O

* Computer code name

TABLE 6-13 (Continued)

SYSTEM COMPONENTS AND EQUIPMENT ITEMS

V. FLUE GAS CLEANUP AND HANDLING	CASCLEAN*
1. Cyclone dust collector	SPAO
2. Baghouse ^E	SPAO
3. Electrostatic precipitator ^E	SPAO
4. Wet flue gas desulfurization scrubber recycle pump/drive scrubber make-up pump/drive caustic injection system slurry collection tank ^B caustic recycle tank	SPO
5. Dry flue gas desulfurization lime slaking and dust particulate collection and storage ^B	EPO
6. Limestone crusher	SPAO
7. Lime/limestone unloaders, conveyors, silo, bins, bunkers	SPAO
8. Lime/limestone mixing tank	SPO
9. I.D. fan/drive/coupling	SPAO
10. Stack	SPAO

* Computer code name

VI. DRY ASH HANDLING ^C	DRYASH*
1. Ash silo and accessories	SPA
2. Ejector	SPA
3. Separator	SPA
4. Air washer	SPA
5. Valves/pipes	SPA
6. Ash transport and disposal equipment	SPAO
7. Dry ash handling equipment installation	SPA

VII. WET ASH HANDLING ^C	WETASH*
1. Bottom ash conveying	SP
2. Fly ash conveying	SP
3. Water pumps	SP
4. Sluice overflow pump	SP
5. Acid feed pump	SP
6. Wet ash handling equipment installation	SP
7. Sludge dewatering ^D	SPO
8. Sludge transport ^D	SPU
9. Settling pond ^D	SPO

TABLE 5-13 (Concluded)
SYSTEM COMPONENTS AND EQUIPMENT ITEMS

VIII. SPENT BED MATERIALS HANDLING	SPENTBED
1. Metering screw coolers	A
2. Spent bed makeup bins	A
3. Reinjection feeders	A
4. Makeup feeders	A
5. Bypass feeders	A

IX. COAL & LIMESTONE HANDLING	AFBMATS
1. Coal feeders	A
2. Coal screw conveyor	A
3. Limestone feeder	A
4. Mixing conveyor	A
5. Elevator	A
6. Feeder bunker	A
7. Layer loader	A
8. Down spouts	A
9. Injection feeders	A
10. Injection piping and valves	A

* Computer code name

A - AFB coal boiler

B - Selects wet or dry scrubber, or neither system, but not both using parameter GASCLEAN FSCRUB

C - Selects wet or dry ash handling, but not both using system parameter FWETA (CONVCOAL and CONVCOIL)

D - Selects either settling pond or sludge dewatering and transport using parameter WETASH FDEWA

E - Selects either baghouse, precipitator, or neither system, but not both using parameter GASCLEAN FESP

H - For superheated steam only

P - Pulverized coal boiler

S - Stoker coal boiler

O - Oil fired boiler

TABLE 6-14

CAPITAL COST CODES

<u>Capital Cost</u>	<u>Code yyyyy^a</u>
Equipment	EQMT
Construction Labor (sum) ^b	LAB ^b
Skilled Construction Labor (Electrical)	LABEL
Skilled Construction Labor (Mechanical)	LABME
Unskilled Construction Labor	LABUN
Construction Material (sum) ^b	MAT ^b
Civil Material	MATCI
Electrical Material	MATEL
Insulation Material	MATIN
Instrument Material	MATIT
Mechanical Construction Material	MATME
Structural Material	MATST
Rented Construction Equipment	RENT
Total Capital Cost ^c	TOTAL ^c

^aEnter the 3-5 character code as shown.

^bSubtotals of labor and material items, respectively

^cTotal

EACH COMPONENT PARAMETER IS IDENTIFIED BY TWO 8 CHARACTER NAMES*

*NOTE: WHENEVER THERE ARE FEWER LETTERS THAN SPACES, THE FIRST LETTER BEGINS AT THE LEFT HAND SPACE. LEAVE BLANK SPACES AT THE RIGHT.

FIGURE 6.1
COMPONENT PARAMETER CODE PROCEDURE

TABLE 6-15

COSTEAM PARAMETERS FOR EQUIPMENT SELECTION

SYSTEM	VARIABLE NAME	OVERRIDE VALUE	RESULT OF OVERRIDE
ALL	XXXXXXXX CYYTOTAL	0	All capital costs for equipment item YY of component XXXXXXXX are set to zero.
ALL	GASCLEAN FESP	0* 1 2**	Baghouse but no ESP ESP but no baghouse Neither ESP nor baghouse
CONVCOAL, CONVOIL	GASCLEAN FSCRUB	0* 1 2	Wet limestone scrubber Dry lime scrubber No scrubber
CONVCOAL, CONVOIL	SYSTEM***FWETA	0* 1 2	Dry ash handling Wet ash handling Both wet and dry ash handling
CONVCOAL, CONVOIL	WETASH FDEWA	0 1*	Sludge pond, no dewatering or transport Sludge dewatering and transport, no sludge pond

* Indicates default value that will be used unless overridden.

** Default value for CONVOIL; coal system default to 0.

*** CONVCOAL or CONVOIL, as appropriate.

TABLE 6-16

BOILER PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
ACELEAUX S,P,A,O		ANNU. COST OF ELECTRICITY FOR BOILER AUXILS, COAL ASH HANDLING, ETC.	DOLLARS / YEAR	ACFLR	1653
ACMAINT *		ANNUAL COST OF MAINTENANCE MATERIALS FOR MAJOR BOILER EQUIPMENT	DOLLARS / YEAR	ACMAIN(1)	1751
ACSOLID S,P,A,O		ANNUAL COST OF SOLIDS REMOVAL FROM AFB	\$/YEAR	ACSOL	1718
BTYPE *	S=1 P=2 S,P,A A: V=1 T=2	BOILER TYPE INDICATOR	NONE	BTYPE	1436
CASO4HR A		CASO4 REMOVED FROM BED IN AFB	LB PER HR	CASHR	1714
CSELEAUX *		COST OF ELECTRICITY FOR BOILER AUXILS, COAL ASH HANDLING, ETC.	\$/1000 LBS PROCESS STEAM	CSFLB	1673
CSSOLID S,P,A,O		COST OF SOLIDS REMOVAL FROM AFB PER 1000 LBS PROCESS STEAM	\$/1000 LBS STEAM	CSSOL	1717
EFFR01L S,P,A,O	S=.81, P=.86, A=.85 O=.85	BOILER EFFICIENCY (FRACTION OF INPUT HEAT OF COAL USED FOR STEAM)	NONE	REFFIN	1452
ELAUXDY *		ELEC. REQUIRED FOR BOILER AUX, COAL, ASH HANDLING, ETC. PER DAY AT CAP. FACTOR	KILOWATT HOURS/DAY	DYELB	1618
ELAUXYR *		ELEC. REQUIRED FOR BOILER AUX, COAL, ASH HANDLING, ETC. PER YR. AT CAP. FACTOR	KILOWATT HOURS/YEAR	YPELR	1633
ELECAUX *		ELECTRICITY REQUIRED BY BOILER AUXILS, COAL, ASH HANDLING, ETC.	KILOWATTS	FLECA	1467
ELECAUXF S,P,A,O	S=.0015, P=.0020 A=.0033, O=.0010	ELECTRICITY REQUIRED BY BOILER AUXILS, COAL, ASH HANDLING, ETC.	KW / LB STEAM / HOUR	FELECA	1691

TABLE 6-16 (Concluded).

BOILER PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
FLFCHP S,P,A,O	S,P,A,O=.0010	ADDITION TO FLFCAUXF FOR HIGH PRESSURE (SUPERHEAT OR BOILER .GT. 300000 LB/HR)	KW / LB STEAM / HOUR	FLFCHP	1690
FEXAIR S,P,A,O	S=.35, P=.25, A=.20 O=.20	EXCESS AIR FRACTION	NONE	FEXAIR	1559
FLUEASH S,P,A	S=.65, P=.80, A=.80	FRACTION OF ASH THAT GOES UP FLUE	NONE	FRASH	1454
FLUESUL S,P,A,O	S,P,A=.95 O=1.0	FRACTION OF SULFUR THAT IS NOT TRAPPED IN ASH PARTICLES	NONE	FSULF	1455
INERTHR A		INERT BED MATERIALS REMOVED FROM AFB	LB PER HR	HRINRT	1715
MAINTFAC S,P,A,O	S,P,A=.025 O=.01	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COSTCOST	NONE	FMAINT(1)	1761
REMOLEHR A		UNREACTED LIMESTONE REMOVED FROM AFB	LB PER HR	UNREHR	1716
SOLIDDY A		TOTAL SOLID WASTE REMOVED IN LBS PER DAY FROM AFB	LB PER DY	DYSOL	1720
SOLIDHR A		TOTAL SOLID WASTE REMOVED IN LBS PER HOUR FROM AFB	LB PER HR	HR SOL	1719
SOLIDYR A		TOTAL SOLID WASTE REMOVED IN LBS PER YEAR FROM AFB	LB PER YR	YRSOL	1721

TABLE 6-17
MECHANICAL PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	ECOSIM VARIABLE	INDEX
			DOLLARS / YEAR	ACFLP	1653
ACFEEDCH S,P,A,O		WATER TREATMENT CHEMICALS FOR BOILER FEEDWATER. ANNUAL COST AT CAP. FACTOR	DOLLARS PER YEAR	ACTREA	1643
ACMAINT *		ANNUAL COST OF MAINTENANCE MATERIALS FOR MAJOR MECHANICAL EQUIPMENT	DOLLARS / YEAR	ACMAINT(1)	1752
CSFEEDCH *		WATER TREATMENT CHEMICALS FOR BOILER FEEDWATER. COST/1000 LBS PROCESS STEAM	DOLLARS/1000 LBS PROCESS STEAM	CSTREA	1663
FEEDFAC S,P,A,O	S,P,A,O=1.25	FACTOR TO MULTIPLY COST OF BOILER WATER TREATMENT CHEMICALS FOR SUPERHEAT	NONE	TREATS	1459
H2GCHEDY *		WATER TREATMENT CHEMICALS FOR BOILER FEEDWATER. DAILY COST AT CAP. FACTOR	DOLLARS PER DAY	DYTRFA	1608
H2GCHEHR *		WATER TREATMENT CHEMICALS FOR BOILER FEEDWATER. HOURLY COST AT PEAK CAPACITY	DOLLARS PER HOUR	HRTREA	1597
H2GCHEYR S,P,A,O		WATER TREATMENT CHEMICALS FOR BOILER FEEDWATER. YEARLY COST AT CAP. FACTOR	DOLLARS PER YEAR	YRTREA	1623
MAINTFAC S,P,A,O	S,P,A,O=.025	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COST/COST	NONE	FMINT(2)	1762

TABLE 6-18
INSTRUMENT PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	EDFIRAN VARIABLE	INDEX
ACMAINT * S,P,A,O		ANNUAL COST OF MAINTENANCE MATERIALS FOR BOILER INSTRUMENTS	DOLLARS / YEAR	ACMAINT(3)	1753
ECOSTFAC S,P,A,O	S,P,A,O=1.00	COST MULTIPLIER FOR BOILER INSTR. TO MEET STRINGENT NOX STANDARDS	NONE	ECOSTFAC	1543
MAINTFAC S,P,A,O	S,P,A,O=.025	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COST	NONE	MAINTFAC(3)	1763

TABLE 6-19

FUEL HANDLING PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
ACHMAINT * S,P,A,D		ANNUAL COST OF MAINTENANCE MATERIALS FOR FUEL STORAGE AND HANDLING	DOLLARS / YEAR	ACHMAINT(4)	1754
COALSTNC S,P,A	S,P,A=75.	SIZE OF COAL STOCKPILE (DAYS AT PLANT CAPACITY FACTOR)	DAYS	DSTOCK	1489
MAINTFAC S,P,A,D	S,P,A,D=.025	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COST/COST	NONE	FMAINT(4)	1764
76 OILCAP D	D=90	CAPACITY OF PLANT OIL STORAGE TANK FOR OIL-FIRED BOILER	DAYS AT PLANT CAP. FAC	OILCAP	1704
REFPILE * S,P,A	S,P,A=75	SIZE OF COAL STOCKPILE AT REF. PLANT (DAYS AT PLANT CAPACITY FACTOR)	DAYS	RPILE	1700
REFSILO S,P,A	S,P,A=50	STORAGE CAPACITY OF REFERENCE PLANT COAL SILO -HRS @ MAX FIRING RATE	HOURS	RSILO	1698
REFTANK * D	D=75	CAPACITY OF REFERENCE PLANT OIL STORAGE TANK FOR OIL-FIRED BOILER	DAYS AT PLANT CAP. FAC	RTANK	1703
SILOCAP S,P,A	S,P,A=50	STORAGE CAPACITY OF COAL SILO (HRS @ MAX FIRING RATE)	HOURS	HRSILO	1699

TABLE 6-20
GAS CLEANUP PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	EQBIZAN VARIABLE	INDEX
ACRAGMAT S,P,A,O		ANNUAL COST OF MAINTENANCE MATERIALS FOR BAGHOUSE	DOLLARS	ACBAGM	1580
ACBAGS S,P,A		ANNUAL COST OF BAGHOUSE BAGS	DOLLARS PER YEAR	ACBAGS	1645
ACDRYMA S,P,A,O		ANNUAL COST OF MAINTENANCE MATERIALS FOR DRY SCRUBBER--EXCEPT SORBENT	DOLLARS	ACDRYS	1583
ACFLBAG S,P,A		ANNUAL ELECTRICITY COST FOR BAGHOUSE AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACFBAG	1648
ACFLPRFC S,P,A,O		ANNUAL ELECTRICITY COST FOR FSP AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACFLPR	1649
ACFLSCOD S,P,A,O		ANNUAL ELECTRICITY COST FOR DRY FGD AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACFLSD	1651
ACFLSCPW S,P,A,O		ANNUAL ELECTRICITY COST FOR WET FGD AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACFLSW	1650
ACFSPMAT S,P,A,O		ANNUAL COST OF MAINTENANCE MATERIALS FOR ELECTROSTATIC PRECIPITATOR	DOLLARS	ACFSPM	1591
ACLINES S,P,A,O		ANNUAL COST OF LIMESTONE INPUT	DOLLARS PER YEAR	ACLIME	1723

TABLE 6-20 (Continued)
GAS CLEANUP PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
ACMAINT * S,P,A,D		ANNUAL COST OF MAINTENANCE MATERIALS FOR FLUEGAS HANDLING EQUIPMENT	DOLLARS / YEAR	ACMAINT51	1755
ACREMAINT S,P,A,D		ANNUAL COST OF MAINTENANCE MATERIALS FOR GASCLEAN--EXCEPT FGD,ESP,BAGHOUSE	DOLLARS	ACGCPF	1586
ACSCRW20 S,P,A,D		ANNUAL COST OF SCRUBBER MAKE-UP WATER AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACW205	1661
78 ACSOPR S,P,A,D		ANNUAL COST OF SCRUBBER CHEMICALS AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACSCHF	1666
ACWETSMA S,P,A,D		ANNUAL COST OF MAINTENANCE MATERIALS FOR WET SCRUBBER--EXCEPT SORRENT	DOLLARS	ACWETS	1582
BAGCOSTF S,P,A	S,P,A=1.00	COST MULTIPLIER FOR BAGHOUSE EQUIPMENT REMOVING MORE PART. THAN REF. BAGHOUSE	NONE	BAGFAC	1577
BAGMAINT S,P,A	S,P=.035, A=.050	FRACTION OF CAP COST OF BAGHOUSE EQUAL TO ANNUAL MAINTENANCE COST	NONE	FMRAG	1576
BAGSDAY * S,P,A		BAGHOUSE BAGS REQUIRED PER DAY CALCULATED FROM ANNUAL REQMT.	DOLLARS PER DAY	DYBAGS	1610
BAGSHOUR * S,P,A		BAGHOUSE BAGS REQUIRED PER HOUR CALCULATED FROM ANNUAL REQMT.	DOLLARS PER HOUR	HRRBAGS	1568

TABLE 6-20 (Continued)
GAS CLEANUP PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	ESTIMATED VARIABLE	INDEX
BAGSYEAR S,P,A		BAGHOUSE BAGS REQUIRED PER YEAR	DOLLARS PER YEAR	YPRAGS	1625
CASRATIO A	A=3.0	MOLAR RATIO OF CALCIUM IN LIMESTONE TO SULFUR IN COAL FOR AFR	RATIO	CASR	1713
CSBAGS * S,P,A		ANNUAL COST OF BAGHOUSE BAGS PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSBAGS	1665
CSELBAG * S,P,A		ELECTRICITY COST FOR BAGHOUSE PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSELBAG	1668
CSELPREC * S,P,A,D		ELECTRICITY COST FOR ESP PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSELPRE	1669
CSELSRD * S,P,D		ELECTRICITY COST FOR DRY EGD PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSELSRD	1671
CSELSRW * S,P,D		ELECTRICITY COST FOR WET EGD PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSELSRW	1670
CSLIMES A		COST OF LIMESTONE INPUT PER 1000 LBS PROCESS STEAM FROM AFR	\$ PER 1000 LBS STEAM	CSLIME	1722
CSSCRH2O * S,P,D		COST OF SCRUBBER MAKE-UP WATER PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSSH2OS	1661
CSSORB * S,P,D		COST OF SCRUBBER CHEMICALS PER 1000 POUNDS PROCESS STEAM	\$ PER 1000 LBS STEAM	CSSCHF	1664
DRYM2D S,P,A	S,P,A=1.	POUNDS OF MAKEUP WATER PER POUND OF SORBENT FOR DRY SCRUBBER	NONE	DRYM2D	1484
DRYSMAIN S,P,D	S,P=.035 D=.025	FRACTION OF CAP COST OF DRY SCRUBBER EQUAL TO ANNUAL MAINTENANCE COST	NONE	FMDRYS	1579
ELBAGDY * S,P,A,D		DAILY ELECTRICITY REQUIRED BY BAGHOUSE AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER DAY	DYERAG	1613
ELBAGYR * S,P,A,D		ANNUAL ELECTRICITY REQUIRED BY BAGHOUSE AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER YEAR	YRERAG	1628
ELFCBAG S,P,A,D		ELECTRICITY REQUIRED BY BAGHOUSE	KW	ELERAG	1469

TABLE 6-21
 DRYASH PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
ACMAINT S,P,A,O		ANNUAL COST OF MAINTENANCE MATERIALS FOR DRY ASH HANDLING EQMT.	DOLLARS / YEAR	ACMAINT(6)	1756
MAINTFAC S,P,A,O	S,P,A,O=.035	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COST/COST	NONE	FMaint(6)	1766

TABLE 6-20 (Continued)

GAS CLEANUP PARAMETER CODES

PARAMETER	VALUE	DESCRIPTION	UNITS	FORTRAN VARIABLE	INDEX
ELECPREC S,P,A,O		ELECTRICITY REQUIRED BY ELECTROSTATIC PRECIPITATOR	KW	ELECSOHO	1468
ELESCPO S,P,O		ELECTRICITY REQUIRED BY DRY SCRUBBER	KW	ELESCOH	1470
ELESCRW S,P,O		ELECTRICITY REQUIRED BY WET SCRUBBER	KW	ELFSCWH	1470
ELPRECOY S,P,O		DAILY ELECTRICITY REQUIRED BY ESP AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER DAY	DYELPR	1614
ELPRECYR S,P,O		ANNUAL ELECTRICITY REQUIRED BY ESP AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER YEAR	YRELPR	1629
ELSCDRYF S,P,O	S,P,O=.0003	ELECTRICITY REQUIRED BY DRY SCRUBBER	KW / LB STEAM / HOUR	FLSCDF	1693
ELSCDRY S,P,O		DAILY ELECTRICITY REQUIRED BY DRY FGD AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER DAY	DYFLSD	1616
ELSCDRYR S,P,O		ANNUAL ELECTRICITY REQUIRED BY DRY FGD AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER YEAR	YRELSD	1631
ELSCRWY S,P,O		DAILY ELECTRICITY REQUIRED BY WET FGD AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER DAY	DYFLSW	1615
FLSCRWYR S,P,O		ANNUAL ELECTRICITY REQUIRED BY WET FGD AT PLANT CAPACITY FACTOR	KILOWATT HOURS PER YEAR	YRELSW	1630
ELSCWYF S,P,O	S,P,O=.0002	ELECTRICITY REQUIRED BY WET SCRUBBER	KW / LB STEAM / HOUR	FLSCWF	1692
ESPAREA S,P,A,O		ELECTROSTATIC PRECIPITATOR COLLECTING ELECTRODE AREA	SQUARE FEET	AFSP	1566
ESPMINT S,P,A,O	S,P,A=.035 O=.01	FRACTION OF CAP COST OF ESP EQUAL TO ANNUAL MAINTENANCE COST	NONE	FMESP	1577

TABLE 6-20 (Continued)

GAS CLEANUP PARAMETER CODES[#]

ESPWATS S,P,A,D	S,P,A,D=0.5	ELEC. POWER FOR ESP AS A FUNCTION OF COLLECTING ELECTRODE AREA	WATTS PER SQUARE FOOT	ESPWT	1567
FANEFF S,P,A,D	S,P,A,D=0.60	EFFICIENCY OF ID FAN, MOTOR, AND DRIVE	NONE	FANEFF	1689
FDVYSCR S,P,D	S,P,D=1.25	COST MULTIPLIER FOR DRY SCRUBBER EOMT. REMOVING MORE SO ₂ THAN REF. SCRUBBER	NONE	SCDFAC	1533
FFSP S,P,A,D	S,P,A = 0 D = 2	PARTICULATE REMOVAL INDICATOR (0=BAGHOUSE, 1=ELEC. PREC., 2=NEITHER)	NONE	FFSP	1437
FSCRIB S,P,D	S,P,D=0 A=2	FLUE GAS SCRUBBING INDICATOR (0=WET LIMESTONE, 1=DRY LINE, 2=NONE)	NONE	FDVYS	1438
FWETSCR S,P,A,D	S,P,A,D=1.25	COST MULTIPLIER FOR WET SCRUBBER EOMT. REMOVING MORE SO ₂ THAN REF. SCRUBBER	NONE	SCWFAC	1534
81 LINESDY A		LIMESTONE REQUIRED BY AFB	LB PER DAY	DVLINE	1725
LINESHR A		LIMESTONE REQUIRED BY AFB	LB PER HR	HPLIME	1724
LINESYR A		LIMESTONE REQUIRED BY AFB	LB PER YEAR	YPLIME	1726
MAINTFAC S,P,A,D	S,P,A,D=0.035	FRACT. OF CAP. COST (LESS BAGHOUSE, ESP & SCRUBBER) = ANNUAL MAINT. COST	NONE	FMATNT(5)	1745
PBAGS S,P,A,D	S,P,A,D=0.20	PRICE OF BAGHOUSE BAGS (ANNUAL COST = PBAGS * ACFM)	DOLLARS/YEAR/ACFM	BAGATR	1558
PCHRCAP S,P,D	S,P,D=24	CAPACITY OF SLUDGE POND (MONTHS OF SLUDGE)	MONTHS	PCHNCA	1702
PRESDROP S,P,A,D	S,P,A,D=7.5	PRESSURE DROP ACROSS BAGHOUSE	INCHES OF WATER	DELTAP	1568
REFPOND S,P,D	S,P,D=24	CAPACITY (MONTHS) OF SLUDGE POND AT REFERENCE PLANT	MONTHS	RPNOD	1701
SCCHMDY * S,P,D		SCRUBBER SO ₂ REMOVAL REQUIREMENT	TONS PER DAY	DVSCHE	1609

TABLE 6-20 (Concluded)

GAS CLEANUP PARAMETER CODES[#]

SCCHEMHR S,P,O		SCRUBBER SORBENT REQUIREMENT	TONS PER HOUR	TSORHR	1483
SCCHEMHR • S,P,O		AMOUNT OF SORBENT USED PER HOUR OF OPERATION AT PEAK CAPACITY	TONS / HOUR	TSORHR	1491
SCCHEMYR • S,P,O		SCRUBBER SORBENT REQUIREMENT	TONS PER YEAR	YPSCHE	1624
SCRH2OYR • S,P,O		SCRUBBER MAKE-UP WATER REQUIREMENT	1000 GALLONS PER DAY	DYH2OS	1606
SCRH2OHR • S,P,O		SCRUBBER MAKE-UP WATER REQUIREMENT	1000 GALLONS PER HOUR	HRH2OS	1596
SCRH2OYR • S,P,O		SCRUBBER MAKE-UP WATER REQUIREMENT	1000 GALLONS PER YEAR	YPH2OS	1621
SORRFAC • S,P,O		FRACTION OF SORBENT THAT IS ACTIVE (FROM GLOBAL FILE)	NONE	ACTIVE	1478
SORRATIO • S,P,A,O		MOLES OF SORBENT REQUIRED TO RECOVER A MOLE OF SO ₂ FROM FLUE GAS	NONE	STORAT	1477
WETH2O • S,P,A,O	S,P,A,O=5	POUNDS OF MAKEUP WATER PER POUND OF SORBENT FOR WET SCRUBBER	NONE	WETH2O	1483
WETSHAIN S,P,O	S,P=.035 O=.025	FRACTION OF CAP. COST OF WET SCRUBBER EQUAL TO ANNUAL MAINTENANCE COST	NONE	FWWETS	1578
WMOLEDRY S,P,O	S,P,O=56	MOLECULAR WEIGHT OF SORBENT FOR DRY SCRUBBER (LTME)	GRAMS PER MOLE		1695
WMOLEWET S,P,O	S,P,O=100	MOLECULAR WEIGHT OF SORBENT FOR WET SCRUBBER (LIMESTONE)	GRAMS PER MOLE		1695

TABLE 6-22

WETASH PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	EDIPAN VARIABLE	INDEX
ACFLSLU S,P,0		ELECTRICITY FOR SLUDGE DEWATERING ANNUAL COST AT PLANT CAPACITY FACTOR	DOLLARS PER YEAR	ACFLSL	1652
ACMAINT * S,P,0		ANNUAL COST OF MAINTENANCE MATERIALS FOR WET ASH HANDLING EQUIPMENT	DOLLARS / YEAR	ACMAINT(7)	1757
CSFLSLU * S,P,0		ELECTRICITY FOR SLUDGE DEWATERING COST PER 1000 POUNDS OF PROCESS STEAM	DOLLARS/1000 LBS STEAM	CSFLSL	1672
ELECSLUD S,P,0		ADDITIONAL ELECTRICITY REQUIRED BY SLUDGE DRYING EQUIPMENT	KW	FLDFEW	1511
ELSLUDDY * S,P,0		ELECTRICITY FOR SLUDGE DEWATERING DAILY REQMT. AT PLANT CAPACITY FACTOR	KILOWATT HRS PER DAY	DYFLSL	1617
ELSLUDGF S,P,0	S,P,0=0	ELECTRICITY REQUIREMENT FOR SLUDGE DRYING EQUIPMENT	KW /TON SLUDGE/ HOUR	ELSLUF	1694
ELSLUDYR * S,P,0		ELECTRICITY FOR SLUDGE DEWATERING ANNUAL REQMT. AT PLANT CAPACITY FACTOR	KILOWATT HRS PER YEAR	YRFLSL	1632
FOFWA S,P,0	S,P,0=0	SLUDGE DISPOSAL INDICATOR (0=POUND, 1=DEWATERING AND TRANSPORT)	NONE	FOFWA	1439
MAINTFAC S,P,0	S,P=-.035 0=-.025	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COST/COST	NONE	FMAINT(7)	1757
SLUDH2O S,P,0	S,P,0=20	PERCENTAGE OF WATER BY WEIGHT IN SLUDGE WHEN TRANSPORTED	NONE	SLUDH2O	1594

TABLE 6-23
SPENTBED PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	EQUATION VARIABLE	INDEX
ACMAINT A		ANNUAL COST OF MAINTENANCE MATERIALS FOR DRY ASH HANDLING EQMT.	DOLLARS / YEAR	ACMAINT(8)	1758
MAINTFAC A	A=.035	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COST/COST	NONE	FMAINT(9)	1768

TABLE 6-24

AFPMATS PARAMETER CODES[#]

PARAMETER	VALUE	DESCRIPTION	UNITS	EDRISAN VARIABLE	INDEX
ACMAINT • A		ANNUAL COST OF MAINTENANCE MATERIALS FOR DRY ASH HANDLING EONT.	DOLLARS / YEAR	ACMAINT(9)	1759
MAINTFAC A	A=.035	FRACTION OF COMPONENT CAPITAL COST EQUALING ANNUAL MAINTENANCE COSTCOST	NONE	FMAINT(9)	1769

TABLE 6-25

WARNING MESSAGES

ALL 1
THE FUEL YOU HAVE SPECIFIED CANNOT BE BURNED BY THIS BOILER. CHANGE
FUEL CHARACTERISTICS.

ALL 2
BOILER PRESSURE IS GREATER THAN 1000 PSIG.
THEREFORE, CAPITAL COSTS FOR MAJOR BOILER EQUIPMENT MAY BE
UNDERESTIMATED.

CONVCOAL 3
COAL SULFUR CONTENT IS GREATER THAN 3 PERCENT.
THEREFORE, THE DRY SCRUBBER CAPITAL AND OPERATING COSTS MAY BE
UNDERESTIMATED.

ALL 4
YOU HAVE INPUT A TEMPERATURE FOR SUPERHEATED STEAM THAT IS
LESS THAN SATURATION TEMPERATURE. THEREFORE, THE SATURATED
STEAM WILL BE USED IN TEMPERATURE CALCULATIONS.

CONVCOAL, CONVOIL 5
DRY SCRUBBER SYSTEM USING LIME AND PRODUCING SOLID WASTE
HAS NOT BEEN COMMERCIALY DEMONSTRATED IN INDUSTRIAL SIZES.

ALL 6
PARTICULATE REMOVAL EQUIPMENT MAY BE REQUIRED TO MEET
ENVIRONMENTAL STANDARDS. SET GASCLEAN FESP TO 0 FOR BAGHOUSE,
1 FOR ESP.

AFB, CONVCOAL 7
COSTS OF MAJOR BOILER EQUIPMENT ARE BASED ON REFERENCE COSTS
FOR BITUMINOUS COAL. THEREFORE, YOUR RESULTS MAY BE INACCURATE.

CONVCOAL, CONVOIL 8
SO2 SCRUBBING MAY BE REQUIRED TO MEET ENVIRONMENTAL STANDARDS.
SET GASCLEAN FSCRUB TO 0 FOR WET LIMESTONE SCRUBBER, 1 FOR DRY
LIME SCRUBBER.

CONVCOAL, CONVOIL 9
WET WASTE WILL BE DEPOSITED IN A SLUDGE POND. NO OPERATING
COSTS ARE CALCULATED FOR WET WASTE DISPOSAL.

AFRCCAL 10
THE EQUIPMENT ITEMS IN THIS "VENDOR" VARIANT ARE APPROPRIATE FOR
A 220,000 LB/HR BABCOCK AND WILCOX DESIGN. COSTS WERE DEVELOPED
BY AFS, INC. AND REFLECT THE STATE OF THE AFB INDUSTRY IN
EARLY 1980. IN ORDER TO APPROXIMATE OTHER AFB
DESIGNS, YOU MAY WISH TO DELETE ITEM XX. TO DO THIS, SET
"COMPONENT CXXTOTAL" TO 0. YOU CAN ALSO INSERT A KNOWN CAPITAL
COST YYYYYY FOR EQUIPMENT ITEM XX BY CHANGING THE PARAMETER VALUE
FOR "COMPONENT CXYYYYYY". THE COST YOU INSERT WILL OVERRIDE THE
CALCULATED VALUE.

CONVCOAL 11
COSTS FOR STOKER BOILERS PRODUCING MORE THAN 180,000 POUNDS OF
STEAM PER HOUR ARE NOT INCLUDED IN COSTEAM DATA FILES.

TABLE 6-25 (Concluded)

WARNING MESSAGES

AFRCOAL 12
THE COSTS AND EQUIPMENT ITEMS IN THIS "THEORETICAL" VARIANT ARE THE SAME AS FOR THE "VENDOR" AFB VARIANT EXCEPT FOR THE COSTS OF THE TUBES, DRUMS, ETC., THE SUPERHEATER, AND THE RED MATERIALS COOLER. THE COST ESTIMATES FOR THOSE 3 ITEMS REPRESENT THEORETICAL ESTIMATES FOR A MATURE AFB INDUSTRY AND DO NOT NECESSARILY REPRESENT ACTUAL 1980 OFFERINGS BY EQUIPMENT MANUFACTURERS. SEE MITRE TECHNICAL REPORT MTR-80W00045 FOR A DERIVATION OF THE COST ESTIMATES.

CONVCIL 13
NO ESP OR BAGHOUSE EQUIPMENT ARE INCLUDED. PARTICULATE CALCULATIONS ASSUME THE WET SO₂ SCRUBBER REMOVES PARTICULATES TO MEET ENVIRONMENTAL STANDARDS.

APPENDIX A
SAMPLE PAGES OF COSTEAM REPORTS

REPORT SUMMARY
(Parameter Names Requested)
(First Page)

SUMMARY REPORT
PHASE 2 RESULTS IN 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0	MILLION BTUS PER HOUR

SECTION 1 CAPITAL COSTS (1980 DOLLARS)

	CAPITAL COST
MAJOR BOILER EQUIPMENT	BOILER C40TOTAL
MAJOR MECHANICAL EQUIPMENT	MECHANIC C40TOTAL
BOILER INSTRUMENTATION	INSTRUM C40TOTAL
COAL HANDLING EQUIPMENT	FUELAND C40TOTAL
FLUE GAS CLEANUP AND HANDLING	GASCLEAN C40TOTAL
DRY ASH HANDLING EQUIPMENT	DPYASH C40TOTAL
WET ASH HANDLING EQUIPMENT	WETASH C40TOTAL
COMPONENT SUBTOTAL	*CONVCOAL CTOTAL
ENGINEERING COST	*CONVCOAL CENG
CONSTRUCTION MANAGEMENT	*CONVCOAL CMANAGE
CONTINGENCY COST	*CONVCOAL CCOST
INTEREST DURING CONSTRUCTION	*CONVCOAL CONSTINT
COAL STOCKPILE	*CONVCOAL CSTACK
WORKING CAPITAL	CONVCOAL WORKCAP
OTHER COSTS	CONVCOAL CFXTRA
TOTAL CAPITAL COSTS	*CONVCOAL CAPITAL

REPORT SUMCAP

CAPITAL COST SUMMARY REPORT PHASE 2 COSTEAM RESULTS IN 1980 DOLLARS

SYSTEM : CONVCOAL STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16 CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983 CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR

SECTION 1

	PURCHASED EQUIPMENT	CONSTRUCTION MATERIALS	CONSTRUCTION LABOR	RENTED EQUIPMENT	TOTAL CAPITAL COST
MAJOR BOILER EQUIPMENT	1953061.	449707.	1206442.	104403.	3713611.
MAJOR MECHANICAL EQUIPMENT	418322.	616655.	520740.	62337.	1618052.
BOILER INSTRUMENTATION	180617.	48718.	256097.	0.	485432.
COAL HANDLING EQUIPMENT	449050.	76251.	203960.	31286.	760547.
FLUE GAS CLEANUP AND HANDLING	845938.	469105.	670576.	43706.	2028325.
DRY ASH HANDLING EQUIPMENT	174917.	34273.	135229.	14295.	358714.
WET ASH HANDLING EQUIPMENT	191398.	27156.	74327.	4101.	296982.
TOTAL	4213301.	1720863.	3067367.	260128.	9261662.

REPORT CAPITAL (Both Parameter Values and Names Requested)

CAPITAL COSTS FOR EACH COMPONENT
PHASE 2 COSTEAM RESULTS IN 1980 DOLLARS

SYSTEM : CONVCOAL STEAM DEMAND : 200000. (LR/HR)
VARIANT : PULVERTZ STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16 CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983 CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR

SECTION 1 MAJOR BOILER EQUIPMENT

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	PURCHASED EQUIPMENT	CONSTRUCTION MATERIALS	CONSTRUCTION LABOR	RENTED EQUIPMENT	BOILER TOTAL CAPITAL COST
TUBES, DRUMS, HEADERS DOORS, ETC.	BOILER C01EQMT 1110696.	BOILER C01MAT 243665.	BOILER C01LAB 980495.	BOILER C01RENT 81788.	BOILER C01TOTAL 2416643.
BURNERS ATOMIZERS	BOILER C02EQMT 65384.	BOILER C02MAT 9300.	BOILER C02LAB 16645.	BOILER C02RENT 2929.	BOILER C02TOTAL 84258.
OIL IGNITION SYSTEM	BOILER C03EQMT 12704.	BOILER C03MAT 6157.	BOILER C03LAB 7994.	BOILER C03RENT 0.	BOILER C03TOTAL 26844.
PULVERIZERS, PRIM. AIR FANS/ETC.	BOILER C04EQMT 406142.	BOILER C04MAT 75273.	BOILER C04LAB 102732.	BOILER C04RENT 3632.	BOILER C04TOTAL 587780.
COAL FEEDERS SCALES	BOILER C05EQMT 61110.	BOILER C05MAT 22517.	BOILER C05LAB 25873.	BOILER C05RENT 3281.	BOILER C05TOTAL 112780.
SOOTBLOWERS	BOILER C08EQMT 54119.	BOILER C08MAT 8953.	BOILER C08LAB 19215.	BOILER C08RENT 0.	BOILER C08TOTAL 82187.
FORCED DRAFT FAN/DRIVE	BOILER C09EQMT 55153.	BOILER C09MAT 28793.	BOILER C09LAB 18704.	BOILER C09RENT 1875.	BOILER C09TOTAL 104524.
AIR HEATER	BOILER C10EQMT 187758.	BOILER C10MAT 55150.	BOILER C10LAB 34796.	BOILER C10RENT 10897.	BOILER C10TOTAL 288601.
BOILER TOTAL CAPITAL COST	BOILER C40EQMT 1953061.	BOILER C40MAT 449707.	BOILER C40LAB 1206442.	BOILER C40RENT 104403.	BOILER C40TOTAL 3713611.

REPORT MATERIAL (First Page)

MATERIALS AND LABOR CAPITAL COSTS FOR EACH COMPONENT
PHASE 2 COSTEAM RESULTS IN 1980 DOLLARS

SYSTEM : CONVCOAL STEAM DEMAND : 200000. (L9/HR)
VARIANT : PULVERI7 STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16 CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983 CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR

SECTION 1 MAJOR BOILER EQUIPMENT

	MECHANICAL MATERIALS	STRUCTURAL MATERIALS	INSTRUMENT MATERIALS	INSULATION MATERIALS	CIVIL MATERIALS
TUBES, DRUMS, HEADERS DOORS, ETC.	46261.	17799.	0.	144006.	35599.
BURNERS ATOMIZERS	9300.	0.	0.	0.	0.
OIL IGNITION SYSTEM	3696.	0.	0.	929.	0.
PULVERIZERS, PRIM. AIR FANS/ETC.	46261.	0.	0.	12659.	5397.
COAL FEEDERS SCALES	11088.	0.	5488.	0.	2641.
SOOTBLOWERS	3696.	0.	0.	1858.	0.
FORCED DRAFT FAN/DRIVE	9300.	0.	2686.	4529.	3560.
AIR HEATER	22177.	16077.	1868.	11730.	0.
BOILER TOTAL CAPITAL COST	151780.	33876.	10042.	175711.	47196.

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REPORT DESIGN
(Portions of All Three Sections)

CONVENTIONAL COAL FIRED INDUSTRIAL STEAM PLANT
DESIGN PARAMETERS AND OPERATING CHARACTERISTICS
PHASE 2 COST DATA COSTS IN 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : FULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL 16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.8500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR	

SECTION 1 COAL CHARACTERISTICS

COAL HIGH HEAT VALUE BTU/POUND	12646.
COAL ASH PERCENTAGE	10.10
COAL SULFUR PERCENTAGE	3.70
COAL MOISTURE PERCENTAGE	3.60
COAL PRICE DOLLARS PER TON	41.73
SIZE OF COAL STOCKPILE (DAYS)	75.00
FUEL PRICE \$/MILLION BTUS	1.65

MAKE-UP WATER TEMPERATURE DEG. F.	70.00
WATER TEMP (DEG. F) AT BOILER INLET	240.
STEAM ENTHALPY BTU/POUND	1205.
FLUE GAS TEMP DEGREES F.	340.
FLUE GAS ACTUAL CUBIC FT PER MINUTE	96411.

SECTION 2 PLANT OPERATING CHARACTERISTICS

BOILER SIZE LBS OF STEAM/HOUR	223852.
FLUEGAS SCRUBBER 1=WET, 2=DRY, 3=NONE	1.000
PART. REMOVAL 3=NONE 2=ESP, 1=BAGHOUSE	1.000
SLUDGE DISPOSAL 1=POND, 2=TRANSPORT	2.000
MILLIONS OF BTUS FIRED PER HOUR	260.
LBS OF COAL PER MILLION BTU FIRED	79.08
LBS OF COAL FIRED/ POUND PROCESS STEAM	0.102
BOILER OVERALL EFFICIENCY	0.860

FRACTION PARTICLES REMOVED BY CYCLONE	0.750
FRACTION PARTICLES REMO. AFTER CYCLONE	0.981
WATTS PER SQ. FT. OF ESP ELECTRODE	0.500
PRES. DROP ACROSS BAGHOUSE (IN. H2O)	7.500
SO2 INTO SCRUBBER LB/MILLION BTU FIRED	5.559
FRACTION OF SO2 REMOVED BY SCRUBBER	0.895
MOLES OF SORBENT PER MOLE SO2	1.255
ACTIVE FRACTION OF SORBENT	0.950
% WATER IN SLUDGE FOR TRANSPORT	20.00

REPORT DESIGN (Concluded)
(Portions of All Three Sections)

CONVENTIONAL COAL FIRED INDUSTRIAL STEAM PLANT
DESIGN PARAMETERS AND OPERATING CHARACTERISTICS
PHASE 2 COST/STEAM DATA COSTS IN 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : FULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0	MILLION BTUS PER HOUR

SECTION 3 CAPITAL COSTS OF ENVIRONMENTAL ITEMS

	COST OF PURCHASED EQUIPMENT	TOTAL CAPITAL COST
CYCLONE DUST COLLECTOR	51534.	87528.
BAGHOUSE	375005.	955507.
WET FLUE GAS SCRUBBER	234813.	626449.
LIMESTONE CRUSHER	22372.	22372.
LIMESTONE UNLOADER, SILO, BINS, CONVEYORS	31203.	98135.
LIMESTONE MIXING TANK	18046.	30173.
INDUCED DRAFT FAN, DRIVE, COUPLING	71165.	150595.
DRY ASH HANDLING	174917.	358714.
WET ASH HANDLING	191398.	296982.
COAL YARD AND DRAIN SYSTEM	60649.	207927.
SLUDGE TRANSPORT EQUIPMENT	41800.	57567.

REPORT OPERATE
(Portions of All Five Sections)

OPERATING COSTS FOR CONVENTIONAL COAL INDUSTRIAL STEAM PLANT
PHASE 2 COSTEAM DATA 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 190. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0	MILLION BTUS PER HOUR

SECTION 1 OPERATING COST SUMMARY (1980 DOLLARS)

	COST PER THOUSAND LBS PROCESS STEAM	ANNUAL COST
FUEL COST	2.15	2449826.
OPERATING AND MAINTENANCE LABOR	0.33	378851.
CONSUMABLES --H2O, ELEC,CHEMICALS,BAGS	0.28	314143.
MAINTENANCE MATERIALS	0.29	335895.
WASTE DISPOSAL	0.14	161144.
INSURANCE COST	0.12	138606.
TOTAL	3.32	3778464.

REPORT OPERATE (Continued)
(Portions of All Five Sections)

OPERATING COSTS FOR CONVENTIONAL COAL INDUSTRIAL STEAM PLANT
PHASE 2 COST DATA 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIG	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR	

SECTION 2 PRICES AND OP. COST-RELATED FACTORS

COAL PRICE DOLLARS PER TON	41.73	BAGHOUSE BAGS DOLLARS/ YEAR/ ACFT	0.2000
WATER PRICE DOLLARS/1000 GAL.	0.80	STEAM DEMAND FOR REHEAT STEAM (FRAC.	1.50
ELECTRICITY PRICE DOLLARS PER KWH	0.0300	FRACTION ANNUAL O&M FOR WORKING CAPITAL	0.2500
PRICE OF SLUDGE DISPOSAL (\$ / TON)	7.50	C/M LABOR OVERHEAD FACTOR	1.40
PRICE OF DRY ASH DISPOSAL (\$ / TON)	7.50	INSURANCE RATE	0.0100
FEEDWATER TREATMENT CHEM. \$/1000GAL H2O	1.00	CONSTRUCTION TIME YEARS	2.00
LIMESTONE DOLLARS PER TON	10.00	INTEREST RATE DURING CONSTRUCTION	0.1000
LIME DOLLARS PER TON	52.00	-----	
LIMESTONE ACTIVE FRACTION	0.95		
LIME ACTIVE FRACTION	0.99		

REPORT OPERATE (Continued)
(Portions of All Five Sections)

OPERATING COSTS FOR CONVENTIONAL COAL INDUSTRIAL STEAM PLANT
PHASE 2 COST DATA 1980 DOLLARS

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LBS/HRI)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR	

SECTION 3 QUANTITIES AND COSTS OF CONSUMABLES

	QUANTITY PER HOUR	QUANTITY PER DAY	QUANTITY PER YEAR	COST PER YEAR	COST PER THOUSAND LBS PROCESS STEAM
COAL (TONS)	10.31	161.	58707.	244926.	2.15
BOILER FEEDWATER (1000 GALLONS)	9.75	152.	55529.	55529.	0.05
SCRUBBER WATER (1000 GALLONS)	1.80	28.03	10231.	10231.	0.00898
TOTAL WATER (1000 GALLONS)	11.55	180.	65760.	65760.	0.06
REHEAT STEAM (LBS) (IN OTHER COSTS)	3000.	46800.	17081984.	55939.	0.05
FEEDWATER TREATMENT CHEMICALS (DOLLARS)	7.80	122.	44423.	44423.	0.04
SCRUBBER CHEMICALS (TONS)	1.50	23.34	8519.	85189.	0.07
RAGHOUSE BAGS (DOLLARS)	3.39	52.83	19282.	19282.	0.01693
SLUDGE & WET ASH DISPOSAL (TONS)	3.77	58.87	21486.	161144.	0.14
DRY WASTE DISPOSAL (TONS)	0.	0.	5907.	0.	0.0
ELECTRICITY FOR RAGHOUSE (KWH)	140.	2186.	797712.	23931.	0.02101
ELECTRICITY FOR WET SCRUBBER (KWH)	36.	567.	206942.	6205.	0.00545
ELECTRICITY FOR REST OF PLANT (KWH)	406.	6334.	2311763.	69353.	0.06
ELECTRICITY TOTAL KILOWATT HOURS	582.	9086.	3316316.	9489.	0.09

REPORT OPERATE (Continued)
(Portions of All Five Sections)

OPERATING COSTS FOR CONVENTIONAL COAL INDUSTRIAL STEAM PLANT
PHASE 2 COSTEAM DATA 1980 DOLLARS

SYSTEM : CONVCOL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0	MILLION BTUS PER HOUR

SECTION 4 EQUIPMENT MAINTENANCE

	FRACTION OF CAPITAL COST	COST PER YEAR
MAJOR BOILER EQUIPMENT	0.0250	170692.
BOILER INSTRUMENTATION	0.0250	15777.
COAL HANDLING EQUIPMENT	0.0250	24718.
BAGHOUSE EQUIPMENT	0.0350	43475.
ELECTROSTATIC PREC. EQUIPMENT	0.0350	0.
WET SCRUBBER EQUIPMENT	0.0350	28503.
DRY SCRUBBER EQUIPMENT	0.0350	0.
REMAINDER OF FLUE GAS HANDLING EQMT.	0.0350	20310.
DRY ASH HANDLING EQUIPMENT	0.0350	16321.
WET ASH HANDLING EQUIPMENT	0.0350	13513.
TOTAL MAINTENANCE MATERIALS COST	0.0279	335895.

REPORT OPERATE (Concluded)
(Portions of All Five Sections)

OPERATING COSTS FOR CONVENTIONAL COAL INDUSTRIAL STEAM PLANT
PHASE 2 CGSTEAM DATA 1980 DOLLARS

SYSTEM :	CONVCOAL	STEAM DEMAND :	200000. (LB/HR)
VAPLANT :	PULVERIZ	STEAM PRESSURE :	250. (PSIG)
REGION :	CHICAGO	STEAM TEMPERATURE :	406. (DEGREE F.)
FUEL :	COAL16	CONDENSATE RETURN :	0.600 (FRACTION)
START UP YEAR :	1983	CONDENSATE TEMP :	180. (DEGREE F.)
ENVIRONMENTAL :	ENVHIGE	CAPACITY FACTOR :	0.6500 (FRACTION)
FIRING RATE :	260.0	MILLION BTUS PER HOUR	

SECTION 5 LABOR FOR OPERATION AND MAINTENANCE

	NUMBER OF PERSONS	WAGE \$ / HOUR	COST PER YEAR
SENIOR OPERATORS	5.00	10.89	158558.
ASSISTANT OPERATORS	4.00	9.02	105365.
MAINTENANCE MECHANICS	1.00	12.28	35759.
EQUIPMENT OPERATORS	1.00	8.02	23354.
PLANT SUPERINTENDENT	1.00	12.65	36837.
UNSKILLED LABORER	1.00	6.62	19277.
TOTAL	13.00	10.01	378851.

REPORT FINANCE

FINANCIAL CALCULATIONS PHASE 2 COSTEAM RESULTS WITH PRELIMINARY FINANCIAL SUBROUTINE DEPRECIATION OVER PLANT LIFETIME, 100% EQUITY FINANCING

SYSTEM : CONVCOAL STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16 CONDENSATE RETURN : 0.680 (FRACTION)
START UP YEAR : 1983 CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR

SECTION 1 PARAMETERS USED IN FINANCIAL CALCS.

PLANT
LIFETIME (YEARS) 30.00

1979 FUEL PRICE
DOLLARS PER TON 41.73

INCOME TAX
RATE 0.50

RATE OF RETURN
OF CAPITAL 0.1500

CAPITAL COST
ESCALATION RATE 0.1000

FUEL COST
ESCALATION RATE 0.1000

O & M LABOR
ESCALATION RATE 0.0800

O & M MATERIALS
ESCALATION RATE 0.0800

SECTION 2 FINANCIAL CALCULATIONS (START-UP YR \$'S)

100 PERCENT EQUITY FINANCING

TOT. CAPITAL
COST AT START 19705728.

FIRST YEAR BEFORE
TAX TOTAL COST 7935600.

FIRST YEAR AFTER
TAX TOTAL COST 9928473.

ANNUALIZED
AFTER TAX COST 16663719.

CAPITAL COST PER
LB/HR PROCESS STEAM 98.53

FIRST YR BEFORE TAX
COST/1000 LB STEAM 6.97

FIRST YR AFTER TAX
COST/1000 LB STEAM 8.72

ANNUALIZE AFTER TAX
COST/1000 LB STEAM 14.63

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REPORT ERA (Summary Section)

CAPITAL COSTS FOR EACH ITEM
PHASE 2 COSTEAM RESULTS IN 1980 DOLLARS
ERA FORMAT

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : CGAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0	MILLION BTUS PER HOUR

ERA SUMMARY REPORT

	TOTAL CAPITAL COST
1.A. STEAM GEN EQMT BOILERS	2641744.
1.E. STEAM GEN EQMT AUXILIARY	983274.
1.G. STEAM GEN EQMT COAL HAND. SYSTEMS	1253178.
1.H. STEAM GEN EQMT OTHER EQMT	1058394.
1.I. STEAM GEN EQMT INDIRECT COSTS	1387317.
2.P. FUEL INVENTORY COAL STOCKPILE	503389.
3.A. AIR POLLUTION PARTICULATE CONTROL	1043035.
3.B. PART. CONTROL INDIRECT COSTS	208607.
3.C. AIR POLLUTION SO2 SCRUBBER	1074111.
3.D. SO2 SCRUBBER INDIRECT COSTS	214822.
4.A. WATER POLL. COAL YARD & DRAINS	207927.
4.D. WATER POLL. INDIRECT COSTS	41585.
5. CONTINGENCY COST	926166.
INTEREST DURING CONSTRUCTION	1317071.
WORKING CAPITAL	944616.
TOTAL	14805235.

REPORT OF ALL PARAMETERS

REPORT ALLP
(First Page)

SYSTEM : CONVCOAL	STEAM DEMAND : 200000. (LB/HR)
VARIANT : PULVERIZ	STEAM PRESSURE : 250. (PSIG)
REGION : CHICAGO	STEAM TEMPERATURE : 406. (DEGREE F.)
FUEL : COAL16	CONDENSATE RETURN : 0.600 (FRACTION)
START UP YEAR : 1983	CONDENSATE TEMP : 180. (DEGREE F.)
ENVIRONMENTAL : ENVHIGH	CAPACITY FACTOR : 0.6500 (FRACTION)
FIRING RATE : 260.0 MILLION BTUS PER HOUR	

GLOBAL PARAMETERS

PLTLIFE	30.000000	CONINTER	0.100000	PH2OCHEM	1.000000	PWATER	0.800000
PELEC	0.030000	PSLUDGE	7.500000	PASH	7.500000	PLSTONE	10.000000
ITCRATE	0.0	TAXRATE	0.500000	ESCCAP	0.100000	ESCCMLA	0.080000
ESCPUEL	0.100000	ESCOMAT	0.080000	RATECAP	0.150000	PSIATM	14.695999
PLINE	52.000000	AFIRSTONE	0.950000	AFLINE	0.990000	INSURATE	0.010000
WCAPPAC	0.250000						

SYSTEM LEVEL PARAMETERS FOR CONVCOAL

SIZE1	100000.000 *	SIZE2	200000.000 *	SIZE3	400000.000 *	SIZEMAX1	179999.000 *
SIZEMAX2	299999.000 *	SIZEMAX3	500001.000 *	PWETA	0.0	WAGEO	5.000000 *
WAGEN	9.000000 *	WAGEE	11.000000 *	ENTHALPY	1205.48877	CENGFC	0.100000
CENG	794299.562 *	CCONT	794299.562 *	CCONTFAC	0.100000	CTOTAL	7942994.000 *
PLTCONST	2.000000	COALHOUR	10.310261 *	COALYEAR	58706.6133 *	COALSTEA	0.101579 *
FEEDTEMP	70.000000	ACH2OT	65759.6250 *	ACCOAL	2449826.00 *	KWHOUR	582.423096 *
KWHTOTAL	3316316.00 *	ACELEC	99489.4375 *	ASHHOUR	0.0 *	SLUDHOUR	1.981314 *
ACDISP	161144.437 *	SO2PAC	0.894737 *	SULHOUR	0.362406 *	PARTFAC	0.981203 *
CAPITAL	12895519.0 *	CHAHAFAC	0.100000	CHAHAGE	794299.562 *	CEIRA	0.0
PARTDAY	121.681122 *	SO2DAY	2373.45068 *	NOIRATE	2028.01880 *	FGDSO2	0.585165 *
FLUSO2	5.559065 *	SO2REN	90.000000 *	BTUFIRED	260.002441 *	ASHYEAB	5907.14844 *
SLUDYEAR	11281.5937 *	ONOVER	1.000000	ACONLAB	378850.750 *	ACOMMAT	293038.812 *
ACINSUR	119663.500 *	ACCONSUM	314142.687 *	ACOPER	887989.437 *	ASHREF	10.000000 *
BTUREF	12500.0000 *	SULREF	2.000000 *	NOISTREF	2.200000 *	CSICCK	503389.062 *
CONSTINT	1137073.00 *	FCYCLCNE	0.750000	RESO2PCT	75.000000 *	REFFBAG	0.950000 *
REFPESP	0.950000 *	ESPCOSTP	1.250000	PARHMBTU	0.030000 *	NOXHMBTU	0.500000 *
REFNOXLB	0.400000 *	SIZEBCIL	223852.000	NSROPER	5.000000	NASSTOP	4.000000
NHAINHEC	1.000000	NEQOPER	1.000000	NPLTSUPE	1.000000	NLABORER	1.000000
ESROPER	10.890000	PASSTOP	9.020000	PHAINNEC	12.280000	PECOPER	8.020000
PPLTSUPE	12.650000	PLABORER	6.620000	INLETTEM	240.000000	ACFM	96410.9375
SCRUBIND	1.000000 *	ESFINE	1.000000 *	TRAININD	2.000000 *	COALNNET	79.076385 *
PLUETEMP	340.000000	CSOHLAB	0.332676 *	CSCONSUM	0.275854 *	CSOHNAT	0.257323 *
CSDISP	0.141504 *	CSINSUR	0.105079 *	CSTOTOP	3.263670 *	NTOTONLA	13.000000 *
PHAINAVG	10.007690	ACSROPER	158558.250 *	ACASSTOP	105064.875 *	ACHAINME	35759.3477 *
ACEQOPER	23354.2266 *	ACPLTSUP	36836.7812 *	ACLABORE	19277.4297 *	BOIH2OHR	9.752112 *
SLUGHR	3.773434	H2OTOTHR	11.546944 *	COALDAY	160.840057 *	BOIH2ODY	152.132935 *
H2OTOTDY	180.163452 *	SLTRANDY	58.865555 *	ASHDAY	0.0 *	ELECTCDY	9085.79687 *
BOIH2OYR	55528.5195 *	H2OTOTYR	65759.6250 *	SLTRANHYR	21485.5258 *	ACBCIH2O	55528.5156 *
ACSLUDGE	161144.437	ACASHDIS	0.0	CSCOAL	2.451236 *	CSECIH2O	0.048761 *
CSH2OT	0.057745 *	CSSLUDGE	0.141504 *	CSASHDIS	0.0 *	CSELETOI	0.087363 *
AVGHAINP	0.028379 *	ACTOTAL	3716665.00 *	BTUPRICE	1.649928	PTREHEAT	1.500000
CSREHEAT	0.048232	ACREHEAT	54926.0664	REHEATHR	3000.00000	REHEATDY	46799.9961
REHEATYR	17081984.0	WORKCAP	929166.250	OILSTEA	0.0 *	OILNNBTU	0.0 *
OILDAY	0.0 *	OILHOUR	0.0 *	OILYEAR	0.0 *	ACOIL	0.0
CSOIL	0.0 *	ZERO	0.0 *				

Department Approval: Paul M. Maxwell

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