

Puget Sound Power & Light Company
Docket No. UE-920499
BENCH REQUEST NUMBER 2

Request:

Provide a copy of the cost of service model and documentation.

Response by Ms. Lynch:

See the Company's response to Staff Data Request No. 2. Additionally, copies of the cost of service model and documentation were distributed to all interested parties who attended the cost of service model training class held on September 29, 1992.

WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION
UE-920433; -920499;
No. -921262 Ex. 27 ✓

Puget Sound Power & Light Company
Docket No. UE-920499
BENCH REQUEST NUMBER 2

Request:

Provide a copy of the cost of service model and documentation.

Response by Ms. Lynch:

Attached is the cost of service model documentation and two diskettes which contain the cost of service model. The costs in this model are reflective of the revenue requirement in Docket No. UE-921262.

UE-920433, UE-920499;
UE-921264 27



January 8, 1993

To: Interested Parties
From: Colleen E. Lynch
Subject: Puget Power's Cost of Service Model

In Dockets UE-920499 and UE-921262 Puget Power presents cost of service results developed using our PC-based model. On September 29, 1992 Puget Power hosted a half-day training session on the use of this model. In response to a request from the WUTC, we are again offering this training to parties interested in using this same model in developing and presenting their respective cost of service proposals. You are invited to attend.

When: Thursday, February 25, 1993
**Where: CSSR Conference Room -- 5th Floor One Bellevue Center Bldg
411 108 NE, Bellevue, Washington**
Time: 9:00 - 12:00

I have included an agenda for the meeting. Once again, the purpose of this session is to assist you in using the Puget model and not to advocate or defend specific assumptions or positions.

If you decide to attend the session, please call me at (206) 462-3451 by Friday, January 22, 1993.

I look forward to seeing you on the 25th!

Thursday, February 25, 1992
CSSR Conference Room -- 5th Floor One Bellevue Center Building
411 108 NE., Bellevue, Washington
9:00 - 12:00

Topics

- 1. Getting Started**
 - System Requirements**
 - INSTCOS**

- 2. Review of the model's elements and worksheets**
 - Names**
 - Definitions**
 - Locations**
 - Functionality**

- 3. Review of how Puget's base case was modeled**
 - Inputs**
 - Accounting Data**
 - Allocation Data**
 - Classification Data**

 - Error Checking**

 - Simulation**
 - Base Case**
 - Scenarios**

 - Initializing Output**

 - Reporting of Results**

- 4. Review of scenarios**
 - How to tweak the model**
 - Suggested steps to follow**

 - How to break the model**
 - What not to do**

- 5. Trouble Shooting**

- 6. Questions & Answers**

Puget Sound Power & Light Cost-of-Service Model

DOCUMENTATION UPDATE

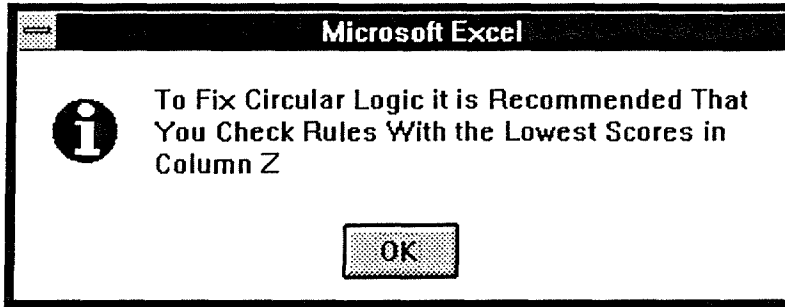
A. OVERVIEW

Section III of the Cost-of-Service model documentation dated July, 1992 reviews the specification of the account data inputs. One of these inputs is the "*type description*" (see page III-14). The type descriptor served two functions: defining how an endogenous account should be allocated and providing a relative order of allocation among all the defined endogenous accounts. The latter function, defining the relative allocation order, *Described Under Heading 2 "Order For Analyzing Accounts"*, is no longer used as of release 2.2 of the cost-of-service model.

B. NEW PROCEDURES FOR ORDERING ACCOUNTS

In the prior version of the model the four type designators (PSUM, PCNT, PRIOR, and PCLAS) used to indicate the allocation method for endogenous accounts was preceded by a single alpha character used to indicate the order for allocating the account. Version 2.2 of the cost-of-service model no longer uses the leading alpha character for determining the allocation order. *Therefore, the leading character before the "P" should be eliminated.* The new version of the model automatically determines the order when the account database is created prior to running the cost-of-service model. The order is automatically determined by searching through the endogenous accounts to identify an order where by each account has all its dependent accounts already allocated.

The analyst must still be careful in defining endogenous classification rules in order to avoid the problem of circular logic errors. A circular logic error is defined as an instance when the accounts can not be automatically ordered since accounts are mutually dependent. A simple example of circular logic is the instance when account A is to be allocated based upon the relationships in account B and account B is to be allocated based upon the relationships in account A.



In addition the analyst will see the following table on the spreadsheet COS2ACNT.XLS starting in cell Z1. The numbers in column Z indicate the number of unresolved rules assuming that the rule shown in column AA were resolved. For example, when the program assumes that the rule TC.T can be resolved there are still 17 other rules that would not be resolved. However, if the rule REVFAC2 were resolved, then all the remaining rules would be resolved. Note that the columns of the matrix starting with AD show the associated rules required rather than the accounts shown in the endogenous classification matrix.

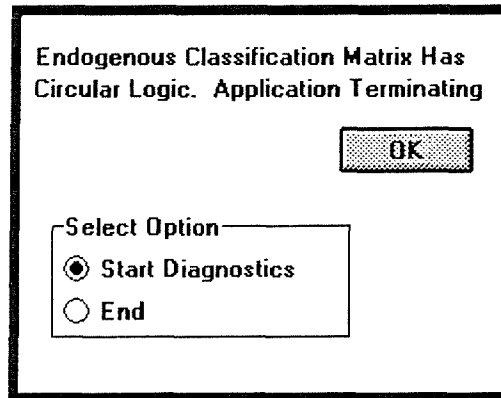
Z	AA	AB	AC	AD	AE
	Rule Name	Summary Classification		Needs Rule	Needs Rule
17	TC.T	Total Cost of Service		OE.T	
15	TAX.T	Total Tax		FIT.T	
16	REVFAC9	REVFAC9 (Classify Energy Diversion Rev ID456.10)		REVFAC2	
17	REVFAC8	REVFAC8 (Classify Late Pay Interest Rev ID450.01)		REVFAC2	
17	REVFAC4	REVFAC4 (CLASSIFY UNBILLED)		REVFAC2	
17	REVFAC3	REVFAC3 (CLASSIFY REV.ST1)		REVFAC2	
0	REVFAC2	REVFAC2 = (REVFAC1 + TOTF.T)		IBFIT.T	
17	REVFAC10	REVFAC10 (Classify Field Call Rev ID450.02)		REVFAC2	
0	REV.T3	Total Operating Revenue		REV.T2	REV.T1
17	REV.T2	Other Operating Revenue - Total		456.T	450.T
17	REV.T1	Sales of Electricity - Total		REVFAC4	REVFAC3
16	OID.T	Operating Income Deficiency		TC.T	REV.T3
16	OE.T	Total Operating Expense		TAX.T	
0	IBFIT.T	Total Income Before FIT		REV.T3	
14	FIT.T	Total Federal Income Tax		IBFIT.T	
17	CF.T	Operating Income Deficiency Adjusted for Conversion Factor		OID.T	
17	456.T	Other Elect Revenue - Total		REVFAC9	
17	450.T	Total Late Payment Revenue		REVFAC8	REVFAC10

2. Undefined Account Errors

In the event that the user has identified an account in the endogenous classification matrix that has no corresponding account reference in the account

C. ACCOUNT ORDERING ERRORS

In the event that there are circular logic errors the account ordering program terminates with the dialog box shown below. The user can elect to either terminate the procedure, or their luck with the diagnostic program. Note that the cost allocation model does not run when this error occurs since it is necessary to resolve ordering of endogenous accounts prior to running the model.



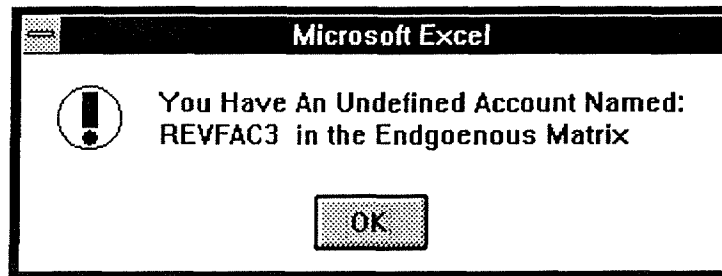
1. Order Error Diagnostics

At best, the diagnostics program helps narrow down the problem. It is not a very good tool if the user has a number of circular logic problems. The diagnostics program goes through three levels of checking in order to help identify where the circular logic problem might be. These three levels are:

- Endogenous allocation rules that can not be resolved are identified and the rules associated with each account used by the rule (the account columns of the endogenous classification matrix) are identified.
- A table is constructed showing the rules that are not resolved and the associated rules required to resolve those rules. This table simplifies the view of the problem since accounts in the endogenous classification matrix that have already been ordered are removed.
- An analysis is done to see what would happen assuming each unresolved rule were resolved on a one-by-one basis.

At the completion of the third level of diagnostics the following dialog box will appear on the screen.

tables, the account ordering will terminate. The user will see the following message. Note that the "problem" account is listed in the dialog box.



PUGET SOUND POWER & LIGHT COST-OF-SERVICE MODEL

License Agreement: The cost-of-service model is available on a limited license basis. Rights to free use of the model are granted to participants in Puget Power's rate collaborative for applications related to Puget Power's cost of service. The macro code is proprietary and both the macro code and model structure are protected by United States copyright law. Puget Power makes no guarantee about the fitness of the model for any application and assumes no liability for damages resulting from its use. Users of the model are encouraged to report bugs, recommend improvements, or provide Puget Power with improvements developed by other users. Puget Power will attempt to provide registered users of the model with updated versions of the software and documentation.

Rates Department - Pricing Group
Puget Sound Power & Light Company
July, 1992

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I. SUMMARY

Puget Power has developed a PC-DOS based cost of service model. The model allows considerable flexibility in the development of cost allocation protocols and is designed to be compatible with historical allocation schema used by Puget Power. The model allows the user to specify up to fifty classes (i.e. residential - all electric, high voltage, general service, firm resale), forty exogenous allocation factors (i.e. customer, energy, and demand types of allocators), one hundred endogenous allocation factors (i.e. based upon allocations of other cost allocations), and virtually an unlimited number of cost accounts. The model contains templates for the analyst to define rules for allocating costs. These rules are then assigned to each cost account. The model constructs a template with formulas for spreading costs over the customer classes by cost account and allocation factor. The model then fills the template using the user defined cost accounts and customer classes. Various reporting features are available for listing model inputs and summarizing model outputs. A database structure allows the analyst to summarize cost allocations by a number of keys including functional categorization of costs, types of cost accounts (i.e. base, resource), and allocation factors. In addition, the model's spreadsheet structure allows the user significant latitude to design customized reports.

The model is a very powerful and is capable of detailed cost allocation. As a consequence it is intended to be used by analysts with an understanding of cost-of-service and utility accounting procedures. The recommended minimum hardware is a 80386 based IBM compatible computer with 6 MB of RAM, a hard disk drive with 10 MB of free disk space, mouse, and a printer compatible with Microsoft Windows. The model is written in Microsoft Excel version 3.0A and the user must have Microsoft Windows version 3 or higher and DOS version 3.1 or higher.

Limited technical assistance is available from the Puget Power Rates Department. Questions, suggestions, and comments should be sent to:

**Rates Department - Pricing Group
Puget Sound Power & Light Company
P.O. Box 97034 OBC-03W
Bellevue, WA 98009
(206) 454-6363**

II. OVERVIEW

The Puget Power cost-of-service model (COS) is a computer spreadsheet model designed for flexibility, ease of use, and accessibility. The model's flexibility allows the user to easily adjust how costs are allocated by rate class along with the factors used to allocate these costs. The model is built in the Excel Version 3.0 spreadsheet package to enhance its ease of use and to make the formulas transparent. Finally, the Excel-based model makes it easy to use and modify by both utility staff and collaborators to the rate making process.

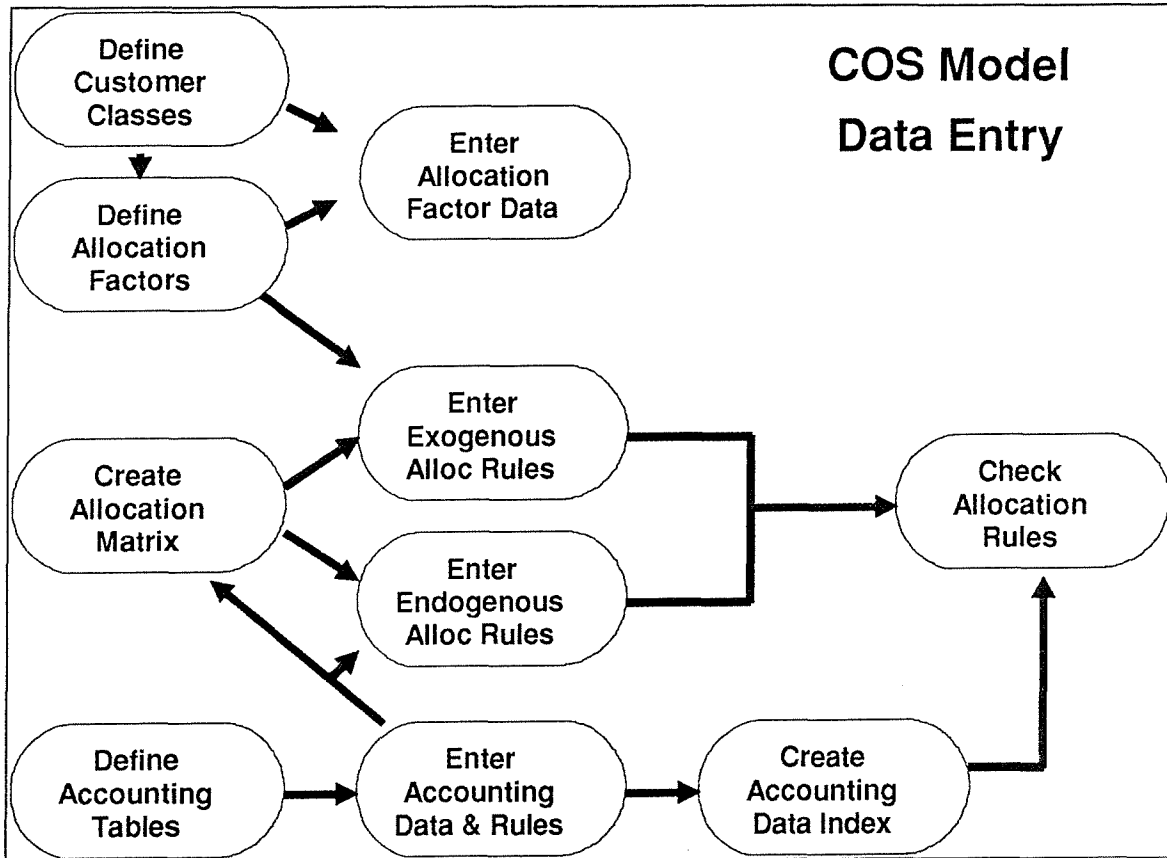
A. INPUTS

The COS model is built around four groups of user inputs. These inputs include:

- definition of customer rate classes,
- definition of cost allocation factors,
- definition of accounting data (the costs to be allocated), and
- definition rules for linking the accounting data to the cost allocation factors.

A flow chart showing these inputs is provided in Figure II-1. The model allows the user to define up to 50 customer rate classes. These individual rate classes can be assigned to summary classes for the purpose of aggregating the model results. The model also allows for the definition of up to 40 allocation factors. Allocation factors define relationships between the customer classes and the means for allocating the accounting costs to each of the classes. For example, the energy allocation factor typically defines the annual kWh consumption of each customer class. The relative energy use of each class can then be used to allocate a group of costs such as fuel costs. The link between the allocation factors and the accounting data is provided by the allocation matrix. There are two type of allocation factors: exogenous and endogenous factors. The rows of the exogenous allocation matrix identify the allocation rules and the columns represent the class allocation factors. The analyst utilizes utility studies, standard utility procedures, and professional judgment to fill in the matrix cells. The endogenous matrix indicates how costs are allocated based upon previously allocated accounts.

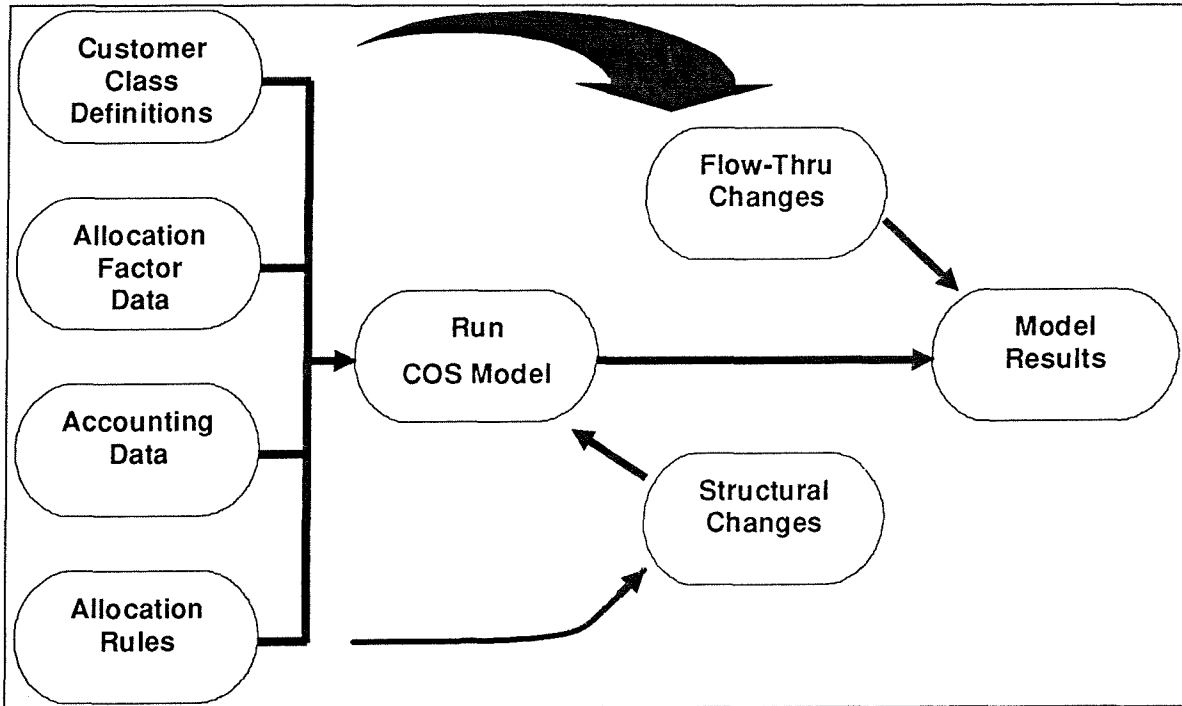
Figure II-I COS Model Data Entry



B. RUNNING THE COS MODEL

Running the model includes two separate functions. The most important function is constructing the spreadsheet that creates the model structure and formulas that define the relationship between the model inputs. The second function shows the consequences of modifying the model input values. This process is shown in Figure II-2.

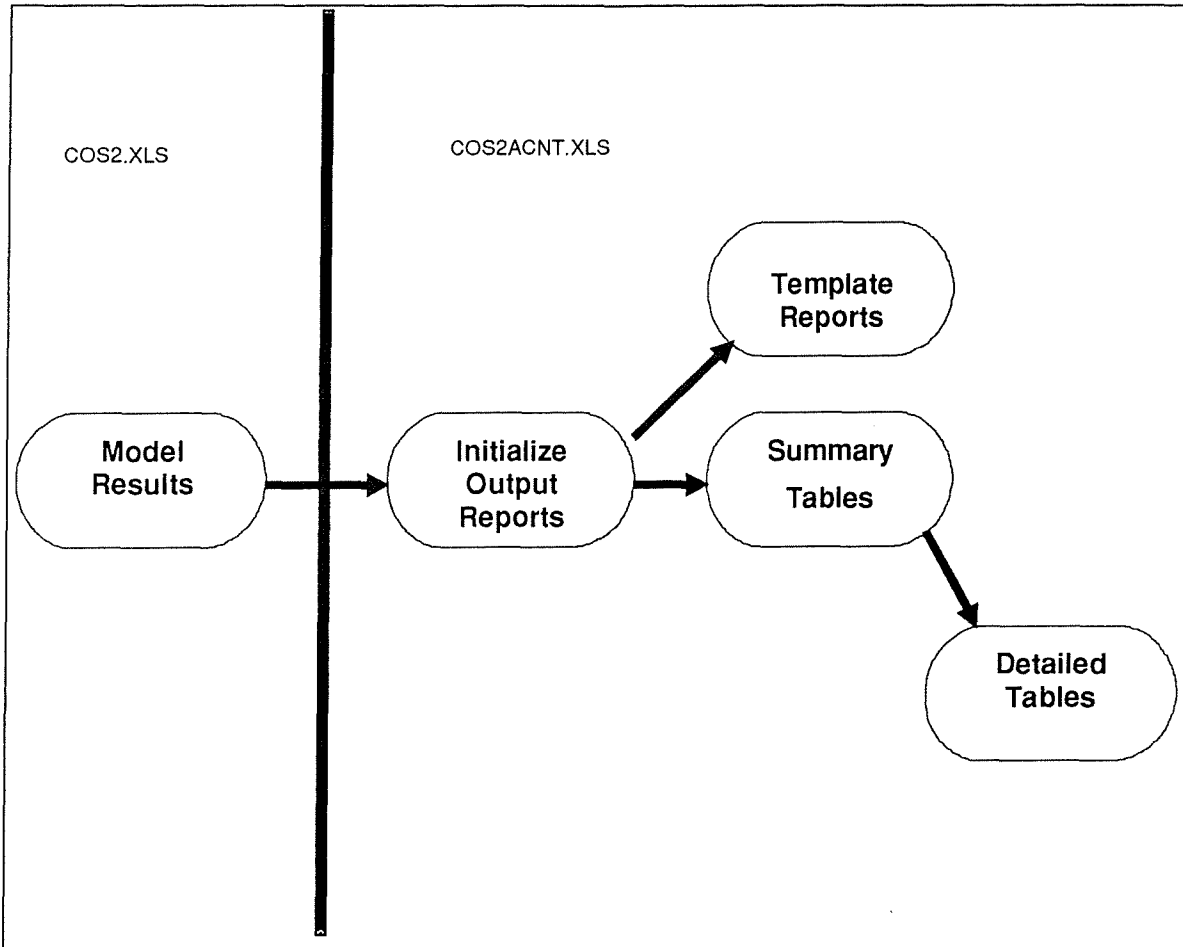
Figure II-2 Model Flow Chart



C. OUTPUTS

The COS model contains four different output report styles. A flow chart of the report process is shown in Figure II-3. The different reports are obtained after copying the model results into a separate spreadsheet. The first style is a detailed listing of the cost assignment to each customer class broken down by each account and allocation factor defined in the model. The second style is a user defined template for creating custom reports. The third style is a summary by up to three key variables defined by the user and reported by customer class or summary groups of customer classes. The key variables include a variety of account descriptions defined in the user inputs. The fourth report is a listing of the detailed accounts contained in each summary defined under the second report structure.

Figure II-3 Reports Flow Chart



D. HARDWARE & SOFTWARE REQUIREMENTS

The COS model is written in Microsoft Excel Version 3.0a written for the PC/DOS system. The model should be run on a minimum of a 386-based system with 10 MB of free disk space, at least 6 MB of RAM, and a mouse. Actual disk space requirements will depend upon how the model inputs are specified. (The fully specified version used by Puget Power requires approximately 3 MB). Ease of use is enhanced by an EGA or VGA monitor although the model will run under a monotone monitor. Printing of reports requires that the user have a Windows compatible printer installed. The user must have Windows Version 3 or higher.

E. MODEL INSTALLATION

The user must have Windows and Excel properly installed on the computer including the correct configuration for any printer(s) used for printing reports. The model consists of six primary files and six template report files that should be copied to a directory named "cos" on the harddisk. The recommended directory is called COS. However, the user can put the software in any directory desired. It is also possible to copy the files into more than one directory so that alternative scenarios can be developed. The model consists of three primary spreadsheets, one macro spreadsheet, six template worksheets, and a work space spreadsheet. A listing of these files is provided in Figure II-4.

The spreadsheet COS2.XLS contains all the data inputs and the equations / results of running the model. The spreadsheet is protected with the password "COS". The protection is used to guide the user in making correct inputs and ensuring that the model is not "clobbered" by incorrect inputs. In order to remove the protection the password must be typed in lower case letters. The file COS2ACNT.XLS is a spreadsheet updated and maintained by macros within the COS model. It is used to determine the order for allocating the cost accounts entered by the user. The spreadsheet COS2RPT.XLS is used for developing and formatting output reports. The file(s) TMPxxxxx.XLS are templates used to summarize the model results using a user-defined report format. The macro spreadsheet, COS2.XLM, is necessary to run the model. The macro spreadsheet contains over thirty macros and fifteen dialog boxes that are necessary to run the model. The contents of the macro spreadsheet are hidden and protected since the code is considered proprietary. The work space spreadsheet, COS2.XLW, is used to load the model spreadsheets.

The file FILEFNS.DLL includes additional functions called by the macro spreadsheet that are not included in basic Excel. This file should be copied into the Excel directory.

Figure II-4. Cost of Service Model Files

	Description
COS2.XLW	Workspace For Spreadsheets
COS2.XLM	Macro spreadsheet for model
FILEFNS.DLL	Add in functions in a dynamic link library
COS2.XLS	Primary model inputs - Excel Spreadsheet
COS2ACNT.XLS	File Used To Sort Accounts For Simulation
COS2.HLP	Help file for model
COS2RPT.XLS	Report spreadsheet - Contains Model Results
TMP*.XLS	Template Reports - Defined By User

Disk one of the model contains an installation program. To install the model the user should insert the diskette labelled "Disk 1" into the A drive and set the DOS prompt to the A drive with the command **A:**. The next step is to type the command **INSTCOS** and press the return key. The installation program checks for sufficient disk space and notifies the user of available space on the harddrive(s). The program then asks the user to enter the disk drive and directory where the model should be installed. The program will create a new directory if the requested directory does not exist. If the directory already exists the user will be notified and queried whether the existing directory should be used. The user will be prompted to insert the second diskette after the files from the first disk are copied to the target directory and uncompressed. After the files from the second diskette are copied and uncompressed the user will be asked for the directory where Excel is located. The file FILEFNS.DLL is copied into the Excel directory.

It is possible to have multiple versions of the model on the same computer. Each version of the model must be in a separate subdirectory since the naming conventions for the model spreadsheets is fixed. *It is important that the model be loaded in Excel by either loading the COS2 workspace (the file COS2.XLW), or loading the model XLS spreadsheets prior to the XLM spreadsheet.* If the XLM spreadsheet is loaded first, Excel will automatically update macro cell references to include a diskdrive and subdirectory designation. The updating of the references will cause errors if the model is then moved to another disk drive or subdirectory!

F. STARTING THE COS MODEL

The first step is to start the Excel program by selecting the proper icon in the Excel Windows box. Once the Excel software has loaded the user can load the model using the "file open" command. The analyst should select the file COS2.XLW in the directory that the spreadsheet was loaded into. Selection of the worksheet will load all the spreadsheets required by the model. This process typically takes a few minutes depending on the size of the model inputs and the type of computer.

Once the model is loaded a dialog box appears that asks the user to identify the subdirectory where the model is located. A sample answer is "C:\COS" assuming that the model is in a subdirectory called COS on the C disk drive. The model then proceeds to modify the menu bar at the top of the screen to reflect the options of the COS model. The modified menu bar has the following choices.

File Options Windows COS_Inputs COS_Model COS_Reports COS_Uilities

The user can return to the standard Excel Menu bar by selecting the "Options" item in the menu bar and then selecting the "Full Menus" item. The user can then switch back to the COS menu bar by selecting "Options" and selecting the "COS Model" item.

The user can exit the model by either going through the Excel File close sequence, or selecting the "COS_Uilities" item from the menu bar and then selecting the "Exit Model" option.

G. DOCUMENTATION ORGANIZATION

Chapter III reviews the data inputs in the model. Chapter IV discusses how to run the model and how to modify the model results to conduct sensitivity analyses. Chapter V reviews the model's reporting features and Chapter VI describes the model utilities. Each of these chapters corresponds to features

accessed through the four "COS" menu bars shown at the top of the spreadsheet when the model is loaded. There are two appendices. The first appendix is a glossary of terms. The second appendix provides technical documentation of the model.

III. DATA INPUTS

Development of the inputs for a full cost of service study is both a complex and time consuming task. In order to successfully create the inputs the analyst must have a good working of knowledge of cost of service concepts and an understanding of how the model uses each type of input in the cost allocation process. This chapter explains the COS paradigm and emphasizes how to construct the inputs. Users who need more background on cost of service concepts should consult other documents including the *Electric Utility Cost Allocation Manual* prepared by the National Association of Regulatory Utility Commissioners. The first section of this chapter provides a general overview of the structure of the inputs and the relationship between customer class definitions, allocation factors, accounting data, and allocation rules. The remaining sections provide detailed instructions on how to successfully construct the model inputs.

A. OVERVIEW OF DATA INPUTS

Entry of all the data for the COS model is a multi-step process. The list of steps is shown in Figure III-1. A brief description of each step follows in this section and latter sections of this chapter provide more detailed instructions.

Step 1: Define Customer Classes

The first step is to define the customer classes. Some examples of customer classes at Puget Power are: residential lights and appliance customers, residential electric water heat customers, residential electric space heat customers, and secondary service non-residential customers.

Step 2: Define Allocation Factors

Once the classes have been defined the allocation factors should be defined. The primary allocation factors used in most cost of service studies are: number of customers, energy consumption, coincident peak demand, and non-coincident peak demand. The model maintains a master table of allocation factors and stores the specific information on each allocation factor in separate

allocation factor tables. The customer classes defined in step 1 are automatically used as the entries into the rows of the allocation factor tables.

Step 3: Enter Allocation Factor Data

Allocation factors are exogenous model variables so it is necessary to enter the associated data for the allocation factor. For example, if the allocation factor is energy sales, then the analyst must enter the associated energy sales for each of the defined customer classes.

Step 4: Define Accounting Data Tables

The accounting data describe the utility's costs. These data typically come from the FERC Uniform System of Accounts. These accounts can all be entered as one table, or be organized into multiple tables to reflect the different types of costs. The model allows the user to organize the data in up to 39 separate tables. The structure of the data entry in each table must conform to specific rules. However, the number and length of the tables are loosely structured to allow latitude in organizing the accounting data inputs. In this step the user defines the number, length, and names of the accounting tables.

Step 5: Enter Accounting Data and Rules

This is a time intensive step where the user enters all the accounts into their appropriate table and defines the rules for allocating the cost accounts.

Step 6: Create The Account Table Index

The account table index defines the location and number of entries in each of the accounting data tables. It should be run after the accounting data have been initially defined. The index, located in a separate table within the model spreadsheet, is used by other model routines in subsequent steps.

Step 7: Create The Allocation Matrix

The allocation matrix defines the algorithms for allocating a cost account to the customer classes. The allocation rules defined within the accounting data tables along with the allocation factors determine the rows and columns of the endogenous and exogenous allocation matrices. The exogenous allocation matrix is used to define how the accounting costs are to be spread over the customer classes based upon the various allocation factors defined in step 2. The endogenous allocation matrix is used to define how the accounting costs are to be spread over customer classes based upon the allocations used by the accounts specified in the matrix.

Step 8: Enter Allocation Matrix Rules

This step is used to specify each of the rules. In the case of the exogenous matrix the user enters the percent of each account that is allocated by each of the exogenous allocation factors. In the case of the endogenous rules the user specifies the accounts that are used to indirectly allocate costs back to the exogenous allocation factors.

Step 9: Check Allocation Rules

Error checking programs are provided to check the allocation rules. The routines highlight data entry problems. Of course these problems should be fixed prior to running the model. *Warning, the model will run even though errors exist.*

The data inputs are all entered into the spread sheet in predefined areas that are delineated by color and column and row labels. Pull-down menus, interactive data inputs, scroll bars, and protected areas of the spreadsheet are provided to help ensure correct data entry.

Figure III-1 Overview of Data Entry Process

Step	Data Entry Process
1	Define Customer Classes
2	Define Allocation Factors
3	Enter Allocation Factor Data
4	Define Accounting Data Tables
5	Enter Accounting Data and Rules
6	Create Accounting Data Table Index
7	Create Allocation Matrix
8	Enter Allocation Matrix Rules
9	Check Allocation Rules
10	Correct Data Input Errors

The primary pull-down menu for data inputs is shown on the menu bar, located at the top of the screen, with the label "COS_INPUTS". When this item is activated by using the mouse, the menu shown in Figure III-2 appears.

Figure III-2 Primary Data Input Menu

Add Allocation Factor
Delete Allocation Factor
Edit Allocation Factors
Create Account Table Index
Edit Accounting Data
Edit Classification Matrix
Update/Replace Matrix
Check Allocation Rules
Main Area
Delete All Inputs

The data inputs are divided into three major groups: customer class and allocation factors (the first three choices on the input menu), accounting data (the fourth and fifth choice on the input menu), and allocation rules (the next three choices on the menu). Each of these areas is discussed in Sections B, C, and D respectively. The allocation rule checking procedures is reviewed in section E. The option labelled "Main Area" moves the cursor back to cell A1. The last choice on the menu, "Delete All Inputs" is dangerous since that is

exactly what it does. The option should only be used when the model inputs need to be completely initialized.

B. CUSTOMER CLASS DEFINITION & ALLOCATION FACTORS

Customer classes and allocation factors are the primary building blocks for the cost of service model. The customer classes determine the grouping of customers that the accounting costs are ultimately allocated to. Customer classes are frequently defined by the rate schedules used by the utility.

The classification of costs is done with exogenous allocation factors in the cost of service model. The primary exogenous allocation factors in most cost of service studies are energy, demand, and customer. These factors are typically further defined to reflect different ways of measuring each of these primary classifications. For example, some allocations by demand may use coincident class demand, while other allocations may use noncoincident peak demands. These allocation factors are referred to as exogenous since the data are derived outside of the model and entered as model inputs. This section discusses the relationships between the class definitions and exogenous allocation factors and how they are entered into the model.

The customer class and customer allocation factors inputs are accessed by selecting one of the first three options on the primary data input menu (Figure III-2). These options allow the user to:

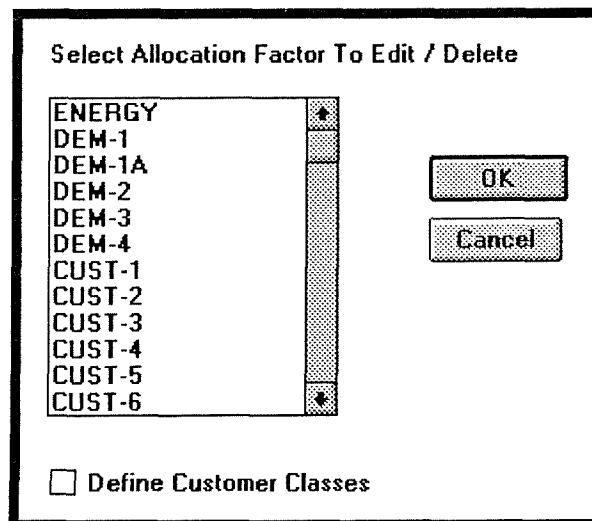
- Define customer classes,
- Create customer allocation factors,
- Delete customer allocation factors, and
- Edit data for the customer allocation factors.

Selection of any of the options, except creating a new allocation factor, results in a pop-up menu asking the user to select the appropriate allocation factor. The pop-up menu is shown below in Figure III-3.

The definition of customer classes should be the first set of inputs defined by the analyst. Customer classes should represent homogenous groups of customers in terms of their service characteristics and load profiles. Customer class definitions can be changed at any time. The customer class names defined by the user automatically "flow through" to the customer allocation factor tables. Therefore, it is important to define customer classes first and to check the allocation factor tables to make sure that the data defining each class's contribution reflect the correct customer classes. The table for editing and defining customer classes is accessed by clicking on the last line, "Define Customer Classes", of the Edit Allocation Factors Dialog box.

The dialog box shown in Figure III-3 also appears when the user selects either the 'Edit' or 'Delete' customer allocation tables options. The analyst should use the mouse to "click" on the appropriate allocation factor. When the "OK" button is selected an area of the spread sheet indicating the defined tables is centered on the screen. A detailed review of these options follows:

Figure III-3. Menu For Selecting Allocation Factors



1. Definition of Customer Classes

Customer classes can be defined in almost any way desired by the analyst. In reality the definition of customer classes is typically constrained by data limitations. In order to segregate costs by customer class it is necessary to

have all the supporting data components for completing the allocation factors. The following attributes can be used to define a customer class: class name, the associated rate schedule name, the revenue code, and an indicator of what other classes schedule it should be grouped with for reporting purposes.

There are two steps to accessing the customer class definition table. The first step is to select the menu bar item "COS_Inputs" and then select the "Edit Allocation Factors" item. The dialog box shown in Figure III-3 will appear and the user should select the bottom item "Define Customer Classes." The user will then see the table shown in Figure III-4 (not all the rows are shown). This table is labelled "Table CC-1 Customer Class Identification" in the spreadsheet.

Figure III-4 Customer Class Identification Table

A	B	C	D	E
Class	Code	Sub Class	Code	Summary Level
Residential	1	Water Heating	47	Residential
Residential	1	Space Heating	37	Residential
Residential	1	Lighting	27	Residential
Secondary Gen'l Svc	2	0-50 kw	24	Secondary Gen'l Svc
Secondary Gen'l Svc	2	51-350 kw	25	Secondary Gen'l Svc
Secondary Gen'l Svc	2	>350 kw	26	Secondary Gen'l Svc

The customer class identification table contains five columns (A - E) and room to enter up to 50 customer classes (one class per row). The customer classes should be entered into consecutive rows in the table. The user must input the data under all five columns. The first column defines the name of the customer revenue class. Examples include: residential, commercial, industrial, street lights, and wholesale for resale. The second column is the associated revenue class code. Puget Power currently uses the codes 0-4. The third column, labeled "Subclass," is what is typically referred to as the rate schedule name. The fourth column is used to define the associated rate schedule code corresponding to the subclass name. The fifth column is used to define summary classes. Summary classes are used to aggregate the subclass cost allocations for reporting purposes. Summary levels must start with an alpha character. For

example, each of Puget Power's rate schedules can be defined as a separate customer class.

2. Creation Of Customer Allocation Factors

The model allows the definition of up to 40 customer exogenous allocation factors. Allocation factors indicate the relative weight of each customer class. These relative weights are expressed as percents and are used to allocate the dollars assigned to a cost account to each of the customer classes. The user must first create a table for the allocation factor prior to entering the values used to determine the weights.

A new table is created by selecting the "Add Allocation Factor" option within the "COS_Inputs" menu bar. When a new table is created the model identifies the class and subclass names and codes from the table that defines the customer classes. The user is prompted for the name of the allocation factor and the input is placed in the newly created allocation table and in the index table. (The model will check to make sure that the allocation factor does not already exist.) Careful attention should be given to naming the allocation factors. The naming has a major impact on how the cost allocation is reported and on the model's performance. Accounts allocated by exogenous rules are shown in detail by each allocation factor. Accounts allocated by endogenous rules show detail for each allocation factor based upon the part of the name preceding the hyphen. In addition, the reporting system has a feature that creates summary reports based upon a component of the allocation factor name defined by the text to the left of an embedded hyphen. For example, different demand allocation factors might be named DEMAND-CP12 and DEMAND-NCP for coincident and non-coincident peak demand. This naming convention allows summarization over the factor DEMAND.

A discussion of the allocation factor table is provided in the "Edit Inputs" section. If the analyst enters a classification factor that already exists, the name is not repeated. The new classification factor is always added after the last defined allocation factor.

3. Delete Customer Allocation Factors

This feature, accessed through the "Delete Allocation Factors" option contained in the COS_INPUTS menu bar deletes an allocation factor and all the data entered into the associated table. The space occupied by the table will be utilized when the next allocation factor is defined.

4. Edit Allocation Factors

This feature, accessed through the "Edit Allocation Factors" option in the the COS_INPUTS menu bar moves the cursor to the selected table for data entry. When this option is selected, a dialog box menu listing the currently defined allocation factors is displayed. The user selects the desired allocation factor and "clicks" the "OK" button. Once the allocation factor is entered, the cursor is moved to the row and column in the spread sheet where the table is located. An example of the table is shown in Figure III-5. These tables are labelled "Table CL-xx Customer Allocation By xxxx."

The table contains 51 rows and five columns. The first four columns of the table are protected since these values are automatically copied from the customer class definition table. Changes to the customer class definition table after entering the allocation data may render values in the allocation table inaccurate. The fifth column is where the user enters the appropriate values based upon the allocation factor shown at the top of the table. A check total for this column appears at the bottom of the table in column 5 and in the title block above the table. The percentages in the sixth column are automatically calculated so these values are locked out from user input. The last row of the table, labelled "check sum", shows the sum of all the values entered into the fifth column.

Figure III-5 Sample Class Allocation Table

Class	Code	Sub Class	Percent	ENERGY
Residential	47	Water Heating	13.71%	2,382,966,681
Residential	37	Space Heating	31.41%	5,460,419,606
Residential	27	Lighting	4.17%	725,506,228
Secondary Gen'l Svc	24	0-50 kw	10.14%	1,761,941,323
Secondary Gen'l Svc	25	51-350 kw	11.02%	1,914,956,460
Secondary Gen'l Svc	26	>350 kw	5.94%	1,032,573,962
Check Sum				13,278,364,260

The percentage allocation to each class, show in the fourth column, is calculated using the following formula.

$$\text{FACTOR}_{if} = \text{FACTOR}_i / \sum_i \text{FACTOR}_{if}$$

FACTOR_{if} = Exogenous allocation factor for the fth allocation factor
and the ith customer class

C. ACCOUNTING DATA

The accounting data input section defines two types of inputs.

- The cost account names to be allocated and the associated cost and functional characterization.
- The definition of rules for allocating the costs among the customer classes.

The accounts should be organized into logical groups and each group entered into a separate accounting table. This process will facilitate data entry and reporting. Each table should be assigned to one of three logical "super groups".

The three super groups are:

- ratebase accounts,
- Expense, and
- revenue accounts.

In order to save space on the spreadsheet the account data tables can be made varying length by cutting and pasting sections of the table below the table heading. This feature is discussed in more detail in section 3.

There are two options under the COS_Inputs menu bar associated with the accounting data: creating the account table index and editing the accounting data tables. The first option, "Create Account Index" creates a master table that shows the starting and ending line of each table and the number of entries. This table should be updated whenever existing accounting data tables are moved around, expanded, or contracted. Selection of the second option, edit accounting data, displays the menu shown in Figure III-6. The user selects the table to be edited from the choices. The tables are separated into three groups for user convenience. The groups are: ratebase related, expense related, and revenue related. The classification of accounting data by type is based upon the type designator following the table name. The three type designators are: "RATEBASE", "EXPENSE", "REVENUE". The model can accept up to fifty accounting data tables. The following discussion of the table entries is separated into four topics. Section 1 reviews the inputs of the cost accounts, section 2 explains the ordering of the accounts in the analysis, section 3 reviews the options for allocating endogenous accounts, and section 4 reviews the inputs of the allocation rules.

Figure III-6 Menu For Selecting Accounting Data To Edit

Select Accounting Data Table To Edit/Print

Expense Related

SALARY & WAGES ALLOCATION	◆
O & M - PRODUCTION	◆
O & M - TRANSMISSION	◆
O & M - DISTRIBUTION	◆
O & M - CUSTOMER ACCTS EXPENSE	◆
O & M - CUSTOMER SVC EXPENSE	◆

Ratebase Related

EPIS - INTANGIBLE	◆
EPIS-PRODUCTION	◆
EPIS-TRANSMISSION	◆
EPIS-DISTRIBUTION	◆
EPIS - GENERAL PLANT	◆
EPIS- COMPL NOT CLASSIFIED	◆

Revenue Related

REVENUES - SALES OF ELECTRICITY	◆
REVENUES - OTHER OPERATING REV	◆

DK

Cancel

1. Accounting Data

An example of the accounting data table is show in Figure III-7. As previously noted, the lengths of these tables can vary and they have eight columns. It is the user's responsibility to logically organize the data and enter the cost element into the correct table. Each cost element that needs to be tracked should be entered as a row in one of the tables with the following six characteristics.

- Rule For Spreading the Cost Account Across Classes (column I)
- Cost Account ID (column J)
- Cost Account Name (column K)
- Dollar Amount (column L)
- Primary Functional Group (column M)
- Secondary Functional Group (column N)
- Type Description (column O)

Figure III-7 Sample Account Data Inputs

H	I	J	K	L	M	N	O
	Table	FF-2	EPIS-PRODUCTION	TRUE	Type:	RateBase	
Rule Type	Rule Name	Account ID	Account Name or Summary Name	Amount	Funct Main	Group Alt.	Type
EX	DEM1A		Demand 1A CP Allocation Factor				
	DEM1A	ID310.00	Shuffleton	8,458,734		Resource	
EX	PC		Peak Credit Classification Factor				
	PC	ID310.01	Thermal Baseload Generation	593,826,471		Resource	
EN	SP.T		Steam Plant - Total				APSUM
	SP.T	SP.T	Steam Plant - Total	456,339,156		Resource	APSUM

The **allocation rule name** (column I) defines the basis for dividing the cost account among the customer classes. The allocation rule is an alpha-numeric description. (The definition of the allocation rule is also made in the accounting data table but the rule contents are defined in the allocation matrix. The rules are discussed in section 2.) Multiple accounts can utilize the same allocation rule and it is not necessary for the accounts sharing an allocation rule to be located adjacent to each other in the accounting table data. All account entries must have an associated rule for spreading their cost.

The **account ID** is an alpha-numeric description corresponding to the cost account name. In some cases the FERC account number will be entered in this field. Note: the account ID can be characters such as 531-536 so that the input will not be resolved to the value of -5. The account ID numbers should be as short and as descriptive as possible.

The **account name** is a description of the cost account. In most cases the user will be entering a standard FERC account name in this field.

The **dollar amount** (Column L) must be a numeric value. It is the user's responsibility to make sure that the amounts are entered in a consistent manner, i.e., the same year dollars. If the user enters a formula rather than a value then

it is critical that the formula use absolute references. *Failure to use absolute references will result in errors when the model is run.*

The **main functional group** is an indicator used for both cost allocation and reporting purposes. Typical cost functions used in cost-of-service are production, transmission, distribution, and customer service. An alternative cost functionalization used by Puget Power is the base / resource bifurcation as part of its decoupling mechanism. Functional descriptions are carried with the account description since they are useful for summarizing the cost allocations in reports. In addition, there is an option to use the functional group name in spreading costs to the customer classes. (The spread is based on the allocation matrix and the customer allocation factors.)

Use of the main functional group in conjunction with the model option to use the name in the cost classification requires careful attention to this input. When the input is left blank for an account allocated with an endogenous rule, the model results will create the main functional group name based upon the accounts used in the endogenous allocation. If the main functional group name is filled in, then that name will always be associated with the account.

The **alternate functional group** serves the same function as the primary allocation; it is used for summarizing the classifying costs in reports. However, the name has no impact on how costs are allocated among the customer classes. The functional group name is the same for an account regardless of how it is divided by allocation factors. Its only purpose is to provide an alternative summary schema for reporting purposes.

The **type description** is used to define how to spread the dollar amount associated with an endogenous account. The field should be left blank for accounts spread by exogenous rules. Accounts that are spread across rate classes by factors external to the model (i.e. energy, demand, customers) are referred to as exogenous accounts. Accounts that are spread indirectly back to the exogenous allocation factors based upon other accounts in the model are referred to as endogenous accounts. There are four types of endogenous accounts:

- summations (referred to as PSUM),
- allocations based upon prior accounts (PRIOR),
- allocations that are a percentage of the summation of prior accounts (PCNT) and,
- allocators based upon prior customer class allocations (PCLAS).

Descriptions of each of these allocators are provided in section three. Remember, one of these four designators are required if the account is to be allocated by an endogenous rule.

2. Order For Analyzing Accounts

Each account in the account table is classified as either an endogenous, or exogenous account. *An entry in the last column of the account table, the "Type" column, tells the model that the account is an endogenous account.* When the cost allocation model is run the model first allocates all the exogenous accounts in the order that they appear in all of the accounting data tables. The model then allocates the endogenous accounts in an iterative process. Endogenous accounts are allocated in multiple passes since they are based upon both exogenous accounts and other endogenous accounts. When the model is told to allocate an account based upon another account(s), the other account(s) must have already been allocated. Consequently, the order of accounts may matter.

One way to make sure that the endogenous accounts are allocated in the correct order is to enter them in the accounting tables in the order that they should be processed. The disadvantage of this approach is that the allocation order may not follow the logical order for organizing the accounting data. Consequently, there is a mechanism for modifying the order that these accounts are analyzed in. Prior to conducting the account cost allocations the model sorts the endogenous accounts in the order of the "TYPE" designator and relative position in the account tables.

The four type designators (PSUM, PCNT, PRIOR, and PCLAS) are all entered with a one letter prefix that can be any capital letter A - Z. If the user enters one account with the type designator "BPSUM" and further on in the

account table enters an endogenous account with the type designator "APSUM" the latter account will be allocated first. The list of sorted accounts is maintained in the spreadsheet COS2ACNT.XLS. The ordering of the accounts in the account tables is not changed by this process. The auxillary spreadsheet COS2ACNT.XLS is not updated automatically when the user enters new data or changes existing accounts in the table. However, the analyst is asked whether the auxillary spreadsheet should be updated at the time the cost of service model is run.

An example of the reordering process is shown in Figures III-8 and III-9. The first table shows the order of the accounts in the account data table. The second table shows the order of processing for the accounts. The second table illustrates the results of the ordering process.

- The exogenous accounts are analyzed first in the relative order they appeared in the accounting tables.
- The endogenous allocation accounts are ordered by the prefix on the type describer i.e. A, then L, then M.
- Accounts with the same type name, LPRIOR for example, appear in the order they were entered into the accounting tables.

Figure III-8. Sample Entries Into Account Tables

Rule	Rule	Account			Functional Group		
Type	Name	ID	Account Name or Summary Name	Amount	Main	Alt.	Type
	SW.T	ID925.00	A&G Exp - Injuries and Damages	4,219,015	B		LPRIOR
	SW.T	ID926.00	A&G Exp - Pensions and Benefits	8,806,923	B		LPRIOR
	ENERGY	ID927.00	A&G Exp - Franchises	16,564	B		
	ADJPTDCE.T	ID928.00	A&G Exp - Reg Comm Exp (BASE)	1,170,218	B		LPRIOR
	ENERGY	ID929.00	A&G Exp - Duplicate Chgs (credit)	-16,564	B		
	ADJPTDCE.T	ID931.00	A&G Exp - Rents	2,831,464	B		LPRIOR
	AGOE.T	AGOE.T	A&G Exp - Total Operation	51,442,798			LPSUM
	GP.T	ID935.00	A&G Exp - Maint of Gen Plant	3,244,194	B		LPRIOR
	AGME.T	AGME.T	A&G Exp - Total Maintenance	3,244,194	B		LPSUM
	TDP.T	ID411.00	A&G Exp - Gain Disposal Prop	-145,221	B		APRIOR
	EBFIT.T	EBFIT.T	TOTAL EXPENSES BEFORE FIT	588,702,233			MPSUM
	IBFIT.T	IBFIT.T	TOTAL INCOME BEFORE FIT	245,793,580			LPSUM

Figure III-9. Order Accounts Will Be Allocated By Model

Rule	Rule	Account			Functional Group		
Type	Name	ID	Account Name or Summary Name	Amount	Main	Alt.	Type
	ENERGY	ID927.00	A&G Exp - Franchises	16,564	B		
	ENERGY	ID929.00	A&G Exp - Duplicate Chgs (credit)	-16,564	B		
	TDP.T	ID411.00	A&G Exp - Gain Disposal Prop	-145,221	B		APRIOR
	SW.T	ID925.00	A&G Exp - Injuries and Damages	4,219,015	B		LPRIOR
	SW.T	ID926.00	A&G Exp - Pensions and Benefits	8,806,923	B		LPRIOR
	ADJPTDCE.T	ID928.00	A&G Exp - Reg Comm Exp (BASE)	1,170,218	B		LPRIOR
	ADJPTDCE.T	ID931.00	A&G Exp - Rents	2,831,464	B		LPRIOR
	GP.T	ID935.00	A&G Exp - Maint of Gen Plant	3,244,194	B		LPRIOR
	AGOE.T	AGOE.T	A&G Exp - Total Operation	51,442,798			LPSUM
	AGME.T	AGME.T	A&G Exp - Total Maintenance	3,244,194	B		LPSUM
	IBFIT.T	IBFIT.T	TOTAL INCOME BEFORE FIT	245,793,580			LPSUM
	EBFIT.T	EBFIT.T	TOTAL EXPENSES BEFORE FIT	588,702,233			MPSUM

3. Options For Allocating Endogenous Accounts

Endogenous accounts are allocated based upon prior endogenous and exogenous accounts. There are four different ways that an exogenous account can be allocated. The account can be the sum of prior accounts. This method is designated with the PSUM "TYPE" describer. The PSUM allocation calculates the total cost allocated to the account as well as the costs allocated to each class based upon the summation of accounts defined in the allocation rule. (Allocation rules are discussed later in the document.) *This function calculates the total value allocated to the account, therefore it may be different than the value entered into column five of the account data table.* The user may want to check the resulting cost allocation to check for logic errors in defining the data inputs. A mathematical description of the PSUM allocation follows.

$$ACNT_{fn} = \sum_i ACNT_{ifn}$$

$$ACNT_{ifn} = \sum_k CLASS_{ifk}$$

$ACNT_{ifn}$ = cost allocated to endogenous account n in allocation factor f and customer class i

$CLASS_{ifk}$ = cost allocated to customer class i for allocation factor f in prior account k

i = index for customer class i.e. residential, secondary voltage..

- f = index of the allocation factor i.e. energy, demand, customer
- k = index of prior accounts to be used in the allocation
(k must be less than 20)
- n = cost account n

The dollars in an endogenous account can be also be allocated to classes based upon the weighted allocation of prior accounts. The weighting is based upon the customer class and the allocation factor. This method is designated with the PRIOR "TYPE" describer. An example of this type of allocation is that salary and wages for production related activities is allocated based on the relative allocation of operation and maintenance costs for the total of hydro plants, steam plants, and other plants. A mathematical description of the PRIOR allocation process follows.

$$ACNT_{fn} = \sum_i ACNT_{ifn}$$

$$ACNT_{ifn} = \left(\sum_k CLASS_{if} / \sum_i \sum_f \sum_k CLASS_{ifk} \right) * ACNT_n$$

ACNT_n = total cost in the endogenous account n to be allocated

ACNT_{ifn} = cost allocated to endogenous account n in allocation factor f and customer class i

CLASS_{ifk} = cost allocated to customer class i for allocation factor f in prior account k

i = index for customer class i.e. residential, secondary voltage..

f = index of the allocation factor i.e. energy, demand, customer

k = index of prior accounts to be used in the allocation
(k must be less than 20)

n = cost account number

The third way to allocate an endogenous account is on a percentage basis of prior accounts. When this allocation type is used the number in the "AMOUNT" column is a percentage rather than a dollar value. A typical example for this allocation type is to calculate return on ratebase and taxes. For example, the value entered for the return on a capital account would be the weighted cost of capital. The allocation rule defines the prior accounts that the percentage will be multiplied by. The percentage should be entered in decimal format. A mathematical description of the PCNT allocation process follows.

$ACNT_{fn}$	=	$\sum_i ACNT_{ifn}$
$ACNT_{ifn}$	=	$(\sum_k CLASS_{ifk}) * ACNT_n$
$ACNT_n$	=	total cost in the endogenous account to be allocated
$ACNT_{ifn}$	=	cost allocated to endogenous account in allocation factor f and customer class i
$CLASS_{ifk}$	=	cost allocated to customer class i for allocation factor f in prior account k
i	=	index for customer class i.e. residential, secondary voltage..
f	=	index of the allocation factor i.e. energy, demand, customer
k	=	index of prior accounts to be used in the allocation (k must be less than 20)
n	=	account number

The fourth allocation type uses the customer class weighted contribution of prior accounts to allocate a single prior endogenous account. The actual value in the "Amount" column of the accounting tables is not used in the calculation. The allocation calculation for the PCLAS factor follows.

$ACNT_{ifn}$	=	$(\sum_k CLASS_{ifk} / \sum_k \sum_f CLASS_{ifk}) * P_ACNT_{in}$
$ACNT_{ifn}$	=	cost allocated to endogenous account n for allocation factor f and customer class i
P_ACNT_{in}	=	prior account n to be allocated for customer class i
$CLASS_{ifk}$	=	cost allocated to customer class i for allocation factor f in prior account k
i	=	index for customer class i.e. residential, secondary voltage..
f	=	index of the allocation factor i.e. energy, demand, customer
k	=	index of prior accounts to be used in the allocation
n	=	account number

4. Allocation Rules

The allocation rule tells the model how the dollars associated with an account is spread among the customer classes. Each allocation rule used in the model must be both defined and specified. The definition phase identifies that a rule should be created and indicates whether the rule is an exogenous or endogenous allocation. The specification phase defines the specific accounts that should be used in the allocation. The definition phase is done in the accounting data tables and the specification phase is done in the classification

matrix. The model uses the rules defined in the accounting data tables to create the classification matrix.

Allocation rules are distinguished from accounting data entries by the fields completed in the accounting data table. *Rules are distinguished from accounts by the entry in column H and no entry of the dollar amount in column L.* Rules should have the following table entries.

- Rule Type Indicator (column H)
- Rule Name (column I)
- Rule Descriptive Name (column K)
- Type Description - Optional - (column O)

The order of the rules in the accounting data tables does not matter. A rule does not have to be defined before it is referenced by an account and it does not matter whether the accounts that use the rule are defined in a different accounting table than the one where the rule is specified.

The rule type, entered in column one of the table, can be either "EX" for exogenous rules, or "EN" for endogenous rules. This entry is mandatory and should be made in upper case letters.

The rule name is the name that is referenced by the individual accounts.

The rule description is used for documentation and is not used in the running of the model.

The type description is optional. However, it may be helpful for documentation purposes. The type description can be misleading if the same endogenous rule is used for different types of allocations, i.e. a PRIOR and PSUM allocation.

5. Modifying The Accounting Data Table

The accounting data tables have a strict column structure for the entry of the data. However, the length and number of tables can be adjusted to facilitate

the logical grouping of the account data. The spreadsheet functions can be used to cut and paste the tables as well as place borders around the table to enhance their readability. It is important that the table header be correctly placed above each table. The format for the table header is shown below in Figure III-10. *It is also critical that a single thick solid border be placed at the bottom of the table. The border is used to identify the bottom of the table to the model.* It is recommended that the user put borders around the whole table in order to enhance readability. The second restriction in locating the tables below each other is that there should not be more than 100 rows between the end of the prior table and the start of the next table.

Figure III-10 Header For Accounting Data

Column	Description
I	The word "TABLE" should appear
J	The table number
K	The table name
L	The word "TRUE" - indicates new summary name
M	The word "TYPE"
N	The table type: RATEBASE, EXPENSES, or REVENUE

When ever the accounting data tables have been restructured *it is essential that the create account table index routine be run.* The create account table index routine updates a table that indexes the accounting data. This table is used by other model routines that locate the accounting tables for the accounting data edit function, printing function, running the model, and for the rule checking routines. The start of the index table is located in cell I10, and an example is shown below in Table III-11.

Table III-11. Index of Tables

Num.	Type	Name	Line	Entries	Line	Error Status
FF-5	Expense	SALARY & WAGES ALLOCATION	242	8	263	
FF-15	Expenset	O & M - PRODUCTION	541	19	574	
FF-1	RateBase	EPIS - INTANGIBLE	57	2	70	
FF-2	RateBase	EPIS-PRODUCTION	81	8	110	
FF-24	Revenue	REVENUES - SALES OF ELECTRICITY	922	6	939	
FF-25	Revenue	OTHER OPERATING REVENUE	943	18	979	

The first column of the index table contains the table number. This number is the number identified by the user in column J at the top of each accounting table created. The table numbering scheme, the combination of alphanumeric characters, does not affect the model operation and is left to the discretion of the user. The second column, the table type indicator, is the entry in column N at the top of the table. Remember, the entry should be one of the three types described previously. The third table column, column M, is the table name. The table names are used by the dialog boxes that allow the user to select accounting tables to edit and print. The next three columns respectively show the starting row number of the table, the number of accounting data entries, and the row number of the table. The final column in the table, the STATUS column, is used to indicate whether there are errors in the account data input. The error notations are shown after the rule checking programs are run. These functions are described in Section E.

D. ALLOCATION MATRIX

The allocation matrix is the key that tells the model how to divide the cost account inputs among the user-defined customer classes. The matrix links the cost account inputs with the class allocation factors. The information necessary to complete the allocation matrix may be derived from utility studies, standard practices, and professional judgment. There are two matrices for each scenario; the exogenous matrix allocates is used to allocate accounts by external rules and the endogenous matrix is used to allocate cost accounts based upon allocation of other accounts. The exogenous allocation matrix can store fifty

rules and the endogenous allocation matrix can store one hundred rules. The model allows for three sets of matrices (a set is the exogenous and endogenous matrix) to define alternative scenarios. The three scenarios are referred to as the base case, alternative 1, and alternative 2. This feature has been added to facilitate scenario analysis since it is anticipated that this will be a relatively complex input for many users and because there is no single "correct" answer.

The allocation matrix should not be created until both the customer allocation factors have been defined and the allocation rules have been created in the accounting data input tables. Each allocation matrix consists of two tables. The first table contains the exogenous rules. The columns of the table matrix are created from the user-defined allocation factors and the rows of the matrix consist of each unique rule name. The second table contains the endogenous rules and the columns are used to specify the cost account IDs that are used in the rule's application. The rules defined in the accounting data tables are transferred to the matrix through a program that scans the accounting data input tables. The table that contains the indices for the allocation matrices is located in the range Q34:W45. An example is shown in Table III-12. The table shows the starting and ending line of each exogenous and endogenous matrix. In addition the last column, Error Status, is used to indicate whether there are definitional problems in the endogenous matrix. This feature is discussed in the next section on rule checking.

Table III-12 Sample Index of Allocation Matrices

Table	Name	Exog Start	Exog End	Endog Start	Endog End	Error Status
AM-1	Base Case Classification Matrix	61	110	117	215	
AM-2	Alternative 1 Classification Matrix	224	273	280	378	
AM-3	Alternative 2 Classification Matrix	387	436	443	541	

1. Editing, Updating, and Recreating the Matrices

Access to the allocation matrix is obtained by selecting either the "Edit Allocation Matrix", or "Update/Recreate Matrix" options from the pop-up menu displayed after selecting the "COS_INPUT" menu option. When the edit option is

selected, the user is requested to enter into the dialog box which of three versions of the matrix to edit (base, alternative 1, and alternative 2) and whether to edit the exogenous or endogenous factors.

As previously noted, the model contains three sets of two allocation matrices. It is only necessary to have one set (two matrices) to run the model. The other two matrices provide the option to run alternative scenario. If the update/recreate option is selected, the user must select from the three versions of the matrix and indicate whether the update or recreate option is desired. The update option is the default.

The **update option** searches through the accounting data table for rules defined in the accounting tables but not currently listed in the allocation matrix. If a new rule is found, it is added to the matrix.

The **recreate option** is a destructive operation. It completely erases the existing matrix and all the associated allocations. It then fills in the first two columns of the matrix with the allocation rule ID and name.

When either the update or recreate options are run the model puts the value "ENDEXOG" after the last entry in the exogenous matrix and the value "ENDENDO" after the last entry in the endogenous matrix. These entries, identifying the last entry in the table, are used to speed up the cost allocation model since they help define search ranges used in the allocation process.

2. Specification of Exogenous Rules

Exogenous rules allocate costs account by factors external to the model. Exogenous allocation factors include customer counts, energy consumption, and coincident peak allocated by customer class. (Remember, the model allows specification of up to forty exogenous allocation factors for up to fifty customer classes.) Each exogenous allocation factor defined in the model becomes a column in the exogenous allocation matrix. An extract of the table is shown in Figure III-13. (Due to space constraints the right 38 columns are not shown hence only two of the allocation factors appear on the table.) Entries into the

first two columns, the rule name and summary classification name are protected inputs since they are copied from the rule definitions in the accounting data tables. The third column, the check column, is also a protected entry since it is calculated automatically. The check column is the sum of the allocation factors.

The number shown in the check column must be one in order to correctly spread the total dollars in the account among the allocation factors. (Note: the model can be run when the allocation factors do not sum to one.) The column shows the "ERROR" indicator if the factors do not sum to one. The allocation percents entered in the forty columns to the right of the check column should be entered as decimal values.

The model uses the exogenous allocation matrix, the accounting data, and the classification factors to allocate costs according the following formula.

$$ACNT_n = \sum_f ACNT_{fn}$$

$$ACNT_{fn} = \sum_i (FACTOR_{if} * EXOG_{rf} * ACNT_n)$$

$$ACNT_{ifn} = FACTOR_{if} * EXOG_{rf} * ACNT_n$$

Note: $\sum_i FACTOR_{if} = 1$

$$\sum_f EXOG_{rf} = 1$$

$ACNT_{ifn}$ = Share of cost account N allocated to customer class i for allocation factor f

$FACTOR_{if}$ = Percent share of exogenous allocation factor f allocated to customer class i

$EXOG_{rf}$ = Percentage share of exogenous rule r allocated to allocation factor f.

Figure III-13. Sample Exogenous Allocation Matrix

Rule Name	Summary Classification	Check	ENERGY	DEMAND-1
DEM1A	Demand 1A CP Allocation Factor	1		1
PC	Peak Credit Classification Factor	ERROR		0.4
ID360.01	Land and Land Rights Ass Factor	ERROR		
DEM2	Demand 2 NCP Allocation Factor	1	0.6	0.4
ID361.01	Structures and Improve Ass Factor	ERROR		

3. Specification of Endogenous Rules

Endogenous rules allocate costs based upon other costs in the model, typically the allocation of other exogenous cost accounts. The matrix is similar to the exogenous rules matrix. An example is shown in Figure III-14. The first three columns of the allocation matrix are protected. The allocation rule name and description are copied from the accounting data input tables. The third column is blank. The following forty columns to the right, only the next two columns are shown) list the accounts that the rule should use for the endogenous allocation. The account numbers correspond to account IDs entered into the third column of the account data tables. *Note, account IDs should be listed consecutively across the columns without gaps.*

An additional feature of the endogenous rule allocation is the ability to treat the account as a negative number or a divisor. This feature is typically used with the PSUM allocation type and is identified by preceding the account name with the indicator " ! ". The subtraction option is signaled with the "!-" symbols before the account name and the divide operation is signaled with the "! /" indicator. The divisor option only works when an endogenous rule has two accounts and the divisor is listed in the second column of the account list.

Figure III-14 Sample Endogenous Allocation Matrix

Rule Name	Summary Classification	Type	Acct 1	Acct 2
PTD	Prod Trans Dist Allocation		PP.T	TP.T
INT.T	Total Intangible Plant		ID300.00	
PPLT.T	Total Production Plant		ID310.00	ID310.01
IBFIT.T	Total Income Before FIT		REV.T3	!-EBFIT.T

E. CHECKING ALLOCATION RULES

In order to successfully run the COS model the cost allocation rules must be correctly assigned to the accounting data. Correct definition of the allocation rules includes:

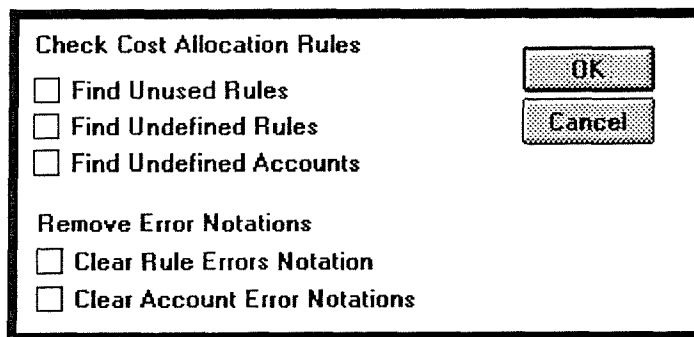
- Each account in the accounting data table must have a rule assigned that tells the model how to allocate the associated costs,
- The rules defined for each account must exist and be correctly specified, and
- Accounts that are allocated by endogenous rules must correctly specify the previous accounts that will be used to allocate the current account.

Error checking programs are provided to help the analyst check the inputs related to the allocation rules. Identification of errors does not prevent the model from running. However, the existence of errors are likely to lead to incorrect results. It is the user's responsibility to fix all errors prior to running the model. The existence of errors is noted in the seventh column, labelled STATUS of the accounting data index table and the index table for the allocation matrix. Different codes are used in the account summary table to indicate the different types of errors. These codes are shown in Table III-15. However, if more than one type of error exists, only the last error to be identified is indicated. The error checking routines are accessed through the "Check Allocation Rules" option in the "COS_Inputs" menu bar. Selection of this option will display the dialog box shown in Figure III-16. There are three options for checking the cost allocation rules and two associated options for clearing the error notations in the spreadsheet. More than one option can be selected by clicking the mouse on the box for each desired feature. A description of these options follows.

Table III-15. Error Codes

Error Code	Description
E-1	An accounting rule defined in the accounting data tables is not used
E-2	A rule specified for allocating an account does not exist in the allocation matrix
E-3	An account defined to be allocated by an endogenous factor does not have an allocation type specified
E-4	An endogenous rule has specified an account that does not exist in the accounting tables

Figure III-16 Dialog Box For Rule Checking



1. Find Unused Rules

The first option "Find Unused Rules" identifies rules defined in the accounting tables that are not used by any of the accounts. If unused rules are identified, then the first three columns of the rule in the accounting data table are shaded and the error code "E-1" is shown in the right column of the index table for the accounting data. In addition, an error message will be displayed on screen at the end of the rule checking procedure. Note, an unused rule does not result in errors in the model results. The feature is provided to help the analyst review the rule assignments.

2. Find Undefined Rules

The second option "Find Undefined Rules" performs two checks. The first check identifies if an allocation rule assigned to an account is defined in the allocation matrix. If the rule does not exist, then the first four columns of the rule definition are shaded in the accounting data table. In addition, an entry with the code of "E-2" is shown in the right column of the account table index table. The

user is asked which allocation matrix should be used (base case, alternative 1, or alternative 2) for the checking.

The second check determines whether endogenous account allocation type has been entered. The type allocator is the entry in the last column of the accounting data table. (Remember, the type indicator is one of the following four options: `_PSUM`, `_PRIOR`, `_PCNT`, and `_PCLAS`.) If an allocation type has not been entered then the account is shaded along with the right column of the accounting data rule. In addition, the error code "E-3" is shown in the right column of the account index table.

3. Find Undefined Accounts

The third error checking routine is used to find undefined accounts assigned to the endogenous rules in the allocation matrix. The program checks the accounts entered into the endogenous matrix against the accounts defined in the account data tables. If the account is not defined then it is shaded in the allocation matrix, the error notation "E-4" is made in the last column of the allocation matrix summary table, and a message is displayed on the screen.

4. Removing Error Indicators on Rules and Accounts

The last two options remove the shading in the cells where errors were identified. Note that when the user corrects an error in either the accounting data table, or the allocation matrix neither the shading around the box, nor the error notation in the summary table is automatically removed.

5. Order Error Checking

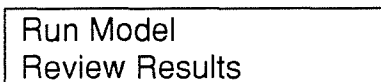
There is one more error check that is not done until the model is run. The first check identifies when an account allocated by an endogenous rule refers to an account that has not been resolved yet. If this error is encountered, the model continues to execute and the error notation "Order Error" appears in column BJ, labeled "Account Type", and the row associated with the rule and account with the error.

IV. RUNNING THE COS MODEL

"Running" the cost of service model consists of two separate functions: setting up the equations that determine how accounting data are allocated to the customer classes, and recalculating the cost allocation. The first function, setting up the allocation equations on the spread sheet, is a relatively time-consuming process. The full historical Puget Power cost of service takes approximately 45 minutes on a 80386 based processor to generate all the equations and calculate the cost allocation. The second function, recalculating the spreadsheet, is performed relatively quickly. The second function is performed automatically once the model has been "set up" on the spread sheet. The option of setting up the equations and completing the calculations is reviewed in Section A. The spreadsheet structure of the model results is described in Section B along with sample calculations. The process of modifying inputs without modifying equations is reviewed in Section C. The last section reviews the process for reviewing the model results.

Options related to running the COS model are accessed from the COS_Model item on the menu bar. Selection of this item will result in displaying the menu options shown in Figure IV-1.

Figure IV-1. COS Menu Bar



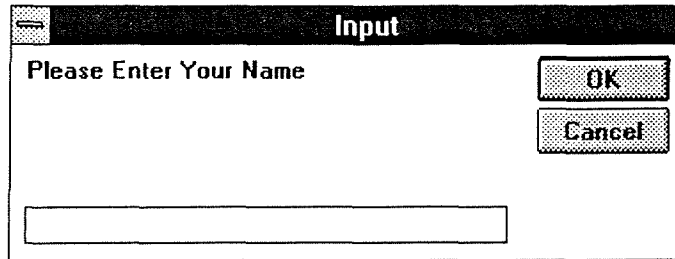
Note that the "Run Model" commands deletes the old model results. If the user needs to save the old model results then the spreadsheet with the old results should either be renamed, or moved to another DOS directory.

A. RUNNING THE MODEL

In order to run the model, the user should select the "Run Model" option from the COS_Model menu bar at the top of the screen. When this option is selected, the user is prompted for five inputs. The first prompt is to enter the analyst's name. This dialog box is show below in Figure IV-2. The analyst's

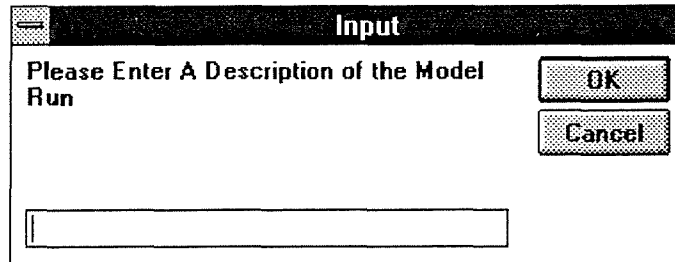
name is recorded on the spreadsheet (in cell BN52) and reports. It is also used to help track the model simulations.

Figure IV-2. Analyst's Name Dialog Box



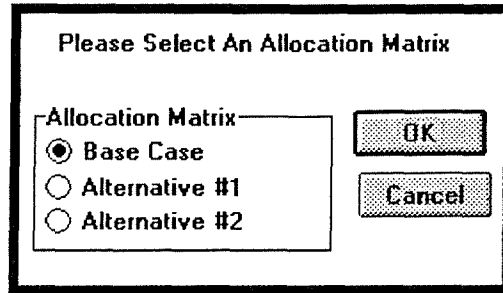
The second input is a description of the model run. This input is recorded on the model (in cell BN51) and report spreadsheets and is used to track the simulation scenario. The dialog box used to request the user's input is shown in Figure IV-3.

Figure IV-3. Dialog Box To Enter Model Description



The third input requires the analyst to identify which allocation matrix to use with the model. The default matrix is the base case. *Note, if the user selects the cancel button the simulation can be terminated without affecting any existing model results.* The associated dialog box for this input is shown in Figure IV-4. The selected allocation matrix is noted at the top of the model (in cell BN54) along with the analyst's name, the model description, the run date, and the run time.

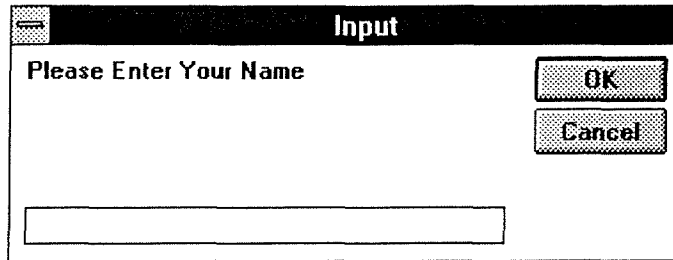
Figure IV-4. Selection of Allocation Matrix



The fourth prompt defines how the cost allocations should be performed. Allocations for each cost account can be tracked by other applicable exogenous and endogenous allocation factors, or by each applicable permutation of the endogenous factors and primary functional group. This option does not affect the accounts allocated by exogenous rules since there is a one-to-one relationship between the exogenous allocation factor and the primary functional group for each account. The set of applicable exogenous factors for each account are based upon the allocation rule used from the classification matrix. The account's primary functional group is defined in the account data table. The option to track accounts by classification factor and primary functional group is used by Puget Power to allocate costs by base and resource categories for its Periodic Rate Adjustment Mechanism. If the user selects the "OK" option then the costs are allocated by both the classification factor and functional group. *Note, this option increases the model run-time and the spreadsheet size.* Selection of the "Cancel" option results in allocation costs by only the classification factors. The dialog box that requests the user's choice is shown in Figure IV-5.

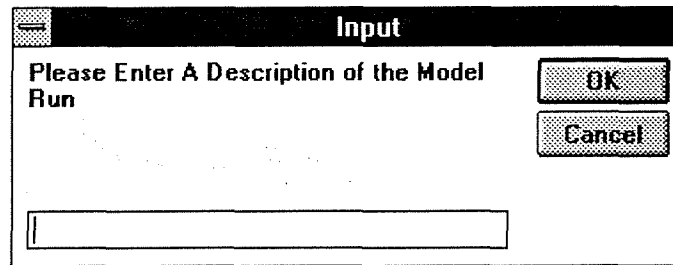
name is recorded on the spreadsheet (in cell BN52) and reports. It is also used to help track the model simulations.

Figure IV-2. Analyst's Name Dialog Box



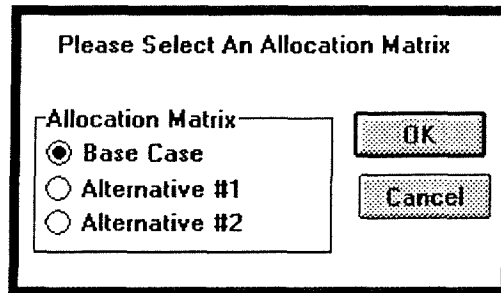
The second input is a description of the model run. This input is recorded on the model (in cell BN51) and report spreadsheets and is used to track the simulation scenario. The dialog box used to request the user's input is shown in Figure IV-3.

Figure IV-3. Dialog Box To Enter Model Description



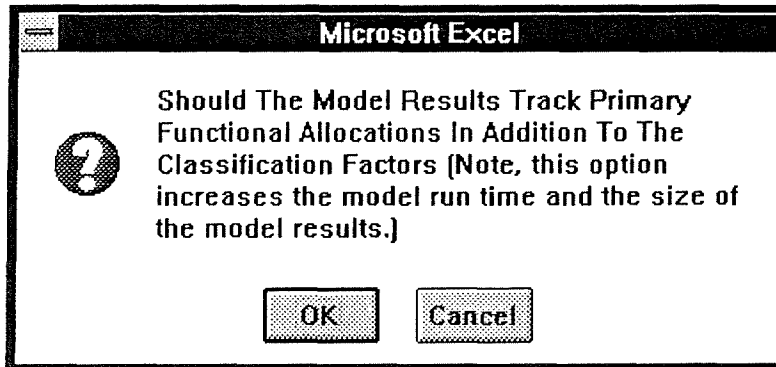
The third input requires the analyst to identify which allocation matrix to use with the model. The default matrix is the base case. *Note, if the user selects the cancel button the simulation can be terminated without affecting any existing model results.* The associated dialog box for this input is shown in Figure IV-4. The selected allocation matrix is noted at the top of the model (in cell BN54) along with the analyst's name, the model description, the run date, and the run time.

Figure IV-4. Selection of Allocation Matrix



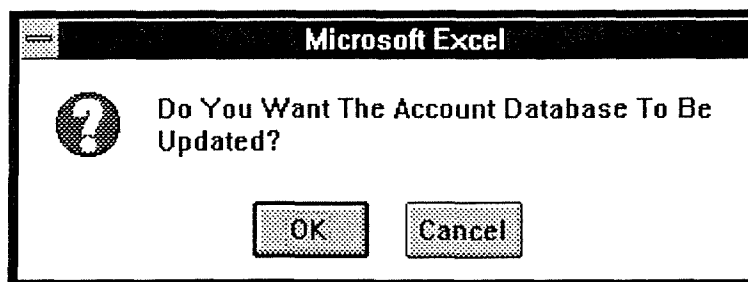
The fourth prompt defines how the cost allocations should be performed. Allocations for each cost account can be tracked by other applicable exogenous and endogenous allocation factors, or by each applicable permutation of the endogenous factors and primary functional group. This option does not affect the accounts allocated by exogenous rules since there is a one-to-one relationship between the exogenous allocation factor and the primary functional group for each account. The set of applicable exogenous factors for each account are based upon the allocation rule used from the classification matrix. The account's primary functional group is defined in the account data table. The option to track accounts by classification factor and primary functional group is used by Puget Power to allocate costs by base and resource categories for its Periodic Rate Adjustment Mechanism. If the user selects the "OK" option then the costs are allocated by both the classification factor and functional group. *Note, this option increases the model run-time and the spreadsheet size.* Selection of the "Cancel" option results in allocation costs by only the classification factors. The dialog box that requests the user's choice is shown in Figure IV-5.

Figure IV-5. Selection of Cost Allocation Level-of-Detail



The final query requests whether the account index needs to be regenerated. The account index is the sorted list of accounts that defines their order in the simulation. The ordering of accounts was discussed in the section on input of account data. The ordering makes sure that exogenous accounts are allocated first and then endogenous accounts are allocated in the order created by the combination of the allocation type and the one letter prefix. It is a good idea to regenerate the index whenever accounts are added, deleted, or the allocation type designator is changed. The index lists all the accounts and their associated row number in the accounting data tables. The dialog box for querying the user is shown in Figure IV-6. Selection of the "OK" options regenerates the account index while selection of the "Cancel" bypasses the index creation phase.

Figure IV-6. Generation of Account Data Index



Once the five user inputs are completed the model starts running. Messages appear on the bottom line of the screen indicating the status of the

simulation. The messages indicate whether the simulation is in the set-up mode, percent of exogenous accounts simulated, percent of endogenous accounts simulated, and when the model is in the clean-up phase.

B. MODEL SPREAD SHEET STRUCTURE

The COS model with the associated cost allocation formulas is contained within the COS2.XLS spreadsheet starting in column BJ row 51. (The model actually uses column BI to contain intermediate results for the PRIOR endogenous allocation type.) The COS model sets up an area of the spread sheet where columns represents each customer class defined in the class definition table. The rows of the model represent each applicable permutation of the accounting data accounts and allocation factors. For example, if a transmission account is allocated to both demand and customer allocation factors, then there will be two rows in the model area, one for each factor. The model puts the appropriate formula in each cell so that the cost account is allocated to the appropriate class based upon the user-defined cost allocation rules. In most cases costs are spread to rate classes according to the percentages defined in the customer allocation factor tables.

Information about the simulation is recorded at the top of the model starting at cell BM48. The simulation description includes the scenario name and details of the simulation. A sample model header is shown in Figure IV-7.

Table IV-7. Model Header

Table MR-1 Detailed Model Run			
Model Run Description:	MODIFIED BASIC CUSTOMER		
Run Date:	5/14/92	End Time:	5/14/92 13:34 Run Time: 0:25:39
Analyst:	Joe Analyst		
Allocation Matrix Used:	Base Case Classification Matrix		

Figure IV-8 Sample Model Output

	BJ	BK	BL	BM	BN	BO	BP	BQ	BR	BS
58										Residential
59	Account Data	Alloc	Account		Total	Functional Group	Functional Group	Allocation	Allocation	47
60	Type	Method	ID #	Account Description	Allocation	Primary	Secondary	Type	Factor	Water Heating
61										
62	EPIS-PRODUCTION	PC1	ID310.00	Shuffleton	7500806.28	R	0	0	ENERGY	1028330.71
63	EPIS-PRODUCTION	PC1	ID310.00	Shuffleton	1536309.72	R	0	0	DEM-1	210880.2808
64	EPIS-PRODUCTION	PC1	ID310.00	Shuffleton	0	R	0	0	DEM-1A	0
65	EPIS-PRODUCTION	PC1	ID310.01	Thermal Baseload Generation	524885752.6	R	0	0	ENERGY	71959749.18
66	EPIS-PRODUCTION	PC1	ID310.01	Thermal Baseload Generation	107506720.4	R	0	0	DEM-1	14756820.9
67	EPIS-PRODUCTION	PC1	ID310.01	Thermal Baseload Generation	0	R	0	0	DEM-1A	0
68	EPIS-PRODUCTION	PC2	ID330.00	Hydro Baseload Generation	95755361	R	0	0	ENERGY	13127679
69	EPIS-PRODUCTION	PC2	ID330.00	Hydro Baseload Generation	19612544	R	0	0	DEM-1	2692099.6
70	EPIS-PRODUCTION	PC2	ID340.00	Other Production Plant	66672077	R	0	0	ENERGY	9140476.6
71	EPIS-PRODUCTION	PC2	ID340.00	Other Production Plant	13655727	R	0	0	DEM-1	1874442
72	EPIS-PRODUCTION	SP.T	SP.T	Steam Plant - Total	532,386,559	R	0	APSUM	ENERGY	72988079.89
73	EPIS-PRODUCTION	SP.T	SP.T	Steam Plant - Total	109,043,030	R	0	APSUM	DEM	14967701.18
74	EPIS-PRODUCTION	HP.T	HP.T	Hydro Plant - Total	95,755,361	R	0	APSUM	ENERGY	13127679.19
75	EPIS-PRODUCTION	HP.T	HP.T	Hydro Plant - Total	19,612,544	R	0	APSUM	DEM	2692099.581
76	EPIS-PRODUCTION	OP.T	OP.T	Other Plant - Total	66,672,077	R	0	APSUM	ENERGY	9140476.641
77	EPIS-PRODUCTION	OP.T	OP.T	Other Plant - Total	13,655,727	R	0	APSUM	DEM	1874442.008
78	SALARY & WAGES ALLOCATION	PP.T	S100	Salary & Wages - Prod Related	4064247.7	R	0	APRIOR	ENERGY	557192.2
79	SALARY & WAGES ALLOCATION	PP.T	S100	Salary & Wages - Prod Related	832436.28	R	0	APRIOR	DEM	114263.68

An extract from a complete simulation is shown in Figure IV-8. Due to space limitations only one of the customer rate classes and a limited number of accounts are shown. The first nine columns contain the account keys and identification data along with the total amount allocated across the classes. These keys are summarized in Figure IV-9 and a description of their use in the model follows.

Figure IV-9 COS Model Keys

Column	Key Name	Description
BJ	Account Type	Defined with accounting data table heading
BK	Allocation Method	Allocation rule assigned in accounting data
BL	Account ID #	Account ID assigned in accounting data table
BM	Account Description	Description assigned in accounting data
BN	Total Allocated	\$ allocated to account / allocation factor
BO	Functional Group - Primary	Name defined in accounting data table
BP	Functional Group-Secondary	Name defined in accounting data table
BQ	Allocation Type	Endogenous account allocation method
BR	Cost Class	Exogenous allocation factor

1. Column Keys

Account Type

The account data type, located in column BJ, is extracted from the user entered table heading that the specific cost account is listed under. This key is not used in any of the COS model calculations. It is retained for reporting purposes only.

Allocation Method

The allocation method, shown in column BK, is the rule used to allocated the account between the different customer classes. The allocation rule refers to the entry associated with the account in the account data table. Note, changing the account rule once the model has been run will not affect the model results.

Account ID

The account ID, shown in column BL, is the cost account that is allocated. This entry is copied from the accounting data input tables. Note, changing this value once the model has been run will change the name in the results but will not change any of the cost allocations.

Account Description

The account description is copied from the accounting data input tables. The account description will be over-written with the message "Order Error" if the account is an endogenous account and one of the accounts used in the allocation has not been allocated yet. If this error occurs it is necessary to first identify the account that could not be allocated by checking the allocation rule, fix the order that the accounts are allocated in, and then rerun the model.

Total Allocation

The total allocation is the total dollars allocated to all the customer classes. In the case of the exogenous allocation factors the total for the row is equal to the product of the account total (from the accounting table) and the percent allocated to the allocation factor (from the classification matrix). This number is allocated according to the following formula.

$$ACNT_{fn} = ACNT_n * EX_ALOC_{fn}$$

$$ACNT_{fn} = \text{cost allocated to account } n \text{ for exogenous allocation factor } f$$

$$EX_ALOC_{fn} = \text{exogenous allocation factor } n \text{ for classification factor } f$$

$$\sum_f EX_ALOC_{fn} = 1$$

There is a separate cost allocation row in the spreadsheet for each non zero classification factor defined in the exogenous classification matrix based upon the allocation rule being used. Note: changing either the total dollars allocated to the exogenous account, or the relative allocation to the classification factor changes the total allocation and resulting allocations by customer class.

The formulas for allocating the total cost for endogenous accounts are more complex. These formulas were described in Chapter III under the discussion of the different endogenous allocation factors. The number of cost allocation rows in the spreadsheet for the account are based upon both the accounts used in the allocation and the primary functional group. The model scans the allocation factors (column BR) of the accounts used in the endogenous allocation. Each unique allocation factor based upon the name preceding the hyphen, if present, is used to create a cost allocation row. Note, that the model collapses allocation factors based upon the allocation factor prefix. For example, if prior accounts used in the allocation have the exogenous factors DEMAND-CP12 and DEMAND-NCP, then both accounts will be summed under the allocation factor name DEMAND. Further permutations of cost allocation rows are made for different combinations of the allocation factors and the primary functional group if the option is requested when the model is run.

Primary Functional Group

The primary functional group is defined in the accounting data tables. This column can be used in the model for the cost allocation features depending on the user selected cost allocation features.

Secondary Functional Group

The secondary functional group is copied from the accounting data table. It is retained for reporting purposes only. If the key name is changed in the model inputs the change will be reflected in the model output. These keys can be used to summarize the account data.

Allocation Type

The allocation type indicates the method used to allocate the endogenous account. (The value is shown as a "0" for an exogenous account allocation.) The name can be modified in the inputs and the changes will appear in the outputs. However, changing the name will not result in modifying any of the calculations made based upon the old name. If the method needs to be changed, then the model must be rerun.

Allocation Factor

The allocation factor for exogenous allocation factors is copied from the top row of the exogenous classification matrix. (The value in the classification matrix in-turn is based upon the user defined allocation factors.) The allocation factor name for endogenous cost allocations is based upon the allocation factors used in the accounts that are used in the indirect allocation. Note that the suffix part of an exogenous allocation factor, the part following a hyphen, is not used in the endogenous allocation.

Customer Class Allocations

The columns to the right of column BR show the allocation for each of the customer classes. There are as many columns as there are customer classes defined in the inputs. The three rows of column headings for the customer class names (rows 58 - 60) are copied from columns E, D, and C from the define customer classes input table.

The customer class allocation for exogenous factors is the product of the total dollars allocated to the account, the percent allocated to the classification factor, and the percent allocated to each customer class. The percentage allocation to each customer class is copied from the column D of the appropriate classification factor.

2. Sample Calculations

This section reviews the sample model output shown in Figure IV-8 and explains how the calculations are made for an exogenous and endogenous allocation factors accounts. For the purpose of this example a single account data table is shown in Figure IV-10 and simplified allocation matrices are shown in Figure IV-11.

Figure IV-10. Simplified Account Data Table

	H	I	J	K	L	M	N	O
72	Table	FF-1	EPIS-PRODUCTION		TRUE	Type:	Ra	Base
73	Rule	Rule	Account			Functional		
74	Type	Name	ID	Account Name or Summary Name	Amount	Main	Alt.	Type
75								
76	EX	PC1		Peak Credit Classification Factor				
77		PC1	ID310.00	Shuffleton	9,037,116	R		
78	EX	PC2		Peak Credit Classification Alt.				
79		PC1	ID310.01	Thermal Baseload Generation	632,392,473	R		
80	EN	SP.T		Steam Plant - Total				
81		SP.T	SP.T	Steam Plant - Total	641,429,589	R		APSUM
82		PC2	ID330.00	Hydro Baseload Generation	115,367,905	R		
83	EN	HP.T		Hydro Plant - Total				
84		HP.T	HP.T	Hydro Plant - Total	115,367,905	R		APSUM
85		PC2	ID340.00	Other Production Plant	80,327,804	R		
86	EN	OP.T		Other Plant - Total				
87		OP.T	OP.T	Other Plant - Total	80,327,804	R		APSUM
88	EN	PP.T		Total Production Plant				
89		PP.T	S100	Salary & Wages - Prod Related	4896683.98	R		APRIOR

Figure IV-11 Sample Allocation Matrices

	Q	R	S	T	U	V
60	Rule Name	Summary Classification	Check	ENERGY	DEM-1	DEM-1A
61	PC1	Peak Credit Classification Factor-Baseload Plant	1	0.83	0.17	0
62	PC2	Peak Credit Classification Factor-Other Plant	1	0.83	0.17	

	Q	R	S	T	U	V
116	Rule Name	Summary Classification		Acct 1	Acct 2	Acct 3
117	SP.T	Steam Plant - Total		ID310.00	ID310.01	
118	HP.T	Hydro Plant - Total		ID330.00		
119	OP.T	Other Plant - Total		ID340.00		
120	PP.T	Total Production Plant		SP.T	HP.T	OP.T

Cost Allocations With Exogenous Factors

The model starts by processing all accounts that are allocated with exogenous allocation factors. In this example the model starts with the first, and only, accounting table shown in Figure IV-10. The first exogenous account in the

table is ID310.00, allocated with the allocation rule PC1. The model copies the account type, from the table heading, the allocation rule, the account ID, and the account description from the accounting table to the first four columns of the model results (line 62 columns BJ - BM) of Figure IV-8). The model also copies the primary and secondary functional groups and the allocation type to columns BO - BQ of the model results.

The model then looks up the rule in the exogenous classification matrix and determines that rule PC1 allocates 83% of the cost by energy, 17% by the factor DEM-1, and 0% by the factor DEM-1A. The model will create one row for each cell allocation factor in the classification matrix that has a value between zero and one and records the allocation factor in column BR. In this case, three rows are created, rows 62 - 64 and column BR shows the three allocation types: ENERGY, DEM-1, and DEM-1A. The next step is to create an equation in column BN that is the product of the dollar amount shown in the account table and the allocation percentage shown in the classification matrix. In this case the energy allocation shown in cell BN62 would have the formula $L77 * T61$. Note that subsequent changes to either the dollars in the account, or the percentage allocation will automatically be reflected in the model output.

The final step is to create the allocations to each customer class. The model looks at the allocation factor in column BR and identifies the associated allocation factor table. The percentages in column D are multiplied by the total allocation in column BN to create the class allocation. For example, assume that the energy allocation table starts at cell A120 and the percent of energy used by the residential water heating class is located in cell D121. The formula shown in cell BS62 would be $BN62 * D121$. Note that changing the percent of energy used by each class automatically will change the model results.

Cost Allocations With An Endogenous Sum Factor

Allocation of endogenous accounts begins after the exogenous accounts are allocated. Allocations of the PSUM type are simply sums of prior accounts. This example reviews the allocation of the steam plant total account, SP.T, shown on lines 72 and 73 of Figure IV-8. The allocation process starts by

copying information from the accounting table into columns BJ - BM and BO - BQ of the model output, just as it did for the exogenous allocation factors.

The model notes that the account SP.T is allocated according to the endogenous rule SP.T. It looks up the rule in the endogenous classification matrix and determines that rule SP.T uses accounts ID310.00 and ID310.01. The allocation type PSUM tells the model that those two accounts should be summed. The model looks at the accounts already simulated (lines 62 - 71 of the output), and identifies all the unique prefixes (in column BR) associated with the allocation factors for rules ID310.00 and ID310.01. The model determines that the unique prefixes are ENERGY and DEM and creates a row in the output for each factor (lines 72 and 73).

The final step is to create formulas to reflect the summation for the total allocation and the allocation to each class. For example, the model determines that the total allocation to the factor ENERGY is the formula BN62+BN65 and the total allocation to the factor DEM is the formula BN63+BN64+BN66+BN67. Note that the actual entry in cell L81 is not used in the model output. However, the analyst correctly entered the inputs so that the sum of cells BN72 and BN73 equal L81.

Cost Allocations With An Endogenous Prior Factor

The allocation of accounts with the endogenous allocation factor type of PRIOR is similar to the PSUM allocation type. An example of this allocation process is demonstrated with the allocation of the salary and wages - production related account, S-100, shown on lines 78 - 79 in Figure IV-8. The S100 account is allocated with the rule PP.T. The endogenous classification matrix defines the rule PP.T as using the accounts SP.T, HP.T, and OP.T. The model identifies each of these accounts from the list of previously allocated accounts and finds them in lines 72 - 77 of the model output. The model also determines that these accounts collectively use two allocators: ENERGY and DEM. Therefore, it splits the allocation of S100 into ENERGY and DEM. The total allocation of S100 to energy is the product of the S100 account amount, shown in cell L89 of the account data table, and the ratio of the ENERGY to the total

amount allocated to the accounts SP.T, HP.T, and OP.T. The resulting formula in cell BN78 would be:

$$L89 * \text{SUM}(BN72+BN74+BN76) / \text{SUM}(BN72,BN73,BN74,BN75,BN76)$$

The allocation of the S100 account to each class reflects the relative contribution of each class based upon the prior accounts. For example the energy portion of S100 allocated to the residential water heating class is:

$$L89 * \text{SUM}(BS72+BS74+BS76) / \text{SUM}(BN72,BN73,BN74,BN75,BN76)$$

C. UPDATING THE MODEL INPUTS

The model has been designed to test a variety of scenarios without changing the model equations. Redefining the model structure and change the equations in a cell, or "running the model" can be a very time intensive affair depending upon the number and types of inputs. Changes to the model inputs that automatically "flow through" to the model output includes: changing the inter-class allocations associated with an allocation factor, changing the relative weight of an exogenous allocation factor, and changing the amount assigned to an account. A list of a number of potential model changes along with an indicator whether the model must be rerun is shown in Figure IV-12. Changes to model inputs that flow through to the model results do not change the model's run date. *It is recommended that the user change the model run date manually when flow through changes are made. The date is found in cell BN52.* The use of equations allows relatively quick modifications to many inputs. The use of equations makes it critical that the rows of the model are not moved around once the model has been run. *Moving rows will result in erroneous results since many of the cells contain relative references.* Finally, if the analyst has a number of changes to the inputs, then it is faster to turn the calculation off, make the changes, and then turn the calculation back on.

Figure IV-12 Model Update Features

Model Modification	Automatic Update
Class Definitions	
Add a new customer class	No
Rename customer class or code	Yes
Change summary class definitions	Yes
Exogenous Allocation Factors	
Add new allocation factor	No
Change name of an allocation factor	Yes
Adjust amount allocated to customer class	Yes
Accounting Data	
Add a new account	No
Change allocation rule for account	No
Change account between endogenous and exogenous	No
Change account name	Yes
Change dollar amount allocated to account	Yes
Change between "Prior", "APSUM", and "PCNT"	No
Allocation Matrix	
Include a new exogenous factor	No
Adjust percentage for defined exogenous factor	Yes
Change, add, or delete an endogenous account	No
Add a new allocation rule	No
Reporting Keys	
Primary functional classification	Yes
Secondary functional classification	Yes

D. REVIEWING THE MODEL RESULTS

The model results can be viewed on screen with the help of scroll bars. The scroll bars maintain the column headings and keep the key row identifiers in view as the analyst pages through the model results. This option is activated by selecting the "COS_Model" option on the menu bar and clicking on the "Review Results" menu option.

V. REPORTING FEATURES

The model reporting features are divided into four main groups:

- developing reports from the model output,
- printing the model output reports,
- printing reports of the model inputs, and
- viewing the reports on screen.

All of the reporting features are accessed from the option "COS_Reports" shown in the ruler at the top of the Excel screen. When the COS_Reports option is selected the menu shown in Figure V-1 is displayed. Each of these selections is reviewed in sections A - G respectively.

Figure V-1 Model Report Option Features

Initialize Output Reports
Summary Reports
Detailed Reports
Template Reports
Review Output Reports
Print Reports
Define Printer Fonts

A. INITIALIZING OUTPUT REPORTS

The cost of service model exists entirely in the spreadsheet COS2.XLS. When the model is run the model sets up the "COS2.XLS" spreadsheet to contain all the relationships necessary to link the allocation factors with the accounting data and the rules to allocate the cost across the defined customer classes. Due to constraints on spreadsheet sizes and the associated memory limitations the model output reporting functions are done on a second spreadsheet called "COS2RPT.XLS". Therefore, the first step is to transfer the model results to the reporting spreadsheet. The "Initialize Output Reports" option copies the model results from the COS2.XLS spreadsheet to the COS2RPT.XLS spreadsheet and creates the database used in constructing the output reports. The two spreadsheets are not linked, therefore changes in the

model do not "flow-through" to the model report spreadsheet. If changes are made to the model inputs that in turn "flow-through" to the model results, then the model output must be recopied to the report spreadsheet.¹

The output initialization procedure not only copies the model results to the COS2RPT.XLS spreadsheet, but also does error checking and creates summary customer classes.

1. Error Checking

The model checks for the message "Order Error" in column BM of the cost allocation model. If the message is found, the following message alerting the user is displayed on the screen. *"There Is An Error In The Allocation of Endogenous Accounts."* The order error indicates that one or more of the accounts used in an endogenous allocation has not been correctly defined.

If the order error message occurs then the user should view the model results to identify which row(s) the message appears in. After the row(s) have been identified, the analyst should make sure that any problems identified by the rule checking programs have been resolved. If the rule checking programs do not identify any problems, then it is likely that one of the endogenous accounts used in the allocation appears after the spreadsheet row where the message occurs. The analyst should check the allocation rule (shown in column BK) and the associated accounts (shown in the endogenous allocation matrix) to identify which account(s) do not appear above the row where the message occurs. If an account does not appear above the row, then check below the row where the error message occurs. If the account appears below the row where the message occurs, then it is necessary to change the order that the endogenous accounts are allocated in.

The second error check looks for divide by zero errors in the model results. If any division errors are detected, the following message appears. *"There Are Division Errors In The Model Results. This Will Cause Errors In The Reporting Features. Please Check The Model Output."* If this message appears, the user should review the model results to identify the problem. This result will cause fatal errors in the template reporting procedures.

2. Summary Classes

The "Initialize Output Reports" option creates class summaries that are used for reporting purposes. The class summaries are based upon the summary levels defined in the fifth column of the customer class identification table and appear in row 58 of the model results. The summary level names can not start with a number since these names become Excel database keys. (The restriction applies to all Excel database keys.) The summary classes can be changed after the model has been run by changing the summary names in the class identification table and re-initializing the output report.

3. Structure of Model Output Spreadsheet

The model results are used to create an Excel database within the report worksheet. The only formulas contained in the database are the ones used to create the class summaries. The database name, called "records", and keys are defined by the report initialization program. The reporting features of the model uses eight of the keys for creating summary level reports. A description of the report keys is shown in Table V-2. The key name shown in the first column of Table V-2 appears in the dialog box when report summaries are requested. The key name is followed by a longer description in column two of the table. The third column shows the name that appears in rows 60 - 62 of the report spreadsheet and the fourth column indicates the column of the spreadsheet that the key corresponds to.

Table V-2. Output Reporting Database Keys

Key	Description	Column Name	Col.
Account Type	Accounting Table Name	Account Data Type	A
Allocation Rule	Rule Name Used To Allocate Account	Alloc Method	B
Account ID #	Account ID Defined In Account Table	Account ID #	C
Account Description	User Description of Account	Account Description	D
Dollar Amount	Dollar Amount Associated With Account	Total Allocation	E
Primary Functional	User Defined Key in Account Data Table	Primary	F
Secondary Functional	User Defined Key in Account Data Table	Secondary	G
Special	Method For Accounts With Endogenous Allocation Factor	Special	H
Allocation Factor	Allocation Factor Used To Spread Account Amount Across Classes	Cost Class	I
Secondary Allocation	Derived From Allocation Factor - Text That Precedes Hyphen	Classification 2	J

B. SUMMARY REPORTS

The summary report feature is designed to sum dollar amounts across the permutations of accounts and allocation factors that constitute the rows of the database. The summary feature is designed to sum the accounts based upon different permutations of the database keys. The sums can be reported at the summary class level, for all rate classes, or for all rate classes in a single summary class.

The summary report is written on the report spreadsheet and can either be viewed at the terminal, or printed. The summary report is always written to the same area of the spreadsheet. Each new summary report created overwrites the prior report. There is no means for saving multiple reports on the same spreadsheet. However, the user can use the Excel copy and paste functions to copy the summary tables to a new spreadsheet.

The summary report feature is accessed through selecting the "Summary Reports" option contained in the "COS_Reports" menu bar. When this option is selected the analyst is queried for their name and a description of the report. These two items along with the data are written at the top of the report. This feature should be used to assist in tracking different scenarios. A dialog box,

shown in Figure V-3, is used to select the report summary keys and rate class level detail that will appear on the report.

The rate class detail box is used to select one of three reporting levels. The reporting levels define the report columns. The summary class level creates one column for each of the summary classes defined in Customer Class Identification Table. The second option, "By Schedule", creates a column for each of the schedules defined in the Customer Class Identification table. The third option, "Summary Class Detail", creates a column for each rate class in the summary selected. When this option is selected a box appears to the right with the different summary class names. The analyst should select the desired summary class name.

The rows of the summary report are defined by the report keys selected. The rows of the database can be totalled by one, two, or three of the database keys. The keys are selected from the three boxes at the bottom of the dialog box. It is the analyst's responsibility to select meaningful combinations of keys.

Table V-3 Dialog Box For Summary Report

Rate Class Detail

Summary Classes
 By Schedule
 Summary Class Detail

OK
Cancel

Primary Key
Account Type

Account Type	+
Allocation Rule	
Account ID #	
Account Description	
Dollar Amount	
Primary Functional	
Secondary Functional	
Special Category	
Allocation Factor	+

Secondary Key
None

None	+
Account Type	
Allocation Rule	
Account ID #	
Account Description	
Dollar Amount	
Primary Functional	
Secondary Functional	
Special Category	+

Third Key
None

None	+
Account Type	
Allocation Rule	
Account ID #	
Account Description	
Dollar Amount	
Primary Functional	
Secondary Functional	
Special Category	+

An example of output from the summary table report is shown in Figure V-4. (Only a few rows of the rows and summary classes are shown.) The report is shown for two keys. Note the keys selected appear in the first three column headings of the table. The fourth column is blank and will be used in latter versions of the model. The rate classes are shown starting in the fifth column of the report (column CL of the spreadsheet).

Figure V-4 Example of Summary Output Report

Cost Class	Account		Summary Class	Summary Class
	Data Type		Residential	Secondary Gen'l Svc
CUST1	EPIS - GENERAL PLANT		274781353.4	32,466,418
CUST1	O & M - CUSTOMER ACCTS EXPENSE		438966.1498	51,865
CUST1	O & M - CUSTOMER SVC EXPENSE		2264766.482	267,590
CUST1	SALARY & WAGES ALLOCATION		63495352.52	7,502,207
CUST2	EPIS-DISTRIBUTION		206425693.3	24,389,948
CUST3	EPIS-DISTRIBUTION		140626911.5	16,615,582
CUST4	FEDERAL INCOME TAXES		6464796.337	763,839
CUST4	RB ADJ - CUSTOMER DEPOSITS AND ADVANCES		-13730723.38	-1,622,335
CUST4	REVENUES - OTHER OPERATING REVENUE		5609406.834	662,772

C. DETAILED REPORTS

The detailed reporting feature is designed to list each of the accounts that compose a row of the summary report table. Each line of the summary report table becomes a separate detailed report table. The rate classes shown in the columns of the summary report table are used in the detailed report tables also. When this option is selected the user is queried whether the recreate the summary class tables. If the analyst elects to recreate the summary tables then the dialog box shown in Section 2 is displayed. If the summary class table is already correct it is faster to proceed directly to creating the detailed reports.

D. TEMPLATE REPORTS

Template reports are designed to allow the user to develop custom reports summarizing the cost of service allocations. The template program reads the user-created report format and uses the Excel database extraction features to complete the report template using the model results. The user can either modify an existing template report provided with the model, or create a new template. This section describes the format of the template report and reviews the use of this feature.

1. Template Report Format

The template report allows the analyst to develop a custom report. An extract from a sample template report is shown in Table V-5. The report generation feature works by looking at the values in "key" columns and either extracting all values that match the associated value for those data keys, or by constructing a formula to create row totals. The keys are used to extract all values in the report database matching the key value. Remember, each line of the model output is a row in the report database. A key is one of the first eleven columns of the report spreadsheet (columns A - K). For example if analyst wants a total of all customer related costs, the key to use is "Classification 2" (found in column J) and the appropriate key value is "CUST". Multiple keys can be used in conjunction with each other. For example, all customer costs associated with operations and maintenance expenses can be identified by using the Classification 2 and the Reference ID # keys in conjunction with the key values of "CUST" and "OME.T". A description of how to construct the template using the report keys follows.

The number of lines in the template report are shown in cell A1. This value does not need to be entered by the user since it is computed by the computer and stored in the A1 cell location.

Table V-5. Sample Template Report

	A	B	C	D	E	F
1	45					
2						
3						
4		Puget Sound Power & Light Company				
5		Summary Results of Operations				
6		5/14/92 13:38				
7			Category	Category		Summary
8			Reference		Total	Class
9		Description	ID #	Classification 2	Allocation	Residential
10	1	Operating Revenues	REV.T3		0	0
11		Operating Expenses				
12						
13	2	Operation & Maintenance Expense	OME.T	CUST	40,664,060	32,023,440
14	3	Depreciation & Amortization Expense	DAE.T	CUST	13,118,624	10,663,104
15	4	Taxes Other Than FIT	TOTF.T	CUST	7,640,973	6,185,999
16	5	Total Expenses Before Fed Income Taxes	(2+3+4)	CUST	61,423,657	48,872,543
17						
18	6	Total Income Before Fed Income Taxes	(1-5)	CUST	-61,423,657	-48,872,543

The report title block is shown in cells B4, B5, and B6. The user can enter any text desired in cells B4 and B5. Text in these cells will appear at the top of each page of a printed template report. Cell B6 is used by the model to record the date and time that the report was run.

Column titles appear in rows 7 - 9. Column A contains row numbers to be used in conjunction with row formulas. A column title is optional for this entry. Column B contains the description of the accounts or entry in the report. Report keys start in column C and can continue out with as many keys as the analyst desires to use. A description of the valid report keys are provided in Table V-2. The column headings for identifying report keys must use the following format.

- A column is identified as a key by the entry "Category" in row 7 of the column,
- The entry in row 9 must be exactly the same as the name used in row 60 of the report spreadsheet.
- All keys must be identified in contiguous columns starting with column C.

The columns showing the total allocation, class summary allocations, and the class totals are automatically filled in by the reporting program. The "total allocation" always follows the last column with the label "Category" in row seven.

Row descriptors follow row 9 of the table. The user can use blank rows to help format the table for reporting purposes provided there are no more than nine consecutive blank rows before a valid entry that should be filled in by the template report program. The entry in column A can either be a numeric character, or left blank. Numerics are used to construct formulas for adding / subtracting/ multiplying/ and dividing prior rows. The row entry in column three, for a non-blank row, can either be an extract value for the database key, or a user constructed formula.

Formulas allow the user to construct the row's value based upon prior rows. Formulas are identified by the starting and ending parentheses. The numbers inside the formula correspond to the row numbers. However, in this case the row numbers are not the spreadsheet rows as displayed on the far left hand side of the spreadsheet, but rather the template row numbers identified in column A. The user can embed parenthesis inside parenthesis to ensure that mathematical operations are performed in the correct order. All of the basic mathematical operators including (+, -, %, x) are allowed in addition to just about any other Excel function. For example, the row formula (2*3/5) will multiply the number in row 2 by row 3 and divide the product by the value in row 5. This operation is performed on each column to the right of the database keys.

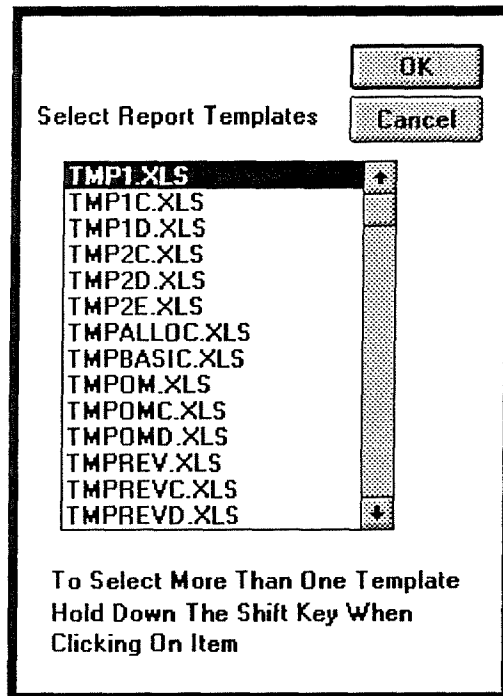
A special version of the formula is the "RESTATE function." The restate function should be put inside parenthesis. This function normalizes prior row totals on a basis of one.

2. Use of Template Procedures

The COS model identifies template reports by Excel file names that have the prefix of "TMP" and the Excel spreadsheet suffix of "XLS". Template names that do not conform with this naming convention will not appear in the associated template menus. When the analyst selects the Template Report option under

the COS_Reports menu bar the menu shown in Figure V-6 appears. The list of templates is extracted from the directory that the cost of service model is running under. (This DOS directory was identified by the user when the model was first loaded.) Consequently, the list that the analyst sees may differ from the listing shown in Figure V-6. A list of template reports provided with the model is shown in Table V-7.

Figure V-6. Template Selection Menu



When the analyst selects one or more templates from the template selection menu the program loads the associated spreadsheet, identifies the database keys to be used, extracts the appropriate values for the summary class totals and individual class totals from the report spreadsheet when data keys are used, and calculates the row totals when a formula is defined on the template.

Table V-7 Template Reports

Template Name	Description
TMP1.XLS	Summary results of operations
TMP2.XLS	Allocation of costs versus revenues
TMPREV.XLS	Allocation of operating revenues
TMPOM.XLS	Allocation of operation and maintenance expenses
TMPTRB.XLS	Allocation of electric plant in service
TMPWAGE.XLS	Allocation of salary and wage expenses

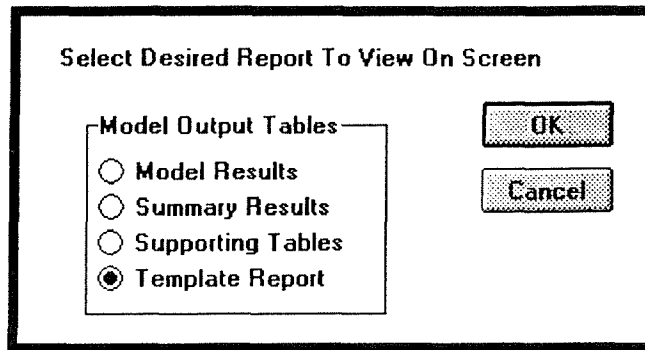
E. REVIEW OUTPUT REPORTS

This option facilitates viewing the output reports on the screen. It is selected from the "Review Output Reports" option in the COS_Reports menu bar. When this option is selected the dialog box shown in Figure V-8 appears. The user can select one of the four viewing options: model results, summary reports, supporting tables, and template reports. The model results option moves the cursor to the full database starting in column A. (Remember the full database is essentially the model results.) The summary reports option moves the analyst to the summary report table and sets scroll bars to keep the column and report keys in view. The supporting tables option results in centering an index table on the screen. The index table shows the starting and ending line of each of the detailed supporting tables. The final option, the template report option displays another menu that requests the user to select the specific template report to view.

F. PRINTED REPORTS

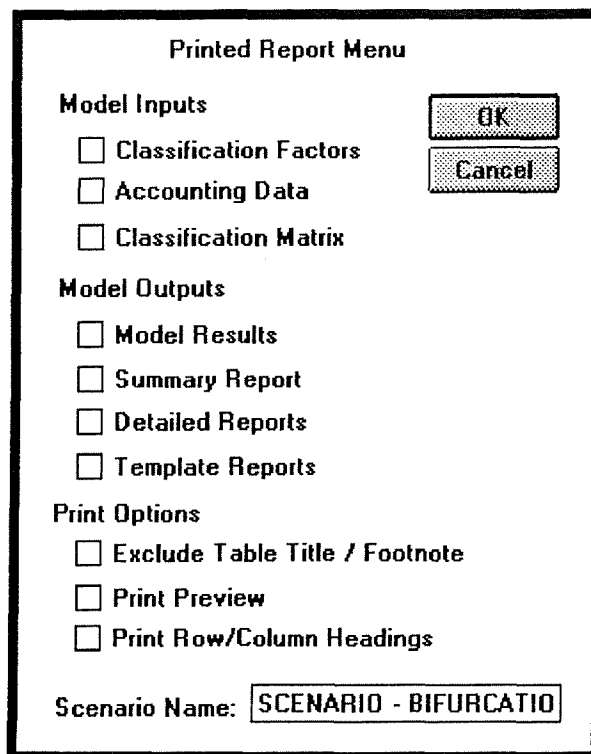
The report printing feature allows the analyst to print any of the model input tables and output reports. The print feature is designed to help the user format the reports while taking advantage of the page formatting features of the Windows/Excel printer interface. It is assumed that the user has already set up their printer in Windows and Excel. In addition, the user must know what printer fonts are available.

Table V-8. Report Viewing Option



A dialog box appears when the "Print Reports" option is requested from the COS_Reports menu bar. An example of the dialog box is shown in Table V-9. The dialog box is organized into three sections: printing model inputs, printing model outputs, and selecting print options. The analyst can select more than one option by clicking on multiple entries.

Figure V-9 Print Report Options



The print options feature helps control the format of the report. The first option allows the analyst to exclude the table title and footnotes. The title line consists of the predefined report name and the user-defined scenario name. The footnote contains the page number and the date printed. The print preview option allows the user to view the report on screen prior to printing. Print preview is an Excel dialog box/window feature that not only allows the user to view the report prior to printing, but also allows the user to make additional page formatting commands. The print row/column headings feature prints the reports with spreadsheet row and column numbers. The final option is the definition of the scenario name. This name appears in the upper right of the report. The scenario name is retained from the prior time the field was completed.

Selection of any of the print options for the model inputs results in the display of additional dialog boxes requesting further definition of the request. The print allocation factors options displays a dialog box allowing the analyst to either print one or multiple allocation factor table selected by the user, or print all the tables. The print option for the accounting data has a similar feature. The user can elect to either select a single or multiple tables to print, or print all the tables. The print allocation matrix table option displays a dialog box requesting which of the three scenarios should be printed.

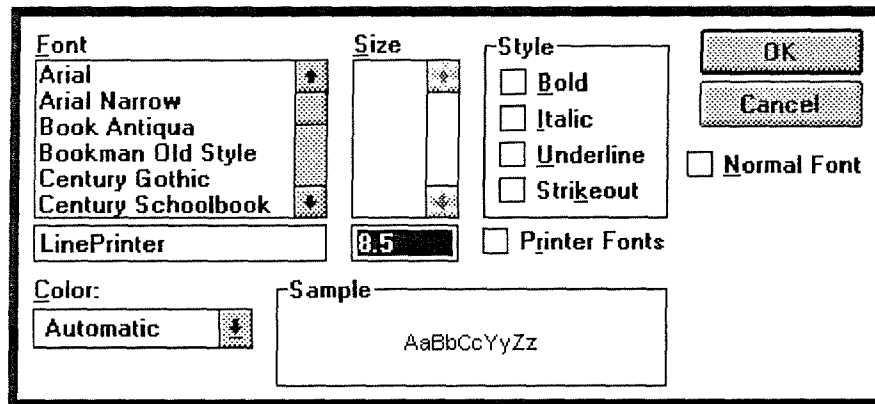
The first two print output options result in the respective reports being printed. The third option, print detailed reports, displays a dialog box where the user selects either one detailed table to print, or the option to print all the tables. The detailed tables are selected by the summary keys used to create the tables. Each key is separated by a comma.

G. SETTING PRINTER FONTS

In order to print reports on laser printers with Excel it is important that the cells be formatted with an available printer font. In many cases the screen fonts that are used will not print on the laser printer. The model report printing feature will automatically format the spreadsheet cells, the report titles, and the footnotes once the user has defined the fonts to be used. The "Define Printer Fonts" option is used to define fonts. A description of the required user inputs follows.

The first step is to define the fonts for the data in the tables. A message is displayed with the following text. *"Please Define Printing Fonts For The Tables."* Once the user selects the "OK" button the dialog box shown in Figure V-10 appears. In order to ensure that a printer font is selected, the "Printer Fonts" box should be checked. Once the printer font box is checked, the "Fonts" box will display all the fonts available for the printer. The user can then select the appropriate font and font characteristics. This sequence must be repeated for selecting fonts for the titles and footnotes. The user is automatically prompted for the second set of font characteristics.

Figure V-10. Font Selection Box



Once the user has selected the table and title/footnote fonts the selected fonts are shown on the font definition table on the COS2.XLS spreadsheet. An example of the table is shown in Figure V-11. This table is located at cell K1. The font selections are saved with the spreadsheet so it is not necessary to redefine the fonts each time a table is printed or each time the Excel model is loaded.

Table V-11 Font Definition Table

Print Area	Size	Name / Sample
Table Text Font	8	Arial
Header / Footer Font	12	Arial

¹Once the model results have been transferred to the report spreadsheet COS2RPT.XLS, the main worksheet COS2.XLS can be closed. This may be necessary if the user is experiencing computer memory limitation problems.

VI. UTILITIES

The utilities designed to assist the user with using the COS model are grouped under the heading "COS_Utilities" on the menu bar. Currently there are the four utilities listed in Table VI-1.

Table VI-1. COS Utilities

Remove Scroll Lock
Unprotect Model
Run Model / Reports
Version
Exit Model

A. CLEARING SCROLL AREAS

Many of the tables in the model contain many screens of data. In order to assist in viewing the data the model uses the Excel feature of freezing window panes to keep column headings and key variables in view at all time. This option removes the window panes in the active spreadsheet.

B. REMOVE MODEL PROTECTION

The model protects cells to guide the user in data entry and to prevent the user from over-writing critical cells that are necessary for proper operation of the model. The spreadsheet is protected with the password "cos". This option turns the spreadsheet protection off. Note, running most of the macros results in turning the cell protection back on.

C. RUN MODEL AND REPORTS

This option combines the options of running the COS model (the cost allocations), initializing the output reports, and completing all of the template reports. The option is essentially a batch operation procedure.

D. EXIT MODEL

This option closes the Excel files associated with the cost of service model. It is an alternative to the standard Excel file closure procedures.

APPENDIX A. GLOSSARY

Cost Account	A grouping of utility costs. The FERC uniform system of accounts is frequently used as the basis of accounts for cost of service models.
Classification Factor	A criterion for defining the relative weight of each customer class in spread of costs.
Classification Matrix:	A matrix that links allocation rules with allocation factors. The allocation rules form the rows of the table and the factors form the table columns.
Cost Of Service	A process for allocating embedded utility costs to the different rate classes.
Customer Class:	A grouping of customers that typically have similar energy consumption and peak demand characteristics.
Embedded Cost:	Historical known and measurable costs of the utility.
Endogenous Classification Factors:	Allocations that are based upon the relative weight or prior allocations made by the model.
Exogenous Classification Factors:	Allocation factors that are determined external to the model and entered directly as model inputs. Examples include energy consumption, peak coincident demand, class peak demand, number of customers, and peak demand.
Template Report:	A worksheet that uses a flexible format for developing customized reports from the model output.

B. TECHNICAL ORGANIZATION OF COS MODEL

The COS model consists of a number of tables organized on a single spreadsheet. Some of these tables are "templates" that are repeated, based upon the user inputs. An index of the major tables is shown in Table B-1. The table columns "Upper Left" and "Lower Right" show list the corners of the table described in the third column. An underscore in the place of the cell's row designation indicates that the row number is not rigid and is determined by the user.

Table B-1. Index of Spreadsheet Tables

Upper Left	Lower Right	Description
A9	F50	List of Classification Tables
A57	F110	Customer Class Definition Table
A117	F171	Classification Table # 1(Energy) Subsequent Tables: $(\text{Factor_Number} - 1) * 60 + 117$
K2	N4	User Selected Font Table
I10	O50	List of Accounting Tables
H59	O__	First Accounting Table
H__	O__	Subsequent Accounting Tables
Q60	BG110	Exogenous Classification Matrix #1
Q116	BG215	Endogenous Classification Matrix #1
Q223	Q273	Exogenous Classification Matrix #2
Q279	BG378	Endogenous Classification Matrix #2
Q386	BG436	Exogenous Classification Matrix #3
Q442	BG541	Endogenous Classification Matrix #3
BJ58	DP__	Model Results / Calculations

This section reviews the structure of the three main groups of inputs: allocation factor tables, accounting data tables, and classification matrices. The structure is important since moving tables from their designated row and column formats will cause errors in the model macros.

The fourth major element of the spreadsheet is the model results, starting in column BM. Cells to the right and below BM58 are used by the model output and are initialized each time the cost of service model is run.