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S^3 FINANCIAL PROJECTION MODEL: PRELIMINARY USER'S MANUAL AND SYSTEM OVERVIEW

by

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FOREWORD

Concurrent with the software development activity described in the preface to this report, specifications were drafted for the various types of source data and control options required to operate the model. Preliminary explanations of most of the special techniques employed in the model as well as certain key logical routines were also drafted to provide a basis for later documentation. These materials have been collected along with revised sections from the documentation of other S^3 software products to form a set of "working" user instructions to assist in the daily operation of the model.

This report is intended only to commit these working papers to the project record. This first draft contains elements that will contribute both to the system description and user's manual for the model. It is not a finished product and is not to be regarded as the completed model software documentation.

REA

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PREFACE

The current version of the S^3 Financial Projection Model ("JFM") that is operational on the S^3 UNIVAC 1108 timesharing computer system is an end product of an accelerated software development effort undertaken to construct a pipeline economic model in order to satisfy the requirements of the U. S. Energy Research and Development Administration (ERDA) program "Energy Study of Pipeline Transportation System". A brief outline of this development process is described in Appendix A "Background on the S^3 Development of a Pipeline Economic Model". As a result of earlier activities for its business clients, S^3 has available in-house a repertoire of computer software products, models, and data management systems. A representative sample of such products is given in Appendix B "Summary of S^3 Developed Economic Models". The current version of JFM was constructed by incorporating the special features characteristic of regulated industries with the various accounting modules utilized in a general business financial projection model.

The computerized S^3 Financial Projection Model is a software product of Systems, Science and Software (S^3). The product consists of three components:

1. <u>Computer Source Programs</u>

The software comprising the JFM model (version #6, 111976) is written in UNIVAC 1100 Series FORTRAN V programming language (Reference 8) which is compatible with and encompasses the American National Standard (ANS) FORTRAN (ANSI X3.9-1966). As operational on the S^3 UNIVAC 1108 timesharing computer system, the JFM source programs total 32 program units of over 7700 lines of symbolic code, including one main program, 27 subprograms, and four Procedure Definition Processor (PDP) elements with six FORTRAN PROCS. In addition, JFM utilizes eleven UNIVAC 1108 assembly language subprograms residing in the S^3 system library. These source programs are represented by a set of computer listings and a copy in machine readable form.

2. Documentation

The software documentation includes: (a) a general system description, (b) user instructions, and (c) programmer information.

3. Base Cases

The base cases are a set of source input and the corresponding projections and output reports generated by the model for typical sample problems.

The purpose of this document is to facilitate the use of the S^3 Financial Projection Model. A general overview of the model is presented first to indicate the rationale underlying the model and to show the linkages between the various submodels. An understanding of the basic accounting definitions and self-evident relationships between line items in the general financial accounting reports is a prerequisite for the effective application of the model. Dixon's text, The Executive's Accounting Primer (Reference 1), provides a good introduction to the subject for the non-accountant. Background information on financial planning, management science techniques, and financial computer models is offered by References 2-7. Particular attention has been paid in this system description not only to defining the methods of calcualtions utilized by the model, but also to describing the optional capital investment planning techniques that may be exercised with the model. The mathematical relationships underlying various planning techniques are defined and the methods for applying these techniques are discussed with illustrations and sample input data specifications. Decision tables are frequently used to illustrate how complex decision rules are applied within the model to determine the logical flow of a particular computational routine. The complete set of source data and model options are described along with the procedures for input data preparation and actual program operation. Sample cases of input data and job control language are included.

SECTION 1

S^3 FINANCIAL PROJECTION MODEL — GENERAL OVERVIEW

The S^3 Financial Projection Model is a software product of Systems, Science and Software (S^3). The model is designed to be a key management tool for financial planning and resource utilization planning. As a computerized financial model, it can assist in the entire business planning process from projections of profits and cash generation to the evaluation of the consequences of "what if" conditions and alternate decisions related to resource utilization.

The primary output generated by the model are financial projections in the form of printed outputs showing data on line items by time period over the planning horizon. The line items are the details of the basic accounting statements:

1. Income and expense,
2. Source and application of funds,
3. Assets and liabilities,
4. Capital investment planning and financial performance measures.

The latter statement includes measures of leverage, liquidity, activity, and profitability. Various return on investment (ROI) measures are calculated and two methods are applied in discounting projected net cash flow:

1. The present value method, and
2. The discounted cash flow method using a calculated internal rate of return.

The relationship between line items and between different planning periods within a line item are described by a set of exact equations. These equations are essentially derived from self-evident relationships and basic accounting definitions. Judgmental data are not embedded within the model itself to define relations between model variables, but rather must be directly entered by the user in the specification of model parameters and the source data such as estimates of revenue, expenses, etc.

While the model has been designed as a general business financial planning model, special capabilities are available to treat the requirements of specific regulated industries. At the option of the user, the model can calculate such quantities as operating income, rate base, and return on rate base, as prescribed by major federal and state regulatory agencies. As an additional option, the model can also automatically maintain conditions such that the rate of return will not exceed allowable limits.

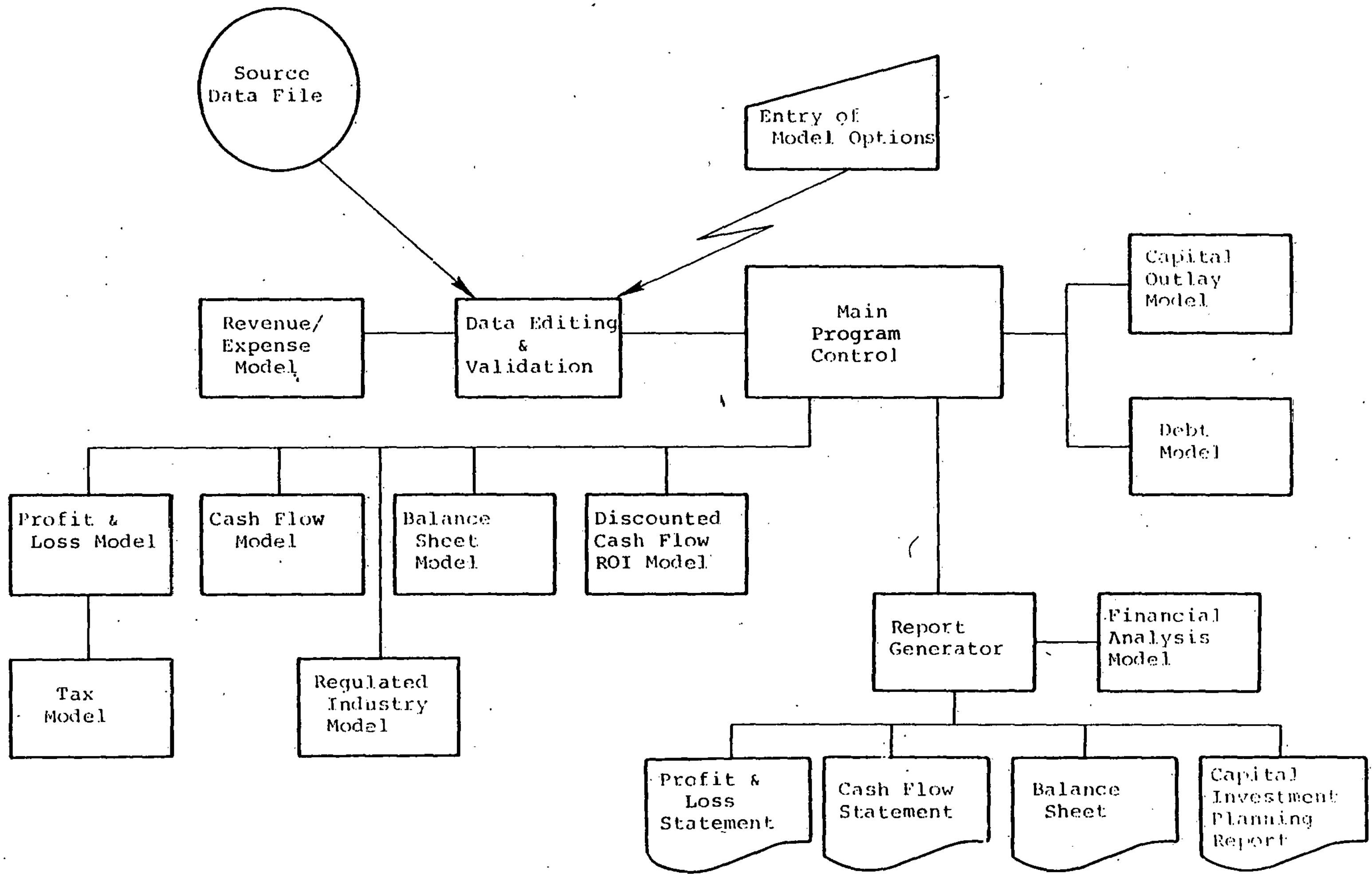
Special attention has been paid in developing the model so that a full range of capabilities are available for treating complex schedules of capital outlays and long-term borrowing. For example, for each planned capital outlay, the model calculates the investment tax credit and generates projections of both the financial and tax depreciation applying any one of the standard depreciation methods. Specific expenditures, such as construction loan interest and other charges during the construction period associated with each capital outlay, can be capitalized and amortized for financial (book) purposes but expensed for tax purposes, as incurred. For each long-term debt borrowing the model projects retirement payments and interest charges according to any prescribed schedule. At the option of the user, short-term borrowing can be handled automatically by the model, if cash requirements demand such loans. In addition to calculating all line items required for financial reporting purposes, the model generates projections of taxable income, current and deferred federal income taxes, tax losses, and investment tax credits. The latter two line items are carried forward and applied in accordance with IRS regulations.

The model offers flexibility in the selection of report content, the method of calculating reported quantities, the specification of source data, and the general control of financial planning options. The model can be applied to an entire corporation or to an individual subsidiary. It has been exercised for several different types of business organizations from a partnership owning a group of condominiums to mining, manufacturing, and regulated transportation companies. Portions of the model may be exercised for special purpose planning studies, such as individual capital investment projects, long-term debt borrowing and equity requirement analyses, and comparative return on investment studies.

The schematic diagram of the general system design (Figure 1) illustrates the primary linkages between the twelve component submodels that comprise the model:

1. Data Editing
2. Revenue and Expense
3. Capital Outlays
4. Debt
5. Tax
6. Profit and Loss
7. Cash Flow
8. Balance Sheet
9. Regulated Industries
10. Discounted Cash Flow — ROI
11. Financial Analysis
12. Report Generator

While only the four major financial projection reports are indicated in this diagram, a series of supporting subschedule reports can be generated by the Data Editing, Revenue and Expense, Capital Outlays, Debt, Tax, Cash Flow, Discounted Cash Flow — ROI, and Report Generator submodels. These ancillary reports supply more detailed information that may



Schematic diagram of the general system design of the S^3 Financial Projection Model.

be requested by the user for special operational or planning studies. A full range of diagnostic message are also available for data editing and validation to ensure the integrity of the financial data base.

The component models and their interrelationships are described very briefly below.

Data Editing — The Data Editing model's primary function is to accept (i.e., load into core memory) all source data, including model options and parameters. Input data may be entered directly from the keyboard of a demand teletype-like terminal or read from a pre-existing source data file. If an input data file has been created in a prior run, selected changes in these data may be keyed in by the user. An updated input file can also be generated. A limited amount of pre-processing editing and validation is performed.

Revenue/Expense — The Revenue/Expense model is used to supply selected revenue and expense figures to the Data Editing model that are derived from a special calculation. These figures may be calculated within the submodel itself or read from a datafile. In the case of the latter, the Revenue/Expense submodel can be used to establish a linkage between the main financial model and the output from a second computer program that is exercised independently in order to calculate selected varialbes such as revenues, unit sales, or some segregated expense.

Capital Outlays — The Capital Outlays model provides the Profit and Loss, Cash Flow, and Balance Sheet models with the required data regarding the impact of all additions to property, plant, and equipment on the basic accounting statements.

Debt — The Debt model provides the Profit and Loss, Cash Flow, and Balance Sheet models with the required data regarding the impact of both long-term debt and short-term borrowing on the basic accounting statements.

Tax — This component calculates taxable income and current and deferred federal income taxes. Tax losses and investment tax credits are carried forward and applied in accordance with IRS regulations.

Profit and Loss — This component performs the calculations required to produce a complete profit and loss statement. It uses the data from the above four models, as well as many expense line items that were included in the source data "loaded" by the Data Editing model but were not the subject of additional processing.

Cash Flow — This component calculates the net cash generated based on the individual source and application of funds as determined by the last four submodels. The net cash generated is then applied according to user specified options to increase working capital, to augment investment funds, or to pay cash dividends.

Balance Sheet — This component performs the calculations required to prepare the balance sheet using data from the last five submodels, plus input on current assets and liabilities at the time the calculation begins.

Regulated Industries — This component calculates the rate base, operating income, and return on rate base as prescribed by major federal regulatory agencies. As an option, the model will automatically maintain conditions such that the rate of return will not exceed allowable limits. This is accomplished by a reduction in revenue and a re-calculation of the Tax, Profit and Loss, and Cash Flow submodels.

Discounted Cash Flow — ROI — This component calculates (1) the present value of the flow of net cash generated, at a specified discount rate, and (2) the discounted cash flow return on investment or internal rate of return using the specified additions to equity as investment costs and the net cash generated as benefits received.

Financial Analysis — This component calculates a variety of financial performance measures regarding leverage, liquidity, activity, and profitability. Individual line items that appear in the profit and loss, cash flow, and balance sheet statements are accumulated over the planning period to derive totals and average values.

Report Generator — This component prepares report headings, formats the projection data and their corresponding descriptive titles, and produces the primary computer output reports for the model.

SECTION 2

GENERAL PROCEDURE FOR DATA INPUT

The "input data" required to operate the model consists of two types of information:

1. Model control options, parameters, and specifications.
2. Primary financial source data.

The general input procedure utilized for entering all input data into the model requires the assignment of values to model "variables". This common FORTRAN procedure is referred to as "NAMELIST" input and is generally described in the section on Input/Output statements in FORTRAN manuals (e.g., see "Sperry UNIVAC 1100 Series FORTRAN V Programmer Reference", UP-4060, Revision 2, or "IBM System/360 and System/370 FORTRAN IV Language" Form GC28-6515-9). NAMELIST is a common extension to American National Standard FORTRAN X3.9-1966. Throughout this report the convention will be followed that all model variables will be capitalized when referred to in the text. Subroutine names will also be capitalized and enclosed in a set of quotation marks, such as "CAP", representing the Capital Outlays model; in any case the distinction between variable and subroutine names should be apparent from the context of the discussion.

The names of the model variables have been chosen whenever possible so as to provide a mnemonic connection between the variable name and the entity being represented. For example, the variable "number of time periods to project" is denoted by "NPROJ"; in the NAMELIST, a value would be assigned to the variable by typing

```
NPROJ = 20
```

on the remote terminal keyboard.

The data manipulated by the computer model are classified as arithmetic, logical, or Hollerith. Arithmetic data are used in computations restricted to numbers. The model uses two types of arithmetic data: integers and real numbers. Logical data are used to indicate whether a specific condition is "true" or "false". Hollerith data are information to be used literally as a string of characters; it may contain any character of the computer set of characters including blanks. The value assigned to any NAMELIST variable must be of the same type as the variable itself. The conventions to be followed are as follows:

1. Model control options are logical variables and are specified by setting the variable equal to "T" or "F" for true or false; (e.g., PAYDIV = T).

2. Model parameters are either integers or real numbers, according to their standard usage; an integer value is assigned by specifying a whole number (e.g., NPROJ = 20) and a real number is assigned by including a decimal point in the number (e.g., PVRATE = 0.10).

3. Model specifications used for titles and headings are Hollerith type; a Hollerith value is given as the letter H preceded by an integer constant which specifies the number of characters following the H that are part of the value (e.g., IDCORP = 16HABC CONSOLIDATED).

4. Financial source data corresponding to variables specified in units of dollars (or thousands of dollars) are real type. The unit for financial data is arbitrary and at the option of the user, as long as all consistency is achieved among all input data.

5. Source data related to time periods are integer type; for example, the "year in which a capital outlay is made" (CAPY(2) = 8) or "the length of the retirement period for a long-term debt item" (LTDNYR(1) = 15) are both integers.

The FORTRAN language in which the programs are written allows an indexing feature termed "subscripting". This feature is used in connection with "arrays". An array is an ordered set of values, each of which is called an array element. The entire set of values is identified by the symbolic name called the array name. The use of array elements in FORTRAN corresponds to the use of subscripted variables in ordinary algebra. For example, the variable array name corresponding to sales revenue is "SREV"; the sales revenue in the third time period will therefore be represented by "SREV(3)". The values to be assigned to sales in time periods 2 - 5 are entered by typing

```
SREV(2) = 1000., SREV(3) = 1100.,
SREV(4) = 1200., SREV(5) = 1300., etc.
```

However, the NAMELIST input procedure allows the following abbreviation for the above consecutive series:

```
SREV(2) = 1000., 1100., 1200., 1300., etc.
```

In a similar fashion, values in a logical array LF may be specified as

```
LF(10) = F, LF(16) = F, T, F.
```

In this example, values for array elements 11 - 15 have not been changed.

Finally, the input data must be entered in a special format in order to be accepted using the NAMELIST technique. The first character in each input record (line) to be read must be blank. The second character in the first record (line) of the namelist input must be a dollar sign ($) or an ampersand (&), immediately followed by the namelist name INPUT. This namelist name must be followed by at least one blank. Input data values are next entered separated by commas. The end of the data group is signaled by $END (&END). As an (abbreviated) example, consider the following, where the space indicates a blank:

```
Column
12345678 ...
 $INPUT
 NPROJ = 5,
 PRT10 = T, PRT20 = T, PRT30 = T,
 PAYDIV = F, REINVF = T,
 IDRUN(1) = 12HTEST CASE 38,
 SREV(2) = 500., 600., 650., 700., 800.,
 .
 .
 .
 $END
```

A few final observations regarding the NAMELIST input technique:

1. The data items (variables) need not be entered in the same order for every case; for example, the fourth and fifth lines could be interchanged. The namelist is essentially "free-form" with the exceptions noted above so that data items can be typed in anywhere on the line (except the first column). An experienced keypunch operator is not required.

2. All variable names in the namelist need not have a corresponding data item in the input; if a particular variable does not appear in the input data, the contents of the variable are unchanged and are equal to the default values assigned by the model.

3. The data item to be read is identified within the input record itself.

4. The acceptable forms of the data and the format in which the data are to be stored is dictated by the type of the list item itself.

SECTION 3

THE DATA BASE CONCEPT

In order to operate the model, values must be supplied for the dozens of arrays and other variables that are utilized. Many of these variables, however, retain certain assigned values during each "run" of the model. This fact suggests that it would be desirable to retain this set of values from one run to another, changing only those few variables which affect the particular calculation being performed.

The model is a financial planning and resource utilization analysis tool. Decision makers and planners apply this tool to answer "What it?" questions. In order to study the effects of a particular change in future market or financial conditions (e.g., "What if long-term rates are 12 percent when we have to obtain financing for the second stage of capital project X?"), the planner utilizing the model would usually make a run with a "standard" set of values assigned to all variables (baseline case). Then, the small subset of variables that represent the particular change being analyzed would be adjusted and the model re-run with these new values without changing the values of any other variables. The ability to retain the "standard" set of variable values or "baseline case" from the first "run", changing only those variables which are necessary to change for the second or successive runs, is an important operational feature of the model.

The financial model "Data Base" is the entity which allows the retention of the baseline case. A "standard" value for every variable in the model is specified during the initial phase of each new planning study, and this set of standard values is stored on some convenient form of long-term computer storage, such as magnetic tape or disc pack. During the operational phase of any study, when a series of computer "runs" are being performed routinely, probably on a daily basis, the standard data base would usually be stored for convenience on a mass storage device having a fast access time, such as a high-speed magnetic drum or a disc. Activation of the model during a typical run will cause the data base to be read from mass storage into the computer's core memory, where the data base resides during the model calculation. After the data base has been "loaded" (copied) into core memory, but before the model calculation commences, the user is provided the opportunity to change any of the variable assignments. In this manner, the set of variable values is preserved on mass storage from one run to another, with individual changes in variable values for each case being made only to the data base copy residing in core memory. The "standard" data base itself remains unaltered in mass storage.

The model also provides the capability to change the primary data base stored in mass storage. After entering a set of changes to the variable assignments as described above, the user may specify that this revised data base be copied from core memory into a new mass storage area. In such a way, several related data bases can be generated. These may have many variable values in common with only certain values differing from case to case.

SECTION 4

DATA BASE MANAGEMENT

4.1 DATA BASE SECURITY

As a preface to a description of the major system operations that are available for data management, a few words will be directed to the question of the security of the data base generated and accessed by the model. The protection of the data base against unapproved access is primarily ensured through several levels of security provided by the computer operating system through both hardware and software facilities. It is beyond the scope of this document to describe these facilities in any detail. The discussion here will, therefore, be restricted to those particular procedures which are immediately available to the user in routine operations. On a UNIVAC 1108 Time-Shared Computing System operating under EXEC 8 OS, for example, the following facilities are available for all data files residing on fast access mass-storage devices (disc or drum):

1. Data files must be identified by a user-specified file name; this designation may be any 12-character alphanumeric string.

2. Data files can be restricted to a single valid codename or qualifier representing a "project-id". This codename is a second 12-character string the user may specify when originally cataloging (creating) each individual data base file. If no specific designation is given, the qualifier's is taken from the @ RUN statement's project-id field. For example, to catalog ("assign") a new "public" data file Unconditionally:

   @ ASG, UP XYZCORP*DB.

   @ ASG, UP MASSO-J*DB.

   @ ASG, UP DB.

   In order to access these data files at a later date, the user must specify the qualifier and data base name exactly as defined when the data file was created.

3. Data files can be labeled with special qualifiers and cataloged as "private" files so that they can be accessed only by those runs having the identical codename (project-id) as the run in which the file was originally cataloged. Unlike "public" files, "private" files are excluded from the general listing of the master file directory; consequently, their identity is not available to another computer user having access to the directory. For example, to catalog a "private" file"

   @ ASG, U XYZCORP*DB.

4. As a further precaution against unapproved manipulation, each data file can be assigned special "read" and "write" keys when cataloged for the first time. These identical keys must henceforth be specified in order to access the file at any later data. Again, these keys are not listed in the master file directory.

In addition to the security measures outlined above for the protection of data files that are offered by the computer time-sharing system, the model has a "built-in" optional "password" control facility. This password must be entered correctly at the start of program execution in order to operate the model and access a data base. This "password", of course, can be made to be unique to each user of the model and an optional feature allows the user to define a different "password" for each of his own data files. This can provide another level of protection to prevent a user from incorrectly changing his own files. If anyone should attempt to operate the model and access confidential data files — without supplying the correct "password" — a series of expletives is printed at the terminal and the run automatically aborts ("bombs").

4.2 DATA BASE IDENTIFICATION

A typical planning study will generally be concerned with analyzing the economic consequences of a number of different alternate courses of action or projected conditions.

To represent this series of cases will require generation of a series of data bases or at least one or two baseline cases with several sets of input data changes. In order to assist the user in distinguishing these data bases, the model provides a convenient mechanism for file identification.

This data management facility is accomplished by storing select data base identification information in the data file itself. This facility allows the user not only to access conveniently any one of a series of data bases, but also to be alerted whenever a particular copy of a file is not available (having been rolled out to long-term storage) or destroyed, possibly due to misuse of the system or to a failure of the computer system.

The data base, identification information stored in the file includes the following:

1. File-id — a 12-character code or label used to identify the data base.

2. File description — a 60-character description or title used to characterize the primary conditions represented by the data base.

3. Creation date/time — the date and time at which the data base was first created.

4. Last access date/time — the date and time at which the data base was last accessed. This information provides a means for reminding the user when the data base was last updated or otherwise altered; it is especially valuable when more than one person frequently uses the model.

5. Model version #/date — the version # and compilation date of the model used to generate the data base. This information is useful since the model is developed in an evolutionary manner and special features or submodels are frequently added to meet specific requirements of individual projects.

6. Model program parameters — a series of parameters that characterize the computer program for the model version # that created the data base, such as the maximum number of time periods that can be processed.

7. Password — a single 6-character label used as a security feature to prevent unapproved access to the data base. The model offers the user the option of defining a special password that can be unique for each individual data base, or standard for all data bases proprietary to the user's organization.

4.3 DATA BASE SPECIFICATIONS

The model provides standard data management facilities. The user can first create a new data base and preserve it in a mass-storage device; in a subsequent run, the user can update an existing data base and also retain this new data base, if desirable. The flexible capabilities offered by the NAMELIST input procedure allow the user to add, change, or delete any individual model control option or parameter as well as the complete set of input source data in any given data base.

The namelist input variables that control data base access are:

SAVEI = Logical variable used to control "saving" the data base. If SAVEI = T, the input data set as it exists after pre-processing by the Data Editing model "EDIT" is copied from computer core memory to a mass-storage device (Default: SAVEI = F).

LUNITO = Logical unit number (integer variable) for the data base file (Default: LUNITO = 10).

DBID = 2-word integer array (12 characters) for data base identification (Default: DBID = Blanks).

DBDESC = 10-word integer array for data base title or description (Default: DBDESC = Blanks).

DBPWD = Integer variable to represent a special password for the data base.

4.3.1 Creation of a Data Base

In the standard execution of the model, no data base is created. The input data is accepted and loaded into core memory. The model generates projections and prints the reports requested. Since the default value for SAVEI = F, the input data are <u>not</u> copied or otherwise saved. To create a data base, that is, to copy the input data from core memory to a mass-storage file, the variable SAVEI must be set equal to "T" or ".TRUE.". For example,

```
@ ASG, A  BASE10.
@ USE  10., BASE10.
@ XQT  JFM. . Execute the model
  $INPUT
  SAVEI = T, LUNITO = 10, DBPWD = 6H007   ,
  DBID = 12HBASELINE  10,
  ...
  $END
```

In the above "runstream" or sequence of UNIVAC 1108 Exec 8 control statements, the first command "assigns" the cataloged file "BASE10" to the current run; the second command links this mass-storage file with logical unit number "10"; the third, "executes" the model. Since SAVEI = T has been specified, the data base will be copied back to file BASE10 after pre-processing by the "EDIT" model.

4.3.2 Updating an Existing Data Base

Access to an existing data base is made possible by means of an @XQT control statement option. Consider first the case where an existing data base is accessed and only selected items are to be updated (add, change or delete); the model is run, but no copy of the updated version of the data base is desired. Simply use the "Z" execute option and do not set SAVEI. For example,

```
@ASG,A  BASE10.
@USE 10.,  BASE10.
@XQT,Z  JFM
 $INPUT
 ADEQ(1) = 1000., ...
 $END
```

In case the updated data base is to be saved — that is, a revised data base is to be generated — set SAVEI = T and LUNITO to the desired logical unit number representing the "updated" data base. For example,

```
@ASG,A  BASE10.
@USE 10.,  BASE10.
@ASG,A  BASE11.
@USE 11., BASE11.
@XQT,Z  JFM
 $INPUT
 SAVEI = T, LUNITO = 11,
 ADEQ(1) = 1000., ...
 DBID = 7HCASE 11, ...
 $END
```

In this example the model accessed the old data base "BASE10" and generated a new data base "BASE11". The original data base "BASE10" was not altered in mass-storage. The changes were made in core memory and the updated data base was copied out to the file "BASE11". The use of the @XQT control statement option "Z" introduced above is convenient, since the two cases can be handled in the same manner. However, it would be a very simple modification to replace this control mechanism by using instead a special input data record to be accepted by the model prior to processing the namelist input.

4.4 USE OF THE UNIVAC 1108 EXEC 8 SYSTEM IN DATA BASE MANAGEMENT

In the above section, procedures were described for creating and changing data bases by means of model control options within the program itself. These facilities are provided to make the model independent of the computer operating system and available more generally to potential users who may not be skilled in using the executive commands or job control language (JCL) offered by the computer system. On the other hand, there are distinct advantages in time and expense, and it is often most convenient to exploit fully the facilities offered by the operating system for data base management. For example, the UNIVAC 1108 Exec 8 Operating System provides:

1. File Utility Routines (FURPUR) — a set of file utility routines that perform a variety of functions for system and user data file maintenance.

2. ED Processor — a text editor which allows the user conversationally to edit a symbolic file or element. It allows insertion, deletion, and replacement of text.

FURPUR control statements can be used to save or copy any given set of input data. The text editor can be used to make all of the changes in a set of input data necessary to produce a "second" or updated version of the input data.

Input data for a given case can be stored either as a "data file" or as a symbolic element in a "program file". Definitions of these terms and selected FURPUR statements are given in Appendix C, "A Short Description of Some UNIVAC 1108 Executive System Functions". For further specifications consult "UNIVAC 1100 Series Operating System Programmer Reference," Sperry UNIVAC Report UP-4144, Rev. 3 (1973), viz Sections 1.4.2 on FURPUR and 18.4 on ED PROCESSOR. Consider use of a symbolic element in a program file. Then, in order to prepare data input, proceed to build or create the element "BASE10" in the program file "P" by use of the text editor. For example,

```
@ASG,A  P. . Assign file P to this run
@ED,I P.BASE10. . Create symbolic element BASE10
 $INPUT
 NPROJ = 20,
 ...
 $END
```

The end result of typing in the namelist input is a symbolic element P.BASE10, which is equivalent to a very abbreviated version of the data base. The "EDIT" model can escalate selected figures and otherwise "fill out" variable arrays.

In order to run the model, only a single command is required once the input data has been prepared as explained above. For example,

```
@XQT  JFM .  Execute the model
@ADD  P.BASE10. . Use input data for BASE10
```

These two control statements are all that is required to operate the model for case "BASE10". No data base is stored except the abbreviated form of P.BASE10, which contains all of the source data and model control options/parameters necessary to operate the model.

To update or otherwise modify the input data for case "BASE10", use the text editor, e.g.,

```
@ED P.BASE10,  .BASE11
```

where the output symbolic element is "BASE11". To run the model for this case simply use the statement @ADD P.BASE11 following the @XQT command. Results for the "updated" case "BASE11" will be produced. Both cases are stored permanently in the file P.

SECTION 5

REPORT DATA SPECIFICATIONS

The user must provide the following kind of information:

- The duration of the reporting period and the designation of the time periods.
- The reports requested to be generated and the specific line items to be suppressed.
- Specification of model control options and model parameters.
- Data required to define capital outlays and long-term debt borrowings.
- Specification of equity and working capital additions and initial values of other assets and liabilities.
- Data required to specify revenues and expenses.

5.1 REPORTING PERIOD SPECIFICATION

The choice of the reporting period on which the model will operate and generated projections is arbitrary and at the option of the user. The standard reporting period, however, is expected to be "years" and consequently, certain report headings and default values have been made with this in mind. In order to simplify much of the discussion in this document the reporting period will be conventionally assumed to be "years". The logical operation of the model depends critically on the reporting period. All specifications regarding time such as the length of the debt retirement period, the economic life of a capital investment, and both short-term and long-term interest rates are dependent on the time unit. Therefore, if a different time period, such as quarters, months, or planning units, is desirable, all input data relating to time units must be carefully examined so that they are consistent with each other. For example, consider the choice of monthly reporting periods. Revenues, expenses, equity additions, borrowing, capital outlays, etc., must all be specified with regard to a monthly period. Interest rates must be provided "per month". The time limits on tax loss and investment tax credit carry-forwards must be adjusted upwards by specifying twelve times the legal limits in years. Similar modifications must be made to other input data related to the time period.

Two model integer parameters are required to specify the reporting period. A control option (logical variable) is available for use when generating projections by month.

NPROJ = The number of time periods for which projections will be generated, including an arbitrary number of initial construction periods.

YEAR0 = Numerical value to be assigned to the initial time period (e.g., "YEAR0 = 0" or "YEAR0 = 1976"); this assignment will be used only for reporting purposes.

FLAGM = Control option that allows input data for long-term debt and capital outlays to be specified in years, while model generates projections for montly reporting periods.

The parameter NPROJ must include not only the span or duration of normal operating time periods over which the projection is desired, but also the duration of any initial construction periods. The initial time period, however, is treated as an exception and is not to be included in NPROJ. The rationale for this can easily be seen, if one considers the normal interpretation of financial reports. The profit and loss and cash flow statements present results that were accomplished over a fixed time period - the accounting or "fiscal" year. On the other hand, the financial position statement presents the condition of all assets and liabilities as of a particular moment in time, namely at the close of business on the last day in the fiscal period or "at the close of the fiscal year". Before the model can generate a projection for the first year of operations, that is actually the second year in the model, it must be "loaded" or "initialized" at the close of the year preceding the "first" (operational) year. In other words, line items in the financial position statement or balance sheet must be initialized; equity, working capital, debts, and possibly capital outlays must be entered in the "0" time period before the model can generate projections for the "first" time period. Due to this requirement, the first reporting period is not to be considered as an operating year. No operational revenue, expense, or even interest on debts should be entered for year "0". However, this "initialization period" can be used to represent a construction period that precedes the operation of a facility.

The convention that is utilized by the model for input reference purposes is to regard this initial time period as year "0" and subsequent periods as years "1", "2", "3", etc. irregardless of the specification of YEAR0 which is only for reporting purposes. All of the source data specifications requiring a year designation can then be entered with reference to this series. At the end of year "2", for example, the model will have generated results for 2 operational years, etc. The specification NPROJ = 20, YEAR0 = 0, will generate projections for years 0, 1, 2, ..., 20. On the other hand, for a case where there are two initial construction years followed by 25 years of operations, set NPROJ = 26 and YEAR0 = -1, then projections will be reported for years -1, 0, 1, 2, 3, ..., 25. The initial period is already available as one of the two construction years. A capital outlay in year 14 (input reference) will appear under the year 13 (report reference) in the projections. As another example, if NPROJ = 10 and YEAR0 = 1976, then projections are reported for the periods 1976, 1977, 1978, ..., 1987. A capital outlay reported during 1978 will be specified as in year "2" (input reference). On the other hand, if the time unit were chosen as months, then NPROJ = 60 and YEAR0 = 0 would generate a five-year projection with results reported for the 61 periods 0, 1, 2, ..., 60.

When the control option FLAGM = T, the user is allowed the simple convenience of entering (1) long-term debt interest rates and the duration of the debt retirement period in years; (2) economic and tax life, as well as the tax depreciation rate for capital outlays in years. The operation of the model, however, will proceed in monthly cycles and all remaining input data must be entered with reference to monthly time periods.

The basic convention regarding the "timing" of individual sources and applications of funds can be stated as follows:

All sources of funds are received and all applications of funds are paid out at the close of the fiscal year. The opearation of all of the submodels reflect this primary convention. Therefore, it is recommended that the user follow this convention carefully when specifying the timing at which debt is incurred, retirement of debt begins, interest charges begin, capital outlays are made, and additions are made to equity or working capital. Depreciation of a capital investment should begin no sonner than the year following the capital outlay. The first year in which the retirement of long-term debt begins and interest is charged should be no sooner than the year following the year that the debt was incurred. Attention to this "timing" convention should result in financial projections that are internally consistent.

On the other hand, the model does allow the user to adopt different conventions for selected financial items. For example, one can specify that interest is charged during the year that the debt is incurred. This simply indicates that the borrowing was made on the first day of the fiscal year rather than the last. In a similar way, the user may apply the flexible specifications provided by the model in order to represent in a realistic manner the situation at hand.

While the model operates with fundamental integral time periods, fractional periods can be simulated in a straight-forward manner. A debt of X dollars that is incurred six months after the start of the fiscal year N can be represented by two depts, each in the amount of 0.5X, the first incurred in the year N and the second incurred in year (N+1); the interest charge in year N will be equal to that due for hald of year N. Other financial items can be segregated in a similar manner to represent sources or applications of funds being made at some point in time other than the close of the fiscal year.

5.2 REPORT REQUEST AND RUN IDENTIFICATION SPECIFICATION

The list of output reports that can be generated by the model and the corresponding line items that are available for printing in these reports is given in Section 6. The report request and line item selection options are specified by means of the following logical input variables (default values for all report and line item requests are "FALSE"):

5.2.1 Financial Accounting Projection Report Requests

PRT10 = Logical variable to control printing Report No. 10, "Statement of Income - Profit and Loss Projection".

PRT20 = Logical variable to control printing Report No. 20, "Statement of Changes in Financial Position - Cash Flow Projection".

PRT30 = Logical variable to control printing Report No. 30, "Statement of Financial Position - Balance Sheet Projection".

PRT40 = Logical variable to control printing Report No. 40, "Capital Investment Planning and Financial Performance Measures".

5.2.2 Supporting Subschedule and Special Report Requests

PRT01 = Logical variable to control listing Report 01, "Financial Accounting Reports, Titles, and Line Items".

PRT02 = Logical variable to control listing Report 02, "Date Base - Namelist Input". This report is generated by the Editing Data model "EDIT".

PRT04 = Logical variable to control listing Report 04, "Capital Outlay Specifications and Tax Depreciation Projection". This report is generated by the Capital Outlay model "CAP".

PRT05 = Logical variable to control listing Report 05, "Long-Term Debt Specifications and Interest, Retirement Payments and Debt Balance Schedules". This report is generated by the Debt model "DEBTS".

PRT08 = Logical variable to control listing Report 08, "Revenue and Expense Model Projection". This report is generated by the "IOSUBS" routine.

PRT12 = Logical variable to control listing Report 12, "Application of Tax Losses and Investment Tax Credits". This report is generated by the Tax model "TAX".

PRT16 = Logical variable to control listing Report 16, "Automatic Short-Term Debt Borrowing Projection". This report is generated by the Cash Flow model "CASHF".

PRT18 = Logical variable to control listing Report 18, "Discounted Cash Flow Internal Rate of Return Calculation". This report is generated by the "DCF" routine.

PRT35 = Logical variable to control listing Report 35, "Maximum Return on Rate Base Constraint Calculation". This report is generated by the Regulated Industry model "RBASES".

PRT38 = Logical variable to control printing Report 38, "Capital Investment Planning and Energy Conservation Impact Projection". This report is generated by the "RPT38" routine.

PRT80 = Logical variable to control printing Report 80, "Purchase and Sale of Assets".

5.2.3 Report Line Item Specification

LF = Logical array variable to print/suppress individual report line items (Default value LF(J) = T, all J); e.g., to print lines 107 and 110 while suppressing lines 108-109, set "LF(107)=T,F,F,T" (see Figure 5.1).

5.2.4 Title and Run Identification

IDCORP = Ten word integer array (60 characters) to be used to provide a corporate title for printing with the model headings; e.g., "IDCORP(1) = 16H ABC CONSOLIDATED". (Default: IDCORP = Blanks).

IDRUN = Twenty word integer array (120 characters) to allow the user to specify a special run identification in the form of a Hollerith string; e.g., "IDRUN(1) = 42HFISCAL 1977 BASELINE CORPORATE PROJECTION,
IDRUN(11) = 22HAPPROVED JULY 1, 1976".
(Default: IDRUN = Blanks).

JFM REPORT NO. 1 JFM FINANCIAL ACCOUNTING REPORT TITLES AND LINE ITEMS

1. CONSOLIDATED STATEMENT OF INCOME **** PROFIT AND LOSS PROJECTION ****
2. CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION **** CASH FLOW PROJECTION ****
3. CONSOLIDATED STATEMENT OF FINANCIAL POSITION **** BALANCE SHEET PROJECTION ****
4. CAPITAL INVESTMENT PLANNING AND FINANCIAL PERFORMANCE MEASURES
5. JFM FINANCIAL ACCOUNTING REPORT TITLES AND LINE ITEMS

1. REVENUES
2. COST AND EXPENSES
3. OTHER INCOME
4. INCOME TAXES
5. SOURCES OF FUNDS
6. APPLICATION OF FUNDS
7. ASSETS
8. CURRENT ASSETS
9. PROPERTY, PLANT AND EQUIPMENT
10. DEFERRED CHARGES
11. LIABILITIES AND SHAREHOLDERS EQUITY
12. CURRENT LIABILITIES
13. STOCKHOLDERS EQUITY
14. LIQUIDITY
15. LEVERAGE
16. ACTIVITY
17. PROFITABILITY
18. ENERGY CONSUMPTION
19. OTHER MEASURES
20. INVESTMENT ACCOUNTS

Figure 5.1. JFM Report Titles and Line Items

1. NET SALES AND OPERATION REVENUES
2. SALES - PRODUCT A
3. SALES - PRODUCT B
4. MISCELLANEOUS REVENUE
5. TOTAL REVENUE
6. DIRECT LABOR COSTS
7. DIRECT MATERIALS COSTS
8. OVERHEAD
9. COST OF GOODS SOLD
10. OPERATION AND MAINTENANCE EXPENSES
11. GENERAL AND ADMINISTRATIVE EXPENSES
12. SELLING EXPENSES
13. SEGREGATED EXPENSES - TYPE A
14. SEGREGATED EXPENSES - TYPE B
15. SEGREGATED EXPENSES - TYPE C
16. MISCELLANEOUS EXPENSES
17. TAXES, OTHER THAN FEDERAL INCOME
18. COSTS, EXCL DEPREC & INTEREST
19. GROSS OPERATING INCOME
20. INTEREST EXPENSES
21. FINANCIAL DEPRECIATION
22. AMORTIZATION OF FINANCIAL EXPENSES
23. TOTAL EXPENSES
24. INVESTMENT INCOME, NET
25. NET INCOME BEFORE TAXES
26. TAX DEPRECIATION
27. TAXABLE INCOME
28. TAX LOSS CARRYFORWARD
29. INVESTMENT TAX CREDIT
30. UNUSED INVESTMENT TAX CREDITS
31. CURRENT INCOME TAX
32. DEFERRED INCOME TAX
33. TOTAL INCOME TAX
34. NET INCOME (BOOK PROFIT)
35. OPERATING INCOME
36. TAX CREDITS CARRIED FORWARD
37. TAX CREDITS APPLIED THIS YEAR
38. PROVIDED BY OPERATIONS
39. SHORT-TERM BORROWING
40. LONG-TERM BORROWING
41. NET ADDITIONS TO EQUITY
42. MISCELLANEOUS SOURCES OF FUNDS
43. TOTAL SOURCES OF FUNDS
44. ADDITIONS TO PLANT & EQUIPMENT
45. NET INCREASE IN INVESTMENTS
46. SHORT-TERM DEBT RETIREMENT
47. LONG-TERM DEBT RETIREMENT
48. FINANCIAL AND DEBT EXPENSE
49. MISCELLANEOUS APPLICATION OF FUNDS
50. SUBTOTAL
51. CASH DIVIDENDS PAID
52. TOTAL APPLICATION OF FUNDS
53. INCREASE IN WORKING CAPITAL
54. NET CASH GENERATED DURING THE PERIOD
55. CUMULATIVE NET CASH GENERATED
56. CASH
57. MARKETABLE SECURITIES (@COST)
58. ACCOUNTS RECEIVABLE - NET
59. INVENTORY
60. PREPAID EXPENSES & OTHER CUR. ASSETS
61. TOTAL CURRENT ASSETS
62. @ ORIGINAL COST
63. LESS - ACCUMULATED DEPRECIATION
64. NET PROPERTY & EQUIP.
65. INVESTMENTS
66. GOODWILL & OTHER ASSETS
67. UNAMORTIZED FIN. & DEBT EXPENSES
68. OTHER DEFERRED CHARGES
69. TOTAL DEFERRED CHARGES
70. TOTAL ASSETS
71. ACCOUNTS PAYABLE
72. ACCRUED EXPENSES
73. ACCRUED TAXES
74. NOTES PAYABLE
75. TOTAL CURRENT LIABILITIES
76. SHORT-DEBT UNPAID BALANCE
77. LONG-DEBT UNPAID BALANCE
78. TOTAL DEBT BALANCE
79. DEFERED FEDERAL INCOME TAXES
80. DEFERRED CREDITS
81. TOTAL LIABILITIES
82. CAPITAL STOCK @ PAR VALUE
83. CAPITAL SURPLUS
84. TOTAL PAID-IN CAPITAL
85. RETAINED EARNINGS
86. TOTAL EQUITY CAPITAL
87. TOTAL LIABILITIES & EQUITY
88. NET WORKING CAPITAL
89. RATE OF RETURN ON PAID-IN CAPITAL(%)
90. RATE OF RETURN ON TOTAL EQUITY (%)
91. RATE OF RETURN ON TOTAL CAPITAL (%)
92. UNAMORTIZED CONSTRUCTION INTEREST
93. TOTAL DISPOSITION OF FUNDS
94. CASH BENEFITS LESS INVESTMENT COSTS
95. QUICK RATIO
96. CURRENT RATIO
97. INVENTORY TO CAPITAL RATIO
98. LONG-TERM (FUNDED) DEBT TO EQUITY
99. LONG-TERM (FUNDED) DEBT TO CAPITAL
100. LONG-TERM (FUNDED) DEBT TO ASSETS
101. NET MARGIN - RETURN ON REVENUES (%)
102. GROSS OPERATING MARGIN (%)
103. ANNUAL UNIT SALES
104. UNIT PRICE
105.
106. ANNUAL ENERGY USAGE IN KW-HRS (000)
107.
108. ANNUAL ENERGY COSTS
109. ANNUAL UNIT COSTS (TOTAL)
110. LONG-TERM AVERAGE COSTS
111. DISCOUNT FACTOR
112. PRESENT VALUE OF AVERAGE UNIT COSTS
113. PRESENT VALUE OF NET CASH GENERATED
114. PRESENT VALUE OF NET CASH BENEFITS
115. PRESENT VALUE OF ABOVE ITEM
116. UNUSED TAX LOSS
117. TAX LOSS APPLIED THIS YEAR
118.
119.
120.
121. INVESTMENT INTEREST RECEIVED
122. INVESTMENT DIVIDENDS RECEIVED
123. INVESTMENT INTEREST CHARGED
124. INVESTMENT EXPENSES
125. INVESTMENT ACCOUNT A (@ COST)
126. INVESTMENT ACCOUNT B (@ COST)
127. TOTAL INVESTMENTS (@ COST)
128. UNREALIZED GAINS
129. TOTAL INVESTMENTS (@ MARKET)
130. LONG-TERM CASH INSTRUMENTS
131. ADJUSTED EQUITY (@ MARKET)
132.
133.
134.
135.
136.

P38 REPORT NO. 1 LINE ITEMS FOR REPORT 38

1. ACTIVITY
2. PROFITABILITY
3. ENERGY CONSUMPTION
4. OTHER MEASURES
5. LEVERAGE
6. OTHER LINE ITEMS

1. ANNUAL THROUGHPUT
2. ANNUAL THROUGHPUT (MM BARRELS)
3. ANNUAL THROUGHPUT (MM BARREL-MILES)
4. ANNUAL THROUGHPUT (MMMMCF-MILES)
5. ANNUAL THROUGHPUT (MM GALLON-MILES)
6. OPERATING INCOME (ICC RULES)
7. OPERATING INCOME (FPC RULES)
8. OPERATING INCOME
9. ANNUAL ICC RATE BASE
10. RATE OF RETURN ON RATE BASE (%)
11. RATE OF RETURN ON PAID-IN CAPITAL(%)
12. RATE OF RETURN ON TOTAL EQUITY (%)
13. ANNUAL ENERGY USAGE IN MM KW-HRS
14. ANNUAL ENERGY USAGE OF GAS (MMCF)
15. ANNUAL ENERGY USAGE OF OIL (BBLS)
16. ANNUAL ENERGY COSTS
17. ANNUAL ENERGY WASTED COST ($)
18. PRESENT VALUE OF ENERGY WASTED
19. NOMINAL TARIFF (UNIT TRANSP. CHARGE)
20. TOTAL ANNUAL UNIT COSTS
21. PRESENT VALUE OF AVERAGE UNIT COSTS
22. NET INCOME (BOOK PROFIT)
23. PRESENT VALUE OF BOOK PROFITS
24. NET CASH GENERATED DURING THE PERIOD
25. PRESENT VALUE OF NET CASH GENERATED
26. CUMULATIVE NET CASH GENERATED
27. CASH BENEFITS LESS INVESTMENT COSTS
28. PRESENT VALUE OF NET CASH BENEFITS
29. DISCOUNT FACTOR
30. SEGREGATED EXPENSES - TYPE A
31. SEGREGATED EXPENSES - TYPE B
32. SEGREGATED EXPENSES - TYPE C
33. MISCELLANEOUS EXPENSES
34. PRESENT VALUE OF ABOVE ITEM
35. RATE OF RETURN ON TOTAL CAPITAL (%)
36. UNIT COST OF ENERGY ($)
37. ANNUAL ENERGY WASTED IN KW-HRS (M)
38. ANNUAL ENERGY WASTED IN GAS (MMCF)
39. PRESENT VALUE OF ENERGY USED
40. NOMINAL TRANSPORTATION REVENUES
41. REVENUE REDUCTION
42. ACTUAL TOTAL REVENUES
43. TARIFF CONSTRAINT FACTOR
44. LONG-TERM (FUNDED) DEBT TO EQUITY(%)
45. LONG-TERM (FUNDED) DEBT TO CAPITAL %
46. LONG-TERM (FUNDED) DEBT TO ASSETS %
47. ANNUAL FPC RATE BASE
48. UNIT COST OF ENERGY $/MMCF
49.
50. ACTUAL TARIFF
51. OPERATION AND MAINTENANCE EXPENSES
52. INTEREST EXPENSES
53. TOTAL EXPENSES
54. UNUSED TAX LOSS
55. UNUSED INVESTMENT TAX CREDITS
56. LONG-TERM BORROWING
57. NET ADDITIONS TO EQUITY
58. ADDITIONS TO PLANT & EQUIPMENT
59. LONG-TERM DEBT RETIREMENT
60. PLANT & EQUIPMENT (@ ORIGINAL COST)
61. NET PROPERTY & EQUIPMENT
62. TOTAL DEBT BALANCE
63. TOTAL EQUITY CAPITAL
64.

SECTION 6

MODEL OUTPUT REPORTS

6.1 REPORT 10, CONSOLIDATED STATEMENT OF INCOME - PROFIT AND LOSS PROJECTION

Revenues	
Net Sales and Operation Revenues	(SREV)
Sales - Product A	(REVA)
Sales - Product B	(REVB)
Miscellaneous Revenues	(MREV)
Total Revenues	(TREV)
Costs and Expenses	
Cost of Goods Sold	(COST)
Operation and Maintenance Expenses	(OMEX)
General and Administrative Expenses	(GAEX)
Selling Expenses	(SEX)
Segregated Expenses - Type A	(SEXA)
Segregated Expenses - Type B	(SEXB)
Segregated Expenses - Type C	(SEXC)
Miscellaneous Expenses	(MEX)
Taxes, other than Federal Income	(TOFIT)
Direct Labor Costs	(DLABOR)
Direct Materials Costs	(DMATR)
Overhead	(OVERH)
Costs, Excluding Depreciation and Interest	(PEX)
Gross Operating Income	(GOINC)
Interest Expenses	(INTEX)
Financial Depreciation	(FDEP)
Amortization of Financial Expenses	(FDCIA)
Total Expenses	(TOTEX)

Other Income

Investment Income, Net	(IINC)
Net Income Before Taxes	(INCBT)

Income Taxes

Tax Depreciation	(FITDEP)
Taxable Income	(FITINC)
Unused Tax Losses	(FITUTL)
Tax Loss Carryforward	(FITLCF)
Tax Loss Applied this Year	(FITTLA)
Investment Tax Credit	(FITITC)
Unused Investment Tax Credits	(UTCR)
Tax Credits Carried Forward	(TCRCF)
Tax Credits Applied this Year	(TCRA)
Current Income Tax	(FITCUR)
Deferred Income Tax	(FITDEF)
Total Income Tax	(FITTOT)
Net Income (Book Profit)	(NET)

6.2 REPORT 20, CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION - CASH FLOW PROJECTIONS

Sources of Funds

Net Income (Book Profit)	(NET)
Financial Depreciation	(FDEP)
Amortization of Financial Expenses	(FDCIA)
Deferred Income Taxes	(FITDEF)
Provided by Operations	(TSOFOP)
Short-Term Borrowing	(STD)
Long-Term Borrowing	(LTD)
Net Additions to Equity	(ADEQ)
Miscellaneous Sources of Funds	(MSOF)
Total Sources of Funds	(TSOF)

Application of Funds

Additions to Plant and Equipment	(CAPO)
Short-Term Debt Retirement	(STDRET)
Long-Term Debt Retirement	(LTDRET)
Financial and Debt Expense	(FDCIX)
Miscellaneous Application of Funds	(MAOF)
Subtotal	(TAOF1)
Cash Dividends Paid	(DIVP)
Net Increase in Investments	(ADINVM)
Total Application of Funds	(TAOF)
Increase in Working Capital	(ADWC)
Total Disposition of Funds	(TDOF)
Cash Benefits Less Investment Costs	(CASHO)
Net Cash Generated During the Period	(CASHG)
Cumulative Net Cash Generated	(CUMCG)

6.3 REPORT 30, CONSOLIDATED STATEMENT OF FINANCIAL POSITION - BALANCE SHEET PROJECTION

Assets

Current Assets

Cash	(CASH)
Accounts Receivable - Net	(RECEIV)
Inventory	(GOODS)
Prepaid Expenses and Other Current Assets	(PREPEX)
Total Current Assets	(CURAS)

Property, Plant and Equipment

At Original Cost	(CAPEO)
Less - Accumulated Depreciation	(CAPED)
Net Property and Equipment	(CAPEN)
Investments	(INVM)
Goodwill and Other Assets	(OTHERA)

Deferred Charges

Unamortized Financial and Debt Expenses	(DEFFDX)
Unamortized Construction Interest	(CAPCI)
Other Deferred Charges	(DEFC)
Total Deferred Charges	(DEF)
Total Assets	(TOTALA)

Liabilities and Shareholders Equity

Current Assets

Accounts Payable	(PAYABS)
Accrued Expenses	(ACCEX)
Accrued Taxes	(ACCTAX)
Notes Payable	(NOTESP)
Total Current Liabilities	(CURLS)
Short-Term Unpaid Balance	(STDBAL)
Long-Term Unpaid Balance	(LTDBAL)
Total Debt Balance	(DBAL)
Deferred Income Taxes	(DEFTAX)
Deferred Credits	(DEFCR)
Total Liabilities	(TOTALL)

Stockholders Equity

Capital Stock at Par Value	(STOCK)
Capital Surplus	(STKSUR)
Total Paid-In Capital	(CAPPD)
Retained Earnings	(RETE)
Total Equity Capital	(EQUITY)
Total Liabilities and Equity	(TOTALE)
New Working Capital	(WORKC)

6.4 REPORT 40, CAPITAL INVESTMENT PLANNING AND FINANCIAL PERFORMANCE MEASURES

Liquidity

Quick Ratio	(RATIOQ)
Current Ratio	(RATIOC)

Inventory to Capital Ratio	(RATIOI)
Working Capital	(WORKC)

Leverage

Long-Term (funded) Debt to Equity	(LTDEQ)
Long-Term (funded) Debt to Capital	(LTDCAR)
Long-Term (funded) Debt to Assets	(LTDASS)

Activity

Annual Unit Sales	(USALES)
Unit Price	(UPRICE)
Total Revenues	(TREV)

Profitability

Net Income (Book Profit)	(NET)
Net Margin - Return on Revenue	(NETM)
Gross Operating Margin	(GROSSM)
Rate of Return on Paid-In Capital (%)	(ROIC)
Rate of Return on Total Equity (%)	(ROIE)
Rate of Return on Total Capital (%)	(ROIT)

6.5 REPORT 38, CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION

Activity

Annual Throughput	(THRUP)
Annual Throughput (MM Barrels)	(THRUP)
Annual Throughput (MM Barrel-Miles)	(THRUP)
Annual Throughput (MMMMCF-Miles)	(THRUP)
Annual Throughput (MM Gallon-Miles)	(THRUP)
Nominal Tariff - Unit Transp. Charge	(UPRICE)
Actual Tariff	(VAR8)
Transportation Revenues	(SREV)
Nominal Actual Total Revenues	(TREV)
Revenue Reduction	(REVA)
Total Revenues	(TREV)
Tariff Constraint Factor	(TARF)

Leverage

Long-Term (funded) Debt to Equity (%)	(LTDEQ)
Long-Term (funded) Debt to Capital (%)	(LTDCAP)
Long-Term (funded) Debt to Assets (%)	(LTDASS)

Profitability

Operating Income (ICC Rules)	(OPINC)
Operating Income (FPC Rules)	(OPINC)
Operating Income	(OPINC)
Annual ICC Rate Base	(RBASE)
Annual FPC Rate Base	(RBASE)
Rate of Return on Rate Base (%)	(ROIR)
Rate of Return on Paid-In Capital (%)	(ROIC)
Rate of Return on Total Equity (%)	(ROIE)
Rate of Return on Total Capital (%)	(ROIT)

Energy Consumption

Annual Energu Usage in MM KW-HRS	(ENERGU)
Annual Energy Usage in Gas (MMCF)	(ENERGU)
Annual Energy Usage of Oil (BBLS)	(ENERGU)
Annual Energy Costs	(ENERGC)
Present Value of Energy Used	(PVEC)
Discounted Value of Energy Used (@ ...)	(PVEC(NT))
Unit Cost of Energy ($)	(UCOSTE)
Unit Cost of Energy ($/MMCF)	(UCOSTE)
Annual Energy Wasted in KW-HRS(M)	(ENERGW)
Annual Energy Wasted Cost ($)	(ENERGS)
Present Value of Energy Wasted	(PVPS)
Discounted Value of Energy Wasted (@ ...)	(PVPS(NT))

Other Measures

Segregated Expenses - Type A	(SEXA)
Present Value of Above Item	(VV)
Discounted Net Cash Flow (@ ...)	(SUM1)
Total Annual Unit Costs	(UCOSTS)

Present Value of Average Unit Costs	(PVCOST)
Discounted Average (Annual) Unit Costs/ Long-Run Average Costs (@ ...)	(LAC)
Net Income (Book Profit)	(NET)
Present Value of Book Profits	(PVBK)
Discounted Value of Book Profits (@ ...)	(PVBK(NT))
Net Cash Generated During the Period	(ASHG)
Present Value of Net Cash Generated	(PVCASH)
Discounted Net Cash Flow (@ ...)	(DNCG)
Discount Factor (@ ...)	(PVF)

Internal Rate of Return

DCF-ROI of $ ____ (from year _____ over _____ years)	DROIA(M),DROIY1(M), DROINY(M)

Other Line Items

Operations and Maintenance Expense	(OMEX)
Interest Expenses	(INTEX)
Total Expenses	(TOTEX)
Unused Tax Loss	(FITUTL)
Unused Investment Tax Credits	(UTCR)
Long-Term Borrowing	(LTD)
Net Additions to Equity	(ADEQ)
Additions to Plant & Equipment	(CAPO)
Long-Term Debt Retirement	(LTDRET)
Plant & Equipment (@ Original Cost)	(CAPEO)
Net Property & Equipment	(CAPEN)
Total Debt Balance	(DBAL)
Total Equity Capital	(EQUITY)

SECTION 7

CAPITAL OUTLAY SPECIFICATIONS

The model provides facilities for handling complex schedules of capital outlays with their corresponding tax depreciation and investment tax credit allocations. After the introduction of the input data specifications for capital outlays, a number of related subjects will be discussed, including tax depreciation methods, carrying forward investment tax credits, and methods to capitalize items expensed for tax purposes.

7.1 CAPITAL OUTLAY INPUT DATA SPECIFICATIONS

The user must supply as source data a complete set of capital outlay specifications for each addition to plant, property, and equipment planned during the projection period. These specifications are defined by assigning values to the following namelist variables:

CAPN = Number (integer) of capital outlay items. Several individual items may be grouped together, if they are to be depreciated in the same way.

CAPA(M) = Amount (real) of outlay for the M^{th} capital item ($).

CAPY(M) = Year (integer) in which the M^{th} outlay is made. The full amount of the outlay will be treated as an application of funds in this year.

CAPY1(M) = First year (integer) in which depreciation of the M^{th} outlay is to begin for both financial and tax purposes. A full year's depreciation will be reported for this year, which is normally set as the first year of operation of the facility associated with the capital outlay.

CAPNYF(M) = Number of years (integer) estimated in the economic life for financial depreciation purposes of the facility associated with the M^{th} outlay. Only whole years are accepted. Fractional years can be represented by separating the outlay into two components, one with a longer life than the other. The financial depreciation in any given year during the life of the facility will be equal to the original depreciable amount (outlay less salvage value) of the outlay divided by the economic life.

CAPNYT(M) = Number of years (integer) in the economic life for tax purposes ("tax life") of the facility associated with the M^{th} outlay. This is the period over which the facility is depreciated for tax purposes according to the method specified by CAPTDM(M).

CAPTDM(M) = Code (integer) to indicate the tax depreciation method to be applied to the M^{th} outlay (Default: CAPTDM(M) = 0). The following methods can be specified:

1. Straight line depreciation at a rate of 1/CAPNYT(M); it is not necessary to specify the rate for this method since this rate will be applied by default (CAPTDM(M) = 0).

2. Straight line depreciation at a given rate (CAPTDM(M) = 1).

3. Declining balance depreciation at a given rate (CAPTDM(M) = 2).

4. Declining balance depreciation at a given switchover to straight line (CAPTDM(M) = 3).

5. Sum of years-digits deprecition (CAPTDM(M) = 4).

CAPTDR(M) = Tax depreciation rate (real) to be applied to the M^{th} outlay expressed as a decimal.

CAPTSY(M) = Year (integer) in which the tax depreciation method applied to the M^{th} outlay is switched for declining balance to straight line, this variable is only applicable when CAPTDM(M) = 3.

CAPSV(M) = Salvage value (real) of the M^{th} capital outlay ($). This is the amount recoverable on retirement of the facility at the end of its economic life. This value is <u>not</u> applied automatically as revenue or as a source of funds by the model; however, the procedure to use, if such an action is desired, is described below.

CAPCIM(M) = Construction interest and other charges (real) during the construction period associated with the M^{th} capital outlay ($). These amounts are expensed for tax purposes as incurred, but capitablized for financial (book) purposes and amortized over the economic life of the facility (see Section 7.3).

CAPTCA(M) = Amount (real) of the M^{th} capital outlay that is subject to an investment tax credit ($). Usually, this amount would be identical to the outlay, unless a portion of the outlay has to be excluded. The value of the investment tax credit ($) itself is calculated as the product of the amount CAPTCA(M) and the tax credit rate CAPTCR(M).

CAPTCR(M) = Investment tax credit rate (real) to be applied to the amount CAPTCA(M) expressed as a decimal (Default: CAPTCR(M) = 0.10).

CAPTY(M) = Year (integer) in which the investment tax credit associated with the M^{th} outlay is available to be applied in reducing current federal income taxes (Default: CAPTY(M) = CAPY(M).

FITITC(N) = Amount (real) of additional investment tax credits ($) available in the N^{th} time period above and beyond those specified via the above variables. The user has the option of entering investment tax credits directly by assiging values to the array FITITC. The user may select this procedure in place of or in addition to specifying the amounts subject to a tax credit CAPTCA(M).

CAPTY1(M) = First year (integer) in which the normalization of the tax credit associated with the M^{th} outlay is to be taken for financial (book) purposes. If normalization of the tax credit for book purposes is not specified via assigning a non-zero value to CAPTNY(M), the tax credit will be applied in the same year for both financial and tax purposes, namely, in the year specified by CAPTY(M).

CAPTNY(M) = Number of year (integer) in which the normalization of the tax credit associated with the M^{th} outlay is taken for book purposes. The default value, CAPTNY(M) = 0, which represents the condition where normalization of the tax credit is <u>not</u> desired, corresponds to "flowing through" the <u>full</u> amount of the credit in the year specified by CAPTY(M). Normalization is specified by assigning a non-zero value to CAPTNY(M). For example,

CAPTY(M) = 0
CAPTY1(M) = 1
CAPTNY(M) = 5

represents the condition where the full tax credit is taken for tax purposes in year 0, while one-fifth of the tax credit will be subtracted from the deferred federal income tax for years 1 through 5.

By appropriate specification of the above variables a large number of possible conditions can be represented. A few non-standard cases will be described in order to illustrate how the above namelist variables can be manipulated. For additions to property, plant and equipment that are not to be depreciated, for example, items fully depreciated before the time period covered in the projection, simply do not assign any values to CAPNYF(M), CAPNYT(M), CAPTDM(M), etc. for this "outlay". By default, these variables will be zero and no depreciation will be charged for financial and tax purposes. To charge financial but not tax depreciation, enter the depreciable amount as CAPA(M) and the economic life remaining as CAPNYF(M); no tax depreciation will be charged, but the asset will be depreciated for book purposes.

Note that calculations concerning investment tax credits proceed independently of those for capital outlays. Consequently, the user may segregate a number of tax credit items in a manner that may differ from the list of capital outlay items. The only provisio is that CAPN must represent the "larger" number of the two lists. This condition may obtain when a particular capital outlay may have two difference tax credit rates applicable according to IRS regulations, due to the nature of the individual item, while only a single "financial" and "tax" life.

While the model does not automatically take any action at the end of the economic life of any capital outlay, the retirement of a facility can be specified by the user. At the end of a facility's economic life, the balance sheet recognizes a depreciated value equal to the salvage value originally specified. To represent recovery of this amount when the facility is actually sold, an extra capital outlay item may be specified, with a value equal to the negative of the salvage value and the year the outlay is made equal to the year the facility is sold. Entering such an "extra" capital outlay will remove the depreciated value of the vacility from the books in the year it is sold without any additional depreciation being taken since CAPNYF(M*) = 0 for this M^{*th} outlay. The salvage value recovered will be reported as a negative application of funds for the year specified. If the actual price received exceeds the salvage value, the book profit on the transaction should be entered as miscellaneous revenue in the year of the transaction. Other types of transactions affecting the plant, property, and equipment account can be handled in a similar manner.

As an example of capital outlay specifications, consider four outlays of $180, 5.6, 17 and 3.7 million in years 0, 1, 3 and 6, respectively, with an economic life of 36 years for the first outlay, but 30 years for the last three. Assume a tax life of 22 years for each outlay. Use double-declining depreciation with automatic switchover to straight-line for outlays 1 and 3, but straightline depreciation for outlays 2 and 4. Also allow for construction interest associated with the first outlay of $8.5 million in year 0, and interest of $800,000 for the third outlay in year 3. Assume a salvage value of $12 million of the first outlay and $1.2 million for the third outlay. Take ten percent investment tax credit for each outlay. Specify in the namelist $INPUT the following:

```
CAPN = 4,
CAPA(1) = 180000., 5600., 17000., 3700.,
CAPY(1) = 0, 1, 3, 6,
CAPY1(1) = 1, 2, 4, 7,
CAPNYF(1) = 36, 30, 30, 30,
CAPNYT(1) = 4*22,
CAPTDM(1) = 3, 1, 3, 1,
```

```
CAPCIM(1) = 8500., 0.0, 800., 0.0,
CAPTCA(1) = 180000., 5600., 17000., 3700.,
CAPTY(1) = 0, 1, 3, 6,
CAPTY1(1) = 1, 2, 4, 7,
CAPTCR(1) = 4*0.10,
CAPSV(1) = 12000., 0.0, 1200., 0.0.
```

7.2 TAX DEPRECIATION METHODS

A variety of investment depreciation methods are offered by the model to apply in computing facility depreciation for tax purposes. The original tax depreciable value for any outlay is taken to be the original outlay amount (cost) less the estimated salvage value specified with the exception of cases where one of the declining balance methods is applied. In the case of the "declining balance" method, the total depreciable value is the original cost (excluding salvage). The following methods may be specified.

7.2.1 Straight Line Method

In this method, the adjusted basis for depreciation, less the estimated salvage value, is recovered evenly over the useful life of the asset. The tax depreciation in any given year is calculated as the lesser of:

a. The product of the original depreciable value and the tax depreciation rate for the outlay, and,

b. The undepreciated balance.

The depreciation rate is specified by assigning a value to the namelist input variable CAPTDR(M). If no rate is specified, the rate will be taken by default as the inverse of the life of the facility for tax purposes, 1/CAPNYT(M).

7.2.2 Declining Balance Method

Using this method, the tax depreciation in any given year is given as the product of the underpreciated balance of the asset and a uniform rate of depreciation. This rate, which may not exceed twice the straight line rate, can be specified by the user. If no rate is given, by default a rate equal to twice the straightline rate will be applied. To be elegible for this method, the asset must have a useful life of three or more years. Since the salvage value is excluded from the original depreciable value, there is an unrecoverable value at the end of the assets useful life.

7.2.3 Declining Balance with Switchover to Straight Line Method

The declining balance method is applied up to the year specified as the "switchover" year CAPTSY or up to the year for which the undepreciated balance divided by the number of years remaining in the tax life of the asset is greater than the declining balance depreciation in that year (automatic switchover). Salvage value is not factored in until the switch to straightline depreciation. At this time the expected salvage value is subtracted from the remaining asset value and the remainder is divided by the residual life in years. Straightline depreciation is required to depreciate fully the asset during the switchover year and the remainder of the tax life. The year of switchover may be specified by the user via CAPTSY, otherwise the switchover is made automatically.

7.2.4 Sum of Years' Digits Method

The depreciation rate under this method for any given year is a fraction, the numerator of which is the remaining tax life of the asset at the beginning of the year, and the denominator of which is the sum of the digits representing the years of the estimated tax life. The original outlay must be reduced by estimated salvage value before computing depreciation. As with the declining-balance method, eligible assets must have a life of three or more years.

Over the total life of the asset the total amount of depreciation is equal to the original depreciable value and is independent of the method applied in calculating the allowances for each year, with the exception of the declining balance method without switchover. For financial (book) purposes, however, may be calculated using accelerated depreciation. The acceleration of the allowance is, in effect, an interest-free loan of an amount given by the product of the tax rate and the difference between the accelerated and the straightline allowance during the period for which it is accelerated. This amount is included in the reported deferred taxes for each year, which increase the deferred tax account that appears under "deferred credits" on the balance sheet.

7.3 CAPITALIZING EXPENSE ITEMS

The model provides facilities for capitalizing an item for financial (book) purposes and expensing the item for tax purposes. Three different quantities of this type are handled routinely by the model:

1. Financial and debt expenses associated with long-term borrowing (LTDFX).
2. Construction interest and other charges associated with a capital investment during the construction period (CAPCIM).
3. Capital outlay items which due to some special allowance have a tax life of only one year, but a useful life of more than one year (CAPA).

In each case, the item is expensed for tax purposes in the year in which the funds are applied, but for book purposes the item is capitalized and subsequently amortized over a much longer time period. The difference between the corresponding amounts charged against taxable income (i.e., expensed for tax purposes) and the amounts charged against pre-tax income (i.e., expensed for financial purposes) times the federal income tax rate contributes to the deferred income tax in any given year.

In order to illustrate how the model handles such items, a general method will be outlined here for expensing an item for tax purposes that is capitalized for financial purposes. The following quantities must be specified by the user:

FX = Amount of the expense item ($).
XY = Year in which the expense FX is incurred.
XY1 = First year in which FX is to be amortized.
NYX = Number of years in the amortization period.

The amount of amortization charged against pre-tax income for financial purposes for each year in the amortization period will be equal to the expense amount divided by the number of years in the amortization period,

$$AFX(N) = FX/NYX,$$

where

$$XY1 \leq N \leq XY2$$

and

$$XY2 = XY1 + NYX - 1.$$

The unamortized amount or capitalized value of the expense item is

$$DEFX(N) = FX, \quad \text{for} \quad XY \leq N < XY1;$$

$$DEFX(N) = FX - \sum_{J=XY1}^{N} AFX(J),$$

$$\text{for } XY1 \leq N \leq XY2;$$

$$DEFX(N) = 0, \quad \text{for} \quad N > XY2$$

On the other hand, for tax purposes the amount to be expensed will be

$$FDX(XY) = FX,$$

where XY is the year in which the expense FX is incurred.

The effect of the expense item FX on the profit and loss statement for financial reporting purposes is indicated explicitly in three reported quantities:

1. Financial Depreciation or Amortization - AFX(N) will be expensed for financial purposes each year during the economic life,

   $$XY1 \leq N \leq XY2;$$

   that is, the annual amortization, AFX(N), will be reported as a financial expense reducing net income before taxes.

2. Taxable Income - FDX(XY) will be expensed only for tax purposes; that is, in calculating the amount of taxable income, the full amount of the item FX will be charged against (subtracted from) taxable income only in the year XY in which the expense was incurred. The annual amortization amounts AFX(N) will not reduce taxable income.

3. Deferred Federal Income Taxes - the amount of deferred federal income tax will be calculated as

   $$FITDEF(N) = (FDX(N) - AFX(N)) \times TAXR,$$

   where $XY \leq N \leq XY2$ and TAXR is the income tax rate; deferred taxes in any given year represent the tax effect of the difference in expenses between "tax" and "financial" accounting for that year.

The effect of the expense item FX on the flow of funds is indicated explicitly in the following reported quantities:

1. Financial Depreciation and Amortization - AFX(N) is a source of funds in year N, where $XY1 \leq N \leq XY2$.

2. Deferred Income Taxes - FITDEF(N) is a source of funds in year N, for $XY \leq N \leq XY2$.

3. Capitalized Expense - FX is an application of funds in year XY only.

The effect of the expense item on the balance sheet is indicated by the following reported quantities:

1. Unamortized Expenses or Net Capital Account - DEFX(N), the deferred charge or unamortized value of the capitalized expense item, represents an asset. When the expense is incurred (cash paid out),

   DEFX(XY) = FX

   first appears in year XY as a deferred charge among the assets. This represents the value of the capitalized expense. As each year in the amortization period passes, this asset is reduced by the amount AFX(N) starting in year XY1 until the value is reduced to 0 in year XY2.

2. Deferred Income Taxes - the accumulated sum of the deferred tax line item FITDEF(N) up to and including the given year N represents a liability.

The model offers the facility to capitalize three different types of expense items via the namelist input variables:

1. LTDFX(M) - Financial and debt expenses.

2. CAPCIM(M) - Construction interest and other related expenses.

3. CAPA(M) - A capital outlay.

The first two expense items LTDFX and CAPCIM are capitalized by the model in a similar manner. Values assigned to these variables represent the full amount of the expense to be capitalized. The amortization period is determined by the economic life of the facility associated with the construction in the case of CAPCIM or by the variable LTDNYX in the case of expenses associated with a long-term borrowing. For both cases the value of the amount capitalized will be reported under the line item "Financial and Debt Expenses" in

Report 20 (FDCIX); the annual amortization charge will be reported under the line item "Amortization of Financial Expenses" in Report 10 and Report 20 (FDCIA); deferred values will be reported in Report 30 under "Unamortized Financial and Debt Expenses" (DEFFDX) for debt related expenses and under "Unamortized Construction Interest" (CAPCI) for capital outlay related expenses.

On the other hand, an item can be capitalized for book purposes and expensed for tax purposes by means of a "capital outlay" in which the tax depreciation rate is 100 percent in the year the item is expensed and the tax life is one year, while the financial or economic life is greater than one. The appropriate namelist input variables that must be specified by the user in order to capitalize an expense item are given in the table below for all three cases.

TABLE 7.1

INPUT VARIABLE FOR CAPITALIZING AN EXPENSE ITEM

Quantity	Debt Expense	Construction Expense	Capital Outlay
FX	LTDFX(M)	CAPCIM(M)	CAPA(M)
XY	LTDY(M)	CAPY(M)	CAPY(M)
XY1	LTDY1(M)	CAPY1(M)	CAPY1(M)
NYX	LTDNYX(M)	CAPNYF(M)	CAPNYF(M)
			CAPNYT(M)
			CAPTDR(M)

In order to illustrate how these variables can be specified, a single example will be discussed in which the same item will be capitalized according to the three types of expenses. Consider the case where, in general terms, an expense item of ten thousand dollars is to be amortized over a five-year period beginning in year 1 while expensed for tax purposes in year 0, when incurred; namely, FX = 10, XY = 0, XY1 = 1 and NYX = 5.

Then the annual amortization will be 2.0 in years 1 through 5. The namelist input would include one of the following:

1. LTDFX(1) = 10.0, LTDY(1) = 0, LTDXY1(1) = 1, LTDNYX(1) = 5.

2. CAPCIM(1) = 10.0, CAPY(1) = 0, CAPY1(1) = 1, CAPNYF(1) = 5.

3. CAPA(1) = 10.0, CAPY(1) = 0, CAPY1(1) = 1, CAPNYF(1) = 5, CAPNYT(1) = 1, CAPTDR(1) = 1.0.

TABLE 7.2

EXAMPLE OF CAPITALIZING AN EXPENSE ITEM

Year	0	1	2	3	4	5	Totals
PROFIT/LOSS STATEMENT							
Operating Income	0	10	10	10	10	10	50
Financial Depreciation	0	2	2	2	2	2	10
Net Income Before Taxes	0	8	8	8	8	8	40
Tax Depreciation	0	10	0	0	0	0	10
Taxable Income	0	0	10	10	10	10	40
Current Taxes	0	0	5	5	5	5	20
Deferred Taxes	0	4	(1)	(1)	(1)	(1)	0
Total Taxes	0	4	4	4	4	4	20
Net Income (Book Profit)	0	4	4	4	4	4	20
SOURCES OF FUNDS							
Net Income	0	4	4	4	4	4	20
Financial Depreciation	0	2	2	2	2	2	10
Deferred Taxes	0	4	(1)	(1)	(1)	(1)	0
Net Additions to Equity	10	0	0	0	0	0	10
Total Sources	10	10	5	5	5	5	40
APPLICATION OF FUNDS							
Catezalized Expense	10	0	0	0	0	0	10
Increase in Working Capital	0	10	5	5	5	5	30
Total Applications	10	10	5	5	5	5	40
BALANCE SHEET							
Current Assets	0	10	15	20	25	30	
Unamortized Expenses	10	8	6	4	2	0	
Total Assets	10	18	21	24	27	30	
Deferred Taxes	0	4	3	2	1	0	
Capital Paid-In	10	10	10	10	10	10	
Retained Earnings	0	4	8	12	16	20	
Total Equity and Liabilities	10	18	21	24	27	30	

SECTION 8

DEBT SPECIFICATIONS

The model provides facilities for handling complex schedules of long-term debt, as well as short-term loans. Since the procedures for specifying long-term debt differ from those pertaining to short-term borrowing, the manner in which a debt is defined and entered into the model will determine whether a given borrowing is classified as "long-term debt" or "short-term debt". There is no distinction between "long-term" and "short-term" debt based on the amount of the borrowing, the interest rate charged, or the retirement period. For example, a short-term debt could be carried for twenty years.

8.1 LONG-TERM DEBT SPECIFICATIONS

The user must supply as source data a complete set of long-term debt (LTD) specifications for each individual borrowing planned during the time periods spanned by the financial projection. The LTD specifications are defined as follows:

LTDN = Number of LTD items (integer).

LTDA(M) = Amount borrowed (real number) in the Mth LTD ($).

LTDY(M) = Year (integer) in which the Mth LTD is incurred. The full amount borrowed will be a source of funds in this year. As a convention, the LTD may be considered as being incurred on the <u>last day</u> of the fiscal year.

LTDYR1(M) = Year (integer) in which the first retirement payment is to be made for the Mth LTD. Usually the retirement period will not begin until at least the year following that in which the debt was incurred; that is, LTDYR1(M) $\geq$ LTDY(M) + 1. Since the convention adopted by the model is that funds are received at the close of the fiscal year in which they are borrowed, it is consistent to assume they will not be paid back for at least a year. While a warning message will be printed, the model does permit the user to specify that funds are borrowed and retired in the same year.

LTDNYR(M) = Number (integer) of years in the debt retirement period for the Mth LTD item.

LTDRM(M) = Code (integer) to indicate the debt retirement method (Default: LTDRM(M) = 1). The following methods may be specified:

1. Equal Principal Payment Method (LTDRM(M) = 1). The principal reduction in each year of the retirement period equals the amount borrowed divided by the number of years in the retirement period, that is,

   LTDA(M)/LTDNYR(M).

2. Equal Mortgage Payment Method (LTDRM(M) = 2). The sum of the principal payment and interest on the unpaid balance is the same in all years of the retirement period. The level payment amount is expressed as

$$PAYM = A \times R \times (1+R)^{N}/[(1+R)^{N} - 1],$$

   where A = LTDA(M), R is the interest rate and N = LTDNYR(M).

LTDPER(M) = Annual interest rate (real) charged on the unpaid balance of the Mth debt expressed as a decimal number. The interest charge for a given year is normally the product of this interest rate and the unpaid balance at the end of the preceding year. There is an exception in the case where interest is charged in the same year the debt was incurred; this case represents borrowing on the first day of the fiscal year and so the interest charged is the product of the rate and the amount borrowed.

LTDYI1(M) = Year (integer) in which the first interest payment is to be made on the Mth LTD. This year is usually specified as any year following the year the debt was incurred; if interest payments are waived for a certain period, LTDYI1(M) will specify the first year interest payments will begin. If interest payments are deferred beyond the first year after the borrowing, the model assumes that there is no interest accumulation in the intervening period. If interest does accumulate, the amount can be entered directly via namelist variables (see below). Interest cannot be charged in year 0. The user may specify that interest payments begin in the same year as the debt was incurred. This represents a case in which the borrowing was made on the first day of the fiscal year and so the funds were available throughout the full year; if retirement payments also were specified as beginning in the same year, such a payment is assumed to be made on the last day of the fiscal year.

LTDFX(M) = Financial and debt expense (real number) associated with the Mth debt ($). The financial and debt expenses associated with a borrowing in year N are likewise assumed to have been incurred in the same year N. These expenses are expensed for tax purposes in year N and are therefore an application of funds in year N; that is, LTDFX(M) is charged against taxable income in year N. On the other hand, financial and debt expenses are capitalized for financial (book) purposes and amortized over the period defined below. These amortization charges, which are charged against net (book) income before taxes, are a source of funds in each year during the amortization period. The sum of all individual deferred financial and debt expenses (unamortized amount) appears on the asset side of the balance sheet under "deferred charges".

LTDXY1(M) = Year (integer) in which the amortization for financial (book) purposes begins on the financial and debt expense associated with the Mth debt. Straight line amortization is applied.

LTDNYX(M) = Length in years (integer) of the financial and debt expense amortization period for the Mth debt.

By following the "timing" convention and other suggestions outlined under the above LTD specifications, the user should be able to define most complex debt conditions. A number of non-standard conditions, which the model was not designed to handle automatically, can also be specified. Any additional interest, above and beyond that calculated on the basis of the LTD specifications, can be entered via the above namelist variables by introducing an additional debt item in which the amount borrowed is set equal to the interest required, the rate is set as unity and the timing specifications are given such that the amount borrowed is retired in the same year.

As an example of LTD debt specifications, consider a borrowing of $16 million at 8 1/2 percent interest incurred in year 0 with a 20-year retirement period starting in the third year; debt is to be retired using the level principal payment method. Interest payments begin in year 1. The financial and debt expense incurred arranging the debt was $750,000, which will be amortized over 25 years starting in year 1. Include in the namelist input,

```
LTDN = 1
LTDA(1) = 16000.,
LTDY(1) = 0,
LTDNYR(1) = 20,
LTDRM(1) = 1,
LTDPER(1) = 0.085,
LTDYI1(1) = 1,
LTDFX(1) = 750.,
LTDXY1(1) = 1,
LTDNYX(1) = 25,.
```

8.2 SHORT-TERM DEBT SPECIFICATIONS

The model offers two procedures for treating short-term borrowing. In the first, the model will handle short-term borrowing and retirement automatically. In the second procedure, the user specifies the short-term debt (STD) incurred and retired in each year. In either case the model calculates the interest charges. The namelist variables provided for STD specifications are:

STD(N) = Short-term debt (real number) incurred in Nth year ($).

STDRET(N) = Short-term debt (real number) retired in the Nth year ($).

STDPER(N) = Short-term interest rate (real number) for the Nth year expressed as a decimal.

Only total values can be entered, so that if short-term loans were made at different interest rates, these must be combined and the average rate entered. As an example of short-term borrowing, consider loans of $800,000 and $400,000 in years 0 and 1 at 9 1/4 percent, which are paid off in years 2 - 5 at the rate of $300,000 per year; specify as follows:

```
STD(1) = 800., 400.,
STDRET(3) = 4*300.,
STDPER(1) = 6*0.0925, .
```

8.2.1 Automatic Short-Term Borrowing Option

A special feature provided by the model allows for automatic short-term borrowing. The namelist variable STDPER must be entered and

AUTOB = Logical control option to apply automatic short-term borrowing (Default: AUTOB = F). If AUTOB = T, short-term debt is incurred in a given year in order to maintain working capital at a minimum level by avoiding deficits in the cumulative cash generated. The amount borrowed, if any, under this option in a given year will be the amount required to maintain a zero cumulative net cash generated in that year.

The net cash generated in any year can be negative, but as long as the cumulative net cash generated is positive, no borrowing is made. STD loans are also automatically paid off in any given year when the net cash generated is positive. As much of the unpaid balance is paid off as possible in any year. The interest is calculated based on the values assigned to the array STDINT.

SECTION 9

REVENUE AND EXPENSE SPECIFICATIONS

9.1 GENERAL

The model offers two general procedures for acquiring revenue and expense source data. On one hand, the user may directly enter all specific revenue and expense source data required for the model to generate the desired P/L, cash flow, and balance sheet projections. Complete source data may be entered; that is, all revenues and expense line items may be specified explicitly via namelist input by assigning numerical (dollar) values to each revenue and expense array variable for all time periods included in the projection span. Partial source data may be entered, such as "initial values" for the revenue and expense input variables and escalation tables may be utilized to generate the complete set of required source data. This latter procedure will be discussed below in Section 9.4.

On the other hand, as a second procedure for data entry, the user may specify that a special revenue/expense model "REVMOD" will be utilized to generate selected revenue and expense line items, while the remaining required items are entered directly via the namelist input variables. One example in which this general procedure has been implemented is discussed in Section 14, "Pipeline Transportation Systems - Regulated Industry Model." The namelist input variable or control option for invoking this special revenue/expense model for pipeline systems ("P38REV") is READP for "reading the PEP output data file", where PEP is an independent model that generates projected transportation revenues and other selected volume and expense line items. Two considerations should be pointed out when using a separate submodel to generate revenue and/or expense source data. First, values generated in the special model will replace (i.e., "override") any values assigned via namelist input. Secondly, even though values are generated in a revenue/expense submodel, escalation tables may still be used to "fill out" or "extend" selected line item arrays. In other words, if the revenue/expense model calculates or otherwise acquires values for operating years, say 1-20, by means of escalation tables the model may calculate values for time periods 21-30, in order to complete the data requirements for a 30-year projection.

The primary revenue and expense source data specifications are given below. Each individual line item may be specified by means of a corresponding namelist input array variable. Expense data related to either capital outlays or debt such as depreciation, interest, financial and debt expense amortization, etc. have been described in Sections 7 and 8, respectively.

9.2 REVENUES

The model offers the user the following revenue variables:

SREV = Net sales and operating revenues; this primary revenue item may be escalated by utilizing the escalation array ESCR (see Section 9.4).

REVA = Segregated revenues from "product A" or "operation A".

REVB = Segregated revenues from "product B" or "operation B". As one example of the utility of the REVA and REVB variables, to represent the sale of capital assets (property, equipment, etc.) the depreciated (taxable basis) cost of the asset sold may be specified by assigning a negative value to REVB, while the sales amount may be specified as REVA; the correct taxable gain (i.e., sales less cost) on the transaction will consequently be included in the reported total revenues, since REVA and REVB are added together in calculating total revenues.

MREV = Miscellaneous revenue from secondary sources, such as the sales of capital equipment or property.

IINC = Net investment income. As described in Section 12, the user may specify the option (REINVF = T) such that all excess net cash generated is re-invested at a given rate of return. The amount of revenue generated in a given year is calculated by the "PAL" model as the product of the specified net annual rate of return (REINVR) and the total amount of re-investment funds available at the start of the year. Any re-investment income calculated by the model is accumulated with any additional net investment income specified by the user via IINC and is reported as "Net Investment Income".

The sum of SERV, REVA, REVB, and MREV are reported under the line item "Total Revenue" (TREV).

9.3 OPERATING EXPENSES

The model offers a collection of expense items from which the user may select those individual items that are most convenient for the case under study. On one hand, if a breakdown of operating expenses is not available, or not required for the projections being made, one may simply aggregate all such expenses under a single variable, say OMEX; on the other hand, if a detailed comparative analysis of individual expenses is called for, any or all of the twelve items defined below may be used to specify and report these segregated expenses. Any of these variables may be used arbitrarily to represent any specific expense item of interest in the case at hand, whether the title of the line item seems appropriate or not. For some studies the user may prefer only the three variables for direct labor, direct materials, and overhead. In other words, the selection of expense items is whatever best suits the user for the case under study. The principal operating expenses are specified via the following variables:

OMEX = Operations and maintenance expenses, including all direct operating costs that are not otherwise segragated; operating expenses may be escalated via the escalation array ESCO.

GAEX = General and administrative expenses, including overhead, insurance, and other indirect operating expenses not otherwise segregated; G&A expenses may be escalated via ESCG.

TOFIT = Taxes other than federal and state income taxes; these taxes may be escalated via ESCT.

COST = Cost of goods sold.

SEX = Selling and marketing expenses.

SEXA = Segregated expenses - "Category A"; this variable allows the user to segregate any arbitrary expense item of special interest for analytical studies.

SEXB = Segregated expenses - "Category B".

MEX = Miscellaneous expenses not included in the categories defined above. The model offers the option of having additional miscellaneous expenses calculated as a fixed percentage of sales revenues via the special namelist input variable MEXF. If the user specifies a non-zero value for this factor (e.g., MEXF = 0.02) the "REVMOD" model calculates an additional expense given as the product of MEXF and the sales revenue SREV; this calculated expense is added to any miscellaneous expenses explicitly specified by the user via MEX and the total is reported under "Miscellaneous Expenses".

DLABOR = Direct labor expenses.

DMATR = Direct materials expenses.

OVERH = Overhead expenses.

The specifications for non-operating or financial expenses such as (1) interest charges on short-term borrowing and long-term debt (Section 8); (2) amortization of financial and debt expenses (Section 8); (3) financial (book) depreciation of capital assets (Section 7); and (4) amortization of construction interest and other related expenses (Section 7) have been discussed above.

The individual operating expenses defined here are aggregated and reported under the title, "Costs, Excl Deprec and Interest" (PEX). The difference between Total Revenue (TREV) and the sum of operating expenses (PEX) is reported as "Gross Operating Income" (GOINC). The sum of all financial expenses is added to the subtotal of all operating expenses to yield the line item "Total Expenses" (TOTEX). The definition of taxable income and the related taxable expenses are given in Section 10. An additional line item "Unit Costs" (UCOSTS), which is defined as the ratio of total expenses (TOTEX) to unit sales (USALES), is also computed for each year in the projection span.

9.4 ESCALATION TABLES

The model offers the user the option of entering only partial source input data for selected items with the remaining data entries being calculated utilizing an appropriate escalation table specified by the user. If ARRAY represents a namelist input variable array, ESC represents an escalation array, and NTOTAL is the number of time periods in the projection span, the automatic escalation routine in "REVMOD" proceeds according to the following prescription:

if ARRAY (N) = 0.0,

then ARRAY (N) = ARRAY (N-1) × ESC (N),

for N = 2, 3, ..., NTOTAL.

Notice that the escalation factor for any given time period ESC (N) is not necessarily a fixed value; rather, each time period may be given a different factor. Any data entries in the array that are not assigned a value by the user will be "filled" by the escalation routine, so that the array will always be complete for the entire projection span. Zero values may be defined, however, for any given time period M by assigning ESC (M) = 0.0 for the M^{th} time period. The default value for all of the escalation arrays used in the model is 1.0, so that unless otherwise specified, any array that has a series of zeroes for certain time periods, corresponding to the data elements that were not explicitly assigned non-zero values, will be "filled-in" by assigning the value corresponding to the last non-zero value to each data element in the series. The result of such a case is a level or constant value for these time periods. A few simple examples will illustrate how the excalation tables may be used.

If the line item corresponding to the variable ARRAY is to escalate at a fixed rate of five percent over a ten-year span and the user specifies an initial value of $1,000 in the first year of operations (i.e., year "1" or the second time period), specify in the namelist $INPUT

```
ARRAY (2) = 1.0, ESC (3) = 9 * 1.05;
```

this is equivalent to giving the following complete specification

```
ARRAY (1) = 0.0, 1.0, 1.05, 1.103, 1.158, 1.216,
            1.276, 1.340, 1.407, 1.477, 1.551.
```

As a second example, let the initial value be $10,000 and apply an escalation factor of seven percent for years two through four, five percent for years five through nine, and let years 10 through 15 be level, specify

```
ARRAY (2) = 10.0,  ESC (3) = 3 * 1.07,
                   ESC (6) = 5 * 1.05,
```

which is equivalent to the specification

```
ARRAY (2) = 10.0,  ESC (3) = 1.07, 1.07, 1.07,
                             1.05, 1.05, 1.05, 1.05,
                               1.05, 1.0,
                             1.0, 1.0, 1.0, 1.0, 1.0
```

As a third example, let the user specify explicitly values for the first five years of operations and then use a detailed escalation table for the next five: for example, ARRAY (2) = 10.0, 11.67, 12.29, 14.23, 1607,

ESC (7) = 1.048, 1.061, 1.063, 1.071, 1.088.

The model provides the following escalation arrays as namelist input variables:

ESC = General escalation factor applied to the variables for unit sales (USALES) and unit cost of energy (UCOSTE).

ESCR = Revenue escalation factor applied to the variables for sales revenues (SREV) and unit price (UPRICE).

ESCO = Operating expense escalation factor applied to OMEX.

ESCG = G and A escalation factor applied to general and administrative expenses (GAEX).

ESCT = Other taxes escalation factor applied to TOFIT.

An additional variable is available for generating miscellaneous expenses as a percentage of revenues:

MEXF = Miscellaneous expense factor expressed as a decimal fraction (Default: MEXF = 0.0). Additional operating expenses for every year in the projection span are calculated as the product of MEXF and sales revenues SREV for each year. These calculated expenses are added to miscellaneous expenses entered explicitly via the MEX variable; for example, MEXF = 0.05 will calculate additional operating expenses equal to five percent of sales revenues for every year.

9.5 UNIT SALES AND UNIT PRICE OPTIONS

The model offers the user a variety of convenient options for generating sales revenue projections via the two namelist input variables:

USALES(N) = Unit sales (real) in any arbitrary units for the N^{th} time period (Default: USALES(N) = 0.0).

UPRICE(N) = Unit price (real) in dollars for the N^{th} time period (Default: UPRICE(N) = 0.0).

The mathematical relationship between these two quantities and the primary sales revenue variable SREV is expressed as

$$SREV(N) = USALES(N) \times UPRICE(N),$$

where both SREV and UPRICE must be given in identical dollar units, such as thousands or millions.

The "Decision Table for Unit Sales and Unit Price Options" illustrates the logical relationship between the three variables SREV, USALES and UPRICE and how the user can control the operation of the "REVMOD" model by means of his selection of input specifications. In other words, which quantity (or quantities) will be calculated by the model depends on the combination of input values assigned to the variables SREV, USALES and UPRICE. The default value for each of these variables is zero. For example, if USALES(N) and UPRICE(N) are specified for N = 2 to N = NPROJ+1, then SREV(N) is calculated as the product of these two quantities; on the other hand, if SREV and UPRICE are specified, USALES is calculated.

As an additional convenience, the use of escalation tables are available as input variables to simplify further data entry for each of these three variables. The revenue escalation array ESCR can be used to escalate either SREV and/or UPRICE, while the general escalation array ESC can be used to escalate USALES. The default value for each array element in both escalation tables ESCR and ESC is 1.0.

Whenever the revenue submodel REVMOD is utilized to generate SREV and/or USALES, the same set of rules are applicable. Such calculated values simply replace whatever values may have been assigned to these variables via namelist input. In other words, values calculated by REVMOD take precedence. However, by manipulating the variable UPRICE, the user can control the final revenue projection. This feature is convenient when an elaborate revenue submodel must be exercised in order to generate unit sales projections.

TABLE 9.1

DECISION TABLE FOR UNIT SALES AND UNIT PRICE OPTIONS
(Default Values: SREV(N) = USALES(N) = UPRICE(N) = 0.0)

SREV	USALES	UPRICE	Calculated Variable(s)
INPUT	0.0	0.0	USALES(N) = 1.0 UPRICE(N) = SREV(N)
INPUT	INPUT	0.0	UPRICE(N) = SREV(N)/USALES(N)
INPUT	0.0	INPUT	USALES(N) = SREV(N)/UPRICE(N)
INPUT	INPUT	INPUT	SREV(N) = USALES(N)*UPRICE(N)
0.0	INPUT	INPUT	SREV(N) = USALES(N)*UPRICE(N)
0.0	0.0	INPUT	SREV(N) = UPRICE(N) USALES(N) = 1.0
0.0	INPUT	0.0	SREV(N) = USALES(N) UPRICE(N) = 1.0

The final dollar sales revenues can then be re-calculated according to alternate inflation/price scenarios represented by alternate values assigned to the variable array UPRICE. In the case where only USALES is generated by the revenue submodel, SREV is calculated as the product of USALES and UPRICE, if UPRICE has been specified, or set equal to USALES, if UPRICE has not been given. On the other hand, in the case where only SREV is generated by the revenue submodel, then USALES and/or UPRICE are calculated depending on which variable has been specified according to the rules summarized in the Decision Table.

SECTION 10

INCOME TAX SPECIFICATIONS

The combined federal and state income tax rate to be applied in the calculation of income taxes is specified by the user via the namelist input variable

TAXR = Income tax rate (real) expressed as a decimal number (Default: TAXR = 0.50).

This rate is assumed to be uniform over the reporting period. The second primary model control option to be specified by the user is

INDEP = Logical variable that controls the "carry-forward" of both tax losses and investment tax credits (Default: INDEP = T).

Set INDEP = T, when the financial projections are to be generated and reported as for an independent corporation. In such a case, tax losses will be carried forward to offset future gains and investment tax credits will be carried forward to offset future tax liabilities. For an independent concern, the current income taxes calculated for any given year will always be non-negative.

On the other hand, set INDEP = F if projections are desired for an organization or project in which the results are not to be reported separately but to be included in the consolidated results of another enterprise. This latter condition (INDEP = F) can be specified when the organization (project) is a subsidiary of a parent corporation. In such a case all tax losses and credits will be reflected directly in the reported results of the model as they are incurred. Current income taxes may be negative, reflecting possibly a loss for the period or an excess of tax credits over the calculated tax liability. The parent corporation is assumed to be able to absorb such tax credits without restriction. There are never any non-zero tax loss carry-forward amounts in such a case.

10.1 CURRENT INCOME TAXES

If the user has specified INDEP = F, then tax losses, which result whenever the calculated taxable income is negative, are reflected directly in the current income taxes reported as a negative tax or "credit" in the year in which the loss occurs. The current income tax in this case for any given year is the product of the specified combined state and federal income tax rate (TAXR) and the taxable income in that year, which is defined in the model as

FITINC(N) = INCBT(N) - TAXDIF(N)

where

TAXDIF(N) = FITDEP(N) - FDEP(N) + FDCIX(N) - FDCIA(N),

INCBT(N) = Income before taxes or pre-tax book profit in year N.

TAXDIF(N) = Difference in expenses charged against "taxable income" and "financial (book) pre-tax income" in year N.

FITDEP(N) = Tax depreciation in year N.

FDEP(N) = Financial depreciation in year N.

FDCIX(N) = Sum of financial and debt expenses and construction interest and associated charges during the construction period incurred in year N.

FDCIA(N) = Sum of the amortization of financial and debt expenses and construction interest and associated expenses charged in year N.

If the taxable income is negative in any given year, current income taxes will accordingly be reported as negative, i.e., as a credit.

10.2 TAX LOSS CARRY-FORWARD OPTION

The user may specify that tax losses be carried forward by setting INDEP = T as described above. The time limit on carrying forward tax losses is specified by

NYTLC = Maximum number of years (integer) that a tax loss may be carried forward (Default: NYTLC = 5).

The model assumes that a tax loss in any given year can be carried forward from that year up to a maximum of NYTLC years to offset subsequent gains. If losses occur in more than one year, the tax losses carried forward are applied to offset gains on the basis of first-in, first-out (FIFO) accounting. In other words, the oldest losses are used first.

10.3 INVESTMENT TAX CREDIT CARRY-FORWARD OPTION

At the option of the user, investment tax credits can be reflected directly as a credit against the income tax liability in the year in which the tax credit is allowed, or the credits can be carried forward to offset gains. The former option is specified by assigning the value "F" or "FALSE" to the logical model control option "INDEP"; this option represents the case when income from the project is to be reported on a consolidated basis with the parent organization's income. If the project is to be represented as an independent enterprise, the variable "INDEP" is assigned the value "T" or "TRUE". This latter method provides that tax credits be carried forward, if they cannot be fully applied against current income taxes in the year in which they are first allowed. The tax loss carry-forward option and the tax credit carry-forward option must always be used together, with or without normalization of the investment tax credit for book purposes.

In any given year there is a limit on how much of the sum of all investment tax credits available can be applied against current income taxes. The credit may not exceed the tax liability. If the tax liability exceeds $25,000, the tax credit may not exceed $25,000 plus 50 percent of the tax liability in excess of that amount. Any part of the investment tax credit which is not applied as a credit against the tax because of such limitations (or due to the lack of a positive taxable income) may be carried back three years and carried forward over seven years (according to IRS regulations applicable in 1975). In order to accomodate furture Congressional changes in the limits on investment tax credits, not only is the rate at which each individual credit is calculated, CAPTCR(M), defined as a user specified input variable, but also the time limit on carrying-forward such credits. The limit on carry-forward tax credits is specified via the namelist variable

NYTCC = Maximum number of years (integer) over which an investment tax credit can be carried forward (Default: NYTCC = 7).

There is a span of NYTCC years over which any tax credit can be carried forward beyond the year in which it becomes available. Note that credits associated with construction of a facility do not become available until the year specified via the variable CAPTY, which will usually be the first year in which the facility is operational. Tax credits are applied to offset the tax liability on a "first in - first out (FIFO)" accounting basis. In other words, the oldest credits are used first.

The input procedure for specifying the normalization of investment tax credits has been presented above in Section 7.1.

SECTION 11

ASSET AND LIABILITY SPECIFICATIONS

Careful attention must be paid to any source data specification which may directly impact balance sheet line items. This is due to the fact that the Balance Sheet model "BALS" is at the center of the operation of the financial projection model. All financial flows calculated in either the Profit and Loss model ("PAL") or the Cash Flow model ("CASHF") culminate in a credit and/or debit to a balance sheet line item. There are four ways in which a balance sheet item may be adjusted:

1. By explicit specification of a limited number of selected source or application of funds namelist input data variables, such as those representing "additions" to some balance sheet item rather than the item itself (e.g., ADEQ or ADWC);
2. by explicit specification of individual asset and/or liability variables;
3. by standard operation of the P/L, Cash Flow and Balance Sheet models;
4. by incorporating into the Balance Sheet model special purpose computer routines that utilize some additional relationships between individual balance sheet items; that is, a more complex and elaborate "model" of the balance sheet than is represented by the general "BALS" model.

For most projection studies, the use of the first method, in which only a very few items must be specified, will suffice along with computations of the general Balance Sheet submodel "BALS". On the other hand, the model offers a full range of variables that allows the user to represent more complex financial relationships either by specifying a large number of asset and liability items or by supplementing the general model with one or more subschedule models. In this document only the first approach will be fully described.

11.1 CAPITAL STRUCTURE SPECIFICATION

The primary namelist input variables used to define the capital structure and the basic financial policy of the enterprise under study are few in number, including the following source and application of funds variables (i.e., each represents an "addition" to some balance sheet account):

EQPER = Percentage of initial capital to be represented by equity, expressed as a decimal fraction; e.g., specifying EQPER = 0.40, will make the model calculate the initial equity ADEQ(1) such that it will be 40 percent of total initial capital requirement with long-term debt being 60 percent.

ADEQ(N) = Net additions to equity capital in the Nth time period. All injections of equity capital will increase the paid-in capital account (CAPPD).

ADWC(N) = Additions in the Nth time period to working capital required to maintain normal operations; such additions will increase the cash account (CASH).

ADINVM(N) = Additions in the Nth time period to the investment funds account (INVM) that are available for re-investment at a net annual rate of return specified by REINVR. Negative values for ADINVM represent the withdrawal of funds from the account.

DIVP(N) = Cash dividends paid or distributed outside of the enterprise in the Nth time period; such distributions decrease the retained earnings account (RETE).

MSOF(N) = Miscellaneous sources of funds in the Nth time period.

MAOF(N) = Miscellaneous applications of funds in the Nth time period.

The model options that are available for control of the net cash generated are described in Section 12. Specification of these model options and, if desired, the variables ADWC and DIVP, represent the financial policy of the enterprise regarding dividends and re-investment of excess cash generated. In short, the user may select one of a range of options so that automatically excess cash will be fully or partially re-invested, dividends will be paid out in an amount given as a specific percentage of net profits, and/or additional cash distributions will be made constituting a "return of capital".

The initial capital structure of the enterprise is determined on one hand by the amount of capital outlays and long-term debt incurred in year 0 (for the appropriate input specifications see Sections 7 and 8), and on the other hand by the specification of equity ADEQ(1), initial working capital ADWC(1), and short-term borrowing STD(1). An examination of the principal items in the source and application of funds for the initial period will determine initial capital requirements. Sources of funds will include the following:

1. Initial equity ADEQ(1).

2. Long-term debt LTD(1), which is the sum of all long-term borrowings incurred in the initial period.

3. Short-term debt STD(1).

Since the initial year is a non-operating period, there are neither revenues nor expenses for book purposes and the net profit (loss) is the negative of the deferred income tax. The application of funds in the initial period includes:

1. Capital outlyas (CAPO(1)), which equals the sum of all additions to plant and equipment in year 0.

2. Financial and debt expenses incurred in year 0 including construction interest and related expenses (FDCIX). This item is the negative of the taxable income, since all such charges are expensed for tax purposes as incurred.

3. Net additions to working capital ADWC(1), as specified.

The initial period capital requirement can be expressed as

$$\begin{aligned} XINV0 &= LTD(1) + ADEQ(1) \\ &= CAPO(1) + FDCIX(1) + ADWC(1) - STD(1) \end{aligned}$$

The user has the option of (1) specifying the initial equity via ADEQ(1) and the long-term debt via the specifications described in Section 8, or (2) specifying EQPER and the long-term debt input data for the first borrowing, namely, LTDYR1(1), LTDNYR(1), LTDPER(1), LTDRM(1), and LTDYI1(1), while leaving LTDA(1) = 0.0 and LTDY(1) = 0. In the latter case, the "REVMOD" model will calculate the following two input data items:

$$ADEQ(1) = EQPER \times XINV0$$

$$LTDA(1) = (1.0 - EQPER) \times XINV0.$$

Note that since only the dollar amount (LTDA(1)) of the first long-term debt is calculated, the user must specify the remaining details such as the year in which retirement of the debt begins, the interest rate, etc. This automatic feature is convenient when performing studies assuming various debt to equity ratios, since only the single input variable EQPER need be adjusted.

11.2 ASSET AND LIABILITY VARIABLES

The model offers the user the option of explicitly specifying any of the balance sheet line items defined below. This may be necessary to model an enterprise that is already in operation at the start of the projection span. The namelist input variables include the following balance sheet arrays:

CASH = Cash.

MKTSEC = Marketable securities and other cash equivalents.

RECEIV = Accounts receivable (net).

GOODS = Inventories at cost.

PREPEX = Prepaid expenses and other current assets not otherwise segregated.

CAPEO = Capital equipment, plant, and property at original cost.

CAPED = Capital equipment — accumulation depreciation.

INVM = Investments, including re-investment funds and subsidiaries.

OTHERA = Other assets not otherwise segregated, including goodwill, patents, mineral rights, leases, etc.

DEFFDX = Deferred (unamortized) financial and debt expenses.

CAPCI = Deferred (unamortized) construction period interest and other related expenses.

DEFC = Other deferred charges.

PAYABS = Accounts payable.

ACCEX = Accrued expenses.

ACCTAX = Accrued taxes.

NOTESP = Notes payable.

DEFTAX = Deferred income tax credits.

DEFCR = Other deferred credits.

STOCK = Capital stock at par value.

STKSUR = Paid-in capital surplus.

RETE = Retained earnings.

The current version of the general Balance Sheet model "BALS" does not contain the mechanics for automatic adjustment of MKTSEC, RECEIV, GOODS, PREPEX, DEFC, PAYABS, ACCEX, ACCTAX, NOTESP, DEFCR, and STKSUR. The user may change these variables only by assigning appropriate values to each of the individual array elements. As discussed above, special routines can be incorporated into the model to represent the relationship between these variables expected over the projection period for a given enterprise. For example, if accounts receivable, inventories, and other items are expected to be a certain percentage of sales revenues, this fact can easily be reflected in the model.

SECTION 12

MODEL OPTIONS REGARDING CONTROL OF THE NET CASH GENERATED

Since a complete financial model is provided, including a balance sheet submodel in which financial line items affecting the source and application of funds must credit and/or debit the appropriate balance sheet account, where the net cash generated is to be applied, must be specified. The model offers the user a flexible set of options, so that the net cash generated can be applied in a variety of ways, which may even differ from year to year. The key to the determination of how the net cash generated is to be applied, that is, which balance sheet accounts will be affected, is provided by the interplay between two model control options.

REINVF = Logical control option that allows the user to specify that all of the "available" or excess net cash generated should be automatically re-invested in the investment account (Default: REINVF = F).

PAYDIV = Logical control option that allows the user to specify that the excess or "available" net cash generated should be paid out in the form of cash dividends (Default: PAYDIV = F).

There are two additional model parameters that are closely related to the above options, namely:

REINVR = Annual net rate of return on re-invested cash in the "investment account" INVM: e.g., REINVR = 0.06 (Default: REINVR = 0.0).

DIVPER = Percent of earnings (net profits after taxes) to be paid out as cash dividends; e.g., DIVPER = 0.50 (Default: DIVPER = 0.0).

The interplay between the two control options and the consequences of any set of user specifications is summarized in the decision table illustrated, where

INVM(N) = Investment account at the close of the Nth time period; re-invested cash goes into this account.

ADINVM(N) = Net addition to the investment account INVM during the Nth time period; ADINVM can also be negative to represent a withdrawal of funds.

CASH(N) = Cash account at the close of time period N.

ADWC(N) = Net additions to working capital during period N; unless otherwise specified, net additions to working capital will go into the cash account.

DIVP(N) = Cash dividends paid out during time period N.

The decision table illustrates how the logical flow in the Cash Flow model "CASHF" is controlled not only by the options REINVF and PAYDIV, but also by the values assigned to ADWC, ADINVM, or DIVP via their input data specifications. The model first computes the net cash generated and then determines if there is any "excess" cash that will then be "available" for dispersal according to the two user specified control options. If non-zero values have been specified for ADWC, ADINVM, or DIVP, as the case may be, these amounts must first be subtracted from the net cash generated. Only when there is excess cash are funds diverted into the cash, dividend, or investment account.

In Case 1 (REINVF = F, PAYDIV = F) all cash generated less specified increases in investments and dividends goes into working capital. This represents the default situation, which will obtain with no special action required on the part of the user. The additional working capital is computed by the Cash Flow model and goes into the cash account in the Balance Sheet model, unless otherwise specified. Note that the net cash generated can be either positive or negative; likewise the change in working capital ADWC can also be positive or negative. In the latter case, cash will be withdrawn from the cash account in order to pay out the dividends or to augment the investment account.

TABLE 12.1

CASH FLOW MODEL DECISION TABLE

Case	REINVF	PAYDIV	All Cash Generated Less Specified ...	Goes Into	The Cash Flow Model Calculates
1	False	False	ADINVM and DIVP	CASH	ADWC
2	False	True	ADWC	DIVP	DIVP
3	True	False	DIVP and ADWC	INVM	ADINVM
4	True	True	ADWC	DIVP (and INVM)	DIVP (ADINVM)

In Case 2 (REINVF = F, PAYDIV = T) all cash generated less specified increases in working capital goes into paying out cash dividends. If there is no excess cash generated, no dividends will be paid out. However, when the cash generated is negative, either the cash or investment account must be reduced. The Cash Flow model chooses to withdraw funds from the investment account, when the net cash generated is negative under this set of options. Note that since there is no restriction on the amount of dividends, cash dividends in excess of the net profits — or even in excess of retained earnings — could be paid out in this case. Such a circumstance corresponds to a return of capital as well as earnings. Use this set of options, if it is desired to minimize the amount of cash left as assets of the business or, in other words, to maximize the return of both profits and other funds invested.

In Case 3 (REINVF = T, PAYDIV = F) all cash generated less specified increases in working capital and cash dividends goes into the investment account. ADINVM is computed. If the cash generated is negative, the investment account is automatically reduced. Use this set of options if it is desired to re-invest all excess cash generated within the business. By also specifying a non-zero value for REINVR, these investment funds will generate investment income in subsequent time periods. In this manner, the overall return from both operating profits and investment income will be maximized. If no dividends are specified, all funds generated will increase the net worth of the business.

In Case 4 (REINVF = T, PAYDIV = T) a number of different financial strategies can be projected. All net cash generated less specified increases in working capital and calculated dividends goes into the investment account. If the cash generated is negative, funds are withdrawn from the investment account. Consider two alternate strategies.

1. DIVPER = 1.00. This specification will cause earnings (book profits) of 100 percent to be paid out as dividends. All remaining excess cash will be available for re-investment at the rate prescribed by REINVR.

2. DIVPER = D, where 0 < D < 1.00. This is similar to the above case except only a portion of earnings are paid out. If the excess cash generated is less than the amount given by NET(N)*DIVPER, only the excess cash is distributed. This circumstance may occur whenever substantial capital outlays or debt retirement payments are made. Note that if dividends in excess of the amount allowable under the last strategy are demanded, the user can apply Case 2.

In order to describe more fully the manner in which the above control options are applied, it is necessary to define the relationship between the financial line items involved, namely:

TDOF = TSOF,

TDOF = TAOF + ADWC,

TAOF = TAOF1 + ADINVM + DIVP,

TAOF1 = CAPO + LTDRET + STDRET + FDCIX + MAOF

TSOF = NET + FDEP + FITDEF + LTD + STD + ADEQ + MSOF + FDCIA,

where

TSOF = Total sources of funds.

TAOF1 = Total application of funds less increases in investments and cash dividends.

TAOF = Total application of funds.

TDOF = Total disposition of funds.

NET = Net profits after taxes.

FDEP = Financial depreciation.

FITDEF = Deferred income tax.

LTD = Long-term debt borrowing.

STD = Short-term debt borrowing.

ADEQ = Additions to equity.

MSOF = Miscellaneous sources of funds.

MAOF = Miscellaneous application of funds.

FDCIA = Amortization of deferred credits.

FDCIX = Deferred credits expensed for tax purposes.

LTDRET = Long-term debt retirement payments.

STDRET = Short-term debt retirement payments.

CAPO = Capital outlays.

The above set of equations simply represent generally accepted accounting principles. The Cash Flow model uses the following definition of the net cash generated:

$$\begin{aligned} \text{CASHG} &= \text{TSOF} - \text{TAOF1} - \text{ADWC} \\ &= \text{TSOF} - \text{TAOF} - \text{ADWC} + \text{ADINVM} + \text{DIVP}, \end{aligned}$$

where ADWC is the <u>specified</u> increase in working capital. A critical assumption that is implicit in the above definition is that if ADWC is specified by the user as part of the input data, then such an increase in working capital is considered as equivalent to a <u>required investment</u> in operations and as such it reduces the net cash available for other purposes. In other words, if a specific amount of additional working capital is needed to sustain normal operations, it really is no different than an investment of the same amount that is made in some fixed piece of capital equipment. Neither is available for paying out dividends or for retirement payments on a long-term loan. Consequently, such an amount reduces the net cash generated from operations and is therefore not "available" or "excess"; it cannot be diverted to another application of funds.

SECTION 13

CAPITAL INVESTMENT PLANNING TECHNIQUES

Capital investment involves making commitments for expenditures now and at various times in the future in the expectation of receiving benefits during future time periods. Capital investment planning requires the application of techniques that can provide a capability for evaluating the financial consequences of proposed capital expenditures. By generating a complete set of financial accounting statement projections the model offers the planner a powerful tool for analyzing the full economic impact of a capital investment. In addition to these reports, however, the model provides several of the more common techniques for evaluating the economic advantages of proposed capital investments.

13.1 ROI MEASURES

The first major technique provided for analyzing the relationship between income and investment is a set of return on investment (ROI) measures:

1. Rate of return on paid-in capital.
2. Rate of return on total equity or net worth.
3. Rate of return on total capital (long-term debt and equity).

Average values over the total planning horizon for each of these ROI measures are generated, as well as values for each time period reported in the projections. One major disadvantage of these methods for computing ROI is that they fail to take into account the different times at which cash flows occur.

13.2 NET PRESENT-VALUE METHOD

Since the value of costs and benefits paid or received at different times cannot be compared directly, different methods are used to bring these cash flows to a single point in time. This process is called discounting the flows to their present value. Two basic techniques for discounting cash flows are provided by the model, namely the net present-value method and the discounted cash flow method.

The Net Present-Value method consists in the calculation of the present value of the net cash benefits received at a specified rate-of-return given as input. Specifically, the net present value (NPV) of an investment is given as

$$NPV(r,n) = \sum_{j=0}^{n} \frac{(b_j - c_j)}{(1 + r)^j} ,$$

where

n = Life of the investment project (years).

r = Discount rate per annum.

b_j = Benefits received at the end of year j.

c_j = Costs paid out at the end of year j.

The above equation can be expressed as the difference between the total discounted income (returns or savings) and the total of the discounted expenses (capital expenditures or investment costs)

$$NPV(r,n) = PVB(r,n) - PVC(r,n)$$

where the present value of any arbitrary cash flow given by the array $\underline{a}$ is

$$PVA(r,n) = \sum_{j=0}^{n} \frac{a_j}{(1 + r)^j} .$$

The value at the end of n periods of a benefit b_0 received now is

$$b_0(1 + r)^n .$$

The value, F_n, at the end of n periods of a series of benefits b_j received at the end of each of the n periods is

$$F_n = b_1(1 + r)^{n-1} + b_2(1 + r)^{n-2} + \ldots + b_{n-1}(1 + r)^1 + b_n .$$

This manner of expression shows that the same fixed rate of return (r) is assumed for all funds received during the n time periods. The present value of F_n to be received n periods from now is therefore,

$$P = F_n(1+r)^{-n} = b_1(1+r)^{-1} + b_2(1+r)^{-2} + \ldots b_n(1+r)^{-n} ,$$

which is simply PVB(r,n) with $b_0 = 0$. If r is the effective annual rate and i is the nominal rate which is to be compounded m times per year ($m \geq 1$), then

$$(1 + r) = (1 + i/m)^m , \text{ or}$$

$$r = (1 + i/m)^m - 1 .$$

Often the present value of the future income stream generated by a capital investment is compared with the initial cost of the investment. Another use of this technique is to calculate the present value of a sequence of specific dollar savings that can be expected to accrue, if a certain action is taken. The net present value in such a case represents the "capitalized" value of the future savings flow, which may be useful in comparing with the cost of alternate capital expenditures that would produce the savings.

13.3 INTERNAL RATE OF RETURN

A major question that arises when applying the Net Present-Value method is the choice of a discount rate; a preferred answer is the appropriate cost of capital to the firm. In any case, the discount rate depends on conditions, such as interest rates, which are externally determined. Consequently, the evaluation of alternate investment projects is seriously affected by the choice of this one parameter. One of the alternatives to the present value method is the discounted cash flow (DCF) or internal rate of return (IRR) method.

In the IRR method both cash inflows and cash outflows are compared at common points in time from the time of inception of the capital project until its completion. The IRR technique consists in finding the rate of return that discounts the cash inflows so that they exactly equal the discounted costs of the project.

The IRR can be found by iteration and is an especially suitable task for a computer. The internal rate of return r* is the solution of the equation

$$PVA(r^*,n) = 0, \text{ or}$$

$$PVB(r^*,n) = PVC(r^*,n)$$

where

$a_j = b_j - c_j$ = net cash benefit at end of year j.

b_j = cash benefits (cash received) generated at the end of year j.

c_j = investment costs paid out at the end of year j.

n = life of the investment project (years).

r* = internal rate of return.

In particular, c_0 and b_0 denote the cost and benefits at the end of the 0th period, or at the very <u>beginning</u> of the first period. Usually, $b_0 = 0$ so that the a_0 represents the total initial investment in the project, that is

$$a_0 = -c_0 .$$

In order that the above equation have a real solution for r^*, it is necessary that

(1) $PVA(r=0,n) > 0$; and

(2) $PVA(r_m,n) < 0$, for some r_m,

such that $0 < r^* < r_m$. The first condition implies that the cumulative sum of the cash benefits b_j must exceed the cumulative sum of investment costs c_j. There are projects which more than one solution r^* for the IRR. The value for r^* is called the "internal rate" or "yield" because it depends solely on costs and benefits associated with the project and not on any interest or other rate determined by conditions outside of the capital investment itself.

The discounted-cash-flow technique is preferred because of three primary considerations:

1. It makes the appropriate allowance for differences in the time at which investments are made and cash is generated.

2. It gives the true rate of return offered by a new project. The calculation of ROI in the DCF technique is based on the investment actually outstanding. The other measures merely given an approximation of the return, since they base their calculations either on the original investment or some average investment during the life of the project.

3. It gives figures which are meaningful in relation to those used throughout the financial world in quoting interest rates on borrowed funds, yields on bonds, etc. It thus permits direct comparisons of the projected return on investment with the cost of borrowed money or equity capital. The DCF technique is sometimes referred to as the "yield" method.

The discounted cash flow procedure can be seen to give the rate of return on the balance of the investment actually outstanding from time to time over the life of the project, as illustrated in Table 13.1. In this example the original investment is $30,000; the net cash flow shown in column 3 is $10,000 per year over the five-year lifetime of the project. Some part of this must be set aside to recover the original capital outlay over the five-year period, as shown in column 5. The remainder given in column 6 represents true earnings. The balance (undepreciated amount) of the original capital investment that has not yet been recovered at the beginning of each year is shown in column 7. The ROI or ratio of earnings to this outstanding investment is 19.857 percent throughout the life of the project. The present value of the net cash flow discounted at this rate is given in column 4. Note that the present value of the net cash flow over the five-year period equals the capital investment made in year 0. In this particular case the conventional procedure for computing a return on the original investment would have given a figure of 13.33 percent. A calculation based on the average investment over the life of the project would have given 26.67 percent assuming straight-line depreciation and zero salvage value in both cases.

13.4 DISCOUNTED CASH FLOW CALCULATION

The Discounted Cash Flow Routine ("DCF") calculates the following quantities:

$$(1)\quad PVA = \sum_{N=1}^{NTOTAL} PV(N)$$

$$(2)\quad PV(N) = A(N) \times PVF(N)$$

$$(3)\quad PVF(N) = 1/(1+PVRATE)^{N-1},$$

TABLE 13.1

Year	Capital Outlay	Cash Flow	Present Value (@19.857%)	Replacement of Investment	Available for Earnings	Investment Outstanding	Return on Investment
0	$30,000						
1	0	$10,000	$ 8,343	$ 4,043	$ 5,957	$30,000	19.857%
2	0	10,000	6,961	4,845	5,154	25,957	19.857%
3	0	10,000	5,808	5,808	4,192	21,111	19.857%
4	0	10,000	4,845	6,961	3,039	15,303	19.857%
5	0	10,000	4,043	8,343	1,657	8,343	19.857%
	$30,000	$50,000	$30,000	$30,000	$20,000	0	

Original Investment = $30,000

Life of Investment = 5 years

Annual Net Income after Taxes = $ 4,000

Annual Depreciation (straight-line) = $ 6,000

Annual Net Cash Flow = $10,000

Return on Original Investment $= \frac{\$\,4,000}{\$30,000} = 13.33\%$

Return on Average Investment $= \frac{\$\,4,000}{\$15,000} = 26.67\%$

Return by Discounted Cash Flow Method = 19.857%

R-3068

where

PVA = "discounted cash flow" or present value of the cash flow stream given by A(N), N=1,2, ... NTOTAL.

PV(N) = present value of the cash flow A(N) received at the end of the Nth time period.

PVF(N) = discount factor for the Nth time period.

The input variables to the DCF routine include:

A(N) = cash flow received at the end of the Nth time period (N = 1,2, ... NTOTAL).

PVRATE = discount rate per time period.

NTOTAL = total number of time periods to be processed (i.e., to be included in the summation);
NTOTAL = NPROJ+1, where
NPROJ = number of time periods in the projection (years in the reporting period).

YEARS(N) = integer designation for the Nth time period used to label column headings when listing present values.

The correspondence between the quantities calculated by the "DCF" routine and the variables in the present value expression,

$$PVA = \sum_{j=0}^{n} \frac{a_j}{(1 + r)^j} ,$$

is given by

A(N) = a_j where N = j+1

PVF(N) = $(1 + r)^{-j}$ where N = j+1

PVRATE = r

NTOTAL = n+1.

Note that N=1 corresponds to year 0, N=2, year 1, etc.

The model uses the "DCF" routine to calculate the present value of several "cash flows":

1. Discounted net cash flow, DNCG, where A(N) is the net cash generated in the Nth period; i.e., CASHG(N). Specifically,

$$DNCG = \sum_{N=1}^{NTOTAL} PVA(N) \text{ ,}$$

$$= CASHG(1) + \frac{CASHG(2)}{(1 + R)}$$

$$+ \ldots \frac{CASHG(NPROJ+1)}{(1+R)^{NPROJ}}$$

$$PVA(N) = CASHG(N) \times PVF(N) \text{ ,}$$

$$PVF(N) = 1/(1 + R)^{N-1} \text{ ,}$$

$$R = PVRATE.$$

   Note that the net cash generated as defined by the model includes equity additions, working capital additions, borrowing, and debt retirement, as well as all other cash inflows and outflows; moreover by convention for year 0, CASHG(1) = 0.

2. Discounted net income (book earnings), where A(N) is the net income after taxes reported for the Nth time period; i.e., NET(N).

3. Capitalized value of some accounting line item, where A(N) is the "savings" or "expenses" segregated according to user-specified instructions for special purpose reports.

13.5 PRESENT VALUE SPECIFICATION

The discount rate to be applied in calculating the present value of the net cash generated and other discounted cash flows is specified via the single namelist input variable:

PVRATE = annual discount rate (real) to be applied in present value calculations expressed as a decimal number (Default: PVRATE = 0.10).

Reports 18 and 40 list the discounted cash flow, the present value of the net cash generated each year PVCASH(N), and the discount factor PVF(N).

The present value for any given cash flow sequence can be obtained very simply without a standard run of the model. Two examples are given here.

1. To calculate the present value of a cash flow stream b_j (j=1,2, ... n) set REVB(j+1) = b_j:

   ```
   $INPUT

   NPROJ = 9, PRT18 = T, TAXR = 0.0,

   REVB(2) = 5., 10., 25., 40., 50., 50., 50., 25., 25.,

   PVRATE = 0.12,

   $END
   ```

2. To calculate the present value of a cash inflow b_j and a cash outflow c_j at a discount rate of 8 percent, set REVB(j+1) = b_j and REVA(j+1) = $-c_j$:

   ```
   $INPUT

   NPROJ = 9, PRT18 = T, TAXR = 0.0,

   REVB(2) = 5., 10., 25., 40., 3*50., 2*25.,

   REVA(1) = -100., -30., 0.0, -20.,

   PVRATE = 0.08,

   $END
   ```

The income tax rate TAXR is set to zero so that the "revenue from product B" REVB will flow through and become cash generated. Report 18 will then list the results of the calculation.

13.6 INTERNAL RATE OF RETURN CALCULATION

The Internal Rate of Return, routine ("IRR") calculates the discounted cash flow-rate of return, DCFROI, given as input variables

B(N) = Cash benefits received at the end of the Nth time period, N = 1,2, ... NTOTAL; it is assumed that B(1) = 0.0.

C(N) = Investment costs paid out at the end of the Nth time period, N = 1,2, ... NTOTAL.

DELIRR = Minimum difference from zero for the net present value acceptable in defining an approximate DCFROI solution.

RMAXRI = Maximum value tested for DCFROI.

The routine first calculates the difference between the cash inflows B(N) and cash outflows C(N) for N = 1,2, ... NTOTAL, where NTOTAL = NY+1. A binary search technique is then applied to derive a solution to the equation defining the internal rate of return R*,

$$PVA(R^*, NTOTAL) = 0,$$

where

$$PVA = A(1) + \sum_{N=2}^{NTOTAL} \frac{A(N)}{(1 + R^*)^{N-1}}$$

and

$$A(N) = B(N) - C(N).$$

The minimum value for R* is taken as zero. A solution may exist only if (1) the cumulative sum of the cash inflows B(N) exceeds the sum of the cash outflows C(N), that is

$$PVA(R^*=0, NTOTAL) > 0;$$

and (2) if when R* = RMAXRI, PVA(R* = RMAXRI, NTOTAL) < 0.

When these two conditions obtain, the routine finds an approximate solution, such that

$$|PVA(R^*, NTOTAL)| \leq DELIRR.$$

The output value R* = DCFROI is thus derived.

The "IRR" routine is used to compute the internal rate of return when two arrays are defined corresponding to cash benefits (inflow) and cash investments (outflow).

A second routine called "IRR1" is used to calculate the internal rate of return when only a single initial investment c_0 is made in year 0 and only one array A(N) is given defining the <u>net</u> cash generated for N = 2,3, ... NTOTAL. This routine derives a solution of the equation

$$-C0 + \sum_{N=2}^{NTOTAL} \frac{A(N)}{(1 + R^*)^{N-1}} = 0 .$$

Note the following conditions in this particular formulation:

$$A(1) = -C0$$

$$B(1) = 0$$

$$C(1) = C0$$

$$A(N) = B(N), \text{ for } N > 1.$$

The capital investment C0 is made at a single time, namely at the <u>end</u> of the 0th time period (year 0), (which is equivalent to the <u>start</u> of year 1). The net cash generated (which may be positive or negative) begins in year 1. These conditions are somewhat different from those assumed in the "IRR" routine, which accepts equity investments C(N) at the end of any time period — not just at the start of year 1.

The concepts of cash benefits and investment costs introduced above and used in the equations defining the internal rate of return will now be related to the quantities reported by the model. The Cash Flow model "CASHF" calculates the projection of CASHG, the net cash generated in the Nth time period, as the difference between cash inflows and cash outflows,

$$CASHG(N) = TSOF(N) - TAOF1(N) - ADWC(N),$$

where

$$\begin{aligned} TSOF(N) &= NET(N) + FDEP(N) + FITDEF(N) \\ &\quad + FDCIA(N) + MSOF(N) \\ &\quad + LTD(N) + STD(N) + ADEQ(N), \end{aligned}$$

$$\begin{aligned} TAOF1(N) &= CAPO(N) + FDCIX(N) \\ &\quad + MAOF(N) + LTDRCT(N) + STDRCT(N). \end{aligned}$$

The various sources of funds (cash inflows) contributing to TSOF and the applications of funds (cash outflows) contributing to TAOF1 are defined in Section 12. Specified additions to working capital, which are equivalent to a required investment in operations, are represented by ADWC. With the exception of the quantity ADEQ representing additions to equity, TSOF is seen to identify total "cash benefits" generated by the capital investment. On the other hand, the sum of TAOF1 and ADWC is seen to identify the total "investment costs" required. Hence, one can deduce the following relationship between "cash benefits" (B) and "investment costs" (C) and net cash generated as calculated by the model (CASHG) and equity investments (ADEQ); by definition,

$$B(N) \equiv TSOF(N) - ADEQ(N),$$

$$C(N) \equiv TAOF1(N) + ADWC(N);$$

the difference between cash inflow and cash outflow is thus,

$$\begin{aligned} A(N) &\equiv B(N) - C(N), \\ &= CASHG(N) - ADEQ(N). \end{aligned}$$

These equations illustrate the exact relationships between the primary quantities CASHG and ADEQ reported by the model and the three arrays A, B, and C that enter the internal rate of return calculation. Moreover, one observes that whenever only the difference A is required, identical results can be derived by simply taking CASHG as the "cash benefits" (B) and ADEQ as the "investment costs" (C), irregardless of the more complex nature of both of the actual variables represented by "B" and "C".

In summary, it has been demonstrated that to compute the internal rate of return

1. The "IRR" routine can be applied by specifying the two arrays

   B(N) = CASHG(N), and

   C(N) = ADEQ(N);

2. The "IRR1" routine can be applied by specifying the initial investment C(1) = C0, which is usually also equal to the first addition to equity ADEQ(1), and the array

   A(N) = CASHG(N).

The former method must be used whenever equity additions at times other than at the start of the project. Furthermore, it can be seen that adding equity, beyond the amount required to maintain a condition such that the cumulative net cash generated be at least equal to zero, will have no effect on the computation of the internal rate of return. The increase in ADEQ will be exactly balanced by the increase in CASHG.

13.7 DISCOUNTED CASH FLOW – ROI SPECIFICATIONS

The discounted cash flow – return on investment (DCFROI) or internal rate of return is calculated according to user specifications via the values assigned to the following namelist variables:

DROIN = Number (integer) of DCFROI calculations to be performed. The user may specify several different investment costs and/or different time spans in a single execution of the model in order to analyze the advantages of alternate strategies (Default: DROIN = 0).

DROIA(M) = Initial investment (real) in the project made at the end of year 0 on which the Mth DCFROI calculation is based. When a non-zero value is assigned to DROIA(M), only this original investment is considered and the "IRR1" routine is used to compute the DCFROI taking the CASHG array as the <u>net</u> cash inflow. If DROIA(M) = 0.0, then the sequence of investments is taken from the array ADEQ and the "IRR" routine is used to compute the DCFROI, taking CASHG as cash inflow (Default: DROIA(M) = 0.0).

DROIY1(M) = First year (integer) to be included in the cash flow span for the Mth DCFROI calculation (Default: DROIY1(M) = 1). This variable identifies the first operational year in which cash flow may occur using the convention of calling the years 0, 1, 2, ... Note that DROIY1(M) $\geq$ 1, since no cash can be generated from operations in year 0.

DROINY(M) = Total number (integer) of years to be included in the cash flow span desired for thw Mth DCFROI calculation. If a value is not assigned to this variable, the model will set DROINY(M) = NPROJ, i.e., the number of years in the reporting period.

DELIRR = Minimum difference (real) from zero for the net present value of cash benefits less investment costs acceptable in defining an approximate DCFROI solution (Default: DELIRR = 1.0).

RMAXIR = Maximum value (real) tested for DCFROI expressed as a decimal; e.g., RMAXIR = 2.0 corresponds to 200 percent (Default: RMAXIR = 4.0).

PRT18 = Logical variable to control printing Report 18, which lists details of the DCFROI calculation including (1) projections of the net cash generated; (2) present values of the net cash inflow, PVCASH(N); (3) the discount factors, PVF(N), at the discount rate PVRATE, and the discounted cash flow, PVA, for all discount rates tested, as well as projections of present values and discount factors at the DCFROI rate derived (Default: PRT18 = F).

ADEQ(N) = Equity investment (real) made at the end of the Nth time period; this array must be entered when the alternate form of the DCFROI calculation is to be applied. The value of the initial equity investment is assigned to ADEQ(1).

As described above, the user has the option of selecting either one of two procedures for the DCFROI calculation. In the first method, an initial investment is specified by assigning its value to DROIA. The "IRR1" routine then is applied to find the rate of return that will discount the series of net cash generated (CASHG) to a present value equal to this initial investment. This method represents the standard DCFROI approach. In the second method, values for all equity investments are assigned to the variable ADEQ; however, since this latter assignment is a basic input requirement for operation of the model, no additional specification is demanded. In either case, because of the application of default routines, the only values that usually must be supplied are those specifying DROIN and DROINY. Examples of specifications for DCFROI calculations are given below.

The first three examples illustrate the specifications that must be included in the complete set of input data requried to exercise the model in a standard run.

1. To derive the DCFROI for an initial investment of $10,000,000 over a 10, 15, and 20 year span (method 1):

   DROIN = 3, DROIA(1) = 3*10000.,

   DROIY1(1) = 3*1,

   DROINY(1) = 10, 15, 20,

2. To derive the DCFROI for an initial investment of $10,000,000 over a 10, 15, and 20 year span (method 2):

   DROIN = 3, ADEQ(1) = 10000.,

   DROINY(1) = 10, 15, 20,

3. To derive the DCFROI for a sequence of investments \$6,000,000, \$3,000,000, and \$1,000,000 made in year 0, 2, and 7 respectively, over a 10, 15, and 20 year span (method 2):

```
DROIN = 3,
ADEQ(1) = 6000., 0.0, 0.0, 3000., ADEQ(8) = 1000.,
DROINY(1) = 10, 15, 20.
```

The model also offers the facility to calculate the DCFROI without supplying a complete set of input data for a standard run. The net cash generated can be specified as sales revenue SREV and the income tax rate can be set equal to zero; as a consequence, all revenues will flow through and be identified as cash inflow.

4. To calculate the DCFROI given a sequence of cash inflows and an initial investment (see Table 13.1):

```
$INPUT
NPROJ = 5, TAXR = 0.0, PRT18 = T, DELIRR = 0.001,
SREV(2) = 10., 10., 10., 10., 10.,
DROIN = 1, DROIA(1) = 30.,
$END
```

5. To calculate the DCFROI given a sequence both of cash flows and cash investments:

```
$INPUT
NPROJ = 9, TAXR = 0.0, PRT18 = T,
SREV(1) = 0.0, 5., 10., 25., 40., 50., 50., 50.,
          25., 25.,
ADEQ(1) = 100., 30., 0.0, 20., ADEQ(10) = -50.,
ADWC(1) = 100., 30., 0.0, 20., ADWC(10) = -50.,
DROIN = 1
$END
```

6. To calculate the DCFROI given a sequence of capital investments during the construction period consisting of years 0 - 4 followed by a sequence of cash inflows during years 5 - 14 (this example is given in Steiner (1969), p. 381, Reference 2):

```
$INPUT
NPROJ = 14, TAXR = 0.0, PRT18 = T, DELIRR = 0.001,
```

```
ADEQ(1) = 0.0, 5., 10.5, 8., 110.,
ADWC(1) = 0.0, 5., 10.5, 8., 110.,
SREV(6) = 40., 40., 40., 55., 50., 45., 15.,
          5., 5., 5.,
DROIN = 1
$END
```

Samples of Report 18 generated for cases 4, 5, and 6 defined above are illustrated in Table 13.2.

TABLE 13.2

****** EXAMPLES OF DISCOUNTED CASH FLOW INTERNAL ROI DATE 112276 PAGE 8

***** INTERNAL RATE OF RETURN CALCULATION *****

INITIAL INVESTMENT	30.000	NO. OF YEARS = 5	MAXIMUM RATE = 4.0000 DEL = .001
CUMULATIVE INVESTMENT	30.000		
CUMULATIVE BENEFITS	50.000		
CUMULATIVE NET CASH FLOW	20.000		

TIME PERIOD	0	1	2	3	4	5	6	7
NET CASH BENEFITS LESS COSTS	.000	10.000	10.000	10.000	10.000	10.000		

M	INITIAL INVESTMENT	PRESENT VALUE OF NET CASH GENERATED	DIFFERENCE	INTERNAL RATE OF RETURN (%)
0	30.000	2.499	-27.601	400.000000
1	30.000	50.000	20.000	.000000
2	30.000	4.979	-25.021	200.000000
3	30.000	9.688	-20.313	100.000000
4	30.000	17.366	-12.634	50.000000
5	30.000	26.893	-3.107	25.000000
6	30.000	35.606	5.606	12.500000
7	30.000	30.748	.748	18.750000
8	30.000	28.713	-1.287	21.875000
9	30.000	29.702	-.298	20.312500
10	30.000	30.217	.217	19.531250
11	30.000	29.958	-.042	19.921875
12	30.000	30.087	.087	19.726563
13	30.000	30.022	.022	19.824219
14	30.000	29.990	-.010	19.873047
15	30.000	30.006	.006	19.848633
16	30.000	29.998	-.002	19.860840
17	30.000	30.002	.002	19.854736
18	30.000	30.000	-.000	19.857788

DCF - ROI OF $ 30.000 (FROM YEAR 1 OVER 5 YEARS) = 19.86 %

****** DISCOUNTED NET CASH FLOW AT THE RATE OF 19.858 % FOR 5 TIME PERIODS

TIME PERIOD	0	1	2	3	4	5
NET CASH GENERATED DURING THE PERIOD	.000	10.000	10.000	10.000	10.000	10.000
PRESENT VALUE OF NET CASH GENERATED	.000	8.343	6.961	5.808	4.845	4.043
DISCOUNT FACTOR (@19.858 %) =	1.000	.834	.696	.581	.485	.404

DISCOUNTED NET CASH FLOW (@ 19.858 %) = 30.000

****** EXAMPLES OF DISCOUNTED CASH FLOW INTERNAL ROI DATE 112276 PAGE 14

***** INTERNAL RATE OF RETURN CALCULATION *****

INITIAL INVESTMENT	100.000	NO. OF YEARS = 9	MAXIMUM RATE = 4.0000 DEL = 1.000
CUMULATIVE INVESTMENT	100.000		
CUMULATIVE BENEFITS	280.000		
CUMULATIVE NET CASH FLOW	180.000		

TIME PERIOD	0	1	2	3	4	5	6	7
INVESTMENT COSTS	100.000	30.000	.000	20.000	.000	.000	.000	.000
CASH BENEFITS GENERATED	.000	5.000	10.000	25.000	40.000	50.000	50.000	50.000
NET CASH BENEFITS LESS COSTS	-100.000	-25.000	10.000	5.000	40.000	50.000	50.000	50.000

TIME PERIOD	8	9	10	11	12	13	14	15
INVESTMENT COSTS	.000	-50.000						
CASH BENEFITS GENERATED	25.000	25.000						
NET CASH BENEFITS LESS COSTS	25.000	75.000						

N	INITIAL INVESTMENT	PRESENT VALUE OF NET CASH GENERATED	DIFFERENCE	INTERNAL RATE OF RETURN (%)
0	100.000	-4.476	-104.476	400.000000
1	100.000	280.000	180.000	.000000
2	100.000	-6.238	-106.238	200.000000
3	100.000	-3.896	-103.896	100.000000
4	100.000	13.987	-86.013	50.000000
5	100.000	59.582	-40.418	25.000000
6	100.000	124.222	24.222	12.500000
7	100.000	85.464	-14.546	18.750000
8	100.000	102.819	2.819	15.625000
9	100.000	93.691	-6.309	17.187500
10	100.000	98.137	-1.863	16.406250
11	100.000	100.448	.448	16.015625

DCF - ROI OF $ 100.000 (FROM YEAR 1 OVER 9 YEARS) = 15.02 %

****** DISCOUNTED NET CASH FLOW AT THE RATE OF 16.016 %. FOR 9 TIME PERIODS

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
NET CASH GENERATED DURING THE PERIOD	-100.000	-25.000	10.000	5.000	40.000	50.000	50.000	50.000
PRESENT VALUE OF NET CASH GENERATED	-100.000	-21.549	7.430	3.202	22.080	23.790	20.506	17.675
DISCOUNT FACTOR (@16.016 %) =	1.000	.862	.743	.640	.552	.476	.410	.353

TIME PERIOD	1984	1985
NET CASH GENERATED DURING THE PERIOD	25.000	75.000
PRESENT VALUE OF NET CASH GENERATED	7.617	19.698
DISCOUNT FACTOR (@16.016 %) =	.305	.263

DISCOUNTED NET CASH FLOW (@ 14.016 %) = .448

TICKER = .5400(SEC)

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***** INTERNAL RATE OF RETURN CALCULATION *****

INITIAL INVESTMENT	.000	NO. OF YEARS = 14	MAXIMUM RATE = 4.0000 DEL = .001
CUMULATIVE INVESTMENT	133.500		
CUMULATIVE BENEFITS	300.000		
CUMULATIVE NET CASH FLOW	166.500		

TIME PERIOD	0	1	2	3	4	5	6	7
INVESTMENT COSTS	.000	5.000	10.500	8.000	110.000	.000	.000	.000
CASH BENEFITS GENERATED	.000	.000	.000	.000	.000	40.000	40.000	40.000
NET CASH BENEFITS LESS COSTS	.000	-5.000	-10.500	-8.000	-110.000	40.000	40.000	40.000

TIME PERIOD	8	9	10	11	12	13	14	15
INVESTMENT COSTS	.000	.000	.000	.000	.000	.000	.000	
CASH BENEFITS GENERATED	55.000	50.000	45.000	15.000	5.000	5.000	5.000	
NET CASH BENEFITS LESS COSTS	55.000	50.000	45.000	15.000	5.000	5.000	5.000	

M	INITIAL INVESTMENT	PRESENT VALUE OF NET CASH GENERATED	DIFFERENCE	INTERNAL RATE OF RETURN (%)
0	.000	-1.644	-1.644	400.000000
1	.000	166.500	165.500	.000000
2	.000	-4.236	-4.238	200.000000
3	.000	-10.447	-10.447	100.000000
4	.000	-16.497	-15.497	50.000000
5	.000	-4.993	-4.993	25.000000
6	.000	32.416	32.415	12.500000
7	.000	7.980	7.980	18.750000
8	.000	.463	.463	21.875000
9	.000	-2.485	-2.485	23.437500
10	.000	-1.070	-1.070	22.656250
11	.000	-.319	-.319	22.265625
12	.000	.068	.068	22.070313
13	.000	-.126	-.126	22.167969
14	.000	-.029	-.029	22.119141
15	.000	.019	.019	22.094727
16	.000	-.005	-.005	22.106934
17	.000	.007	.007	22.100830
18	.000	.001	.001	22.103882
19	.000	-.002	-.002	22.105408
20	.000	-.001	-.001	22.104645

DCF - ROI OF $ .000 (FROM YEAR 1 OVER 14 YEARS) = 22.10 %

****** DISCOUNTED NET CASH FLOW AT THE RATE OF 22.105 % FOR 14 TIME PERIODS

TIME PERIOD	0	1	2	3	4	5	6	7
NET CASH GENERATED DURING THE PERIOD	.000	-5.000	-10.500	-8.000	-110.000	40.000	40.000	40.000
PRESENT VALUE OF NET CASH GENERATED	.000	-4.095	-7.042	-4.394	-49.484	14.737	12.069	9.884
DISCOUNT FACTOR (@22.105 %) =	1.000	.819	.671	.549	.450	.368	.302	.247

TIME PERIOD	8	9	10	11	12	13	14
NET CASH GENERATED DURING THE PERIOD	55.000	50.000	45.000	15.000	5.000	5.000	5.000
PRESENT VALUE OF NET CASH GENERATED	11.130	8.287	6.108	1.667	.456	.373	.305
DISCOUNT FACTOR (@22.105 %) =	.202	.166	.136	.111	.091	.075	.061

DISCOUNTED NET CASH FLOW (@ 22.105 %) = -.001

TICKER = .6304(SEC)

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SECTION 14

PIPELINE TRANSPORTATION SYSTEMS — REGULATED INDUSTRY MODEL

14.1 THROUGHPUT AND TARIFF SPECIFICATIONS

The primary namelist input variables provided by the model to specify transportation volume, revenues, and tariff projections are:

PMODE = Numeric (integer) code specifying the type of pipeline (Default: PMODE = 0).

- PMODE = 1 Liquid Petroleum Products Pipeline
- PMODE = 2 Crude Oil Pipeline
- PMODE = 3 Natural Gas Pipeline
- PMODE = 4 Coal Slurry Pipeline
- PMODE = 5 Fresh Water Pipeline
- PMODE = 6 Waste Water Pipeline

READP = Logical control option to link the model with the Pipeline Energy Program (PEP) (Default: READP = F).

LUNIT8 = Logical unit (integer) number for the datafile generated by the PEP program (Default: LUNIT8 = 8).

THRUM = Numeric (integer) code representing the mode (liquid or gas) and the corresponding unit of throughput (Default: THRUM = 0).

- THRUM = 0 Million barrels
- THRUM = 1 Million barrel-miles
- THRUM = 2 Thousand MMCF-miles of natural gas
- THRUM = 3 Thousand gallon-miles

THRUP(N) = Throughput (real) or annual transportation volume that can be supported by market demand and transported by the facility for the Nth time period in arbitrary units of volume-distance. While the units of throughput are arbitrary (e.g., bbls-mi, MMCF-mi, etc.) they must be consistent with the units selected for the tariff (THRUP(N) ≡ USALES(N)).

UPRICE(N) = Tariff (real) or unit price ($) per arbitrary volume-distance unit in the Nth time period.

SREV(N) = Transportation revenues (real) in the Nth time period ($).

MEXF = Product loss factor (real) expressed as a decimal fraction. The product loss expense for any year is calculated as the product of MEXF and the transportation revenues for that year; e.g., if MEXF = 0.025, then product losses would be calculated as 2.5 percent of transportation revenues.

In general, there are two different modes of operating the model for pipeline transportation systems, namely

1. Stand-alone operation (READP = F) in which all throughput and tariff (or revenue) projections are entered directly as input source data estimated by some independent means; and

2. linking the model (READP = T) with the Pipeline Energy Program (PEP), a fluid dynamics model representing the physical operation of liquid pipelines (petroleum products, crude oil, coal slurry, fresh water, and waste water).

In this latter case "linkage" between the model and PEP is accomplished by means of a datafile that is generated by an independent execution of PEP and processed by the model in a subsequent run. In short, the datafile is written as an output file from PEP and then read as an input file by the model. Identical routines for input and output are contained in the subroutine "IOSUBS"; the entry point for reading the datafile is "PEPIN", while the entry point for writing the datafile is "PEPOUT". The special revenue submodel for pipeline transportation systems is "P38REV"; this submodel calls the "PEPIN" routine and thereby acquires values from PEP for the throughput mode (THRUPM), throughput (THRUP), transportation revenues (SREV), energy usage (ENERGU), energy costs (ENERGC), energy wasted (ENERGS), segregated expense data (SEXA), and a header that identifies the PEP run that generated the datafile (IDPEP).

Throughput and energy usage projections are the primary data generated by PEP. All of the remaining variables such as revenues, energy costs, etc. are optional, inasmuch as they can usually be derived from these two key "unit" measures of throughput and energy usage. In particular, the user can <u>override</u> the transportation revenues and energy costs data supplied by PEP simply by entering UPRICE and UCOSTE data directly as namelist input source data; in such a way, the user can analyze many alternate economic conditions based on a single set of throughput and energy usage projections.

The mathematical relationship between the last three variables is

SREV(N) = THRUP(N)×UPRICE(N),

where

THRUP(N) = USALES(N).

The manner in which the user can control the operation of the model by means of his selection of input specifications for these three variables is discussed in Section 9.5 "Unit Sales and Unit Price Options", and illustrated in Table 9.1 "Decision Table for Unit Sales and Unit Price Options".

The tariff is the transportation revenue generated per unit volume transported a unit distance by the pipeline facility. The monetary unit used to express the tariff (dollars, thousands, millions, etc.) must be consistent with the units used to express all of the other accounting line items in the model. The tariff may be either calculated by the model itself or supplied explicitly by the user for each year of the reporting period (via UPRICE). In the latter case the general escalation table, ESC can be utilized to assist in generating a tariff projection.

The user has the option of allowing the model to determine the tariff. The namelist input variables that control this option are:

RBASEF = Logical control option that allows the user to have the tariff calculated by the model as that required for the rate of return on rate base not to exceed a user-specified value in a given year (Default: RBASEF = F).

RBMAX(N) = Maximum allowed rate of return on rate base for the Nth time period expressed in percent (Default: RBMAX(N) = 9.99×10^{31}).

The default condition describes a case in which there are no limits placed on the rate of return on rate base; in such a case the tariff (or revenues) must be supplied by the user. On the other hand, when values are assigned such as RBASEF = T and RBMAX(2) = 20 * 10.0, a tariff (or operating revenues) must still be supplied by the user; however, the model will not allow the rate of return to exceed the maximum allowable of 10 percent in this case. The manner in which the model reduces the tariff for each year of operations is as follows:

1. Operating income is calculated based on the revenues and/or tariff originally specified.
2. The rate of return on rate base is compared to the maximum allowable.
3. If the rate of return exceeds the maximum, revenues are reduced by an amount equal to the difference between the calculated and the maximum allowed operating income.
4. The above procedural steps are repeated until the rate of return on rate base equals the maximum specified.
5. The amount by which the original revenue projection must be reduced to satisfy this condition is reported as REVA in Report 10.

6. A "Tariff Constraint Factor" defined as the ratio of the calculated (actual) tariff to the original (nominal) tariff as specified or

   TARF(N) = 1.0 + REVA(N)/SREV(N),

   where SREV is the original revenue projection specified or calculated by the "P38REV" submodel and REVA is the (negative) revenue reduction.

Three special reports for pipeline transportation systems are available via the following namelist control options:

PRT08 = Logical variable to control printing Report 08 "Transportation Revenue, Throughput, and Energy Costs Model (PEP) Projection" (Default: PRT08 = F).

PRT35 = Logical variable to control printing Report 35 "Maximum Return on Rate Base Constraint Calculation" (Default: PRT35 = F).

PRT38 = Logical variable to control printing Report 38 "Capital Investment Planning and Energy Conservation Impact Projection" (Default: PRT38 = F).

14.2 OPERATING INCOME AND RATE BASE CALCULATIONS

For pipeline transportation systems there are two model options that control the application of specific regulatory agency definitions in the calculation of operating income and rate base. These are requested via the two namelist input variables:

ICC = Logical variable to control calculation of operating income and rate base according to rules of the Interstate Commerce Commission (ICC) (Default: ICC = F).

FPC = Logical variable to control calculation of operating income and rate base according to rules of the Federal Power Commission (FPC) (Default: FPC = F).

These two options are exclusive. If one is selected, the other is non-operable.

14.2.1 ICC Rate Base Specifications

According to the U. S. Interstate Commerce Commission (ICC) regulations for interstate "common carrier" pipelines, operating income is calculated by the model (under the ICC option) as

OPINC(N) = NET(N) + FITDEF(N),

where NET(N) and FITDEF(N) are the net income (book profits) after taxes and deferred income taxes, respectively, for the Nth time period.

The annual ICC Rate Base is calculated by the model using the following user-specified namelist input variables:

RBICO = ICC valuation (real) of the existing line or facilities for depreciation purposes prior to adding capital improvements or new construction ($) (Default: RBICO = 0.0).

RBICC = Total initial ICC property and equipment valuation (real) of the new facilities for depreciation purposes ($) (Default: RBICC = CAPO(1) + LTDFDX(1) + CAPCIX(1) + ADWC(1)).

RBICY1 = First year (integer) in the year which depreciation of the above valuation is to begin; the depreciation normally begins in the first year of operation of the new facility (Default: RBICY1 = 1).

RBICR = Annual ICC depreciation rate (real) expressed as a decimal. This is a composite rate established by averaging the dollar amounts of the various age groups (Default: RBICR = 1.0/CAPNYF(1)).

If the user desires that the model automatically reduce tariffs in order to maintain a condition such that the operating income does not exceed a specified percentage of the annual ICC rate base, the user must supply this ICC rate limit via the namelist input variable RBMAX defined previously.

The ICC rate base is reduced annually by the amount of accrued depreciation on a cumulative basis. Any capital additions in later year increase the rate base. For the Nth time period the ICC rate base can be expressed as

$$\mathrm{RBASE(N)} = \mathrm{RBIC0} + \mathrm{RBICC} + \sum_{J=2}^{N} \mathrm{CAPO(J)}$$

$$- \mathrm{RBICR} \times \left\{ \mathrm{RBICO} + \mathrm{RBICC} + \sum_{J=2}^{N-1} \mathrm{CAPO(J)} \right\}$$

where

$N \geq \mathrm{RBICY1} + 1$ and

CAPO(N) = additions to plant property and equipment in the Nth time period.

The total initial ICC valuation RBICC for a new facility is usually given as the total capital assets (equity investment plus long-term debt) required in year 0. Note that if the user specifies ICC = T, but does not supply information on the ICC valuation, first year, and depreciation rate, the model will calculate the default values defined above.

14.2.2 FPC Rate Base Specifications

According to the U. S. Federal Power Commission (FPC) regulations for natural gas pipelines, interest on debt as well as amortization of both financial and debt expenses and construction period interest and other related charges are not included as income deductions. Operating income is calculated (under the FPC option) as

$$\mathrm{OPINC(N)} = \mathrm{NET(N)} + \mathrm{INTEX(N)} + \mathrm{LTDAFX(N)} + \mathrm{CAPCIA(N)},$$

where NET is the net income after taxes, INTEX is the total interest charge on all borrowings, LTDAFX is the annual amortization of financial and debt expense, and CAPCIA is the annual amortization of construction interest and related expenses allowed during the construction period. If the user desires that the model should reduce the tariffs so that the operating income does not exceed a specified percentage of the FPC base, the user must assign a value to RBMAX.

Since interest is not an allowable income deduction under FPC rules, the capital structure of a gas pipeline has a critical bearing on the amount of income and ROI that can be generated. A highly leveraged capital structure will result in a much smaller net income after taxes, when the operating income reaches its maximum allowed as a percentage of the rate base. Since the ROI involves net income and not operating income, a less leveraged structure with reduced interest charges will increase the ROI for a given return on rate base.

The annual FPC Rate Base is calculated by the model using the following namelist input variables:

ADWC(N) = Additions (real) to working capital required to maintain normal operations in the Nth time period.

FILL = Value (real) of the gas line fill to be used in the rate base calculation ($); this value is assumed to be uniform over the projection period.

The specifications for capital outlays supply the remaining input source data required for the calculation.

The FPC rate base for the reporting period is computed as the sum of:

1. The undepreciated capital balance (book value) at the start of the period.

2. One-half of the capital outlays less one-half of the financial depreciation for the period.

3. The cumulative sum of required working capital additions for all periods up to and including the current period.

4. The user-specified value of line fill.

The rate base for the Nth time period may be expressed as

$$RBASE(N) = CAPEN(N-1) + 0.5 \times \{CAPO(N) - FDEP(N)\} + \sum_{J=1}^{N} ADWC(J) + FILL ,$$

where the undepreciated capital property, plant and equipment account as the start of the period is

$$CAPEN(N-1) = \sum_{J=1}^{N-1} \{(CAPO(J) - FDEP(J)\} ,$$

FDEP(N) is the financial depreciation in the Nth period, CAPO(N) is the total capital outlay for the Nth period, ADWC(N) is required addition to working capital in the Nth period, and FILL is the line fill.

Since additions to working capital affect the FPC rate base, it is critical that the user control the model in such a manner that excess cash generated will not go into the cash account and thereby increase the working capital beyond the specific requirements of the business. This can be conveniently accomplished via the model control options REINVF and PAYDIV as discussed in Section 12, "Model Options Regarding Control of Net Cash Generated". In particular, setting REINVF = T will cause the model to accrue all excess cash generated in a special investment account which is not included among "current assets" and so does not affect working capital. Note that under the default conditions (REINVF = F and PAYDIV = F) all excess cash will be allocated to the "cash" account and thereby increase working capital. Some other selection of these control options must be made in order to simulate the economic operation of a gas pipeline under FPC regulations.

14.3 ENERGY CONSERVATION IMPACT

Energy conservation impact projections are generated by the Energy Conservation Impact Model "P38REV" utilizing the following namelist input variables:

ENERGM = Numeric code (integer) representing the mode and corresponding unit of energy consumption (Default: ENERGM = 0).

ENERGM = 0 1000 kilowatt-hours of electric energy

ENERGM = 1 1,000,000 cubic feet (MMCF) of natural gas

ENERGM = 2 1000 barrels of diesel oil

ENERGU(N) = Energy usage (real) in the Nth time period in units specified by ENERGM.

ENERGC(N) = Energy costs (real) in the Nth time period ($); energy costs are included in segregated expenses — type C and reported as such in the profit and loss report.

ENERGW(N) = Energy wasted (real) in the Nth time period in units specified by ENERGM.

ENERGS(N) = Cost of energy wasted (real) in the Nth time period ($).

UCOSTE(N) = Unit cost (real) of energy consumed in the Nth time period (Default: UCOSTE(N) = 0.0).

At the option of the user, the unit of cost of energy UCOSTE can be escalated via the namelist variable ESC, the general escalation factor. The relationship between the above variables can be expressed as

$$ENERGC(N) = UCOSTE(N) \times ENERGU(N),$$

$$ENERGS(N) = UCOSTE(N) \times ENERGW(N).$$

The basic rules governing the calculation of the energy variables are:

1. If ENERGU, ENERGW and UCOSTE are specified via namelist input or generated by the "P38REV" submodel, then ENERGC and ENERGS are calculated, irregardless of any values originally assigned to these two variables or generated by the submodel.

2. If ENERGU and ENERGC are specified or generated by the "P38REV" submodel, but UCOSTE is <u>not</u> given, then UCOSTE is calculated by

   UCOSTE(N) = ENERGC(N)/ENERGU(N).

In short, whenever UCOSTE is specified, then ENERGC and ENERGS are calculated or readjusted; when UCOSTE has not been specified, it is calculated.

The variables ENERGU, ENERGC, ENERGW, ENERGS, and UCOSTE are reported as line items in Report 38, "Capital Investment Planning and Energy Conservation Impact Projection" along with the present value of energy costs and the present value of energy wasted.

SECTION 15

PROGRAM/SUBPROGRAM LINKAGES

The JFM model (version #6 111976) software is comprised of 32 program units totaling over 7700 lines of symbolic source code. There is one main program, 27 subprograms, and four PDP elements. A synopsis of these program units is presented in Table 15.1 under the four sections:

1. Directory of JFM Program Units
2. Program/Subprogram Linkages
3. FORTRAN Procedure Table
4. Directory of JFM Reports

The first section gives a directory of all JFM program units. The main JFM program listing is followed by three PDP elements, which define the data bases on which the model operates. The next item (0.4) is a FORTRAN PROC ("REF") that contains Table 15.1. The twelve major submodels in JFM are listed as 1.0, 2.0, ... 12.0; related routines are grouped with one of these major submodels.

The second section of Table 15.1 presents the interfaces or linkages between all of the 28 program units in the model. The table illustrates that a program unit, which is separately compiled, may contain more than one routine. Both the subroutines which call a given routine and the subroutines which are called by the routine itself are indicated. The name of each subprogram unit is listed under the title "LINK" in the second column. The individual routines within a given subprogram unit are named after their corresponding "entry points" which are listed in the first column. The routine which calls a given subroutine (entry point) is listed in the last column under "CALLED BY". The third column titled "EXTERNAL REFERENCES" lists the routine (entry points) called by the routine named in column 1. For example, the Capital Outlays Model "CAP" calls the subprogram "TAXCR"; "CAP" itself is called by the main program "JFM". If a program unit uses a labeled common block to transmit arguments, the name of the corresponding common block is given in parentheses. Specifications for all of the labeled common blocks (JFMDB, P38DB, and P81COM) are given in the FORTRAN PROCS listed in the third section of the table under FORTRAN PROCEDURE TABLE.

The following UNIVAC 1108 assembly language routines, which reside in the S^3 system library, are also utilized by the model:

1. S3XOPT
2. S3DAY1
3. S3DAY2
4. S3DAY3
5. S3ETIM
6. S3TICK
7. S3MOVE
8. S3SET
9. S3MCHR
10. S3DINP
11. BLOCKA
12. NS3CSF
13. NS3ELT
14. NS3PF

These routines provide required utility functions, such as acquiring the run time and date, monitoring the execution time for selected parts of the model, manipulating characters in formatting headings and titles, setting up block printing, interactive communication facilities, accessing program file contents, etc.

Finally, a directory of JFM reports is given in the fourth section of the table. The routine which generates each report is listed in the first column.

```
REF   PROC
C     ****************************************************************
C
C          S Y S T E M S,   S C I E N C E   A N D   S O F T W A R E
C
C     ****************************************************************
C
C          J F M   F I N A N C I A L   P R O J E C T I O N   M O D E L
C
C     ****************************************************************
C
C     ******     DIRECTORY OF JFM PROGRAM UNITS     ******
C
C     ****************************************************************
C
C     PROGRAM    TITLE                                            SOURCE
C     UNIT                                                        LINES
C     *******    *****                                            ******
C
C 0.0 JFM        MAIN PROGRAM                                     134
C
C 0.1 PROCS      JFM FINANCIAL DATA BASE                          433
C
C 0.2 PROCSP     PIPELINE DATA BASE                               117
C
C 0.3 PROCBI     SALES TRANSACTION DATA BASE                      46
C
C 0.4 REF        JFM REFERENCE PROC                               280
C
C 1.0 EDIT       DATA EDITING MODEL                               245
C
C 1.1 GETDCF     SPECIAL ROUTINE FOR DCF CALCULATIONS             58
C
C 1.2 MPAY       MORTGAGE PAYMENT CALCULATOR                      129
C
C 1.3 BLOCKI     SET UP OFF-LINE PRINTING                         26
C
C 1.4 NTABS      SET UP ALTERNATE PRINT FILE                      2
C
C 1.5 PFRWS      PROGRAM FILE READER/WRITER UTILITY PROCESSOR     551
C
C 2.0 REVMOD     REVENUE/EXPENSE MODEL                            218
C
C 2.1 P3BREV     PIPELINE REVENUE MODEL                           195
C
C 2.2 IOSUBS     IO ROUTINES FOR LINKING WITH PEP MODEL           202
C
C 2.3 PBIREV     SALES TRANSACTIONS MODEL                         385
C
C 3.0 CAP        CAPITAL OUTLAYS MODEL                            513
```

```
C
C 4.0 DEBTS        DEBT MODEL                                            432
C
C 5.0 TAX          TAX MODEL                                             392
C
C 5.1 TAXCR        UNUSED INVESTMENT TAX CREDITS MODEL                    37
C
C 6.0 PAL          PROFIT & LOSS MODEL                                   103
C
C 7.0 CASHF        CASH FLOW MODEL                                       457
C
C 8.0 BALS         BALANCE SHEET MODEL                                   200
C
C 9.0 RBASES       REGULATED INDUSTRY MODEL                              197
C
C10.0 IRROI        DCF INTERNAL RATE OF RETURN MODEL                     117
C
C10.1 DCF          DISCOUNTED CASH FLOW - INTERNAL ROI MODEL             316
C
C11.0 TOTALS       FINANCIAL ANALYSIS MODEL                              309
C
C11.1 TOT38        REGULATED INDUSTRY ANALYSIS MODEL                     205
C
C12.0 REPORT       REPORT GENERATOR                                      751
C
C12.1 RPTYRS       TIME PERIOD RE-FORMAT ROUTINE                         100
C
C12.2 FMHEAD       JFM HEADER & TITLE/RUN TIMER                           95
C
C12.3 PHEAD        PIPELINE ECONOMIC MODEL HEADER & TITLE                 76
C
C12.4 RPT38        REGULATED INDUSTRY REPORT                             434
C
C                                                                       ****
C
C     TOTAL SYMBOLIC LINES                                              7755
C
C     ******************************************************************
C     ******************************************************************
C
C              PROGRAM/SUBPROGRAM LINKAGES
C
C     ******************************************************************
C
C     ENTRY POINT      EXTERNAL REFERENCES                       CALLED BY
C     TABLE            (COMMON BLOCKS)
C     ***********      *******************                       *********
C
C     NAME      LINK
C
C     BALS      BALS      (JFMOB)                                JFM
C
C     BLOCK1    BLOCK1    NS3CSF, BLOCKA                         EDIT
C
```

```
C       CAP       CAP       TAXCR (JFMDB)                                 JFM
C
C       CASHF     CASHF     (JFMDB)                                       JFM
C
C       DCF       DCF                                                     IRROI
C
C       DCFO      DCF
C
C       IRR       DCF                                                     IRROI
C
C       IRRI      DCF                                                     IRROI
C
C       DEBTS     DEBTS     (JFMDB)                                       JFM
C
C       LTDS      DEBTS     (JFMDB)                                       JFM
C
C       STDS      DEBTS     (JFMDB)                                       JFM
C
C       EDIT      EDIT      S3XOPT, S3DAYI, S3ETIM, BLOCKI, FMHEAD        JFM
C                           REVMH, REVMOD
C                           MPAY,GETDCF,PFRWS (JFMDB, P38DB)
C                                                                         /
C       FMHEAD    FMHEAD    S3DAY3, S3ETIM, S3SET, S3MOVE                 REVMOD
C                           S3TICK
C
C       STITLE    FMHEAD                                                  REPORT
C
C       STIME     FMHEAD                                                  JFM
C
C       SCTIME    FMHEAD                                                  JFM
C
C       SYTIME    FMHEAD                                                  JFM
C
C       GETDCF    GETDCF    DCF, IRR, IRRI                                EDIT
C
C       IOSUBS    IOSUBS    NS3CSF, S3ETIM, S3DAYI, S3MCHR
C
C       PEPOUT    IOSUBS                                                  PEP
C
C       PEPIN     IOSUBS                                                  P38REV
C
C       IRROI     IRROI     DCF, IRR IRRI (JFMDB)                         JFM
C
C       JFM       JFM       EDIT, CAP, LTDS, STDS, PAL, CASHF,            FORMAINS
C                           BALS, RBASES, IRROI, STIME, SCTIME
C                           RPT01, RPT10, RPT20, RPT30,  RPT40
C                           RPT38, EXIT (JFMDB, P38DB)
C
C       MPAY      MPAY      S3DINP                                        EDIT
C
C       NTABS     NTABS
C
C       PAL       PAL       TAX (JFMDB)                                   JFM
C
```

```
C     PFRWS     PFRWS     NS3PF, NS3ELT, S3SET, S3MOVE             EDIT
                          S3TICK, S3DAY1, S3DAY2, S3ETIM

C     PHEAD     PHEAD     S3DAY3, S3ETIM, S3SET, S3MOVE            RPT38
C                         S3TICK
C
C     PTITLE    PHEAD                                              RPT38
C
C     PTIME     PHEAD
C
C     REVMOD    REVMOD    P00REV, P38REV, P81REV(JFMDB, P38DB)     EDIT
C
C     P38REV    P38REV    PEPIN, STITLE, S3MOVE (JFMDB, P38DB)     REVMOD
C
C     REVMH     P38REV    S3MOVE                                   EDIT
C
C     P00REV    P38REV                                             REVMOD
C
C     P81REV    P81REV    (JFMDB, JFMDB8)                          EDIT
C
C     RBASES    RBASES    S3MOVE (JFMDB, P38DB)                    JFM
C
C     REPORT    REPORT    STITLE (JFMDB)                           JFM
C
C     RPT01     REPORT                                             JFM
C
C     RPT10     REPORT    TOT10                                    JFM
C
C     RPT20     REPORT    TOT20                                    JFM
C
C     RPT30     REPORT    TOT30                                    JFM
C
C     RPT40     REPORT    TOT40                                    JFM

C     RPT38     RPT38     TOT38, PTITLE (JFMDB, P38DB)             JFM
C
C     RPTYRS    RPTYRS    S3SET, S3MOVE                            REPORT, RPT38
C
C     TAX       TAX       TAXCR (JFMDB)                            PAL

C     TAXCR     TAXCR     (JFMDB)                                  TAX
C
C     TOTALS    TOTALS    (JFMDB)
C
C     TOT10     TOTALS    (JFMDB)                                  RPT10

C     TOT20     TOTALS    (JFMDB)                                  RPT20
C
C     TOT30     TOTALS    (JFMDB)                                  RPT30
C
C     TOT40     TOTALS    (JFMDB)                                  RPT40

C     TOT38     TOT38     DCF (JFMDB, P38DB)                       RPT38
C
```

```
C      ****************************************************************
C
C
C      FORTRAN PROCEDURE TABLE
C
C      ****************************************************************
C
C      NAME      LINK
C
C      JFMCOM    PROCS
C
C      JFMDBD    PROCS
C
C      P38COM    PROCSP
C
C      P38DBD    PROCSP
C
C      JFMDB8    PROCBI
C
C      REF       REF
C
C      ****************************************************************
C
C      ******     DIRECTORY OF JFM REPORTS     ******
C
C      ****************************************************************
C
C      PRINTED   REPORT     TITLE
C      BY        NO.
C      ROUTINE
C
C      RPT01     01     FINANCIAL ACCOUNTING REPORTS, TITLES, AND LINE ITEMS
C
C      EDIT      02     DATA BASE - NAMELIST INPUT
C
C      CAP       04     CAPITAL OUTLAY SPECIFICATIONS AND TAX DEPRECIATION
C                       PROJECTION
C
C      DEBTS     05     LONG-TERM DEBT SPECIFICATIONS AND INTEREST,
C                       RETIREMENT PAYMENTS, AND DEBT BALANCE SCHEDULES
C
C      P38REV    08     REVENUE AND EXPENSE MODEL PROJECTION
C
C      TAX       12     APPLICATION OF TAX LOSSES AND INVESTMENT CREDITS
C
C      CASHF     16     AUTOMATIC SHORT-TERM DEBT BORROWING SCHEDULE
C
C      DCF       18     DISCOUNTED CASH FLOW - RETURN ON INVESTMENT
C
C      RBASES    35     RETURN ON RATE BASE CONSTRAINT CALCULATION
C
C      RPT38     38     CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION
C                       IMPACT PROJECTION
C
```

```
C       RPT10    10    STATEMENT OF INCOME - PROFIT & LOSS PROJECTION
C
C       RPT20    20    STATEMENT OF CHANGES IN FINANCIAL POSITION -
C                      CASH FLOW PROJECTION
C
C       RPT30    30    STATEMENT OF FINCANCIAL POSITION -
C                      BALANCE SHEET PROJECTION
C
C       RPT40    40    CAPITAL INVESTMENT PLANNING AND FINANCIAL PERFORMANCE
C                      MEASURES
C
C       PRT80    80    PURCHASE AND SALE OF ASSETS
C       ************************************************************************
 END
```

SECTION 16

EXAMPLES OF INPUT DATA AND OUTPUT REPORTS FOR BASE CASES

16.1 PETROLEUM PRODUCTS PIPELINE REFERENCE SYSTEM — BASE10

The first base case represents a newly-constructed petroleum products pipeline operating under ICC regulations. Throughput, transportation revenues, and energy cost figures are entered explicitly as source data. The financial structure is highly leveraged with equity contributing only 10 percent of the initial capital. After operations commence, all excess cash generated is left to accumulate in an internal investment account, but no net return is assumed on these funds; also, no cash dividends are paid. There is a series of fifteen capital outlays made. The double-declining balance method with switchover to straightline in year 11 is used for the tax depreciation of the first two capital outlays; straightline depreciation is used for the remaining outlays.

This example represents a case in which all source data are entered as namelist input, which is given as the symbolic element P.BASE10. Twenty year projections are illustrated in Reports 10, 20, 30, and 38. The throughput mode THRUM = 1 corresponding to a unit of one thousand barrels.

16.2 PETROLEUM PRODUCTS PIPELINE REFERENCE SYSTEM LINKED WITH PEP DATAFILE PROD1 — BASE1

This example is based on the same products pipeline reference system as in BASE10; capital outlays and debt specifications have not been changed. However, the PEP program has been exercised in order to generate values for throughput, revenues, energy usage, energy costs, and energy wasted due to the dissipation of excess pressure produced by the constant velocity pumps installed at pumping stations along the line. The throughput mode in this case is THRUM = 1 corresponding to a unit of 10^6 barrel-miles. The revenue/expense model PEP has thus been linked to JFM. The source data is listed as P.BASE1. Reports 8 and 38 are illustrated.

16.3 NATURAL GAS REFERENCE SYSTEM – BASE310

This example represents a natural gas pipeline. All source data has been entered as namelist input, which is listed as symbolic element P.BASE310. Reports 10, 20, 30, and 38 are illustrated. FPC rules have been applied in calculating operating income and the rate base. A maximum of 10 percent has been taken as the limit on the allowable return on rate base. The initial equity required has been computed by specifying that the capital structure during the construction period should be 40 percent equity and 60 percent long-term debt. Excess funds are reinvested at a net return of 6 percent; dividends equal to 100 percent of net profits are paid out each year. Only initial values have been specified for (1) the nominal tariff or unit transportation charge UPRICE and (2) the unit cost of energy UCOSTE. Escalation tables are used to calculate subsequent values of these source variables.

```
****  PRODUCTS PIPELINE SYSTEM     BASELINE CASE  BASE10                                    DATE 112376       PAGE    21
MASSO-J.P.BASE10
          $INPUT
          PMODE=1,NPROJ=20,READO=F,ICC=T,RBASEF=T,RBMAX=10.,PRT08=T,AUTO8=T,THRUPM=0,
          PRT38=T,PRT01=F,PRT10=T,PRT20=T,PRT30=T,
          AUTO8=T,PAYDIV=F,REINVF=T,REINVR=0.0,TAXR=0.5
          ENERGC(1)=0., 356., 748., 2179., 2562., 2984., 3467.,
                    3979., 4582., 5226., 5808., 6511., 7404.,
                      8329., 9352., 10467., 11671., 13055., 14691., 15095.,15499.,
          THRUP(1)=0.0,54093.,55174.86,80738.,83957.52,87326.25,90819.3,
          THRUP(8)=94452.145,98230.26,102159.485,105224.390,108383.91,
          THRUP(13)=111632.33,114981.57,118430.82,121983.73,
          THRUP(17)=125643.22,129412.575,133295.030,137293.655,141412.315,
                    94452.145,98230.26,102159.485,
          SREV(1)=0.0,24666.335,52332.096,72493.035,70338.522,71097.519,
          SREV(7)=73995.166,72893.631,81673.996,85887.419,85384.959,
          SREV(12)=87967.046,86185.024,85201.588,84743.608,84151.556,
          SREV(17)=81786.732,80747.746,81280.020,80643.386,79780.418,
          OMEX(1)=0.0,623.,1304.,1500.,1613.,1759.,1838.,1921.,2045.,2142.,2279.,
          OMEX(12)=2444.,2545.,2752.,2940.,3163.,3361.,3503.,3652.,3766.,3885.,
          GAEX(1)=0.0,1175.,2481.,2604.,2743.,2843.,2943.,3057.,3190.,
          3315.,3450.,3683.,3733.,3887.,4055.,4225.,4391.,4566.,4749.,4942.,
          5144.,
          TOFIT(2)=2058.,4447.,4700.,5009.,5259.,5529.,5843.,6265.,6620.,
                7022.,7382.,7835.,8296.,8820.,9327.,9795.,10285.,10799.,11339.,
                11906.,
          LTON=6,
          LTOA(1)=127126.35,  127126.35,  7205.4,  7443.9,  4811.4, 6213.6,
          LTOY(1)=0,   0,   2,  8,   12,   14,
          LTONYR(1)=13,13,15,15,15,15,
          LTOYR1(1)=3,3,2,8,12,14,
          LTORM(1)=1,1,1,1,1,1,
          LTOPER(1)=0.10,0.1,.1,.1,.1,.1,
          LTOY1(1)=1,2,2,8,12,14,
          LTOFX(1)=9372.5,9372.5,
          LTOXY1(1)=1,2,1,1,1,1,
          LTONYA(1)=15,15,15,15,15,15,
          CAPN=15,
          CAPA(1)=127803.5, 127803.5, 8006., 1955., 4652.,
          CAPA(6)=451.,2378.,8271.,2775.,4561.,
          CAPA(11)=532.,5346.,4414.,6904.,4319.,
          CAPY(1)=0,0,2,3,4,6,7,8,9,10,11,12,13,14,15,
          CAPY1(1)=1,2,3,4,5,7,8,9,10,11,12,13,14,15,16,
          CAPNYF(1)=36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36,
          CAPNYT(1)=22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22,
          CAPTOM(1)=3,3,1,1,1,1,1,1,1,1,1,1,1,1,1,
          CAPTOR(1)=.114,.114,.0455,.0455,.0455,.0455,.0455,.0455,.0455,.0455,
          0.0455,.0455,.0455,.0455,.0455,
          CAPTSY(1)=11,11,
          CAPCIM(1)=0.0,
          CAPTCA(1)=127803.5, 127803.5, 8006., 1955., 4652.,
           451.,2378.,8271.,2775.,4561.,532.,5346.,4414.,6904.,4319.,
          CAPTCR(1)=0.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,
          CAPTY(1)=0,0,2,3,4,6,7,8,9,10,11,12,13,14,15,
          CAPTY1(1)=0,0,2,3,4,6,7,8,9,10,11,12,13,14,15,
```

Figure 16.1 BASE10

```
ADWC(1)=6151.,
ADER(1)=28250.3,
PVRATE=0.10,
RBICC=282503.,RBICYI=1,RBICO=0.0,RBICYO=1,RBICR=0.0275,FILL=0.0
DROIN=3,DROIA(1)=28250.3,28250.3,DROIYI(1)=1,1,DROINY(1)=10,15,20,
DROIA(3)=28250.3,DROIYI(3)=1,
LF(3)=F,LF(12)=F,F,F,T,LF(56)=5*F,LF(71)=6*F,
LF(6)=F,F,F,F, LF(66)=F,LF(68)=F,LF(80)=F,LF(82)=2*F,
&END
```

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@XQT JFM

JFM FINANCIAL PROJECTION MODEL    ****    ON-LINE         TODAY IS 11/23/76         11:13:03
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SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 23, 1976 11113:09 #6 111976
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME **** PROFIT AND LOSS PROJECTION ****

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
REVENUES								
NET SALES AND OPERATION REVENUES	.000	24665.335	52332.096	72493.036	70338.522	71077.519	73995.166	72893.631
SALES - PRODUCT A	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS REVENUE	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL REVENUE	.000	24665.335	52332.096	72493.036	70338.522	71077.519	73995.166	72893.631
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	.000	623.000	1304.000	1500.000	1613.000	1759.000	1838.000	1921.000
GENERAL AND ADMINISTRATIVE EXPENSES	.000	1175.000	2481.000	2604.000	2743.000	2840.000	2943.000	3057.000
SEGREGATED EXPENSES - TYPE C	.000	356.000	768.000	2179.000	2562.000	2984.000	3467.000	3979.000
MISCELLANEOUS EXPENSES	.000	.000	.000	.000	.000	.000	.000	.000
TAXES, OTHER THAN FEDERAL INCOME	.000	2058.000	4447.000	4700.000	5009.000	5259.000	5529.000	5843.000
COSTS, EXCL DEPREC & INTEREST	.000	4212.000	9000.000	10983.000	11927.000	12842.000	13777.000	14800.000
GROSS OPERATING INCOME	.000	20454.335	43332.096	61510.036	58411.522	58235.519	60218.166	58093.631
INTEREST EXPENSES	.000	12712.635	26145.810	26097.774	24093.948	22090.122	20086.296	18082.470
FINANCIAL DEPRECIATION	.000	3550.097	7100.194	7322.583	7376.889	7506.111	7506.111	7518.639
AMORTIZATION OF FINANCIAL EXPENSES	.000	624.833	1249.667	1249.667	1249.667	1249.667	1249.667	1249.667
TOTAL EXPENSES	.000	21099.565	43495.670	45653.023	44647.503	43687.899	42619.073	41650.775
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	.000	3566.770	8836.426	26840.0[illegible]4	25691.020	27389.620	31376.093	31242.855
INCOME TAXES								
TAX DEPRECIATION	.000	14569.599	27478.264	24710.025	22023.553	19776.201	17597.512	15687.714
TAXABLE INCOME	-18745.000	-6827.899	-10291.977	10702.249	12294.022	16369.197	22534.358	24323.447
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	-18745.000	-25572.899	-35864.875	-25162.627	-12868.605	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	-10702.249	-12294.022	-12868.605	.000	.000
INVESTMENT TAX CREDIT	25560.700	.000	800.600	195.500	465.200	.000	45.100	237.600
UNUSED INVESTMENT TAX CREDITS	12971.101	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	.000	25560.700	25560.700	26361.300	26556.799	27021.999	26146.852	20558.362
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	.000	.000	875.148	5633.590	6080.862
CURRENT INCOME TAX	.000	.000	.000	.000	.000	875.148	5633.590	6080.862
DEFERRED INCOME TAX	9372.500	5157.334	9564.201	8068.832	6698.499	5510.212	4420.867	3459.704
TOTAL INCOME TAX	9372.500	5157.334	9564.201	8068.832	6698.499	6385.360	10054.457	9540.566
NET INCOME (BOOK PROFIT)	-9372.500	-1630.565	-727.776	18771.131	18992.521	21004.260	21321.636	21702.290

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS   ENERGY CONSERVATION STUDY

DATE   NOVEMBER 23, 1976   11:13:09   #6   111976
RUN ID   THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10   CONSOLIDATED STATEMENT OF INCOME   •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
REVENUES								
NET SALES AND OPERATION REVENUES	81673.996	85887.419	85384.969	87987.048	86185.024	85201.588	84743.608	84151.656
SALES - PRODUCT A	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS REVENUE	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL REVENUE	81673.996	85887.419	85384.969	87987.048	86185.024	85201.588	84743.608	84151.656
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	2045.000	2142.000	2279.000	2444.000	2545.000	2752.000	2940.000	3163.000
GENERAL AND ADMINISTRATIVE EXPENSES	3190.000	3315.000	3450.000	3683.000	3733.000	3887.000	4055.000	4225.000
SEGREGATED EXPENSES - TYPE C	4582.000	5226.000	5688.000	6611.000	7404.000	8329.000	9362.000	10467.000
MISCELLANEOUS EXPENSES	.000	.000	.000	.000	.000	.000	.000	.000
TAXES, OTHER THAN FEDERAL INCOME	6265.000	6620.000	7022.000	7382.000	7835.000	8296.000	8820.000	9329.000
COSTS, EXCL DEPREC & INTEREST	16082.000	17303.000	18639.000	20120.000	21517.000	23264.000	25167.000	27184.000
GROSS OPERATING INCOME	65591.996	68584.419	66745.969	67867.048	64668.024	61937.588	59576.608	56967.656
INTEREST EXPENSES	16823.034	14769.583	12716.131	10662.679	9090.367	7004.839	5540.671	3413.719
FINANCIAL DEPRECIATION	7584.694	7814.444	7891.528	8018.222	8033.000	8181.500	8304.111	8495.889
AMORTIZATION OF FINANCIAL EXPENSES	1249.667	1249.667	1249.667	1249.667	1249.667	1249.667	1249.667	1249.667
TOTAL EXPENSES	41739.395	41136.693	40496.325	40050.567	39890.033	39700.005	40261.448	40343.274
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	39934.602	44750.727	44688.645	47936.481	46294.991	46501.583	44482.160	43808.383
INCOME TAXES								
TAX DEPRECIATION	14085.650	12946.688	11730.402	7985.924	8010.130	8253.373	8454.209	8768.341
TAXABLE INCOME	34683.312	40868.149	42299.437	49218.446	47567.528	46679.376	45581.728	44785.596
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	.000	.000	.000
INVESTMENT TAX CREDIT	827.100	277.500	456.100	53.200	534.600	441.400	690.400	431.900
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	1744.200	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS APPLIED THIS YEAR	2571.300	277.500	456.100	53.200	534.600	441.400	690.400	431.900
CURRENT INCOME TAX	14770.356	20156.575	20693.619	24556.023	23249.164	22898.288	22100.464	21960.898
DEFERRED INCOME TAX	2625.645	1941.289	1294.604	-640.982	-636.268	-588.697	-549.784	-488.607
TOTAL INCOME TAX	17396.001	22097.864	21988.222	23915.041	22612.896	22309.392	21550.680	21472.492
NET INCOME (BOOK PROFIT)	22538.601	22652.863	22900.422	24021.441	23682.096	23192.191	22931.480	22336.091

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 23, 1976 11113:09 #6 111976
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME **** PROFIT AND LOSS PROJECTION ****

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
REVENUES							
NET SALES AND OPERATION REVENUES	81786.732	80747.746	81280.020	80643.366	79780.418	1523249.844	76162.492
SALES - PRODUCT A	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS REVENUE	.000	.000	.000	.000	.000	.000	.000
TOTAL REVENUE	81786.732	80747.746	81280.020	80643.366	79780.418	1523249.844	76162.492
COST AND EXPENSES							
OPERATION AND MAINTENANCE EXPENSES	3361.000	3503.000	3652.000	3766.000	3888.000	49038.000	2451.900
GENERAL AND ADMINISTRATIVE EXPENSES	4391.000	4566.000	4749.000	4942.000	5144.000	71173.000	3558.650
SEGREGATED EXPENSES - TYPE C	11671.000	13055.000	14691.000	15095.000	15499.000	144165.000	7208.250
MISCELLANEOUS EXPENSES	.000	.000	.000	.000	.000	.000	.000
TAXES, OTHER THAN FEDERAL INCOME	9795.000	10285.000	10799.000	11339.000	11906.000	148538.000	7426.900
COSTS, EXCL DEPREC & INTEREST	29218.000	31409.000	33891.000	35142.000	36437.000	412914.000	20645.700
GROSS OPERATING INCOME	52568.732	49338.746	47389.020	45501.366	43343.418	1110335.659	55516.793
INTEREST EXPENSES	1286.767	1115.604	992.478	869.352	746.226	234340.468	11717.024
FINANCIAL DEPRECIATION	8615.861	8615.861	8615.861	8615.861	8615.861	155283.305	7764.165
AMORTIZATION OF FINANCIAL EXPENSES	624.833	.000	.000	.000	.000	18744.999	937.250
TOTAL EXPENSES	39745.460	41140.464	43499.338	44627.212	45799.086	821282.781	41064.139
INVESTMENT INCOME, NET	.000	.000	.000	.000	.000	.000	.000
NET INCOME BEFORE TAXES	42041.272	39607.282	37780.682	36016.174	33981.332	701967.094	35098.354
INCOME TAXES							
TAX DEPRECIATION	8964.856	8964.856	8964.856	8964.856	8964.856	266901.840	12709.611
TAXABLE INCOME	42317.110	39258.287	37431.687	35667.179	33632.337	590348.547	28111.835
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	-35864.876	-1707.851
INVESTMENT TAX CREDIT	.000	.000	.000	.000	.000	31017.098	1477.005
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	12971.101	617.671
TAX CREDITS CARRIED FORWARD	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	.000	.000	18045.999	859.333
CURRENT INCOME TAX	21158.555	19629.144	18715.843	17833.589	16816.168	277128.277	13196.585
DEFERRED INCOME TAX	-137.919	174.498	174.498	174.498	174.498	55809.270	2657.584
TOTAL INCOME TAX	21020.636	19803.641	18890.341	18008.087	16990.666	332937.543	15854.169
NET INCOME (BOOK PROFIT)	21020.636	19803.641	18890.341	18008.087	16990.666	369029.539	17672.835

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS   ENERGY CONSERVATION STUDY

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BASELINE CASE

JFM REPORT NO. 20   CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION   •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	-9372.500	-1630.565	-727.776	18771.131	18992.521	21004.260	21321.636	21702.290
FINANCIAL DEPRECIATION	.000	3550.097	7100.194	7322.583	7376.889	7506.111	7506.111	7518.639
AMORTIZATION OF FINANCIAL EXPENSES	.000	624.633	1249.667	1249.667	1249.667	1249.667	1249.667	1249.667
DEFERRED INCOME TAX	9372.500	5197.334	9564.201	8068.882	6698.499	5510.212	4420.867	3459.704
PROVIDED BY OPERATIONS	.000	7741.700	17166.287	35412.263	34317.575	35270.250	34498.280	33930.299
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	254252.699	.000	7205.400	.000	.000	.000	.000	.000
NET ADDITIONS TO EQUITY	28250.300	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	282502.996	7741.700	24391.687	35412.263	34317.575	35270.250	34498.280	33930.299
APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	255607.000	.000	8006.000	1955.000	4652.000	.000	451.000	2378.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	.000	.000	480.360	20038.260	20038.260	20038.260	20038.260	20038.260
FINANCIAL AND DEBT EXPENSE	18745.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	274352.000	.000	8486.360	21993.260	24690.260	20038.260	20489.260	22416.260
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	.000	7741.700	15905.327	13419.003	9627.315	15231.990	14009.021	11514.039
TOTAL APPLICATION OF FUNDS	274352.000	7741.700	24391.687	35412.263	34317.575	35270.250	34498.280	33930.299
INCREASE IN WORKING CAPITAL	8151.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	282503.000	7741.700	24391.687	35412.263	34317.575	35270.250	34498.280	33930.299
CASH BENEFITS LESS INVESTMENT COSTS	-282503.000	7741.700	9180.287	33457.263	29665.575	35270.250	34047.280	31552.299
NET CASH GENERATED DURING THE PERIOD	.000	7741.700	15905.327	13419.003	9627.316	15231.990	14009.021	11514.039
CUMULATIVE NET CASH GENERATED	.000	7741.700	23647.027	37066.030	46693.346	61925.335	75934.355	87448.396

**** PRODUCTS PIPELINE SYSTEM BASELINE CASE BASE13 DATE 112376 PAGE 33

SYSTEMS, SCIENCE AND SOFTWARE
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BASELINE CASE

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION **** CASH FLOW PROJECTION ****

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	22538.801	22652.863	22900.422	24021.441	23662.096	23192.191	22931.480	22336.091
FINANCIAL DEPRECIATION	7584.894	7814.444	7891.528	8018.222	8033.000	8181.600	8304.111	8495.869
AMORTIZATION OF FINANCIAL EXPENSES	1249.667	1249.657	1249.667	1249.667	1249.667	1249.667	1249.667	1249.667
DEFERRED INCOME TAX	2625.645	1941.289	1294.604	-640.982	-636.268	-586.897	-549.784	-488.607
PROVIDED BY OPERATIONS	33998.606	33658.262	33336.220	32648.347	32328.494	32034.461	31935.473	31593.040
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	7443.200	.000	.000	.000	4811.400	.000	6213.600	.000
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	41442.506	33658.262	33336.220	32648.347	37139.894	32034.461	38149.073	31593.040

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APPLICATION OF FUNDS	1984	1985	1986	1987	1988	1989	1990	1991
ADDITIONS TO PLANT & EQUIPMENT	8271.000	2775.000	4561.000	532.000	5346.000	4414.000	6904.000	4319.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	20534.520	20534.520	20534.520	20534.520	20855.279	20855.279	21269.519	21269.519
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	28805.520	23309.520	25095.520	21066.520	26201.279	25269.279	28173.519	25588.519
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	12635.986	10348.743	8240.700	11581.827	10938.614	6765.182	9975.554	6004.520
TOTAL APPLICATION OF FUNDS	41442.506	33658.262	33336.220	32648.347	37139.894	32034.461	38149.073	31593.040
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	41442.506	33658.262	33336.220	32648.347	37139.894	32034.461	38149.073	31593.040
CASH BENEFITS LESS INVESTMENT COSTS	25727.506	30883.262	28775.220	32116.347	26982.494	27620.461	25031.473	27274.040
NET CASH GENERATED DURING THE PERIOD	12635.986	10348.743	8240.700	11581.827	10938.614	6765.182	9975.554	6004.520
CUMULATIVE NET CASH GENERATED	100085.381	110434.123	118674.823	130256.650	141195.264	147960.445	157935.998	163940.518

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JFM REPORT NO. 20   CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION   **** CASH FLOW PROJECTION ****

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
SOURCES OF FUNDS							
NET INCOME (BOOK PROFIT)	21020.636	19803.641	18890.341	18008.087	16990.666	369029.539	17572.835
FINANCIAL DEPRECIATION	8615.861	8615.861	8615.861	8615.861	8615.861	155283.305	7764.165
AMORTIZATION OF FINANCIAL EXPENSES	624.833	.000	.000	.000	.000	16744.999	937.250
DEFERRED INCOME TAX	-137.919	174.498	174.498	174.498	174.498	55809.270	2657.584
PROVIDED BY OPERATIONS	30123.411	28593.999	27680.699	26798.445	25781.024	596867.109	28517.481
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	.000	.000	.000	.000	.000	279926.992	13329.857
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	28250.300	1345.252
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	30123.411	28593.999	27680.699	26798.445	25781.024	907044.375	43192.589

APPLICATION OF FUNDS							
ADDITIONS TO PLANT & EQUIPMENT	.000	.000	.000	.000	.000	310171.000	14770.048
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	1711.632	1231.260	1231.260	1231.260	1231.260	273695.988	13033.142
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	18745.000	892.619
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	1711.632	1231.260	1231.260	1231.260	1231.260	602611.969	28695.608
CASH DIVIDENDS PAID	.000	.000	.000	.000	.000	.000	.000
NET INCREASE IN INVESTMENTS	28411.779	27362.739	26449.439	25567.185	24549.764	296281.414	14108.639
TOTAL APPLICATION OF FUNDS	30123.411	28593.999	27680.699	26798.445	25781.024	898693.383	42804.447
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	8151.000	368.143
TOTAL DISPOSITION OF FUNDS	30123.411	28593.999	27680.699	26798.445	25781.024	907044.375	43192.589
CASH BENEFITS LESS INVESTMENT COSTS	30123.411	28593.999	27680.699	26798.445	25781.024	261800.119	12466.672
NET CASH GENERATED DURING THE PERIOD	28411.779	27362.739	26449.439	25567.185	24549.764	296281.414	14108.639
CUMULATIVE NET CASH GENERATED	192352.295	219715.033	246164.471	271731.652	296281.414	2637184.156	125580.197

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JFM REPORT NO. 30 CONSOLIDATED STATEMENT OF FINANCIAL POSITION •••• BALANCE SHEET PROJECTION ••••

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ASSETS								
CURRENT ASSETS								
TOTAL CURRENT ASSETS	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000
PROPERTY, PLANT AND EQUIPMENT								
@ ORIGINAL COST	255607.000	255607.000	263613.000	265566.000	270220.000	270220.000	270671.000	273049.000
LESS - ACCUMULATED DEPRECIATION	.000	3550.097	10650.292	17972.875	25349.763	32855.874	40361.985	47880.624
NET PROPERTY & EQUIP.	255607.000	252056.904	252962.711	247595.129	244870.238	237364.129	230309.016	225168.379
INVESTMENTS	.000	7741.700	23647.027	37066.030	46693.345	61925.335	75934.355	87448.395
DEFERRED CHARGES								
UNAMORTIZED FIN. & DEBT EXPENSES	18745.000	18120.167	16870.500	15620.834	14371.167	13121.500	11871.834	10622.167
UNAMORTIZED CONSTRUCTION INTEREST	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DEFERRED CHARGES	18745.000	18120.167	16870.500	15620.834	14371.167	13121.500	11871.834	10622.167
TOTAL ASSETS	282503.000	286069.766	301631.234	308432.938	314085.746	320561.961	326266.203	331389.937

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LIABILITIES AND SHAREHOLDERS EQUITY								
CURRENT LIABILITIES								
LONG-DEBT UNPAID BALANCE	254252.699	254252.699	260977.738	240939.480	220901.221	200862.963	180824.705	160786.445
TOTAL DEBT BALANCE	254252.699	254252.699	260977.738	240939.480	220901.221	200862.963	180824.705	160786.445
DEFERED FEDERAL INCOME TAXES	9372.500	14569.834	24134.036	32202.918	38901.417	44411.628	48832.495	52292.199
TOTAL LIABILITIES	263625.199	268822.531	285111.773	273142.398	259802.637	245274.590	229657.199	213078.645

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STOCKHOLDERS EQUITY								
TOTAL PAID-IN CAPITAL	28250.300	28250.300	28250.300	28250.300	28250.300	28250.300	28250.300	28250.300
RETAINED EARNINGS	-9372.500	-11003.064	-11730.840	7040.291	26032.812	47037.073	68358.708	90060.997
TOTAL EQUITY CAPITAL	18877.800	17247.236	16519.460	35290.591	54283.112	75287.372	96609.008	118311.297
TOTAL LIABILITIES & EQUITY	282502.996	286069.766	301631.230	308432.938	314085.746	320561.961	326266.207	331389.941

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NET WORKING CAPITAL	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000

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JFM REPORT NO. 30 CONSOLIDATED STATEMENT OF FINANCIAL POSITION •••• BALANCE SHEET PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ASSETS								
CURRENT ASSETS								
TOTAL CURRENT ASSETS	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000
PROPERTY, PLANT AND EQUIPMENT								
@ ORIGINAL COST	281320.000	284095.000	288656.000	289188.000	294534.000	298948.000	305852.000	310171.000
LESS - ACCUMULATED DEPRECIATION	55465.317	63279.761	71171.288	79189.510	87222.509	95404.008	103708.118	112204.006
NET PROPERTY & EQUIP.	225854.684	220815.242	217484.715	209996.492	207311.492	203543.992	202143.883	197966.996
INVESTMENTS	100085.381	110434.123	118674.823	130256.650	141195.264	147960.445	157935.998	163940.518
DEFERRED CHARGES								
UNAMORTIZED FIN. & DEBT EXPENSES	9372.501	8122.834	6873.167	5623.501	4373.834	3124.167	1874.501	624.834
UNAMORTIZED CONSTRUCTION INTEREST	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DEFERRED CHARGES	9372.501	8122.834	6873.167	5623.501	4373.834	3124.167	1874.501	624.634
TOTAL ASSETS	343463.562	347523.195	351183.699	354029.641	361031.586	362779.602	370105.379	370663.344

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LIABILITIES AND SHAREHOLDERS EQUITY								
CURRENT LIABILITIES								
LONG-DEBT UNPAID BALANCE	147695.826	127161.310	106626.791	86092.271	70048.392	49193.112	34137.192	12867.673
TOTAL DEBT BALANCE	147695.826	127161.310	106626.791	86092.271	70048.392	49193.112	34137.192	12867.673
DEFERED FEDERAL INCOME TAXES	54917.844	56859.132	58163.736	57512.753	56876.485	56287.689	55737.805	55249.199
TOTAL LIABILITIES	202613.670	184020.491	164780.525	143605.023	126924.877	105480.701	89874.997	68116.871

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STOCKHOLDERS EQUITY								
TOTAL PAID-IN CAPITAL	28250.300	28250.300	28250.300	28250.300	28250.300	28250.300	28250.300	28250.300
RETAINED EARNINGS	112599.598	135252.461	158152.883	182174.322	205856.418	229048.609	251980.086	274316.176
TOTAL EQUITY CAPITAL	140849.896	163502.760	186403.182	210424.621	234106.717	257298.906	280230.387	302566.473
TOTAL LIABILITIES & EQUITY	343463.566	347523.199	351183.707	354029.645	361031.594	362779.609	370105.383	370663.344

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NET WORKING CAPITAL	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000	8151.000

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JFM REPORT NO. 30 CONSOLIDATED STATEMENT OF FINANCIAL POSITION •••• BALANCE SHEET PROJECTION ••••

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
ASSETS							
CURRENT ASSETS							
TOTAL CURRENT ASSETS	8151.000	8151.000	8151.000	8151.000	8151.000	171171.000	8151.000
PROPERTY, PLANT AND EQUIPMENT							
@ ORIGINAL COST	310171.000	310171.000	310171.000	310171.000	310171.000	6028174.000	287055.902
LESS - ACCUMULATED DEPRECIATION	120819.866	129435.727	138051.586	146667.445	155283.305	1530523.906	73167.605
NET PROPERTY & EQUIP.	189351.137	180735.273	172119.414	163503.555	154887.695	4491649.612	213888.086
INVESTMENTS	192352.295	219715.033	246164.471	271731.652	294201.414	2637184.156	125580.197
DEFERRED CHARGES							
UNAMORTIZED FIN. & DEBT EXPENSES	.001	.001	.001	.001	.001	159332.500	7587.262
UNAMORTIZED CONSTRUCTION INTEREST	.000	.000	.000	.000	.000	.000	.000
TOTAL DEFERRED CHARGES	.001	.001	.001	.001	.001	159332.500	7587.262
TOTAL ASSETS	389854.430	4086C1.305	426434.883	443386.207	469320.109	7459337.437	355206.543
LIABILITIES AND SHAREHOLDERS EQUITY							
CURRENT LIABILITIES							
LONG-DEBT UNPAID BALANCE	11156.041	9924.781	8693.521	7462.261	6231.001	2451087.906	116718.472
TOTAL DEBT BALANCE	11156.041	9924.781	8693.521	7462.261	6231.001	2451087.906	116718.472
DEFERED FEDERAL INCOME TAXES	55111.260	55285.777	55460.275	55634.772	55809.270	993612.898	47314.900
TOTAL LIABILITIES	66267.320	65210.558	64153.795	63097.033	62040.271	3444700.781	164033.369
STOCKHOLDERS EQUITY							
TOTAL PAID-IN CAPITAL	28250.300	28250.300	28250.300	28250.300	28250.300	593256.258	28250.298
RETAINED EARNINGS	295336.809	315140.449	334030.789	352038.875	369029.539	3421380.406	162922.875
TOTAL EQUITY CAPITAL	323587.105	343390.746	362281.086	380289.172	397279.836	4014636.694	191173.170
TOTAL LIABILITIES & EQUITY	389854.426	408608.301	426434.879	443386.203	459320.105	7459337.437	355206.543
NET WORKING CAPITAL	8151.000	8151.000	8151.000	8151.000	8151.000	171171.000	8151.000

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS   ENERGY CONSERVATION STUDY

DATE   NOVEMBER 23, 1976   11:13:09   #6   111976
RUN ID   THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE

P38 REPORT NO. 38   CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ACTIVITY								
ANNUAL THROUGHPUT (MM BARRELS)	.000	54093.000	55174.860	80738.000	83967.620	87326.250	90819.300	94452.145
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	.000	.456	.948	.898	.838	.814	.815	.772
ACTUAL TARIFF	.000	.456	.948	.898	.838	.814	.815	.772
NOMINAL TRANSPORTATION REVENUES	.000	24666.335	52332.096	72493.036	70338.522	71077.519	73995.166	72893.631
ACTUAL TOTAL REVENUES	.000	24666.335	52332.096	72493.036	70338.522	71077.519	73995.166	72893.631
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO CAPITAL %	93.088	93.647	94.047	87.224	80.274	72.737	65.178	57.609
LONG-TERM (FUNDED) DEBT TO ASSETS %	90.000	88.878	86.522	78.117	70.332	62.660	55.422	48.519
PROFITABILITY								
OPERATING INCOME (ICC RULES)	.000	3566.770	8836.426	26840.014	25691.020	26514.472	25742.503	25161.994
ANNUAL ICC RATE BASE	.000	282503.000	282740.168	276706.172	273315.414	265144.727	257425.039	251619.947
RATE OF RETURN ON RATE BASE (%)	.000	1.263	3.125	9.700	9.400	10.000	10.000	10.000
RATE OF RETURN ON PAID-IN CAPITAL(%)	.000	-5.772	-2.576	66.446	67.229	74.351	75.474	76.621
RATE OF RETURN ON TOTAL CAPITAL (%)	.000	-.601	-.262	6.795	6.902	7.606	7.685	7.776
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE IN MM KW-HRS	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY COSTS	.000	356.000	768.000	2179.000	2562.000	2984.000	3467.000	3979.000
PRESENT VALUE OF ENERGY USED	.000	323.636	634.711	1637.115	1749.880	1852.829	1957.031	2041.856
UNIT COST OF ENERGY ($)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED IN KW-HRS (M)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.000
OTHER MEASURES								
TOTAL ANNUAL UNIT COSTS	.000	.390	.788	.565	.532	.500	.469	.441
PRESENT VALUE OF AVERAGE UNIT COSTS	.000	.355	.652	.425	.363	.311	.265	.226
NET INCOME (BOOK PROFIT)	-9372.500	-1630.565	-727.776	18771.131	18992.521	21004.260	21321.636	21702.290
PRESENT VALUE OF BOOK PROFITS	-9372.500	-1482.331	-601.467	14103.029	12972.147	13041.993	12035.508	11136.706
NET CASH GENERATED DURING THE PERIOD	.000	7741.700	15905.327	13419.003	9627.315	15231.990	14009.021	11514.039
PRESENT VALUE OF NET CASH GENERATED	.000	7037.909	13144.898	10081.896	6575.586	9457.667	7907.727	5906.523
DISCOUNT FACTOR (@10.000 %) =	1.000	.909	.826	.751	.683	.621	.564	.513

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 23, 1976 11:13:09 #6 111976
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ACTIVITY								
ANNUAL THROUGHPUT (MM BARRELS)	98233.260	102159.465	105224.390	108380.910	111632.330	114981.570	118430.820	121983.730
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	.831	.841	.811	.812	.772	.741	.716	.690
ACTUAL TARIFF	.831	.841	.811	.812	.772	.741	.716	.690
NOMINAL TRANSPORTATION REVENUES	81673.996	85887.419	85384.969	87987.048	86185.024	85201.588	84743.608	84151.656
ACTUAL TOTAL REVENUES	81673.996	85887.419	85384.969	87987.048	86185.024	85201.588	84743.608	84151.656
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO CAPITAL %	51.186	43.749	36.388	29.035	23.030	16.050	10.859	4.079
LONG-TERM (FUNDED) DEBT TO ASSETS %	43.002	36.591	30.362	24.318	19.402	13.560	9.224	3.471
PROFITABILITY								
OPERATING INCOME (ICC RULES)	25164.245	24594.152	24195.026	23380.458	23045.827	22603.295	22381.696	21847.465
ANNUAL ICC RATE BASE	251642.461	245941.521	241950.270	233804.590	230458.281	226032.957	223976.248	219144.680
RATE OF RETURN ON RATE BASE (%)	10.000	10.000	10.000	10.000	10.000	10.000	9.993	9.969
RATE OF RETURN ON PAID-IN CAPITAL(%)	79.782	80.186	81.063	85.031	83.830	82.095	81.173	79.065
RATE OF RETURN ON TOTAL CAPITAL (%)	7.811	7.793	7.815	8.101	7.786	7.567	7.294	7.081
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE IN MM KW-HRS	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY COSTS	4582.000	5226.000	5888.000	6611.000	7404.000	8329.000	9352.000	10467.000
PRESENT VALUE OF ENERGY USED	2137.537	2216.334	2270.079	2317.115	2359.143	2412.615	2462.674	2505.717
UNIT COST OF ENERGY ($)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED IN KW-HRS (M)	.000	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.000
OTHER MEASURES								
TOTAL ANNUAL UNIT COSTS	.425	.403	.385	.370	.357	.345	.340	.331
PRESENT VALUE OF AVERAGE UNIT COSTS	.198	.171	.148	.130	.114	.100	.090	.079
NET INCOME (BOOK PROFIT)	28538.601	22452.863	22900.422	24021.441	23582.096	23192.191	22931.460	22336.091
PRESENT VALUE OF BOOK PROFITS	13514.424	9507.026	8829.105	8419.369	7595.846	6717.952	6038.576	5347.083
NET CASH GENERATED DURING THE PERIOD	12636.986	10348.743	8240.700	11581.827	10738.614	6765.182	9975.554	6004.520
PRESENT VALUE OF NET CASH GENERATED	5895.248	4388.877	3177.147	4059.360	3885.380	1959.632	2626.875	1437.435
DISCOUNT FACTOR (W10.000 %) =	.467	.424	.386	.350	.319	.290	.263	.239

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 23, 1976 11:13:09 #6 111976
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE

P36 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
ACTIVITY							
ANNUAL THROUGHPUT (MM BARRELS)	125643.220	129412.575	133295.080	137293.654	141412.314	2094651.328	104732.566
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	.651	.624	.610	.587	.564	14.791	.740
ACTUAL TARIFF	.651	.624	.610	.587	.564	14.791	.740
NOMINAL TRANSPORTATION REVENUES	81786.732	80747.746	81280.020	80643.366	79780.418	1523249.844	76162.492
ACTUAL TOTAL REVENUES	81786.732	80747.746	81280.020	80643.386	79780.418	1523249.844	76162.492
LEVERAGE							
LONG-TERM (FUNDED) DEBT TO CAPITAL %	3.333	2.809	2.343	1.924	1.544	37.909	37.909
LONG-TERM (FUNDED) DEBT TO ASSETS %	2.862	2.429	2.039	1.683	1.357	32.659	32.859
PROFITABILITY							
OPERATING INCOME (ICC RULES)	20882.717	19978.139	19064.838	18182.584	17165.164	424838.601	21241.940
ANNUAL ICC RATE BASE	209875.338	200605.996	191336.654	182067.312	172797.971	4719088.437	235954.422
RATE OF RETURN ON RATE BASE (%)	9.950	9.959	9.964	9.987	9.934	9.003	9.003
RATE OF RETURN ON PAID-IN CAPITAL(%)	74.409	70.101	66.668	63.745	60.143	62.204	62.204
RATE OF RETURN ON TOTAL CAPITAL (%)	6.280	5.605	5.092	4.644	4.211	5.707	5.707
ENERGY CONSUMPTION							
ANNUAL ENERGY USAGE IN MM KW-HRS	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY COSTS	11671.000	13055.000	14691.000	15095.000	15499.000	144165.000	7208.250
PRESENT VALUE OF ENERGY USED	2539.950	2582.862	2642.306	2468.153	2303.826	41415.371	.000
DISCOUNTED VALUE OF ENERGY USED (@ 10.00 %) =		41415.371					
UNIT COST OF ENERGY (%)	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED IN KW-HRS (M)	.000	.000	.000	.000	.000	.000	.000
ANNUAL ENERGY WASTED COST (%)	.000	.000	.000	.000	.000	.000	.000
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000
DISCOUNTED VALUE OF ENERGY WASTED (@ 10.00 %) =		.000					
OTHER MEASURES							
TOTAL ANNUAL UNIT COSTS	.316	.318	.326	.325	.324	8.251	.413
PRESENT VALUE OF AVERAGE UNIT COSTS	.069	.063	.059	.053	.048	3.917	.196
DISCOUNTED AVERAGE (ANNUAL) UNIT COSTS (LONG-RUN AVERAGE COSTS) (@ 10.00 %) =		.196					
NET INCOME (BOOK PROFIT)	21020.636	19803.641	18890.341	18008.087	16990.666	369029.539	17572.836
PRESENT VALUE OF BOOK PROFITS	4574.703	3918.045	3397.594	2944.466	2525.554	132212.824	6610.641
DISCOUNTED VALUE OF BOOK PROFITS (@ 10.00 %) =		132212.824					
NET CASH GENERATED DURING THE PERIOD	28411.779	27362.739	26449.439	25567.165	24549.764	296281.414	14108.639
PRESENT VALUE OF NET CASH GENERATED	6183.231	5413.573	4757.164	4180.440	3649.166	111327.927	5566.396
DISCOUNTED NET CASH FLOW (@ 10.00 %) =		111327.927					
DISCOUNT FACTOR (@10.000 %) =	.218	.198	.180	.164	.149	.000	.000

•••••• INTERNAL RATE OF RETURN ••••••

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DCF - ROI OF $ 28250.300 (FROM YEAR 1 OVER 10 YEARS) = 40.33 %
DCF - ROI OF $ 28250.300 (FROM YEAR 1 OVER 15 YEARS) = 40.28 %
DCF - ROI OF $ 28250.300 (FROM YEAR 1 OVER 20 YEARS) = 40.71 %
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MASSD=JOP.BASE1
        $INPUT
        PMODE=1,NPROJ=20,READP=T,ICC=T,RBASEF=T,RBMAX=10.,PRTOB=T,AUTOB=T,THRUPM=1,
        PRT3A=T,PRT10=F,PRT20=F,PRT30=F,
        IDRUN(16)=30H    LINKED WITH PEP  *PROD1    ,
        AUTOB=T,PAYDIV=F,REINVF=T,REINVR=0.0,TAXR=0.5
        DMEX(1)=0.0,623.,1304.,1500.,1613.,1759.,1838.,1921.,2045.,2142.,2279.,
        DMEX(12)=2444.,2545.,2752.,2940.,3163.,3361.,3503.,3652.,3766.,3888.,
        GAEX(1)=0.0,1175.,2481.,2604.,2743.,2840.,2943.,3057.,3190.,
        3315.,3450.,3663.,3731.,3887.,4055.,4225.,4391.,4566.,4749.,4942.,
        5144.,
        TOFIT(2)=2058.,4447.,4700.,5009.,5259.,5529.,5843.,6265.,6620.,
        7022.,7382.,7835.,8294.,8820.,9329.,9795.,10285.,10799.,11339.,
        11906.,
        LTON=6,
        LTDA(1)=127126.35,  127126.35,  7205.4,  7443.9,  4811.4,  6213.6,
        LTDY(1)=0,   0,   2,  8,  12,  14,
        LTONYR(1)=13,13,15,15,15,15,
        LTOYR1(1)=3,3,2,8,12,14,
        LTORM(1)=1,1,1,1,1,1,
        LTOPER(1)=0.10,0.1,.1,.1,.1,.1,
        LTOY11(1)=1,2,2,6,12,14,
        LTOFX(1)=9372.5,9372.5,
        LTOXY1(1)=1,2,1,1,1,1,
        LTONYX(1)=15,15,15,15,15,15,
        CAPN=15,
        CAPA(1)=127803.5, 127603.5, 8006., 1955., 4652.,
        CAPA(6)=451.,2378.,8271.,2775.,4561.,
        CAPA(11)=532.,5346.,4419.,6904.,4319.,
        CAPY(1)=0,0,2,3,4,6,7,8,9,10,11,12,13,14,15,
        CAPY1(1)=1,2,3,4,5,7,8,9,10,11,12,13,14,15,16,
        CAPNYF(1)=36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36, 36,
        CAPNYT(1)=22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22, 22,
        CAPTOM(1)=3,3,1,1,1,1,1,1,1,1,1,1,1,1,1,
        CAPTOR(1)=.114,.114,.0455,.0455,.0455,.0455,.0455,.0455,.0456,.0466,
        0.0455,.0455,.0455,.0455,.0455,
        CAPTSY(1)=11,11,
        CAPCIM(1)=0.0,
        CAPTCA(1)=127803.5, 127803.5, 8006., 1955., 4652.,
         451.,2378.,8271.,2775.,4561.,532.,5346.,4414.,6904.,4319.,
        CAPTCH(1)=0.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,.1,
        CAPTY(1)=0,0,2,3,4,6,7,8,9,10,11,12,13,14,16,
        CAPTY1(1)=0,0,2,3,4,6,7,8,9,10,11,12,13,14,15,
        ADWC(1)=8151.,
        ADEG(1)=28250.3,
        LF(3)=F,LF(12)=F,F,F,T,LF(56)=5*F,LF(71)=6*F,
        LF(6)=F,F,F,F, LF(66)=F,LF(68)=F,LF(80)=F,LF(82)=2*F,
        PVRATE=0.10,
        RBICC=282503.,RBICY1=1,RBICO=0.0,RBICYO=1,RBICR=0.0275,FILL=0.0,
        DROIN=3,DROIA(1)=28250.3,28250.3,DROIY1(1)=1,1,DROINY(1)=10,15,20,
        DROIA(3)=28250.3,DROIY1(3)=1,
        $END
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Figure 16.2. BASE1

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 14:42:56 #6 101476
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE LINKED WITH PEP •PRODI

JFM REPORT NO. 9 TRANSPORTATION REVENUE, THROUGHPUT, AND ENERGY COSTS MODEL (PEP) PROJECTION

•••••• PEP OUTPUT FILE •PEPOUT• READ FROM UNIT 8 PMODE = 1 THRUPM = 1 ENERGM = 0 NYPEP = 20

IDPEP •REFERENCE SYSTEM 06/24/76 13:23:24

YEAR	ENERGY USED THOUSAND KILOWATT-HRS	COST OF ENERGY THOUS. $/YR.	ENERGY WASTED THOUSAND KILOWATT-HRS	COST WASTED ENG. THOUS. $/YR.	THROUGHPUT MILLION BARREL-MILES/YR	REVENUE THOUS. $/YR.	SEG. EXPENSES THOUS. $/YR.
2	24459.642	611.491	.000	.000	22607.907	25773.014	.000
3	48898.810	1320.268	.000	.000	45894.055	54935.183	.000
4	129641.862	3736.650	.000	.000	67141.010	84383.689	.000
5	145439.801	4371.440	.000	.000	69828.729	92152.446	.000
6	156608.459	4870.528	.000	.000	72622.875	100633.467	.000
7	176312.361	5647.820	.000	.000	75526.755	109883.476	.000
8	191498.391	6318.303	6.730	.222	78547.821	119993.209	.000
9	215782.172	7339.905	3.923	.133	81689.727	131033.031	.000
10	233336.197	8157.050	364.675	12.765	84140.426	141717.639	.000
11	250366.588	9026.582	.000	.000	86669.633	153267.617	.000
12	269231.836	9977.942	167.151	6.207	89269.570	165758.926	.000
13	293814.160	11236.132	21.762	.832	91942.510	179268.279	.000
14	321793.891	12677.582	636.126	25.061	94700.783	193878.639	.000
15	341304.961	13849.639	21.740	.882	97541.812	209679.755	.000
16	373707.945	15619.438	149.693	6.257	100466.062	226768.648	.000
17	411978.066	17736.400	545.531	23.485	103462.101	245258.281	.000
18	447678.566	19850.607	151.285	6.708	106586.562	265238.172	.000
19	484375.156	22122.113	79.754	3.642	109784.165	286855.094	.000
20	530802.773	24969.804	27.725	1.304	113077.681	310233.758	.000
21	530802.773	25718.899	27.725	1.343	113077.681	325745.441	.000

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 14:42:56 #6 101476
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE LINKED WITH PEP *PRODI

P33 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ACTIVITY								
ANNUAL THROUGHPUT (MM BARREL-MILES)	.000	22607.907	45894.065	67143.010	69828.729	72621.875	76526.755	78547.821
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	.000	1.140	1.197	1.257	1.320	1.386	1.455	1.528
ACTUAL TARIFF	.000	1.140	1.197	1.115	1.057	1.030	1.009	.958
NOMINAL TRANSPORTATION REVENUES	.000	25773.014	54935.183	84388.689	92152.446	100630.467	109888.476	119998.209
ACTUAL TOTAL REVENUES	.000	25773.014	54935.183	74851.489	73808.483	74780.360	76208.908	75243.863
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO CAPITAL %	93.088	93.355	93.074	86.061	78.737	71.344	63.929	56.511
LONG-TERM (FUNDED) DEBT TO ASSETS %	90.000	88.614	85.698	77.183	69.149	61.623	54.517	47.737
PROFITABILITY								
OPERATING INCOME (ICC RULES)	.000	4417.958	10887.245	27670.617	27331.541	26533.424	25767.195	25170.192
ANNUAL ICC RATE BASE	.000	282503.000	282740.168	276706.172	273315.414	265144.727	257425.039	251619.947
RATE OF RETURN ON RATE BASE (%)	.000	1.564	3.851	10.000	10.000	10.007	10.010	10.003
RATE OF RETURN ON PAID-IN CAPITAL(%)	.000	-2.759	4.683	69.386	73.037	74.418	75.561	76.650
RATE OF RETURN ON TOTAL CAPITAL (%)	.000	-.286	.472	7.002	7.354	7.467	7.547	7.630
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE IN MM KW-HRS	.000	24459.642	48898.810	129641.862	145439.801	156608.459	176312.361	191498.391
ANNUAL ENERGY COSTS	.000	611.491	1320.268	3706.850	4391.440	4870.528	5647.820	6318.303
PRESENT VALUE OF ENERGY USED	.000	555.901	1091.130	2785.011	2999.412	3024.215	3188.047	3242.288
UNIT COST OF ENERGY ($)	.000	.025	.027	.029	.030	.031	.032	.033
ANNUAL ENERGY WASTED IN KW-HRS (M)	.000	.000	.000	.000	.000	.000	.000	6.730
ANNUAL ENERGY WASTED COST ($)	.000	.000	.000	.000	.000	.000	.000	.222
PRESENT VALUE OF ENERGY WASTED	.000	.000	.000	.000	.000	.000	.000	.114
OTHER MEASURES								
TOTAL ANNUAL UNIT COSTS	.000	.945	.960	.703	.666	.628	.593	.560
PRESENT VALUE OF AVERAGE UNIT COSTS	.000	.859	.793	.528	.455	.390	.335	.287
NET INCOME (BOOK PROFIT)	-9372.500	-779.376	1323.043	19601.735	20633.042	21023.212	21346.328	21710.488
PRESENT VALUE OF BOOK PROFITS	-9372.500	-708.524	1093.424	14727.073	14092.646	13053.761	12049.446	11140.913
NET CASH GENERATED DURING THE PERIOD	.000	6592.888	17956.146	14249.607	11267.836	15250.941	14033.713	11522.237
PRESENT VALUE OF NET CASH GENERATED	.000	7811.717	14839.790	10705.941	7696.084	9469.635	7921.665	5912.730
DISCOUNT FACTOR (@10.000 %) =	1.000	.909	.826	.751	.683	.621	.564	.513

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE. NOVEMBER 22, 1976 14:42:56 #6 101476
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE LINKED WITH PEP •PROD1

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ACTIVITY								
ANNUAL THROUGHPUT (MM BARREL-MILES)	81689.727	84140.426	86664.633	89264.570	91942.510	94700.783	97541.812	100468.062
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	1.604	1.684	1.769	1.857	1.950	2.047	2.150	2.257
ACTUAL TARIFF	1.034	1.056	1.022	1.029	.980	.946	.916	.891
NOMINAL TRANSPORTATION REVENUES	131038.031	141717.639	153267.617	165758.926	179268.279	193878.639	209679.758	226768.648
ACTUAL TOTAL REVENUES	84477.415	88844.299	88555.166	91410.311	90062.736	89575.643	89302.502	89471.592
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO CAPITAL %	50.238	42.942	35.720	28.506	22.620	15.766	10.670	4.008
LONG-TERM (FUNDED) DEBT TO ASSETS %	42.330	36.025	29.896	23.946	19.110	13.356	9.087	3.419
PROFITABILITY								
OPERATING INCOME (ICC RULES)	25187.033	24607.067	24210.833	23398.619	23067.618	22616.031	22412.323	21931.233
ANNUAL ICC RATE BASE	251642.441	245941.521	241950.270	233804.590	230458.281	226032.957	223976.248	219144.680
RATE OF RETURN ON RATE BASE (%)	10.039	10.005	10.007	10.008	10.009	10.006	10.007	10.008
RATE OF RETURN ON PAID-IN CAPITAL(%)	79.862	80.232	81.119	85.095	83.907	82.140	81.281	79.361
RATE OF RETURN ON TOTAL CAPITAL (%)	7.674	7.654	7.677	7.960	7.656	7.437	7.177	6.983
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE IN MM KW-HRS	215982.172	233036.197	250366.588	269231.836	293814.160	321793.891	341304.961	373707.945
ANNUAL ENERGY COSTS	7339.905	8157.050	9026.582	9997.942	11238.132	12677.582	13849.639	15619.438
PRESENT VALUE OF ENERGY USED	3424.120	3459.386	3480.138	3504.218	3580.815	3672.244	3647.043	3739.170
UNIT COST OF ENERGY ($)	.034	.035	.036	.037	.038	.039	.041	.042
ANNUAL ENERGY WASTED IN KW-HRS (M)	3.923	364.675	.000	167.151	21.762	636.126	21.740	149.693
ANNUAL ENERGY WASTED COST ($)	.133	12.765	.000	6.207	.832	25.061	.882	6.257
PRESENT VALUE OF ENERGY WASTED	.062	5.414	.000	2.176	.265	7.259	.232	1.498
OTHER MEASURES								
TOTAL ANNUAL UNIT COSTS	.545	.524	.503	.487	.476	.465	.459	.453
PRESENT VALUE OF AVERAGE UNIT COSTS	.254	.222	.194	.171	.152	.135	.121	.108
NET INCOME (BOOK PROFIT)	22561.358	22665.778	22916.230	24039.602	23703.886	23204.928	22962.107	22419.840
PRESENT VALUE OF BOOK PROFITS	10525.090	9612.603	8835.199	8425.734	7552.789	6721.641	6046.641	5367.132
NET CASH GENERATED DURING THE PERIOD	12659.794	10361.658	8256.508	11599.988	10960.405	6777.918	10006.182	6088.269
PRESENT VALUE OF NET CASH GENERATED	5905.864	4394.354	3183.241	4065.725	3492.323	1963.322	2634.941	1457.483
DISCOUNT FACTOR (@10.000 %) *	.467	.424	.386	.350	.319	.290	.263	.239

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 14:42:56 #6 101476
RUN ID THE LIQUID PETROLEUM PRODUCTS REFERENCE SYSTEM
BASELINE CASE LINKED WITH PEP •PROD1

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
ACTIVITY							
ANNUAL THROUGHPUT (MM BARREL-MILES)	103482.101	106586.562	109784.165	113077.681	113077.681	1704590.797	85229.539
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	2.370	2.488	2.613	2.744	2.881	37.695	1.885
ACTUAL TARIFF	.851	.823	.810	.801	.798	17.764	.888
NOMINAL TRANSPORTATION REVENUES	245250.281	265238.172	286855.094	310233.758	325745.441	3422466.656	171123.332
ACTUAL TOTAL REVENUES	88100.143	87729.949	88872.961	90593.301	90258.336	1612855.578	80642.778
LEVERAGE							
LONG-TERM (FUNDED) DEBT TO CAPITAL %	3.276	2.763	2.306	1.895	1.521	37.315	37.315
LONG-TERM (FUNDED) DEBT TO ASSETS %	2.820	2.395	2.011	1.661	1.339	32.412	32.412
PROFITABILITY							
OPERATING INCOME (ICC RULES)	21006.722	20071.436	19145.752	18220.140	17294.173	430947.094	21547.354
ANNUAL ICC RATE BASE	209875.336	200605.996	191336.654	182067.312	172797.971	4719088.437	235954.422
RATE OF RETURN ON RATE BASE (%)	10.009	10.005	10.006	10.007	10.008	9.132	9.132
RATE OF RETURN ON PAID-IN CAPITAL(%)	74.847	70.431	67.154	63.878	60.600	63.234	63.234
RATE OF RETURN ON TOTAL CAPITAL (%)	6.210	5.540	5.033	4.583	4.179	5.711	5.711
ENERGY CONSUMPTION							
ANNUAL ENERGY USAGE IN MM KW-HRS	411998.066	447678.566	484375.156	530802.773	530802.773	5577754.250	278887.711
ANNUAL ENERGY COSTS	17736.400	19850.609	22122.113	24969.804	25718.899	225170.787	11258.539
PRESENT VALUE OF ENERGY USED	3859.958	3927.337	3978.857	4082.763	3822.951	65065.001	.000
DISCOUNTED VALUE OF ENERGY USED (@ 10.00 %) =		65065.001					
UNIT COST OF ENERGY ($)	.043	.044	.046	.047	.048	.738	.037
ANNUAL ENERGY WASTED IN KW-HRS (M)	545.531	151.285	79.754	27.725	27.725	2203.819	110.191
ANNUAL ENERGY WASTED COST ($)	23.485	6.708	3.642	1.304	1.343	88.843	4.442
PRESENT VALUE OF ENERGY WASTED	5.111	1.327	.655	.213	.200	24.526	1.226
DISCOUNTED VALUE OF ENERGY WASTED (@ 10.00 %) =		24.526					
OTHER MEASURES							
TOTAL ANNUAL UNIT COSTS	.443	.450	.464	.482	.495	11.298	.565
PRESENT VALUE OF AVERAGE UNIT COSTS	.096	.089	.083	.079	.074	5.424	.271
DISCOUNTED AVERAGE (ANNUAL) UNIT COSTS (LONG-RUN AVERAGE COSTS) (@ 10.00 %) =		.271					
NET INCOME (BOOK PROFIT)	21144.641	19896.938	18971.255	18045.642	17119.675	375137.840	17863.707
PRESENT VALUE OF BOOK PROFITS	4601.690	3936.504	3412.147	2950.607	2544.731	136608.590	6830.429
DISCOUNTED VALUE OF BOOK PROFITS (@ 10.00 %) =		136608.590					
NET CASH GENERATED DURING THE PERIOD	28535.784	27456.037	26530.353	25604.740	24678.774	302389.715	15119.486
PRESENT VALUE OF NET CASH GENERATED	6210.218	5432.031	4771.718	4186.580	3668.343	115723.697	5786.165
DISCOUNTED NET CASH FLOW (@ 10.00 %) =		115723.697					
DISCOUNT FACTOR (@10.000 %) =	.218	.198	.180	.164	.149	.000	.000

•••••• INTERNAL RATE OF RETURN ••••••

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DCF = ROI OF $ 28250.300 (FROM YEAR 1 OVER 10 YEARS) = 43.99 %
DCF = ROI OF $ 28250.300 (FROM YEAR 1 OVER 15 YEARS) = 44.76 %
DCF = ROI OF $ 28250.300 (FROM YEAR 1 OVER 20 YEARS) = 45.07 %
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TIME PERIOD	1976	1977	1978	1979	1980	1981	1962	1963
OTHER LINE ITEMS								
OPERATION AND MAINTENANCE EXPENSES	.000	623.000	1304.000	1500.000	1613.000	1759.000	1838.000	1921.000
INTEREST EXPENSES	.000	12712.635	26145.810	26097.774	24093.948	22090.122	20086.296	18062.470
TOTAL EXPENSES	.000	21355.056	44047.938	47180.873	46476.942	45574.427	44799.893	43990.078
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
UNUSED INVESTMENT TAX CREDITS	11162.776	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	254252.699	.000	7205.400	.000	.000	.000	.000	.000
NET ADDITIONS TO EQUITY	28250.300	.000	.000	.000	.000	.000	.000	.000
ADDITIONS TO PLANT & EQUIPMENT	255607.000	.000	8006.000	1955.000	4652.000	.000	451.000	2378.000
LONG-TERM DEBT RETIREMENT	.000	.000	480.360	20038.260	20038.260	20038.260	20038.260	20038.260
PLANT & EQUIPMENT (@ ORIGINAL COST)	255607.000	255607.000	263613.000	265568.000	270220.000	270220.000	270671.000	273049.000
NET PROPERTY & EQUIPMENT	255607.000	252056.904	252962.711	247595.129	244870.238	237364.129	230309.016	225166.379
TOTAL DEBT BALANCE	254252.699	254252.699	260977.738	240939.480	220901.221	200862.963	180824.705	160766.445
TOTAL EQUITY CAPITAL	18877.000	18098.424	19421.467	39023.202	59656.244	80679.456	102025.784	123736.271

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
OTHER LINE ITEMS								
OPERATION AND MAINTENANCE EXPENSES	2045.000	2142.000	2279.000	2444.000	2545.000	2762.000	2940.000	3163.000
INTEREST EXPENSES	16823.034	14769.583	12716.131	10662.679	9090.367	7004.839	5540.671	3413.719
TOTAL EXPENSES	44497.299	44067.743	43634.906	43437.508	43724.165	44048.587	44759.087	45495.712
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	7443.900	.000	.000	.000	4811.400	.000	6213.600	.000
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	.000	.000	.000
ADDITIONS TO PLANT & EQUIPMENT	8271.000	2775.000	4561.000	532.000	5346.000	4414.000	6904.000	4319.000
LONG-TERM DEBT RETIREMENT	20534.520	20534.520	20534.520	20534.520	20855.279	20855.279	21269.519	21269.519
PLANT & EQUIPMENT (@ ORIGINAL COST)	281320.000	284095.000	288656.000	289188.000	294534.000	298948.000	305852.000	310171.000
NET PROPERTY & EQUIPMENT	225054.684	220815.242	217484.715	209998.492	207311.492	203543.992	202143.883	197966.996
TOTAL DEBT BALANCE	147695.826	127161.310	106626.791	86092.271	70048.392	49193.112	34137.192	12867.673
TOTAL EQUITY CAPITAL	146297.629	168963.406	191879.635	215919.236	239623.121	262828.047	285790.156	308209.992

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
OTHER LINE ITEMS							
OPERATION AND MAINTENANCE EXPENSES	3361.000	3503.000	3652.000	3766.000	3888.000	49038.000	2451.900
INTEREST EXPENSES	1286.767	1115.604	992.478	869.352	746.226	234340.488	11717.024
TOTAL EXPENSES	45810.863	47936.073	50930.452	54502.017	56018.985	902288.578	45114.429
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	11162.776	558.139
LONG-TERM BORROWING	.000	.000	.000	.000	.000	279926.992	13329.657
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	28250.300	1345.252
ADDITIONS TO PLANT & EQUIPMENT	.000	.000	.000	.000	.000	310171.000	14770.048
LONG-TERM DEBT RETIREMENT	1711.632	1231.260	1231.260	1231.260	1231.260	273695.988	13033.142
PLANT & EQUIPMENT (@ ORIGINAL COST)	310171.000	310171.000	310171.000	310171.000	310171.000	6028174.000	287055.902
NET PROPERTY & EQUIPMENT	189351.137	180735.273	172119.414	163503.555	154887.695	4491649.812	213868.086
TOTAL DEBT BALANCE	11156.041	9924.781	8693.521	7462.261	6231.001	2451087.906	116718.472
TOTAL EQUITY CAPITAL	329354.633	349251.570	368222.824	386268.466	403388.137	4117515.375	196072.160

****** AND THAT'S THE WAY IT WILL BE .... THIS IS THE S-CUBED FINANCIAL PROJECTION MODEL *JFM* VERSION #6 101476

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MASSO-J.P.BASE310
        $INPUT
        IORUN(1)=30HGAS REF SYSTEM CONVERSION 10      ,
        IORUN(6)=30HSIMPLE CYCLE TURBINES             ,
        IORUN(11)=30HBASELINE CASE (P38.0)
        PMODE=3,THRUPM=2,ENERGM=1,NPROJ=20,AUTCB=T,YEAR0=1976,FEADP=F,NYTLC=7,
        PRTOA=T,PRT38=T,PRT10=T,PRT20=T,PRT30=T,
        REINVF=T,PAYDIV=T,DIVPER=1.0,REINVR=0.06,FPC=T,RBASEF=T,RBMAX=10.,
        ESCO(2)=1.0,19*1.05,
        ESCR(2)=1.0,19*1.05,
        ESC(2)=1.0,19*1.05,
        THRUP(1)=0.0,57.562,60.936,64.512,67.854,71.477,75.155,78.903,81.836,
        THRUP(10)=85.513,89.098,92.843,96.286,100.129,103.597,106.913,
        THRUP(17)=5*106.91,
        ENERGU(1)=0.0,1559.081,2005.124,2263.467,2978.737,3307.456,3719.576,
        ENERGU(8)=4400.231,4466.495,4920.097,5294.936,6183.64,
        ENERGU(13)=6942.746,7740.591,9563.023,10614.371,
        ENERGU(17)=5*10660.011,
        UPRICE(2)=660.,
        UCOSTE(2)=1.42,
        OMEX(2)=6242.,6567.,7159.,7722.,8078.,8558.,9606.,10052.,
           11545.,12084.,12653.,13409.,16038.,16986.,17793.,18639.,
              19526.,20458.,21418.,22446.,
        ADEQ(1)=0.0,LTDA(1)=0.0,EQPER=0.40,AOWC(1)=1907.,STOPER(1)=21*0.08,
        LTON=11,
        LTOA(2)=5569.,16941.,3685.,23705.,9092.,3502.,15592.,47550.,3326.,3921.,
        LTOY(1)=0,1,3,6,7,9,10,11,13,14,15,
        LTONYR(1)=11*19,
        LTOYRL(1)=1,2,4,7,8,10,11,12,14,15,16,
        LTORM(1)=11*1,
        LTOPER(1)=11*0.08,
        LTOYI(1)=1,2,4,7,8,10,11,12,14,15,16,
        LTOFX(1)=1767.,LTOXYL(1)=1,LTONYX(1)=18,
        CAPN=12,
        CAPA(1)=166177.,
        CAPA(2)=17765.,5569.,16941.,3685.,23705.,9092.,3502.,15592.,47550.,
           3325.,3921.,
        CAPY(1)=2*0,1,3,6,7,9,10,11,13,14,15,
        CAPYI(1)=2*1,2,4,7,8,10,11,12,14,15,16,
        CAPNYF(1)=13*36,CAPNYT(1)=13*22,
        CAPTOM(1)=3*1,9*3,CAPTOR(1)=12*0.0,
        CAPCIM(1)=8459.,
        CAPTCA(1)=186177.,
        CAPTCA(2)=17766.,5569.,16941.,3686.,23705.,9092.,3502.,15592.,47550.,
           3325.,3921.,
        CAPTY(1)=2*0,1,3,6,7,9,10,11,13,14,15,
        CAPTYI(1)=2*1,2,4,7,8,10,11,12,14,15,16,
        CAPTCR(1)=12*0.10,
        DCFR=0.10,DROIN=3,DROIA(1)=3*0.0,DROINY(1)=10,15,20
        FILL=495.,
        LF(3)=F,F, LF(14)=F,T,F,F,  LF(105)=F,LF(95)=F,F,F,
        LF(11)=F,F,F, LF(9)=F,LF(66)=F,LF(80)=F,F,F,F,
        LF(56)=5*F,  LF(71)=F,F,F,F,  LF(114)=F,
        $END
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Figure 16.3. BASE310

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15153147 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME •••• PROFIT AND LOSS PROJECTION ••••

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
REVENUES								
NET SALES AND OPERATION REVENUES	.000	37990.919	42228.647	46942.156	51842.660	57341.286	63306.498	69706.790
SALES - PRODUCT A	.000	-1604.286	-2802.201	-5180.592	-7300.187	-12309.104	-17186.499	-19750.443
TOTAL REVENUE	.000	36386.634	39426.446	41761.564	44542.473	45032.183	46119.999	50036.348
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	.000	6242.000	6567.000	7159.000	7722.000	8078.000	8558.000	9606.000
SEGREGATED EXPENSES - TYPE C	.000	2213.898	2989.640	3543.571	4896.530	5708.731	6741.059	8373.357
COSTS, EXCL DEPREC & INTEREST	.000	8455.898	9556.640	10702.571	12618.530	13786.731	15299.059	17979.357
GROSS OPERATING INCOME	.000	27930.736	29869.806	31058.994	31923.944	31245.452	30820.940	32056.991
INTEREST EXPENSES	.000	10371.648	10240.965	9640.012	10394.338	9718.091	9041.844	8660.396
FINANCIAL DEPRECIATION	.000	5665.083	5819.778	5819.778	6290.361	6290.361	6290.361	6392.722
AMORTIZATION OF FINANCIAL EXPENSES	.000	333.139	333.139	333.139	333.139	333.139	333.139	333.139
TOTAL EXPENSES	.000	24825.768	25950.521	26495.499	29636.367	30128.322	30964.402	33365.614
INVESTMENT INCOME, NET	.000	.000	25.899	45.469	65.039	88.460	107.680	123.082
NET INCOME BEFORE TAXES	.000	11560.866	13601.823	15311.534	14971.146	14992.321	15263.277	16793.816
INCOME TAXES								
TAX DEPRECIATION	.000	9270.136	9523.273	9523.273	11063.363	10923.355	10796.075	11015.365
TAXABLE INCOME	-10226.000	8288.952	10131.468	11941.178	10531.282	10692.466	11090.702	12504.312
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	-10226.000	-1937.048	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	-8288.952	-1937.048	.000	.000	.000	.000	.000
INVESTMENT TAX CREDIT	20394.300	556.900	.000	1694.100	.000	.000	368.500	2370.500
UNUSED INVESTMENT TAX CREDITS	4165.710	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	.000	20394.300	20951.199	18902.595	17611.400	14978.580	12305.463	9901.288
TAX CREDITS APPLIED THIS YEAR	.000	.000	2048.605	2985.295	2632.821	2673.116	2772.675	3126.078
CURRENT INCOME TAX	.000	.000	2048.605	2985.295	2632.821	2673.117	2772.675	3126.078
DEFERRED INCOME TAX	5113.000	1635.957	1685.178	1685.178	2219.932	2149.928	2086.288	2144.752
TOTAL INCOME TAX	5113.000	1635.957	3733.783	4670.473	4852.752	4823.044	4858.963	5270.630
NET INCOME (BOOK PROFIT)	-5113.000	9924.909	9768.041	10641.062	10118.394	10169.277	10404.319	11522.986

**** GAS PIPELINE BASELINE CASE BASE310 DATE 112276 PAGE 10

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15153:47 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME **** PROFIT AND LOSS PROJECTION ****

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
REVENUES								
NET SALES AND OPERATION REVENUES	75999.966	83385.480	91215.114	99812.757	108692.192	118673.477	128929.396	139709.064
SALES - PRODUCT A	-23594.287	-28269.004	-29621.345	-35672.259	-38040.817	-46032.577	-42569.988	-46683.415
TOTAL REVENUE	52405.680	55116.478	61593.770	64140.498	70651.376	72640.900	86359.409	93025.650
COST AND EXPENSES								
OPERATION AND MAINTENANCE EXPENSES	10052.000	11545.000	12084.000	12653.000	13409.000	16038.000	16986.000	17793.000
SEGREGATED EXPENSES - TYPE C	8924.425	10322.297	11664.140	14302.946	16861.720	19739.403	25606.156	29842.332
COSTS, EXCL DEPREC & INTEREST	18976.425	21867.297	23748.140	26955.946	30270.720	35777.403	42592.156	47635.332
GROSS OPERATING INCOME	33429.254	33249.180	37845.630	37184.552	40380.656	36863.498	43767.253	45390.319
INTEREST EXPENSES	9864.172	9066.191	8995.571	8437.341	8830.748	7907.496	10788.245	9919.660
FINANCIAL DEPRECIATION	7051.194	7051.194	7303.750	7401.028	7834.139	7834.139	9154.972	9247.333
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	333.139	333.139	333.139	333.139	333.139
TOTAL EXPENSES	36224.930	38317.821	40380.599	43127.453	47268.745	51852.176	62868.511	67135.463
INVESTMENT INCOME, NET	135.850	149.937	154.446	154.446	154.446	154.446	154.446	154.446
NET INCOME BEFORE TAXES	16316.600	16948.593	21367.616	21167.491	23537.078	20943.171	23645.344	26044.634
INCOME TAXES								
TAX DEPRECIATION	13034.721	12715.498	13251.841	13231.244	14311.610	13876.307	17803.303	17352.646
TAXABLE INCOME	10666.213	11617.427	15752.664	15670.414	17392.746	15234.142	15330.152	18272.259
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	.000	.000	.000
INVESTMENT TAX CREDIT	.000	909.200	350.200	1559.200	.000	4765.000	332.500	392.100
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS CARRIED FORWARD	4990.000	2323.447	328.290	.000	.000	.000	946.465	.000
TAX CREDITS APPLIED THIS YEAR	2666.553	2904.357	678.490	1559.200	.000	3808.535	1278.965	392.100
CURRENT INCOME TAX	2666.553	2904.357	7197.842	6276.007	8696.373	3808.535	6386.111	8744.030
DEFERRED INCOME TAX	2825.194	2665.583	2807.476	2748.539	3072.166	2854.515	4157.596	3886.187
TOTAL INCOME TAX	5491.747	5569.939	10005.318	9024.546	11768.539	6663.050	10543.708	12630.217
NET INCOME (BOOK PROFIT)	10824.853	11378.653	11362.298	12142.946	11768.539	14280.121	13101.637	13414.417

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SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 10 CONSOLIDATED STATEMENT OF INCOME **** PROFIT AND LOSS PROJECTION ****

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
REVENUES							
NET SALES AND OPERATION REVENUES	146690.400	154024.920	161726.164	169812.471	178303.092	2026413.359	101320.668
SALES - PRODUCT A	-50952.105	-56527.902	-62346.633	-68341.565	-75564.260	-670349.445	-33517.472
TOTAL REVENUE	95738.297	97497.018	99379.531	101470.906	102738.832	1356063.969	67803.198
COST AND EXPENSES							
OPERATION AND MAINTENANCE EXPENSES	18639.000	19526.000	20458.000	21418.000	22446.000	266979.000	13348.950
SEGREGATED EXPENSES - TYPE C	31469.181	33042.640	34694.771	36429.510	38250.985	345617.281	17280.864
COSTS, EXCL DEPREC & INTEREST	50108.181	52568.640	55152.771	57847.510	60696.985	612596.273	30629.813
GROSS OPERATING INCOME	45630.116	44928.378	44226.760	43623.396	42041.848	743467.672	37173.383
INTEREST EXPENSES	9083.977	7917.188	6750.399	5583.609	4993.022	176204.900	8810.245
FINANCIAL DEPRECIATION	9356.250	9356.250	9356.250	9356.250	9356.250	152227.432	7611.372
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	234.972	234.972	6466.444	323.322
TOTAL EXPENSES	68881.546	70175.215	71592.558	73022.340	75281.228	947495.039	47374.752
INVESTMENT INCOME, NET	154.446	154.446	154.446	154.446	458.860	2744.737	137.237
NET INCOME BEFORE TAXES	27011.197	27476.249	27941.420	28603.012	27916.464	411313.633	20565.682
INCOME TAXES							
TAX DEPRECIATION	17046.593	16411.727	15834.576	15320.567	14921.952	267227.613	12725.124
TAXABLE INCOME	19653.992	20753.910	21796.232	22873.667	22585.734	292553.898	13931.138
UNUSED TAX LOSS	.000	.000	.000	.000	.000	.000	.000
TAX LOSS CARRYFORWARD	.000	.000	.000	.000	.000	.000	.000
TAX LOSS APPLIED THIS YEAR	.000	.000	.000	.000	.000	-10226.000	-486.952
INVESTMENT TAX CREDIT	.000	.000	.000	.000	.000	33682.498	1603.928
UNUSED INVESTMENT TAX CREDITS	.000	.000	.000	.000	.000	4155.710	197.891
TAX CREDITS CARRIED FORWARD	.000	.000	.000	.000	.000	.000	.000
TAX CREDITS APPLIED THIS YEAR	.000	.000	.000	.000	.000	29526.789	1406.038
CURRENT INCOME TAX	9826.996	10376.955	10898.116	11436.833	11292.867	116750.163	5559.532
DEFERRED INCOME TAX	3678.602	3361.169	3072.594	2864.673	2665.365	59379.868	2827.613
TOTAL INCOME TAX	13505.599	13738.124	13970.710	14301.506	13958.232	176130.029	8387.144
NET INCOME (BOOK PROFIT)	13505.599	13738.125	13970.710	14301.506	13958.232	235183.607	11199.219

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION **** CASH FLOW PROJECTION ****

TIME PERIOD	1975	1977	1978	1979	1980	1981	1982	1983
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	-5118.000	9924.909	9768.041	10641.062	10118.394	10169.277	10404.314	11522.986
FINANCIAL DEPRECIATION	.000	6665.083	5819.778	5819.778	6290.361	6290.361	6290.361	6392.722
AMORTIZATION OF FINANCIAL EXPENSES	.000	333.139	333.139	333.139	333.139	333.139	333.139	333.139
DEFERRED INCOME TAX	5118.000	1635.957	1685.178	1685.178	2219.932	2149.928	2086.288	2144.752
PROVIDED BY OPERATIONS	.000	17557.088	17606.135	18479.156	18961.825	18942.704	19114.101	20393.599
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	129645.602	5567.000	.000	16941.000	.000	.000	3685.000	23705.000
NET ADDITIONS TO EQUITY	86430.399	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	216076.000	23124.088	17606.135	35420.156	18961.825	18942.704	22799.101	44098.599

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APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	203943.000	5567.000	.000	16941.000	.000	.000	3685.000	23705.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	.000	7202.533	7511.922	7511.922	8953.089	8953.089	8453.089	6657.611
FINANCIAL AND DEBT EXPENSE	10222.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	214165.000	12771.533	7511.922	24452.922	8953.089	8953.089	12138.089	32362.811
CASH DIVIDENDS PAID	.000	9924.909	9768.041	10641.062	10118.394	10169.277	10404.314	11522.986
NET INCREASE IN INVESTMENTS	.000	431.646	326.172	326.172	390.342	320.338	256.698	212.802
TOTAL APPLICATION OF FUNDS	214165.000	23128.088	17606.135	35420.156	18961.825	18942.704	22799.101	44098.599
INCREASE IN WORKING CAPITAL	1907.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	216076.000	23128.088	17606.135	35420.156	18961.825	18942.704	22799.101	44098.599
CASH BENEFITS LESS INVESTMENT COSTS	-216076.000	11990.088	17606.135	1538.156	18961.825	18942.704	15429.101	-3311.401
NET CASH GENERATED DURING THE PERIOD	.000	10356.555	10094.213	10967.234	10508.736	10489.616	10661.012	11735.788
CUMULATIVE NET CASH GENERATED	.000	10356.555	20450.768	31418.002	41926.738	52416.353	63077.365	74813.152

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SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 #6 111976
RUN ID GAS REF. SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
SOURCES OF FUNDS								
NET INCOME (BOOK PROFIT)	10824.853	11378.653	11362.298	12142.946	11768.539	14280.121	13101.637	13414.417
FINANCIAL DEPRECIATION	7051.194	7051.194	7303.750	7401.028	7834.139	7834.139	9154.972	9247.333
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	333.139	333.139	333.139	333.139	333.139
DEFERRED INCOME TAX	2825.194	2665.583	2807.476	2748.539	3072.166	2854.515	4157.596	3886.187
PROVIDED BY OPERATIONS	21034.380	21428.569	21806.663	22625.650	23007.982	25301.913	26747.344	26881.075
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	.000	9092.000	3502.000	15592.000	.000	47550.000	3325.000	3921.000
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	21034.380	30520.569	25308.663	38217.650	23007.982	72851.912	30072.344	30602.075
APPLICATION OF FUNDS								
ADDITIONS TO PLANT & EQUIPMENT	.000	9092.000	3602.000	15592.000	.000	47550.000	3325.000	3921.000
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	9974.755	9974.755	10479.866	10674.422	11540.644	11540.644	14182.311	14367.033
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	.000	.000	.000
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	9974.755	19066.755	13981.866	26266.422	11540.644	59090.644	17507.311	18288.033
CASH DIVIDENDS PAID	10824.853	11378.653	11326.796	11951.229	11467.338	13761.269	12565.033	12514.042
NET INCREASE IN INVESTMENTS	234.771	75.160	.000	.000	.000	.000	.000	.000
TOTAL APPLICATION OF FUNDS	21034.380	30520.569	25308.663	38217.650	23007.982	72851.912	30072.344	30602.075
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DISPOSITION OF FUNDS	21034.380	30520.569	25308.663	38217.650	23007.982	72851.912	30072.344	30802.075
CASH BENEFITS LESS INVESTMENT COSTS	21034.380	12336.669	18304.663	7033.650	23007.982	-22248.087	23422.344	22960.075
NET CASH GENERATED DURING THE PERIOD	11059.624	11453.813	11326.796	11951.229	11467.338	13761.269	12565.033	12514.042
CUMULATIVE NET CASH GENERATED	85872.776	97326.589	108653.385	120604.613	132071.951	145833.219	158398.250	170912.291

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 20 CONSOLIDATED STATEMENT OF CHANGES IN FINANCIAL POSITION •••• CASH FLOW PROJECTION ••••

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
SOURCES OF FUNDS							
NET INCOME (BOOK PROFIT)	13505.597	13738.125	13770.710	14301.506	13958.232	235183.607	11199.219
FINANCIAL DEPRECIATION	9356.250	9356.250	9356.250	9356.250	9356.250	152227.432	7611.372
AMORTIZATION OF FINANCIAL EXPENSES	333.139	333.139	333.139	234.972	234.972	6466.444	323.322
DEFERRED INCOME TAX	3678.602	3361.169	3372.594	2864.673	2665.365	59379.868	2827.613
PROVIDED BY OPERATIONS	26873.589	26788.682	26732.692	26757.401	26214.818	453257.348	21583.683
SHORT-TERM BORROWING	.000	.000	.000	.000	.000	.000	.000
LONG-TERM BORROWING	.000	.000	.000	.000	.000	262527.602	12501.314
NET ADDITIONS TO EQUITY	.000	.000	.000	.000	.000	86430.399	4115.733
MISCELLANEOUS SOURCES OF FUNDS	.000	.000	.000	.000	.000	.000	.000
TOTAL SOURCES OF FUNDS	26873.589	26788.682	26732.692	26757.401	26214.818	802215.312	38200.729
APPLICATION OF FUNDS							
ADDITIONS TO PLANT & EQUIPMENT	.000	.000	.000	.000	.000	336825.000	16039.286
SHORT-TERM DEBT RETIREMENT	.000	.000	.000	.000	.000	.000	.000
LONG-TERM DEBT RETIREMENT	14584.866	14584.866	14584.866	7382.337	7072.944	207187.756	9866.083
FINANCIAL AND DEBT EXPENSE	.000	.000	.000	.000	.000	10226.000	486.952
MISCELLANEOUS APPLICATION OF FUNDS	.000	.000	.000	.000	.000	.000	.000
SUBTOTAL	14584.866	14584.866	14584.866	7382.337	7072.944	554238.719	26392.320
CASH DIVIDENDS PAID	12288.723	12203.816	12147.825	14301.506	13958.232	233238.287	11106.585
NET INCREASE IN INVESTMENTS	.000	.000	.000	5073.558	5183.642	12831.301	611.014
TOTAL APPLICATION OF FUNDS	26873.589	26788.682	26732.692	26757.401	26214.818	800308.312	38109.919
INCREASE IN WORKING CAPITAL	.000	.000	.000	.000	.000	1907.000	90.810
TOTAL DISPOSITION OF FUNDS	26873.589	26788.682	26732.692	26757.401	26214.818	802215.312	38200.729
CASH BENEFITS LESS INVESTMENT COSTS	26873.589	26788.682	26732.692	26757.401	26214.818	104299.359	4966.636
NET CASH GENERATED DURING THE PERIOD	12288.723	12203.816	12147.825	19375.064	19141.874	246069.588	11717.599
CUMULATIVE NET CASH GENERATED	183201.014	195404.828	207552.652	226927.715	246069.588	2373287.687	113013.699

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE: NOVEMBER 22, 1976 15:53:47 #6 111976
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BASELINE CASE (P38.0)

JFM REPORT NO. 30 CONSOLIDATED STATEMENT OF FINANCIAL POSITION **** BALANCE SHEET PROJECTION ****

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ASSETS								
CURRENT ASSETS								
TOTAL CURRENT ASSETS	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000
PROPERTY, PLANT AND EQUIPMENT								
@ ORIGINAL COST	203943.000	209512.000	209512.000	226453.000	226453.000	226453.000	230138.000	253843.000
LESS - ACCUMULATED DEPRECIATION	.000	5665.083	11484.861	17304.639	23595.000	29885.360	36175.721	42568.443
NET PROPERTY & EQUIP.	203943.000	203846.918	198027.141	209148.361	202858.002	196567.641	193962.279	211274.559
INVESTMENTS	.000	431.646	757.818	1083.990	1474.333	1794.671	2051.369	2264.171
DEFERRED CHARGES								
UNAMORTIZED FIN. & DEBT EXPENSES	1767.000	1668.833	1570.667	1472.500	1374.333	1276.167	1178.000	1079.833
UNAMORTIZED CONSTRUCTION INTEREST	8459.000	8224.028	7989.056	7754.083	7519.111	7284.139	7049.167	6814.195
OTHER DEFERRED CHARGES	.000	.000	.000	.000	.000	.000	.000	.000
TOTAL DEFERRED CHARGES	10226.000	9892.861	9659.722	9226.583	8893.445	8560.306	8227.167	7894.028
TOTAL ASSETS	216076.000	216078.422	210251.678	221365.934	215132.777	208829.615	206147.812	223339.756

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LIABILITIES AND SHAREHOLDERS EQUITY								
CURRENT LIABILITIES								
TOTAL CURRENT LIABILITIES	.000	.000	.000	.000	.000	.000	.000	.000
SHORT-DEBT UNPAID BALANCE	.000	.000	.000	.000	.000	.000	.000	.000
LONG-DEBT UNPAID BALANCE	129645.602	128012.068	120500.146	129929.224	121476.135	113023.046	108254.958	123302.146
TOTAL DEBT BALANCE	129645.602	128012.068	120500.146	129929.224	121476.135	113023.046	108254.958	123302.146
DEFERED FEDERAL INCOME TAXES	5113.000	6748.957	8434.135	10119.313	12339.245	14489.172	16575.460	18720.212

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STOCKHOLDERS EQUITY								
TOTAL PAID-IN CAPITAL	86430.399	86430.399	86430.399	86430.399	86430.399	86430.399	86430.399	86430.399
RETAINED EARNINGS	-5113.000	-5113.000	-5113.000	-5113.000	-5113.000	-5113.000	-5113.000	-5113.000
TOTAL EQUITY CAPITAL	81317.399	81317.399	81317.399	81317.399	81317.399	81317.399	81317.399	81317.399
TOTAL LIABILITIES & EQUITY	216076.000	216078.424	210251.680	221365.934	215132.777	208829.617	206147.816	223339.756

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NET WORKING CAPITAL	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000

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SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P36.0)

JFM REPORT NO. 30 CONSOLIDATED STATEMENT OF FINANCIAL POSITION **** BALANCE SHEET PROJECTION ****

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ASSETS								
CURRENT ASSETS								
TOTAL CURRENT ASSETS	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000
PROPERTY, PLANT AND EQUIPMENT								
@ ORIGINAL COST	253843.000	262935.000	266437.000	282029.000	282029.000	329579.000	332904.000	336825.000
LESS - ACCUMULATED DEPRECIATION	49619.637	56670.831	63974.580	71375.607	79209.746	87043.885	96198.856	105446.189
NET PROPERTY & EQUIP.	204223.363	206264.172	202462.922	210653.393	202819.254	242535.117	236705.145	231378.812
INVESTMENTS	2498.942	2574.102	2674.102	2574.102	2574.102	2574.102	2574.102	2574.102
DEFERRED CHARGES								
UNAMORTIZED FIN. & DEBT EXPENSES	981.667	883.500	785.333	687.167	569.000	490.833	392.667	294.500
UNAMORTIZED CONSTRUCTION INTEREST	6579.223	6344.250	6109.278	5874.306	6639.334	5404.362	5169.390	4934.417
OTHER DEFERRED CHARGES	.030	.000	.000	.000	.000	.000	.000	.000
TOTAL DEFERRED CHARGES	7560.839	7227.751	5694.612	6561.473	6228.334	5895.195	5562.056	5228.918
TOTAL ASSETS	216190.173	217973.023	213838.135	221695.969	213528.689	252911.412	246748.301	241088.830

****

LIABILITIES AND SHAREHOLDERS EQUITY								
CURRENT LIABILITIES								
TOTAL CURRENT LIABILITIES	.000	.000	.000	.000	.000	.000	.000	.000
SHORT-DEBT UNPAID BALANCE	.000	.000	.000	.000	.000	.000	.000	.000
LONG-DEBT UNPAID BALANCE	113327.391	112444.636	105466.769	110384.347	98843.702	134853.059	123995.749	113549.716
TOTAL DEBT BALANCE	113327.391	112444.636	105466.769	110384.347	98843.702	134853.059	123995.749	113549.716
DEFERED FEDERAL INCOME TAXES	21545.406	24210.988	27018.464	29767.003	32839.169	35693.683	39851.279	43737.466

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STOCKHOLDERS EQUITY								
TOTAL PAID-IN CAPITAL	86430.399	86430.399	86430.399	86430.399	86430.399	86430.399	86430.399	86430.399
RETAINED EARNINGS	-5113.000	-5113.000	-5077.498	-4886.781	-4584.581	-4065.728	-3529.124	-2626.750
TOTAL EQUITY CAPITAL	81317.399	81317.399	81352.901	81544.618	81846.819	82364.672	82901.275	83801.649
TOTAL LIABILITIES & EQUITY	216190.193	217973.021	213838.133	221695.967	213528.689	252911.412	246748.303	241088.830

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NET WORKING CAPITAL	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000	1907.000

SYSTEMS, SCIENCE AND SOFTWARE
JFM FINANCIAL PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 *6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

JFM REPORT NO. 30 CONSOLIDATED STATEMENT OF FINANCIAL POSITION **** BALANCE SHEET PROJECTION ****

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
ASSETS							
CURRENT ASSETS							
TOTAL CURRENT ASSETS	1907.000	1907.000	1907.000	1907.000	1907.000	40047.000	1907.000
PROPERTY, PLANT AND EQUIPMENT							
& ORIGINAL COST	336825.000	336825.000	336825.000	336825.000	336825.000	5817013.000	277000.617
LESS - ACCUMULATED DEPRECIATION	114802.438	124158.687	133514.936	142871.184	152227.432	1443793.062	68752.050
NET PROPERTY & EQUIP.	222022.562	212666.312	203310.066	193953.816	184597.570	4373219.750	208248.559
INVESTMENTS	2574.102	2574.102	2574.102	7647.659	12831.301	58576.916	2789.377
DEFERRED CHARGES							
UNAMORTIZED FIN. & DEBT EXPENSES	196.333	98.167	.000	.000	.000	16786.500	799.357
UNAMORTIZED CONSTRUCTION INTEREST	4699.445	4464.473	4229.501	3994.529	3759.557	128294.841	6109.278
OTHER DEFERRED CHARGES	.000	.000	.000	.000	.000	.000	.000
TOTAL DEFERRED CHARGES	4895.779	4562.640	4229.501	3994.529	3759.557	145081.336	6908.635
TOTAL ASSETS	231399.441	221710.053	212020.668	207503.002	203095.428	4616924.937	219853.568
LIABILITIES AND SHAREHOLDERS EQUITY							
CURRENT LIABILITIES							
TOTAL CURRENT LIABILITIES	.000	.000	.000	.000	.000	.000	.000
SHORT-DEBT UNPAID BALANCE	.000	.000	.000	.000	.000	.000	.000
LONG-DEBT UNPAID BALANCE	98964.849	84379.983	69795.118	62412.781	55339.837	2257901.094	107519.100
TOTAL DEBT BALANCE	98964.849	84379.983	69795.118	62412.781	55339.837	2257901.094	107519.100
DEFERED FEDERAL INCOME TAXES	47416.068	50777.237	53849.831	56714.503	59379.868	615340.437	29301.926
STOCKHOLDERS EQUITY							
TOTAL PAID-IN CAPITAL	86430.399	86430.399	86430.399	86430.399	86430.399	1815038.297	86430.395
RETAINED EARNINGS	-1411.874	122.435	1945.319	1945.319	1945.319	-71354.945	-3397.855
TOTAL EQUITY CAPITAL	85018.525	86552.834	88375.718	88375.718	88375.718	1743683.344	83032.540
TOTAL LIABILITIES & EQUITY	231399.441	221710.055	212020.666	207503.002	203095.422	4616924.875	219853.564
NET WORKING CAPITAL	1907.000	1907.000	1907.000	1907.000	1907.000	40047.000	1907.000

**** GAS PIPELINE BASELINE CASE BASE310 DATE 112276 PAGE 18

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15153:47 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1976	1977	1978	1979	1980	1981	1982	1983
ACTIVITY								
ANNUAL THROUGHPUT (MMMMCF-MILES)	.003	57.562	60.936	64.512	67.854	71.477	75.155	78.903
NOMINAL TARIFF UNIT TRANSP. CHARGE)	.000	660.000	693.000	727.650	764.032	802.234	842.346	884.463
ACTUAL TARIFF	.000	632.129	647.014	647.346	656.446	630.023	613.665	634.150
NOMINAL TRANSPORTATION REVENUES	.003	37990.919	42228.647	46942.156	51842.660	57341.286	63306.498	69786.790
ACTUAL TOTAL REVENUES	.000	36386.634	39426.446	41761.564	44592.473	45032.183	46119.999	50036.348
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO CAPITAL %	61.454	61.153	59.707	61.506	59.901	58.157	57.105	60.259
LONG-TERM (FUNDED) DEBT TO ASSETS %	60.000	59.243	57.312	58.694	56.466	54.122	52.513	55.208
PROFITABILITY								
OPERATING INCOME (FPC RULES)	.003	20629.696	23342.145	20614.212	20845.870	20220.506	19779.296	20516.621
ANNUAL FPC RATE BASE	206345.000	206296.959	203339.029	205989.750	208405.182	202114.822	197666.961	205020.418
RATE OF RETURN ON RATE BASE (%	.000	10.000	10.004	10.007	10.003	10.004	10.006	10.007
RATE OF RETURN ON PAID-IN CAPITAL(%)	.000	11.483	11.302	12.312	11.707	11.766	12.038	13.332
RATE OF RETURN ON TOTAL CAPITAL (%)	.000	4.741	4.840	5.037	4.990	5.233	5.488	5.631
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE OF GAS (MMCF)	.000	1559.083	2005.124	2263.467	2978.737	3307.456	3719.575	4480.231
ANNUAL ENERGY COSTS	.000	2213.898	2989.640	3543.571	4896.530	5708.731	6741.059	8373.357
PRESENT VALUE OF ENERGY USED	.000	2012.634	2470.777	2662.337	3394.396	3544.673	3805.152	4296.856
UNIT COST OF ENERGY $/MMCF	.000	1.420	1.491	1.566	1.644	1.726	1.812	1.903
OTHER MEASURES								
TOTAL ANNUAL UNIT COSTS	.000	431.287	425.865	410.707	436.767	421.511	412.007	422.869
PRESENT VALUE OF AVERAGE UNIT COSTS	.000	392.079	351.955	308.570	298.318	261.725	232.567	216.999
NET INCOME (BOOK PROFIT)	-5113.000	9924.909	9768.041	10641.062	10118.394	10169.277	10404.314	11522.986
PRESENT VALUE OF BOOK PROFITS	-5113.000	9022.645	8072.761	7994.787	6910.999	6314.321	5872.964	5913.114
NET CASH GENERATED DURING THE PERIOD	.000	10356.555	10094.213	10967.234	10508.736	10489.615	10661.012	11735.788
PRESENT VALUE OF NET CASH GENERATED	.000	9415.350	8342.325	8239.845	7177.608	6513.226	6017.864	6022.315
DISCOUNT FACTOR (010.000 %) =	1.000	.909	.826	.751	.683	.621	.564	.513

SYSTEMS, SCIENCE AND SOFTWARE
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PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15:53:47 #6 111976
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BASELINE CASE (P38,0)

P38 REPORT NO. 38 CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1984	1985	1986	1987	1988	1989	1990	1991
ACTIVITY								
ANNUAL THROUGHPUT (MMMMCF-MILES)	81.836	85.513	89.088	92.843	96.288	100.124	103.597	106.913
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	928.686	975.121	1023.877	1075.070	1128.824	1185.265	1244.528	1306.755
ACTUAL TARIFF	640.374	644.539	691.381	690.849	733.751	725.509	833.609	870.106
NOMINAL TRANSPORTATION REVENUES	75999.966	83385.480	91215.114	99812.757	108692.192	118673.477	128929.396	139709.064
ACTUAL TOTAL REVENUES	52405.680	55116.478	61593.770	64140.498	70651.376	72640.900	86359.409	93025.650
LEVERAGE								
LONG-TERM (FUNDED) DEBT TO CAPITAL %	58.223	58.032	56.454	57.513	54.704	62.082	59.931	57.537
LONG-TERM (FUNDED) DEBT TO ASSETS %	52.420	51.586	49.321	49.791	46.291	53.320	50.252	47.099
PROFITABILITY								
OPERATING INCOME (FPC RULES)	21022.164	20777.983	20691.008	20913.426	20932.425	22520.756	24223.020	23667.215
ANNUAL FPC RATE BASE	210150.963	207645.766	206765.299	208959.906	209138.326	225079.184	242022.133	236443.979
RATE OF RETURN ON RATE BASE (%)	10.003	10.006	10.007	10.008	10.009	10.006	10.009	10.010
RATE OF RETURN ON PAID-IN CAPITAL(%)	12.524	13.165	13.146	14.049	13.616	16.522	15.159	15.520
RATE OF RETURN ON TOTAL CAPITAL (%)	6.561	5.872	6.082	6.327	6.513	6.574	6.332	6.797
ENERGY CONSUMPTION								
ANNUAL ENERGY USAGE OF GAS (MMCF)	4466.495	4920.097	5294.936	6183.640	6942.746	7740.591	9563.023	10614.371
ANNUAL ENERGY COSTS	8924.425	10322.297	11664.140	14302.946	16861.720	19739.403	25606.156	29842.332
PRESENT VALUE OF ENERGY USED	4163.310	4377.662	4497.031	5013.096	5372.664	5717.802	6742.902	7144.017
UNIT COST OF ENERGY $/MMCF	1.998	2.098	2.203	2.313	2.429	2.550	2.678	2.812
OTHER MEASURES								
TOTAL ANNUAL UNIT COSTS	442.653	448.094	453.266	464.520	490.910	517.880	606.856	627.945
PRESENT VALUE OF AVERAGE UNIT COSTS	206.501	190.035	174.764	162.812	156.419	150.011	159.804	150.325
NET INCOME (BOOK PROFIT)	10824.853	11378.653	11362.298	12142.946	11768.539	14280.121	13101.637	13414.417
PRESENT VALUE OF BOOK PROFITS	5049.874	4825.660	4380.658	4256.029	3749.819	4136.443	3450.071	3211.306
NET CASH GENERATED DURING THE PERIOD	11059.624	11453.813	11326.796	11951.229	11467.338	13761.269	12565.033	12514.042
PRESENT VALUE OF NET CASH GENERATED	5159.396	4857.535	4366.971	4188.833	3653.848	3986.150	3308.766	2995.762
DISCOUNT FACTOR (@10.000 %) =	.467	.424	.386	.350	.319	.290	.263	.239

SYSTEMS, SCIENCE AND SOFTWARE
LAC PROJECTION MODEL
PIPELINE TRANSPORTATION SYSTEMS ENERGY CONSERVATION STUDY

DATE NOVEMBER 22, 1976 15153147 #6 111976
RUN ID GAS REF SYSTEM CONVERSION TO SIMPLE CYCLE TURBINES
BASELINE CASE (P38.0)

P38 REPORT NO. 3A CAPITAL INVESTMENT PLANNING AND ENERGY CONSERVATION IMPACT PROJECTION (DOLLARS IN THOUSANDS)

TIME PERIOD	1992	1993	1994	1995	1996	TOTAL	AVERAGE
ACTIVITY							
ANNUAL THROUGHPUT (MMMMCF-MILES)	106.910	106.910	106.910	106.910	106.910	1767.151	88.358
NOMINAL TARIFF (UNIT TRANSP. CHARGE)	1372.092	1490.697	1512.732	1588.368	1667.787	21823.527	1091.176
ACTUAL TARIFF	895.504	911.954	929.563	949.125	968.984	14604.176	730.209
NOMINAL TRANSPORTATION REVENUES	146690.400	159024.920	161726.164	169812.471	178303.092	2026413.359	101320.668
ACTUAL TOTAL REVENUES	95738.297	97497.018	99379.531	101470.906	102738.632	1356063.969	67803.198
LEVERAGE							
LONG-TERM (FUNDED) DEBT TO CAPITAL %	53.290	49.364	44.126	41.391	38.507	56.425	56.425
LONG-TERM (FUNDED) DEBT TO ASSETS %	42.268	39.059	32.919	30.078	27.248	48.905	48.905
PROFITABILITY							
OPERATING INCOME (FPC RULES)	22922.314	21968.451	21054.247	20120.088	19186.227	422967.949	21148.397
ANNUAL FPC RATE BASE	229102.689	219746.439	210390.189	201033.943	191677.693	4433334.500	221666.725
RATE OF RETURN ON RATE BASE (%)	10.005	10.036	10.007	10.008	10.010	9.541	9.541
RATE OF RETURN ON PAID-IN CAPITAL(%)	15.626	15.895	16.164	16.547	16.850	12.958	12.958
RATE OF RETURN ON TOTAL CAPITAL (%)	7.341	8.037	8.833	9.484	9.712	5.877	5.877
ENERGY CONSUMPTION							
ANNUAL ENERGY USAGE OF GAS (MMCF)	10660.011	10660.011	10660.011	10660.011	10660.011	129259.623	6462.981
ANNUAL ENERGY COSTS	31469.181	33042.640	34694.771	36429.510	38250.985	345617.281	17280.864
PRESENT VALUE OF ENERGY USED	6848.811	6537.311	6240.160	5956.517	5685.766	96433.670	.000
DISCOUNTED VALUE OF ENERGY USED (@ 10.00 %) =	96433.673						
UNIT COST OF ENERGY $/MMCF	2.952	3.100	3.255	3.417	3.588	46.954	2.348
OTHER MEASURES							
TOTAL ANNUAL UNIT COSTS	644.295	656.375	669.653	683.026	704.155	10370.660	518.533
PRESENT VALUE OF AVERAGE UNIT COSTS	140.217	129.864	120.443	111.680	104.668	4019.746	200.987
DISCOUNTED AVERAGE (ANNUAL) UNIT COSTS (LONG-RUN AVERAGE COSTS) (@ 10.00 %) =	200.987						
NET INCOME (BOOK PROFIT)	13505.599	13738.125	13970.710	14301.506	13958.232	235183.607	11199.219
PRESENT VALUE OF BOOK PROFITS	2939.212	2718.015	2512.755	2338.411	2074.802	90631.640	4531.582
DISCOUNTED VALUE OF BOOK PROFITS (@ 10.00 %) =	90631.640						
NET CASH GENERATED DURING THE PERIOD	12288.723	12203.8.6	12187.825	19375.064	19191.874	246069.588	11717.599
PRESENT VALUE OF NET CASH GENERATED	2674.384	2414.4.0	2134.893	3167.978	2845.318	97532.519	4876.626
DISCOUNTED NET CASH FLOW (@ 10.00 %) =	97532.519						
DISCOUNT FACTOR (@10.000 %) =	.218	.1.8	.180	.164	.149	.000	.000

****** INTERNAL RATE OF RETURN ******

DCF - ROI OF $ 86430.399 (FROM YEAR 1 OVER 10 YEARS) = 4.30 %
DCF - ROI OF $ 86430.399 (FROM YEAR 1 OVER 15 YEARS) = 9.57 %
DCF - ROI OF $ 86430.399 (FROM YEAR 1 OVER 20 YEARS) = 11.70 %

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APPENDIX A

BACKGROUND ON THE S^3 DEVELOPMENT OF A PIPELINE ECONOMIC MODEL

In April, 1976, Systems, Science and Software (S^3) began development of a computer model of the economic operation of pipeline transportation systems. This effort was undertaken in order to satisfy the requirements of the U.S. Energy Research and Development Administration (ERDA) program, "Energy Study of Pipeline Transportation Systems," (Contract No. E(04-3)-1171, ERDA SF00). The primary objective of developing a preliminary model describing the economic behavior of the pipeline industry was to calculate:

1. The long-run average cost (LAC) behavior of a pipeline.
2. The return on investment of the required capital.

In order to accomplish this task under the constraints of time and funds imposed by this program, S^3 chose to modify and enhance currently available computer models that could be quickly developed to simulate pipeline operations.

As a result of many earlier development efforts for its business clients, S^3 has available in-house a repertoire of computer software products, models, and data management systems. A representative sample of such products is given in the attached, "Summary of S^3 Developed Economic Models". Due to the availability of such S^3-developed financial models, including documentation, utility routines, and P/L cash flow, and balance sheet models, it was possible to develop a general pipeline financial model within a very short period of time. This was accomplished by modifying the S^3 Financial Projection Model ("JFM"), a general business accounting package, to incorporate not only the ICC and FPC definitions of rate base and operating income, but also many other special features that are characteristic of regulated industries. Further enhancements to the model were made in order to segregate energy usage/cost and to project the impact of specific energy conservation measures.

The limited objectives of the subject ERDA program demanded that a general pipeline financial model be developed and made operational in as expeditious a manner as possible. Due to the special conditions under which the development of the model was initiated, no special effort was made at the time to ensure the portability of the end product. In order to minimize programming labor and computer compilation and execution time, the powerful convenience features of UNIVAC FORTRAN V were exploited; these features are an extension to American National Standards Institute (ANSI) Standard FORTRAN (ANSI × 3.9-1966). The end product is a model comprised of over thirty (30) source subprograms of over 7000 lines written in the UNIVAC 1108 FORTRAN V programming language and fourteen utility subprograms from the S^3 system library written in UNIVAC 1108 assembly language.

As the second step in meeting the requirements of the ERDA program, the S^3 subcontractor, Pipe Line Technologists, Inc. of Houston, Texas, modified their steady state liquid pipeline model. This model, hereinafter called the Pipeline Energy Program ("PEP"), was further enhanced and installed at S^3. PEP calculates the pressure profile to be found in any steady-state, constant density liquid pipeline. The pressure gradient is computed according to the energy-entropy balance and applications of the first and second laws of thermodynamics, with friction losses accounted for according to the Moody friction correlation, using either the Darcy-Weisbach correlation or the Hazen and Williams formula. PEP is used to simulate the steady-state physical operation of any liquid pipeline.

As the final step in this accelerated model development process, a general Pipeline Economic Model ("PEM") was implemented on S^3's UNIVAC 1108 computer system. PEM links together PEP, which simulates the physical operation of a pipeline, with JFM which simulates the financial operation of a pipeline. The end product is a single economic model that can be used to analyze the long range economic impact of a wide range of possible technological innovations in pipeline operation.

In order to facilitate the investigation of the impact of various technological innovations on energy conservation and the long-term economic behavior of pipelines, a reference system has been defined by Pipe Line Technologists, Inc. for each of the six types of pipelines of interest, namely:

1. Liquid petroleum products
2. Crude oil
3. Natural gas
4. Coal slurry
5. Fresh water
6. Waste water

The physical parameters for these referenced systems were extracted from available design specifications for existing or planned pipelines. Estimates of capital and operating costs and lifetime throughput have been prepared for each reference system. Source data for PEM includes both financial data, such as capital and operating costs, and physical data, such as the physical characteristics of the pipeline, the fluids being transported, and the pumping stations and terminals of the system.

For a given market demand, PEP generates projections of throughput, energy usage and energy losses. PEM generates all of the standard financial accounting reports, such as projections of income and expense, source and application of funds, and assets and liabilities. In addition to these basic accounting statement projections, the model produces a special report entitled, "Capital Investment Planning and Energy Conservation Impact Projection". The output generated includes projections of the following:

1. Annual throughput in volume-distance units.
2. Nominal tariff.
3. Actual tariff or unit transportation charge taking into account reductions to the nominal tariff required to maintain a maximum allowable return on rate base.
4. Actual total revenues.
5. Ratio of long-term debt to capital.
6. Ratio of long-term debt to total assets.
7. Rate base according to ICC or FPC rules.
8. Operating income according to ICC or FPC rules.
9. Rate of return on rate base.
10. Rate of return on paid-in capital.
11. Rate of return on total capital.
12. Annual energy usage.
13. Annual energy costs.
14. Present value of energy used.
15. Unit of cost energy.
16. Annual energy wasted in energy units.
17. Annual energy wasted cost.
18. Present value of energy wasted.
19. Total annual unit costs.
20. Discounted average (annual) unit costs (long-run average costs).

21. Net income (book profit).

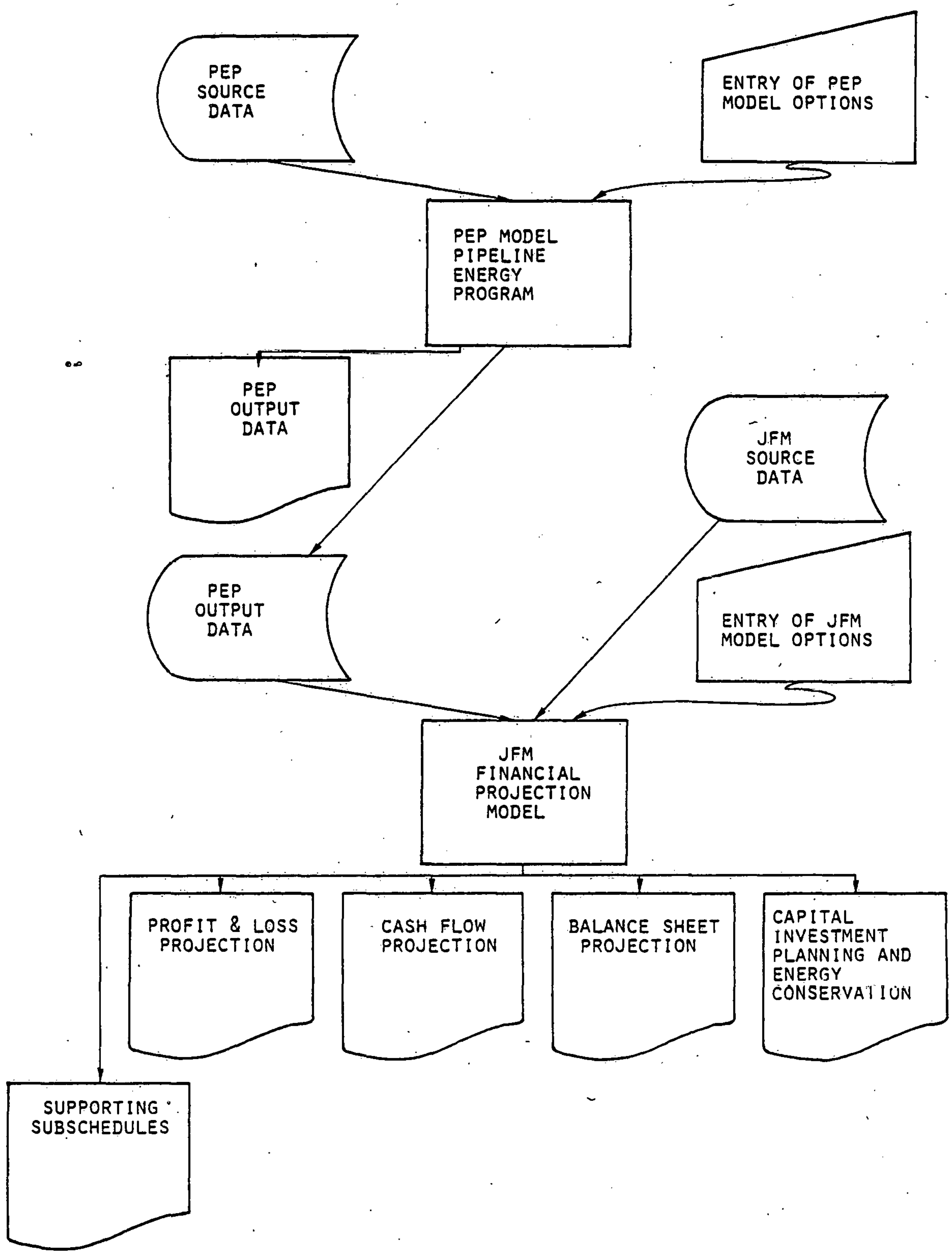
22. Present value of book profits.

23. Net cash generated.

24. Present value of net cash generated.

25. Discounted cash flow rate of return on investment.

The Pipeline Economic Method has been exercised on the reference systems described above in order to establish a series of baseline cases. As various technological innovations were postulated during the subject ERDA program, the model was utilized as a planning tool to analyze the economic impact of each change as compared to the baseline cases.



Schematic diagram of the general system design of the Pipeline Economic Model.

APPENDIX B
SUMMARY OF S^3 DEVELOPED ECONOMIC MODELS

Since its inception in 1967, S^3 has maintained an ongoing internal research and development program in computer-based economic, business, financial, management and resource planning models. As a result of this activity, and the expertise of its staff, S^3 has developed a repertoire of proprietary computer software products including models and special-purpose data management systems that have been successfully implemented for its clients. The following models are representative.

1. FINANCIAL PROJECTION MODELS

1.1 GENERAL BUSINESS FINANCIAL ACCOUNTING PROJECTION MODEL - JFM

- Masso, J. F., "S^3 Financial Projection Model - Preliminary User's Manual and System Overview," Systems, Science and Software Report, SSS-R-77-3060, November, 1976.

1.2 PIPELINE ECONOMIC MODEL - PEM

Simulates the economic behavior of pipeline transportation systems by linking the financial projection capabilities of JFM with a series of steady-state pipeline models.

1.3 PUBLISHER'S MODEL - PUBCO

One of the most advanced corporate financial models in the United States. It is operated interactively by nontechnical managers on a daily basis via remote timesharing terminals by a large number of diversified publishing corporations.

- "Publisher's Model Development," Systems, Science and Software Report 3SR-755, October, 1971 (Revised January 21, 1976).
- "Publisher's Model User's Manual", Systems, Science and Software Report, October, 1971 (Revised August 22, 1972).

1.4 CONSUMER MODELS

1.4.1 Single Shot Model

1.4.2 Book Club Model

1.4.3 Open End (Book Series) Continuity Model

- "Consumer Division Financial Projection Model Development, Phase I Progress Report," Systems, Science and Software Report 3SR-887, December 3, 1971.
- Goyette, D. R., J. H. Alexander and J. M. Bareno, "Consumer Division Financial Projection Model," Systems, Science and Software Report 3SR-998, March 1972.

1.5 S^3 FINANCIAL INFORMATION SYSTEM (FIS)

A project-oriented projection model for a professional firm.

2. URBAN LAND USE PLANNING MODELS

2.1 FORESITE

An S^3 proprietary software product in which a retail site evaluation model operates on an integrated data base of geographic, demographic, transporation network, and retail facilities information.

- Masso, J. F., et al., "FORESITE - Retail Site Evaluation System," Systems, Science and Software Report SSS-R-75-2473, October 30, 1974.
- Masso, J. F., "A Site Evaluation Model," Proceedings of a Symposium at Salem, Oregon: Environmental Systems Analysis and Planning, August 29, 1974.

- Hays, S. D., "Orange County Site Evaluation Study," Systems, Science and Software Report 3SR-155, January, 1970.
- Hays, S. D., "Retail Store Site Selection," Systems, Science and Software Report 3SR-92, April, 26, 1969.

2.2 RISK ANALYSIS/BRANCH STORE MODEL

- Masso, J. F., Systems, Science and Software Technical Note, "Branch Store Model No. 1," 3ST-15, September 18, 1968.

2.3 MATCH

An integrated real estate data base management system used to support computer matching and other buyer/seller services of a large brokerage operation.

- Masso, J. F., "MATCH - Preliminary Application Brief," Systems, Science and Software Report, March 15, 1973.
- Masso, J. F., "The Real Exchange Computer-Match System - MATCH - User Instructions for Data Entry," Systems, Science and Software Report, February 1, 1974.
- Masso, J. F., "Modifications to the HOMEMATCH Computer System," Systems, Science and Software Technical Memorandum, August 13, 1974.

3. MANUFACTURING MODELS

3.1 POFUS

A Procurement Follow-Up System to control materials planning through exception reporting and projection techniques.

- Masso, J. F., "S^3 POFUS Procurement Follow-Up System - Application Brief," Systems, Science and Software Report SSS-IR-72-1450 (Rev. 1), July, 1976.

3.2 CONFIGURATION MANAGEMENT MODEL (CPFMS)

A milestone/cost/financial projection system for aerospace manufacturing.

- French, R. O., "Cost Projection File Management System," Systems, Science and Software Report 3SR-376, June 25, 1970.

3.3 INTERACTIVE SHOP ORDER STATUS SYSTEM

3.4 MANUFACTURING COST MODEL (for a processing industry)

4. MANAGEMENT INFORMATION SYSTEMS

4.1 GENERAL LEDGER FILE MANAGEMENT SYSTEM (GLFMS)

- French, R. O. and W. Misselwitz, "General Ledger File Management System," Systems, Science and Software Report 3SR-1054, March 27, 1972.

4.2 S^3 MANAGEMENT INFORMATION SYSTEM (MIS)

A project projection and cost control system including a general ledger, accounts payable, and other modules.

4.3 PROPOSAL PLANNING SYSTEM

4.4 AUDIT

A management system that performs a thorough analysis of an organization's historical data base and generates over 100 analytic and statistical reports.

5. DIRECT MARKETING MODELS

5.1 ADPAK - Direct Marketing Data System

An interactive data base management system used to generate projections and monitor results for advertising campaigns.

- Masso, J. F., "ADPAK - Direct Marketing System Preliminary Application Brief," Systems, Science and Software Technical Note, July, 1974.
- Alexander, J. H., "MDSPAK - A Market Data System," Systems, Science and Software Technical Note, January, 1973.

5.2 TARGET

A direct marketing system that generates customer profiles, analyzes trade areas, and executes selective strategies and experiments.

- "Computer Match May Signal Retail Print/Mail Revolution," Direct Marketing, Vol. 35, p. 22, April, 1973.

APPENDIX C

A SHORT DESCRIPTION OF SOME UNIVAC 1108 EXECUTIVE SYSTEM FUNCTIONS

DEFINITIONS

File	An organized collection of data stored in such a manner so as to facilitate the retrieval of each individual item. There are two kinds of files: (1) Program Files and (2) Data Files.
Program File	A file in which the data are the constituents of a program or a set of symbolic card images. A program file consists in elements of symbolic, relocatable binary, or absolute binary form.
Data File	A file that is processed by a program, either as an input file which is "read" by the program or as an output file which is generated ("written") by the program.
Element	The basic component of a program file usually defined and manipulated as a unit.
Run	The standard unit in which work is entered into the time-shared operating system. This consists of a run command followed by one or more control commands which cause the ordered execution of processors and/or user programs.

File Utility Routines/Program Utility Routines (FUR/PUR)

To aid the user in the manipulation of program and data files, a set of file utility routines is provided by the executive system. These routines perform a variety of functions for system and user data file maintenance.

Facilities Assignment

File Nomenclature

An "External" file name has the format:

QUALIFIER*FILE(F-CYCLE).

The QUALIFIER, the asterisk (*), and the F-CYCLE may be implied and both the QUALIFIER and the FILE are limited to 12 characters each. Unless otherwise specified, the QUALIFIER is taken from the programmer's (or project) name given in the @RUN statement.

Temporary Program File (TPF$)

A temporary program file (TPF$) is created automatically for each run. The qualifier for the filename is taken from the programmer name field of the @RUN control statement. The file may be used as a scratch file for the user's program absolute element and/or symbolic data elements. An element in TPF$ can be referred to simply by specifying the element name with or without the name TPF$. For example, @ED ELT1, ELT2 will use the element ELT1 in TPF$ as the input element and ELT2 as the output element. One could have used @ED TPF$.ELT1, TPF$.ELT2. In order to save the edited output element the user could keyin: @COPY,S ELT2, PROGFILE.ELT2.

1. @ASG,UP FILENAME.
   To assign a new file to be catalogued as a public file at the termination of the run.

2. @ASG,A FILENAME.
   To assign the file "FILENAME" that is currently catalogued.

3. @ASG,T FILENAME.
   To assign a file to the run that will be used for a temporary file and not to be catalogued.

4. @FREE FILE.
   To deassign a file and release its input/output facilities. For a file being catalogued, such as @ASG,UP FILE., the @FREE FILE. statement catalogues the file. If the file is later needed in the run, use @ASG,A FILE.

5. @USE INTERNAL.,EXTERNAL.
   To refer to a file by two or more names, where INTERNAL is the internal name by which the file is referenced within the run (e.g., within a specific program) and EXTERNAL is the external name of the file as specified in the @ASG statement.

6. @DELETE FILENAME.
   To delete a catalogued file and release its facilities.

7. @QUAL QUALIFIER

To specify a file name qualification for implied usage on succeeding control statements involving file names. For example, @QUAL ABC will allow the user to refer to the file ABC*FILE simply as FILE. To assign ABC*FILE., @ASG,A FILE. is sufficient.

File Utility Routines

1. @PRT,T PROGFILE.

   To list the table of contents for a program file names PROGFILE. The option TL will give a more detailed listing if desired; i.e., @PRT,TL PROGILE. To list the table of contents of TPF$, @PRT,T.

2. @PRT,F FILE.

   To list the master directory information pertaining to a catalogued file named FILE.

3. @PRT,I

   To list all files currently assigned to the run.

4. @PRT,P PROJNAME.

   To list the master directory items catalogued under a project name. A less expensive method is to use the statement

   @U*OM.CATF,W QUAL/PROJNAME

5. @PRT,N XXX.

   To list the master directory items for all files catalogued under account number "XXX".

6. @COPY FILE1., FILE2.

   To copy the entire contents of FILE1 to the output file FILE2.

7. @COPY, options SPEC1, SPEC2.

   Where options are S, R, or A. To copy one or more elements from one program file to another, for example

   @COPY,A FILE.PROG, PG

   will copy the absolute ("A") element PROG from the program file FILE into TPF$ and the absolute element will be named "PG". Further reference can be made to the element PG, e.g., @XQT PG. As a second example, to copy a symbolic element ELT1 in TPF$ to a catalogued file PROGFILE and name the new element ELEMENT1, use @COPY,S ELT1, PROGFILE.ELEMENT1.

8. @ERS FILENAME.

   To erase the contents of any file FILENAME, but to maintain the file in the master directory (i.e., "catalogued").

9. @ENABLE FILE.

To clear the disable flags for a catalogued file. The file is disabled if the user had the file open when a system failure took place.

10. To copy a series of FASTRAND (Drum) files to magnetic tape (Reel #1234), proceed as follows:

```
@ASG,T  X,T,  1234
@MSG  Please Mount Reel 1234 (RING IN)
@COPY,GM  FILE1.,  X.
@COPY,GM  FILE2.,  X.
 etc.
@FREE  X.
```

11. To copy a series of files from magnetic tape (Reel #1000) to FASTRAND, proceed as follows:

```
@ASG, UP  FILE1.      (if FILE1 is not already catalogued)
@ASG, UP  FILE2.
 etc.

@ASG, T  X,T,1000
@Please Mount Reel 1000 (no ring)
@COPY,G  X.,  FILE1.
@COPY,G  X.,  FILE2.
 etc.

@FREE X.
```

12. @MOVE X., 2

To move past 2 files on a magnetic tape called "X" as in above operation. If only FILE2 is desired to be copied, after the tape is assigned and mounted:

```
@MOVE X., 1
@COPY,G X., FILE2.
@FREE X.
```

13. @REWIND X.

To rewind tape "X" to the starting point.

OTHER CONTROL STATEMENTS

1. @BRKPT^ PRINT$/PRINTFILE

   To direct all print output generated either by a user program or the system from the demand terminal to a catalogued file PRINTFILE.

2. @BRKPT^ PRINT$

   To re-direct all printing back to the demand terminal.

3. @SYM PRINTFILE.,^,PR3

   To direct the queuing of a previously-created print file named PRINTFILE to a specific on-site printer (printer 3). The file PRINTFILE must be a catalogued file and not be assigned to the run, i.e., remember to "@FREE PRINTFILE." The file will be de-catalogued and deleted after the printing is accomplished.

4. @SYM,U PRINTFILE.

   To print multiple copies of PRINTFILE. The "U" option inhibits decataloguing of the file when processing is complete. Example: print two copies of the output produced by program PROG.

```
@ASG,UP  PRINTF.             .^assign print file
@BRKPT  PRINT$/PRINTF
@XQT  PROG
@BRKPT  PRINT$
@FREE  PRINTF.               .catalogues PRINTF
@SYM,U  PRINTF.,^,PR3        .print 1st copy
@SYM  PRINTF.,^,PR3          .print 2nd copy de-catalogued file
```

5. @MSG Message Text...

   To display a message on the operator's console at the computing center.

6. @ADD,L FILE.RUN

   To insert a set of previously "canned" card images into the run stream. The card images, which may be a series of control statements and/or data are contained in the element RUN in file FILE. The "L" option will list all control statements encountered in the added file or element at the demand terminal.

7. @ERROR FAC/XXXXXXXXXXXX

To obtain an explanation for a system error message. For example, if the system prints out at a demand terminal: FACILITY WARNING 100000000000; the user could keyin

@ERROR FAC/100000000000.

The system will respond with the message "File already assigned". Other error warnings can be handled in a similar way.

@ERROR Error-mnemonic, Error-Code

8. @RUN^ RUNID,ACCOUNT#,NAME,MAXTIME,MAXPAGES

To initiate a job, where RUNID is any 1-6 character name from the set A-Z and 0-9; ACCOUNT# is the account number to which the run will be charged; NAME is either the programmer's name (LAST-INITIAL) or the project's name (it is important that the "NAME" used be exactly the same for every run by an individual, since this name is used to identify catalogued files and charges); MAXTIME is the amount of CPU (central processing unit) time allowed (input/output and connect time are excluded from this figure). The run will be terminated ("MAX TIME") when this limit is reached. Whenever a "MAXTIME" termination occurs during a demand run, the user is given an additional 20 seconds of CPU time to save files or to do other "clean up" operations. The value 60 seconds is assumed, if no specific value is given. A larger value up to a maximum of 120 seconds is permissible. The value is considered to be in minutes unless preceeded by an "S" for seconds. MAXPAGES is the number of pages of printed output produced before a termination occurs due to "MAX PAGES". What is counted is the creation of print images, whether or not they are actually printed during the run. In a demand run if MAXPAGES is exceeded during execution the following message will be printed:

```
$$$ Error: TYPE=002,
    CODE=041, ERR.ADDRESS=XXXXXX
USER DID AN ER EABTS
REENT ADDR: XXXXXX
```

An example of a run statement:

@RUN^ TEST12, 999, PROJNAME-A, 2, 1000

In order to execute multiple jobs special care must be taken, not to exceed the "MAXTIME" and "MAXPAGES" limit specified on the @RUN statement. In general, if insufficient time remains, start a new run, by entering @FIN,L to terminate the run and then a second @RUN statement to initiate a new job. The amount of CPU time used since the start of any run can be found by using the TEXT EDITOR and the "CPT" operation. For example, proceed as follows:

```
@ED, I TIME
 carriage return    (to switch to edit mode)
 CPT
 EXIT
```