Over/Under (AREEP Version) Model User's Manual

Volume XI

November 1982

Prepared for the Office of the Governor
State of Alaska
Division of Policy Development and Planning
and the Governor's Policy Review Committee
under Contract 2311204417

Battelle
Pacific Northwest Laboratories

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RAILBELT ELECTRIC POWER ALTERNATIVES STUDY; OVER/UNDER (AREEP VERSION) MODEL USERS MANUAL

Volume XI

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SUMMARY

The Alaska Railbelt Electric Power Alternatives Study is an electric power planning study for the State of Alaska, Office of the Governor and the Governor's Policy Review Committee. Begun in October 1980, and extending into April 1982, the study's objectives are to forecast the demand for electric power through the year 2010 for the Railbelt region of Alaska and to estimate the monetary, socioeconomic, and environmental costs of all options (including conservation) that could be used to supply this power.

This document, Volume XI, is one in a series of 17 reports listed below. It describes changes which were made in this project to the EPRI Over/Under Capacity Planning model to produce the Alaska Railbelt Electric Energy Planning (AREEP) model. Model operations on the Alaska Department of Administration Anchorage Data Center main frame computer are described. Also included in the document is a revised listing of the model code. Users of this document are expected to have the original documentation on the Over/Under Model available.

RAILBELT ELECTRIC POWER ALTERNATIVES STUDY

Volume I - Railbelt Electric Power Alternatives Study: Evaluation of Railbelt Electric Energy Plans

Volume II - Selection of Electric Energy Generation Alternatives for Consideration in Railbelt Electric Energy Plans

Volume III - Executive Summary - Candidate Electric Energy Technologies for Future Application in the Railbelt Region of Alaska

Volume IV - Candidate Electric Energy Technologies for Future Application in the Railbelt Region of Alaska

Volume V - Preliminary Railbelt Electric Energy Plans

Volume VI - Existing Generating Facilities and Planned Additions for the Railbelt Region of Alaska

Volume VII - Fossil Fuel Availability and Price Forecasts for the Railbelt Region of Alaska

Volume VIII - Railbelt Electricity Demand (RED) Model Specifications

Volume VIII - Appendix - Red Model User's Manual

Volume IX - Alaska Economic Projections for Estimating Electricity Requirements for the Railbelt

Volume X - Community Meeting Public Input for the Railbelt Electric Power Alternatives Study

Volume XI - Over/Under (AREEP Version) Model User's Manual

Volume XII - Coal-Fired Steam-Electric Power Plant Alternatives for the Railbelt Region of Alaska

Volume XIII - Natural Gas-Fired Combined-Cycle Power Plant Alternative for the Railbelt Region of Alaska

Volume XIV - Chakachamna Hydroelectric Alternative for the Railbelt Region of Alaska

Volume XV - Browne Hydroelectric Alternative for the Railbelt Region of Alaska

Volume XVI - Wind Energy Alternative for the Railbelt Region of Alaska

Volume XVII - Coal-Gasification Combined-Cycle Power Plant Alternative for the Railbelt Region of Alaska

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

The purpose of this report is to describe the Over/Under (AREEP Version) Model. This model was used in the Railbelt Electric Power Alternatives Study to balance the demand and supply of electricity over the 1980-2010 time horizon.

The Over/Under (AREEP Version) Model (AREEP-Alaska Railbelt Electric Energy Planning was developed by modifying an existing model, the Over/Under Capacity Planning Model, which was originally developed for the Electrical Power Research Institute (EPRI) by Decision Focus, Incorporated (EPRI 1978).

This document deals only with the modifications made to the model as part of the Railbelt Electric Power Alternatives Study. In addition to this report, the reader is expected to have the following EPRI documents describing the Over/Under Capacity Planning Model:

- Cazalet, E. G., C. E. Clark and T. W. Keelin. 1978. Costs and Benefits of Over/Under Capacity in Electric Power System Planning. Prepared by Decision Focus, Incorporate, for the Electric Power Research Institute, Palo Alto, California.
- Clark, C. E., T. W. Keelin and R. D. Shur. 1979. Users Guide to the Over/Under Capacity Planning Model. Prepared by Decision Focus, Incorporated, for the Electric Power Research Institute, Palo Alto, California.

The principal modifications made to the model as part of this study include the following:

- The demand uncertainty portion of the model was restructured to allow the user to input three forecasts of annual peak demand (MW) and annual energy (GWh). The probability tree method used in the original model was eliminated.
- Provisions were made to allow the fuel costs and heat rate for each technology to be input directly. In the original model the fuel

costs were assumed to be included with the variable cost data. Annual fuel costs are entered directly for the first 15 years of the time horizon. An annual fuel escalation rate is entered to represent escalation during the last 15 years of the time horizon.

- The model was modified to explicitly include up to 7 hydroelectric projects. Previously, only a single hydroelectric technology could be evaluated.
- Three additional output reports were developed and can be selected if desired. These outputs provide data on the Anchorage-Cook Inlet and Fairbanks-Tanana Valley load centers.
- Data input and output files were designed to allow the model to be more easily used with the RED electrical demand model (RED - Railbelt Electrical Demand). The peak demand and annual energy requirements are output from the RED model in a format that can be read by the AREEP model. The AREEP model outputs the annual prices of electricity in a format that can be read by the RED model.
- The data input necessary to describe the financial status of the system was reduced.

The primary function of the AREEP model is to compute the price of electricity. In general, the computational procedure used by AREEP to determine the price of electricity for a particular case is presented in Figure 1.1. The first step is to adjust the consumption forecast for transmission line losses and unaccounted energy. This adjustment determines the amount of energy that must be generated. Because the AREEP model considers the Railbelt an intertied electrical system, the peak demands and annual energy from each of the three load centers are added together and a single annual load duration curve is developed for the combined Railbelt area.

The next step in the computational procedure is to develop a schedule for new additions to generating capacity. Generating capacity additions are based upon the need to meet the forecast annual peak demand, with an allowance for line losses over the time horizon of the analysis, as well as a reserve margin

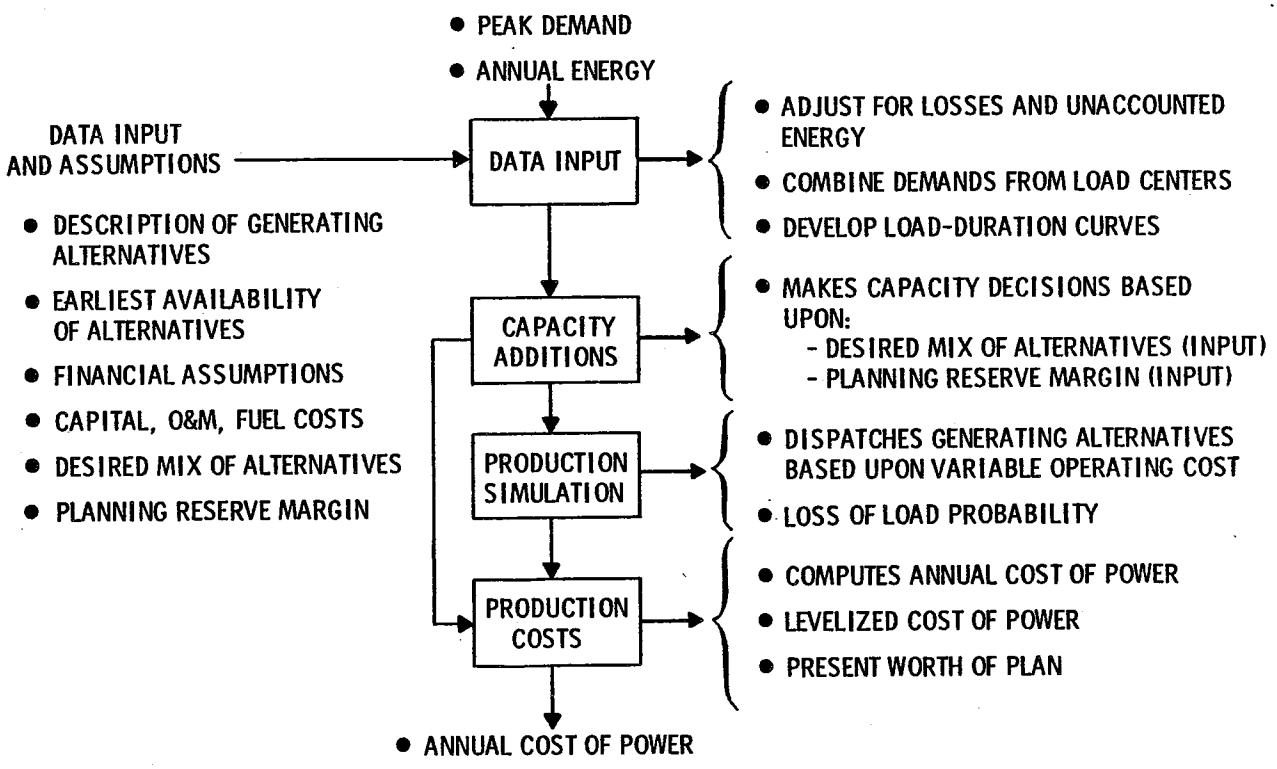

FIGURE 1.1. AREEP Diagram

that allows for extra capacity in the event of unscheduled downtime of generating plants. The model accounts for retirement of existing plants.

Once the schedule of new plant additions is established, the capital cost and fixed cost portion of the electricity production cost can be computed. As indicated in Figure 1.1, this information is computed and used to forecast the production cost of electricity.

The next step in the computational procedure is choosing the available generating alternatives that will be used to generate electricity during any particular year. The model decides this based upon the relative variable operating costs for the alternatives. The alternative with the lowest operating costs is selected to be used (dispatched) to generate electricity first, followed by the alternatives with the next lowest variable cost. The generating alternatives are dispatched in this order until the annual energy demand is satisfied.

Finally, the information on the amount of electricity produced by each generating technology is then used to compute the annual variable costs of producing electricity for the Railbelt. As shown, the total annual costs of power to the consumer is produced by adding the total annual fixed costs that are computed earlier to the total annual variable costs.

The demand for electricity is partially determined by the price of electricity. Since the price of electricity is determined by the types and performance of the facilities used to generate electricity, electricity demand forecasts may require some interaction between the demand and supply forecasting models.

The interaction between the supply model (AREEP) and the demand model (RED) is represented in Figure 1.2. Initially, a price of electricity is assumed as input to the electrical demand model (RED Model). Using this price, as well as other input data and assumptions, the RED model produces forecasts of peak demand and annual energy for the Railbelt. The AREEP model uses these forecasts of peak demand and annual energy as input data and produces a schedule of plant additions to the electrical generation system, as well as a new price of electricity to the consumer. RED is then rerun with the new price assumptions. If the two demand forecasts are relatively close, then supply and demand are said to be in equilibrium and the process is halted. On the other hand, if the two demand forecasts are not relatively close, the RED and AREEP models then are rerun, producing a new price and demand forecast.

This process is continued until the demand forecasts of two successive iterations of RED are relatively close. In actual practice, the model user quickly develops an understanding of how the two models relate, and equilibrium is reached within two or three model runs.

The remainder of this report is divided into five chapters. Chapter 2 presents an overview of the model. Chapter 3 presents the data input format for the model. Chapter 4 describes the additional output files available from the AREEP model. Chapter 5 gives information of the new subroutines that were added as part of the modification process, as well as the subroutines that are no longer used. Chapter 6 presents information on the operation of the model on the computer system.

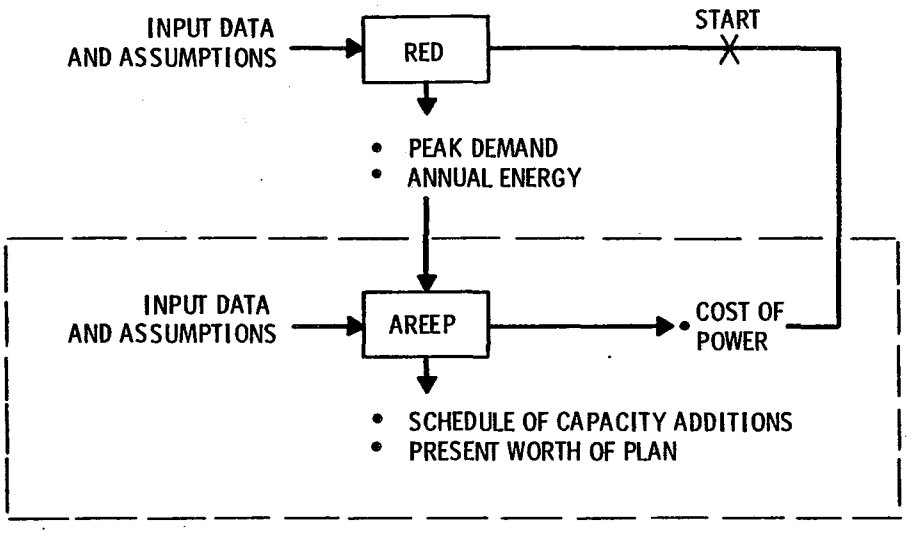

FIGURE 1.2. Electrical Demand and Supply Interactions

2.0 DESCRIPTION OF THE MODEL

The purpose of this chapter is to present an overview of the modifications that were made to the Over/Under Capacity Planning Model as part of the Railbelt Electric Power Alternatives Study. The modified model is referred to as the Over/Under (AREEP Version) model or AREEP.

As described in the Users Guide (EPRI 1979), the Over/Under Capacity Planning Model included 6 submodels:

- demand-uncertainty model
- capacity-decision model
- production-simulation model
- fixed-charge model
- terminal-value model
- consumer-preference model

As part of the model modification process for this study, the demand-uncertainty model was extensively modified. The capacity-decision and production-simulation models were modified slightly for this study. The fixed-charge, terminal-value, and consumer-preference models were not changed. The terminal-value model is not employed as part of the modeling methodology used in the Railbelt study. Each of these models is briefly discussed in this section.

DEMAND-UNCERTAINTY

In the original model the demand-uncertainty model created a demand-probability tree. As indicated above, this submodel was extensively modified as part of the Railbelt study. As part of the modeling methodology used in this study, electrical demands are forecasted over the time horizon of the study using a series of economic activity models and an electrical end-use model. The end-use model developed as part of this study is called RED - the Railbelt Electrical Demand model (see Volume VIII).

The RED model can provide three demand forecasts (low, medium, and high) to the AREEP model when operating in the uncertainty mode. It is assumed that there is a 75% probability that the true forecast is higher than the low

forecast; a 50% probability that the true forecast is higher than the medium forecast; and a 25% probability that the true forecast is higher than the high forecast. When the RED model is not operating in the uncertainty mode, all three forecasts are the same.[a]

CAPACITY-DECISION

Few changes were made to the capacity decision model. The method used to select what type of capacity to add at any point in time involves three stages: initial planning and studies, licensing, and construction and startup remains the same. The primary change was the inclusion of six additional hydroelectric technology "slots" that allow up to seven hydroelectric projects to be evaluated in a single model run.

PRODUCTION-SIMULATION

As with the capacity-decision model, few changes were made to the production-simulation model. One change was made to allow fuel price data to be input directly rather than to be included as a part of the variable cost. Another modification provides for the computation of a load duration curve for each year of the planning horizon.

FIXED-CHARGE

No changes were made to the fixed-charge model. The data input requirements for this model were reduced. For example, only a single cost of capital is required.

TERMINAL-VALUE

The terminal-value model was not used as part of this study. No modifications were made to this model.

CONSUMER-PREFERENCE

No changes were made to the consumer-preference model.

(a) Large industrial load is data input to RED. Unless the low, medium, and high case industrial demand is set equal to the same number, the three forecasts will differ.

3.0 DATA INPUT

As with the original Over/Under model, the AREEP version is a batch program. It uses two data files for input. The primary data file is prepared by manipulating an existing input file with a text editor utility. Several nondata labels are included in the file to help format data entries and to enhance readability. The secondary data file, containing forecasts of peak demand and annual energy for the Railbelt, is available from the RED model program.

PRIMARY INPUT DATA FILE

An example primary data file is illustrated in Figure 3.1. This is the primary data file for Case 1A (Base Case Without Upper Susitna), as presented in Volume I of the study series. The data entries in this file are located in the correct fields to be read by the program. In editing such a file, care must be taken to place values in these same fields. Appendix A of this report presents a quick guide to the data-entry fields. General rules for data entry include the following:

1. Values must be inserted in the correct column ranges (fields). Numbers that include a decimal point need not be right-justified. Numbers with no decimal point must be right-justified.
2. Any value, unless otherwise noted, can be a decimal.
3. In "decimal percent" values, 1.00 equals 100%.
4. Years are four-digit integers, as in "1980".
5. Data input lines are serially ordered, but their line numbers are arbitrary. Any five integers can be used for the line numbers, as long as the order of the lines remains the same.

Figure 3.1 and the following text explain the changes made to the data input format in the AREEP version of the Over/Under Capacity Planning Model.

```
00100 TITLE: RAILBELT PLAN 1A: BASE CASE W/O UPPER SUSITNA - 1-7-82CHA
00110 *
00120 *   FYR     THOR  CONSTANT-$-SYS    CONS.DISC     CD  FC    PS-YEARLY-MWINC
00130 *  1980       0            T   T         0.03      T   T     T       T    5.
00140 *
00150 PRM:      LOW---HIGH---INC       RMBAS    RMINC      BEGIN-----WINDOW-----END
00160 *         .30    .30   .10         0.0      0.0        .20    1980,2045  .20
00170 *
00180 REPORTS:    CADD     PRICES     FINOUT       PCOS    TPCOS       PDET    TPDET
00190 *             T          T          T          T        T          T        T
00200 *
00210 REPORTS:    CPRT       CSUM       INTR
00220 *             T          T          T
00230 *
00240 ************************** DEMAND UNCERTAINTY ***************************
00250 *
00260 *              - - DEMAND AND ENERGY FOR EACH PERIOD OF EACH PATH AND
00270 *                    THE CONSERVATION DATA ARE ON THE SECONDARY FILE
00280 *
00290 2NDARY FILE:***.***
00300 *
00310 ************************ CAPACITY-DECISION (CD) *************************
00320 *
00330 TECHNOLOGY: AOGCT ANGCT AOGCC ANGCC  ACST  FCST F&GCD  FGCC -----
00340 CAPFYR(MW)    379    82     0   139     0    69   266     0     0
00350 ADD+1(MW)       0     0     0     0     0     0     0     0     0
00360 ADD+2(MW)    -110   +90  +178     0     0     0     0     0     0
00370 ADD+3(MW)       0     0     0     0     0     0    -8     0     0
00380 ADD+4(MW)       0     0     0     0     0     0     0     0     0
00390 ADD+5(MW)       0     0     0     0     0     0     0     0     0
00400 ADD+6(MW)       0     0     0     0     0     0    -1     0     0
00410 ADD+7(MW)       0     0     0     0     0    -4    -8     0     0
00420 ADD+8(MW)       0     0     0     0     0     0    -6     0     0
00430 ADD+9(MW)       0     0     0     0     0    -5     0     0     0
00440 ADD+10(MW)      0     0     0     0     0     0     0     0     0
00450 ADD+11(MW)      0     0     0     0     0     0   -18     0     0
00460 ADD+12(MW)      0   -16     0     0     0     0   -19     0     0
00470 ADD+13(MW)     -9     0     0     0     0     0     0     0     0
00480 ADD+14(MW)    -14   -16     0     0     0     0     0     0     0
00490 ADD+15(MW)    -14     0     0     0     0     0   -33     0     0
00500 ADD+16(MW)      0     0     0     0     0     0  -102     0     0
00510 ADD+17(MW)      0     0     0     0     0     0   -65     0     0
00520 ADD+18(MW)    -32   -18     0     0     0     0     0     0     0
00530 ADD+19(MW)      0     0     0     0     0     0     0     0     0
00540 ADD+20(MW)    -18     0     0     0     0     0     0     0     0
00550 ADD+21(MW)      0     0     0     0     0     0     0     0     0
00560 ADD+22(MW)    -19   -32     0     0     0   -25     0     0     0
00570 ADD+23(MW)    -53     0     0     0     0     0     0     0     0
00580 ADD+24(MW)      0     0     0     0     0     0     0     0     0
00590 ADD+25(MW)    -58     0     0     0     0   -21     0     0     0
00600 ADD+26(MW)      0     0     0     0     0     0     0     0     0
00610 ADD+27(MW)      0     0     0     0     0     0     0     0     0
00620 ADD+28(MW)    -26     0     0     0     0     0     0     0     0
00630 ADD+29(MW)      0     0     0     0     0     0     0     0     0
00640 ADD+30(MW)      0     0     0     0     0     0     0     0     0
00650 *
00660 CAPLIM(MW)    379  1000   178  1000  1000   800   266   300     0
00670 MIX-LONG RN     0     0     0   .10   .35   .33     0   .02     0
00680 RES MARGIN      T     T     T     T     T     T     T     T     T
00690 SIZE(MW)       25    70    50   200   200   200    70   100     0
00700 1ST YR AVL   1983  1983  1983  1983  1988  1988  1980  1988  1980
00710 ADD JUS(MW) 99999    50 99999    50    50    50    50    50    50
00720 STUDIES(YR)     1     1     1     1     1     1     1     1     1
00730 LICENSE(YR)     1     1     1     1     1     1     1     1     1
00740 CONSTR.(YR)     1     1     2     3     4     4     4     2     1
00750 STARTUP(YR)     0     0     0     0     0     0     0     0     0
```

FIGURE 3.1. Example Primary Input Data File

```
00760 *                                    HYDRO TECHNOLOGIES
00770 HYDRO TECH: AEHYD ----- ----- ACHAK AALLI ----- TRANS
00780 CAPFYR(MW)     46     0     0     0     0     0     0
00790 ADD+1(MW)      12     0     0     0     0     0     0
00800 ADD+2(MW)       0     0     0     0     0     0     0
00810 ADD+3(MW)       0     0     0     0     0     0     0
00820 ADD+4(MW)       0     0     0     0     0     0    71
00830 ADD+5(MW)       0     0     0     0     0     0     0
00840 ADD+6(MW)       0     0     0     0     0     0     0
00850 ADD+7(MW)       0     0     0     0     0     0     0
00860 ADD+8(MW)      90     0     0     0     0     0     0
00870 ADD+9(MW)       0     0     0     0     0     0     0
00880 ADD+10(MW)      0     0     0     0     0     0     0
00890 ADD+11(MW)      0     0     0     0     0     0     0
00900 ADD+12(MW)      0     0     0     0     7     0   204
00910 ADD+13(MW)      0     0     0     0     0     0     0
00920 ADD+14(MW)      0     0     0     0     0     0     0
00930 ADD+15(MW)      7     0     0     0     0     0     0
00940 ADD+16(MW)      0     0     0     0     0     0   108
00950 ADD+17(MW)      0     0     0     0     0     0     0
00960 ADD+18(MW)      0     0     0     0     0     0     0
00970 ADD+19(MW)      0     0     0     0     0     0     0
00980 ADD+20(MW)      0     0     0     0     0     0     0
00990 ADD+21(MW)      0     0     0     0     0     0     0
01000 ADD+22(MW)      0     0     0   330     0     0     0
01010 ADD+23(MW)      0     0     0     0     0     0     0
01020 ADD+24(MW)      0     0     0     0     0     0     0
01030 ADD+25(MW)      0     0     0     0     0     0     0
01040 ADD+26(MW)      0     0     0     0     0     0     0
01050 ADD+27(MW)      0     0     0     0     0     0     0
01060 ADD+28(MW)      0     0     0     0     0     0     0
01070 ADD+29(MW)      0     0     0     0     0     0     0
01080 ADD+30(MW)      0     0     0     0     0     0     0
01090 *
01100 CAPLIM(MW)    155     0     0   330     7     0  2000
01110 MIX-LONG RN     0     0     0   .20     0     0     0
01120 RES MARGIN      T     T     T     T     T     T     F
01130 SIZE(MW)        7    90     7   330     0     0     0
01140 1ST YR AVL   1996  2003  2003  2003  2010  2010  2010
01150 ADD JUS(MW)    50 99999 99999    50    50 99999     5
01160 STUDIES(YR)     4     4     4     4     4     4     0
01170 LICENSE(YR)     2     2     2     2     2     2     0
01180 CONSTR.(YR)     2     3     3     3     3     1     1
01190 STARTUP(YR)     0     0     0     0     0     0     0
01200 *
```

FIGURE 3.1. (contd)

```
01210 ********************** PRODUCTION SIMULATION (PS) ***********************
01220 *
01230 TECHNOLOGY: AOGCT ANGCT AOGCC ANGCC  ACST  FCST F&GCD  FGCC -----
01240 *
01250 MAINT-PEAK   .300  .300  .300  .300  .300  .300  .300  .300  .300
01260 1-F.O.R.     .92   .92   .92   .92   .943  .943  .92   .92   .92
01270 EQ AVAIL     .89   .89   .85   .85   .863  .863  .85   .85   .85
01280 *
01290 VC(M/KWH)    4.4   4.4   1.6   1.6   0.6   0.6   4.4   1.6    0
01300 VCESC/YR     .02   .02   .02   .02   .02   .02   .02   .02   .02
01310 ENV(M/KWH)    0     0     0     0     0     0     0     0     0
01320 HR(BTU/KWH) 12200 12200  8000  8000 10000 10000 12200  8000    0
01330 FTU           1     2     1     2     4     5     6     3    10
01340 *                          HYDRO TECHNOLOGIES
01350 HYDRO TECH: AHHYD ----- ----- ACHAK AALLI ----- TRANS
01360 *
01370 MAINT-PEAK   .300  .300  .300  .300  .300  .300  .300
01380 1-F.O.R.     .95   .95   .95   .95   .95   .95   .95
01390 EQ AVAIL     .94   .94   .94   .94   .94   .94   .94
01400 *
01410 VC(M/KWH)     0     0     0     0     0     0     0
01420 VCESC/YR      0     0     0     0     0     0     0
01430 ENV(M/KWH)    0     0     0     0     0     0     0
01440 *
01450 UTIL FACTOR  .50   .44   .50   .50   .50   .50    0
01460 *                    -  FUEL COST CONSIDERATIONS  -
01470 FUEL TYPE:      1     2     3     4     5     6     7     8     9    10
01480 FUEL COST ($/MMBTU)
01490 FYR          0.44  1.11  5.51  1.31  1.60  6.25  1.13  1.00  2.00   ***
01500 FYR+1        0.46  1.09  5.51  1.34  1.63  6.38  1.15  1.00  2.00   ***
01510 FYR+2        0.45  1.10  5.51  1.37  1.66  6.50  1.17  1.00  2.00   ***
01520 FYR+3        0.46  1.09  5.51  1.40  1.69  6.63  1.19  1.00  2.00   ***
01530 FYR+4        0.47  1.10  5.51  1.43  1.72  6.67  1.21  1.00  2.00   ***
01540 FYR+5        0.54  1.10  5.51  1.46  1.75  6.90  1.23  1.00  2.00   ***
01550 FYR+6        0.61  1.37  5.51  1.49  1.78  7.04  1.24  1.00  2.00   ***
01560 FYR+7        0.68  1.58  5.51  1.52  1.81  7.18  1.26  1.00  2.00   ***
01570 FYR+8        0.76  1.68  5.51  1.55  1.84  7.32  1.29  1.00  2.00   ***
01580 FYR+9        0.89  1.87  5.51  1.58  1.87  7.47  1.31  1.00  2.00   ***
01590 FYR+10       1.46  2.11  5.51  1.62  1.91  7.62  1.33  1.00  2.00   ***
01600 FYR+11       1.58  3.59  5.51  1.65  1.94  7.77  1.35  1.00  2.00   ***
01610 FYR+12       1.79  3.68  5.51  1.68  1.98  7.93  1.37  1.00  2.00   ***
01620 FYR+13       1.93  3.76  5.51  1.72  2.01  8.09  1.39  1.00  2.00   ***
01630 FYR+14       2.07  3.85  5.51  1.76  2.05  8.25  1.41  1.00  2.00   ***
01640 FYR+15       4.24  3.94  5.51  1.79  2.08  8.41  1.44  1.00  2.00   ***
01800 *
01810 FC ESC/YR    .02   .02   .00   .021  .018   .02 .0160 .0000 .0000   ***
01820 *
01830 VARIABLE G-A (M/KWH):  8.13
01840 *
01850 L.D.C.-   .10  .20  .30  .40  .50  .60  .70  .80  .90 1.00
01860 * PEAK   .765 .670 .590 .540 .500 .465 .425 .385 .335 .260
01870 *  VMLDC .040 .100 .120 .120 .120 .120 .120 .110 .090 .060
01880 * PEAK WIDTH: .025
01890 *
01900 EMERGENCY ACTIONS AND UNSERVED ENERGY
01910 *
01920 TYPE:           INRUPT INTIE1 INTIE2 VLT RD VOL C1 VOL PB VOL C2 UE
01930 CAPACITY(MW)         0      0      0      0      0      0      0    ***
01940 AVAILABILITY       .90    .90    .90    .90    .90    .90    .90    ***
01950 CAP PROP TO DEM\     T      T      T      T      T      T      T    ***
01960 OUT(T)/VAR(T) COST\  T      T      T      T      T      T      T      T
01970 COST(M/KWH)         70     48     48    100    300    400    500   1000
01980 COST.ESC/YR       .0000  .0000  .0000  .0000  .0000  .0000  .0000  .0000
01990 *
```

FIGURE 3.1. (contd)

```
02000 ************************* FIXED CHARGE (FC) ****************************
02010 *
02020 TECHNOLOGY: AOGCT ANGCT AOGCC ANGCC  ACST  FCST F&GCD  FGCC -----
02030 *
02040 CC($/KW)      607   607   923   923  1892  1943   607   923     0
02050 CCESC/YR     .014  .014  .014  .014  .014  .014  .014  .014  .014
02060 OM($/KW-YR)   2.5   2.5   6.6   6.6  15.3  15.3   2.5   6.6    13
02070 * DELAYS:
02080 STUDIES       0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
02090 LICENSE       0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0   0.0
02100 *
02110 *    DISTR
02120 TL      24     20    20    20    20    20    20    20    20    20
02130 BL      35     30    30    30    30    30    30    20    30    30
02140 * FIXED-CHARGE RATES:
02150      .0490  .0535 .0535 .0535 .0535 .0535 .0535 .0697 .0535 .0535
02160 *                          HYDRO TECHNOLOGIES
02170 HYDRO TECH: AEHYD ----- ----- ACHAK AALLI ----- TRANS
02180 *
02190 CC($/KW)     2610     0     0  4053  7710     0  1000
02200 CCESC/YR     .014  .014  .014  .014  .014  .014  .014
02210 OM($/KW-YR)    22    22    22   6.5    22     0     0
02220 * DELAYS:
02230 STUDIES       0.0   0.0   0.0   0.0   0.0   0.0   0.0
02240 LICENSE       0.0   0.0   0.0   0.0   0.0   0.0   0.0
02250 *
02260 TL             25    25    25    25    25    25    25
02270 BL             50    50    50    50    50    50    35
02280 * FIXED-CHARGE RATES:
02290             .0399 .0399 .0399 .0399 .0399 .0399 .0490
02300 *
02310 DISTRIBUTION CC($/GWH):  4000   DESC/YR: .0140    LOSS AND UNACC: .080
02320 *
02330 GENERAL:   FYR-ASSETS     INFLATION      ITC   ITC-NOR      CWIP      AFUDC
02340 *             .624E09          .000      0.0         T       0.0       .076
02350 *
02360 * YEAR              FYR      +3      +6      +9     +12     +15     +18
02370 * EXIST. DEBT   .495E09 .415E09 .364E09 .319E09 .279E09 .245E09 .214E09
02380 * EX. DEBT INT. .239E08 .187E08 .164E08 .144E08 .126E08 .110E08 .960E07
02390 * EX. RATE BASE .454E09 .381E09 .334E09 .292E09 .256E09 .224E09 .197E09
02400 *
02410 *          RATE-BASE GROWTH FYR-1: .000          REGULATORY LAG(YRS): 0
02420 *
02430 *HIST.CAP.COST: .030     MAR.TAX RATE:  0.0     CASH PCT.INT.PMTS: 1.00
02440 *
02450 *FUTURE CAPITAL COST: .030
```

FIGURE 3.1. (contd)

Line Number		AREEP (Over/Under Version) Modifications
Old	New	
100	100	TITLE - No change (NC)
120-130	120-130	FYR - NC
		THOR - NC
		CONSTANT-$-SYS - NC
		CONS. DISC - NC
		CD - NC
		FC - NC
		PS - NC
		YEARLY - NC
		MWINC - This must now be a decimal value greater than zero.
150-160	150-160	PRM - NC
		LOW-HIGH-INC - NC
		RMBAS - NC
		RMINC - NC
		BEGIN - NC
		WINDOW - NC
		END - NC
180-190	180-220	REPORTS - The AREEP version has three additional output reports: CPRT, CSUM, and INTR. The table below shows which models are required to make the various reports meaningful.

Line Number Old	Line Number New	AREEP (Over/Under Version) Modifications

Output Report — Models that must be run for output to be meaningful

Output Report	CD	PS	FC
CPRT	X	X	
CSUM	X	X	X
INTR	X	X	

CPRT - the capacity and energy generation report. One table is printed for each planning reserve margin and each demand path.

CSUM - the cost summary report. One table is printed for each planning reserve margin and each demand path.

INTR - the Anchorage-Fairbanks intertie report. One table is printed for each planning reserve margin and each demand path.

CADD - NC

PRICES - NC

FINOUT - NC

PCOS - NC

TPCOS - NC

PDET - NC

TPDET - NC

DEMAND UNCERTAINTY

230-400 | None

TREE - Not used (NU) as input parameters in the AREEP version

PERIODS - NU

YRS/PERIOD - NU

Line Number Old	Line Number New	AREEP (Over/Under Version) Modifications
		BRANCHES - NU
		T.PROB - NU
		FULL? - NU
		PATHS - NU
		PERFECT? - NU
		PATHS: - NU
		FYR DEMAND (MW) - NU
		GROWTH PROBABILITIES: - NU
		SHORT TERM (YRS) - NU
		LONG-TERM (YRS) - NU
440	330	TECHNOLOGY: - NC
	770	HYDRO TECH: - In the AREEP version line 330 may contain up to 9 generating technologies. Line 770 may contain up to 7 hydro technologies (technologies 10 through 16 are assumed to be hydro technologies). In AREEP technology names beginning with an "A" are assumed to be located in the Anchorage-Cook Inlet area, whereas technology names beginning with an "F" are assumed to be located in the Fairbanks-Tanana Valley area.

Line Number		AREEP (Over/Under Version) Modifications
Old	New	
450	340 780	CAPFYR(MW) - NC
460-570	350-640 790-1080	ADD+1(MW) - NC
580	650 1090	These lines must be blank, except for the asterisk(*) in column 7 and the line number in columns 1-5.
590	660 1100	CAPLIM(MW) - NC
600	670 1110	MIX-LONG RN - Note that in AREEP the entries on lines 670 and 1110 should add to 1.0.
610	680 1120	RES MARGIN - NC
620	690 1130	SIZE(MW) - NC
630	700 1140	1ST YEAR AVL - NC
640	710 1150	ADD JUS(MW) - NC
650	720 1160	STUDIES(YR) - NC
660	730 1170	LICENSE(YR) - NC
670	740 1180	CONSTR.(YR) - NC
680	750 1190	STARTUP(YR) - NC

Line Number Old	Line Number New	AREEP (Over/Under Version) Modifications
		PRODUCTION SIMULATION
720	1230 1350	TECHNOLOGY: - NC HYDRO TECH: - for hydro technologies 10 through 16.
730	1250 1370	MAINT-PEAK - the limitation on this value does not apply to technologies 10 through 16.
740	1260 1380	1-F.O.R. - NC
750	1270 1390	EQ AVAIL - NC
770	1290 1410	VC(M/KWH) - fuel costs for technologies 1 through 9 are entered separately; refer to line 1330.
780	1300 1420	VCESC/YR - fuel cost escalation for technologies 1 through 9 are entered separately; refer to line 1810.
790	1310 1430	ENV(M/KWH) - NC
None	1320	HR(BTU/KWH) - heat rate for technologies 1 through 9.
None	1330	FTU - fuel type used by technologies 1 through 9. This entry should be an integer 1 through 9 corresponding to one of the fuel type price streams defined in lines 1470 through 1790. A fuel type of 10 indicates no fuel used.
None	1450	UTIL FACTOR - annual capacity factor in decimal percent for hydro technologies (technologies 10 through 16).
None	1470-1790	FUEL COST ($/MMBTU) - fuel cost in dollars per million BTU for each fuel type beginning in FYR. Entries must be made for FYR and may be made for up to thirty more years. For years beyond the last entry costs are escalated as specified in line 1810.

Line Number		AREEP (Over/Under Version) Modifications
Old	New	
None	1800	This line must be blank except for the asterisk (*) in column 7 and the line number in columns 1 through 5.
None	1810	FC ESC/YR - real fuel cost escalation rate per year as a decimal percent. This escalation rate applies only to the years subsequent to the last entry in lines 1490-1790.
810	1830	VARIABLE G-A(M/KWH) - NC
830-850	None	The contents of these lines do not exist as data input parameters in the AREEP version.
870-890	1850-1860	L.D.C - load-duration curve data. These data are entered in the same format as in the original model. Since the AREEP version deals with the entire year, the load duration curve description given in line 1860 should represent the entire year. This should be a typical load duration curve since AREEP calculates load duration curves for each demand path and year. This is done to keep the load duration curve consistent with the peak load and annual energy input data. P.ENRG and P.YR do not exist as data input parameters in the AREEP version.
None	1870	VMLDC - Percent of the load duration curve (LDC) adjustment area corresponding to 0-10%, 10-20%, etc. as a decimal percent. These values must add to 1.0. The AREEP version uses the VMLDC values to adjust the LDC entered on line 1860 to fit a particular year's peak demand and annual energy. Given the peak demand (Peak) and annual energy (Energy) for a particular year, a yearly load factor (YLFR) is calculated

$$YLFR = \frac{Energy}{Peak * 8.76.}$$

The area under the typical LDC presented in line 1860 is calculated in AREEP. The area under the LDC (YLF) and the YLFR calculated should be equal. If they are not equal (within 1% of each other), a new LDC is defined by decreasing or increasing the area under each segment of the typical LDC by the corresponding VMLDC percentage of the difference between YLF and YLFR.

Line Number Old	Line Number New	AREEP (Over/Under Version) Modifications
900	1880	PEAK WIDTH - NC
940	1920	TYPE - NC
950	1930	CAPACITY(MW) - NC
960	1940	AVAILABILITY - NC
970	1950	CAP PROP TO DEM? - NC
980	1960	OUT(T)/VAR(F) COST? - NC
990	1970	COST(M/KWH) - NC
1000	1980	COST.ESC/YR - NC
		FIXED CHARGE
1040	2020 2170	TECHNOLOGY:- NC HYDRO TECH:- for hydro technologies 10 through 16.
1060	2040 2190	CC($/KW) - NC
1070	2050 2200	CCESC/YR - NC
1080	2060 2210	OM($/KW-YR) - NC
1100	2080 2230	STUDIES - NC
1110	2090 2240	LICENSE - NC
1130	2110	DISTR - NC
1140	2120 2260	TL - NC
1150	2130 2270	BL - NC

Line Number		AREEP (Over/Under Version) Modifications
Old	New	
1160	None	FIXED-CHARGE PROFILES - NU
1170	None	1 - NU
1180	None	TL/2 - NU
1190	None	TL - NU
1200	None	TL+1 - NU
1210	None	BL - NU
None	2140-2150 2280-2290	FIXED-CHARGE RATES - revenue requirements for each year as a percent of installed capital cost in decimal percent.
1230	2310	DISTRIBUTION CC($/GWH) - NC
		DESC/YR - NC
		LOSS AND UNACC - NC
1250-1260	2330-2340	FYR ASSETS - NC
		INFLATION - NC
		ITC - NC
		ITC-NOR - NC
		CWIP - NC
		AFUDC - NC
1280	2360	YEAR - NC
1290	2370	EXIST. DEBT - NC
1300	2380	EX.DEBT INT. - NC
1310	2390	EX.RATE BASE - NC
1320	2410	RATE-BASE GROWTH FYR-1 - NC
		REGULATORY LAG(YRS) - NC

Line Number		
Old	New	AREEP (Over/Under Version) Modifications
1340	2430	HIST. CAP. COST - NC
		MAR.TAX RATE - NC
		CASH PCT. INT. PMTS - NC
1360	None	INTEREST COVERAGE - NU
		COST OF COMM - NU
		COST OF PREF - NU
		COST OF DEBT - NU
		PCT. ASSETS - NU
		MAR. COST - NU
None	2450	FUTURE CAPITAL COST - The cost of capital in decimal percent. NOTE: This should be with inflation rates and full cost escalation rates.

SECONDARY INPUT DATA FILE

An example secondary data file is illustrated in Figure 3.2. This is the secondary data file for Case 1A as presented in Volume I of the study series. The following is a description of the fields in the secondary input data file.

Delivered Electricity

For each area (Anchorage-Cook Inlet, Fairbanks-Tanana Valley and Glennallen-Valdez) and for each five year increment from the first year of the model run (FYR), the required peak demand in megawatts and annual energy in gigawatt hours are entered for each demand path (low, medium, and high) as follows:

	Columns	Value Type
YEAR	2 - 5	Integer
LOW - (Low demand path)		
PEAK (MW)	8 - 16	decimal
ANN (GWH)	17 - 25	decimal

```
********** DEMAND AND ANNUAL ENERGY **********
*
          - - - - -  DELIVERED ELECTRICITY  - - - - -
*
PATHS:          LOW                  MED                 HIGH
YEAR    PEAK(MW) ANN(GWH)   PEAK(MW) ANN(GWH)   PEAK(MW) ANN(GWH)
*
ANCHORAGE:
1980       414.9    2025.7      414.9    2025.7      414.9    2025.7
1985       496.4    2423.5      496.4    2423.5      496.4    2423.5
1990       616.2    3008.5      616.2    3008.5      616.2    3008.5
1995       719.7    3533.1      728.2    3607.6      736.7    3686.0
2000       802.4    3936.6      810.9    4011.1      819.4    4089.5
2005       897.8    4402.4      906.3    4476.9      914.8    4555.3
2010      1064.0    5213.7     1072.5    5288.1     1081.0    5366.6
*
FAIRBANKS:
1980       113.4     486.6      113.4     486.6      113.4     486.6
1985       155.0     665.1      155.0     665.1      155.0     665.1
1990       269.0    1154.5      269.0    1154.5      269.0    1154.5
1995       269.5    1156.8      269.5    1156.8      269.5    1156.8
2000       208.0     892.5      208.0     892.5      208.0     892.5
2005       184.9     793.3      184.9     793.3      184.9     793.3
2010       185.1     794.4      185.1     794.4      185.1     794.4
*
GLENNALLEN:
1980         8.5      38.6        8.5      38.6        8.5      38.6
1985        10.3      47.2       10.3      47.2       10.3      47.2
1990        13.0      59.6       20.8      92.6       28.5     125.7
1995        16.9      77.3       24.7     110.4       32.4     143.4
2000        21.2      96.7       28.9     129.8       36.7     162.8
2005        25.7     117.6       33.5     150.7       41.2     183.7
2010        31.1     142.1       38.8     175.2       46.6     208.2
*
```

FIGURE 3.2. Example Secondary Input Data File

- - - - - LOAD MANAGEMENT AND CONSERVATION - - - - -

YEAR	ANN(GWH)	PEAK(MW)	T-COST(1980$ X 1000)	P-COST(M/KWH)
ANCHORAGE:				
LOW:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
MED:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0

FIGURE 3.2. (contd)

HIGH:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
*				
FAIRBANKS:				
*				
LOW:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
*				

FIGURE 3.2. (contd)

MED:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
*				
HIGH:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0
*				

FIGURE 3.2. (contd)

GLENNALLEN:
*
LOW:

1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0

*
MED:

1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0

*

FIGURE 3.2. (contd)

HIGH:				
1980	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0
1982	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0
1988	0.0	0.0	0.0	0.0
1989	0.0	0.0	0.0	0.0
1990	0.0	0.0	0.0	0.0
1991	0.0	0.0	0.0	0.0
1992	0.0	0.0	0.0	0.0
1993	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0
1995	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0
2002	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0
2004	0.0	0.0	0.0	0.0
2005	0.0	0.0	0.0	0.0
2006	0.0	0.0	0.0	0.0
2007	0.0	0.0	0.0	0.0
2008	0.0	0.0	0.0	0.0
2009	0.0	0.0	0.0	0.0
2010	0.0	0.0	0.0	0.0

FIGURE 3.2. (contd)

	Columns	Value Type
MED - (Medium demand path)		
PEAK (MW)	27 - 35	decimal
ANN (GWH)	36 - 44	decimal
HIGH - (High demand path)		
PEAK (MW)	46 - 54	decimal
ANN (GWH)	55 - 63	decimal

The program uses linear interpolation to calculate the values for the years between those years entered.

Load Management and Conservation

For each area (Anchorage-Cook Inlet, Fairbanks-Tanana Valley, and Glennallen-Valdez), for each demand path (low, medium and high), and for each year of the forecast period, including FYR, the annual energy savings in gigawatt hours, the peak demand savings in megawatts, the total cost in thousands of FYR dollars, and the power cost in mills per kilowatt hours resulting from load management and conservation activities are entered as follows:

	Columns	Value Type
YEAR	2 - 5	integer
ANN (GWH)	7 - 16	decimal
PEAK (MW)	17 - 26	decimal
T-COST (FYR $ X1000)	39 - 48	decimal
P-COST (M/KWH)	54 - 63	decimal

4.0. DATA OUTPUT

This chapter describes the three new reports produced by the AREEP version of the Over/Under model. These reports are called the Capacity and Energy Generation report (CPRT), the Cost Summary report (CSUM), and the Anchorage-Cook Inlet-Fairbanks-Tanana Valley Intertie report (INTR). The figures used to illustrate the reports are AREEP outputs for Case 1A (Base Case Without Upper Susitna), as presented in Volume I of the study series. In addition to describing these reports, differences from the original reports of the EPRI Over/Under model are noted and the AREEP output data file used by the RED model is described.

CAPACITY AND ENERGY GENERATION (CPRT)

Tables: 1 per PRM, per tree path

The CPRT report (Figure 4.1) shows the capacity in megawatts and the energy generation in gigawatt hours for the technology types and years of the planning horizon.

Each table in the report contains a summary line at the top with these entries:

BY YEAR - the planning horizon for this table.

PRM - the planning reserve margin for this table.

TREE PATH - the demand path (LOW, MEDIUM, or HIGH) for this table. All ones represent LOW demand, all twos represent MEDIUM demand, and all threes represent HIGH demand.

Beneath this top summary line, there are up to twelve columns of data, depending on the number of technology types with capacity and energy generation available. The column headings are as follows:

YEAR - the year in which capacity (energy generation) is available. Additions and retirements are made as of the beginning of the year.

DEMAND - the total demand in megawatts for that year. This is the sum of the data input demand for the three areas, (Anchorage-Cook Inlet, Fairbanks-Tanana Valley and Glennallen-Valdez) times COINF, times (1 + ELOSS), where ELOSS is the "loss and unaccounted for" data input value and COINF is the "coincidence factor", set in subroutine INCONS.

RAILBELT PLAN 1A: BASE CASE W/O UPPER SUSITNA - 1-7-82CHA CPRT REPORT
PEAK DEMAND & CAPACITY (MW) BY YEAR: 1980-2010, PRM= 0.300, TREE PATH= 222222

YEAR	DEMAND	HYDRO	AOGCT	ANGCT	AOGCC	ANGCC	ACST	FCST	F&GCD	FGCC
1980	562.	46.	379.	82.	0.	139.	0.	69.	266.	0.
1981	589.	58.	379.	82.	0.	139.	0.	69.	266.	0.
1982	615.	58.	269.	172.	178.	139.	0.	69.	266.	0.
1983	641.	58.	269.	172.	178.	139.	0.	69.	258.	0.
1984	667.	129.	269.	172.	178.	139.	0.	69.	258.	0.
1985	693.	129.	269.	172.	178.	139.	0.	69.	258.	0.
1986	744.	129.	269.	172.	178.	139.	0.	69.	257.	0.
1987	796.	129.	269.	172.	178.	139.	0.	65.	249.	0.
1988	847.	219.	269.	172.	178.	139.	0.	65.	243.	0.
1989	898.	219.	269.	172.	178.	139.	0.	60.	243.	0.
1990	949.	219.	269.	172.	178.	139.	0.	60.	243.	0.
1991	974.	219.	269.	172.	178.	139.	0.	60.	225.	100.
1992	998.	430.	269.	156.	178.	139.	200.	60.	206.	100.
1993	1022.	430.	260.	156.	178.	139.	200.	60.	206.	100.
1994	1047.	430.	246.	140.	178.	139.	200.	60.	206.	100.
1995	1071.	437.	232.	140.	178.	139.	200.	60.	173.	100.
1996	1076.	545.	232.	140.	178.	339.	200.	60.	71.	100.
1997	1082.	545.	232.	140.	178.	339.	200.	260.	6.	100.
1998	1087.	545.	200.	122.	178.	339.	200.	260.	6.	100.
1999	1092.	545.	200.	122.	178.	339.	200.	260.	6.	100.
2000	1098.	545.	182.	122.	178.	339.	200.	260.	6.	100.
2001	1114.	545.	182.	122.	178.	339.	200.	260.	6.	100.
2002	1130.	875.	163.	90.	178.	339.	200.	235.	6.	100.
2003	1146.	875.	110.	90.	178.	339.	200.	235.	6.	100.
2004	1162.	875.	110.	90.	178.	339.	200.	235.	6.	100.
2005	1178.	875.	52.	90.	178.	339.	200.	214.	6.	100.
2006	1214.	875.	52.	90.	178.	339.	200.	214.	6.	100.
2007	1250.	875.	52.	90.	178.	339.	200.	214.	6.	100.
2008	1286.	875.	26.	90.	178.	339.	200.	214.	6.	100.
2009	1322.	875.	26.	90.	178.	339.	200.	214.	6.	100.
2010	1358.	875.	26.	90.	178.	339.	200.	214.	6.	200.

FIGURE 4.1. CPRT Report

RAILBELT PLAN 1A: BASE CASE W/O UPPER SUSITNA - 1-7-82CHA CPRT REPORT
ENERGY GENERATION (GWH) BY YEAR: 1980-2010, PRM= 0.300, TREE PATH= 222222

YEAR	ENERGY	HYDRO	AOGCT	ANGCT	AOGCC	ANGCC	ACST	FCST	F&GCD	FGCC
1980	2755.									
1981	2881.	254.	2013.	4.	9.	46.	0.	537.	27.	0.
1982	3008.	254.	763.	2.	1366.	20.	0.	537.	66.	0.
1983	3134.	254.	835.	4.	1368.	32.	0.	537.	104.	0.
1984	3260.	254.	940.	1.	1373.	13.	0.	537.	143.	0.
1985	3387.	254.	405.	4.	1400.	865.	0.	458.	0.	0.
1986	3629.	254.	1338.	7.	1403.	62.	0.	537.	27.	0.
1987	3870.	254.	1423.	17.	1400.	105.	0.	537.	133.	0.
1988	4112.	648.	1237.	7.	1400.	45.	0.	537.	238.	0.
1989	4354.	648.	1344.	11.	1402.	67.	0.	496.	386.	0.
1990	4596.	648.	953.	45.	1410.	1080.	0.	457.	3.	0.
1991	4730.	648.	1861.	17.	1410.	245.	0.	496.	1.	51.
1992	4864.	679.	749.	0.	1410.	19.	1578.	427.	0.	2.
1993	4997.	679.	857.	1.	1410.	28.	1584.	436.	0.	3.
1994	5131.	679.	964.	1.	1390.	38.	1611.	443.	0.	5.
1995	5265.	710.	12.	79.	1105.	1057.	1611.	496.	0.	197.
1996	5299.	710.	1.	9.	209.	2235.	1611.	496.	0.	29.
1997	5333.	710.	0.	1.	29.	966.	1611.	2013.	0.	3.
1998	5368.	710.	0.	1.	32.	992.	1611.	2019.	0.	4.
1999	5402.	710.	0.	1.	37.	1020.	1611.	2020.	0.	4.
2000	5436.	710.	0.	1.	40.	1045.	1611.	2026.	0.	4.
2001	5520.	710.	0.	1.	49.	1110.	1611.	2034.	0.	5.
2002	5603.	2155.	0.	0.	5.	164.	1611.	1668.	0.	0.
2003	5687.	2155.	0.	0.	6.	176.	1611.	1738.	0.	0.
2004	5771.	2155.	0.	0.	7.	189.	1611.	1809.	0.	0.
2005	5855.	2155.	0.	0.	12.	360.	1611.	1716.	0.	1.
2006	6035.	2155.	0.	0.	16.	531.	1611.	1722.	0.	1.
2007	6216.	2155.	0.	0.	20.	702.	1611.	1727.	0.	1.
2008	6397.	2155.	0.	0.	24.	875.	1611.	1730.	0.	2.
2009	6578.	2155.	0.	1.	10.	1049.	1611.	1732.	0.	20.
2010	6758.	2155.	0.	0.	3.	1222.	1611.	1734.	0.	33.

FIGURE 4.1. (contd)

ENERGY - the total energy generation in gigawatt hours required for that year. This is the sum of the data input energy generation for the three areas, (Anchorage-Cook Inlet, Fairbanks-Tanana Valley, and Glennallen-Valdez) times (1 + ELOSS).

HYDRO - The capacity and energy generation for all hydro technologies (entered on line 770 of the data input) are combined in this column.

TECHNOLOGY TYPES - The next several columns are the technology names entered on line 330 of the data input. Data in these columns are the capacity (energy generation) available from each of these technology types. If a technology has no capacity (energy generation) for every year of the planning horizon, then the technology will not be listed in the table.

COST SUMMARY REPORT (CSUM)

Tables: 1 per PRM, per tree path

The CSUM report (Figure 4.2) shows the total electrical requirement costs broken down by delivered energy and load management and conservation. This report combines the costs derived from the model and the costs supplied from the secondary input data file.

The top line of each table in the report contains the following entries:

PRM - the planning reserve margin for the table.

TREE PATH - the demand path (LOW, MEDIUM, or HIGH) for this table. All ones represent LOW demand, all twos represent MEDIUM demand, and all threes represent HIGH demand.

The column headings for this table are as follows:

YEAR - the year for which the costs are shown, as of the end of that year.

TOTAL ELECTRICAL REQUIREMENTS:

ANNUAL ENERGY - the energy generation in gigawatt hours required for that year. This is the sum of the ANNUAL ENERGY entries under the DELIVERED ENERGY and the LOAD MANAGEMENT AND CONSERVATION headings.

PEAK - the peak demand requirements in megawatts for that year. This is the sum of the PEAK entries under the DELIVERED ENERGY and LOAD MANAGEMENT AND CONSERVATION headings.

TOTAL COST - the total costs of energy in FYR millions of dollars for that year. This is the sum of the TOTAL COST entries under the DELIVERED ENERGY and LOAD MANAGEMENT AND CONSERVATION headings.

RAILBELT PLAN 1A: BASE CASE W/O UPPER SUSITNA - 1-7-R2CHA CSUM REPORT
PRM= 0.300 TREE PATH= 222222

YEAR	TOTAL ELECTRICAL REQUIREMENTS ANNUAL ENERGY (GWH)	PEAK (MW)	TOTAL COST 1980$ - MILLIONS	POWER COST M/KWH	DELIVERED ENERGY ANNUAL ENERGY (GWH)	PEAK (MW)	TOTAL COST 1980$ - MILLIONS	POWER COST M/KWH	LOAD MANAGEMENT AND CONSERVATION ELECTRICITY ANNUAL ENERGY (GWH)	PEAK (MW)	TOTAL COST 1980$ - MILLIONS	POWER COST M/KWH
1980	2755.	562.	113.23	41.1	2755.	562.	113.23	41.1	0.	0.	0.00	0.0
1981	2881.	589.	118.64	41.2	2881.	589.	118.64	41.2	0.	0.	0.00	0.0
1982	3008.	615.	129.79	43.2	3008.	615.	129.79	43.2	0.	0.	0.00	0.0
1983	3134.	641.	135.54	43.2	3134.	641.	135.54	43.2	0.	0.	0.00	0.0
1984	3260.	667.	136.22	41.8	3260.	667.	136.22	41.8	0.	0.	0.00	0.0
1985	3387.	693.	127.89	37.8	3387.	693.	127.89	37.8	0.	0.	0.00	0.0
1986	3629.	744.	139.21	38.4	3629.	744.	139.21	38.4	0.	0.	0.00	0.0
1987	3870.	796.	155.25	40.1	3870.	796.	155.25	40.1	0.	0.	0.00	0.0
1988	4112.	847.	180.20	43.8	4112.	847.	180.20	43.8	0.	0.	0.00	0.0
1989	4354.	898.	204.09	46.9	4354.	898.	204.09	46.9	0.	0.	0.00	0.0
1990	4596.	949.	193.02	42.0	4596.	949.	193.02	42.0	0.	0.	0.00	0.0
1991	4730.	974.	218.61	46.2	4730.	974.	218.61	46.2	0.	0.	0.00	0.0
1992	4864.	998.	258.16	53.1	4864.	998.	258.16	53.1	0.	0.	0.00	0.0
1993	4997.	1022.	267.80	53.6	4997.	1022.	267.80	53.6	0.	0.	0.00	0.0
1994	5131.	1047.	279.44	54.5	5131.	1047.	279.44	54.5	0.	0.	0.00	0.0
1995	5265.	1071.	320.29	60.8	5265.	1071.	320.29	60.8	0.	0.	0.00	0.0
1996	5299.	1076.	339.58	64.1	5299.	1076.	339.58	64.1	0.	0.	0.00	0.0
1997	5333.	1082.	355.52	66.7	5333.	1082.	355.52	66.7	0.	0.	0.00	0.0
1998	5368.	1087.	361.12	67.3	5368.	1087.	361.12	67.3	0.	0.	0.00	0.0
1999	5402.	1092.	376.26	69.7	5402.	1092.	376.26	69.7	0.	0.	0.00	0.0
2000	5436.	1098.	381.78	70.2	5436.	1098.	381.78	70.2	0.	0.	0.00	0.0
2001	5520.	1114.	388.00	70.3	5520.	1114.	388.00	70.3	0.	0.	0.00	0.0
2002	5603.	1130.	418.64	74.7	5603.	1130.	418.64	74.7	0.	0.	0.00	0.0
2003	5687.	1146.	423.46	74.5	5687.	1146.	423.46	74.5	0.	0.	0.00	0.0
2004	5771.	1162.	428.88	74.3	5771.	1162.	428.88	74.3	0.	0.	0.00	0.0
2005	5855.	1178.	436.72	74.6	5855.	1178.	436.72	74.6	0.	0.	0.00	0.0
2006	6035.	1214.	449.34	74.5	6035.	1214.	449.34	74.5	0.	0.	0.00	0.0
2007	6216.	1250.	462.62	74.4	6216.	1250.	462.62	74.4	0.	0.	0.00	0.0
2008	6397.	1286.	476.46	74.5	6397.	1286.	476.46	74.5	0.	0.	0.00	0.0
2009	6578.	1322.	491.05	74.7	6578.	1322.	491.05	74.7	0.	0.	0.00	0.0
2010	6758.	1358.	515.32	76.3	6758.	1358.	515.32	76.3	0.	0.	0.00	0.0
PVTC			5474.43				5474.43				0.00	
LPC				58.0				58.0				0.0

FIGURE 4.2. CSUM Report

POWER COST - the total power cost in FYR mills per kilowatt hour for that year. This is the TOTAL COST entry divided by the ANNUAL ENERGY entry, times a scaling factor of 1000.

DELIVERED ENERGY:

ANNUAL ENERGY - the delivered energy generation requirements in gigawatt hours for that year. This is the sum of the data input annual energy for the three areas (Anchorage-Cook Inlet, Fairbanks-Tanana Valley, and Glennallen-Valdez) times (1 + ELOSS) where ELOSS is the "loss and unaccounted for" data input value.

PEAK - the delivered energy peak demand requirements in megawatts for that year. This is the sum of the data input demand for the three areas (Anchorage-Cook Inlet, Fairbanks-Tanana Valley, and Glennallen-Valdez) times COINF, times (1 + ELOSS) where COINF is the "coincidence factor" set in subroutine INCONS.

TOTAL COST - the total cost of delivered energy in FYR millions of dollars for that year. This is the POWER COST entry times the ANNUAL ENERGY entry, divided by a scaling factor of 1000.

POWER COST - the cost of delivered energy in mills per FYR killowatt hour for that year. This is the sum of the V+E+O entry and the FIXED entry under the FYR DOLLARS heading of the PRICES report.

LOAD MANAGEMENT AND CONSERVATION ELECTRICITY:

ANNUAL ENERGY - the amount of energy generation in gigawatt hours displaced by load management and conservation activities for that year. This is the sum of the data input load management and conservation energy entries for the three areas (Anchorage-Cook Inlet, Fairbanks-Tanana Valley, and Glennallen-Valdez).

PEAK - the amount of peak demand in megawatts displaced by load management and conservation activities for that year. This is the sum of the data input load management and conservation peak demand entries for the three areas times COINF, where COINF is the "coincidence factor" set in subroutine INCONS.

TOTAL COST - the total cost of load management and conservation activities in FYR millions of dollars for that year. This is the sum of the data input load management and conservation total cost entries for the three areas divided by a scale factor of 1000.

POWER COST - the cost of load management and conservation activities in FYR mills per kilowatt hours for that year. This is the TOTAL COST entry divided by the ANNUAL ENERGY entry, times a scale factor of 1000.

The bottom of the table contains two summary lines:

PVTC - The present value of the TOTAL COST column. That is,

$$PVTC = TC_{FYR} + \sum_{i=1}^{LR} \left[TC_{FYR+i} \left(\frac{1 + INFLA}{1 + CDSC} \right)^{i} \right]$$

where: TC_{FYR} = total cost for the first year of the model
LR = number of years in the planning horizon
TC_{FYR+i} = total cost in year FYR+i of the planning horizon
$INFLA$ = data input value: "annual inflation rate"
$CDSC$ = data input value: "consumer discount rate"

**NOTE: In the study, INFLA was set equal to zero and CDSC equal to 3 percent, the "real" discount rate. The same results will be forthcoming if a consistent set of nominal rates--e.g., seven percent and ten percent, respectively--are used.

LPC - Levelized power cost. That is,

$$LPC = (PVTC \times 1000) / \left[AE_{FYR} + \sum_{i=1}^{LR} \left[AE_{FYR+i} \left(\frac{1 + INFLA}{1 + CDSC} \right)^{i} \right] \right]$$

where: AE_{FYR} = annual energy for the first year of the model

AE_{FYR+i} = annual energy for year FYR+i of the planning horizon

and LR, INFLA, CDSC are as above.

ANCHORAGE-COOK INLET - FAIRBANKS-TANANA VALLEY INTERTIE REPORT (INTR)

Tables: 1 per PRM, per tree path

The INTR report (Figure 4.3) shows the peak demand and energy requirements for the Anchorage-Cook Inlet, Glennallen-Valdez, and Fairbanks-Tanana Valley areas

RAILBELT PLAN 1A: BASE CASE W/O UPPER SUSITNA - 1-7-82CHA
PRN= 0.300 TREE PATH= 222222

ANCHORAGE

YEAR	PEAK DEMAND (MW)	INSTALLED CAPACITY (MW)	ANNUAL ENERGY (GWH)	ANNUAL GENERATION (GWH)	LOLP DAYS/10 YR
1980	457.3	646.0	2229.4		
1981	475.3	658.0	2317.2	2316.4	10.593
1982	493.3	816.0	2405.0	2404.9	0.356
1983	511.3	816.0	2492.8	2492.7	1.007
1984	529.2	816.0	2580.6	2580.6	0.201
1985	547.2	816.0	2668.4	2928.3	1.283
1986	575.4	816.0	2804.5	3064.3	2.145
1987	603.5	816.0	2940.7	3200.1	6.701
1988	631.7	906.0	3076.9	3336.7	2.356
1989	659.8	906.0	3213.0	3472.6	4.334
1990	688.0	906.0	3349.2	4136.3	0.207
1991	713.0	906.0	3482.4	4182.0	0.091
1992	738.0	1097.0	3615.7	4435.3	0.000
1993	763.1	1088.0	3748.9	4558.8	0.001
1994	788.1	1058.0	3882.2	4683.0	0.003
1995	813.1	1051.0	4015.4	4572.1	0.016
1996	831.9	1251.0	4106.8	4774.4	0.016
1997	850.7	1251.0	4198.1	3317.1	0.008
1998	869.4	1201.0	4289.5	3345.5	0.023
1999	888.2	1201.0	4380.8	3377.7	0.025
2000	907.0	1183.0	4472.2	3406.4	0.043
2001	928.6	1183.0	4577.3	3480.8	0.048
2002	950.2	1462.0	4682.4	3935.1	0.002
2003	971.8	1409.0	4787.6	3948.4	0.007
2004	993.4	1409.0	4892.7	3961.7	0.012
2005	1015.0	1351.0	4997.8	4138.0	0.078
2006	1052.0	1351.0	5178.3	4312.6	0.140
2007	1089.1	1351.0	5358.8	4488.3	0.224
2008	1126.1	1325.0	5539.3	4665.0	0.537
2009	1163.2	1325.0	5719.9	4826.0	0.860
2010	1200.2	1325.0	5900.4	4991.7	0.275

FIGURE 4.3. INTR Report

RAILBELT PLAN 1A: BASE CASE W/O UPPER SUSITNA - 1-7-82CHA
PRM= 0.300 TREE PATH= 222222

	FAIRBANKS				INTERTIE	
YEAR	PEAK DEMAND (MW)	INSTALLED CAPACITY (MW)	ANNUAL ENERGY (GWH)	ANNUAL GENERATION (GWH)	MAXIMUM CAPACITY (MW)	ENERGY TRANSFER (GWH)
1980	122.5	335.0	525.5			
1981	131.5	335.0	564.1	564.1	0.0	0.0
1982	140.4	335.0	602.6	602.6	0.0	0.0
1983	149.4	327.0	641.2	641.2	0.0	0.0
1984	158.4	327.0	679.8	679.8	0.0	0.0
1985	167.4	327.0	718.3	458.3	0.0	259.9
1986	192.0	326.0	824.0	564.0	0.0	259.8
1987	216.6	314.0	929.7	669.7	0.0	259.4
1988	241.3	308.0	1035.4	775.4	0.0	259.8
1989	265.9	303.0	1141.1	881.1	0.0	259.6
1990	290.5	303.0	1246.9	459.7	0.0	787.1
1991	290.6	385.0	1247.4	547.8	0.0	699.6
1992	290.7	366.0	1247.9	428.2	0.0	819.6
1993	290.8	366.0	1248.4	438.4	0.0	809.9
1994	291.0	366.0	1248.8	448.0	0.0	800.8
1995	291.1	333.0	1249.3	692.7	0.0	556.7
1996	277.8	231.0	1192.3	524.6	46.8	667.6
1997	264.5	366.0	1135.2	2016.2	0.0	-881.0
1998	251.2	366.0	1078.1	2022.1	0.0	-944.0
1999	237.9	366.0	1021.0	2024.1	0.0	-1003.1
2000	224.6	366.0	963.9	2029.7	0.0	-1065.8
2001	219.7	366.0	942.5	2039.0	0.0	-1096.5
2002	214.7	341.0	921.0	1668.4	0.0	-747.4
2003	209.7	341.0	899.6	1738.8	0.0	-839.2
2004	204.7	341.0	878.2	1809.2	0.0	-931.0
2005	199.7	320.0	856.8	1716.5	0.0	-859.8
2006	199.7	320.0	857.0	1722.7	0.0	-865.7
2007	199.8	320.0	857.2	1727.7	0.0	-870.5
2008	199.8	320.0	857.5	1731.8	0.0	-874.3
2009	199.9	320.0	857.7	1751.5	0.0	-893.7
2010	199.9	420.0	858.0	1766.6	0.0	-908.7

FIGURE 4.3. (contd)

together with the installed capacity and energy generation available from the Anchorage-Cook Inlet and Fairbanks-Tanana Valley technologies. The intertie portion of the report gives the amount of energy transferable from the Anchorage-Cook Inlet technologies to the Fairbanks-Tanana Valley area or from the Fairbanks-Tanana Valley technologies to the Anchorage-Cook Inlet and Glennallen-Valdez area, for each year of the planning horizon.

The top line of each table in the report contains the following entries:

PRM - the planning reserve margin for the table.

TREE PATH - the demand path (LOW, MEDIUM, or HIGH) for this table. All ones represent LOW demand, all twos represent MEDIUM demand, and all threes represent HIGH demand.

The column headings for this table are as follows:

ANCHORAGE:

YEAR - the year of the planning horizon for which the other values on that line apply.

PEAK DEMAND - the peak demand requirements in megawatts for that year for Anchorage-Cook Inlet and Glennallen-Valdez. This is the sum of the data input demand entries for Anchorage-Cook Inlet and Glennallen-Valdez times (1 + ELOSS), where ELOSS is the "loss and unaccounted for" data input value.

INSTALLED CAPACITY - the capacity in megawatts available for that year from Anchorage-Cook Inlet technologies. An Anchorage-Cook Inlet technology is identified in lines 330 and 770 of the input data by a technology name beginning with 'A'.

ANNUAL ENERGY - the annual energy requirements in gigawatt hours for that year for Anchorage-Cook Inlet and Glennallen-Valdez. This is the sum of the data input annual energy entries for Anchorage-Cook Inlet and Glennallen-Valdez times (1 + ELOSS), where ELOSS is the "loss and unaccounted for" data input value.

ANNUAL GENERATION - the annual energy generation in gigawatt hours from Anchorage-Cook Inlet technologies for that year.

LOLP - the yearly expected loss-of-load probability in days per 10 years. This is the probability that demand will exceed the available capacity of all plants and emergency actions (not including unserved energy), multiplied by 3652.5, the number of days in ten years.

FAIRBANKS:

YEAR - the year of the planning horizon for which the other values on that line apply.

PEAK DEMAND - the peak demand requirements in megawatts for that year for Fairbanks-Tanana Valley. This is the data input demand entry for Fairbanks-Tanana Valley times (1 + ELOSS), where ELOSS is the "loss and unaccounted for" data input value.

INSTALLED CAPACITY - the capacity in megawatts available for that year from Fairbanks-Tanana Valley technologies. A Fairbanks-Tanana Valley technology is identified in lines 330 and 770 of the input data by a technology name beginning with 'F'.

ANNUAL ENERGY - the annual energy requirements in gigawatt hours for that year for Fairbanks-Tanana Valley. This is the data input annual energy entry for Fairbanks-Tanana Valley times (1 + ELOSS) where ELOSS is the "loss and unaccounted for" data input value.

ANNUAL GENERATION - the annual energy generation in gigawatt hours from Fairbanks-Tanana Valley technologies for that year.

INTERTIE:

MAXIMUM CAPACITY (MW) - If positive, this is the excess capacity (after satisfying Anchorage-Cook Inlet and Glennallen-Valdez capacity requirements) available from Anchorage-Cook Inlet technologies to fill unsatisfied Fairbanks-Tanana Valley capacity requirements in that year. If negative, this is the excess capacity (after satisfying Fairbanks-Tanana Valley capacity requirements) available from Fairbanks-Tanana Valley technologies to fill unsatisfied Anchorage-Cook Inlet and Glennallen-Valdez capacity requirements in that year.

ENERGY TRANSFER (GWH) - If positive, this is the excess energy (after satisfying Anchorage-Cook Inlet and Glennallen-Valdez energy requirements) available from Anchorage-Cook Inlet technologies to fill unsatisfied Fairbanks-Tanana Valley energy requirements in that year. If negative, this is the excess energy (after satisfying Fairbanks-Tanana Valley energy requirements) available from Fairbanks-Tanana Valley technologies to fill unsatisfied Anchorage-Cook Inlet and Glennallen-Valdez energy requirements in that year.

PRODUCTION DETAIL REPORTS (PDET and TPDET)

The tables for the PDET and TPDET reports are identical to those described in the Over/Under Users Guide with the exception that, in the AREEP version, all hydro technologies are combined and are labeled together under the name of the first hydro technology (Technology #10).

PRODUCTION COST REPORTS (PCOS and TPCOS)

The tables for the PCOS and TPCOS reports are identical to those described in the Over/Under Users Guide with the exception that in the AREEP version, the hydro technologies are broken out by their proportional contribution to total hydro energy.

DATA FILE OUTPUT

One data file is written by the program for use by the RED model. This file contains the power cost for delivered energy in FYR dollars per kilowatt hour, for the MEDIUM demand path of every planning reserve margin (PRM). This is the same as the POWER COST column under the heading DELIVERED ENERGY of the CSUM report, divided by a scale factor of 1000. The complete format of the file is as follows:

Record No.	Field	Format
1	PRM	F5.3
2	PC_{FYR}	F10.4
3	PC_{FYR+1}	F10.4
etc.	etc.	etc.
•	•	•
•	•	•
•	•	•
LR+2	PC_{FYR+LR}	F10.4

where:

PRM = planning reserve margin for the following set of costs

PC_{FYR+i} = power cost ($/kWh) for delivered energy under the MEDIUM demand path in year FYR+i

FYR = first year of the model run

LR = number of years in the planning horizon.

Records 1 through LR+2 are repeated for every planning reserve margin of the model run.

5.0 OVERVIEW OF THE COMPUTER PROGRAM

The AREEP version of the Over/Under model consists of the main program, a Block Data subroutine, and 63 additional subroutines. Of these 63 subroutines, 12 are new, 37 have been modified from the original model, and 8 are unchanged from the original model. The remaining 6 routines are original routines not used in the AREEP version, but which have been included in the source code. All AREEP additions to the original Over/Under code are identified with a distinct set of line numbers beginning with the characters "MOD". Original source lines not used in the AREEP version have been commented out; i.e., a "C" is in column one of each of these FORTRAN statements. Appendix B gives a complete listing of the AREEP source code.

MAIN PROGRAM

In the AREEP version, the main program has been extensively modified. A major change to the original Over/Under model is the elimination of the Demand Uncertainty model and the corresponding provisions to directly input demand and energy values for various demand growth possibilities. Other modifications include a restructuring of the primary data input file format with provisions for up to 16 technologies and separate fuel cost input, and the fitting of load duration curves for each year.

Table 5.1 lists the subroutines included in the AREEP version by order of call. In reference to the original Over/Under model, the subroutines have been categorized as follows:

New - new subroutine
Mod - modified subroutine
UC - unchanged subroutine
NU - original subroutine, but not used

TABLE 5.1. Subroutines in Order of Call

Subroutine	Line Number of Call	New	Mod	UC	NU
INCONS	MOD01680	X			
SETPAR	MOD02900	X			
READSF	MOD03870	X			
DEMPYR	MOD04250	X			
DETLDC	MOD04670	X			
FALPHA	3230				X
INICEP	3660		X		
INTEG	3670		X		
INTEG	3680		X		
SGROW	3740				X
SORDER	3750				X
SCPRS	3930				X
SCPROB	3950				X
CAPCON	4430		X		
FAIRCK	MOD05460	X			
FLORDR	MOD05850	X			
LORDER	MOD05870			X	
LORDER	4860			X	
PRMGN	4880			X	
PRODUC	5380		X		
CAPPRE	21760		X		
BALPRE	21770		X		
BALLDC	21930			X	
HYDRO	21980		X		
BALERU	22000		X		
PRTPD	22290		X		
EXPEN	22360		X		
EVC	MOD09340		X		
PRTAPC	22400		X		
CEXS	5670				X
CEXD	MOD06850		X		
PRMGN	6510			X	
CPLAN	6560		X		
DSTAT	38540		X		
DIFF	46460		X		
INTEG	46510		X		
DSTAT	39070		X		
DIFF	46460		X		
INTEG	46510		X		
AMWUP	39310		X		

TABLE 5.1. (cont'd)

Subroutine	Line Number of Call	New	Mod	UC	NU
PRODUC	6830		X		
CAPPRE	21760		X		
BALPRE	21770		X		
BALLDC	21930			X	
HYDRO	21980		X		
BALERU	22000		X		
PRTPD	22290		X		
EXPEN	22360		X		
EVC	MOD09340		X		
SVNUMS	MOD09400	X			
SVENG	MOD09470	X			
PRTAPC	22400		X		
DPRNT	7530		X		
DEMPRT	MOD07290	X			
PROLEV	7570		X		
LEVEL	20650			X	
LEVEL	20840			X	
TERFIX	7640		X		
FOMESC	7760		X		
TERM	7810			X	
PRMGN	45840			X	
CEPMOD	7880		X		
START	7890		X		
CAPCUR	7900		X		
AMORT	7910		X		
FXCHAR	7920		X		
FXCHRL	7930		X		
FXCWIP	7940		X		
CAAHOR	7950		X		
DIST	7960		X		
PLMEXC	7970		X		
COMFIN	7980		X		
FIXITC	34808			X	
QOST	34200		X		
FIXITC	34480			X	
QOST	34580		X		
NORITC	34900		X		
CEPFIX	7990		X		
FIXOM	8050		X		
PRTFIN	8320		X		
WRTPRC	8750			X	
WRTSUM	MOD07630	X			
WRTINT	MOD07690	X			
PTCOST	9790			X	
PTCOST	10010			X	

SUBROUTINES

Each of the new AREEP subroutines is described in this section. These descriptions follow the order in which the subroutines are called. The subroutine name in each heading below is followed in parentheses by the program line number where that subroutine begins.

Subroutine INCONS - (MOD13050)

This subroutine sets the values for various parameters. These variables and their values are as follows:

ALPHA = 0.5	ALPHA was formerly calculated in subroutine FALPHA. Refer to page B-18 of the Over/Under Users Guide for a description of this parameter. ALPHA is currently used in line 3380 and in Subroutine CEXD (called on line MOD6850)
FCPER1 = 20. FCPER2 = 5. FCPER3 = 6.	These parameters are various years in the planning horizon. They are used in computing expected demand growth rates (lines MOD4920 MOD6670 - MOD6700, and MOD06850 of the main program).
COINF = 0.97	Coincidence factor. This is used as a multiplier to adjust the sum of the input peak demand for the three areas (Anchorage-Cook Inlet, Fairbanks-Tanana Valley, and Glennallen-Valdez).
ALLINT = 260. (GWh)	This parameter is used in subroutine BALERU to restrict the amount of energy transferred from Anchorage-Cook Inlet to Fairbanks-Tanana Valley in years 5-9 (1985-1989). That is, in years 1985-1989, up to 260 GWh of energy can be transferred from Anchorage-Cook Inlet to Fairbanks-Tanana Valley. For years 1-4 (1981-1984), it is assumed that no energy can

be transferred from Anchorage-Cook Inlet to Fairbanks-Tanana Valley. For 1990 and on, the only limitation on energy flow from Anchorage-Cook Inlet to Fairbanks-Tanana Valley is the amount available after satisfying the Anchorage-Cook Inlet area and Glennallen-Valdez area requirements.

The following parameters are former data input variables:

NP = 6	The number of periods is set to 6.
NYPP = 5	The number of years per period is set to 5.
NB = 1	The number of branches on a path is set to 1.
NSCEN = 3	The number of demand paths is 3 (low, medium, high).
Q = 0.5	The probability of the middle path (medium) in the 3 path system is 0.5.
RSNOT = .FALSE. PERFCS = .FALSE.	These are not used in the AREEP version.

Subroutine SETPAR - (MOD13570)

This subroutine sets the values of former input parameters. These variables and their values are:

HYEN(1) = 0. HYEN(2) = 0. HYEN(3) = 0.	The maximum available energy from the hydro technologies. The HYEN array is not used in the AREEP version.
HYMULT(1) = 1.0 HYMULT(2) = 1.0 HYMULT(3) = 1.0	CAPACITY MULTIPLIER
HYPROB(1) = 0.0 HYPROB(2) = 1.0 HYPROB(3) = 0.0	HYDRO PROBABILITIES: In AREEP, normal weather conditions are assumed for each year.

HYINC = 0.	NORMAL WEATHER HYDRO ENERGY INCREASE PER MW ADDED (MWH)
FTIME(1) = 1.0	P.YR. In AREEP, the peak season is 100% of the year.
FENG(1) = 1.0	P.ENRG. In AREEP, 100% of annual energy demanded is in the peak season.
PRERT = .150	PCT.ASSETS - PREF. Percent of assets financed by preferred stock.
DBTRT = .490	PCT. ASSETS - DEBT. Percent of assets financial by debt.
COV(1) = 2.0 COV(2) = 3.0 COV(3) = 4.0 COV(4) = 5.0 COV(5) = 6.0 COV(6) = 7.0	INTEREST COVERAGE Interest - coverage ratios.

NOTE: The following are former input variables that are set in AREEP (lines MOD03550 - MOD03620 of the main program) to the data input value FUTURE CAPITAL COST.

COC - COST OF COMM
PRECOV - COST OF PREF
EMBPRE - MAR. COST OF PREF
AINT - COST OF DEBT
EMBDRT - MAR. COST OF DEBT
EMBCOM - MAR. COST OF COMM

Subroutine READSF (MOD013930)

This subroutine reads the secondary input file containing the average energy and peak demand values for each area, path and period. The average energy and peak demand are combined for the three areas (Anchorage-Cook Inlet, Fairbanks-Tanana Valley and Glennallen-Valdez). The conservation and load management data for each area, path and year are read and combined for the three areas.

Subroutine DEMPYR - (MOD15200)

This subroutine calculates the yearly demand and energy from the input period demand and energy. The method is linear interpolation from one period to the next.

Subroutine DETLDC - (MOD16080)

This subroutine calculates load duration curves for each year of each demand path, given the input load duration curve and the annual energy and peak demand values for each year of each path.

Subroutine FAIRCK - (MOD17620)

This subroutine determines if any nonhydro Fairbanks-Tanana Valley technologies exist with capacity for each of the years 1-9 (1981-1989). If such technologies exist, then the two least-cost nonhydro Fairbanks-Tanana Valley technologies are forced first in the loading order for 1981-1989. Because the Anchorage-Cook Inlet and Fairbanks-Tanana Valley intertie is restricted in the years 1981-1989, all Fairbanks-Tanana Valley energy requirements are satisfied by Fairbanks-Tanana Valley technologies in years 1-4 (1981-1984) and all Fairbanks-Tanana Valley energy requirements, minus ALLINT gWh, are satisfied by Fairbanks-Tanana Valley technologies in years 5-9 (1985-1989).

Subroutine FLORDR - (MOD18570)

This subroutine is a modification of subroutine LORDER. In FLORDR, the two least-cost nonhydro Fairbanks-Tanana Valley technologies are forced first in the loading order; then the remaining technologies are loaded in the order of increasing cost.

Subroutine SVNUMS - (MOD19400)

This subroutine determines the total installed capacity and energy generation attributable to Anchorage-Cook Inlet and Fairbanks-Tanana Valley technologies for a given year in the planning horizon. This information is used later by subroutine WRTINT in producing the INTR report.

Subroutine SVENG (MOD20280)

This subroutine stores the energy generation for each technology and each year of the planning horizon. This information is used later by subroutine DEMPRT in producing the CPRT report.

Subroutine DEMPRT - (MOD20700)

This subroutine prints an output table to report CPRT.

Subroutine WRTSUM - (MOD21830)

This subroutine prints an output table to report CSUM. When called under the medium demand path, this subroutine also outputs a set of power costs to a data file for subsequent use by the RED model.

Subroutine WRTINT - (MOD23700)

This subroutine prints an output table to report INTR.

6.0 PROGRAM OPERATION

This chapter describes how to run the AREEP program on the Anchorage Data Center's IBM computer. It assumes that the user is familiar with CMS (Conversational Monitor System) file manipulation commands and text editing procedures on the computer system.

DATA FILES

Input data file to and output data files from the AREEP program are predetermined by the file assignments made when the program was installed. Figure 6.1 gives the current file assignments for the AREEP program. Thus before the program is run, the input files (those files with an access of "read") must already exist in the user's disk directory and they must have the same filenames and filetypes as specified in Figure 6.1.

After execution of the program, the output files (those files with an access of "write") are available in the user's disk directory and these output files have the filenames and filetypes listed in Figure 6.1.

The two input files to the program can be prepared by editing the "template" files AREEP DTF and RED DAT. The usual procedure is to copy the input file to a new file with a different filename and/or filetype (e.g., COPYFILE AREEP DTF * AREEP OLD =) and edit the original file (e.g., AREEP DTF). Another means of generating the RED DAT file is to run the program RED. Finally there are 42 files available with the filetype of DTF and filenames ranging from 001 to 045 which can be copied to AREEP DTF. There are also 6 files available with the filename RED and the filetypes of M1A, M1B, M2A, M2B, MM3, MM4, respectively, which can be copied to RED DAT. These 48 files were used in the analyses described in Volume I of the study series.

The 14 output files are created when the program is run. An execution of AREEP will erase any previously created files of the same filenames and filetypes. Thus to save results from a run, it is necessary to copy the output files to new files with different filenames or filetypes (e.g., COPYFILE INTR PRT * INTR OLD =).

Filename	Filetype	File Description	FORTRAN Unit #	Type of Access
FINOUT	OUT	report	1	write
CADD	OUT	report	2	write
PDET	OUT	report	3	write
PCOS	OUT	report	4	write
AREEP	DTF	primary input	5	read
TREE	OUT	report and system error messages	6	write
PRICES	OUT	report	7	write
TPDET	OUT	report	8	write
TPCOS	OUT	report	9	write
TCOST	OUT	report	10	write
DEBUG	OUT	report	11	write
CPRT	PRT	report	12	write
CSUM	PRT	report	13	write
INTR	PRT	report	14	write
AREEP	DAT	data output	19	write
RED	DAT	secondary input (available from program RED)	20	read

FIGURE 6.1. AREEP File Assignments

RUNNING THE PROGRAM

The AREEP program has been installed to run from a user's terminal. Although there is no user/program dialog, the process is interactive in the sense that once the command is given to execute AREEP, the terminal is tied up until the processing stops. AREEP is run by invoking what is called an "exec" file. An annotated listing of the EXEC #2 command file currently used to invoke AREEP is given in Figure 6.2.

The steps in running AREEP are as follows:

1) Log on to the system.

2) Prepare the input files.

3) If necessary rename or copy the input files to files which conform to the filename and filetype conventions given in Figure 6.1.

4) Invoke the AREEP program "exec" file. The command for this is "AREEP".

5) After processing, one of the following two messages will appear:

   "SUCCESSFUL FINISH" - This means that the program has terminated normally. All report files are printed at the central site.

   "!! UNSUCCESSFUL FINISH" - This means that something has caused the program to abort. The report files are not printed. Refer to the output file TREE OUT for any system error messages.

6) The output files are available in the user's disk directory. They may be listed or edited from the terminal.

7) Rename or copy any output files which should be saved before the next AREEP run.

AREEP MODEL ERROR MESSAGE

In the AREEP version of the Over/Under Capacity Planning Model, one model error message has been added to those described on pages 5-12 and 5-13 of the Over/Under User's Guide.

```
&TRACE OFF
&IF X&1 = X? &GOTO -INFO
                                                    ---------- Display
                                                               greeting
CLRSCRN
&BEGPRINT 8
  AREEP  --
            A LASKA
              R AILBELT
                E LECTRICAL
                  E NERGY
                    P LANNING
                      MODEL

                                                    ---------- Make file
                                                               assignments
*   OUTPUT FILE (PRINT)
FI FT01F001 DISK FINOUT OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT02F001 DISK CADD OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT03F001 DISK PDET OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT04F001 DISK PCOS OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   INPUT FILE
FI FT05F001 DISK AREEP DTF A1
*   OUTPUT FILE (PRINT - ALSO HAS SYSTEM ERROR MESSAGES)
FI FT06F001 DISK TREE OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT07F001 DISK PRICES OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT08F001 DISK TPDET OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT09F001 DISK TPCOS OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT10F001 DISK TCOST OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT)
FI FT11F001 DISK DEBUG OUT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT WITH CARRIAGE CONTROL)
FI FT12F001 DISK CPRT PRT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT WITH CARRIAGE CONTROL)
FI FT13F001 DISK CSUM PRT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (PRINT WITH CARRIAGE CONTROL)
FI FT14F001 DISK INTR PRT A1 (RECFM FM LRECL 132 BLOCK 132
*   OUTPUT FILE (DATA)
FI FT19F001 DISK AREEP DAT A1
*   INPUT FILE
FI FT20F001 DISK RED DAT A1
                                                    ---------- Execute AREEP
AREEP
```

FIGURE 6.2. AREEP EXEC 2 Command File

```
&IF &RETCODE NE 0 &GOTO -DONE
                                                  ---------- Successful run -

                                                             Print reports
                                                             at central site
CP SPOOL PRT SYSTEM
*
PRINT FINOUT OUT A1
PRINT CADD OUT A1
PRINT PDET OUT A1
PRINT PCOS OUT A1
PRINT TREE OUT A1
PRINT PRICES OUT A1
PRINT TPDET OUT A1
PRINT TPCOS OUT A1
PRINT TCOST OUT A1
PRINT DEBUG OUT A1
PRINT CPRT PRT A1 (CC
PRINT CSUM PRT A1 (CC
PRINT INTR PRT A1 (CC
*
CP SPOOL PRT * CLOSE
*
&TYPE AREEP  --  SUCCESSFUL FINISH
&EXIT 0
*
                                                  ---------- Type error
                                                             message
-DONE
&TYPE &RETCODE
&TYPE AREEP  --  !! UNSUCCESSFUL FINISH
&EXIT
*
                                                  ---------- Display the
                                                             following when
                                                             user types
                                                             "AREEP ?"
-INFO
CLRSCRN
&BEGPRINT 11

   THIS EXEC RUNS THE AREEP PROGRAM.  ALL FILE ASSIGNMENTS ARE MADE
AND THE AREEP PROGRAM IS CALLED BY THIS EXEC.  NO INTERACTIVE DIALOG
OCCURS IN EITHER THIS EXEC OR THE AREEP PROGRAM.

   AFTER EXECUTION OF AREEP, THE STATUS OF THE RUN IS TYPED.  IF THE
STATUS IS SUCCESS, THEN THIS EXEC SPOOLS THE 3 'PRT' AND 10 'OUT'
FILES TO THE LINE PRINTER.

   NOTE THAT ALL SYSTEM ERROR MESSAGES GO TO THE FILE 'TREE OUT'.

&EXIT 0
```

FIGURE 6.2. contd

This message is:

SUB DETLDC: ITERATION LIMIT OF 10 REACHED

PATH = _____, YEAR = _____, XLDC = _____

XALF = _____, YLFK = _____

The subroutine DETLDC has a limit of 10 iterations for calculating the load duration curve for a given year and demand path. Usually 2-5 iterations are enough. If the limit of 10 iterations is exceeded, then the program will stop and this message will appear on the TREE OUT report. Check the input L.D.C. values (primary data input file, lines 1860-1880) for errors and the input annual energy and peak demand values (secondary input file, lines 7-34) for inconsistencies.

APPENDIX A

AREEP QUICK REFERENCE INPUT

APPENDIX A

AREEP QUICK REFERENCE INPUT

Line		General Parameters	
Old	New		
100	100	TITLE	Title of model run (alphanumeric, columns 13-72).
130	130	FYR	First year of model (integer, columns 10-13).
		THOR	Terminal horizon, in years (integer, columns 18-21).
		CONSTANT-$-SYS	Constant dollars in TCOST and TREE reports ($) and cost levelization with respect to constant system size (SYS) (T or F, columns 33 and 37).
		CONS.DISC	Consumer discount rate (decimal percentage, columns 45-49).
		CD	Capacity-decision model included (T or F, column 55).
		FC	Fixed-charge model included (T or F, column 59).
		PS	Production-simulation model included (T or F, column 64).
		YEARLY	Production costing every year (T or F, column 71). Costing once per period is done if F is entered.
		MWINC	Megawatt increment (decimal value greater than 0, columns 72-77).
160	160	LOW	Lowest planning reserve margin to be evaluated (decimal percentage, columns 14-18).
		HIGH	Highest planning reserve margin to be evaluated (decimal percentage, columns 21-25).
		INC	Increment of planning reserve margin between LOW and HIGH (decimal percentage, columns 27-31).

Line Old	Line New	General Parameters	
		RMBAS	Reserve-margin base differential (decimal percentage, columns 37-42).
		RMINC	Reserve-margin increment (decimal percentage, column 45-50).
		BEGIN	Planning reserve margin before the beginning of a "window" (decimal percentage, columns 56-60).
		WINDOW	Range of years over which planning reserve margins are varied according to LOW-HIGH-INC (integer, columns 64-67 and 69-72).
		END	Planning reserve margin after the end of a "window" (decimal percentage, columns 73-77).
190	190	CADD	Capacity-additions report (T or F, column 21).
		PRICES	Cost-to-consumers-by-year report (T or F, column 31).
		FINOUT	Fixed-charge financial report (T or F, column 41).
		PCOS	Production-cost report (T or F, column 51).
		TPCOS	Terminal-production cost report (T or F, column 59).
		PDET	Production-detail report (T or F, column 69).
		TPDET	Terminal-production detail report (T or F, column 77).
--	220	CPRT	Capacity & energy report (T or F, column 21).
		CSUM	Cost-summary report (T or F, column 31).
		INTR	Anchorage-Fairbanks intertie report (T or F, column 41).

Line Old	Line New		General Parameters
Capacity-Decision (CD)			
440	330 770	TECHNOLOGY HYDRO TECH	Technology names. (alphanumeric, columns 18-23, 24-29, 30-35, 36-41, 42-47, 48-53, 54-59, 60-65, 66-71, for line 330, columns 18-23, 24-29, 30-35, 36-41, 42-47, 48-53, 54-59, for line 770), Technologies #10-16 (line 770) are energy limited. A technology name beginning with an 'A' is considered an Anchorage technology, similarly a name beginning with an 'F' is considered a Fairbanks technology.
450	340 780	CAPFYR(MW)	Rated capacity at beginning of FYR (same columns as lines 330 and 770).
460-570	350-640 790-1080	ADD	Capacity to be added or retired in various years after FYR (same columns as lines 330 and 770). Up to thirty ADD lines can be used.
590	660 1100	CAPLIM(MW)	Capacity limit for each technology (same columns as lines 330 and 770). Five or six 9's should be entered when capacity is unlimited.
600	670 1110	MIX-LONG RN	Target long-run technology mix (same columns as lines 330 and 770). Entries on lines 670 and 1110 should total to one.
610	680 1120	RES MARGIN	Technologies to be included in reserve-margin calculations (T or F, columns 23, 29, 35, 41, 47, 53, 59, 65, 71, for line 680 and columns 23, 29, 35, 41, 47, 53, 59 for line 1120).
620	690 1130	SIZE(MW)	Plant sizes (integer, columns 19-23, 25-29, 31-35, 37-41, 43-47, 49-53, 55-59, 61-65, 67-71, for line 690 and columns 19-23, 25-29, 31-35, 37-41, 43-47, 49-53, 55-59 for line 1130). Use zero for "small plant".
630	700 1140	1ST YR AVL	First year model can make decisions to install or delay plants (integer, same columns as lines 690 & 1130).
640	710 1150	ADD JUS(MW)	Planning reserve margin justification for adding a new plant (same columns as lines 330 and 770). Five 9's means don't add under any circumstances.

Line Old	Line New		General Parameters
Capacity-Decision (CD) (contd)			
650	720 1160	STUDIES (YR)	Lead time for studies (integer greater than or equal to 1, same columns as lines 330 and 770).
660	730 1170	LICENSE (YR)	Lead time for licensing (integer greater than or equal to 1, same columns as lines 330 and 770).
670	740 1180	CONSTR (YR)	Lead time for construction (integer greater than or equal to 1, same columns as lines 330 and 770).
680	750 1190	STARTUP (YR)	Lead time for startup (integer greater than or equal to 0, same columns as lines 330 and 770).
Production Simulation (PS)			
720	1230 1350	TECHNOLOGY HYDRO TECH	Same as lines 330 and 770 (not read by program).
730	1250 1370	MAINT-PEAK	Fraction of annual maintenance scheduled in peak season (same columns as lines 330 and 770).
740	1260 1380	1-F.O.R.	One minus the force outage rate (same columns as lines 330 and 770).
750	1270 1390	EQ AVAIL	Equivalent availability, or maximum-capacity factor (same columns as lines 330 and 770).
770	1290 1410	VC (M/KWH)	Variable cost in mills/kWh (same columns as lines 330 and 770). Fuel cost for technologies 1-9 may be entered separately; see line 1330.
780	1300 1420	VCESC/YR	Variable-cost escalation per year (same columns as lines 330 and 770). Fuel cost escalation for technologies 1-9 may be entered separately; see line 1810.
790	1310 1430	ENV (M/KWH)	Environmental cost in mills/kWh (same columns as lines 330 and 770).
--	1320	HR (BTU/KWH)	Heat rate in Btu/kWh (same columns as line 330).

Line Old	Line New	General Parameters	
Production Simulation (PS) (contd)			
--	1330	FTU	Fuel type used. Indicates one of the fuel types defined in lines 1490-1810. A fuel type of 10 indicates that no defined fuel type is used (integer, 1-10, same columns as line 330).
--	1450	UTIL FACTOR	Utilization factor for technologies 10-16 (decimal percent, same columns as line 770).
--	1480-1790	FUEL COST ($/MMBTU)	Fuel Cost in dollars/mmBtu for each of nine defined fuel types and each year beginning with FYR (columns 18-23, 24-29, 30-35, 36-41, 42-47, 48-53, 54-59, 60-65, 66-71). Up to thirty-one (including FYR) lines can be entered.
--	1810	FC ESC/YR	Fuel cost escalation per year from the last year entered in lines 1480-1790 (decimal percent, same columns as lines 1480-1790).
810	1830	VARIABLE G-A (M/KWH)	Variable general and administrative costs in mills/kWh (columns 28-33).
--	1860	PEAK	Load duration curve data represented as percent of peak demand at 10% of the time, 20% of the time etc., for peak and off-peak seasons, (decimal percent, columns 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59, 60-64).
--	1870	VMLDC	Percentage of the load duration curve adjustment area corresponding to 0-10% of the time, 10-20% of the time, etc. (decimal percent, same columns as line 1860). These values must add to 1.
900	1880	PEAK WIDTH	Percent of the time corresponding to demand midway between peak demand and demand at 10% of the time (decimal percent, columns 20-24).
940	1920	TYPE	Names of emergency actions and unserved energy (alphanumeric, columns 22-28, 29-35, 36-42, 43-49, 50-56, 57-63, 64-70, 71-77). The last column is reserved for unserved energy.

Line Old	Line New	General Parameters	
Production Simulation (PS) (contd)			
950	1930	CAPACITY(MW)	Demand-serving or demand-reducing capacity of emergency actions (same columns as line 1920 except for unserved energy).
960	1940	AVAILABILITY	Probability that emergency action CAPACITY will be available when needed (same columns as line 1920 except for unserved energy).
970	1950	CAP PROP TO DEM?	Emergency-action CAPACITY grows in proportion to demand growth (T or F, columns 28, 35, 42, 49, 56, 63, 70).
980	1960	OUT(T)/VAR(F) COST?	Cost allocated to "outage" or "variable" cost category (T or F, columns 28, 35, 42, 49, 56, 63, 70, 77).
990	1970	COST(M/KWH)	Cost in mills/kWh (same columns as line 1920).
1000	1980	COST.ESC/YR	Annual cost escalation (same columns as line 1920).
Fixed Charge (FC)			
1040	2020 2170	TECHNOLOGY HYDRO TECH	Same as lines 330 and 770 (not read by program).
1060	2040 2190	CC($/KW)	Capital cost per kilowatt (same columns as lines 330 and 770).
1070	2050 2200	CCESC/YR	Capital cost escalation rate per year (decimal percentage, same columns as lines 330 and 770).
1080	2060 2210	OM($/KW-YR)	Fixed operating and maintenance cost per kilowatt per year (same columns as lines 330 and 770).
1100	2080 2230	STUDIES	Annual cost of delay after completion of studies, as percent of capital cost (decimal percent, same columns as lines 330 and 770).
1110	2090 2240	LICENSE	Annual cost of delay after completion of licensing, as percent of capital cost (decimal percent, same columns as lines 330 and 770).

Line Old	Line New		General Parameters
Fixed Charge (FC) (contd)			
1140	2120 2260	TL	Tax life in years (integer, first entry for "distribution" is columns 13-16 and remaining columns are the same as lines 330 and 770).
1150	2130 2270	BL	Book life in years (integer, same columns as lines 2120 and 2260).
--	2150 2290	FIXED-CHARGE RATES	Revenue requirements for each year as percent of capital cost (decimal percent, first entry on line 2150, for "distribution," is columns 11-16 and remaining columns are the same as lines 330 and 770).
1230	2310	DISTRIBUTION CC($/GWH)	Capital cost of non-generating facilities (columns 30-35).
		DESC/YR	Distribution capital-cost escalation rate per year (decimal percent, columns 48-53).
		LOSS AND UNACC	Loss and unaccounted for, equal to one minus the ratio of energy sold to energy generated (columns 73-77).
1260	2340	FYR-ASSETS	Total utility assets at the beginning of the first year (decimal percent, columns 19-27).
		INFLATION	Annual inflation rate (decimal percent, columns 35-40).
		ITC	Investment tax credit rate (decimal percent, columns 43-48).
		ITC-NOR	Investment tax credit normalization (T or F, column 58).
		CWIP	Percent of construction work in progress that is included in rate base (decimal percent, columns 62-67).
		AFUDC	Annual rate at which allowance for funds used during construction compounds (decimal percent, columns 72-77).

Line Old	Line New	General Parameters	
Fixed Charge (FC) (contd)			
1290	2370	EXIST. DEBT	Debt existing during the FYR (year 1), three years after FYR (year 4), etc. (decimal exponential, columns 22-29, 30-37, 38-45, 46-53, 54-61, 62-69, 70-77).
1300	2380	EX. DEBT INT.	Interest on EXIST. DEBT (decimal exponential, same columns as line 2370).
1310	2390	EX. RATE BASE	Existing rate base (decimal exponential, same columns as line 2370).
1320	2410	RATE-BASE GROWTH FYR-1	Growth rate of the rate base from the year prior to FYR (FYR minus 1) to the FYR (decimal percent, columns 41-45).
		REGULATORY LAG (YRS)	Regulatory lag for rate base changes (integer, columns 76-77).
1340	2430	HIST. CAP. COST	Historical cost of capital (decimal percent, columns 22-26).
		MAR. TAX RATE	Marginal tax rate (decimal percent, columns 45-49).
		CASH PCT. INT. PMTS	Percent of interest payments made with operating cash flows (decimal percent, columns 73-77).
--	2450	FUTURE CAPITAL COST	Cost of capital (decimal percent, columns 28-32).

APPENDIX B

AREEP SOURCE CODE

```
C      PROGRAM CAPPLAN(INPUT,OUTPUT,TT,TAPE5=TT,PDET,TAPE3=PDET,PCOS,     00000010
C     +TAPE4=PCOS,FINOUT,TAPE1=FINOUT,CADD,TAPE2=CADD,DEBUG,TAPE11=DEBUG,00000020
C     +PRICES,TAPE7=PRICES,TPCOS,TAPE9=TPCOS,TPDET,TAPE8=TPDET,TCOST,    00000030
C     +TAPE10=TCOST)                                                     00000040
C      INCLUDE (AREEPPR)                                                 MOD00010
C ***** DIMENSION AND DATA STATEMENTS FROM CAPPLAN *****                 00000050
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD00020
C                                                                        MOD00030
C              -- NOTE:  THE ARRAYS ASSOCIATED WITH TECHNOLOGIES         MOD00040
C                        HAVE DIMENSIONS INCREASED FROM 10 TO 16.        MOD00050
C                        ADDITIONALLY, THE ARRAY HA(2) HAS BEEN          MOD00060
C                        REDIMENSIONED TO HA(7,2) AND 2 NEW ARRAYS,      MOD00070
C                        HCUTIL(7) AND HYENPR(7), HAVE BEEN CREATED.     MOD00080
C                        (HYENPR(7) IS DECLARED IN SUBROUTINE PRODUC).   MOD00090
C                        THIS IS TO ACCOMMODATE UP TO 7 HYDROELECTRIC    MOD00100
C                        TECHNOLOGIES RATHER THAN THE 1 ALLOWED IN       MOD00110
C                        THE ORIGINAL PROGRAM.                           MOD00120
C                                                                        MOD00130
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD00140
      DIMENSION GROW(11),Q1(4),EVALUE(31,3),ISCORD(10),TITLE(15),        00000060
     +HYMULT(3)                                                          00000070
C ***** DATA AND COMMON STATEMENTS FOR SET DECISIONS *****              00000080
      DIMENSION LEAD(16,3),RETIRE(16,31),LSTAGE(16,3),CEP(16,31,3),      00000090
     +STAPRT(16,2),COST(7,5),TTOCOS(31),TTECOS(31),TTOOS(31),TTEOS(31)  00000100
      DIMENSION CEXDEM(25),PRMG(25),SCPR(10),ISN(10,10),ISPN(10)         00000110
      LOGICAL DECDET,FFS,AVL(16),RSCEN,PERFCS,OUTC(8),SIDE               00000120
C ***** END OF DIMENSION AND DATA STATEMENTS FROM CAPPLAN*****          00000130
      DIMENSION TKNAM(16,2),AJ(16),CCAP78(16),VCES(16),LO(9,30),         00000140
     +CAPLIM(16),AMIX90(16),NSIZE(16),FCNIDC(16),VC(16),ITENGY(30),      00000150
     +ENV(16),DFP(16),DFO(16),PLAN(16),PERM(16),CONSTR(16),TTTCOS(30),   00000160
     +STARTD(16),TL(16),BL(16),FC1(16),FCTL(16),FCTLH(16),               00000170
     +FCTL1(16),FCBL(16),COC(6),AINT(6),YEARS(5),FCLEV(16),              00000180
     +FIXPRC(100),VARPRC(100),EPROB(5),EGR1(5),EGR14(5),TERMIX(16),      00000190
     +HYPROB(3),CLDC(1500),IAVYR(16),FCESC(16),VCESC(16),DEMFOR(30),     00000200
     +HYEN(3),OUTCAP(8),OUTAV(8),OUTCST(8),HYRN(3),OUTESC(8)             00000210
      DIMENSION LOAD(9),AVAIL(9,2),ALF(2),CAP(16),PKMAIN(16),            00000220
     +NSMAL(16),BLDC(12,2),DBLDC(12),TFC(100),PMAIN(16,2),HA(7,2),       00000230
     +RRM(30),SIZE(16),DEM(30),FENG(2),FTIME(2),IS(30),FOANDM(16)        00000240
      LOGICAL APCDET,RPROD(3,2),CURD,FINDET,RUNFIN,RUNPR,PPDET,MANYD,    00000250
     +LVZ,RUNDEC,TERMIN,RMYES(16),SCHED(16),OCDEM(7),PRCS                00000260
C ***** FINANCIAL DIMENSION AND COMMON STATEMENTS *****                 00000270
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),   00000280
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                              00000290
      COMMON /C3/ EXCPLM(100),CWIP(100),CC,DINT(100),LAGR(16)            00000300
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),         00000310
     + FCWIP(16,13),NCON(16),FAFUDC(16,15),LEN(100),PCWIP,BONDRT(100),   00000320
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78               00000330
     + ,AAMORT(100),CURCAP(16,100),FCESC,ADDION(100),DEPREC(100),        00000340
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),          00000350
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                    00000360
      COMMON /C2/ COV(6),COC,AINT,PRECOV(6)                              00000370
      COMMON /WRITE/ WRI(3)                                              00000380
      DIMENSION LT(16)                                                   00000390
      DIMENSION ISTART(16),CAP78(16),EDEBT(7),OUTTYP(8,2)                00000400
      DIMENSION EDINT(7),RBE(7)                                          00000410
      INTEGER HORIZN,PHORZN                                              00000420
      REAL ITCRAT,INFLA                                                  00000430
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00150
C             - - CAPACITY PRINTOUT INPUT FLAG                          MOD00160
      LOGICAL CPRT                                                      MOD00170
C             - - COST SUMMARY REPORT INPUT FLAG                        MOD00180
      LOGICAL CSUM                                                      MOD00190
C             - - ANCHURAGE-FAIRBANKS INTERTIE REPORT INPUT FLAG        MOD00200
      LOGICAL INTR                                                      MOD00210
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00220
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00230
C            - - VARIABLE MWINC IS REAL TO ACCOMMODATE SMALL SYSTEMS   MOD00240
      REAL  MWINC, MTINC                                                MOD00250
C                                                                       MOD00260
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00270
      LOGICAL WRT,CNDOL,CNSYS,PTPCOS,PTPDET,SYMM,TRUE,FALSE,RSNOT,LITCNR00000440
      EQUIVALENCE(CAP78(1),FCNIDC(1))                                   00000450
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00280
C                                                                       MOD00290
C      DEMAND, ENERGY, AND GROWTH ARRAYS                                MOD00300
C                                                                       MOD00310
      DIMENSION PEAKDM(3,11), AVENGY(3,11), YRLYDM(3,30), ACTGR(30)    MOD00320
C                                                                       MOD00330
C            - - YEARLY ENERGY ARRAY                                    MOD00340
      DIMENSION YRLYEN(3,30)                                            MOD00350
C                LOAD DURATION CURVE COMPUTATION RELATED ARRAYS         MOD00360
      DIMENSION VMLDC(10),XLDC(3,30,12),XALF(3,30),FYLDC(12)            MOD00370
C                SECONDARY INPUT FILE NAME ARRAY                        MOD00380
      DIMENSION SFILE(5)                                                MOD00390
C                CONSERVATION INPUT ARRAYS  (LOW,MED,HIGH)              MOD00400
      DIMENSION AECONS(3,31),PKCONS(3,31),TCCONS(3,31),PCCONS(3,31)     MOD00410
C                                                                       MOD00420
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00430
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00440
C            - - ANCHORAGE, FAIRBANKS INSTALLED CAPACITY AND             MOD00450
C                           ANNUAL GENERATION ARRAYS                    MOD00460
C                                                                       MOD00470
      DIMENSION ACAP(30),FCAP(30),AGEN(30),FGEN(30),XLOLP(30)           MOD00480
C                ANCHORAGE, FAIRBANKS PEAK DEMAND AND ENERGY ARRAYS     MOD00490
      DIMENSION FPEAK(3,11),FENE(3,11),APEAK(3,11),AENE(3,11)           MOD00500
C                ANCHORAGE, FAIRBANKS YEARLY DEMAND AND ENERGY          MOD00510
      DIMENSION FPYRLY(3,30),FEYRLY(3,30),APYRLY(3,30),AEYRLY(3,30)     MOD00520
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00530
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00540
C             - -  GLENNALLEN PEAK DEMAND AND ENERGY                     MOD00550
C                       ALSO YEARLY DEMAND AND ENERGY                   MOD00560
C                                                                       MOD00570
      DIMENSION GPEAK(3,11),GENE(3,11),GPYRLY(3,30),GEYRLY(3,30)        MOD00580
C                                                                       MOD00590
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00600
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00610
C                                                                       MOD00620
C      FOSSIL FUEL ARRAYS                                               MOD00630
C                                                                       MOD00640
      DIMENSION HR(16), IFTU(16), FC(31,10), FUESC(10)                 MOD00650
C                                                                       MOD00660
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD00670
C                                                                       MOD00680
C             - - NEW ARRAYS FOR ADDITIONAL HYDRO TECHNOLOGIES          MOD00690
```

```
C                    HCUTIL = CAPACITY UTILIZATION FACTOR                MOD00700
C                    HYENPR = PROPORTION OF TOTAL HYDRO ENERGY           MOD00710
C                             (DECLARED IN SUBROUTINE PRODUC)            MOD00720
      DIMENSION HCUTIL(7)                                                MOD00730
C                                                                        MOD00740
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD00750
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD00760
C              - - FLAG THAT INDICATES IF THERE EXISTS FAIRBANKS NON-     MOD00770
C                    HYDRO TECHNOLOGIES FOR YEARS 1-9                    MOD00780
C                                                                        MOD00790
      LOGICAL FAIR(9)                                                    MOD00800
C                                                                        MOD00810
C                    INDICES OF FAIRBANKS NON-HYDRO TECHNOLOGIES         MOD00820
C                    AVAILABLE WITH CAPACITY FOR YEARS 1-9               MOD00830
      DIMENSION ITFAIR(9,9)                                              MOD00840
C                    INDICES OF THE 2 LEAST COST FAIRBANKS TECHNOLOGIES  MOD00850
C                         FOR THE 9 YEARS 1981-1989                      MOD00860
      DIMENSION LCFAIR(2,9)                                              MOD00870
C                                                                        MOD00880
C              - -  NEW ARRAY FOR EACH TECHNOLOGY'S YEARLY GENERATION.   MOD00890
C                   SUBROUTINE SVENG STORES INTO THE ARRAY AND THE       MOD00900
C                   ENERGY TABLE IS PRINTED IN SUBROUTINE DEMPRT         MOD00910
C                                                                        MOD00920
      DIMENSION TECHEN(16,30)                                            MOD00930
C                                                                        MOD00940
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD00950
C ***** END OF FINANCIAL DIMENSION AND COMMON STATEMENTS *****           00000460
C                                                                        00000470
      DATA TTENGY,TTTCOS,ISN,PMAIN,HA/30*0.,30*0.,100*0,32*0.,14*0./     00000480
      DATA CEP,NSMAL,AVAIL,SCPR,ISPN/1488*0.,16*0,18*0.,10*0.,10*0/      00000490
      DATA RETIRE,DEMFOR/496*0.,30*0./                                   00000500
      DATA GROW,EVALUE,TTOCOS,TTECOS/11*0.,93*0.,31*0.,31*0./            00000501
      DATA TTOOS,TTEOS,PRMG,VCES/31*0.,31*0.,25*0.,16*0./                00000502
      DATA YEARS,OUTCAP,LOAD,RRM,DEM/5*0.,8*0.,9*0,30*0.,30*0./          00000503
      DATA ENS78,CFT,AMM,TVC,CSOUT,CSENV/0.,0.,0.,0.,0.,0./              00000510
C     DATA LAGR,LEN/16*0,100*1/                                          00000520
      DATA CLDC/1.249,1.06,.890,.74,.61,.5,.41,.34,.29,.26,              00000530
     +1.880,1.182,.759,.502,.346,.250,.190,.151,.127,.116,               00000540
     +2.518,1.217,.643,.375,.241,.167,.123,.096,.079,.071,               00000550
     +3.171,1.199,.548,.298,.184,.125,.091,.070,.057,.050,               00000560
     +3.824,1.154,.474,.246,.149,.100,.072,.055,.044,.039,1450*0./       00000570
      DATA TRUE,FALSE,AUD/.TRUE.,.FALSE.,5HADD/                          00000580
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD00960
C                                                                        MOD00970
C                                                                        MOD00980
      DATA FYR /3HFYR/                                                   MOD00990
      DATA FC, FUESC /310*0.0,10*0.0/                                    MOD01000
C                                                                        MOD01010
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01020
      DATA LCFAIR /18*0/                                                 MOD01030
C                                                                        MOD01040
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01050
C                                                                        MOD01060
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01070
C                                                                        MOD01080
C          OPEN OUTPUT FILES WITH CARRIAGE CONTROL EQUAL TO              MOD01090
C               LIST  (FOR THE LINE PRINTER)                             MOD01100
```

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C                THE FILENAMES ARE ASSIGNED OUTSIDE THE PROGRAM                 MOD01110
C                                                                               MOD01120
C                                                                               MOD01130
C     OPEN (UNIT=1,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01140
C     OPEN (UNIT=2,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01150
C     OPEN (UNIT=3,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01160
C     OPEN (UNIT=4,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01170
C                                                                               MOD01180
C     UNIT 5 IS THE INPUT FILE                                                  MOD01190
C     PRINT STATEMENT OUTPUT GOES TO LOGICAL FILE 'FORSPRINT',                  MOD01200
C        SO THE CC FEATURE FOR THE PRINTER IS DONE WITH THE                     MOD01210
C        VAX COMMAND LANGUAGE OUTSIDE THE EXECUTION OF THE                      MOD01220
C        PROGRAM                                                                MOD01230
C                                                                               MOD01240
C     OPEN (UNIT=7,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01250
C     OPEN (UNIT=8,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01260
C     OPEN (UNIT=9,CARRIAGECONTROL='LIST',STATUS='NEW')                         MOD01270
C     OPEN (UNIT=10,CARRIAGECONTROL='LIST',STATUS='NEW')                        MOD01280
C     OPEN (UNIT=11,CARRIAGECONTROL='LIST',STATUS='NEW')                        MOD01290
C                                                                               MOD01300
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01310
C              - - UNIT 12 ADDED FOR CAPACITY PRINTOUT                          MOD01320
C      OPEN (UNIT=12,CARRIAGECONTROL='FORTRAN',STATUS='NEW')                    MOD01330
C              - - UNIT 13 ADDED FOR TOTAL COST SUMMARY REPORT                  MOD01340
C      OPEN (UNIT=13,CARRIAGECONTROL='FORTRAN',STATUS='NEW')                    MOD01350
C              - - UNIT 14 ADDED FOR ANCHORAGE-FAIRBANKS INTERTIE REPORT        MOD01360
C      OPEN (UNIT=14,CARRIAGECONTROL='FORTRAN',STATUS='NEW')                    MOD01370
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01380
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01390
C              - - UNIT 19 ADDED FOR RED/(RATE) INPUT FILE 'AREEP.DAT'          MOD01400
C                  THIS FILE CONTAINS THE DELIVERED POWER COST FOR              MOD01410
C                  EACH PRM AND PLANNING YEAR UNDER THE MEDIUM PATH             MOD01420
C                  (FILE IS WRITTEN TO IN SUBROUTINE WRTSUM)                    MOD01430
C                                                                               MOD01440
C      OPEN (UNIT=19,CARRIAGECONTROL='LIST',STATUS='NEW')                       MOD01450
C                                                                               MOD01460
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01470
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01480
C                                                                               MOD01490
C                                                                               MOD01500
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01510
C              - - UP TO 16 TECHNOLOGIES                                        MOD01520
C     NGTEC=10                                                                  00000590
      NGTEC=16                                                                  MOD01530
      NCONM=12                                                                  00000600
C     DO  8824 MIKE=1,10                                                        00000610
      DO  8824 MIKE=1,16                                                        MOD01540
8824  LAGR(MIKE)=0                                                              00000620
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD01550
      DO 8828  MIKE=1,100                                                       00000630
8828  LEN(MIKE)=1                                                               00000640
C READ IN DATA REQUIREMENTS                                                     00000650
      READ(5,4700)(TITLE(I),I=1,15)                                             00000660
      READ(5,4702)YEARS(1),ITHOR,CNDOL,CNSYS,CDSC,RUNDEC,RUNFIN,                00000670
     +RUNPR,LVZ,MWINC                                                           00000680
      READ(5,4704)PRML,PRMH,PRMI,RMBAS,RMINC,PRMDEF,IFRMYR,                     00000690
     +ILRMYR,PRMAFT                                                             00000700
```

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      READ(5,4706)DECDET,PRCS,FINDET,APCDET,PTPCOS,PPDET,PTPDET          00000710
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01560
C              - - CAPACITY PRINTOUT INPUT FLAG - CPRT                   MOD01570
C              - - AND COST SUMMARY REPORT INPUT FLAG - CSUM              MOD01580
C              - - AND ANCHORAGE-FAIRBANKS INTERTIE REPORT FLAG - INTR    MOD01590
      READ (5,4706) CPRT, CSUM, INTR                                     MOD01600
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01610
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01620
C              - - THE FOLLOWING PARAMETERS ARE NOW INITIALIZED           MOD01630
C                    IN SUBROUTINE INCONS                                 MOD01640
C     READ(5,4708)NP,NYPP,NB,Q,RSNOT,NSCEN,PERFCS                        00000720
C                                                                        MOD01650
C     GET CONSTANTS                                                      MOD01660
C                                                                        MOD01670
      CALL INCONS (ALPHA,FCPER1,FCPER2,FCPER3,                           MOD01680
C              - - VARIABLE ALLINT - - CONTAINS THE ANCHORAGE - FAIRBANKS MOD01690
C                                      INTERTIE LIMITATION FOR YRS 5-9    MOD01700
     +             ALLINT,                                               MOD01710
     +            NP,NYPP,NB,Q,RSNOT,NSCEN,PERFCS,COINF)                 MOD01720
C                                                                        MOD01730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01740
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01750
C                                                                        MOD01760
C     DO 4713 I=1,10                                                     00000730
C     IF(NB.NE.3)READ(5,4710)ISPN(I),(ISN(I,J),J=1,10)                   00000740
C     IF(NB.EQ.3)READ(5,4712)ISPN(I),(ISN(I,J),J=1,10)                   00000750
C4713 CONTINUE                                                           00000760
C     READ(5,4714)(EPROB(I),I=1,5)                                       00000770
C     READ(5,4716)DEM78,NYF,(EGR1(I),I=1,5)                              00000780
C     READ(5,4718)NYL,(EGR14(I),I=1,5)                                   00000790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01770
C                                                                        MOD01780
C     USE THE ISPN ARRAY FOR PATH INDEX                                  MOD01790
C         (IF THE NUMBER OF PATHS IS ONE, ASSUME MED PATH=2)             MOD01800
C                                                                        MOD01810
      DO 47131 I=1,3                                                     MOD01820
         IF (NSCEN .EQ. 1) ISPN(I)=2                                     MOD01830
         IF (NSCEN .EQ. 3) ISPN(I)=I                                     MOD01840
47131 CONTINUE                                                           MOD01850
C                                                                        MOD01860
C                                                                        MOD01870
C     READ PEAK DEMAND AND AVERAGE ENERGY FOR EACH PERIOD                MOD01880
C         OF EACH PATH                                                   MOD01890
C                                                                        MOD01900
      NPP1=NP + 1                                                        MOD01910
C                                                                        MOD01920
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD01930
C              - - DATA NOW ON THE SECONDARY FILE -                      MOD01940
C                                                                        MOD01950
C     SECONDARY FILE NAME                                                MOD01960
      READ (5,47102) SFILE                                               MOD01970
      SFILE(5)=0.0                                                       MOD01980
C                                                                        MOD01990
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD02000
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD02010
C              - - MODIFICATIONS TO THE INPUT STRUCTURE                  MOD02020
C                  INFORMATION FOR THE FIRST 9 TECHNOLOGIES IS READ,     MOD02030
```

```
C                  THEN THE INFORMATION FOR THE REMAINING 7 HYDRO        MOD02040
C                  TECHNOLOGIES IS READ.                                 MOD02050
C                                                                        MOD02060
C     READ(5,4720)((TKNAM(I,J),J=1,2),I=1,10)                           00000800
      READ (5,4720) ((TKNAM(I,J),J=1,2),I=1,9)                          MOD02070
C     READ(5,4722)(CCAP78(I),I=1,10)                                    00000810
      READ (5,4722) (CCAP78(I),I=1,9)                                   MOD02080
      LR=NP*NYPP                                                        00000820
      LRP1=LR+1                                                         00000830
      NS=3                                                              00000840
      DO 4725 J=2,31                                                    00000850
C     READ(5,4726)FNAME,(CAPLIM(I),I=1,10)                              00000860
      READ (5,4726) FNAME,(CAPLIM(I),I=1,9)                             MOD02090
      IF(FNAME.NE.ADD)GOTO 4727                                         00000870
C     DO 4729 K=1,10                                                    00000880
      DO 4729 K=1,9                                                     MOD02100
4729  CEP(K,J,NS)=CAPLIM(K)                                             00000890
4725  CONTINUE                                                          00000900
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD02110
C                                                                       MOD02120
C     IF 'ADD +' FOR 30 YEARS, SKIP COMMENT LINE                        MOD02130
      READ (5,4726) FNAME                                               MOD02140
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD02150
4727  CONTINUE                                                          00000910
C     READ(5,4722)(CAPLIM(I),I=1,10)                                    00000920
      READ (5,4722) (CAPLIM(I),I=1,9)                                   MOD02160
C     READ(5,4722)(AMIX90(I),I=1,10)                                    00000930
      READ (5,4722) (AMIX90(I),I=1,9)                                   MOD02170
C     READ(5,4728)(RMYES(I),I=1,10)                                     00000940
      READ (5,4728) (RMYES(I),I=1,9)                                    MOD02180
C     READ(5,4730)(NSIZE(I),I=1,10)                                     00000950
      READ (5,4730) (NSIZE(I),I=1,9)                                    MOD02190
C     READ(5,4730)(IAVYR(I),I=1,10)                                     00000960
      READ (5,4730) (IAVYR(I),I=1,9)                                    MOD02200
C     READ(5,4722)(AJ(I),I=1,10)                                        00000970
      READ (5,4722) (AJ(I),I=1,9)                                       MOD02210
C     READ(5,4722)(PLAN(I),I=1,10)                                      00000980
      READ (5,4722) (PLAN(I),I=1,9)                                     MOD02220
C     READ(5,4722)(PERM(I),I=1,10)                                      00000990
      READ (5,4722) (PERM(I),I=1,9)                                     MOD02230
C     READ(5,4722)(CONSTR(I),I=1,10)                                    00001000
      READ (5,4722) (CONSTR(I),I=1,9)                                   MOD02240
C     READ(5,4722)(STARTD(I),I=1,10)                                    00001010
      READ (5,4722) (STARTD(I),I=1,9)                                   MOD02250
C                                                                       MOD02260
      READ (5,47201) ((TKNAM(I,J),J=1,2),I=10,16)                       MOD02270
      READ (5,4722) (CCAP78(I),I=10,16)                                 MOD02280
      DO 47251 J=2,31                                                   MOD02290
      READ (5,4726) FNAME,(CAPLIM(I),I=10,16)                           MOD02300
      IF (FNAME .NE. ADD) GO TO 47271                                   MOD02310
      DO 47291 K=10,16                                                  MOD02320
47291 CEP(K,J,NS)=CAPLIM(K)                                             MOD02330
47251 CONTINUE                                                          MOD02340
      READ (5,4726) FNAME                                               MOD02350
47271 CONTINUE                                                          MOD02360
      READ (5,4722) (CAPLIM(I),I=10,16)                                 MOD02370
      READ (5,4722) (AMIX90(I),I=10,16)                                 MOD02380
```

```
      READ (5,4728) (RMYES(I),I=10,16)                                  MOD02390
      READ (5,4730) (NSIZE(I),I=10,16)                                  MOD02400
      READ (5,4730) (IAVYR(I),I=10,16)                                  MOD02410
      READ (5,4722) (AJ(I),I=10,16)                                     MOD02420
      READ (5,4722) (PLAN(I),I=10,16)                                   MOD02430
      READ (5,4722) (PERM(I),I=10,16)                                   MOD02440
      READ (5,4722) (CONSTR(I),I=10,16)                                 MOD02450
      READ (5,4722) (STARTD(I),I=10,16)                                 MOD02460
C                                                                       MOD02470
C     READ(5,4732)(PKMAIN(I),I=1,10)                                    00001020
      READ (5,4732) (PKMAIN(I),I=1,9)                                   MOD02480
C     READ(5,4722)(DFO(I),I=1,10)                                       00001030
      READ (5,4722) (DFO(I),I=1,9)                                      MOD02490
C     READ(5,4722)(DFP(I),I=1,10)                                       00001040
      READ (5,4722) (DFP(I),I=1,9)                                      MOD02500
C     READ(5,4734)(VC(I),I=1,10)                                        00001050
      READ (5,4734) (VC(I),I=1,9)                                       MOD02510
C     READ(5,4722)(VCESC(I),I=1,10)                                     00001060
      READ (5,4722) (VCESC(I),I=1,9)                                    MOD02520
C     READ(5,4722)(ENV(I),I=1,10)                                       00001070
      READ (5,4722) (ENV(I),I=1,9)                                      MOD02530
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD02540
C                                                                       MOD02550
C                                                                       MOD02560
      READ (5,4722) (HR(I),I=1,9)                                       MOD02570
      READ (5,4730) (IFTU(I),I=1,9)                                     MOD02580
C                                                                       MOD02590
      READ (5,47301)                                                    MOD02600
      READ (5,4722) (PKMAIN(I),I=10,16)                                 MOD02610
      READ (5,4722) (DFO(I),I=10,16)                                    MOD02620
      READ (5,4722) (DFP(I),I=10,16)                                    MOD02630
      READ (5,4734) (VC(I),I=10,16)                                     MOD02640
      READ (5,4722) (VCESC(I),I=10,16)                                  MOD02650
      READ (5,4722) (ENV(I),I=10,16)                                    MOD02660
C     HYDRO CAPACITY UTILIZATION FACTORS                                MOD02670
      READ (5,4734) (HCUTIL(I),I=1,7)                                   MOD02680
C                                                                       MOD02690
      READ (5,47301)                                                    MOD02700
      DO 47272 J=1,31                                                   MOD02710
         READ (5,4726) FNAME, (FC(J,I),I=1,9)                           MOD02720
         IF (FNAME .NE. FYR) GO TO 47273                                MOD02730
47272 CONTINUE                                                          MOD02740
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD02750
C                                                                       MOD02760
C     IF 'FYR +' FOR 30 YEARS, SKIP COMMENT LINE                       MOD02770
      READ (5,4726) FNAME                                               MOD02780
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD02790
      IYFDE=31                                                          MOD02800
      GO TO 47274                                                       MOD02810
C                                                                       MOD02820
47273 IYFDE=J - 1                                                       MOD02830
47274 CONTINUE                                                          MOD02840
      READ (5,4722) (FUESC(I),I=1,9)                                    MOD02850
C                                                                       MOD02860
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD02870
      READ(5,4736)OM                                                    00001080
C             - - THE FOLLOWING VARIABLES ARE INITIALIZED IN            MOD02880
```

```
C                    SUBROUTINE SETPAR                                  MOD02890
C     READ(5,4738)(HYPROB(I),I=1,3)                                     00001090
C     READ(5,4740)(HYEN(I),I=1,3)                                       00001100
C     READ(5,4740)(HYMULT(I),I=1,3),HYINC                               00001110
C     READ(5,4742)(BLDC(I,1),I=2,11),FENG(1),FTIME(1)                   00001120
      CALL SETPAR (HYPROB,HYEN,HYMULT,HYINC,FENG,FTIME,                 MOD02900
     +             COV,PRERT,DBTRT)                                     MOD02910
      READ (5,4742) (BLDC(I,1),I=2,11)                                  MOD02920
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD02930
C           - - VMLDC REPLACES OFF-PEAK LDC                            MOD02940
C                OFF-PEAK LDC IS ASSUMED EQUAL TO PEAK LDC             MOD02950
C     READ(5,4744)(BLDC(I,2),I=2,11)                                    00001130
      READ (5,4744) (VMLDC(I),I=1,10)                                   MOD02960
C                                                                       MOD02970
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD02980
      READ(5,4746)PW                                                    00001140
      READ(5,4748)((OUTTYP(I,J),J=1,2),I=1,8)                           00001150
      READ(5,4750)(OUTCAP(I),I=1,7)                                     00001160
      READ(5,4750)(OUTAV(I),I=1,7)                                      00001170
      READ(5,4752)(OCDEM(I),I=1,7)                                      00001180
      READ(5,4752)(OUTC(I),I=1,8)                                       00001190
      READ(5,4750)(OUTCST(I),I=1,8)                                     00001200
      READ(5,4750)(OUTESC(I),I=1,8)                                     00001210
C                                                                       MOD02990
C     READ(5,4732)(FCNIDC(I),I=1,10)                                    00001220
      READ (5,4732) (FCNIDC(I),I=1,9)                                   MOD03000
C     READ(5,4722)(FCESC(I),I=1,10)                                     00001230
      READ (5,4722) (FCESC(I),I=1,9)                                    MOD03010
C     READ(5,4722)(FOANDM(I),I=1,10)                                    00001240
      READ (5,4722) (FOANDM(I),I=1,9)                                   MOD03020
C     READ(5,4734)(STAPRT(I,1),I=1,10)                                  00001250
      READ (5,4734) (STAPRT(I,1),I=1,9)                                 MOD03030
C     READ(5,4722)(STAPRT(I,2),I=1,10)                                  00001260
      READ (5,4722) (STAPRT(I,2),I=1,9)                                 MOD03040
C     READ(5,4754)LTD,(TL(I),I=1,10)                                    00001270
      READ (5,4754) LTD,(TL(I),I=1,9)                                   MOD03050
C     READ(5,4756)LBD,(BL(I),I=1,10)                                    00001280
      READ (5,4756) LBD,(BL(I),I=1,9)                                   MOD03060
C     READ(5,4758)DF1,(FC1(I),I=1,10)                                   00001290
      READ (5,4758) DF1,(FC1(I),I=1,9)                                  MOD03070
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03080
C           - - THE INPUTS RELATING TO FIXED CHARGE PROFILES AND        MOD03090
C                CUSTS OF CAPITAL HAVE BEEN MODIFIED SO THAT           MOD03100
C                ONLY CERTAIN VALUES NEED BE INPUT.  THE               MOD03110
C                REMAINING VALUES ARE ASSUMED TO BE EITHER THE         MOD03120
C                SAME FOR ALL RUNS OR EQUAL TO ONE OF THE INPUT        MOD03130
C                VALUES.                                               MOD03140
C                                                                      MOD03150
C     READ(5,4758)DF2,(FCTLH(I),I=1,10)                                 00001300
C     READ (5,4758) DF2,(FCTLH(I),I=1,9)                                MOD03160
C     READ(5,4758)DF3,(FCTL(I),I=1,10)                                  00001310
C     READ (5,4758) DF3,(FCTL(I),I=1,9)                                 MOD03170
C     READ(5,4758)DF4,(FCTL1(I),I=1,10)                                 00001320
C     READ (5,4758) DF4,(FCTL1(I),I=1,9)                                MOD03180
C     READ(5,4758)DF5,(FCBL(I),I=1,10)                                  00001330
C     READ (5,4758) DF5,(FCBL(I),I=1,9)                                 MOD03190
C                                                                       MOD03200
```

```
      READ (5,47301)                                                    MOD03210
      READ (5,4722) (FCNIDC(I),I=10,16)                                 MOD03220
      READ (5,4722) (FCESC(I),I=10,16)                                  MOD03230
      READ (5,4722) (FOANDM(I),I=10,16)                                 MOD03240
      READ (5,4734) (STAPRT(I,1),I=10,16)                               MOD03250
      READ (5,4722) (STAPRT(I,2),I=10,16)                               MOD03260
      READ (5,4734) (TL(I),I=10,16)                                     MOD03270
      READ (5,4722) (BL(I),I=10,16)                                     MOD03280
      READ (5,4734) (FC1(I),I=10,16)                                    MOD03290
C     READ (5,4722) (FCTLH(I),I=10,16)                                  MOD03300
C     READ (5,4722) (FCTL(I),I=10,16)                                   MOD03310
C     READ (5,4722) (FCTL1(I),I=10,16)                                  MOD03320
C     READ (5,4722) (FCBL(I),I=10,16)                                   MOD03330
C                                                                       MOD03340
C                                                                       MOD03350
C             FIXED-CHARGE PROFILE VALUES THE SAME FOR EACH TECHNOLOGY  MOD03360
C                                                                       MOD03370
      DF2=DF1                                                           MOD03380
      DF3=DF1                                                           MOD03390
      DF4=DF1                                                           MOD03400
      DF5=DF1                                                           MOD03410
      DO 47280 I=1,16                                                   MOD03420
      FCTLH(I)=FC1(I)                                                   MOD03430
      FCTL(I)=FC1(I)                                                    MOD03440
      FCTL1(I)=FC1(I)                                                   MOD03450
      FCBL(I)=FC1(I)                                                    MOD03460
47280 CONTINUE                                                          MOD03470
C                                                                       MOD03480
      READ(5,4760)DISTRA,DISESC,ELOSS                                   00001340
      READ(5,4762)ASS78,INFLA,ITCRAT,LITCNR,PCWIP,ARATE                 00001350
      READ(5,4764)(EDEBT(I),I=1,7)                                      00001360
      READ(5,4766)(EDINT(I),I=1,7)                                      00001370
      READ(5,4766)(RBE(I),I=1,7)                                        00001380
      READ(5,4768)BGRO,LAGREG                                           00001390
      READ(5,4770)COCHIS,TAXMAR,FAIADJ                                  00001400
C             - - COV, PRERT, AND DBTRT INITIALIZED IN SUBROUTINE       MOD03490
C                     SETPAR ABOVE.                                     MOD03500
C                     ONLY EMBCOM IS READ IN; COC, PRECOV, EMBPRE,      MOD03510
C                     AINT, AND EMBDRT ARE SET TO THIS INPUT VALUE.     MOD03520
C                                                                       MOD03530
C     READ(5,4772)(COV(I),I=1,6)                                        00001410
C     READ(5,4774)(COC(I),I=1,6),EMBCOM                                 00001420
C     READ(5,4776)(PRECOV(I),I=1,6),PRERT,EMBPRE                        00001430
C     READ(5,4776)(AINT(I),I=1,6),DBTRT,EMBDRT                          00001440
C                                                                       MOD03540
      READ (5,47741) EMBCOM                                             MOD03550
      EMBPRE=EMBCOM                                                     MOD03560
      EMBDRT=EMBCOM                                                     MOD03570
      DO 47281 I=1,6                                                    MOD03580
      COC(I)=EMBCOM                                                     MOD03590
      PRECOV(I)=EMBCOM                                                  MOD03600
      AINT(I)=EMBCOM                                                    MOD03610
47281 CONTINUE                                                          MOD03620
C                                                                       MOD03630
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03640
4700  FORMAT(12X,15A4)                                                  00001450
4702  FORMAT(//9X,F4.0,4X,I4,                                           00001460
```

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C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03650
C              - - MWINC IS NOW REAL                                            MOD03660
C     +8X,2(3X,L1),7X,F5.3,2X,2(3X,L1),4X,L1,6X,L1,I6)                          00001470
      +8X,2(3X,L1),7X,F5.3,2X,2(3X,L1),4X,L1,6X,L1,F6.0)                        MOD03670
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03680
4704  FORMAT(//13X,F5.2,1X,2(1X,F5.2),3X,2(2X,F6.3),5X,F5.2,                    00001480
     +3X,I4,1H,I4,F5.2 )                                                        00001490
4706  FORMAT(//11X,3(9X,L1),2(9X,L1,7X,L1) )                                    00001500
C4708 FORMAT(////19X,I2,10X,I2,9X,I2,4X,F5.3,6X,L1,5X,I2,9X,L1//)               00001510
4710  FORMAT(51X,I2,2X,10I1)                                                    00001520
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03690
C                                                                               MOD03700
47101 FORMAT (1X,/)                                                             MOD03710
47102 FORMAT (//////,18X,5A4)                                                   MOD03720
C                                                                               MOD03730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03740
4712  FORMAT(22X,I2,2X,10I1)                                                    00001530
4714  FORMAT(/47X,5(1X,F5.3) )                                                  00001540
4716  FORMAT(16X,F6.0,23X,I2,5(1X,F5.3) )                                       00001550
4718  FORMAT(45X,I2,5(1X,F5.3) )                                                00001560
4720  FORMAT(///17X,10(A4,A2) )                                                 00001570
47201 FORMAT (/17X,7(A4,A2))                                                    MOD03750
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03760
4722  FORMAT(17X,10F6.0 )                                                       00001580
4726  FORMAT(6X,A3,8X,10F6.0)                                                   00001590
4728  FORMAT(17X,10(5X,L1) )                                                    00001600
4730  FORMAT(17X,10(1X,I5) )                                                    00001610
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03770
C                                                                               MOD03780
47301 FORMAT (//)                                                               MOD03790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD03800
4732  FORMAT(/////17X,10F6.0 )                                                  00001620
4734  FORMAT(/17X,10F6.0 )                                                      00001630
4736  FORMAT(/27X,F6.2 )                                                        00001640
4738  FORMAT(/25X,3(2X,F7.3),19X )                                              00001650
4740  FORMAT(25X,3(2X,F7.0),19X,3PF6.0 )                                        00001660
4742  FORMAT(//14X,10F5.3,F7.3,F6.3 )                                           00001670
4744  FORMAT(14X,10F5.3 )                                                       00001680
4746  FORMAT(19X,F5.3 )                                                         00001690
4748  FORMAT(///21X,8(A4,A3) )                                                  00001700
4750  FORMAT(21X,8F7.0 )                                                        00001710
4752  FORMAT(21X,8(6X,L1) )                                                     00001720
4754  FORMAT(//12X,I4,1X,10F6.0 )                                               00001730
C4756 FORMAT(12X,I4,1X,10F6.0/)                                                 00001740
4756  FORMAT (12X,I4,1X,9F6.0,/)                                                MOD03810
4758  FORMAT(10X,F6.3,1X,10F6.3 )                                               00001750
4760  FORMAT(/29X,F6.0,12X,F6.4,19X,F5.3 )                                      00001760
4762  FORMAT(//18X,E9.2,5X,2(2X,F6.3),9X,L1,3X,F6.3,4X,F6.3 )                   00001770
4764  FORMAT(//21X,7E8.3 )                                                      00001780
4766  FORMAT(21X,7E8.3 )                                                        00001790
4768  FORMAT(/40X,F5.3,30X,I2 )                                                 00001800
4770  FORMAT(/21X,F5.3,18X,F5.3,23X,F5.2 )                                      00001810
4772  FORMAT(/24X,6F5.1 )                                                       00001820
4774  FORMAT(24X,6F5.3,18X,F5.3 )                                               00001830
47741 FORMAT (/27X,F5.0)                                                        MOD03820
4776  FORMAT(24X,6F5.3,7X,F5.3,6X,F5.3 )                                        00001840
C ***** INITIAL OPERATIONS ************************************               00001850
```

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C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
C
C           - - READ SECONDARY FILE AND ADJUST DEMAND AND ANN ENERGY
C
      CALL READSF (SFILE,NPP1,PEAKDM,AVENGY,LRP1,
C    +            AECONS,PKCONS,TCCONS,PCCONS)
C           - - ADDITIONAL PARAMETERS FOR SUBROUTINE WRTINT
     +            AECONS,PKCONS,TCCONS,PCCONS,FPEAK,FENE,APEAK,AENE,
C           - - ADDITIONAL PARAMETERS FOR GLENNALLEN
     +            GPEAK,GENE)
C
      DO 1 I=1,NSCEN
      DO 1 J=1,NPP1
         PEAKDM(ISPN(I),J)=PEAKDM(ISPN(I),J)*COINF*(1. + ELOSS)
         AVENGY(ISPN(I),J)=AVENGY(ISPN(I),J)*(1. + ELOSS)
C
         FPEAK(ISPN(I),J)=FPEAK(ISPN(I),J)*(1. + ELOSS)
         FENE(ISPN(I),J)=FENE(ISPN(I),J)*(1. + ELOSS)
         APEAK(ISPN(I),J)=APEAK(ISPN(I),J)*(1. + ELOSS)
         AENE(ISPN(I),J)=AENE(ISPN(I),J)*(1. + ELOSS)
C           - - CALCULATIONS FOR GLENNALLEN
         GPEAK(ISPN(I),J)=GPEAK(ISPN(I),J)*(1. + ELOSS)
         GENE(ISPN(I),J)=GENE(ISPN(I),J)*(1. + ELOSS)
    1 CONTINUE
C
      DO 3 I=1,NSCEN
      DO 3 J=1,LRP1
         PKCONS(ISPN(I),J)=PKCONS(ISPN(I),J)*COINF
    3 CONTINUE
C
      DEM78=PEAKDM(ISPN(2),1)
      AVE78=AVENGY(ISPN(2),1)
C
      FP78=FPEAK(ISPN(2),1)
      AP78=APEAK(ISPN(2),1)
      FE78=FENE(ISPN(2),1)
      AE78=AENE(ISPN(2),1)
C           - - CALCULATIONS FOR GLENNALLEN
      GP78=GPEAK(ISPN(2),1)
      GE78=GENE(ISPN(2),1)
C
C     CALCULATE DEMAND AND ENERGY PER YEAR
      CALL DEMPYR (PEAKDM,AVENGY,YRLYDM,YRLYEN,ISPN,NYPP,NP,NSCEN,
C           - - ADDITIONAL PARAMETERS FOR SUBROUTINE WRTINT
     +            FPEAK,FENE,APEAK,AENE,FPYRLY,FEYRLY,APYRLY,AEYRLY,
C           - - ADDITIONAL PARAMETERS FOR GLENNALLEN
     +            GPEAK,GENE,GPYRLY,GEYRLY)
C
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      WRT(1)=FALSE
      WRT(2)=FALSE
      WRT(3)=FALSE
      CURD=TRUE
      NPMAX=10
      RATE1=.8
      WRITE(1,50501)(TITLE(I),I=1,15)
      WRITE(2,50502)(TITLE(I),I=1,15)
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```
      WRITE(3,50503)(TITLE(I),I=1,15)                                   00001940
      WRITE(4,50504)(TITLE(I),I=1,15)                                   00001950
      WRITE(7,50507)(TITLE(I),I=1,15)                                   00001960
      WRITE(8,50508)(TITLE(I),I=1,15)                                   00001970
      WRITE(9,50509)(TITLE(I),I=1,15)                                   00001980
      WRITE(10,50510)(TITLE(I),I=1,15)                                  00001990
      WRITE(11,50511)(TITLE(I),I=1,15)                                  00002000
      PRINT 50506,(TITLE(K),K=1,15)                                     00002010
50501 FORMAT(/15A4,'      FINOUT REPORT')                               00002020
50502 FORMAT(/15A4,'        CADD REPORT')                               00002030
50503 FORMAT(/15A4,'        PDET REPORT')                               00002040
50504 FORMAT(/15A4,'        PCOS REPORT')                               00002050
50506 FORMAT(/15A4,'        TREE REPORT')                               00002060
50507 FORMAT(/15A4,'      PRICES REPORT')                               00002070
50508 FORMAT(/15A4,'       TPDET REPORT')                               00002080
50509 FORMAT(/15A4,'       TPCOS REPORT')                               00002090
50510 FORMAT(/15A4,'       TCOST REPORT')                               00002100
50511 FORMAT(/15A4,'       DEBUG REPORT')                               00002110
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04320
C                                                                       MOD04330
C     WRITE(11,921)((ISN(I,J),J=1,10),I=1,10)                           00002120
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04340
C                                                                       MOD04350
      DO 9212 I=1,NSCEN                                                 MOD04360
         WRITE (11,9211) I,(YRLYDM(ISPN(I),J),J=1,LR)                   MOD04370
9212  CONTINUE                                                          MOD04380
9211  FORMAT (1X,'YEARLY DEMAND, PATH ',I1,':  ',6(F8.0,1X),/,          MOD04390
     1        4(25X,6(F8.0,1X),/))                                      MOD04400
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04410
921   FORMAT((10I1))                                                    00002130
      WRITE(11,7500)(OUTC(I),I=1,8),(OCDEM(I),I=1,7),(OUTAV(I),I=1,8),  00002140
     +(OUTCST(I),I=1,8)                                                 00002150
7500  FORMAT('OUTC,OCDEM,OUTAV,OUTCST:',1X,8L1,1X,7L1/8F7.3/8F7.0)      00002160
C                                                                       00002170
C ***** WARNING STATEMENTS PRINTED TO TREE ********************         00002180
      IF(NYPP*NP.GT.30)PRINT 7775                                       00002190
7775  FORMAT('CAUTION DIMENSION OF EVALUE .GT. 30')                     00002200
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04420
C                                                                       MOD04430
C     IF(NP.GT.10.AND..NOT.RSNOT)PRINT 7774                             00002210
C7774 FORMAT('CAUTION: DIMENSION OF GROW .GT. 10')                      00002220
C                                                                       MOD04440
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04450
C                                                                       00002230
C ***** BEGIN MAIN PROGRAM ************************************         00002240
C                                                                       00002250
C***** ONCE ONLY CALCULATIONS *****                                     00002260
      TMIX=0.                                                           00002270
C                - - UP TO 16 TECHNOLOGIES                              MOD04460
C     DO 2 I=1,10                                                       00002280
      DO 2 I=1,16                                                       MOD04470
2     TMIX=TMIX+AMIX90(I)                                               00002290
C     DO 9 I=1,10                                                       00002300
      DO 9 I=1,16                                                       MOD04480
9     AMIX90(I)=AMIX90(I)/TMIX                                          00002310
      RATE2=1.-RATE1                                                    00002320
C SCHEDULE MAINTENANCE AND CALCULATE AVAILABILITIES                     00002330
```

```
C      DO 10 I=1,10                                                    00002340
       DO 10 I=1,16                                                    MOD04490
       YMAINT=1.-DFP(I)/DFO(I)                                         00002350
       IF(FTIME(1).GT.0.)PMAIN(I,1)=YMAINT*PKMAIN(I)/FTIME(1)          00002360
       IF(FTIME(1).LT.1.)PMAIN(I,2)=YMAINT*(1.-PKMAIN(I))/             00002370
      +(1.-FTIME(1))                                                   00002380
       DO 12 J=1,2                                                     00002390
       IF(PMAIN(I,J).LT.0..OR.PMAIN(I,J).GT.1.)PRINT 5,I               00002400
       PMAIN(I,J)=1.-PMAIN(I,J)                                        00002410
C      IF(I.NE.10)AVAIL(I,J)=DFO(I)                                    00002420
       IF (I .LT. 10) AVAIL(I,J)=DFO(I)                                MOD04500
C      IF(I.EQ.10)HA(J)=DFO(I)*PMAIN(I,J)                              00002430
       IF (I .GE. 10) HA(I-9,J)=DFO(I)*PMAIN(I,J)                      MOD04510
12     CONTINUE                                                        00002440
C      IF(I.NE.10.AND.PMAIN(I,1).LT.PMAIN(I,2))PRINT 4,I               00002450
       IF (I .LT. 10 .AND. PMAIN(I,1) .LT. PMAIN(I,2)) PRINT 4,I       MOD04520
10     CONTINUE                                                        00002460
4      FORMAT('WARNING: MORE MAINTENANCE IS SCHEDULED IN PEAK SEASON',  00002470
      +' THAN IN OFF PEAK SEASON FOR TECHNOLOGY',I3,'.')               00002480
5      FORMAT('WARNING: SEASONS ARE TOO SHORT FOR',                    00002490
      +' TECHNOLOGY',I3,'  MAINENANCE TO BE FULLY SCHEDULED!')         00002500
C      WRITE(11,6)((PMAIN(I,J),I=1,10),J=1,2),((AVAIL(I,J),I=1,9),     00002510
C     +HA(J),J=1,2)                                                    00002520
       WRITE (11,6) ((PMAIN(I,J),I=1,16),J=1,2),((AVAIL(I,J),I=1,9),   MOD04530
      + J=1,2),((HA(I,J),I=1,7),J=1,2)                                 MOD04540
C6     FORMAT('PMAIN(I,J),AVAIL(I,J)'/(10F6.3))                        00002530
 6     FORMAT ('PMAIN(I,J),AVAIL(I,J),HA',/,8F6.3,/,8F6.3,/,8F6.3,/,   MOD04550
      +        8F6.3,/,9F6.3,/,9F6.3,/,7F6.3,/,7F6.3)                  MOD04560
C                                                                      MOD04570
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04580
C SCALE LDC'S SO THAT PEAK=1/(LOAD FACTOR)                             00002540
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04590
C              - - SET UP BLDC ARRAY FOR SUBROUTINE DETLDC             MOD04600
C      DO 40 J=1,2                                                     00002550
C      PEAK AND OFF PEAK ASSUMED THE SAME                              MOD04610
       DO 40 J=1,1                                                     MOD04620
C      ALF(J)=0.                                                       00002560
       BLDC(1,J)=1.                                                    00002570
       DO 20 I=3,12                                                    00002580
20     BLDC(15-I,J)=BLDC(14-I,J)                                       00002590
       BLDC(2,J)=(BLDC(3,J)+BLDC(1,J))/2.                              00002600
C                                                                      MOD04630
C      DO 30 I=3,11                                                    00002610
C30    ALF(J)=ALF(J)+.05*(BLDC(I,J)+BLDC(I+1,J))                       00002620
C      ALF(J)=ALF(J)+.5*(.1-PW)*(BLDC(2,J)+BLDC(3,J))                  00002630
C      ALF(J)=ALF(J)+.5*PW*(BLDC(1,J)+BLDC(2,J))                       00002640
C      DO 35 I=1,12                                                    00002650
C35    BLDC(I,J)=BLDC(I,J)/ALF(J)                                      00002660
C                                                                      MOD04640
40     CONTINUE                                                        00002670
C                                                                      MOD04650
C      NOW CALCULATE LDC'S FOR EACH YEAR                               MOD04660
       CALL DETLDC (BLDC,PW,VMLDC,YRLYDM,YRLYEN,DEM78,AVE78,LR,NSCEN,  MOD04670
      +             ISPN,XLDC,XALF,FYLDC,FYALF)                       MOD04680
C                                                                      MOD04690
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD04700
       DBLDC(1)=PW                                                     00002680
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      DBLDC(2)=0.1-PW                                                   00002690
      DO 60 I=3,12                                                      00002700
60    DBLDC(I)=0.1                                                      00002710
      FENG(2)=1.-FENG(1)                                                00002720
      FTIME(2)=1.-FTIME(1)                                              00002730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD04710
C           - - MWINC IS REAL                                           MOD04720
C     AMWINC=FLOAT(MWINC)                                               00002740
      AMWINC=MWINC                                                      MOD04730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD04740
      CTOT78=0.                                                         00002750
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD04750
C           - - DO LOOP FINAL VALUES CHANGED TO 16 FOR UP TO 16         MOD04760
C                 TECHNOLOGIES                                          MOD04770
C     DO 70 I=1,10                                                      00002760
      DO 70 I=1,16                                                      MOD04780
      SIZE(I)=FLOAT(NSIZE(I))                                           00002770
      IF(RMYES(I))CTOT78=CTOT78+CCAP78(I)                               00002780
70    NSIZE(I)=IFIX(FLOAT(NSIZE(I))/AMWINC+.5)                          00002790
      DO 75 I=1,3                                                       00002800
      DO 75 J=1,2                                                       00002810
75    RPROD(I,J)=HYPROB(I).GT..0005.AND.(FTIME(J).GT..0005.AND.         00002820
     +FENG(J).GT..0005)                                                 00002830
C     DO 77 I=1,10                                                      00002840
      DO 77 I=1,16                                                      MOD04790
      VC(I)=VC(I)/1000.                                                 00002850
77    ENV(I)=ENV(I)/1000.                                               00002860
      DO 78 I=1,8                                                       00002870
78    OUTCST(I)=OUTCST(I)/1000.                                         00002880
      NH=0                                                              00002890
      DO 79 I=1,3                                                       00002900
      IF(HYPROB(I).LT..0005)GOTO 79                                     00002910
      NH=NH+1                                                           00002920
79    CONTINUE                                                          00002930
      IF(NH.NE.1)GOTO 793                                               00002940
      DO 792 I=1,3                                                      00002950
792   IF(HYPROB(I).GT..0005)NHY=1                                       00002960
793   CONTINUE                                                          00002970
C                                                                       00002980
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD04800
C           - - YLF FOR THE FIRST YEAR'S LDC IS FYALF FROM SUB DETLDC   MOD04810
C                                                                       MOD04820
C     IF(FENG(1).LT..0005.OR.FTIME(1).LT..0005)GOTO 7931                00002990
C     YLF=FTIME(1)*ALF(1)*(1.+FENG(2)/FENG(1))                          00003000
C     GOTO 7932                                                         00003010
C7931 YLF=ALF(2)                                                        00003020
C7932 CONTINUE                                                          00003030
C     EN78=DEM78*8.76*YLF                                               00003040
C                                                                       MOD04830
      EN78=DEM78*8.76*FYALF                                             MOD04840
      ENS78=EN78*(1.-ELOSS)                                             00003050
C                                                                       MOD04850
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD04860
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD04870
C                                                                       MOD04880
C     SIGMA=0.                                                          00003060
C     SIG14=0.                                                          00003070
```

```
C       GL=0.                                                           00003080
C       AL=0.                                                           00003090
C       DO 7810 I=1,5                                                   00003100
C       AL=AL+EPROB(I)*EGR14(I)                                         00003110
C       GL=GL+EPROB(I)*EGR1(I)                                          00003120
C       SIG14=SIG14+EPROB(I)*EGR14(I)*EGR14(I)                          00003130
C7810   SIGMA=SIGMA+EPROB(I)*EGR1(I)*EGR1(I)                           00003140
C       SIGMA=SIGMA-GL*GL                                               00003150
C       SIG14=SIG14-AL*AL                                               00003160
C       IF(LR.GT.3.AND.LR.LT.12)GOTO 7811                               00003170
C       IF(LR.LE.3)SIGALR=SIGMA                                         00003180
C       IF(LR.GE.12)SIGALR=SIG14                                        00003190
C       GOTO 7812                                                       00003200
C7811   SIGALR=SIGMA+(SIG14-SIGMA)*FLOAT(LR-3)/9.                      00003210
C7812   CONTINUE                                                        00003220
C       CALL FALPHA(CLDC,SIGMA,SIGALR,NP,NPMAX,ALPHA)                   00003230
C       SIGMA=SQRT(SIGMA)                                               00003240
C       GROW(1)=AL                                                      00003250
C       GC=2.*(AL-GL)/FLOAT(NYL-NYF)                                    00003260
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD04890
C                                                                       MOD04900
C       CALCULATE AL FROM EXPECTED DEMAND (PATH=2)                      MOD04910
        AL=(YRLYDM(2,1FIX(FCPER1)) - DEM78)/(DEM78*FCPER1)              MOD04920
C                                                                       MOD04930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD04940
        WRITE(11,8001)YLF,ALPHA,SIGMA,SIGALR,GL,AL,GC                   00003270
8001    FORMAT('YEARLY LOAD FACTOR,ALPHA,SIGMA,SIGALR,GL,AL,GC:'/       00003280
       +2F7.4,5E12.4,2X,10L1)                                           00003290
        EVALUE(1,2)=0.                                                  00003300
        DF=1./(1.+CDSC)                                                 00003310
        NVCPP=1                                                         00003320
        IF(LVZ)NVCPP=NYPP                                               00003330
        Q1(1)=1.                                                        00003340
        Q1(2)=Q/2.                                                      00003350
        Q1(3)=1.-Q                                                      00003360
        Q1(4)=Q1(2)                                                     00003370
        BETA=1.-ALPHA                                                   00003380
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD04950
C                                                                       MOD04960
C       DLTA=SIGMA/SQRT(Q)                                              00003390
C       IF(NB.EQ.2)DLTA=SIGMA                                           00003400
C                                                                       MOD04970
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD04980
        AIF=INFLA+1.                                                    00003410
        DLR=DF**LR                                                      00003420
        ALR=AIF**LR                                                     00003430
        LRP2=LR+2                                                       00003440
        OMM=OM*1000.                                                    00003450
        LEADMN=100000                                                   00003460
        LEADMX=1                                                        00003470
C       DO 65 I=1,10                                                    00003480
        DO 65 I=1,16                                                    MOD04990
        LEAD(I,1)=IFIX(PLAN(I)+.5)                                      00003490
        LSTAGE(I,1)=LEAD(I,1)                                           00003500
        LEAD(I,2)=IFIX(PERM(I)+.5)                                      00003510
        LSTAGE(I,2)=LEAD(I,2)                                           00003520
        LEAD(I,3)=IFIX(CONSTR(I)+STARTD(I)+.5)                          00003530
```

```
      LSTAGE(I,3)=IFIX(CONSTR(I)+.5)                                    00003540
      AVL(I)=AJ(I).LE.90000                                             00003550
      IF(.NOT.AVL(I))GOTO 65                                            00003560
      L=0                                                               00003570
      DO 66 ISTAG=1,NS                                                  00003580
      IF(LEADMN.GT.LEAD(I,ISTAG))LEADMN=LEAD(I,ISTAG)                   00003590
66    L=L+LEAD(I,ISTAG)                                                 00003600
      IF(LEADMX.LT.L)LEADMX=L                                           00003610
65    CONTINUE                                                          00003620
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05000
      IFFYR=IFIX(YEARS(1)+.5)                                           00003630
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05010
C                                                                       MOD05020
C     FNYL=FLOAT(NYL)                                                   00003640
C     HNYL=FNYL/2.+.5                                                   00003650
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05030
      CALL INICEP(CEP,RETIRE,LR,LRP1,LEAD,NS)                           00003660
      CALL INTEG(RETIRE,1,LR)                                           00003670
      CALL INTEG(CEP,NS,LR)                                             00003680
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05040
C                                                                       MOD05050
C                                                                       MOD05060
C     RSCEN=.NOT.RSNOT                                                  00003690
C     IF(.NOT.RSCEN)GOTO 67                                             00003700
C                                                                       00003710
C FIND SELECTED TREE PATH PROBABILITIES.                                00003720
C                                                                       00003730
C     CALL SGROW(NP,AL,NSCEN,ISN,ISPN,CLDC,ALPHA,NB,DLTA,NYL,NYPP)      00003740
C     CALL SORDER(CLDC,ISCORD,ISPN,NSCEN)                               00003750
C     SYMM=TRUE                                                         00003760
C     IF(NSCEN.EQ.1)SYMM=FALSE                                          00003770
C     NSCENH=(NSCEN+1)/2                                                00003780
C     CENTER=2.                                                         00003790
C     IF(NB.EQ.2)CENTER=1.5                                             00003800
C     DO 69 J=1,NSCENH                                                  00003810
C     L1=ISCORD(J)                                                      00003820
C     L2=ISCORD(NSCEN+1-J)                                              00003830
C     DO 68 I=1,NP                                                      00003840
C     C1=FLOAT(ISN(L1,I))-CENTER                                        00003850
C     C2=FLOAT(ISN(L2,I))-CENTER                                        00003860
C     IF(J.EQ.NSCEN/2+1)C2=0.                                           00003870
C     IF(ABS(C1+C2).GT..0001)SYMM=FALSE                                 00003880
C68   CONTINUE                                                          00003890
C69   CONTINUE                                                          00003900
C     WRITE(11,71)SYMM                                                  00003910
C71   FORMAT('SYMMETRIC SCENARIOS: ',L1)                                00003920
C     IF(SYMM)CALL SCPRS(SIG14,AL,SCPR,NSCEN,NSCENH,ISCORD,SYMM,CLDC,   00003930
C    +ISPN)                                                             00003940
C     IF(.NOT.SYMM)CALL SCPROB(EGR14,EPROB,SCPR,NSCEN,CLDC,ISCORD,      00003950
C    +CLDC(11),CLDC(21),CLDC(31))                                       00003960
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05070
C                                                                       MOD05080
C     PATH PROBABILITIES                                                MOD05090
      DO 651 J=1,3                                                      MOD05100
        IF (NSCEN .EQ. 1) SCPR(J)=1.0                                   MOD05110
        IF (NSCEN .EQ. 3) SCPR(J)=W1(J+1)                               MOD05120
651   CONTINUE                                                          MOD05130
```

```
C                                                                       MOD05140
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05150
C                                                                       00003970
      WRITE(11,8002)(CLDC(I),I=21,27),(CLDC(I),I=31,37)                 00003980
      WRITE(11,8003)(ISCORD(I),I=1,10),(CLDC(I),I=1,10),(SCPR(I),I=1,10)00003990
8002  FORMAT('CUM,EGR:'/(7F9.5))                                        00004000
8003  FORMAT('ISCORD,SCGR,SCPR:'/10I7,(/10F7.4))                        00004010
67    CONTINUE                                                          00004020
C ***** ONCE ONLY FINANCIAL CALCULATIONS **********************         00004030
      ITCNOR=0                                                          00004040
      IF(LITCNR)ITCNOR=1                                                00004050
      WRITE(11,113) ITCNOR,EMBDRT                                       00004060
113   FORMAT('ITCNOR,EMBDRT  ',I3,5X,F5.4)                              00004070
      EQRT=1.-PRERT-DBTRT                                               00004080
      CC=DBTRT*EMBDRT+(PRERT*EMBPRE+EQRT*EMBCOM)/(1.-TAXMAR)            00004090
      WRITE(11,7935)(COV(I),I=1,6),(COC(I),I=1,6),(PRECOV(I),I=1,6),    00004100
     +(AINT(I),I=1,6)                                                   00004110
      WRITE(11,7937)DBTRT,PRERT,EQRT,TAXMAR,CC                          00004120
      WRITE(11,7941)(EDINT(I),I=1,7),(EDEBT(I),I=1,7),(RBE(I),I=1,7)    00004130
7935  FORMAT('COV,COC,PRECOV,AINT'/(6F8.4))                             00004140
7937  FORMAT('DBTRT,PRERT,EQRT,TAXMAR,CC'/10F8.4)                       00004150
7941  FORMAT('EDINT,EDEBT,RBE'/(7E10.4))                                00004160
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05160
C                                                                       MOD05170
C     SGRO=GL                                                           00004170
C                                                                       MOD05180
      SGRO=AL                                                           MOD05190
C                                                                       MOD05200
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05210
      PHORZN=LR+1                                                       00004180
      NPRDS=LR                                                          00004190
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05220
C             - - DO LOOP FINAL VALUES CHANGED TO 16 FOR THE 16         MOD05230
C                 TECHNOLOGIES                                          MOD05240
C     DO 7960 I=1,10                                                    00004200
      DO 7960 I=1,16                                                    MOD05250
      IAVYR(I)=IAVYR(I)-IFFYR+1                                         00004210
      LB(I)=IFIX(BL(I)+.5)                                              00004220
      LT(I)=IFIX(TL(I)+.5)                                              00004230
      NCON(I)=IFIX(CONSTR(I)+.5)                                        00004240
      LAGR(I)=LAGREG                                                    00004250
      ISTART(I)=IFIX(STARTD(I)+.5)                                      00004260
7960  CONTINUE                                                          00004270
      DA=(1.+INFLA)*DF                                                  00004280
      IF(.NOT.CNDOL)DA=DF                                               00004290
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05260
C             - - CORRECTION FOR WHEN CDSC=INFLA                        MOD05270
C                                                                       MOD05280
      IF (CDSC .EQ. INFLA) ANIZE=1.0                                    MOD05290
C     ANIZE=(1.-DA)/(1.-DA**(LR+ITHOR+1))                               00004300
      IF (CDSC .NE. INFLA) ANIZE=(1. - DA)/(1. - DA**(LR+ITHOR+1))      MOD05300
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05310
      HORIZN=PHORZN+ITHOR                                               00004310
      ILFYR=IFFYR+HORIZN-1                                              00004320
      PVAEN=0.                                                          00004330
      DO 7970 I=1,HORIZN                                                00004340
      IF(CNDOL)PVAEN=PVAEN+(1.+FLOAT(I-1)*AL)*(DF*AIF)**(I-1)           00004350
```

```
7970  IF(.NOT.CNDOL)PVAEN=PVAEN+(1.+FLOAT(I-1)*AL)*DF**(I-1)                00004360
C CHANGE PVAEN INTO ENERGY AND ADJUST FOR LOSSES.                           00004370
      PVAEN=PVAEN*EN78*(1.-ELOSS)                                           00004380
      GFINAL=FLOAT(HORIZN-1)*AL                                             00004390
      MTINC=IFIX(1.5+GFINAL)*MWINC                                          00004400
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -     MOD05320
C             - - MTINC IS REAL                                             MOD05330
C     AMTINC=FLOAT(MTINC)                                                   00004410
      AMTINC=MTINC                                                          MOD05340
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -     MOD05350
      DFINAL=DEM78*(1.+GFINAL)                                              00004420
      CALL CAPCON(ARATE,CAP78,ISTART,CONSTR)                                00004430
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -     MOD05360
C                                                                           MOD05370
C                                                                           MOD05380
C     DO 7965 I=1,9                                                         00004440
C7965 VCES(I)=VC(I)*(1.+VCESC(I))**(HORIZN-1)                               00004450
C     DO 7968 IYR=1,LR                                                      00004460
C     DO 7980 I=1,9                                                         00004470
C7980 CLDC(I)=VC(I)*(1.+VCESC(I))**IYR                                      00004480
C     CALL LORDER(CLDC,ENV,LO(1,IYR))                                       00004490
C7968 CONTINUE                                                              00004500
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -     MOD05390
C                                                                           MOD05400
C               - -  DETERMINE IF THERE EXISTS FAIRBANKS NON-HYDRO          MOD05410
C                       TECHNOLOGIES WITH CAPACITY FOR YEARS 1-9.           MOD05420
C                       IF SO, THEN THE TECHNOLOGY NUMBERS                  MOD05430
C                       ARE RETURNED IN ARRAY ITFAIR.                       MOD05440
C                                                                           MOD05450
      CALL FAIRCK (ITKNAM,FAIR,ITFAIR,CCAP78,CEP,RETIRE)                    MOD05460
C                                                                           MOD05470
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -     MOD05480
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -     MOD05490
C                                                                           MOD05500
C     FUEL COST CONSIDERATIONS                                              MOD05510
C                                                                           MOD05520
C             - - SET FUEL TYPE TO 10 AND HEAT RATE TO 0 FOR THE            MOD05530
C                     HYDRO TECHNOLOGIES                                    MOD05540
C                     THIS INSURES THAT THE FUEL COST CALCULATIONS          MOD05550
C                     GIVE 0 FUEL COST FOR THE HYDRO TECHNOLOGIES           MOD05560
C                                                                           MOD05570
      DO 7964 I=10,16                                                       MOD05580
      IFTU(I)=10                                                            MOD05590
      HR(I)=0.0                                                             MOD05600
 7964 CONTINUE                                                              MOD05610
C                                                                           MOD05620
C                                                                           MOD05630
      DO 7965 I=1,9                                                         MOD05640
      FCTY=FC(IYFDE,IFTU(I))*(1. + FUESC(IFTU(I)))**(HORIZN-IYFDE)          MOD05650
C     UNITS CONVERSION                                                      MOD05660
      FCTY=(FCTY*HR(I))/1000000.                                            MOD05670
7965  VCES(I)=(VC(I)*(1 + VCESC(I))**(HORIZN-1)) + FCTY                     MOD05680
      DO 7968 IYR=1,LR                                                      MOD05690
      DO 7980 I=1,9                                                         MOD05700
      IF (IYR .GT. (IYFDE - 1)) GO TO 7975                                  MOD05710
      FCIYR=(HR(I)*FC(IYR+1,IFTU(I)))/1000000.                              MOD05720
      GO TO 7980                                                            MOD05730
```

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7975  CONTINUE                                                          MOD05740
      FCIYR=FC(1YFDE,IFTU(I))*(1. + FUESC(IFTU(I)))**(IYR-(IYFDE-1))    MOD05750
C     UNITS CONVERSION                                                  MOD05760
      FCIYR=(FCIYR*HR(I))/1000000.                                      MOD05770
7980  CLDC(I)=(VC(I)*(1. + VCESC(1))**IYR) + FCIYR                      MOD05780
C                                                                       MOD05790
C           IF IYR BETWEEN 1 AND 9 (1981 - 1989) AND IF THERE EXISTS    MOD05800
C           FAIRBANKS NON-HYDRO TECHNOLOGIES, LOAD THE 2 LEAST COST     MOD05810
C           FAIRBANKS NON-HYDRO TECHNOLOGIES FIRST (I.E. CALL FLORDR)   MOD05820
C                                                                       MOD05830
      IF (IYR .LT. 10 .AND. FAIR(IYR))                                  MOD05840
     *    CALL FLORDR (CLDC,ENV,LO(1,IYR),ITFAIR(1,IYR),LCFAIR(1,IYR))  MOD05850
      IF (IYR .GE. 10 .OR. .NOT. FAIR(IYR))                             MOD05860
     *    CALL LORDER (CLDC,ENV,LO(1,IYR))                              MOD05870
C                                                                       MOD05890
7968  CONTINUE                                                          MOD05900
C                                                                       MOD05910
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD05920
C ***** END OF ONCE ONLY FINANCIAL CALCULATIONS **************          00004510
      MANYD=PRMH.GT.(PRML+.0000001).AND.PRMI.GT..0000001                00004520
      IF(.NOT.MANYD)GOTO 1100                                           00004530
      LDEC=IFIX((PRMH-PRML)/PRMI+1.0001)                                00004540
      GOTO 1110                                                         00004550
1100  LDEC=1                                                            00004560
C                                                                       00004570
C LOOP OVER PLANNING RESERVE MARGINS                                    00004580
C                                                                       00004590
1110  SIDE=LDEC.GE.8                                                    00004600
      DO 9999 IDEC=1,LDEC                                               00004610
      PRM=PRML+FLOAT(IDEC-1)*PRMI                                       00004620
      PRINT 1988                                                        00004630
      PRINT 1989                                                        00004640
      IF(CNDOL)PRINT 1990,IFFYR,IFFYR                                   00004650
      IF(.NOT.CNDOL)PRINT 1991,IFFYR                                    00004660
C                                                                       00004670
C DO 85 IY=1,LEADMX                                                     00004680
C PRMG(IY)=PRM-RMBAS+FLOAT(IY)*RMINC                                    00004690
C 85 CONTINUE                                                           00004700
C INITIAL CALCULATIONS DEPENDING ON PRM AND INITIALIZATIONS             00004710
      FFS=TRUE                                                          00004720
      TENGY=0.                                                          00004730
      TTCOS=0.                                                          00004740
C     JCT=0                                                             00004750
      TERMV=0.                                                          00004760
      TERMF=0.                                                          00004770
C     ERMARG=0.                                                         00004780
      TERME=0.                                                          00004790
      TERMO=0.                                                          00004800
C FIND THE TERMINAL VARIABLE COST EEVC(M/KWH).                          00004810
C                                                                       00004820
      IF(ITHOR.LT.1)GOTO 160                                            00004830
      TERMIN=TRUE                                                       00004840
      CURDEM=DFINAL                                                     00004850
      CALL LORDER(VCES,ENV,LOAD)                                        00004860
      IACTYR=IFFYR+LR+ITHOR                                             00004870
      CALL PRMGN(PRMBEF,PRM,PRMAFT,IFRMYR,ILRMYR,IACTYR,PRMGIN)         00004880
      CFTOT=DFINAL*(1.+PRMGIN)                                          00004890
```

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C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD05930
C             - - DO LOOP FINAL VALUES INCREASED TO 16 FOR THE 16      MOD05940
C                  TECHNOLOGIES                                        MOD05950
C     DO 76 I=1,10                                                     00004900
      DO 76 I=1,16                                                     MOD05960
      SCHED(I)=AMIX90(I).LT..0000001                                   00004910
      CAP(I)=CFTOT*AMIX90(I)                                           00004920
76    IF(SCHED(I))CAP(I)=0.                                            00004930
      ICOUNT=0                                                         00004940
      TMIX=1.                                                          00004950
      SHORT=0.                                                         00004960
87    CONTINUE                                                         00004970
C     DO 80 I=1,10                                                     00004980
      DO 80 I=1,16                                                     MOD05970
      IF(SCHED(I))GOTO 80                                              00004990
      IF(TMIX.LT..00001)GOTO 81                                        00005000
      IF(RMYES(I))CAP(I)=CAP(I)+AMIX90(I)*SHORT/TMIX                   00005010
      IF(CAP(I).LE.CAPLIM(I)+.1)GOTO 80                                00005020
      CAP(I)=CAPLIM(I)                                                 00005030
      SCHED(I)=TRUE                                                    00005040
80    CONTINUE                                                         00005050
      ICOUNT=ICOUNT+1                                                  00005060
      TMIX=0.                                                          00005070
      CFT=0.                                                           00005080
C     DO 90 I=1,10                                                     00005090
      DO 90 I=1,16                                                     MOD05980
      IF(.NOT.RMYES(I))GOTO 90                                         00005100
      CFT=CFT+CAP(I)                                                   00005110
      IF(.NOT.SCHED(I))TMIX=TMIX+AMIX90(I)                             00005120
90    CONTINUE                                                         00005130
      SHORT=CFTOT-CFT                                                  00005140
      ICOUNT=ICOUNT+1                                                  00005150
      IF(SHORT.LE..1.AND.SHORT.GE.-.1)GOTO 83                          00005160
      IF(ICOUNT.GT.10)GOTO 81                                          00005170
      GOTO 87                                                          00005180
81    PRINT 82,PRM,TMIX,SHORT                                          00005190
82    FORMAT('WARNING: THERE IS INSUFFICIENT TERMINAL CAPACITY FOR',   00005200
     +' PRM =',F5.3,'.  TMIX =',F6.3,'.','  SHORT =',F10.0)            00005210
83    CONTINUE                                                         00005220
      CTOT=0.                                                          00005230
C     DO 86 I=1,10                                                     00005240
      DO 86 I=1,16                                                     MOD05990
86    CTOT=CTOT+CAP(I)                                                 00005250
C     DO 89 I=1,10                                                     00005260
      DO 89 I=1,16                                                     MOD06000
      TERMIX(I)=CAP(I)/CTOT                                            00005270
89    CONTINUE                                                         00005280
      IS(1)=0                                                          00005290
      YEARS(1)=YEARS(1)+FLOAT(LR+ITHOR-1)                              00005300
      IYR=1                                                            00005310
      IP=1                                                             00005320
      DEM(1)=DFINAL                                                    00005330
      RRM(1)=CFT/DFINAL-1.                                             00005340
      DO 84 I=1,7                                                      00005350
      IF(.NOT.OCDEM(I))PKMAIN(I)=OUTCAP(I)                             00005360
84    IF(OCDEM(I))PKMAIN(I)=OUTCAP(I)*DFINAL/DEM78                     00005370
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD06010
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C              - - FOR THE TERMINAL HORIZON ASSUME BLDC, YLF, AND ALF     MOD06020
C                     ARE THE SAME AS FOR THE MED PATH OF THE LAST       MOD06030
C                     YEAR OF THE PLANNING HORIZON                       MOD06040
C                                                                        MOD06050
      DO 79321 I=1,2                                                     MOD06060
         ALF(I)=XALF(ISPN(2),LR)                                         MOD06070
      DO 79321 J=1,12                                                    MOD06080
         BLDC(J,I)=XLDC(ISPN(2),LR,J)                                    MOD06090
79321 CONTINUE                                                           MOD06100
         YLF=ALF(1)                                                      MOD06110
C                                                                        MOD06120
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD06130
      CALL PRODUC(IYR,CAP,MTINC,AMTINC,DFP,NSMAL,LOAD,AVAIL,CLDC,        00005380
     +PKMAIN,OUTAV,CURDEM,YLF,FENG,FTIME,HYPROB,ALF,BLDC,DBLDC,PW,PMAIN,00005390
     +HYEN,PTPDET,RRM,DEM,TKNAM,OUTTYP,NH,NHY,IS,IP,NP,NYPP,NVCPP,YEARS,00005400
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD06140
C     +RPROD,VC,ENV,OUTCST,PTPCOS,TERMIN,TVC,AMM,ITHOR,VCESC,HYMULT,DFO,  00005410
C     +HA,OUTESC,OUTC,CSENVT,CSOUTT,PRM)                                 00005420
     +RPROD,VC,ENV,HR,IFTU,FC,IYFDE,OUTCST,PTPCOS,TERMIN,TVC,AMM,ITHOR,  MOD06150
C              - - ADDED PARAMETER - HCUTIL                              MOD06160
     +VCESC,FUESC,HYMULT,DFO,HA,OUTESC,OUTC,CSENVT,CSOUTT,PRM,HCUTIL,    MOD06170
C              - - ADDITIONAL PARAMETERS FOR SUBROUTINE WRTINT           MOD06180
     +ACAP,AGEN,FCAP,FGEN,XLOLP,INTR,                                    MOD06190
C              - - ADDITIONAL PARAMETERS FOR ANCHORAGE - FAIRBANKS       MOD06200
C                  LIMITED INTERTIE CALCULATIONS                         MOD06210
     +LCFAIR,FEYRLY,ALLINT,                                              MOD06220
C              - - ADDITIONAL PARAMETERS FOR CPRT REPORT - ENERGY TABLE   MOD06230
     +CPRT,TECHEN)                                                       MOD06240
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD06250
      YEARS(1)=YEARS(1)-FLOAT(LR+ITHOR-1)                                00005430
      EEVC=AMM+OM                                                        00005440
      CSOUTT=CSOUTT*1000./(CURDEM*YLF*8.76)                              00005450
      CSENVT=CSENVT*1000./(CURDEM*YLF*8.76)                              00005460
160   CONTINUE                                                           00005470
      TERMIN=FALSE                                                       00005480
C ***** START VISITATION ******                                          00005490
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD06260
C                                                                        MOD06270
C                                                                        MOD06280
C     IP=0                                                               00005500
C     N=1                                                                00005510
C     DO 1910 I=1,NP                                                     00005520
C1910 IS(I)=0                                                            00005530
C     IF(.NOT.RSCEN)GOTO 1909                                            00005540
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD06290
      NSC=0                                                              00005550
1900  IP=1                                                               00005560
1901  NSC=NSC+1                                                          00005570
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD06300
C                                                                        MOD06310
C                                                                        MOD06320
C     IF(NSC.GT.10)GOTO 1980                                             00005580
      IF (NSC .GT. NSCEN) GO TO 1980                                     MOD06330
C     IF(ISPN(NSC).LE.NSCEN)GOTO 1904                                    00005590
C     GOTO 1901                                                          00005600
C1904 IF(IS(IP).NE.ISN(NSC,IP).OR.PERFCS)GOTO 1906                       00005610
C     IP=IP+1                                                            00005620
```

```
C      GOTO 1904                                                        00005630
1906   DO 1907 I=IP,NP                                                  00005640
1907   IS(I)=ISPN(NSC)                                                  MOD06340
C1907  IS(I)=ISN(NSC,I)                                                 00005650
       FFS=TRUE                                                         00005660
       CGR=0.0                                                          MOD06350
C      IF(PERFCS)CALL CEXS(ALPHA,BETA,NYPP,NP,DLTA,IS,                  00005670
C     +DEMFOR,GC,NYL,FNYL,DEM78,NB,AL,LR)                               00005680
C                                                                       MOD06360
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06370
       GOTO 1905                                                        00005690
1908   IP=IP+1                                                          00005700
1905   IF(IP.GT.NP)GOTO 1900                                            00005710
       GOTO 1931                                                        00005720
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06380
C                                                                       MOD06390
C                                                                       MOD06400
C1909  CONTINUE                                                         00005730
C1920  IP=IP+1                                                          00005740
C      IF(IP.EQ.NP)GOTO 1940                                            00005750
C      IS(IP)=NB                                                        00005760
C1930  N=N+1                                                            00005770
C                                                                       MOD06410
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06420
1931   CONTINUE                                                         00005780
C      IY=NYPP*IP+1                                                     00005790
C ***** LOGIC FORWARD *****                                             00005800
       IR=(IP-1)*NYPP                                                   00005810
       AIP=AIF**(IR)                                                    00005820
C                                                                       00005830
C CALCULATE PROBABILITIES AND GROWTH RATES                              00005840
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06430
C                                                                       MOD06440
C                                                                       MOD06450
C      IF(NB.EQ.2)GOTO 19361                                            00005850
C      IF(NB.EQ.1)GOTO 19367                                            00005860
C      PR=1.                                                            00005870
C      DO 1935 I=1,NP                                                   00005880
C      IS1=IS(I)+1                                                      00005890
C1935  PR=PR*Q1(IS1)                                                    00005900
C      GOTO 19365                                                       00005910
C19361PR=.5**IP                                                         00005920
C      GROW(IP+1)=ALPHA*GROW(IP)+BETA*AL+DLTA*2.*(FLOAT(IS(IP))-1.5)    00005930
C      GOTO 19368                                                       00005940
C19365GROW(IP+1)=ALPHA*GROW(IP)+BETA*AL+FLOAT(IS(IP)-2)*DLTA            00005950
C      GOTO 19368                                                       00005960
C19367PR=1.                                                             00005970
C      GROW(IP+1)=GROW(1)                                               00005980
C19368CGR=0.                                                            00005990
C      IS1=IS(IP)                                                       00006000
C      IF(IP.EQ.1)GOTO 19372                                            00006010
C      DO 1937 I=2,IP                                                   00006020
C1937  CGR=CGR+FLOAT(NYPP)*GROW(I)                                      00006030
C19372CONTINUE                                                          00006040
C                                                                       00006050
C      IF(.NOT.RSCEN)GOTO 1925                                          00006060
C FIND SELECTED TREE PATH BRANCH PROBABILITY.                           00006070
```

```
C      PR=0.                                                          00006080
C      DO 1927 I=1,10                                                 00006090
C      IF(ISPN(I).GT.NSCEN)GOTO 1927                                  00006100
C      DO 1926 IT=1,IP                                                00006110
C      IF(IS(IT).NE.ISN(I,IT))GOTO 1927                               00006120
C1926  CONTINUE                                                       00006130
C      PR=PR+SCPR(I)                                                  00006140
C1927  CONTINUE                                                       00006150
C1925  CONTINUE                                                       00006160
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06460
C                                                                     MOD06470
C      PERIOD PROBABILITY IS THE SAME AS THE PATH PROBABILITY         MOD06480
       PR=SCPR(NSC)                                                   MOD06490
C                                                                     MOD06500
       IS1=IS(IP)                                                     MOD06510
C                                                                     MOD06520
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06530
C BEGIN LOOP OVER YEARS IN PERIOD                                     00006170
C                                                                     00006180
       ALOOPF=AIP                                                     00006190
       DO 1938 ILOOP=1,NYPP                                           00006200
       ALOOPF=ALOOPF*AIF                                              00006210
       IYR=(IP-1)*NYPP+ILOOP                                          00006220
       FIYR=FLOAT(IYR)                                                00006230
       IYRP1=IYR+1                                                    00006240
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06540
C                                                                     MOD06550
C                                                                     MOD06560
C      GCOR=GC*(FIYR-HNYL)                                            00006250
C      IF(IYR.GT.NYL)GCOR=0.                                          00006260
C                                                                     MOD06570
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06580
       IYEAR=IFIX(YEARS(1)+.5)+IYR                                    00006270
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06590
C                                                                     MOD06600
C                                                                     MOD06610
C      CGR=CGR+GROW(IP+1)                                             00006280
C      GCSUM=GC*FIYR*(FIYR-FNYL)/2.                                   00006290
C      IF(IYR.GE.NYL)GCSUM=0.                                         00006300
C      CURDEM=(1.+CGR+GCSUM)*DEM78                                    00006310
C      EGRO(IYR)=GROW(IP+1)+GCOR                                      00006320
20000  FORMAT('RMYES,IYR,CURDEM,TOTCAP '/10L1,I4,                     00006330
      +2F10.0,F6.3)                                                   00006340
C      CURDGR=GROW(IP+1)                                              00006350
C                                                                     MOD06620
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06630
C                                                                     MOD06640
C      CALCULATE GROWTH                                               MOD06650
C                                                                     MOD06660
       IF (IYR .LE. IFIX(FCPER2)) ACTGR(IYR)=AL                       MOD06670
       IF (IYR .GT. IFIX(FCPER2)) ACTGR(IYR)=                         MOD06680
      *   (YRLYDM(ISPN(NSC),IYR) - YRLYDM(ISPN(NSC),IYR-IFIX(FCPER2)))/ MOD06690
      *   (DEM78*FCPER2)                                              MOD06700
       CURDEM=YRLYDM(ISPN(NSC),IYR)                                   MOD06710
       CURDGR=ACTGR(IYR)                                              MOD06720
       IF (IYR .EQ. 1) EGRO(1)=(YRLYDM(ISPN(NSC),1) - DEM78)/DEM78    MOD06730
       IF (IYR .NE. 1) EGRO(IYR)=                                     MOD06740
```

```
     *                (YRLYDM(ISPN(NSC),IYR) - YRLYDM(ISPN(NSC),IYR-1))/ MOD06750
     *                DEM78                                              MOD06760
      CGR=CGR + EGRO(IYR)                                               MOD06770
C                                                                       MOD06780
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06790
C                                                                       00006360
C SET DECISIONS FOR IYR                                                 00006370
C                                                                       00006380
      IF(.NOT.RUNDEC)GOTO 2035                                          00006390
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06800
C                                                                       MOD06810
C                                                                       MOD06820
C     IF(.NOT.RSCEN.OR..NOT.PERFCS)GOTO 11110                           00006400
C     DO 12111 I=1,LEADMX                                               00006410
C     IF(IYR+I-1.GT.LR)GOTO 11122                                       00006420
C12111CEXDEM(I)=DEMFOR(IYR+I-1)                                         00006430
C     GOTO 11122                                                        00006440
C11110CONTINUE                                                          00006450
C     CALL CEXD(LEADMX,NYPP,IYR,CURDEM,ALPHA,BETA,AL,CURDGR,            00006460
C    +NYL,GCOR,NP,GC,IP,CEXDEM,DEM78)                                   00006470
C11122CONTINUE                                                          00006480
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06830
C                                                                       MOD06840
      CALL CEXD (LEADMX,NYPP,IYR,CURDEM,ALPHA,BETA,AL,CURDGR,NP,        MOD06850
     *           CEXDEM,DEM78,FCPER3)                                   MOD06860
C                                                                       MOD06870
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06880
      DO 11123 I=1,LEADMX                                               00006490
      IF(IYR+I-1.GT.LR)GOTO 11124                                       00006500
      CALL PRMGN(PRMBEF,PRM,PRMAFT,IFRMYR,ILRMYR,IFFYR+IYR+I-1,         00006510
     +PRMGIN)                                                           00006520
11123 PRMG(I)=PRMGIN+FLOAT(I)*RMINC-RMBAS                               00006530
11124 CONTINUE                                                          00006540
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06890
C              - -  ADD AMWINC TO CPLAN PARAMETER LIST                  MOD06900
      CALL CPLAN(IYR,NS,LRP1,LEADMN,LEADMX,LEAD,CCAP78,RETIRE,          00006550
C    +IAVYR,TKNAM,FFS,AVL,CEP,CEXDEM,PRMG,AJ,CAPLIM,AMIX90,SIZE,RMYES)  00006560
     +IAVYR,TKNAM,FFS,AVL,CEP,CEXDEM,PRMG,AJ,CAPLIM,AMIX90,SIZE,RMYES,  MOD06910
     +AMWINC)                                                           MOD06920
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06930
2035  CONTINUE                                                          00006570
      FFS=FALSE                                                         00006580
      TOTCAP=CTOT78                                                     00006590
      DEM(IYR)=CURDEM                                                   00006600
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD06940
C              - - DO LOOP FINAL VALUES INCREASED TO 16 FOR THE 16       MOD06950
C                   TECHNOLOGIES                                        MOD06960
C     DO 2030 I=1,10                                                    00006610
      DO 2030 I=1,16                                                    MOD06970
2030  IF(RMYES(I)) TOTCAP=TOTCAP+CEP(I,IYRP1,NS)-RETIRE(I,IYRP1)        00006620
      RRM(IYR)=TOTCAP/DEM(IYR)-1.                                       00006630
      IVCYR=(IP-1)*NYPP+(NYPP+2)/2                                      00006640
      IF(IP.EQ.1)IVCYR=NYPP/2                                           00006650
      IF(IP.EQ.1.AND.NYPP.EQ.1)IVCYR=1                                  00006660
      IF(NVCPP.EQ.1.AND.IYR.NE.IVCYR)GOTO 1938                          00006670
C                                                                       00006680
      IF(.NOT.RUNPR)GOTO 110                                            00006690
```

```
C FIND CAP FOR PRODUCTION COSTING                                       00006700
      DO 2032 IC=1,7                                                    00006710
      IF(.NOT.OCDEM(IC))PKMAIN(IC)=OUTCAP(IC)                           00006720
2032  IF(OCDEM(IC))PKMAIN(IC)=OUTCAP(IC)*CURDEM/DEM78                   00006730
C     DO 19373 IC=1,10                                                  00006740
      DO 19373 IC=1,16                                                  MOD06980
19373 CAP(IC)=CCAP78(IC)+CEP(IC,IYRP1,NS)-RETIRE(IC,IYRP1)              00006750
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD06990
C              - - HYRN IS NO LONGER USED BY PRODUC                     MOD07000
C     IF(HYEN(2).LT..5)GOTO 19376                                       00006760
C     DO 19374 I=1,3                                                    00006770
C     PP=HYEN(I)/HYEN(2)                                                00006780
C19374HYRN(I)=HYEN(I)+(CEP(10,IYRP1,NS)                                 00006790
C    +-RETIRE(10,IYRP1))*HYINC*PP                                       00006800
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07010
19376 CONTINUE                                                          00006810
C                                                                       00006820
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07020
C              - - SET BLDC, ALF, YLF TO THE IYR YEAR VALUES            MOD07030
C                                                                       MOD07040
      DO 109 I=1,2                                                      MOD07050
         ALF(I)=XALF(ISPN(NSC),IYR)                                     MOD07060
      DO 109 J=1,12                                                     MOD07070
         BLDC(J,I)=XLDC(ISPN(NSC),IYR,J)                                MOD07080
 109  CONTINUE                                                          MOD07090
      YLF=ALF(1)                                                        MOD07100
C                                                                       MOD07110
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07120
      CALL PRODUC(IYR,CAP,MWINC,AMWINC,DFP,NSIZE,LU(1,IYR),AVAIL,CLDC,  00006830
     +PKMAIN,OUTAV,CURDEM,YLF,FENG,FTIME,HYPROB,ALF,BLDC,DBLDC,PW,PMAIN,00006840
     +HYRN,PPDET,KRM,DEM,TKNAM,OUTTYP,NH,NHY,IS,IP,NP,NYPP,NVCPP,YEARS, 00006850
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07130
C    +RPROD,VC,ENV,OUTCST,APCDET,TERMIN,TVC,AMM,ITHOR,VCESC,HYMULT,DFO, 00006860
C    +HA,OUTESC,OUTC,CSENV,CSOUT,PRM)                                   00006870
     +RPROD,VC,ENv,HR,IFTU,FC,IYFDE,OUTCST,APCDET,TERMIN,TVC,AMM,ITHOR, MOD07140
C              - - HCUTIL ADDED TO PARAMETER LIST                       MOD07150
     +VCESC,FUESC,HYMULT,DFO,HA,OUTESC,OUTC,CSENV,CSOUT,PRM,HCUTIL,     MOD07160
C              - - ADDITIONAL PARAMETERS FOR SUBROUTINE WRTINT          MOD07170
     +ACAP,AGEN,FCAP,FGEN,XLOLP,INTR,                                   MOD07180
C              - - ADDITIONAL PARAMETERS FOR ANCHORAGE - FAIRBANKS      MOD07190
C                  LIMITED INTERTIE CALCULATIONS                        MOD07200
     +LCFAIR,FEYRLY,ALLINT,                                             MOD07210
C              - - ADDITIONAL PARAMETERS FOR CPRT REPORT - ENERGY TABLE  MOD07220
     +CPRT,TECHEN)                                                      MOD07230
C                                                                       MOD07240
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07250
110   CONTINUE                                                          00006880
      AMS=(AMM+OM)/(1.-ELOSS)                                           00006890
      ENYEAR=CURDEM*YLF*8.76                                            00006900
      TVC=TVC+OM*ENYEAR/1000.                                           00006910
      TTCOS(IYR)=TVC                                                    00006920
      TTOOS(IYR+1)=CSOUT                                                00006930
      TTEOS(IYR+1)=CSENV                                                00006940
      TTENGY(IYR)=ENYEAR                                                00006950
      IYRA=LR-5                                                         00006960
2037  TENGY=.000001                                                     00006970
      TTCOS=0.                                                          00006980
```

```
      TECOS=0.                                                          00006990
      TOCOS=0.                                                          00007000
      IF(IYR.LT.LR-5.AND.(LVZ.OR.(NYPP.LE.8)))GOTO 2043                 00007010
      DO 2039 I=IYRA,LR                                                 00007020
      TTCOS=TTCOS+TITCOS(I)                                             00007030
      TECOS=TECOS+TTEOS(I+1)                                            00007040
      TOCOS=TOCOS+TTOOS(I+1)                                            00007050
2039  TENGY=TENGY+TTENGY(I)                                             00007060
      IF(TENGY.GT..0001)GOTO 2041                                       00007070
      IYRA=IYRA-1                                                       00007080
      IF(IYRA.GE.1)GOTO 2037                                            00007090
2041  TAM=TTCOS*1000./TENGY                                             00007100
      TEM=TECOS*1000./TENGY                                             00007110
      TOM=TOCOS*1000./TENGY                                             00007120
2043  CONTINUE                                                          00007130
C                                                                       00007140
C PRINT 1 LOGIC                                                         00007150
C                                                                       00007160
      IF(NVCPP.EQ.1.OR.IYR.NE.1)GOTO 2500                               00007170
      G=EN78/ENYEAR                                                     00007180
      EVALUE(1,2)=G*TVC*10.**6                                          00007190
      TTOCOS(1)=CSOUT*G*10.**6                                          00007200
      TTECOS(1)=CSENV*G*10.**6                                          00007210
2500  CONTINUE                                                          00007220
      VALUE=TVC*10.**6                                                  00007230
      EVALUE(IYR+1,IS1)=VALUE*AIF**(IYR)                                00007240
      TTOCOS(IYR+1)=CSOUT*10.**6*AIF**IYR                               00007250
      TTECOS(IYR+1)=CSENV*10.**6*AIF**IYR                               00007260
      IF(NVCPP.EQ.1)GOTO 1938                                           00007270
      IF(ILOOP.NE.1)GOTO 19378                                          00007280
      PRINT 1996,IYEAR,EGRO(IYR),AMS,DEM(IYR),RRM(IYR),PR,(IS(I),I=1,IP)00007290
      GOTO 1938                                                         00007300
19378 IF(ILOOP.EQ.NYPP)GOTO 1938                                        00007310
      PRINT 1997,IYEAR,EGRO(IYR),AMS,DEM(IYR),RRM(IYR)                  00007320
C                                                                       00007330
C                                                                       00007340
1938  CONTINUE                                                          00007350
      IF(NVCPP.NE.1)GOTO 19375                                          00007360
      AAF=AIF**(IVCYR)                                                  00007370
      IF(IP.NE.1)GOTO 1919                                              00007380
      G=EN78/ENYEAR                                                     00007390
      TTOCOS(1)=TTOCOS(IVCYR+1)*G/AAF                                   00007400
      TTECOS(1)=TTECOS(IVCYR+1)*G/AAF                                   00007410
      EVALUE(1,2)=EVALUE(IVCYR+1,IS1)*G/AAF                             00007420
1919  CONTINUE                                                          00007430
      ET=EVALUE(IVCYR+1,IS1)                                            00007440
      DO 1939 I=1,NYPP                                                  00007450
      FRACTN=(DEM(IYR+1-I)/DEM(IVCYR))*AIF**(IYR+1-I)/AIF**IVCYR        00007460
      EVALUE(IYR+2-I,IS1)=ET*FRACTN                                     00007470
      TTOCOS(IYR+2-I)=TTOCOS(IVCYR+1)*FRACTN                            00007480
      TTECOS(IYR+2-I)=TTECOS(IVCYR+1)*FRACTN                            00007490
1939  CONTINUE                                                          00007500
19375 CONTINUE                                                          00007510
      IF(IP.NE.NP)GOTO 19380                                            00007520
      IF(DECDET)CALL DPRINT(YEARS,TKNAM,IS,NP,IYR,CEP,DEM,PR,PRM,       00007530
     +DECDET,RETIRE,NS,CTOT78,RRM,IFRMYR,ILRMYR)                        00007540
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MUD07260
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C                                                                       MOD07270
C            - - CAPACITY AND ENERGY PRINTOUT ROUTINE - DEMPRT          MOD07280
      IF (CPRT) CALL DEMPRT (TITLE,YEARS,TKNAM,IS,NP,IYR,CEP,DEM,DEM78, MOD07290
     +                       PRM,RETIRE,NS,CCAP78,                      MOD07300
C              - -  ADDITIONAL VARIABLES FOR THE ENERGY TABLE           MOD07310
     +                       AVE78,YRLYEN,TECHEN)                       MOD07320
C                                                                       MOD07330
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07340
      IF(ITHOR.LT.1)GOTO 40003                                          00007550
      IF(.NOT.RUNFIN)GOTO 19380                                         00007560
      CALL PROLEV(FC1,FCTLH,FCTL,FCTL1,FCBL,LT,LB,DF1,DF2,DF3,          00007570
     +DF4,DF5,LTD,LBD,DF,DFLEV,FCLEV)                                   00007580
C     WRITE(11,40000)                                                   00007590
C     WRITE(11,40001)(FCLEV(I),I=1,10),DFLEV                            00007600
C     WRITE (11,40001) (FCLEV(I),I=1,16),DFLEV                          MOD07350
40000 FORMAT('LEVELIZED FIXED CHARGE RATES TO LB AND LBAVE FOR '        00007610
C    +/'TECHS 1 TO 10, DIST.  THEN WRITE TERMIX(I),I=1,10.')            00007620
     +/'TECHS 1 TO 16, DIST.  THEN WRITE TERMIX(I),I=1,16.')            MOD07360
C40001FORMAT(11F7.5)                                                    00007630
40001 FORMAT (17F7.5)                                                   MOD07370
      CALL TERFIX(LBAVE,DF,LB,LBD,FCLEV,DFLEV,FCESC,TERMIX,             00007640
     +LR,CAPCST,DISFC,TFC,ITHOR)                                        00007650
C     WRITE(11,40001)(FCLEV(I),I=1,10),DFLEV                            00007660
C     WRITE (11,40001) (FCLEV(I),I=1,16),DFLEV                          MOD07380
C     WRITE(11,40001)(TERMIX(I),I=1,10)                                 00007670
C     WRITE (11,40001) (TERMIX(I),I=1,16)                               MOD07390
C     WRITE(11,40002)(TFC(I),I=1,ITHOR)                                 00007680
40002 FORMAT('TERFIX TFC:'/((10F8.0)))                                  00007690
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07400
C            - - CALCULATE CUHY FOR 7 HYDRO TECHNOLOGIES                MOD07410
C     CUHY=CCAP78(10)+CEP(10,LRP1,NS)+RETIRE(10,LRP1)                   00007700
      CUHY=0.0                                                          MOD07420
      DO 11117 I=10,16                                                  MOD07430
      CUHY=CUHY + CCAP78(I) + CEP(I,LRP1,NS) + RETIRE(I,LRP1)           MOD07440
11117 CONTINUE                                                          MOD07450
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07460
      FOMRET=0.                                                         00007710
      DO 11118 I=1,9                                                    00007720
      CAP(I)=CCAP78(I)+CEP(I,LRP1,NS)-RETIRE(I,LRP1)                    00007730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07470
C                                                                       MOD07480
C            - - CODE CORRECTION FOR THE CASE WHEN TOTCAP=CUHY          MOD07490
C11118FOMRET=FOMRET+FOANDM(I)*CAP(I)/(TOTCAP-CUHY)                     00007740
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07500
      IF (TOTCAP - CUHY .LT. .00001) GO TO 11118                        MOD07510
      FOMRET=FOMRET + FOANDM(I)*CAP(I)/(TOTCAP - CUHY)                  MOD07520
11118 CONTINUE                                                          MOD07530
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07540
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07550
C                                                                       MOD07560
C                                                                       MOD07570
C     EGRO(LRP1)=RATE1*GROW(NP+1)+RATE2*AL                              00007750
      EGRO(LRP1)=RATE1*EGRO(LR) + RATE2*AL                              MOD07580
C                                                                       MOD07590
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07600
      CALL FOMESC(CLDC(501),CLDC(601),FCESC,CAP,CTOT,CUHY,LR,           00007760
     +ITHOR,FOANDM,TERMIX)                                              00007770
```

```
      DO 7934 I=LRP2,HORIZN                                              00007780
7934  EGRO(I)=EGRO(I-1)*RATE1+AL*RATE2                                   00007790
C ***** CALL TERMINAL VALUE MODEL *****                                  00007800
      CALL TERM(TAM,EEVC,DF,AIF,DLR,ALR,LR,ITHOR,AL,RATE1,RATE2,         00007810
     +DEM,EGRO,YLF,CUHY,TOTCAP,CLDC(201),PRM,RRM,TFC,TERMVC,VARPRC,      00007820
     +EN78,CGR,DEM78,CLDC,CLDC(601),CLDC(501),DFLEV,DISESC,DISTRA,       00007830
     +PRMBEF,PRMAFT,IFFYR,IFRMYR,ILRMYR,LBAVE,CLDC(701),                 00007840
     +TOM,TEM,TERMEC,TERMOC,CSENVT,CSOUTT)                               00007850
40005 CONTINUE                                                           00007860
C ***** FINANCIAL CALCULATIONS THAT DEPEND ON DECISIONS *******          00007870
      CALL CEPMOD(CLDC(401),NS,CEP,LRP1,ISTART,CLDC,TERMIX)              00007880
      CALL START(LAGREG,SGRO,BGRO,EDINT,RBE,EDEBT,COCHIS)                00007890
      CALL CAPCUR(CEP,NS)                                                00007900
      CALL AMORT                                                         00007910
      IF(LAGREG.EQ.0) CALL FXCHAR(FC1,FCTLH,FCTL,FCTL1,FCBL,LT)          00007920
      IF(LAGREG.NE.0) CALL FXCHRL(FC1,FCTLH,FCTL,FCTL1,FCBL,LT)          00007930
      CALL FXCWIP                                                        00007940
      CALL CAAHOR(CLDC,TERMIX)                                           00007950
      CALL DIST(LBD,LTD,DF1,DF2,DF3,DF4,DF5,EN78,DISTRA,ARATE,DISESC)    00007960
      CALL PLMEXC(CEP,STAPRT,NS,LSTAGE)                                  00007970
      CALL COMFIN(LAGREG,EMBORT,EMBPRE,EMBCOM)                           00007980
      CALL CEPFIX(CLDC(401),NS,CEP,LRP1,ISTART)                          00007990
C                                                                        00008000
C                                                                        00008010
C                                                                        00008020
C                                                                        00008030
C                                                                        00008040
      CALL FIXOM(FIXCHG,LRP1,CEP,RETIRE,NS,CCAP78,FOANDM,INFLA,          00008050
     +FCESC,HORIZN)                                                      00008060
C **********  END OF FINANCIAL SUBMODEL  ******************              00008070
      AAF=1./AIF                                                         00008080
      GCUM=1.                                                            00008090
      PVENGY=0.                                                          00008100
      DDF=1./DF                                                          00008110
      ANNFX=0.                                                           00008120
      ANNEX=0.                                                           00008130
      DO 19400 I=1,HORIZN                                                00008140
C HERE,TERMINAL FIXED CHARGES START STORAGE IN CLDC(200+PHORZN+1).       00008150
      IF(I.GT.PHORZN)FIXCHG(I)=FIXCHG(I)+CLDC(200+I)                     00008160
      DDF=DDF*DF                                                         00008170
      AAF=AAF*AIF                                                        00008180
      ENERGY=EN78*GCUM                                                   00008190
      ANNEX=ANNEX+EXCOST(I)*DDF                                          00008200
      ANNFX=ANNFX+FIXCHG(I)*DDF                                          00008210
      FIXPRC(I)=FIXCHG(I)/(ENERGY*AAF)                                   00008220
      IF(CNDOL)PVENGY=PVENGY+ENERGY*AAF*DDF                              00008230
      IF(.NOT.CNDOL)PVENGY=PVENGY+ENERGY*DDF                             00008240
19400 GCUM=GCUM+EGRO(I)                                                  00008250
      TERMF=TERMF+PR*ANNFX                                               00008260
C CHANGE ENERGY GENERATED INTO ENERGY SALES                              00008270
      PVENGY=PVENGY*(1.-ELOSS)                                           00008280
      ANNEX=ANNEX/PVENGY                                                 00008290
      ANNFX=ANNFX/PVENGY                                                 00008300
C                                                                        00008310
      IF(FINDET.AND.RUNFIN)CALL PRTFIN(IFFYR,ILFYR,CURD,ANNFX,           00008320
     +ANNEX,IS,NP,RUNFIN,PRM)                                            00008330
C                                                                        00008340
```

```
      IPERD=1                                                          00008350
      ICOUNT=0                                                         00008360
      ANNEC=0.                                                         00008370
      ANNOC=0.                                                         00008380
      ANNVC=0.                                                         00008390
      DDF=1./DF                                                        00008400
      ISE=2                                                            00008410
      GCUM=1.                                                          00008420
      AAF=1./AIF                                                       00008430
      DO 19386 I=1,LRP1                                                00008440
      AAF=AAF*AIF                                                      00008450
      DDF=DDF*DF                                                       00008460
      ENERGY=EN78*GCUM                                                 00008470
      VARPRC(I)=EVALUE(I,ISE)/(ENERGY*AAF)                             00008480
      GCUM=GCUM+EGRO(I)                                                00008490
C THE PRESENT VALUE OVER THE PLANNING HORIZON IS ACCUMULATED           00008500
C IN ANNEC, ANNOC, AND ANNVC. THIS IS DONE FOR EACH TREE PATH.         00008510
      ANNEC=ANNEC+DDF*TIECOS(I)                                        00008520
      ANNOC=ANNOC+DDF*TTOCOS(I)                                        00008530
      ANNVC=ANNVC+DDF*EVALUE(I,ISE)                                    00008540
      IF(I.EQ.1)ISE=IS(1)                                              00008550
      ICOUNT=ICOUNT+1                                                  00008560
      IF(ICOUNT.LE.NYPP)GOTO 19386                                     00008570
      IPERD=IPERD+1                                                    00008580
      ICOUNT=1                                                         00008590
      ISE=IS(IPERD)                                                    00008600
19386 CONTINUE                                                         00008610
C TERMEC, TERMOC, AND TERMVC ARE PRESENT VALUES FROM THE TERMINAL      00008620
C VALUE MODEL. TERME, TERMO, AND TERMV ACCUMULATE THE                  00008630
C EXPECTED PRESENT VALUES OVER ALL TREE PATHS.                         00008640
      TERME=TERME+PR*(ANNEC+TERMEC)                                    00008650
      TERMO=TERMO+PR*(ANNOC+TERMOC)                                    00008660
      TERMV=TERMV+PR*(ANNVC+TERMVC)                                    00008670
      ANNVC=(ANNVC+TERMVC)/PVENGY                                      00008680
C     ERMARG=ERMARG+PR*RRM(LR)                                         00008690
      TOTCG=ANNVC+ANNFX                                                00008700
C CHANGE PRICES FROM GENERATION COST INTO SALES PRICE.                 00008710
      DO 19384 I=1,HORIZN                                              00008720
      VARPRC(I)=VARPRC(I)/(1.-ELOSS)                                   00008730
19384 FIXPRC(I)=FIXPRC(I)/(1.-ELOSS)                                   00008740
      IF(PRCS)CALL WRTPRC(FIXPRC,VARPRC,AIF,IFFYR,ILFYR,HORIZN,IS,NP,  00008750
     +PRM,ANNVC,ANNFX,OHM)                                             00008760
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD07610
C              - - COST SUMMARY REPORT ROUTINE                         MOD07620
      IF (CSUM) CALL WRISUM (FIXPRC,VARPRC,YRLYDM,DEM78,YRLYEN,AVE78,  MOD07630
     +          IFFYR,LR,PRM,IS,NP,INFLA,CDSC,ISPN,NSC,AECONS,         MOD07640
     +          PKCONS,TCCONS,PCCONS,TITLE)                            MOD07650
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD07660
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD07670
C              - - ANCHORAGE-FAIRBANKS INTERTIE REPORT                 MOD07680
      IF (INTR) CALL WRIINT (TITLE,TKNAM,CCAP78,AP78,FP78,AE78,FE78,   MOD07690
     +          APYRLY,FPYRLY,AEYRLY,FEYRLY,ACAP,AGEN,FCAP,FGEN,XLOLP, MOD07700
     +          IFFYR,LR,PRM,IS,NP,ISPN,NSC,                           MOD07710
C             - - ADDITIONAL PARAMETERS FOR GLENNALLEN                 MOD07720
     +          GP78,GE78,GPYRLY,GEYRLY)                               MOD07730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD07740
19380 CONTINUE                                                         00008770
```

```
C                                                                       00008780
C END OF ANNUALIZED FIXED AND VARIABLE COST LOGIC                       00008790
C                                                                       00008800
C                                                                       00008810
C PRINT LOGIC 2                                                         00008820
C                                                                       00008830
      IF(NVCPP.NE.1)GOTO 19394                                          00008840
      IYER=IVCYR+IFIX(YEARS(1)+.5)                                      00008850
      IMR=IVCYR                                                         00008860
      IF(IP.EQ.NP)PRINT 1995,IYER,EGRO(IMR),AMS,DEM(IMR),RRM(IMR),      00008870
     +ANNVC,ANNFX,TOTCG,PR,(IS(I),I=1,IP)                               00008880
      IF(IP.NE.NP)PRINT 1996,IYER,EGRO(IMR),AMS,DEM(IMR),RRM(IMR),      00008890
     +PR,(IS(I),I=1,IP)                                                 00008900
      GOTO 19397                                                        00008910
19394 IF(IP.NE.NP)GOTO 19398                                            00008920
      PRINT 1998,IYEAR,EGRO(IYR),AMS,DEM(IYR),RRM(IYR),                 00008930
     +ANNVC,ANNFX,TOTCG                                                 00008940
      GOTO 19397                                                        00008950
19398 PRINT 1997,IYEAR,EGRO(IYR),AMS,DEM(IYR),RRM(IYR)                  00008960
19397 CONTINUE                                                          00008970
C                                                                       00008980
C ************************                                            00008990
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07750
C                                                                       MOD07760
C                                                                       MOD07770
C     IF(RSCEN)GOTO 1908                                                00009000
C     IF(IP.EQ.NP)GOTO 1950                                             00009010
C     GOTO 1920                                                         00009020
C1940 IS(IP)=NB+1                                                       00009030
C1950 IS(IP)=IS(IP)-1                                                   00009040
C     IF(IS(IP).EQ.NB)GOTO 1953                                         00009050
C     FFS=TRUE                                                          00009060
C1953 CONTINUE                                                          00009070
C     IF(IS(IP).NE.0)GOTO 1930                                          00009080
C     ISB=2                                                             00009090
C     IF(IP.NE.1)ISB=IS(IP-1)                                           00009100
C                                                                       MOD07780
      GO TO 1908                                                        MOD07790
C                                                                       MOD07800
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD07810
C     IY=NYPP*IP+1                                                      00009110
C ***** LOGIC BACK *****                                                00009120
C DISCOUNTING                                                           00009130
C IF(NYPP.EQ.1)GOTO 19705                                               00009140
C NYPPM1=NYPP-1                                                         00009150
C DO 1970 J=1,NB                                                        00009160
C DO 1970 I=1,NYPPM1                                                    00009170
C 1970 EVALUE(IY-I,J)=EVALUE(IY-I,J)+DF*EVALUE(IY+1-I,J)                00009180
C 19705 CONTINUE                                                        00009190
C TAKE EXPECTED VALUE AND DISCOUNT                                      00009200
C IF(NB.EQ.2)GOTO 1973                                                  00009210
C IF(NB.EQ.1)GOTO 1974                                                  00009220
C ETEMP=DF*(Q*(EVALUE(IY-NYPP+1,3)+EVALUE(IY-NYPP+1,1))/2.              00009230
C+              +(1.-Q)*EVALUE(IY-NYPP+1,2))                            00009240
C GOTO 1975                                                             00009250
C 1973 ETEMP=DF*(EVALUE(IY-NYPP+1,1)+EVALUE(IY-NYPP+1,2))/2.            00009260
C GOTO 1975                                                             00009270
```

```
C 1974 ETEMP=DF*EVALUE(IY-NYPP+1,1)                                    00009280
C 1975 EVALUE(IY-NYPP,ISB)=EVALUE(IY-NYPP,ISB)+ETEMP                   00009290
C **********************                                               00009300
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07820
C                                                                      MOD07830
C     IP=IP-1                                                          00009310
C     IF(IP.NE.0)GOTO 1950                                             00009320
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07840
1980  CONTINUE                                                         00009330
C ***** END OF VISITATION *****                                       00009340
1988  FORMAT(//8X,'PRODUCTION BY YEAR',12X,'LEVELIZED PRICES',         00009350
     +'(M/KWH)',4X,'PROB  TREE')                                       00009360
1989  FORMAT('YEAR  GROW   V+E+O   DEMAND    RM',4X,                  00009370
     +'     V+E+O  FIXED  TOTAL',10X,'PATH')                          00009380
1990  FORMAT(08X,'(M/KWH-',I4,'$)',2X,'(MW)',10X,                      00009390
     +'(LEVELIZED ',I4,' DOLLARS)'/)                                   00009400
1991  FORMAT(08X,'(M/KWH-',I4,'$)',2X,'(MW)',8X,                       00009410
     +'(LEVELIZED CURRENT DOLLARS)'/)                                  00009420
1995  FORMAT(I4,F6.3,F08.2,F9.0,F6.3,7X,-3PF7.2,2F7.2,0PF8.3,          00009430
     +2X,30I1)                                                         00009440
1996  FORMAT(I4,F6.3,F08.2,F9.0,F6.3,28X,F8.3,2X,30I1)                 00009450
1997  FORMAT(I4,F6.3,F08.2,F9.0,F6.3)                                  00009460
1998  FORMAT(I4,F6.3,F08.2,F9.0,F6.3,7X,-3PF7.2,2F7.2)                 00009470
3995  FORMAT(/'EXPECTED PRICES(M/KWH)',10X,8X,-3PF7.2,2F7.2/           00009480
     +'ANNUAL COST TO CONSUMERS($M)',5X,8X,-6P3F7.0//                  00009490
     +'PLANNING RESERVE MARGIN:',0PF8.3)                               00009500
3996  FORMAT('EXPECTED RESERVE MARGIN:',F8.3)                          00009510
3997  FORMAT(10X,15A4)                                                 00009520
C                                                                      00009530
C                                                                      00009540
C                                                                      00009550
C ACCUMULATE LEVELIZED COSTS FOR PRINTOUT                              00009560
C                                                                      00009570
      IF(.NOT.SIDE)COST(IDEC,1)=PRM                                    00009580
      IF(CNSYS)FRACTN=ENS78/(PVAEN*1000000.)                           00009590
      IF(.NOT.CNSYS)FRACTN=ANIZE/1000000.                              00009600
      IOTHER=1                                                         00009610
      ICOUD=IDEC                                                       00009620
      IF(SIDE)IOTHER=0                                                 00009630
      IF(SIDE)ICOUD=1                                                  00009640
      IF(.NOT.CNSYS)GG=PVAEN*ANIZE                                     00009650
      IF(CNSYS)GG=ENS78                                                00009660
      COST(ICOUD,IOTHER+1)=TERMF*FRACTN                                00009670
      COST(ICOUD,IOTHER+2)=(TERMV-TERME-TERMO)*FRACTN                  00009680
      COST(ICOUD,IOTHER+3)=TERME*FRACTN                                00009690
      COST(ICOUD,IOTHER+4)=TERMO*FRACTN                                00009700
      IF(.NOT.SIDE)GOTO 3999                                           00009710
      DO 4001 I=1,4                                                    00009720
4001  COST(2,I)=COST(1,I)*1000./GG                                     00009730
      DO 4002 J=1,2                                                    00009740
      COST(J,5)=0.                                                     00009750
      DO 4003 I=1,4                                                    00009760
4003  COST(J,5)=COST(J,5)+COST(J,I)                                    00009770
4002  CONTINUE                                                         00009780
      CALL PTCOST(SIDE,CNDOL,PVAEN,COST,IDEC,IFFYR,IFRMYR,ILRMYR,PRM,  00009790
     +ANIZE,CNSYS,ENS78)                                               00009800
3999  CONTINUE                                                         00009810
```

```
C CALCULATE PRICE OF ENERGY                                              00009820
C                                                                        00009830
      TERMV=TERMV/PVAEN                                                  00009840
      TERMF=TERMF/PVAEN                                                  00009850
      EPVREQ=TERMF+TERMV                                                 00009860
      POE=EPVREQ                                                         00009870
C                                                                        00009880
C ANNUALIZE EXPECTED CHARGES                                             00009890
C                                                                        00009900
C EANREQ HAS UNITS (MILLS/KWH)*1000.                                     00009910
      EANREQ=TERMV+TERMF                                                 00009920
      O=OMM*GG                                                           00009930
      TV=TERMV*GG                                                        00009940
      TF=TERMF*GG                                                        00009950
      E=EANREQ*GG                                                        00009960
C                                                                        00009970
      PRINT 3995,TERMV,TERMF,EANREQ,TV,TF,E,PRM                          00009980
C                                                                        00009990
9999  CONTINUE                                                           00010000
      IF(.NOT.SIDE)CALL PTCOST(SIDE,CNDOL,PVAEN,COST,LDEC,IFFYR,         00010010
     +IFRMYR,ILRMYR,PRM,ANIZE,CNSYS,ENS78)                               00010020
99999 CONTINUE                                                           00010030
      WRITE(10,3998)                                                     00010040
3998  FORMAT(//'OVER/UNDER CAPACITY PLANNING MODEL'/                     00010050
     +'UPDATED BY DECISION FOCUS, INC.   8/8/79.')                       00010060
      WRITE (10,39981)                                                   MOD07850
39981 FORMAT (//'OVER/UNDER CAPACITY PLANNING MODEL - - AREEP VERSION'/  MOD07860
     +          'MODIFIED BY BATTELLE NORTHWEST.   2/1/82.')            MOD07870
      STOP                                                               00010070
      END                                                                00010080
```

```
C  ********************************************************      00010090
C  *                                                      *      00010100
C  *          ELECTRIC POWER RESEARCH INSTITUTE           *      00010110
C  *                                                      *      00010120
C  *          OVER/UNDER CAPACITY PLANNING MODEL          *      00010130
C  *                                                      *      00010140
C  *               DEVELOPED UNDER RP-1107                *      00010150
C  *                                                      *      00010160
C  *      COSTS AND BENEFITS OF OVER/UNDER CAPACITY       *      00010170
C  *          IN ELECTRIC POWER SYSTEM PLANNING           *      00010180
C  *                                                      *      00010190
C  *                VERSION DATED 8/8/79                  *      00010200
C  *                                                      *      00010210
C  ********************************************************      00010220
C  *                                                      *      00010230
C  *                    ATTACHMENT B                      *      00010240
C  *                                                      *      00010250
C  *          THE FOLLOWING IS A NOTICE OF COPYRIGHT,     *      00010260
C  *  AVAILABILITY OF SUBJECT MATTER, AND DISCLAIMER      *      00010270
C  *  WHICH MUST BE INCLUDED IN THE PROLOGUE OF THE       *      00010280
C  *  CODE, IN ALL PRINTOUTS OF THE CODE, AND IN REPORTS  *      00010290
C  *  MADE FROM THE CODE.                                 *      00010300
C  *                                                      *      00010310
C  *          (COPYRIGHT) 1978 ELECTRIC POWER RESEARCH    *      00010320
C  *  INSTITUTE, INC.                                     *      00010330
C  *                                                      *      00010340
C  *          EPRI RESERVES ALL RIGHTS IN THE CODE.       *      00010350
C  *  THE CODE OR ANY PORTION THEREOF MAY NOT BE          *      00010360
C  *  REPRODUCED IN ANY FORM WHATSOEVER WITHOUT THE       *      00010370
C  *  CONSENT OF EPRI.  SUCH CONSENT HAVING BEEN          *      00010380
C  *  OBTAINED, CHANGES OR MODIFICATIONS MAY BE MADE IN   *      00010390
C  *  THE CODE PROVIDED THAT WRITTEN NOTICE AND A         *      00010400
C  *  DETAILED DESCRIPTION OF ANY SUCH CHANGES OR         *      00010410
C  *  MODIFICATIONS SHALL BE TRANSMITTED TO EPRI WITHIN   *      00010420
C  *  ONE MONTH AFTER SUCH CHANGES OR MODIFICATIONS ARE    *      00010430
C  *  MADE AND PROVIDED FURTHER THAT, UPON THE WRITTEN     *      00010440
C  *  REQUEST OF EPRI, THE CODE, AS CHANGED OR MODIFIED,   *      00010450
C  *  SHALL BE GIVEN A NEW DESIGNATION SUFFICIENTLY       *      00010460
C  *  DIFFERENT FROM ITS CURRENT DESIGNATION AS TO        *      00010470
C  *  PREVENT MISTAKE, CONFUSION, OR DECEPTION AS         *      00010480
C  *  BETWEEN THE CURRENT CODE AND THE CODE AS CHANGED     *      00010490
C  *  OR MODIFIED.                                        *      00010500
C  *                                                      *      00010510
C  *          A LICENSE UNDER EPRI'S RIGHTS IN THE        *      00010520
C  *  CODE CAN BE OBTAINED DIRECTLY FROM EPRI.            *      00010530
C  *                                                      *      00010540
C  *          REQUESTS FOR THE CODE SHOULD BE             *      00010550
C  *  ADDRESSED TO:                                       *      00010560
C  *                                                      *      00010570
C  *          MR. EUGENE OATMAN                           *      00010580
C  *          ENERGY ANALYSIS & ENVIRONMENT DIVISION      *      00010590
C  *          ELECTRIC POWER RESEARCH INSTITUTE           *      00010600
C  *          3412 HILLVIEW AVENUE                        *      00010610
C  *          PALO ALTO, CALIFORNIA  94304                *      00010620
C  *                                                      *      00010630
C  *          (415) 855-2629                              *      00010640
C  *                                                      *      00010650
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C   *            NEITHER EPRI, ANY MEMBER OF EPRI NOR ANY  *              00010660
C   *  PERSON OR ORGANIZATION ACTING ON BEHALF OF ANY  OF  *              00010670
C   *  THEM:                                               *              00010680
C   *                                                      *              00010690
C   *            (1)  MAKES     ANY      WARRANTY      OR  *              00010700
C   *                 REPRESENTATION WHATSOEVER, EXPRESS   *              00010710
C   *                 OR IMPLIED,  WITH  RESPECT  TO  THE  *              00010720
C   *                 ACCURACY,      COMPLETENESS      OR  *              00010730
C   *                 USEFULNESS   OF  THE  CODE  OR  ANY  *              00010740
C   *                 PORTION THEREOF;                     *              00010750
C   *                                                      *              00010760
C   *            (2)  MAKES     ANY      WARRANTY      OF  *              00010770
C   *                 MERCHANTABILITY  OR FITNESS FOR ANY  *              00010780
C   *                 PURPOSE WITH RESPECT TO  THE  CODE;  *              00010790
C   *                 OR                                   *              00010800
C   *                                                      *              00010810
C   *            (3)  ASSUMES  ANY  LIABILITY  WHATSOEVER  *              00010820
C   *                 WITH RESPECT TO ANY USE OF THE CODE  *              00010830
C   *                 OR  ANY  PORTION  THEREOF  OR  WITH  *              00010840
C   *                 RESPECT TO ANY  DAMAGES  WHICH  MAY  *              00010850
C   *                 RESULT FROM SUCH USE.                *              00010860
C   *                                                      *              00010870
C   ********************************************************              00010880
      BLOCK DATA                                                          00011010
C   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -      MOD07880
C               - - DIMENSIONS RELATING TO THE NUMBER OF TECHNOLOGIES     MOD07890
C                     HAVE BEEN MODIFIED TO ACCOMMODATE UP TO 7 HYDRO     MOD07900
C                     TECHNOLOGIES.                                       MOD07910
C   - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -      MOD07920
      COMMON /C3/ EXCPLM(100),CWIP(100),CC,DINT(100),LAGR(16)             00011020
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RIBASE(100),          00011030
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),    00011040
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78                00011050
     + ,AAMORT(100),CURCAP(16,100),FCESC,ADDION(100),DEPREC(100),         00011060
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),           00011070
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100),DUMMY(250)          00011080
C               - - FCESC WAS NOT ORIGINALLY DIMENSIONED HERE !           MOD07930
      DIMENSION FCESC(16)                                                 MOD07940
      DATA EXCPLM,FCWIP,FAFUDC,AAMORT,ADDION/100*0.,208*0.,208*0.,        00011090
     +100*0.,100*0./                                                      00011100
      DATA DUMMY/250*0./                                                  00011110
      END                                                                 00011120
```

```
      SUBROUTINE TERFIX(LBAVE,DISC,LB,LBD,FCLEV,DFLEV,FCESC,TERMIX,     00020010
     +LR,CAPCST,DISFC,TFC,LBMAX)                                        00020020
C                                                                       00020030
C THIS SUBROUTINE CHANGES THE LEVELIZED FIXED CHARGE RATES INTO         00020040
C RATES LEVELIZED OVER LBAVE YEARS.  THEN THE ESCALATED LEVELIZED       00020050
C FIXED CHARGE IS CALCULATED AND STORED IN TFC.  NOTE THAT THE          00020060
C WEIGHTED AVERAGE IS CALCULATED USING TERMIX.                          00020070
C                                                                       00020080
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07950
C            - - DIMENSIONS AND DO LOOP FINAL VALUES MODIFIED TO        MOD07960
C                  ACCOMMODATE 16 TECHNOLOGIES.                         MOD07970
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD07980
      DIMENSION FCLEV(16),LB(16),TFC(100),FCESC(16),TERMIX(16),         00020090
     +CAPCST(16)                                                        00020100
C                                                                       00020110
C LEVELIZE TO COMMON LBAVE HORIZON.                                     00020120
C                                                                       00020130
      BAVE=0.                                                           00020140
C     DO 5 I=1,10                                                       00020150
      DO 5 I=1,16                                                       MOD07990
5     BAVE=BAVE+FLOAT(LB(I))*TERMIX(I)                                  00020160
      LBAVE=IFIX(BAVE+.5)                                               00020170
C           - - BYPASS SOME CODE TO AVOID DIVISION BY ZERO FOR THE       MOD08000
C                 CASE WHEN DISC=1 (I.E. INPUT CDSC=0)                  MOD08010
C                 THE EFFECT IS NOT TO DISCOUNT DFLEV AND FCLEV         MOD08020
      IF (DISC .EQ. 1.0) GO TO 11                                       MOD08030
C                                                                       MOD08040
      DFLBM=1.-DISC**LBAVE                                              00020180
      DFLEV=DFLEV*(1.-DISC**LBD)/DFLBM                                  00020190
C     DO 10 I=1,10                                                      00020200
      DO 10 I=1,16                                                      MOD08050
10    FCLEV(I)=FCLEV(I)*(1.-DISC**LB(I))/DFLBM                          00020210
C                                                                       00020220
C CALCULATE THE WEIGHTED AVERAGE FIXED CHARGES IN DOLLARS PER           00020230
C MEGAWATT.                                                             00020240
C                                                                       00020250
C                                                                       MOD08060
 11   CONTINUE                                                          MOD08070
C                                                                       MOD08080
      DO 30 J=1,LBMAX                                                   00020260
      TFC(J)=0.                                                         00020270
C     DO 20 I=1,10                                                      00020280
      DO 20 I=1,16                                                      MOD08090
      TFC(J)=CAPCST(I)*(1.+FCESC(I))**(LR+J)*FCLEV(I)*TERMIX(I)*1000.   00020290
     ++TFC(J)                                                           00020300
20    CONTINUE                                                          00020310
30    CONTINUE                                                          00020320
      RETURN                                                            00020330
      END                                                               00020340
```

```
      SUBROUTINE PROLEV(FC1,FCTLH,FCTL,FCTL1,FCBL,LT,LB,DF1,DF2,DF3,     00020350
     +DF4,DF5,LTD,LBD,DISC,DFLEV,FCLEV)                                  00020360
C                                                                        00020370
C THIS SUBROUTINE LEVELIZES THE FIXED CHARGE PROFILES FOR                00020380
C DISTRIBUTION AND ALL TEN TECHNOLOGIES, AND STORES THEM                 00020390
C IN DFLEV AND FCLEV,RESPECTIVELY.                                       00020400
C                                                                        00020410
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD08100
C             - - DIMENSIONS AND DO LOOP FINAL VALUES MODIFIED TO        MOD08110
C                   ACCOMMODATE 16 TECHNOLOGIES.                         MOD08120
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD08130
      DIMENSION FC1(16),FCTLH(16),FCTL(16),FCTL1(16),FCBL(16),LT(16),    00020420
     +LB(16),FCLEV(16),POINT(3),SLOPE(3),ITIME(4),DIFF(3)                00020430
C                                                                        00020440
      ITIME(1)=0                                                         00020450
C     DO 100 I=1,10                                                      00020460
      DO 100 I=1,16                                                      MOD08140
      ITIME(2)=LT(I)/2                                                   00020470
      ITIME(3)=LT(I)                                                     00020480
      ITIME(4)=LB(I)                                                     00020490
      DO 10 J=1,3                                                        00020500
10    IF(ITIME(J+1)-ITIME(J).LE.1)PRINT 20                               00020510
20    FORMAT('WARNING: TIME IS INCONSISTENT IN SUBROUTINE PROLEV.')      00020520
      DIFF(1)=FC1(I)-FCTLH(I)                                            00020530
      F2B=FCTLH(I)-(FCTLH(I)-FCTL(I))/FLOAT(ITIME(3)-ITIME(2))           00020540
      DIFF(2)=F2B-FCTL(I)                                                00020550
      DIFF(3)=FCTL1(I)-FCBL(I)                                           00020560
C                                                                        00020570
C FIND POINT AND SLOPE INPUTS FOR SUBROUTINE LEVEL.                      00020580
C                                                                        00020590
      DO 30 J=1,3                                                        00020600
30    SLOPE(J)=DIFF(J)/FLOAT(ITIME(J+1)-ITIME(J)-1)                      00020610
      POINT(2)=F2B+SLOPE(2)*FLOAT(ITIME(2)+1)                            00020620
      POINT(1)=FC1(I)+SLOPE(1)*FLOAT(ITIME(1)+1)                         00020630
      POINT(3)=FCTL1(I)+SLOPE(3)*FLOAT(ITIME(3)+1)                       00020640
      CALL LEVEL(POINT,SLOPE,ITIME,DISC,FCLEV(I))                        00020650
100   CONTINUE                                                           00020660
C                                                                        00020670
C FIND DISTRIBUTION POINT AND SLOPE INPUTS FOR SUBROUTINE LEVEL.         00020680
C                                                                        00020690
      ITIME(2)=LTD/2                                                     00020700
      ITIME(3)=LTD                                                       00020710
      ITIME(4)=LBD                                                       00020720
      DO 40 J=1,3                                                        00020730
40    IF(ITIME(J+1)-ITIME(J).LE.1)PRINT 20                               00020740
      DIFF(1)=DF1-DF2                                                    00020750
      F2B=DF2-(DF2-DF3)/FLOAT(ITIME(3)-ITIME(2))                         00020760
      DIFF(2)=F2B-DF3                                                    00020770
      DIFF(3)=DF4-DF5                                                    00020780
      DO 50 J=1,3                                                        00020790
50    SLOPE(J)=DIFF(J)/FLOAT(ITIME(J+1)-ITIME(J)-1)                      00020800
      POINT(2)=F2B+SLOPE(2)*FLOAT(ITIME(2)+1)                            00020810
      POINT(1)=DF1+SLOPE(1)*FLOAT(ITIME(1)+1)                            00020820
      POINT(3)=DF4+SLOPE(3)*FLOAT(ITIME(3)+1)                            00020830
      CALL LEVEL(POINT,SLOPE,ITIME,DISC,DFLEV)                           00020840
      RETURN                                                             00020850
      END                                                                00020860
```

```
      SUBROUTINE LEVEL(POINT,SLOPE,ITIME,DISC,FLEVEL)                   00020870
C                                                                       00020880
C THIS SUBROUTINE FINDS THE LEVELIZED FIXED CHARGE RATE                 00020890
C (FLEVEL) EQUIVALENT TO A GIVEN FIXED CHARGE PROFILE                   00020900
C UNDER DISCOUNT RATE DISC.                                             00020910
C                                                                       00020920
      DIMENSION POINT(3),SLOPE(3),ITIME(4)                              00020930
C                                                                       00020940
      FLEVEL=0.                                                         00020950
      DISSUM=0.                                                         00020960
      DISFAC=1.                                                         00020970
      DO 50 J=1,3                                                       00020980
      ITLOW=ITIME(J)+1                                                  00020990
      ITHIGH=ITIME(J+1)                                                 00021000
      DO 40 I=ITLOW,ITHIGH                                              00021010
      DISFAC=DISFAC*DISC                                                00021020
      DISSUM=DISSUM+DISFAC                                              00021030
      FLEVEL=FLEVEL+(POINT(J)-FLOAT(I)*SLOPE(J))*DISFAC                 00021040
40    CONTINUE                                                          00021050
50    CONTINUE                                                          00021060
      FLEVEL=FLEVEL/DISSUM                                              00021070
      RETURN                                                            00021080
      END                                                               00021090
```

```
      SUBROUTINE INICEP(CEP,RETIRE,LR,LRP1,LEAD,NS)                     00021100
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD08150
C              - - DIMENSIONS HAVE BEEN MODIFIED AND DO LOOP FINAL      MOD08160
C                   VALUES INCREASED TO ACCOMMODATE THE 7 HYDRO         MOD08170
C                   TECHNOLOGIES.                                       MOD08180
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD08190
      DIMENSION CEP(16,31,3),RETIRE(16,31),LEAD(16,3)                   00021110
C                                                                       00021120
C THIS SUBROUTINE INITIALIZES  CEP  AND  RETIRE.                        00021130
C                                                                       00021140
C REMOVE RETIREMENTS FROM CEP AND PUT THEM INTO RETIRE.                 00021150
C     DO 10 I=1,10                                                      00021160
      DO 10 I=1,16                                                      MOD08200
      DO 10 IY=2,LRP1                                                   00021170
      IF(CEP(I,IY,NS).GE.0.)GOTO 10                                     00021180
      RETIRE(I,IY)=-CEP(I,IY,NS)                                        00021190
      CEP(I,IY,NS)=0.                                                   00021200
10    CONTINUE                                                          00021210
C                                                                       00021220
C PUT INITIAL COMMITED ADDITIONS INTO PRIOR COMMITMENT STAGES           00021230
C AS WELL.                                                              00021240
      IF(NS.EQ.1)GOTO 50                                                00021250
C     DO 40 I=1,10                                                      00021260
      DO 40 I=1,16                                                      MOD08210
      DO 40 IS=2,NS                                                     00021270
      ISTAGE=NS+2-IS                                                    00021280
      DO 30 IY=1,LR                                                     00021290
      IF(CEP(I,IY,ISTAGE).LT..01)GOTO 30                                00021300
      IYP=IY-LEAD(I,ISTAGE)                                             00021310
      IF(IYP.LT.1)IYP=1                                                 00021320
      CEP(I,IYP,ISTAGE-1)=CEP(I,IYP,ISTAGE-1)+CEP(I,IY,ISTAGE)          00021330
30    CONTINUE                                                          00021340
40    CONTINUE                                                          00021350
50    CONTINUE                                                          00021360
      RETURN                                                            00021370
      END                                                               00021380
```

```
      SUBROUTINE PRODUC(IYR,CAP,MWINC,AMWINC,DFP,NSIZE,LOAD,AVAIL,CLDC, 00021390
     +OUTCAP,OUTAV,CURDEM,YLF,FENG,FTIME,HYPROB,ALF,BLDC,DBLDC,PW,PMAIN,00021400
     +HYEN,PPDET,RRM,DEM,TKNAM,OUTTYP,NH,NHY,IS,IP,NP,NYPP,NVCPP,YEARS, 00021410
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08220
C     +RPROD,VC,ENV,OUTCST,APCDET,TERMIN,TVC,AMM,LBMAX,VCESC,HYMULT,DFO, 00021420
C     +HA,OUTESC,OUTC,CSENV,CSOUT,PRM)                                  00021430
      +RPROD,VC,ENV,HR,IFTU,FC,IYFDE,OUTCST,APCDET,TERMIN,TVC,AMM,LBMAX, MOD08230
C     +VCESC,FUESC,HYMULT,DFO,HA,OUTESC,OUTC,CSENV,CSOUT,PRM)           MOD08240
      +VCESC,FUESC,HYMULT,DFO,HA,OUTESC,OUTC,CSENV,CSOUT,PRM,HCUTIL,    MOD08250
C             - - ADDITIONAL PARAMETERS FOR SUBROUTINE WRTINT           MOD08260
      + ACAP,AGEN,FCAP,FGEN,XXLOLP,INTR,                                MOD08270
C             - - ADDITIONAL PARAMETERS FOR ANCHORAGE - FAIRBANKS       MOD08280
C                 LIMITED INTERTIE CALCULATIONS                         MOD08290
      + LCFAIR,FEYRLY,ALLINT,                                           MOD08300
C             - - ADDITIONAL PARAMETERS FOR CPRT REPORT - ENERGY TABLE   MOD08310
      +CPRT,TECHEN)                                                     MOD08320
C                                                                       MOD08330
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08340
C     INCLUDE (AREEPPR)                                                 MOD08350
C                                                                       00021440
C THIS SUBROUTINE CALLS THE PRODUCTION ENERGY, PRODUCTION COSTING,      00021450
C AND PRODUCTION PRINTOUT SUBROUTINES.                                  00021460
C                                                                       00021470
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08360
C             - - DIMENSIONS HAVE BEEN MODIFIED TO ACCOMMODATE THE      MOD08370
C                   7 HYDRO TECHNOLOGIES.                               MOD08380
      DIMENSION DFP(16),NSIZE(16),NPLANT(9),IREM(9),LOAD(9),AVAIL(9,2), 00021480
     +OUTCAP(7),OUTAV(7),ITYP(100),ICAP(100),AVCAP(100,2),FENG(2),      00021490
     +FTIME(2),HYPROB(3),ALF(2),BLDC(12,2),DBLDC(12),CAP(16),           00021500
     +CLDC(1500),HYEN(3),ENCAP(100),EOUT(100,3,2),                      00021510
     +OUTOUT(3,2),OUTXL(3,2),HYENLM(3,2),                               00021520
     +RRM(30),DEM(30),TKNAM(16,2),OUTTYP(8,2),IS(30),YEARS(5),VC(16),   00021530
     +ENV(16),OUTCST(8),VCESC(16),HYMULT(3),DREM(9),ICA(100,2),DFO(16)  00021540
C    +,PMAIN(10,2),HA(2),MHY2(2),ITYP1(100),OUTESC(8)                   00021550
C             - - DIMENSION OF HA(2) MODIFIED TO HA(7,2)                MOD08390
     +,PMAIN(16,2),HA(7,2),MHY2(2),ITYP1(100),OUTESC(8)                 MOD08400
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08410
C                                                                       MOD08420
C     FOSSIL FUEL ARRAYS                                                MOD08430
      DIMENSION HR(16), IFTU(16), FC(31,10), FUESC(10)                  MOD08440
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08450
C             - -                                                       MOD08460
C                  HCUTIL - CAPACITY UTILIZATION FACTOR (INPUT)         MOD08470
C                  HYENPR - PROPORTION OF TOTAL HYDRO ENERGY (LOCAL)    MOD08480
      DIMENSION HCUTIL(7), HYENPR(7)                                    MOD08490
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08500
C                                                                       00021560
      LOGICAL PPDET,RPROD(3,2),TRUE,FALSE,APCDET,TERMIN,OUTC(8)         00021570
     +,DONE                                                             00021580
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08510
C             - - MWINC IS REAL TO ACCOMMODATE SMALL SYSTEMS             MOD08520
      REAL MWINC                                                        MOD08530
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08540
C    - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD08550
C             - - ANCHORAGE-FAIRBANKS INTERTIE REPORT ARRAYS             MOD08560
      DIMENSION ACAP(30),AGEN(30),FCAP(30),FGEN(30),XXLOLP(30)          MOD08570
      LOGICAL INTR                                                      MOD08580
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C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD08590
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD08600
C                - - ANCHORAGE-FAIRBANKS INTERTIE CALULATION ARRAYS     MOD08610
C                    2 LEAST COST NON-HYDRO FAIRBANKS TECHNOLOGIES      MOD08620
C                    FOR YEAR 1-9 (1981-1989) - - LCFAIR                MOD08630
C                    ANNUAL ENERGY FOR FAIRBANKS - - FEYRLY             MOD08640
C                    USED BY SUBROUTINE BALERU                          MOD08650
      DIMENSION LCFAIR(2,9),FEYRLY(3,30)                                MOD08660
C                                                                       MOD08670
C              - - FOR CPRT REPORT - ENERGY TABLE                       MOD08680
C                  TECHEN STORED IN SUBROUTINE SVENG                    MOD08690
      LOGICAL CPRT                                                      MOD08700
      DIMENSION TECHEN(16,30)                                           MOD08710
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD08720
      DATA ITYP1/100*0/                                                 00021581
      DATA TRUE,FALSE,NCAPS1/.TRUE.,.FALSE.,0/                          00021590
C                                                                       00021600
C CALL PRODUCTION COSTING MODEL(CAPADD,CURDEM)                          00021610
C                                                                       00021620
C                                                                       00021630
C                                                                       00021640
C                                                                       00021650
      DO 10 K=1,100                                                     00021660
      DO 10 I=1,3                                                       00021670
      DO 10 J=1,2                                                       00021680
10    EOUT(K,I,J)=0.                                                    00021690
C                                                                       00021700
      ENYEAR=CURDEM*YLF*8.76                                            00021710
      DONE=FALSE                                                        00021720
      DO 105 J=1,2                                                      00021730
      IF(FENG(J).LT..0005.OR.FTIME(J).LT..0005)GOTO 105                 00021740
C CALCULATE CAPACITIES FOR SUBROUTINE BALERU.                           00021750
      CALL CAPPRE(DFP,CAP,MWINC,NSIZE,NPLANT,IREM,J,AVAIL,DREM,PMAIN)   00021760
      CALL BALPRE(NPLANT,LOAD,MWINC,IREM,NSIZE,AVAIL,OUTCAP,OUTAV,      00021770
     +ITYP,ICAP,AVCAP,NCAPS,DREM,ICA,DFO,J)                             00021780
      IF(NCAPS.GT.100)PRINT 18,NCAPS                                    00021790
18    FORMAT('WARNING:  ',I7,' PLANTS EXCEEDS DIMENSIONS.')             00021800
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD08730
C                                                                       MOD08740
C              - - DETERMINE THE FIRST PLANT THAT IS NOT ONE OF THE     MOD08750
C                  2 LEAST COST NON-HYDRO FAIRBANKS TECHNOLOGIES        MOD08760
C                  FOR THIS YEAR (IYR=1-9)                              MOD08770
C                                                                       MOD08780
C     ICP IS USED IN SUBROUTINE BALERU TO DETERMINE WHEN THE 2 LEAST    MOD08790
C         COST FAIRBANKS TECHNOLOGY PLANTS HAVE BEEN EXHAUSTED IN THE   MOD08800
C         LOADING ORDER                                                 MOD08810
C                                                                       MOD08820
      ICP=0                                                             MOD08830
      IF (TERMIN .OR. IYR .GE. 10) GO TO 20                             MOD08840
C                                                                       MOD08850
      DO 19 K=1,NCAPS                                                   MOD08860
      IF (ITYP(K) .EQ. LCFAIR(1,IYR) .OR. ITYP(K) .EQ. LCFAIR(2,IYR))   MOD08870
     *    ICP=K                                                         MOD08880
      IF (ITYP(K) .NE. LCFAIR(1,IYR) .AND. ITYP(K) .NE. LCFAIR(2,IYR))  MOD08890
     *    GO TO 20                                                      MOD08900
 19   CONTINUE                                                          MOD08910
 20   CONTINUE                                                          MOD08920
```

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C                                                                       MOD08930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD08940
      EN=ENYEAR*FENG(J)                                                 00021810
      TIM=8.76*FTIME(J)                                                 00021820
      IF(J.NE.1)GOTO 50                                                 00021830
      NCAPS1=NCAPS                                                      00021840
      DO 40 I=1,NCAPS1                                                  00021850
40    ITYP1(I)=ITYP(I)                                                  00021860
50    CONTINUE                                                          00021870
      IF(NCAPS.GT.NCAPS1)PRINT 8                                        00021880
8     FORMAT('WARNING: PEAK SEASON HAS FEWER PLANTS THAN OFF ',         00021890
     +'PEAK SEASON.')                                                   00021900
      DO 100 I=1,3                                                      00021910
      IF(HYPROB(I).LT..0005)GOTO 100                                    00021920
      CALL BALLDC(J,EN,TIM,ALF,BLDC,DBLDC,PW,AMWINC,CLDC,IPEAK,ENTOT1)  00021930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD08950
C              - - INCORPORATE ALL HYDRO TECHNOLOGIES IN CALCULATING     MOD08960
C                     HYENL AND MWHY                                    MOD08970
C     HYENL=HYEN(I)*FENG(J)                                             00021940
C     IF(HYENL.LT..0005)GOTO 80                                         00021950
C     MWHY=IFIX(CAP(10)*HA(J)*HYMULT(I)/AMWINC+.5)*MWINC                00021960
C                                                                       MOD08980
      HYENR=0.0                                                         MOD08990
      DO 62 K=10,16                                                     MOD09000
      HYENR=HYENR + CAP(K)*HCUTIL(K-9)                                  MOD09010
  62  CONTINUE                                                          MOD09020
      HYENL=HYENR*FENG(J)*8.76                                          MOD09030
C     HYENEX WILL BE USED FOR CALCULATING PROPORTIONS BELOW             MOD09040
      IF (I .EQ. 2 .AND. J .EQ. 1) HYENEX=HYENL                         MOD09050
      IF (HYENL .LT. .0005) GO TO 80                                    MOD09060
      MWHYR=0                                                           MOD09070
      DO 72 K=10,16                                                     MOD09080
      MWHYR=MWHYR + IFIX(CAP(K)*HA(K-9,J)*HYMULT(I)/AMWINC + .5)*MWINC  MOD09090
  72  CONTINUE                                                          MOD09100
      MWHY=MWHYR                                                        MOD09110
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09120
      IF(I.EQ.2)MHY2(J)=MWHY                                            00021970
      CALL HYDRO(MWHY,HYENL,TIM,AMWINC,IPEAK,CLDC,ENTOT1)               00021980
80    CONTINUE                                                          00021990
      CALL BALERU(J,NCAPS,ICAP,AVCAP,EN,TIM,AMWINC,CLDC,IPEAK,          00022000
     +ENTOT1,XLOLP,OUTEN,ENCAP,                                         00022010
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09130
C              - -  ADDITIONAL PARAMETERS FOR THE LIMITED INTERTIE       MOD09140
C                     CALCULATIONS                                      MOD09150
     +IYR,ICP,IS,FEYRLY,ALLINT)                                         MOD09160
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09170
      K2=1                                                              00022020
      NCAPSM=NCAPS1-1                                                   00022030
      K1=0                                                              00022040
      DO 85 K=1,NCAPS1                                                  00022050
      IF(J.EQ.1.OR.DONE)GOTO 82                                         00022060
      IF(ITYP(K-K1).EQ.ITYP1(K))GOTO 82                                 00022070
      DO 81 II=K,NCAPSM                                                 00022080
      LAST=NCAPS1+K-I1                                                  00022090
81    ICA(LAST,J)=ICA(LAST-1,J)                                         00022100
      ICA(K,J)=0                                                        00022110
      K1=K1+1                                                           00022120
```

```
82    CONTINUE                                                          00022130
      EOUT(K,I,J)=0.                                                    00022140
      IF(ITYP(K2).NE.ITYP1(K))GOTO 85                                   00022150
      EOUT(K,I,J)=ENCAP(K2)                                             00022160
      K2=K2+1                                                           00022170
85    CONTINUE                                                          00022180
      OUTOUT(I,J)=OUTEN                                                 00022190
      OUTXL(I,J)=XLOLP                                                  00022200
      HYENLM(I,J)=HYENL                                                 00022210
      IF(J.EQ.2)DONE=TRUE                                               00022220
100   CONTINUE                                                          00022230
105   CONTINUE                                                          00022240
C                                                                       00022250
400   FORMAT('(EOUT(PK,UPK),HYDRO=1,3):'/(6F9.0))                       00022260
C ***** END OF INNER LOOP *****                                         00022270
      IF(.NOT.PPDET)GOTO 108                                            00022280
      CALL PRTPD(MHY2,HYENLM,NCAPS1,ICA,MWINC,ITYP1,NSIZE,AVAIL,        00022290
     +RRM,DEM,TKNAM,EOUT,OUTTYP,OUTAV,OUTOUT,OUTXL,FTIME,               00022300
     +HYPROB,NH,NHY,IS,IYR,IP,NP,NYPP,NVCPP,YEARS,TERMIN,DFO,PRM)       00022310
108   CONTINUE                                                          00022320
      IY=IYR                                                            00022330
      IF(TERMIN)IY=NP*NYPP+L8MAX                                        00022340
      MMMM=MAXO(MHY2(1),MHY2(2))                                        00022350
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09180
C              - - CALCULATE THE PROPORTION OF EACH HYDRO TECHNOLOGIES  MOD09190
C                    CONTRIBUTION TO TOTAL HYDRO ENERGY                 MOD09200
C                    (USED FOR COSTING)                                 MOD09210
      DO 110 K=1,7                                                      MOD09220
      IF (HYENEX .LT. .0001) HYENPR(K)=0.0                              MOD09230
      IF (HYENEX .LT. .0001) GO TO 110                                  MOD09240
      HYENPR(K)=CAP(K+9)*HCUTIL(K)*FENG(1)*8.76/HYENEX                  MOD09250
 110  CONTINUE                                                          MOD09260
C                                                                       MOD09270
C     HYENPR IS USED IN SUBROUTINE EXPEN FOR COSTING                    MOD09280
      CALL EXPEN(FTIME,HYPROB,RPROD,HYENLM,OUTOUT,NCAPS1,MMMM,          00022360
C     +OUTXL,ITYP1,NTPO,NLP,EOUT)                                       00022370
     +OUTXL,ITYP1,NTPO,NLP,EOUT,HYENPR)                                 MOD09290
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09300
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09310
C                                                                       MOD09320
C     CALL EVC(NTPO,NLP,ITYP1,VC,ENV,OUTCST,TVC,EOUT,IY,VCESC,OUTESC,   00022380
C    +OUTC,CSENV,CSOUT)                                                 00022390
C                                                                       MOD09330
      CALL EVC (NTPO,NLP,ITYP1,VC,ENV,HR,IFTU,FC,IYFDE,OUTCST,TVC,EOUT, MOD09340
     +IY,VCESC,FUESC,OUTESC,OUTC,CSENV,CSOUT)                           MOD09350
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09360
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09370
C              - - STORE YEARLY RESULTS FOR SUBROUTINE WRTINT           MOD09380
      IF (.NOT.TERMIN .AND. INTR)                                       MOD09390
     +    CALL SVNUMS (IYR,TKNAM,CAP,EOUT,ITYP1,NLP,OUTXL,              MOD09400
     +                 ACAP,AGEN,FCAP,FGEN,XXLOLP)                      MOD09410
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09420
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09430
C              - - STORE YEARLY ENERGY GENERATION FOR EACH TECHNOLOGY    MOD09440
C                  FOR THE CPRT REPORT (ENERGY TABLE)                   MOD09450
      IF (.NOT. TERMIN .AND. CPRT)                                      MOD09460
     +   CALL SVENG (IYR,EOUT,ITYP1,NLP,TECHEN)                         MOD09470
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
      CALL PRTAPC(YEARS,IS,NVCPP,IYR,NP,IP,EOUT,ITYP1,CAP,OUTCAP,
     +AMM,ENYEAR,OUTXL,APCDET,TVC,NYPP,TKNAM,OUTTYP,NLP,NTPO,TERMIN,
     +LBMAX,PRM)
      RETURN
      END
```

```
C                                                                       00022450
      SUBROUTINE LORDER(VC,ENV,LOAD)                                    00022460
      DIMENSION VC(10),ENV(10),LOAD(9),INDEX(9)                         00022470
C FIND LOADING ORDER FOR EXISTING CAPACITIES BASED ON VARIABLE AND      00022480
C ENVIRONMENTAL COST                                                    00022490
C LOAD(1)=6  MEANS THAT THE FIRST CAPACITY TO BE LOADED IS              00022500
C            CAPACITY 6.                                                00022510
      ILOW=1                                                            00022520
      DO 10 I=1,9                                                       00022530
10    INDEX(I)=1                                                        00022540
      DO 40 J=1,9                                                       00022550
      DO 20 I=1,9                                                       00022560
      IF(INDEX(I).EQ.0) GOTO 20                                         00022570
      IF(VC(I)+ENV(I).LT.VC(ILOW)+ENV(ILOW))ILOW=I                      00022580
20    CONTINUE                                                          00022590
      LOAD(J)=ILOW                                                      00022600
      INDEX(ILOW)=0                                                     00022610
      DO 30 I=1,9                                                       00022620
      IF(INDEX(I).EQ.1)ILOW=I                                           00022630
      IF(INDEX(I).EQ.1)GOTO 40                                          00022640
30    CONTINUE                                                          00022650
40    CONTINUE                                                          00022660
      RETURN                                                            00022670
      END                                                               00022680
```

```
C                                                                       00022690
      SUBROUTINE CAPPRE(DFP,CAP,MWINC,NSIZE,NPLANT,IREM,J,AVAIL,DREM,   00022700
     +PMAIN)                                                            00022710
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09490
C              - - DIMENSIONS HAVE BEEN MODIFIED TO ACCOMMODATE THE     MOD09500
C                    7 HYDRO TECHNOLOGIES.                              MOD09510
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09520
      DIMENSION DFP(16),CAP(16),NSIZE(9),NPLANT(9),IREM(9),AVAIL(9,2),  00022720
     +PMAIN(16,2),DREM(9)                                               00022730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09530
C              - - MWINC IS REAL TO ACCOMMODATE SMALL SYSTEMS           MOD09540
      REAL MWINC                                                        MOD09550
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09560
C NSIZE - ROUNDOFF SIZE TO NEAREST MWINC.                               00022740
C NPLANT - NUMBER OF PLANTS OF SIZE NSIZE.                              00022750
C IREM - DERATED REMAINDER IN MWINCS TO BE USED WITH AVAILABILITY 1.0   00022760
      DO 10 I=1,9                                                       00022770
      IF(NSIZE(I).EQ.0)NPLANT(I)=0                                      00022780
      IF(NSIZE(I).EQ.0)GOTO 9                                           00022790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09570
C              - - MODIFICATIONS FOR MWINC REAL                         MOD09580
C     NPLANT(I)=IFIX(CAP(I)*PMAIN(I,J))/(NSIZE(I)*MWINC)                00022800
      NPLANT(I)=(CAP(I)*PMAIN(I,J))/(NSIZE(I)*MWINC)                    MOD09590
C9    DREM(I)=(CAP(I)*PMAIN(I,J)-FLOAT(NPLANT(I)*NSIZE(I)*MWINC))       00022810
 9    DREM(I)=(CAP(I)*PMAIN(I,J) - (NPLANT(I)*NSIZE(I)*MWINC))          MOD09600
C     IREM(I)=IFIX(DREM(I)*AVAIL(I,J)/FLOAT(MWINC)+.5)                  00022820
      IREM(I)=IFIX(DREM(I)*AVAIL(I,J)/MWINC + .5)                       MOD09610
C     IF(DREM(I).LE.FLOAT(NSIZE(I)*MWINC))IREM(I)=IFIX(DREM(I)/         00022830
      IF (DREM(I) .LE. (NSIZE(I)*MWINC)) IREM(I)=IFIX(DREM(I)/          MOD09620
     +MWINC + .5)                                                       MOD09630
C    +FLOAT(MWINC)+.5)                                                  00022840
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09640
10    CONTINUE                                                          00022850
      RETURN                                                            00022860
      END                                                               00022870
```

```
C                                                                       00022880
      SUBROUTINE BALPRE(NPLANT,LOAD,MWINC,IREM,NSIZE,AVAIL,             00022890
     +OUTCAP,OUTAV,ITYP,ICAP,AVCAP,NCAPS,DREM,ICA,DFO,JS)               00022900
C     INCLUDE (AREEPPR)                                                 MOD09650
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09660
C              - - DIMENSION OF DFO INCREASED TO 16 FOR THE UP TO 16     MOD09670
C                   POSSIBLE TECHNOLOGIES.                              MOD09680
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09690
      DIMENSION NPLANT(9),LOAD(9),NSIZE(9),AVAIL(9,2)                   00022910
      DIMENSION ICAP(100),IREM(9),AVCAP(100,2),ITYP(100)                00022920
      DIMENSION OUTCAP(7),OUTAV(7),ICA(100,2),DREM(9),DFO(16)           00022930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09700
C              - - MWINC IS REAL TO ACCOMMODATE SMALL SYSTEMS            MOD09710
      REAL MWINC                                                        MOD09720
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09730
C THIS SUBROUTINE LOADS PLANTS IN LOADING ORDER FOR SUBROUTINE BALERU.   00022940
C OUTPUT PLANT LIST IS STORED IN ICAP, WHICH INCLUDES                   00022950
C SEVEN TYPES OF EMERGENCY ACTIONS (IF THEY ARE NON-ZERO).              00022960
C ASSOCIATED WITH EACH CAPACITY IS ITS AVAILABILITY (AVCAP) AND ITS     00022970
C TYPE. THE TOTAL NUMBER OF CAPACITIES IS RETURNED AS NCAPS.            00022980
      N=0                                                               00022990
      DO 40 I=1,9                                                       00023000
      L=LOAD(I)                                                         00023010
      IF(NPLANT(L).EQ.0)GOTO 30                                         00023020
      NP=NPLANT(L)                                                      00023030
      DO 20 K=1,NP                                                      00023040
      N=N+1                                                             00023050
      ICAP(N)=NSIZE(L)                                                  00023060
      ICA(N,JS)=ICAP(N)*MWINC                                           00023070
      DO 15 J=1,2                                                       00023080
15    AVCAP(N,J)=DFO(L)                                                 00023090
20    ITYP(N)=L                                                         00023100
30    IF(IREM(L).EQ.0)GOTO 40                                           00023110
      N=N+1                                                             00023120
      ICAP(N)=IREM(L)                                                   00023130
      ICA(N,JS)=ICAP(N)*MWINC                                           00023140
      DO 35 J=1,2                                                       00023150
      AVCAP(N,J)=1.0                                                    00023160
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09740
C              - - MODIFICATIONS FOR MWINC REAL                          MOD09750
35    IF (DREM(L) .LE. (NSIZE(L)*MWINC)) AVCAP(N,J)=DFO(L)              MOD09760
C35   IF(DREM(L).LE.FLOAT(NSIZE(L)*MWINC))AVCAP(N,J)=DFO(L)             00023170
      ITYP(N)=L                                                         00023180
40    CONTINUE                                                          00023190
      DO 60 I=1,7                                                       00023200
      MWOUT=IFIX(OUTCAP(I)/MWINC + .5)                                  MOD09770
C     MWOUT=IFIX(OUTCAP(I)/FLOAT(MWINC)+.5)                             00023210
      IF(MWOUT.EQ.0)GOTO 60                                             00023220
      N=N+1                                                             00023230
      ICAP(N)=MWOUT                                                     00023240
      ICA(N,JS)=ICAP(N)*MWINC                                           00023250
      DO 50 J=1,2                                                       00023260
50    AVCAP(N,J)=OUTAV(I)                                               00023270
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09780
C              - - 16 IS NOW THE BASE FOR OUTAGE DATA                    MOD09790
C     ITYP(N)=10+I                                                      00023280
      ITYP(N)=16+I                                                      MOD09800
```

```
C - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -
60    CONTINUE
      NCAPS=N
      IF(NCAPS.GT.100)PRINT 110
110   FORMAT('DIMENSIONS ARE GREATER THAN UZ IN SUBR BALPRE')
      RETURN
      END
```

```
C                                                                       00023350
      SUBROUTINE BALLDC(J,EN,TIM,ALF,BLDC,DBLDC,PW,AMWINC,CLDC,IPEAK,   00023360
     +ENTOT1)                                                           00023370
C     INCLUDE (AREEPPR)                                                 MOD09820
      DIMENSION BLDC(12,2),DBLDC(12),CLDC(1500),ALF(2)                  00023380
C THIS SUBROUTINE TURNS THE  LDC  INTO A COMPLEMENTARY                  00023390
C CUMULATIVE DISTRIBUTION FOR SUBROUTINE BALERU. OUTPUT                 00023400
C IS STORED IN  CLDC.  EACH INDEX UNIT REPRESENTS ONE MWINC.            00023410
C CLDC UP TO BASE LOAD =1.0.                                            00023420
      ICLDCB=IFIX(EN*BLDC(12,J)/(TIM*AMWINC)+1.5)                       00023430
      DO 100 I=1,ICLDCB                                                 00023440
100   CLDC(I)=1.0                                                       00023450
C CALCULATE POINTS ON THE COMPLEMENTARY CUMULATIVE                      00023460
      X=FLOAT(ICLDCB)                                                   00023470
      NCLDC=ICLDCB+1                                                    00023480
      CN=FLOAT(NCLDC)                                                   00023490
      YNEW=1.1                                                          00023500
      DO 120 J1=1,11                                                    00023510
      NLDC=13-J1                                                        00023520
      NN=NCLDC                                                          00023530
      XNEW=BLDC(NLDC-1,J)*FLOAT(ICLDCB-1)/BLDC(12,J) + 1.0              00023540
      YNEW=YNEW-DBLDC(NLDC)                                             00023550
      IF(XNEW.LE.CN) GOTO 120                                           00023560
      DELTAX=X-XNEW                                                     00023570
      SLOPE=DBLDC(NLDC-1)/DELTAX                                        00023580
      DO 110 I=NN,1500                                                  00023590
      CLDC(I)=SLOPE*(FLOAT(I)-X) + YNEW                                 00023600
      NCLDC=NCLDC+1                                                     00023610
      CN=FLOAT(NCLDC)                                                   00023620
      IF(XNEW.LE.CN) GOTO 120                                           00023630
110   CONTINUE                                                          00023640
120   X=XNEW                                                            00023650
      IPEAK=NCLDC                                                       00023660
      DO 125 I=IPEAK,1500                                               00023670
125   CLDC(I)=0.                                                        00023680
      AREA=0.                                                           00023690
      DO 130 I=2,IPEAK                                                  00023700
130   AREA=AREA+(CLDC(I-1)+CLDC(I))/2.                                  00023710
      ENTOT1=AREA*TIM*AMWINC                                            00023720
140   CONTINUE                                                          00023730
      RETURN                                                            00023740
      END                                                               00023750
```

```
C                                                                       00023760
      SUBROUTINE HYDRO(MWHY,HYENL,TIM,AMWINC,IPEAK,CLDC,ENTOT1)         00023770
C     INCLUDE (AREEPPR)                                                 MOD09830
      DIMENSION CLDC(1500)                                              00023780
C REMOVE PEAK HYDRO FROM CURVE                                          00023790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09840
C              - - AMWINC MAY BE LESS THAN 1                            MOD09850
      IHYCAP=MWHY/AMWINC                                                MOD09860
C     IHYCAP=MWHY/IFIX(AMWINC)                                          00023800
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09870
      IF(IHYCAP.LE.0)HYENL=0.                                           00023810
      IF(IHYCAP.LE.0)GOTO 190                                           00023820
      ALIM=HYENL/(TIM*AMWINC)                                           00023830
      AREA=0.                                                           00023840
      IPEAK1=IPEAK-1                                                    00023850
      DO 150 I=1,IPEAK1                                                 00023860
      AOLD=AREA                                                         00023870
      ICHG=IPEAK-I                                                      00023880
      AREA=AREA+(CLDC(ICHG+1)+CLDC(ICHG)-CLDC(ICHG+IHYCAP+1)-CLDC(ICHG+ 00023890
     +IHYCAP))/2.                                                       00023900
      IF(AREA.GE.ALIM)GOTO160                                           00023910
150   CONTINUE                                                          00023920
160   IF(ABS(AOLD-ALIM).LT.ABS(AREA-ALIM))ICHG=ICHG+1                   00023930
      DO 170 I=ICHG,IPEAK                                               00023940
170   CLDC(I)=CLDC(I+IHYCAP)                                            00023950
      IF(AREA.LT.ALIM)HYENL=AREA*TIM*AMWINC                             00023960
      IF(IHYCAP.GT.IPEAK-ICHG)IHYCAP=IPEAK-ICHG                         00023970
      IPEAK=IPEAK-IHYCAP                                                00023980
      DO 180 I=IPEAK,1500                                               00023990
180   CLDC(I)=0.0                                                       00024000
      AREA=0.                                                           00024010
      IF(IPEAK.LT.2)GOTO 40                                             00024020
      DO 26 I=2,IPEAK                                                   00024030
26    AREA=AREA+(CLDC(I-1)+CLDC(I))/2.                                  00024040
40    CONTINUE                                                          00024050
      ENTOT1=AREA*TIM*AMWINC                                            00024060
      ENTOT1=ENTOT1+HYENL                                               00024070
190   CONTINUE                                                          00024080
      RETURN                                                            00024090
      END                                                               00024100
```

```
C                                                                       00024110
      SUBROUTINE BALERU(J,NCAPS,ICAP,AVCAP,EN,TIM,AMWINC,CLDC,IPEAK,    00024120
     +ENTOT1,XLOLP,OUTEN,ENCAP,                                         00024130
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09880
C              - - ADDITIONAL PARAMETERS FOR THE LIMITED INTERTIE       MOD09890
C                     CALCULATIONS                                      MOD09900
     +IYR,ICP,ISS,FEYRLY,ALLINT)                                        MOD09910
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09920
C     INCLUDE (AREEPPR)                                                MOD09930
      DIMENSION CLDCNW(750)                                             00024140
      DIMENSION ICAP(100),AVCAP(100,2),CLDC(1500),ENCAP(100)            00024150
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09940
C              - -                                                      MOD09950
C     FAIRBANKS ANNUAL ENERGY, PATH ARRAYS                              MOD09960
      DIMENSION FEYRLY(3,30),ISS(30)                                    MOD09970
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09980
C INPUTS                                                                00024160
C   CAPACITIES IN LOADING ORDER: ICAP(NCAPS)                            00024170
C   PROBABILITIES OF CAPACITY AVAILABILITY: AVCAP(NCAPS)                00024180
C                                                                       00024190
C   COMPLEMENTARY CUMULATIVE LDC FROM BALLDC AND HYDRO: CLDC(UYYZ)      00024200
C OUTPUTS                                                               00024210
C   ENERGY FOR EACH CAPACITY: ENCAP(NCAPS)                              00024220
C   XLOLP                                                               00024230
C   OUTAGE ENERGY: OUTEN                                                00024240
970   FORMAT((10F7.4))                                                  00024250
      IF(IPEAK.GT.750)PRINT 610                                         00024260
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD09990
C              - - INITIALIZATION FOR THE ANCHORAGE-FAIRBANKS           MOD10000
C                     LIMITED INTERTIE CALCULATIONS                     MOD10010
C                                                                       MOD10020
      CFE=0.                                                            MOD10030
C     RFGEN IS THE AMOUNT OF GENERATION THAT MUST COME FROM FAIRBANKS   MOD10040
C           2 LEAST COST TECHNOLOGIES                                   MOD10050
      RFGEN=0.                                                          MOD10060
      IF (ICP .EQ. 0) GO TO 1                                           MOD10070
      IF (IYR .GE. 1 .AND. IYR .LE. 4) RFGEN=FEYRLY(ISS(1),IYR)         MOD10080
      IF (IYR .GE. 5 .AND. IYR .LE. 9) RFGEN=FEYRLY(ISS(1),IYR)-ALLINT  MOD10090
      IF (RFGEN .LE. 0.) RFGEN=0.                                       MOD10100
  1   CONTINUE                                                          MOD10110
C                                                                       MOD10120
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10130
      IHIGHX=1                                                          00024270
      DIFINC=(EN-ENTOT1)/(TIM*AMWINC)                                   00024280
      ADIFL=DIFINC                                                      00024290
      IADD=IFIX(DIFINC)                                                 00024300
      IIABS=IABS(IADD)                                                  00024310
      FINC=DIFINC-FLOAT(IADD)                                           00024320
      DO 400 I=1,NCAPS                                                  00024330
C INTEGRATE UNDER LDC TO FIND EXPECTED ENERGY SERVED BY CAP. I.         00024340
      ILOWX=IHIGHX+1                                                    00024350
      IHIGHX=IHIGHX+ICAP(I)                                             00024360
      AREA=0.0                                                          00024370
      DO 250 IA=ILOWX,IHIGHX                                            00024380
250   AREA=AREA+(CLDC(IA-1)+CLDC(IA))/2.0                               00024390
C CORRECT FOR DISCRETIZATION ERROR                                      00024400
      AADD=0.                                                           00024410
```

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      IF(IIABS.EQ.0) GOTO 220                                          00024420
      IF(IADD.LT.0) GOTO 210                                           00024430
      DO 205 K=1,IIABS                                                 00024440
      ITEMP=IHIGHX-K                                                   00024450
      IF(ITEMP.LT.1)ITEMP=1                                            00024460
205   AADD=AADD-(CLDC(ITEMP+1)+CLDC(ITEMP))/2.                         00024470
      GOTO 220                                                         00024480
210   DO 215 K=1,IIABS                                                 00024490
215   AADD=AADD+(CLDC(IHIGHX+K-1)+CLDC(IHIGHX+K))/2.                   00024500
220   ICORH=IHIGHX-IFIX(SIGN(1.,DIFINC)+.5)*(IIABS+1)                  00024510
      IF(ICORH.LT.1)ICORH=1                                            00024520
      ICORM=ICORH+IFIX(SIGN(1.,DIFINC)*.5)                             00024530
      ADIFH=0.                                                         00024540
      ADIFH=-FINC*(CLDC(ICORM)+FINC*ABS(CLDC(ICORH)-CLDC(ICORM)))      00024550
      ADIFH=ADIFH+AADD                                                 00024560
      ENCOR=(ADIFL+ADIFH)*TIM*AMWINC                                   00024570
      ADIFL=-ADIFH                                                     00024580
C FIND ENERGY                                                          00024590
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD10140
C              - - CALCULATIONS FOR ENERGY CONSIDERING LIMITATIONS     MOD10150
C                  OF THE ANCHORAGE - FAIRBANKS INTERTIE               MOD10160
C                                                                      MOD10170
      IF (I .GT. ICP) RFGEN=0.                                         MOD10180
      IF (RFGEN .EQ. 0.) GO TO 225                                     MOD10190
C                                                                      MOD10200
      IF (CFE .GE. RFGEN .AND. I .LE. ICP) ENCAP(I)=0.                 MOD10210
      IF (CFE .GE. RFGEN .AND. I .LE. ICP) AVVCAP=0.                   MOD10220
      IF (CFE .GE. RFGEN .AND. I .LE. ICP) GO TO 230                   MOD10230
C                                                                      MOD10240
C                                                                      MOD10250
      ENCAP(I)=AVCAP(I,J)*AREA*TIM*AMWINC                              MOD10260
      ENCAP(I)=ENCAP(I) + ENCOR                                        MOD10270
C     ACCUMULATE THE FAIRBANKS GENERATED ENERGY WE HAVE SO FAR         MOD10280
      CFE=CFE + ENCAP(I)                                               MOD10290
      IF (CFE .LE. RFGEN) GO TO 229                                    MOD10300
C                                                                      MOD10310
C     SUBTRACT OFF WHAT WE DO NOT NEED FROM FAIRBANKS TECHNOLOGIES     MOD10320
      ENCAP(I)=RFGEN - (CFE - ENCAP(I))                                MOD10330
      AVVCAP=ENCAP(I)/(AREA*TIM*AMWINC)                                MOD10340
      GO TO 230                                                        MOD10350
C                                                                      MOD10360
 225  CONTINUE                                                         MOD10370
C                                                                      MOD10380
      ENCAP(I)=AVCAP(I,J)*AREA*TIM*AMWINC                              00024600
      ENCAP(I)=ENCAP(I)+ENCOR                                          00024610
C                                                                      MOD10390
 229  AVVCAP=AVCAP(I,J)                                                MOD10400
C                                                                      MOD10410
 230  CONTINUE                                                         MOD10420
C                                                                      MOD10430
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD10440
C CALCULATE NEW CLDC                                                   00024620
      IPEAK=IPEAK+ICAP(I)                                              00024630
C     IS=ILOWX-1                                                       00024640
      IGHX=IHIGHX                                                      00024650
      DO 300 JJ=IGHX,IPEAK                                             00024660
      JJNEW=JJ-ICAP(I)                                                 00024670
```

```
      IF(JJNEW.LT.1)JJNEW=1                                              00024680
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10450
C              - -                                                        MOD10460
300   CLDCNW(JJ-IGHX+1)=AVVCAP*CLDC(JJ) + (1. - AVVCAP)*                 MOD10470
C300  CLDCNW(JJ-IGHX+1)=AVCAP(I,J)*CLDC(JJ)+(1.-AVCAP(I,J))*            00024690
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10480
     +CLDC(JJNEW)                                                        00024700
      DO 350 K=IGHX,IPEAK                                                00024710
350   CLDC(K)=CLDCNW(K-IGHX+1)                                           00024720
400   CONTINUE                                                           00024730
      IF(IPEAK.GT.1500)PRINT 600                                         00024740
C CALCULATE XLOLP AND OUTAGE ENERGY                                      00024750
      XLOLP=CLDC(IHIGHX)*3652.5                                          00024760
      IHIGHX=IHIGHX+1                                                    00024770
      AREA=0.0                                                           00024780
      DO 500 JJ=IHIGHX,IPEAK                                             00024790
500   AREA=AREA+(CLDC(JJ-1)+CLDC(JJ))/2.                                 00024800
      AREA=AREA+AUIFL                                                    00024810
      OUTEN=AREA*TIM*AMWINC                                              00024820
C                                                                        00024830
600   FORMAT('WARNING:CLDC DIMENSIONS EXCEEDED,SUBROUTINE BALERU')       00024840
610   FORMAT('WARNING:CLDCNW DIMENSIONS EXCEEDED,SUBROUTINE BALERU')     00024850
      RETURN                                                             00024860
      END                                                                00024870
```

```
      SUBROUTINE EXPEN(FTIME,HYPROB,RPROD,HYENLM,OUTOUT,NCAPS,MWHY,     00024880
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10490
C               - - HYENPR(7) ADDED TO PARAMETER LIST                 MOD10500
C     +OUTXL,ITYP,NTPO,NLP,EOUT)                                      00024890
     +OUTXL,ITYP,NTPO,NLP,EOUT,HYENPR)                                MOD10510
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10520
C     INCLUDE (AREEPPR)                                              MOD10530
      DIMENSION FTIME(2),HYPROB(3),HYENLM(3,2),OUTOUT(3,2),OUTXL(3,2),  00024900
     +EOUT(100,3,2),ITYP(100)                                        00024910
      LOGICAL RPROD(3,2)                                             00024920
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10540
C              - -                                                    MOD10550
C                 HYENPR - EACH HYDRO TECHNOLOGY'S PROPORTION         MOD10560
C                          (BASED ON CAPACITY) OF TOTAL               MOD10570
C                          HYDRO ENERGY                               MOD10580
      DIMENSION HYENPR(7)                                            MOD10590
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD10600
C                                                                     00024930
C THIS SUBROUTINE FINDS THE EXPECTED OUTPUT ENERGY BY TECHNOLOGY      00024940
C AND EMERGENCY ACTION, AND STORES IT IN  EOUT(I,1,2), I=1,...,NTPO.  00024950
C NLP  IS THE NUMBER OF THE LAST PRODUCTION TECHNOLOGY.  THE          00024960
C YEARLY EXPECTED LOLP IS ALSO COMPUTED AND IS STORED IN              00024970
C OUTXL(1,2).                                                         00024980
C                                                                     00024990
      DATA NFIR/0/                                                    00024991
      DO 50 I=1,3                                                     00025000
      IF(HYPROB(I).LT..0005)GOTO 50                                   00025010
      IF(RPROD(I,1).AND.RPROD(I,2))GOTO 10                            00025020
      GOTO 20                                                         00025030
10    HYENLM(I,1)=HYENLM(I,1)+HYENLM(I,2)                             00025040
      OUTOUT(I,1)=OUTOUT(I,1)+OUTOUT(I,2)                             00025050
      OUTXL(I,1)=OUTXL(I,1)*FTIME(1)+OUTXL(I,2)*FTIME(2)              00025060
      DO 15 K=1,NCAPS                                                 00025070
15    EOUT(K,I,1)=EOUT(K,I,1)+EOUT(K,I,2)                             00025080
      GOTO 30                                                         00025090
20    IF(.NOT.RPROD(I,2))GOTO 30                                      00025100
      HYENLM(I,1)=HYENLM(I,2)                                         00025110
      OUTOUT(I,1)=OUTOUT(I,2)                                         00025120
      OUTXL(I,1)=OUTXL(I,2)                                           00025130
      DO 25 K=1,NCAPS                                                 00025140
25    EOUT(K,I,1)=EOUT(K,I,2)                                         00025150
30    CONTINUE                                                        00025160
50    CONTINUE                                                        00025170
C TAKE EXPECTED VALUES                                                00025180
      HYENLM(1,2)=0.                                                  00025190
      OUTOUT(1,2)=0.                                                  00025200
      OUTXL(1,2)=0.                                                   00025210
      DO 35 K=1,NCAPS                                                 00025220
35    EOUT(K,1,2)=0.                                                  00025230
      DO 55 I=1,3                                                     00025240
      HYENLM(1,2)=HYENLM(1,2)+HYPROB(I)*HYENLM(I,1)                   00025250
      OUTOUT(1,2)=OUTOUT(1,2)+HYPROB(I)*OUTOUT(I,1)                   00025260
      OUTXL(1,2)=OUTXL(1,2)+HYPROB(I)*OUTXL(I,1)                      00025270
      DO 40 K=1,NCAPS                                                 00025280
40    EOUT(K,1,2)=EOUT(K,1,2)+HYPROB(I)*EOUT(K,I,1)                   00025290
55    CONTINUE                                                        00025300
C                                                                     00025310
```

```
C EXPECTED ENERGY OUTPUTS ARE NOW INDEXED BY I=1,J=2.  NEXT,              00025320
C ACCUMULATE CAPACITIES OF THE SAME TYPE FOR PRINTOUT.  INSERT           00025330
C PEAK HYDRO AS THE LAST PRODUCTION TECHNOLOGY AND ADD                   00025340
C UNSERVED ENERGY AS THE LAST OUTAGE TYPE.                               00025350
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD10610
C              - - THE REMAINDER OF THE CODE HAS BEEN                    MOD10620
C                   MODIFIED TO ACCOMMODATE THE 16 TECHNOLOGIES.         MOD10630
C                   NOTE THAT 16 IS NOW THE BASE FOR THE OUTAGE          MOD10640
C                   DATA.                                                MOD10650
C                                                                        MOD10660
      K1=0                                                               00025360
      N=0                                                                00025370
      DO 80 K=1,NCAPS                                                    00025380
C MOD IF(K.EQ.1)GOTO 60                                                  00025390
C     IF(ITYP(K).GT.10)K1=K                                              00025400
      IF (ITYP(K) .GT. 16) K1=K                                          MOD10670
C     IF(ITYP(K).GT.10)GOTO 120                                          00025410
      IF (ITYP(K) .GT. 16) GO TO 120                                     MOD10680
      IF (K .EQ. 1) GO TO 60                                             MOD10690
      IF(ITYP(K).EQ.ITYP(NFIR))GOTO 70                                   00025420
60    CONTINUE                                                           00025430
      NFIR=K                                                             00025440
      N=N+1                                                              00025450
      ITYP(N)=ITYP(NFIR)                                                 00025460
      EOUT(N,1,2)=EOUT(NFIR,1,2)                                         00025470
      GOTO 80                                                            00025480
70    EOUT(N,1,2)=EOUT(N,1,2)+EOUT(K,1,2)                                00025490
80    CONTINUE                                                           00025500
C                                                                        00025510
C120  IF(MWHY.GT.1)N=N+1                                                 00025520
 120  IF (MWHY .LE. 1) GO TO 140                                         MOD10700
      NHS=N                                                              MOD10710
      DO 125 K=1,7                                                       MOD10720
      IF (HYENPR(K) .LE. 0.0) GO TO 125                                  MOD10730
      N=N + 1                                                            MOD10740
 125  CONTINUE                                                           MOD10750
 140  CONTINUE                                                           MOD10760
      NLP=N                                                              00025530
      IF(K1.EQ.0)GOTO 160                                                00025540
C     IF(N.EQ.K1)GOTO 200                                                00025550
      IF (N .GE. K1) GO TO 200                                           MOD10770
      DO 150 K=K1,NCAPS                                                  00025560
      N=N+1                                                              00025570
      ITYP(N)=ITYP(K)                                                    00025580
150   EOUT(N,1,2)=EOUT(K,1,2)                                            00025590
      GOTO 160                                                           00025600
200   DO 210 K=K1,NCAPS                                                  00025610
      NN=N+NCAPS-K+1                                                     00025620
      ITYP(NN)=ITYP(NN-1)                                                00025630
210   EOUT(NN,1,2)=EOUT(NN-1,1,2)                                        00025640
      N=N+NCAPS-K1+1                                                     00025650
160   CONTINUE                                                           00025660
C     IF(MWHY.GT.1)EOUT(NLP,1,2)=HYENLM(1,2)                             00025670
C     IF(MWHY.GT.1)ITYP(NLP)=10                                          00025680
      IF (MWHY .LE. 1) GO TO 165                                         MOD10780
      DO 163 K=1,7                                                       MOD10790
      IF (HYENPR(K) .LE. 0.0) GO TO 163                                  MOD10800
```

```
      NHS=NHS + 1                                                    MOD10810
      ITYP(NHS)=9 + K                                                MOD10820
      EOUT(NHS,1,2)=HYENPR(K)*HYENLM(1,2)                            MOD10830
  163 CONTINUE                                                       MOD10840
  165 CONTINUE                                                       MOD10850
      N=N+1                                                          00025690
C     ITYP(N)=18                                                     00025700
      ITYP(N)=24                                                     MOD10860
      EOUT(N,1,2)=OUTOUT(1,2)                                        00025710
      NTPO=N                                                         00025720
      RETURN                                                         00025730
      END                                                            00025740
```

```
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD10870
C                                                                        MOD10880
C     SUBROUTINE EVC(NTPO,NLP,ITYP,VC,ENV,OUTCST,TVC,EOUT,IYR,VCESC,     00025750
C    +OUTESC,OUTC,CSENV,CSOUT)                                           00025760
C                                                                        MOD10890
      SUBROUTINE EVC (NTPO,NLP,ITYP,VC,ENV,HR,IFTU,FC,IYFDE,OUTCST,TVC,  MOD10900
     +                EOUT,IYR,VCESC,FUESC,OUTESC,OUTC,CSENV,CSOUT)      MOD10910
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD10920
C     INCLUDE (AREEPPR)                                                  MOD10930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD10940
C               - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES   MOD10950
      DIMENSION EOUT(100,3,2),OUTCST(8),ITYP(100),VC(16),ENV(16),        00025770
     +VCESC(16),OUTESC(6)                                                00025780
      LOGICAL OUTC(8)                                                    00025790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD10960
C                                                                        MOD10970
C     FOSSIL FUEL ARRAYS                                                 MOD10980
      DIMENSION HR(16), IFTU(16), FC(31,10), FUESC(10)                   MOD10990
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD11000
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD11010
C                                                                        00025800
C THIS SUBROUTINE FINDS THE EXPECTED VARIABLE PRODUCTION                 00025810
C AND ENVIRONMENTAL COSTS BY TECHNOLOGY AND STORES THEM IN               00025820
C EOUT(I,J,K).  J AND K INDEX THE FOLLOWING VARIABLES:                   00025830
C          J,K=1,2   EXPECTED PRODUCTION ENERGY                          00025840
C              2,1   PRODUCTION COST                                     00025850
C              2,2   ENVIRONMENTAL COST                                  00025860
C              3,1   TOTAL VARIABLE COST                                 00025870
C TOTAL VARIABLE COST TOTAL IS TVC IN MILLIONS OF CONSTANT $.            00025880
C                                                                        00025890
      CSENV=0.                                                           00025900
      CSOUT=0.                                                           00025910
      DO 10 I=1,NLP                                                      00025920
      L=ITYP(I)                                                          00025930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD11020
C                                                                        MOD11030
C     FOSSIL FUEL CONSIDERATIONS                                         MOD11040
      IF (IYR .GT. (IYFDE-1)) GO TO 5                                    MOD11050
      FCIYR=(HR(L)*FC(IYR+1,IFTU(L)))/1000000.                           MOD11060
      GO TO 6                                                            MOD11070
    5 CONTINUE                                                           MOD11080
      FCIYR=FC(IYFDE,IFTU(L))*(1. + FUESC(IFTU(L)))**(IYR-(IYFDE-1))     MOD11090
C     UNITS CONVERSION                                                   MOD11100
      FCIYR=(FCIYR*HR(L))/1000000.                                       MOD11110
    6 CONTINUE                                                           MOD11120
      EOUT(I,2,1)=EOUT(I,1,2)*((VC(L)*(1. + VCESC(L))**IYR) + FCIYR)     MOD11130
C     EOUT(I,2,1)=EOUT(I,1,2)*VC(L)*(1.+VCESC(L))**IYR                   00025940
C                                                                        MOD11140
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - MOD11150
      EOUT(I,2,2)=EOUT(I,1,2)*ENV(L)                                     00025950
      EOUT(I,3,1)=EOUT(I,2,2)+EOUT(I,2,1)                                00025960
      CSENV=CSENV+EOUT(I,2,2)                                            00025970
   10 CONTINUE                                                           00025980
      NLPP1=NLP+1                                                        00025990
      DO 30 I=NLPP1,NTPO                                                 00026000
C               - - 16 IS NOW THE BASE FOR OUTAGE DATA                   MOD11160
C     L=ITYP(I)-10                                                       00026010
```

```
      L=ITYP(I)-16                                                      M0011170
      EOUT(I,3,1)=EOUT(I,1,2)*OUTCST(L)*(1.+OUTESC(L))**IYR             00026020
      IF(OUTC(L))CSOUT=CSOUT+EOUT(I,3,1)                                00026030
30    CONTINUE                                                          00026040
      TVC=0.                                                            00026050
      DO 35 I=1,NTPO                                                    00026060
35    TVC=TVC+EOUT(I,3,1)                                               00026070
40    CONTINUE                                                          00026080
      RETURN                                                            00026090
      END                                                               00026100
```

```
      SUBROUTINE SORDER(SCGR,ISCORD,ISPN,NSCEN)                          00026110
      DIMENSION SCGR(10),ISCORD(10),ISPN(10)                             00026120
      LOGICAL USED(10)                                                   00026130
C                                                                        00026140
C THIS SUBROUTINE ORDERS SCENARIOS BY AVERAGE GROWTH RATE.               00026150
C ISCORD(J)=I MEANS THAT SCENARIO I HAS THE J TH LOWEST AVERAGE          00026160
C GROWTH RATE.                                                           00026170
C                                                                        00026180
      DATA ILOW/0/                                                       00026181
      IF(NSCEN.NE.1)GOTO 5                                               00026190
      DO 7 I=1,10                                                        00026200
      II=I                                                               00026210
      IF(ISPN(I).EQ.1)GOTO 8                                             00026220
7     CONTINUE                                                           00026230
8     ISCORD(1)=II                                                       00026240
      GOTO 100                                                           00026250
5     DO 10 I=1,10                                                       00026260
      ISCORD(I)=0                                                        00026270
      USED(I)=ISPN(I).GT.NSCEN                                           00026280
10    IF(.NOT.USED(I))ILOW=I                                             00026290
      DO 40 J=1,NSCEN                                                    00026300
      DO 20 I=1,10                                                       00026310
      IF(USED(I))GOTO 20                                                 00026320
      IF(SCGR(I).LT.SCGR(ILOW))ILOW=I                                    00026330
20    CONTINUE                                                           00026340
      ISCORD(J)=ILOW                                                     00026350
      USED(ILOW)=.TRUE.                                                  00026360
C                                                                        00026370
      DO 30 I=1,10                                                       00026380
      IF(.NOT.USED(I))ILOW=I                                             00026390
      IF(.NOT.USED(I))GOTO 40                                            00026400
30    CONTINUE                                                           00026410
40    CONTINUE                                                           00026420
100   CONTINUE                                                           00026430
      RETURN                                                             00026440
      END                                                                00026450
```

```
      SUBROUTINE SGROW(NP,AL,NSCEN,ISN,ISPN,SCGR,ALPHA,NB,DLTA,NYL,NYPP)00026460
      DIMENSION SCGR(10),ISN(10,10),ISPN(10)                            00026470
C                                                                       00026480
C THIS SUBROUTINE FINDS THE AVERAGE GROWTH RATE FOR EACH SCENARIO.      00026490
C THE COMPUTATION IS DONE ACCORDING TO                                  00026500
C EQUATION C-1 ON PAGE C-4 OF THE OVER/UNDER                            00026510
C REPORT. THIS EQUATION IS EXPANDED, HOWEVER, TO REPRESENT              00026520
C MULTIPLE YEARS PER PERIOD. THE GROWTH IS CALCULATED                   00026530
C AND AVERAGED OVER A PERIOD OF  NYL  YEARS.                            00026540
C                                                                       00026550
C                                                                       00026560
      DO 20 I=1,10                                                      00026570
      IF(ISPN(I).GT.NSCEN)GOTO 20                                       00026580
      SUM=0.                                                            00026590
      NN=1+(NYL-1)/NYPP                                                 00026600
C                                                                       00026610
      DO 15 J=1,NN                                                      00026620
      TEMP=0.                                                           00026630
C                                                                       00026640
      DO 11 L=1,J                                                       00026650
      K=ISN(I,L)-2                                                      00026660
      IF(NB.EQ.2.AND.K.EQ.0)K=1                                         00026670
      TEMP=TEMP+FLOAT(K)*ALPHA**(J-L)                                   00026680
11    CONTINUE                                                          00026690
C                                                                       00026700
      NR=NYPP                                                           00026710
      IF(J.EQ.NN)NR=NYL-(NN-1)*NYPP                                     00026720
15    SUM=SUM+(AL+DLTA*TEMP)*FLOAT(NR)                                  00026730
C                                                                       00026740
      SCGR(I)=SUM/FLOAT(NYL)                                            00026750
20    CONTINUE                                                          00026760
      RETURN                                                            00026770
      END                                                               00026780
```

```
      SUBROUTINE SCPROB(EGR14,EPROB,SCPR,NSCEN,SCGR,ISCORD,SCCUM,CUM,    00026790
     +EGR)                                                               00026800
      DIMENSION EGR14(5),EPROB(5),SCPR(10),SCGR(10),ISCORD(10),SCCUM(10)00026810
     +,CUM(7),EGR(7)                                                     00026820
C                                                                        00026830
C THIS SUBROUTINE FINDS THE PROBABILITY FOR EACH SCENARIO THAT WILL      00026840
C BE RUN.                                                               00026850
C                                                                        00026860
      IF(NSCEN.GT.1)GOTO 5                                               00026870
      I=ISCORD(1)                                                        00026880
      SCPR(I)=1.                                                         00026890
      GOTO 100                                                           00026900
5     CUM(1)=0.                                                          00026910
      CUM(7)=1.                                                          00026920
      CUM(2)=EPROB(1)/2.                                                 00026930
      EGR(2)=EGR14(1)                                                    00026940
      DO 10 I=3,6                                                        00026950
      CUM(I)=CUM(I-1)+(EPROB(I-1)+EPROB(I-2))/2.                         00026960
10    EGR(I)=EGR14(I-1)                                                  00026970
      I=ISCORD(1)                                                        00026980
      IF(SCGR(I).LT.EGR(2))EGR(1)=EGR(2)-2.*(EGR(2)-SCGR(I))             00026990
      I=ISCORD(NSCEN)                                                    00027000
      IF(SCGR(I).GT.EGR(6))EGR(7)=EGR(6)+2.*(SCGR(I)-EGR(6))             00027010
C                                                                        00027020
C FIND THE POINT ON THE CUMULATIVE FOR EACH SCENARIO.                    00027030
C                                                                        00027040
      IP=2                                                               00027050
      DO 40 I=1,NSCEN                                                    00027060
      L=ISCORD(I)                                                        00027070
20    IF(SCGR(L).LE.EGR(IP).OR.IP.GT.7)GOTO 30                           00027080
      IP=IP+1                                                            00027090
      GOTO 20                                                            00027100
C                                                                        00027110
30    SLOPE=(CUM(IP)-CUM(IP-1))/(EGR(IP)-EGR(IP-1))                      00027120
40    SCCUM(L)=CUM(IP)-SLOPE*(EGR(IP)-SCGR(L))                           00027130
C                                                                        00027140
C FIND SCENARIO PROBABILITIES                                            00027150
C                                                                        00027160
      L1=ISCORD(1)                                                       00027170
      PDELTA=SCCUM(L1)                                                   00027180
      DO 70 I=2,NSCEN                                                    00027190
      L2=ISCORD(I)                                                       00027200
      DELTA=(SCCUM(L2)-SCCUM(L1))/2.                                     00027210
      SCPR(L1)=PDELTA+DELTA                                              00027220
      L1=L2                                                              00027230
70    PDELTA=DELTA                                                       00027240
C                                                                        00027250
      L1=ISCORD(NSCEN)                                                   00027260
      SCPR(L1)=PDELTA+1.-SCCUM(L1)                                       00027270
100   CONTINUE                                                           00027280
      RETURN                                                             00027290
      END                                                                00027300
```

```
      SUBROUTINE SCPRS(VAR,EV,SCPR,NSCEN,NSCENH,ISCORD,SYMM,SCGR,ISPN)   00027310
      DIMENSION SCPR(10),ISCORD(10),SCGR(10),ISPN(10)                   00027320
      LOGICAL SYMM,ODD                                                  00027330
C                                                                       00027340
C THIS SUBROUTINE ASSIGNS SCENARIO PROBABILITIES WHEN THE               00027350
C SCENARIOS ARE SYMMETRIC WITH RESPECT TO THE CENTER TREE PATH.         00027360
C WHENEVER POSSIBLE THE PROBABILITIES ARE ASSIGNED IN A WAY             00027370
C THAT THE MEAN AND VARIANCE OF THE AVERAGE DEMAND                      00027380
C GROWTH THROUGH THE LONG RUN YEAR  NYL  ARE THE SAME FOR THE           00027390
C SCENARIOS AS THEY ARE FOR THE FULL PROBABILITY TREE.                  00027400
C A SIMPLE TRIANGULAR SCHEME FOR ASSIGNING THESE PROBABILITIES          00027410
C IS USED.  WHENEVER THIS SCHEME FAILS TO ASSIGN A CONSISTENT           00027420
C SET OF PROBABILITIES, THE SCENARIO PROBABILITIES ARE ASSIGNED         00027430
C INSTEAD USING SUBROUTINE SCPROB.  SCPROB IS ALSO USED WHENEVER        00027440
C THE SCENARIOS ARE NOT SYMMETRIC.                                      00027450
C                                                                       00027460
      IF(NSCEN.GT.2)GOTO 10                                             00027470
      DO 5 I=1,10                                                       00027480
5     SCPR(I)=.5                                                        00027490
      GOTO 800                                                          00027500
C                                                                       00027510
C10   IF(VAR.LT.1./10.**50)GOTO 100                                     00027520
C --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---   MOD11180
C               - - VAX VERSION - -                                     MOD11190
C                                                                       MOD11200
C       10.**50 IN THE ABOVE STATEMENT IS REPLACED WITH 10.**38         MOD11210
C               IN THE STATEMENT BELOW.  10.**38 IS APPROXIMATELY       MOD11220
C               THE LARGEST REAL NUMBER REPRESENTATION FOR THE VAX      MOD11230
C                                                                       MOD11240
10    IF (VAR .LT. 1./10.**38) GO TO 100                                MOD11250
C                                                                       MOD11260
C --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- --- ---   MOD11270
C                                                                       00027530
C MAKE INITIAL PROBABILITY ASSIGNMENTS                                  00027540
C                                                                       00027550
      PTOT=0.                                                           00027560
      DUNE=1.                                                           00027570
      SIG=SQRT(VAR)                                                     00027580
      DO 20 I=1,NSCEN                                                   00027590
      J=ISCORD(I)                                                       00027600
      PTOT=PTOT+EXP(-(ABS(SCGR(J)-EV)/SIG)**DUNE)                       00027610
20    CONTINUE                                                          00027620
      DO 25 I=1,NSCEN                                                   00027630
      J=ISCORD(I)                                                       00027640
25    SCPR(J)=EXP(-(ABS(SCGR(J)-EV)/SIG)**DUNE)/PTOT                    00027650
      WRITE(11,520)(SCPR(I),I=1,10)                                     00027660
C                                                                       00027670
C CALCULATE PROBABILITY ADJUSTMENTS FOR PROPER VARIANCE.                00027680
C                                                                       00027690
      ODD=2*NSCENH.NE.NSCEN                                             00027700
      NUMBER=NSCENH                                                     00027710
      IF(ODD)NUMBER=NSCENH-1                                            00027720
      CONST=FLOAT(NUMBER+1)/2.                                          00027730
      IF(ODD)CONST=(FLOAT(NUMBER)+.5)/2.                                00027740
      ALPHA=0.                                                          00027750
      BETA=0.                                                           00027760
C                                                                       00027770
```

```
      DO 40 I=1,NUMBER                                                  00027780
      J=ISCORD(NUMBER+1-I)                                              00027790
      ALPHA=ALPHA+2.*SCPR(J)*(SCGR(J)-EV)**2                            00027800
      BETA=BETA+2.*(CONST-FLOAT(I))*(SCGR(J)-EV)**2                     00027810
40    CONTINUE                                                          00027820
C                                                                       00027830
      ALPHA=(VAR-ALPHA)/BETA                                            00027840
C                                                                       00027850
      DO 50 I=1,NUMBER                                                  00027860
      J1=ISCORD(NSCEN-NUMBER+I)                                         00027870
      J2=ISCORD(NUMBER+1-I)                                             00027880
      SCPR(J1)=SCPR(J1)+ALPHA*(CONST-FLOAT(I))                          00027890
      SCPR(J2)=SCPR(J2)+ALPHA*(CONST-FLOAT(I))                          00027900
50    CONTINUE                                                          00027910
C                                                                       00027920
      J1=ISCORD(NSCENH)                                                 00027930
      IF(ODD)SCPR(J1)=SCPR(J1)+ALPHA*FLOAT(NUMBER)/2.                   00027940
C                                                                       00027950
C CHECK RESULTS FOR CONSISTENCY.                                        00027960
C                                                                       00027970
      VARF=0.                                                           00027980
      DO 60 I=1,10                                                      00027990
      IF(ISPN(I).GT.NSCEN)GOTO 60                                       00028000
      VARF=VARF+SCPR(I)*(SCGR(I)-EV)**2                                 00028010
60    CONTINUE                                                          00028020
C                                                                       00028030
      IF(ABS((VARF-VAR)/VAR).GT..000001)GOTO 70                         00028040
      WRITE(11,500)VARF,VAR                                             00028050
      GOTO 80                                                           00028060
C                                                                       00028070
70    WRITE(11,510)VARF,VAR                                             00028080
C                                                                       00028090
C CHECK TO SEE THAT PROBABILITIES ARE ALL BETWEEN  0  AND  1            00028100
C AND THAT THEY SUM TO 1. IF THEY ARE NOT OR IF THEY DO NOT             00028110
C SUM TO 1, USE SUBROUTINE SCPROB INSTEAD.                              00028120
C                                                                       00028130
80    WRITE(11,520)(SCPR(I),I=1,10)                                     00028140
      PTOT=0.                                                           00028150
      DO 90 I=1,10                                                      00028160
      IF(ISPN(I).GT.NSCEN)GOTO 90                                       00028170
      PTOT=PTOT+SCPR(I)                                                 00028180
      IF(SCPR(I).GT.1.0.OR.SCPR(I).LT.0.)GOTO 100                       00028190
90    CONTINUE                                                          00028200
      IF(ABS(PTOT-1.).GT..0000001)GOTO 100                              00028210
      WRITE(11,530)                                                     00028220
      GOTO 800                                                          00028230
C                                                                       00028240
100   SYMM=.FALSE.                                                      00028250
      WRITE(11,540)                                                     00028260
C                                                                       00028270
500   FORMAT('SCENARIO VARIANCE  ',E10.4,' EQUALS LONG RUN ',           00028280
     +'VARIANCE  ',E10.4,' .')                                          00028290
510   FORMAT('SCENARIO VARIANCE  ',E10.4,' DOES NOT EQUAL LONG ',       00028300
     +'RUN VARIANCE  ',E10.4,' .')                                      00028310
520   FORMAT('SCPR(I) IN SUBROUTINE SCPRS:'/10F7.3)                     00028320
530   FORMAT('SCENARIO PROBABILITIES ASSIGNED CONSISTENTLY WITH '/      00028330
     +'LONG RUN MEAN AND VARIANCE IN SUBROUTINE SCPRS.')                00028340
```

```
540   FORMAT('SCENARIO PROBABILITIES ARE ASSIGNED IN SUBROUTINE ',      00028350
     +'SGROW.')                                                         00028360
C                                                                       00028370
800   CONTINUE                                                          00028380
C                                                                       00028390
      RETURN                                                            00028400
      END                                                               00028410
```

```
      SUBROUTINE FIXOM(FIXCHG,LRP1,CEP,RETIRE,NS,CCAP78,FOANDM,FLA,     00028420
     +FCESC,IHORZ)                                                      00028430
C THIS SUBROUTINE ADDS FIXED  O  AND  M  COSTS INTO FIXCHG              00028440
C THROUGH THE TERMINAL HORIZON.                                         00028450
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11280
C            - - DIMENSIONS AND DO LOOP FINAL VALUES MODIFIED TO        MOD11290
C                  ACCOMMODATE THE 16 TECHNOLOGIES                     MOD11300
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11310
      DIMENSION FIXCHG(100),CEP(16,31,3),CCAP78(16),FOANDM(16),         00028460
     +FCESC(16),RIZ(16),RETIRE(16,31),CAP(16)                           00028470
      DATA CAP/16*0./                                                   00028471
C                                                                       00028480
C     DO 5 I=1,10                                                       00028490
      DO 5 I=1,16                                                       MOD11320
5     RIZ(I)=1000.                                                      00028500
      DO 20 J=1,IHORZ                                                   00028510
      FXG=0.                                                            00028520
C     DO 10 I=1,10                                                      00028530
      DO 10 I=1,16                                                      MOD11330
      IF(J.GT.LRP1)GOTO 15                                              00028540
      CAP(I)=CCAP78(I)+CEP(I,J,NS)-RETIRE(I,J)                          00028550
15    CONTINUE                                                          00028560
      COST=FOANDM(I)*RIZ(I)                                             00028570
      FXG=FXG+CAP(I)*COST                                               00028580
      RIZ(I)=RIZ(I)*(1.+FCESC(I))*(1.+FLA)                              00028590
10    CONTINUE                                                          00028600
      FIXCHG(J)=FIXCHG(J)+FXG                                           00028610
C     WRITE(11,100)J,FIXCHG(J),FXG                                      00028620
20    CONTINUE                                                          00028630
100   FORMAT('J,FIXCHG(J),FXG:',I5,-6P2F10.2)                          00028640
      RETURN                                                            00028650
      END                                                               00028660
```

```
      SUBROUTINE FOMESC(FOMRET,TEROAM,FCESC,CAP,TOTCAP,CUHY,LR,          00028670
     +LBMAX,FOANDM,TERMIX)                                               00028680
C                                                                        00028690
C THIS SUBROUTINE ESCALATES,BUT DOES NOT INFLATE,FIXED                   00028700
C O AND M COSTS FOR TERMINAL ADDITIONS (TEROAM) AND FOR                  00028710
C RETIREMENTS (FOMRET) TO THE APPROPRIATE YEAR.                          00028720
C                                                                        00028730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11340
C            - - DIMENSIONS AND DO LOOP FINAL VALUES MODIFIED TO         MOD11350
C                  ACCOMMODATE 16 TECHNOLOGIES.                          MOD11360
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11370
      DIMENSION FOMRET(100),TEROAM(100),FCESC(16),CAP(16),               00028740
     +FOANDM(16),TERMIX(16)                                              00028750
C                                                                        00028760
      DO 20 J=1,LBMAX                                                    00028770
      FOMRET(J)=0.                                                       00028780
      TEROAM(J)=0.                                                       00028790
      DO 10 I=1,9                                                        00028800
      CAP(I)=TOTCAP*TERMIX(I)                                            00028810
      RIZ=(1.+FCESC(I))**(LR+J)                                          00028820
      TEROAM(J)=TEROAM(J)+FOANDM(I)*RIZ*TERMIX(I)                        00028830
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11380
C            - -  SKIP NEXT CALCULATION IF TOTCAP=CUHY                   MOD11390
      IF (TOTCAP - CUHY .LT. .00001) GO TO 10                            MOD11400
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11410
      FOMRET(J)=FOMRET(J)+FOANDM(I)*RIZ*CAP(I)/(TOTCAP-CUHY)             00028840
10    CONTINUE                                                           00028850
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11420
C            - - USE ALL 7 HYDRO TECHNOLOGIES                            MOD11430
C     TEROAM(J)=TEROAM(J)+FOANDM(10)*(1.+FCESC(10))**(LR+J)*TERMIX(10)   00028860
      DO 15 I=10,16                                                      MOD11440
      TEROAM(J)=TEROAM(J) + FOANDM(I)*(1. + FCESC(I))**(LR+J)*TERMIX(I)  MOD11450
   15 CONTINUE                                                           MOD11460
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11470
20    CONTINUE                                                           00028870
C     WRITE(11,90)                                                       00028880
C     WRITE(11,100)(TEROAM(I),I=1,LBMAX)                                 00028890
C     WRITE(11,100)(FOMRET(I),I=1,LBMAX)                                 00028900
90    FORMAT('TEROAM(I),FOMRET(I):')                                     00028910
100   FORMAT((10F6.1))                                                   00028920
      RETURN                                                             00028930
      END                                                                00028940
```

```
      SUBROUTINE START(LAGREG,SGRO,BGRO,EDINT,RBE,EDEBT,COCHIS)          00028950
C*************************************                                   00028960
C                                                                       00028970
C PUT THE INITIAL RATE BASE IN THE PROGRAM.  ALSO THE EXISTING          00028980
C DEBT INTEREST.  CALCULATE THE FIXED CHARGE ON THE EXISTING            00028990
C RATE BASE                                                             00029000
C                                                                       00029010
C*************************************                                   00029020
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11480
C           - - DIMENSIONS MODIFIED TO ACCOMMODATE THE 16 TECHNOLOGIES  MOD11490
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11500
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00029030
     +DBTRT,FAIADJ,ITCNUR,TAXMAR,EQRT,PRERT                             00029040
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00029050
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00029060
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00029070
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00029080
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00029090
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00029100
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00029110
      DIMENSION EDINT(7),RBE(7),EDEBT(7)                                00029120
      INTEGER HORIZN,PHORZN                                             00029130
      K=0                                                               00029140
      DO 101 I=1,HORIZN                                                 00029150
      AFUDC(I)=0.                                                       00029160
      EXCPLM(I)=0.                                                      00029170
      ADDPON(I)=0.                                                      00029180
      ADDION(I)=0.                                                      00029190
      TAXES(I)=0.                                                       00029200
      BONDRT(I)=0.                                                      00029210
      DEPREC(I)=0.                                                      00029220
      DITC(I)=0.                                                        00029230
101   CONTINUE                                                          00029240
      DO 10 I=1,7                                                       00029250
      BNEXT=(.9**3)*RBE(I)                                              00029260
      DINEXT=(.9**3)*EDINT(I)                                           00029270
      DNEXT=(.9**3)*EDEBT(I)                                            00029280
      IF(I.EQ.7) GO TO 30                                               00029290
      I1=I+1                                                            00029300
      BNEXT=RBE(I1)                                                     00029310
      DINEXT=EDINT(I1)                                                  00029320
      DNEXT=EDEBT(I1)                                                   00029330
30    CONTINUE                                                          00029340
      J1=3                                                              00029350
      SDEBT=(EDEBT(I)-DNEXT)/FLOAT(J1)                                  00029360
      SINT=(EDINT(I)-DINEXT)/FLOAT(J1)                                  00029370
      DO 20 J=1,J1                                                      00029380
      K=K+1                                                             00029390
      RETINT(K)=SINT                                                    00029400
      BONDRT(K)=SDEBT                                                   00029410
      Z=FLOAT(3)                                                        00029420
      ZZ=FLOAT(J)                                                       00029430
      RTBASE(K)=RBE(I)-(ZZ-1.)*(RBE(I)-BNEXT)/Z                         00029440
      DINT(K)=EDINT(I)-(ZZ-1.)*(EDINT(I)-DINEXT)/Z                      00029450
20    CONTINUE                                                          00029460
10    CONTINUE                                                          00029470
      K=K+1                                                             00029480
```

```
      DO 35 I=K,HORIZN                                                  00029490
      J=I-1                                                             00029500
      RTBASE(I)=.9*RTBASE(J)                                            00029510
      DINT(I)=.9*DINT(J)                                                00029520
      RETINT(I)=.1*DINT(J)                                              00029530
      BONDRT(I)=BONDRT(J)*.9                                            00029540
35    CONTINUE                                                          00029550
C                                                                       00029560
C PUT IN THE FIXED CHARGED ASSOCIATED WITH                              00029570
C THE INITIAL RATE BASE                                                 00029580
C                                                                       00029590
      IF(LAGREG.EQ.0) GO TO 40                                          00029600
      K=0                                                               00029610
      CHARGE=RBE(1)*(COCHIS+.02)                                        00029620
      DO 50 I=1,LAGREG                                                  00029630
      K=K+1                                                             00029640
      FIXCHG(K)=CHARGE*((1+SGRO)**(LAGREG+1-I))/((1+BGRO)**(LAGREG+1-I))00029650
      FIXCHG(K)=FIXCHG(K)+.05*RBE(1)                                    00029660
      DEPREC(K)=DEPREC(K)+.05*RBE(1)                                    00029670
50    CONTINUE                                                          00029680
40    CONTINUE                                                          00029690
      L=HORIZN-LAGREG                                                   00029700
      K=LAGREG                                                          00029710
      DO 60 I=1,L                                                       00029720
      K=K+1                                                             00029730
      FIXCHG(K)=(COCHIS+.02)*RTBASE(I)                                  00029740
60    CONTINUE                                                          00029750
      K=LAGREG+1                                                        00029760
      FIXCHG(K)=FIXCHG(K)+.05*RBE(1)                                    00029770
      DEPREC(K)=DEPREC(K)+.05*RBE(1)                                    00029780
      DO 70 I=2,L                                                       00029790
      K=K+1                                                             00029800
      FIXCHG(K)=FIXCHG(K)+RTBASE(K-1)-RTBASE(K)                         00029810
      DEPREC(K)=DEPREC(K)+RTBASE(K-1)-RTBASE(K)                         00029820
70    CONTINUE                                                          00029830
      RETURN                                                            00029840
      END                                                               00029850
```

```
      SUBROUTINE CAPCON(ARATE,CAP78,ISTART,CONSTR)                      00029860
C*****************************************                              00029870
C                                                                       00029880
C THIS SUBROUTINE CONVERTS CAPITAL SPENDING FROM $78 TO THE             00029890
C CAPITAL REQUIRED FOR A PLANT TURNED ON IN 78.  THIS ROUTINE           00029900
C ALSO CALCULATES THE SPREAD OF AFUDC AND CWIP OVER TIME.               00029910
C                                                                       00029920
C*****************************************                              00029930
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11510
C            - - DIMENSIONS HAVE BEEN MODIFIED TO ACCOMMODATE THE       MOD11520
C                  7 HYDRO TECHNOLOGIES.                                MOD11530
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11540
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00029940
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                             00029950
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00029960
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00029970
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00029980
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00029990
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00030000
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00030010
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00030020
      DIMENSION CAP78(16),ISTART(16),CONSTR(16)                         00030030
      INTEGER HORIZN,PHORZN                                             00030040
      REAL INFLA                                                        00030050
      DO 10 I=1,NGTEC                                                   00030060
      N1=CONSTR(I)                                                      00030070
      NCON(I)=N1+ISTART(I)                                              00030080
      IF(ISTART(I).EQ.0) GO TO 15                                       00030090
      N3=NCONM+1                                                        00030100
      J1=ISTART(I)                                                      00030110
      DO 20 J=1,J1                                                      00030120
      N4=N3-J                                                           00030130
      FCWIP(I,N4)=1000.                                                 00030140
20    CONTINUE                                                          00030150
15    CONTINUE                                                          00030160
      N3=NCONM-N1-ISTART(I)                                             00030170
      Z=FLOAT(N1)                                                       00030180
      DO 30 J=1,N1                                                      00030190
      N4=N3+J                                                           00030200
      FCWIP(I,N4)=1000.*FLOAT(J)/Z                                      00030210
30    CONTINUE                                                          00030220
      FCWIP(I,NCONM+1)=(PCWIP-1.)*1000.                                 00030230
      N3=NCONM-N1-ISTART(I)                                             00030240
      FAFUDC(I,N3)=0                                                    00030250
      S1=0.                                                             00030260
      DO 40 J=1,N1                                                      00030270
      N5=N3+J                                                           00030280
      N8=N5-1                                                           00030290
      S2=ARATE*((.5*(1.-PCWIP)*1000./N1)+FAFUDC(I,N8))                  00030300
      S2=S2+FAFUDC(I,N8)+1000.*(1.-PCWIP)/FLOAT(N1)                     00030310
      FAFUDC(I,N5)=S2                                                   00030320
40    CONTINUE                                                          00030330
      IF(ISTART(I).EQ.0) GO TO 50                                       00030340
      J1=ISTART(I)                                                      00030350
      N6=NCONM-J1                                                       00030360
      DO 60 J=1,J1                                                      00030370
      N7=N6+J                                                           00030380
```

```
      FAFUDC(I,N7)=S2
60    CONTINUE                                                                  00030390
50    CONTINUE                                                                  00030400
      FAFUDC(I,NCONM+1)=-S2                                                     00030410
C*************************************                                          00030420
C                                                                               00030430
C CHANGE THE CAPITAL COST FROM $78 TO A                                         00030440
C 78 START-UP                                                                   00030450
C                                                                               00030460
C*****************************************                                      00030470
      S1=0.                                                                     00030480
      DO 70 J=1,N1                                                              00030490
      S1=S1+(1/FLOAT(N1))*(((1.+INFLA)*(1.+ESC(I)))**(-N1-ISTART(I)+J))         00030500
70    CONTINUE                                                                  00030510
      CAPCST(I)=S1*CAP78(I)                                                     00030520
10    CONTINUE                                                                  00030530
      RETURN                                                                    00030540
      END                                                                       00030550
                                                                                00030560
```

```
      SUBROUTINE AMORT                                                  00030570
C*************************************************                      00030580
C                                                                       00030590
C THIS SUBROUTINE CALCULATES THE RATE BASE THAT IS AFUDC,AND THE        00030600
C PROFIT AND TAXES THAT RESULT FROM ITS AMORTIZATION.                   00030610
C                                                                       00030620
C*************************************************                      00030630
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11550
C             - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES    MOD11560
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11570
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00030640
     +DBTRT,FAIADJ,ITCNUR,TAXMAR,EQRT,PRERT                             00030650
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00030660
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00030670
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00030680
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00030690
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00030700
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00030710
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00030720
      INTEGER HORIZN,PHORZN                                             00030730
C     DATA AAMORT/100*0./                                               00030740
      DO 10 I=1,HORIZN                                                  00030750
      AAMORT(I)=0.                                                      00030760
10    CONTINUE                                                          00030770
      DO 20 I=1,NGTEC                                                   00030780
      L2=LB(I)                                                          00030790
      FAC=(-FAFUDC(I,NCONM+1)-1000.*(1.-PCWIP))/FLOAT(L2)               00030800
      L1=LAGR(I)                                                        00030810
      N=L1                                                              00030820
      DO 30 J=1,NPRDS                                                   00030830
      N=N+LEN(J)                                                        00030840
      IF(CURCAP(I,J).LE..01) GO TO 30                                   00030850
      DO 40 K=1,L2                                                      00030860
      M=N+K                                                             00030870
      AAMORT(M)=AAMORT(M)+FAC*CURCAP(I,J)                               00030880
40    CONTINUE                                                          00030890
30    CONTINUE                                                          00030900
20    CONTINUE                                                          00030910
      RETURN                                                            00030920
      END                                                               00030930
```

```
      SUBROUTINE CAPCUR(CEP,NS)                                          00030940
C*****************************************                               00030950
C                                                                        00030960
C THIS FUNCTION CONVERTS THE CAPITAL PROGRAM IN MEGAWATTS INTO THOUSANDS00030970
C OF DOLLARS. INFLATION IS APPLIED, YIELDING CURRENT DOLLARS.            00030980
C                                                                        00030990
C*****************************************                               00031000
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11580
C             - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES     MOD11590
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11600
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPROS,NGTEC,LB(16),   00031010
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                              00031020
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)           00031030
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),         00031040
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),   00031050
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78               00031060
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),      00031070
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),          00031080
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                    00031090
      DIMENSION CEP(16,31,1)                                             00031100
      REAL INFLA                                                         00031110
      L=0                                                                00031120
      DO 20 I=1,NPROS                                                    00031130
C     L1=LEN(I)                                                          00031140
      L=L+1                                                              00031150
      DO 40 K=1,NGTEC                                                    00031160
      FAC=((1.+INFLA)*(1.+ESC(K)))**(L-1)                                00031170
      CURCAP(K,L)=(CEP(K,I+1,NS)-CEP(K,I,NS))*CAPCST(K)*FAC              00031180
40    CONTINUE                                                           00031190
20    CONTINUE                                                           00031200
      RETURN                                                             00031210
      END                                                                00031220
```

```
      SUBROUTINE FXCHAR(FC1,FCTLH,FCTL,FCTL1,FCBL,LT)                    00031230
C*****************************************                               00031240
C                                                                        00031250
C CALCULATE THE FIXED CHARGES BEFORE CONSIDERATION OF EXTRA              00031260
C FINANCIAL COSTS, WITH NO REGULATIONRY LAG.                             00031270
C                                                                        00031280
C*****************************************                               00031290
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11610
C            - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES.     MOD11620
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11630
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),   00031300
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRER1                              00031310
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)           00031320
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),         00031330
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),   00031340
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78               00031350
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),      00031360
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),          00031370
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                    00031380
      DIMENSION FC1(16),FCTLH(16),FCTL(16),FCTL1(16),FCBL(16),LT(16)     00031390
      INTEGER HORIZN,PHORZN                                              00031400
      DO 10 I=1,NGTEC                                                    00031410
      L1=LB(I)-LT(I)                                                     00031420
      L2=LT(I)/2                                                         00031430
      L3=LT(I)-L2                                                        00031440
      Z=FLOAT(L1)                                                        00031450
      ZZ=FLOAT(L2)                                                       00031460
      ZZZ=FLOAT(L3)                                                      00031470
      DO 20 J=1,NPRDS                                                    00031480
      IF(CURCAP(I,J).LE..01) GO TO 20                                    00031490
      K=0                                                                00031500
      DO 40 N=1,J                                                        00031510
40    K=K+LEN(N)                                                         00031520
70    CONTINUE                                                           00031530
      SAV=1000.*CURCAP(I,J)                                              00031540
      DO 30 L=1,L2                                                       00031550
      K=K+1                                                              00031560
      FIXCHG(K)=FIXCHG(K)+SAV*(FC1(I)-FLOAT(L-1)*(FC1(I)-FCTLH(I))/ZZ)   00031570
30    CONTINUE                                                           00031580
      DO 35 L=1,L3                                                       00031590
      K=K+1                                                              00031600
      FIXCHG(K)=FIXCHG(K)+SAV*(FCTLH(I)-FLOAT(L-1)*(FCTLH(I)-FCTL(I))/   00031610
     +ZZZ)                                                               00031620
35    CONTINUE                                                           00031630
      IF(L1.LE.0) GO TO 52                                               00031640
      DO 50 L=1,L1                                                       00031650
      K=K+1                                                              00031660
      FIXCHG(K)=FIXCHG(K)+SAV*(FCTL1(I)-FLOAT(L-1)*(FCTL1(I)-FCBL(I))/Z)00031670
50    CONTINUE                                                           00031680
52    CONTINUE                                                           00031690
20    CONTINUE                                                           00031700
10    CONTINUE                                                           00031710
      RETURN                                                             00031720
      END                                                                00031730
```

```
      SUBROUTINE FXCHRL(FC1,FCTLH,FCTL,FCTL1,FCBL,LT)                    00031740
C*********************************************                          00031750
C                                                                        00031760
C CALCULATE THE FIXED CHARGES BEFORE CONSIDERATION OF EXTRA              00031770
C FINANCIAL COSTS, CONSIDERING REGULATORY LAG                            00031780
C                                                                        00031790
C*****************************************                              00031800
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11640
C            - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES.     MOD11645
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11650
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),   00031810
     +DBTRT,FAIADJ,ITCNUR,TAXMAR,EQRT,PRERT                              00031820
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)           00031830
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),         00031840
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),   00031850
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS76               00031860
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),      00031870
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),          00031880
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                    00031890
      DIMENSION FC1(16),FCTLH(16),FCTL(16),FCTL1(16),FCBL(16),LT(16)     00031900
      INTEGER HORIZN,PHORZN                                              00031910
      DO 10 I=1,NGTEC                                                    00031920
      L1=LB(I)-LT(I)                                                     00031930
      L2=LT(I)/2                                                         00031940
      L3=LT(I)-L2                                                        00031950
      Z=FLOAT(L1)                                                        00031960
      ZZ=FLOAT(L2)                                                       00031970
      ZZZ=FLOAT(L3)                                                      00031980
      DO 20 J=1,NPRDS                                                    00031990
      IF(CURCAP(I,J).LE..01) GO TO 20                                    00032000
      K=LAGR(I)                                                          00032010
      DO 40 N=1,J                                                        00032020
40    K=K+LEN(N)                                                         00032030
70    CONTINUE                                                           00032040
      SAV=1000.*CURCAP(I,J)                                              00032050
      DO 30 L=1,L2                                                       00032060
      K=K+1                                                              00032070
      FACTOR=1.                                                          00032080
      N2=LAGR(I)                                                         00032090
      N7=K+1                                                             00032100
      DO 60 N=1,N2                                                       00032110
      N7=N7-1                                                            00032120
      IF(N7.LE.0) FACTOR=FACTOR+.045                                     00032130
      IF(N7.GT.0) FACTOR=FACTOR+EGRO(N7)                                 00032140
60    CONTINUE                                                           00032150
      FIXCHG(K)=FIXCHG(K)+SAV*FACTOR*(FC1(I)-(L-1)*(FC1(I)-FCTLH(I))/ZZ)00032160
30    CONTINUE                                                           00032170
      DO 35 L=1,L3                                                       00032180
      K=K+1                                                              00032190
      FACTOR=1.                                                          00032200
      DO 45 III=1,N2                                                     00032210
      FACTOR=FACTOR+EGRO(K+1-III)                                        00032220
45    CONTINUE                                                           00032230
      FIXCHG(K)=FIXCHG(K)+SAV*FACTOR*(FCTLH(I)-(L-1)*(FCTLH(I)-FCTL(I))  00032240
     +/ZZZ)                                                              00032250
35    CONTINUE                                                           00032260
      IF(L1.LE.0) GO TO 52                                               00032270
```

```
      DO 50 L=1,L1                                                          00032280
      K=K+1                                                                 00032290
      FACTOR=1.                                                             00032300
      DO 48 III=1,N2                                                        00032310
      FACTOR=FACTOR+EGRO(K+1-III)                                           00032320
48    CONTINUE                                                              00032330
      FIXCHG(K)=FIXCHG(K)+SAV*FACTOR*(FCTL1(I)-(L-1)*(FCTL1(I)-FCBL(I))     00032340
     +/Z)                                                                   00032350
50    CONTINUE                                                              00032360
52    CONTINUE                                                              00032370
20    CONTINUE                                                              00032380
10    CONTINUE                                                              00032390
      RETURN                                                                00032400
      END                                                                   00032410
```

```
      FUNCTION QOST(COVER,COSTD,COSTP)                                  00032420
C*****************************************************************     00032430
C*****  THIS SUBROUTINE CONVERTS THE INTEREST COVERAGE INTO A          00032440
C*****  COST OF CAPITAL AND AN INTEREST  RATE.                         00032450
C*****                                                                 00032460
C*****************************************************************     00032470
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD11660
C            - - DIMENSION OF LB MODIFIED TO ACCOMMODATE 16 TECH.      MOD11670
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD11680
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPROS,NGTEC,LB(16),  00032480
     +DBTRT,FAIADJ,ITCNUR,TAXMAR,EQRT,PRERT                             00032490
      COMMON /C2/ COV(6),CCCOV(6),DBTCOV(6),PRECOV(6)                   00032500
      INTEGER HORIZN,PHORZN                                             00032510
      QOST=CCCOV(1)                                                     00032520
      COSTD=DBTCOV(1)                                                   00032530
      COSTP=PRECOV(1)                                                   00032540
      IF(COVER.LT.COV(1)) GO TO 10                                      00032550
      N=0                                                               00032560
      DO 20 M=1,6                                                       00032570
      IF(COVER.GE.COV(M)) N=N+1                                         00032580
20    CONTINUE                                                          00032590
      QOST=CCCOV(6)                                                     00032600
      COSTD=DBTCOV(6)                                                   00032610
      COSTP=PRECOV(6)                                                   00032620
      IF(N.EQ.6)GO TO 10                                                00032630
      FAC=(COVER-COV(N))/(COV(N+1)-COV(N))                              00032640
      QOST=CCCOV(N)+FAC*(CCCOV(N+1)-CCCOV(N))                           00032650
      COSTP=PRECOV(N)+FAC*(PRECOV(N+1)-PRECOV(N))                       00032660
      COSTD=DBTCOV(N)+FAC*(DBTCOV(N+1)-DBTCOV(N))                       00032670
10    RETURN                                                            00032680
      END                                                               00032690
```

```
      SUBROUTINE FXCWIP                                                 00032700
C*****************************************                             00032710
C                                                                       00032720
C CALCULATE CWIP AND REVENUE REQUIREMENTS ON CWIP, AND PUT REQUIRED     00032730
C AMOUNT IN THE RATE BASE.                                              00032740
C                                                                       00032750
C*****************************************                             00032760
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11690
C            - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES.    MOD11700
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11710
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00032770
     +DBTRT,FAIADJ,ITCNUR,TAXMAR,EQRT,PRERT                             00032780
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00032790
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00032800
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00032810
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00032820
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00032830
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00032840
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00032850
      INTEGER HORIZN,PHORZN                                             00032860
C     DATA CWIP,DINVST/100*0.,100*0./                                   00032870
      DO 101 I=1,HORIZN                                                 00032880
      DINVST(I)=0.                                                      00032890
      CWIP(I)=0.                                                        00032900
101   CONTINUE                                                          00032910
      IF(PCWIP.GT..99999) GO TO 102                                     00032920
      FIXCHG(1)=FIXCHG(1)+CC*CWIP(1)*PCWIP/(1.-PCWIP)                   00032930
102   CONTINUE                                                          00032940
      DO 10 I=1,NGTEC                                                   00032950
      SAVE=1000./FLOAT(NCON(I))                                         00032960
      DO 20 J=1,NPRDS                                                   00032970
      IF(CURCAP(I,J).LE..01) GO TO 20                                   00032980
      K=0                                                               00032990
      DO 30 N=1,J                                                       00033000
30    K=K+LEN(N)                                                        00033010
35    CONTINUE                                                          00033020
      N1=MIN0(K,NCON(I))                                                00033030
      N2=NCONM-N1                                                       00033040
      N3=K-N1                                                           00033050
      DO 40 N=1,N1                                                      00033060
      N4=N3+N                                                           00033070
      N5=N2+N                                                           00033080
      SAV=FCWIP(I,N5)*CURCAP(I,J)*PCWIP                                 00033090
      FIXCHG(N4)=FIXCHG(N4)+SAV*CC                                      00033100
      RTBASE(N4)=RTBASE(N4)+SAV                                         00033110
      DINVST(N4)=DINVST(N4)+SAVE*CURCAP(I,J)                            00033120
      CWIP(N4)=CWIP(N4)+CURCAP(I,J)*FCWIP(I,N5)*(1.-PCWIP)              00033130
40    CONTINUE                                                          00033140
      IF(LAGR(I).EQ.0) GO TO 50                                         00033150
      L1=LAGR(I)                                                        00033160
      N5=N4                                                             00033170
      DO 60 N=1,L1                                                      00033180
      N5=N5+1                                                           00033190
      SAV=FCWIP(I,NCONM)*CURCAP(I,J)*PCWIP                              00033200
      FIXCHG(N5)=FIXCHG(N5)+SAV*CC                                      00033210
      RTBASE(N5)=RTBASE(N5)+SAV                                         00033220
      CWIP(N5)=CWIP(N5)+CURCAP(I,J)*FCWIP(I,NCONM)*(1.-PCWIP)           00033230
```

```
60    CONTINUE                                                  00033240
50    CONTINUE                                                  00033250
20    CONTINUE                                                  00033260
10    CONTINUE                                                  00033270
      RETURN                                                    00033280
      END                                                       00033290
```

```
      SUBROUTINE FIXITC(AVAILT,CUMITC,CC,ITCRAT,RTB,AAMORT,RATINT,DINVST00033300
     +,DITC,DBTRT,TAXMAR)                                              00033310
C*****************************************                            00033320
C                                                                      00033330
C THIS SUBROUTINE CALCULATES TJE ITC ASSOCIATED                        00033340
C WITH A PARTICULAR INVESTMENT PROGRAM                                 00033350
C                                                                      00033360
C*****************************************                            00033370
      REAL ITCRAT                                                      00033380
      AVAILT=(RTB*TAXMAR*(CC-(RATINT*DBTRT))/2.)+AVAILT+AAMORT/2.      00033390
      CUMITC=ITCRAT*DINVST+CUMITC                                      00033400
      DITC=AMIN1(CUMITC,AVAILT)                                        00033410
      AVAILT=AVAILT-DITC                                               00033420
      CUMITC=CUMITC-DITC                                               00033430
      RETURN                                                           00033440
      END                                                              00033450
```

```
      SUBROUTINE COMFIN(LAGREG,EMBORT,EMBPRE,EMBCOM)                    00033460
C*****************************************                              00033470
C                                                                       00033480
C THIS SUBROUTINE CALCULATES THE ASSETS, RATEBASE AND INTEREST PAYMENTS 00033490
C OF  THE COMPANY.  INTEREST COVERAGE IS CALCULATED.                    00033500
C EXTRA FINANCIAL CHARGES ARE ADDED, AND ITC IS SUBTRACTED.             00033510
C                                                                       00033520
C*****************************************                              00033530
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11720
C            - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES     MOD11730
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11740
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00033540
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                             00033550
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00033560
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00033570
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00033580
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00033590
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00033600
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00033610
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00033620
      COMMON /WRITE/ WRT(3)                                             00033630
      INTEGER HORIZN,PHORZN                                             00033640
      REAL ITCRAT                                                       00033650
      LOGICAL WRT                                                       00033660
      N4=0                                                              00033661
      EMD=0.                                                            00033662
      EMP=0.                                                            00033663
      DO 10 I=1,NGTEC                                                   00033670
      DO 20 J=1,NPRDS                                                   00033680
      IF(CURCAP(I,J).LE..01) GO TO 20                                   00033690
      K=1                                                               00033700
      DO 30 N=1,J                                                       00033710
30    K=K+LEN(N)                                                        00033720
35    CONTINUE                                                          00033730
      L=K-1                                                             00033740
      IF(L.EQ.0) GO TO 45                                               00033750
      N1=MIN0(L,NCON(I))                                                00033760
      N3=K-N1-1                                                         00033770
      DO 40 N=1,N1                                                      00033780
      N4=N3+N                                                           00033790
      N5=NCONM-N1+N                                                     00033800
      AFUDC(N4)=AFUDC(N4)+CURCAP(I,J)*FAFUDC(I,N5)                      00033810
40    CONTINUE                                                          00033820
45    CONTINUE                                                          00033830
      IF(LAGR(I).EQ.0) GO TO 48                                         00033840
      L=LAGR(I)                                                         00033850
      DO 47 II=1,L                                                      00033860
      N4=N4+1                                                           00033870
      AFUDC(N4)=AFUDC(N4)+CURCAP(I,J)*FAFUDC(I,NCONM)                   00033880
47    CONTINUE                                                          00033890
48    CONTINUE                                                          00033900
      SAVE=(1000.*PCWIP+FAFUDC(I,NCONM))*CURCAP(I,J)/LB(I)              00033910
      L1=LB(I)                                                          00033920
      N3=K+LAGR(I)-1                                                    00033930
      DO 50 N=1,L1                                                      00033940
      N4=N3+N                                                           00033950
      RTBASE(N4)=RTBASE(N4)+SAVE*(LB(I)+1-N)                            00033960
```

```
      DEPREC(N4)=DEPREC(N4)+SAVE                                        00033970
50    CONTINUE                                                          00033980
20    CONTINUE                                                          00033990
10    CONTINUE                                                          00034000
      RATINT(1)=EMBORT                                                  00034010
      AT=0.                                                             00034020
      CI=0.                                                             00034030
C*************************************************************        00034040
C*****                                                                 00034050
C*************************************************************        00034060
C IF (WRT(3)) PRINT,* INTEREST COVER INTEREST RATE  DELTA  ADDINT*      00034070
      CALL FIXITC(AT,CI,CC,ITCRAT,RTBASE(1),AAMORT(1),RATINT(1),        00034080
     +DINVST(1),DITC(1),DBTRT,TAXMAR)                                   00034090
      TAXES(1)=RTBASE(1)*(CC-(RATINT(1)*DBTRT))*TAXMAR                  00034100
      ASSETS(1)=RTBASE(1)+AFUDC(1)                                      00034110
      AAA=ASS78-ASSETS(1)                                               00034120
      OTHERA=AMAX1(0.,AAA)                                              00034130
      ASSETS(1)=ASSETS(1)+OTHERA                                        00034140
      AVAIL=FIXCHG(1)-DITC(1)-(.02*ASSETS(1))                           00034150
      DADD=DBTRT*(ASSETS(1)-ASS78)+BONDRT(1)                            00034160
      ADDINT=RATINT(1)*DADD                                             00034170
      DINT(1)=DINT(1)+ADDINT                                            00034180
      COVER(1)=AVAIL/(DINT(1)*FAIADJ)                                   00034190
      COFCOM(1)=QUOT(COVER(1),RATINT(1),PREFER(1))                      00034200
      COFCAP(1)=(DBTRT*RATINT(1))+                                      00034210
     + ((PRERT*PREFER(1))+EQRT*(COFCOM(1)))/(1.-TAXMAR)                 00034220
      DELTA(1)=COFCOM(1)-EMBCOM                                         00034230
      EXCOST(1)=EQRT*DELTA(1)*RTBASE(1)/(1.-TAXMAR)                     00034240
      III=1                                                             00034250
      SAVI=DADD*(RATINT(1)-EMBORT)                                      00034260
      I9=31+LAGREG                                                      00034270
      IJK=MIN0(I9,HORIZN)                                               00034280
      JJJ=2+LAGREG                                                      00034290
      DO 11 KJI=JJJ,IJK                                                 00034300
      ADDION(KJI)=ADDION(KJI)+SAVI                                      00034310
11    CONTINUE                                                          00034320
      PADD=(ASSETS(1)-ASS78)*PRERT                                      00034330
      SAVP=PADD*(PREFER(1)-EMBPRE)                                      00034340
      DO 111 KJI=JJJ,HORIZN                                             00034350
      ADDPON(KJI)=ADDPON(KJI)+SAVP                                      00034360
111   CONTINUE                                                          00034370
      EXCOST(1)=EXCOST(1)+ADDPON(1)/(1.-TAXMAR)+ADDION(1)               00034380
C*************************************************************        00034390
C*****                                                                 00034400
C*************************************************************        00034410
      IF(WRT(3)) PRINT 901,III,COVER(1),RATINT(1),DELTA(1),ADDINT       00034420
901   FORMAT(I4,F8.2,2F10.4,E12.4)                                      00034430
      DO 60 N=2,PHORZN                                                  00034440
      SAV=CC+EMD+(DELTA(N-1)*EQRT+EMP*PRERT)/(1.-TAXMAR)                00034450
      SSS=RTBASE(N)                                                     00034460
      TTT=RATINT(N-1)                                                   00034470
      CALL FIXITC(AT,CI,SAV,ITCRAT,SSS,AAMORT(N),TTT,DINVST(N),         00034480
     + DITC(N),DBTRT,TAXMAR)                                            00034490
      TAXES(N)=(RTBASE(N)*(SAV-(RATINT(N-1)*DBTRT))*TAXMAR)             00034500
     +  +AAMORT(N)-DITC(N)                                              00034510
      ASSETS(N)=AFUDC(N)+RTBASE(N)+OTHERA                               00034520
      AVAIL=FIXCHG(N)+EXCOST(N-1)-DITC(N)-(.02*ASSETS(N))               00034530
```

```
      ADDINT=ADDINT+DBTRT*RATINT(N-1)*(ASSETS(N)-ASSETS(N-1))          00034540
      ADDINT=ADDINT+RATINT(N-1)*BONDRT(N)                              00034550
      DINT(N)=DINT(N)+ADDINT                                           00034560
      COVER(N)=AVAIL/(DINT(N)*FAIADJ)                                  00034570
      COFCOM(N)=COST(COVER(N),RATINT(N),PREFER(N))                     00034580
      COFCAP(N)=DBTRT*RATINT(N)+                                       00034590
     +  (PRERT*PREFER(N)+EQRT*COFCOM(N))/(1.-TAXMAR)                   00034600
      DADD=DBTRT*(ASSETS(N)-ASSETS(N-1))+BONDRT(N)                     00034610
      SAVI=DADD*(RATINT(N)-EMBDRT)                                     00034620
      I9=N+LAGREG+31                                                   00034630
      IJK=MIN0(I9,HORIZN)                                              00034640
      JJJ=N+1+LAGREG                                                   00034650
      DO 12 KJI=JJJ,IJK                                                00034660
      ADDION(KJI)=ADDION(KJI)+SAVI                                     00034670
12    CONTINUE                                                         00034680
      PADD=(ASSETS(N)-ASSETS(N-1))*PRERT                               00034690
      SAVP=PADD*(PREFER(N)-EMBPRE)                                     00034700
      DO 122 KJI=JJJ,HORIZN                                            00034710
      ADDPON(KJI)=ADDPON(KJI)+SAVP                                     00034720
122   CONTINUE                                                         00034730
      EMD=DBTRT*((DINT(N)/(ASSETS(N)*DBTRT))-EMBDRT)                   00034740
      DELTA(N)=COFCOM(N)-EMBCOM                                        00034750
      EMP=ADDPON(N)/(PRERT*(ASSETS(N)-ASSETS(1)))                      00034760
C*****************************************************************   00034770
C*****                                                               00034780
C*****************************************************************   00034790
      IF(WRT(3)) PRINT 901,N,COVER(N),RATINT(N),DELTA(N),ADDINT        00034800
      EXCOST(N)=(DELTA(N)*EQRT*RTBASE(N)+ADDPON(N))/(1.-TAXMAR)        00034810
     ++ADDION(N)                                                       00034820
60    CONTINUE                                                         00034830
      SAV=DELTA(PHORZN)*.8                                             00034840
      IJK=PHORZN+1                                                     00034850
      DO 70 N=IJK,HORIZN                                               00034860
      SAV=SAV*.8                                                       00034870
      EXCOST(N)=SAV*RTBASE(N)+ADDION(N)+ADDPON(N)/(1.-TAXMAR)          00034880
70    CONTINUE                                                         00034890
      IF(ITCNOR.EQ.1) CALL NORITC                                      00034900
      DO 80 N=1,HORIZN                                                 00034910
      FIXCHG(N)=FIXCHG(N)+EXCPLM(N)-(DITC(N)/(1.-TAXMAR))+EXCOST(N)    00034920
80    CONTINUE                                                         00034930
C*****************************************************************   00034940
C*****                                                               00034950
C*****************************************************************   00034960
      IF(.NOT.WRT(1)) GO TO 89                                         00034970
C PRINT,* PERIOD   FIXED COST      ITC      EXTRA COSTS  PRELIM COSTS* 00034980
      DO 88 I=1,HORIZN                                                 00034990
      PRINT 902,I,FIXCHG(I),DITC(I),EXCOST(I),EXCPLM(I)                00035000
88    CONTINUE                                                         00035010
89    CONTINUE                                                         00035020
      IF(.NOT.WRT(2)) GO TO 85                                         00035030
C PRINT,* PERIOD    ASSETS   RATEBASE     AFUDC     CWIP   INTEREST*  00035040
      DO 82 N=1,HORIZN                                                 00035050
      PRINT 900,N,ASSETS(N),RTBASE(N),AFUDC(N),CWIP(N),DINT(N)         00035060
82    CONTINUE                                                         00035070
85    CONTINUE                                                         00035080
C*****************************************************************   00035090
C*****                                                               00035100
```

```
C*************************************************************          00035110
900    FORMAT(I5,5(2X,E10.3))                                           00035120
902    FORMAT(I5,4(2X,E10.3))                                           00035130
       RETURN                                                           00035140
       END                                                              00035150
```

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      SUBROUTINE DIST(LBD,LTD,F1,F2,F3,F4,F5,EN78,DISTRA,ARATE,DISESC)   00035160
C*****                                                                  00035170
C*****                                                                  00035180
C***** THIS SUBROUTINE HANDLES DISTRIBUTION CAPITAL.  RATE BASE,        00035190
C***** CWIP AND AFUDC ARE INCREASED, AND FIXED CHARGES ARE ADDED.       00035200
C***** CONSTRUCTION TIME IS TWO YEARS.                                  00035210
C*****                                                                  00035220
C*****                                                                  00035230
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11750
C             - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES.   MOD11760
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11770
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00035240
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                             00035250
      COMMON /C5/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00035260
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00035270
     + FCWIP(16,15),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00035280
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00035290
     + ,AAMORT(100),CUMCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00035300
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00035310
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00035320
      DIMENSION DBUCKS(100)                                             00035330
      INTEGER PHORZN,HORIZN                                             00035340
      REAL INFLA                                                        00035350
      FAC2=1.+ARATE/2.                                                  00035360
      FAC1=(1.+(5.*ARATE/4.)+(3.*(ARATE**2.)/8.))                       00035370
      FAC=(1.+INFLA)*(1.+DISESC)                                        00035380
      G=EGRO(1)                                                         00035390
      DBUCKS(1)=DISTRA*EN78*(1.+G)*FAC                                  00035400
      CWIP(1)=CWIP(1)+.5*DBUCKS(1)*FAC*(1.-PCWIP)                       00035410
      RTBASE(1)=RTBASE(1)+.5*DBUCKS(1)*PCWIP                            00035420
      AFUDC(1)=AFUDC(1)+DBUCKS(1)*FAC1*(1.-PCWIP)                       00035430
      DINVST(1)=DINVST(1)+.5*DBUCKS(1)                                  00035440
      DO 20 I=2,PHORZN                                                  00035450
      G=G+EGRO(I)                                                       00035460
      FAC=FAC*(1.+INFLA)*(1.+DISESC)                                    00035470
      DBUCKS(I)=DISTRA*EN78*(1.+G)*FAC                                  00035480
      AFUDC(I)=AFUDC(I)+DBUCKS(I)*FAC1*(1.-PCWIP)                       00035490
      CWIP(I)=CWIP(I)+DBUCKS(I)*(1.-PCWIP)                              00035500
      RTBASE(I)=RTBASE(I)+DBUCKS(I)*PCWIP                               00035510
      AFUDC(I-1)=AFUDC(I-1)+.5*DBUCKS(I)*FAC2*(1.-PCWIP)                00035520
      CWIP(I-1)=CWIP(I-1)+.5*DBUCKS(I)*(1.-PCWIP)                       00035530
      RTBASE(I-1)=RTBASE(I-1)+.5*DBUCKS(I)*PCWIP                        00035540
      DINVST(I)=DINVST(I)+.5*DBUCKS(I)                                  00035550
      DINVST(I-1)=DINVST(I-1)+.5*DBUCKS(I)                              00035560
20    CONTINUE                                                          00035570
      FAC=FAC*(1.+INFLA)*(1.+DISESC)                                    00035580
      G=G+EGRO(PHORZN+1)                                                00035590
      DBUCKS(PHORZN+1)=DISTRA*EN78*(1.+G)*FAC                           00035600
      AFUDC(PHORZN)=AFUDC(PHORZN)+.5*DBUCKS(PHORZN+1)*FAC2*(1.-PCWIP)   00035610
      CWIP(PHORZN)=CWIP(PHORZN)+DBUCKS(PHORZN+1)*.5*(1.-PCWIP)          00035620
      RTBASE(PHORZN)=RTBASE(PHORZN)+.5*DBUCKS(PHORZN+1)*PCWIP           00035630
      DINVST(PHORZN)=DINVST(PHORZN)+.5*DBUCKS(PHORZN+1)                 00035640
      DO 70 I=1,PHORZN                                                  00035650
      L3=LTD/2                                                          00035660
      L2=LTD-L3                                                         00035670
      L1=LBD-LTD                                                        00035680
      F21=(F2-F1)/FLOAT(L3)                                             00035690
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      F32=(F3-F2)/FLOAT(L2)                                          00035700
      F54=(F5-F4)/(FLOAT(L1))                                        00035710
      ASAVE=(FAC1-1.)*DBUCKS(I)/FLOAT(LBD)                           00035720
      K=I                                                            00035730
      DO 30 J=1,L3                                                   00035740
      K=K+1                                                          00035750
      FIXCHG(K)=FIXCHG(K)+(F1-(J-1)*F21)*DBUCKS(I)                   00035760
      AAMORT(K)=AAMORT(K)+ASAVE                                      00035770
30    CONTINUE                                                       00035780
      DO 40  J=1,L2                                                  00035790
      K=K+1                                                          00035800
      FIXCHG(K)=FIXCHG(K)+(F2-(J-1)*F32)*DBUCKS(I)                   00035810
      AAMORT(K)=AAMORT(K)+ASAVE                                      00035820
40    CONTINUE                                                       00035830
      DO 50 J=1,L1                                                   00035840
      K=K+1                                                          00035850
      FIXCHG(K)=FIXCHG(K)+(F4-(J-1)*F54)*DBUCKS(I)                   00035860
      AAMORT(K)=AAMORT(K)+ASAVE                                      00035870
50    CONTINUE                                                       00035880
      RBSAVE=DBUCKS(I)*FAC1/FLOAT(LBD)                               00035890
      DO 60 J=1,LBD                                                  00035900
      DEPREC(I+J)=DEPREC(I+J)+RBSAVE                                 00035910
      RTBASE(I+J)=RTBASE(I+J)+FLOAT(LBD+1-J)*RBSAVE                  00035920
60    CONTINUE                                                       00035930
70    CONTINUE                                                       00035940
      RETURN                                                         00035950
      END                                                            00035960
```

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      SUBROUTINE CAAHOR(ADAHOR,AMIX90)                                  00035970
C*********************************************                          00035980
C*****                                                                 00035990
C***** THIS SUBROUTINE FINDS THE CWIP AND AFUDC,THE RATE BASE          00036000
C***** AND FIXED CHARGE ADDITIONS CONTRIBUTED TO THR YEARS             00036010
C***** BEFORE THE PLANNING HORIZON CONTRIBUTED BY CAPACITY             00036020
C***** ADDED AFTER THE PLANNING HORIZON.  ADAHOR REPRESENTS THE        00036030
C***** AMOUNT OF MEGAWATTS ADDED PER YEAR AFTER THE HORIZON,           00036040
C***** WITH THE TECHNOLOGY PERCENTS BEING DETERMINED BY                00036050
C***** AMIX90.                                                        00036060
C*****                                                                00036070
C*********************************************                          00036080
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11780
C             - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES.  MOD11790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11800
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00036090
     +DBTRT,FAIADJ,ITCNUR,TAXMAR,EQRT,PRERT                             00036100
      COMMON /C3/ EXCPLN(100),CWIP(100),CC ,DINT(100),LAGR(16)          00036110
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00036120
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00036130
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS76              00036140
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00036150
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00036160
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00036170
      DIMENSION ADAHOR(1),AMIX90(16)                                    00036180
      INTEGER PHORZN                                                    00036190
      REAL INFLA                                                        00036200
      DO 80 I=1,NGTEC                                                   00036210
      FAC=(1.+INFLA)*(1.+ESC(I))                                        00036220
      BASE=CAPCST(I)*1000.*AMIX90(I)*(FAC**(PHORZN+NCON(I)))            00036230
      J1=NCON(I)-1                                                      00036240
      IF(J1.LE.0) GO TO 80                                              00036250
      DO 60 J=1,J1                                                      00036260
C*****************************************                              00036270
C*****                                                                 00036280
C***** THIS LOOP GOES BACKWARDS OVER TIME.                             00036290
C*****                                                                 00036300
C*****************************************                              00036310
      BASE=BASE/FAC                                                     00036320
      L1=J1+1-J                                                         00036330
      DBASE=BASE*ADAHOR(L1)                                             00036340
      SS=DBASE/FLOAT(NCON(I))                                           00036350
      DO 50 K=1,J                                                       00036360
      N1=PHORZN+K-J                                                     00036370
      N2=NCONM+K-NCON(I)                                                00036380
      SAVE=FCWIP(I,N2)*DBASE/1000.                                      00036390
      CWIP(N1)=CWIP(N1)+SAVE                                            00036400
      AFUDC(N1)=AFUDC(N1)+FAFUDC(I,N2)*(1.-PCWIP)*(DBASE/1000.)         00036410
      RTBASE(N1)=RTBASE(N1)+PCWIP*SAVE                                  00036420
      FIXCHG(N1)=FIXCHG(N1)+PCWIP*CC*SAVE                               00036430
      DINVST(N1)=DINVST(N1)+SS                                          00036440
50    CONTINUE                                                          00036450
60    CONTINUE                                                          00036460
80    CONTINUE                                                          00036470
      RETURN                                                            00036480
      END                                                               00036490
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      SUBROUTINE PLMEXC(CEP,STAPRT,NS,LSTAGE)                           00036500
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11810
C              -  - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES  MOD11820
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11830
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPROS,NGTEC,LB(16),  00036510
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                             00036520
C*****************************************                             00036530
C*****                                                                00036540
C***** THIS SUBROUTINE CALCULATES THE EXTRA CHARGES ASSOCIATED WITH    00036550
C***** DELAYS IN PRE-CONSTRUCTION PROCESSES LIKE STUDIES AND           00036560
C***** LICENSING.  THE COSTS ASSOCIATED WITH NORMAL TIMING            00036570
C***** IS CONTAINED IN THE CAPITAL COST.                              00036580
C*****                                                                00036590
C*****************************************                             00036600
      DIMENSION CEP(16,31,1),STAPRT(16,1),LSTAGE(16,1)                  00036610
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00036620
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00036630
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00036640
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00036650
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00036660
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00036670
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00036680
      INTEGER PHORZN,HORIZN                                             00036690
      REAL INFLA                                                        00036700
      IF(NS.EQ.1) GO TO 89                                              00036710
      DO 10 I=1,HORIZN                                                  00036720
      EXCPLM(I)=0.                                                      00036730
10    CONTINUE                                                          00036740
      NS1=NS-1                                                          00036750
      DO 70 I=1,NGTEC                                                   00036760
      CINFLA=1.                                                         00036770
      DO 60 K=1,NS1                                                     00036780
C*****************************************                             00036790
C*****                                                                00036800
C***** THIS LOOP ITTERATES BACKWARDS OVER STAGES, FROM                 00036810
C***** CONSTRUCTION TO LICENCING TO ...                                00036820
C*****                                                                00036830
C*****************************************                             00036840
      KSAVE=NS+1-K                                                      00036850
      LSAVE=LSTAGE(I,KSAVE)                                             00036860
      CINFLA=(1.+INFLA)**LSAVE*CINFLA                                   00036870
      LOOP=PHORZN-LSAVE                                                 00036880
      FAC=1./(1.+INFLA)                                                 00036890
      DO 50 J=1,LOOP                                                    00036900
      FAC=FAC*(1.+INFLA)                                                00036910
      SAVE=(CEP(I,J,KSAVE-1)-CEP(I,J+LSAVE,KSAVE))*1000.*CAPCST(I)      00036920
      EXCPLM(J)=EXCPLM(J)+SAVE*CINFLA*STAPRT(I,NS-K)*FAC                00036930
50    CONTINUE                                                          00036940
60    CONTINUE                                                          00036950
70    CONTINUE                                                          00036960
89    CONTINUE                                                          00036970
      RETURN                                                            00036980
      END                                                               00036990
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      SUBROUTINE NORITC                                                 00037000
C*****************************************                            00037010
C***** THIS SUBTOUTINE NORMALIZES INVESTMENT TAX CREDITS; THAT IS      00037020
C***** ;THE TAX SAVINGS DUE TO ITC IS USED TO REDUCE THE REVENUE       00037030
C***** REQUIREMENT BY AN EQUAL AMOUNT OVER THE BOOK LIFE OF THE        00037040
C***** PLANT.  THERE IS A CHECK TO DETERMINE THAT CUMULATIVE CUSTOMER  00037050
C***** SAVINGS ARE LESS THAN OR EQUAL TO THE COMPANY'S TAX SAVINGS.    00037060
C*****                                                                00037070
C*****************************************                            00037080
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11840
C            - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES   MOD11850
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD11860
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),  00037090
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                             00037100
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00037110
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00037120
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00037130
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00037140
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00037150
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00037160
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00037170
      DIMENSION SAVE(100)                                               00037180
      REAL ITCRAT                                                       00037190
      INTEGER HORIZN,PHORZN                                             00037200
      DO 20 I=1,HORIZN                                                  00037210
20    SAVE(I)=0.                                                        00037220
      DO 70 I=1,NGTEC                                                   00037230
      L1=LB(I)                                                          00037240
      Z=FLOAT(L1)                                                       00037250
      DO 60 J=1,NPRDS                                                   00037260
      IF(CURCAP(I,J).LE..01) GO TO 60                                   00037270
      K=0                                                               00037280
      DO 40 N=1,J                                                       00037290
40    K=K+LEN(N)                                                        00037300
      STORE=ITCRAT*1000.*CURCAP(I,J)/Z                                  00037310
      DO 50 L=1,L1                                                      00037320
      K=K+1                                                             00037330
      SAVE(K)=SAVE(K)+STORE                                             00037340
50    CONTINUE                                                          00037350
60    CONTINUE                                                          00037360
70    CONTINUE                                                          00037370
      CUMTAK=DITC(1)                                                    00037380
      CUMPAS=SAVE(1)                                                    00037390
      DO 80 I=1,HORIZN                                                  00037400
      DITC(I)=AMIN1(CUMPAS,CUMTAK)                                      00037410
      I1=I+1                                                            00037420
      IF(I.EQ.HORIZN)GOTO 80                                            00037430
      CUMTAK=CUMTAK+DITC(I1)-DITC(I)                                    00037440
      CUMPAS=CUMPAS+SAVE(I1)-DITC(I)                                    00037450
80    CONTINUE                                                          00037460
      RETURN                                                            00037470
      END                                                               00037480
```

```
      SUBROUTINE PRMGN(PRMBEF,PRM,PRMAFT,IFRMYR,ILRMYR,IACTYR,          00037490
     +PRMGIN)                                                           00037500
C                                                                       00037510
C THIS SUBROUTINE COMPUTES THE PLANNING RESERVE MARGIN  PRMGIN          00037520
C THAT SHOULD BE USED DEPENDING ON THE CALENDAR YEAR  IACTYR.           00037530
C THIS COMPUTATION IS MADE BASED ON THE DATA SET ENTRIES IN             00037540
C LINE 160.                                                             00037550
C                                                                       00037560
      PRMGIN=PRMAFT                                                     00037570
      IF(IACTYR.LE.ILRMYR)PRMGIN=PRM                                    00037580
      IF(IACTYR.LT.IFRMYR)PRMGIN=PRMBEF                                 00037590
      RETURN                                                            00037600
      END                                                               00037610
```

```
      SUBROUTINE CPLAN(IYRDEC,NS,LR,LEADMN,LEADMX,LEAD,CCAP78,RETIRE,   00037620
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11870
C               - - AMWINC ADDED TO PARAMETER LIST                    MOD11880
C     +IAVYR,TKNAM,FFS,AVL,CEP,CEXDEM,PRMG,AJ,CAPLIM,AMIX90,SIZE,RMYES) 00037630
     +IAVYR,TKNAM,FFS,AVL,CEP,CEXDEM,PRMG,AJ,CAPLIM,AMIX90,SIZE,RMYES,  MOD11890
     +AMWINC)                                                           MOD11900
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11910
C                                                                       00037640
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD11920
C               - - DIMENSIONS AND DO LOOP FINAL VALUES HAVE BEEN      MOD11930
C                     MODIFIED TO ACCOMMODATE THE 16 TECHNOLOGIES.     MOD11940
      LOGICAL AVL(16),AVLLYR(16),AMWAVL(16,3),FFS,RMYES(16),T,F         00037650
      DIMENSION LEAD(16,3),PLAN(16),CCAP78(16),RETIRE(16,31),           00037660
     +CEP(16,31,3),CEXDEM(25),PRMG(25),AJ(16),CAPLIM(16),AMW(16,3),     00037670
     +ERROR(16),AMIX90(16),SIZE(16),TKNAM(16,2),TEP(16),IAVYR(16)       00037680
      DATA F,AMW,AMWAVL/.FALSE.,48*0.,48*.FALSE./                       00037690
      DATA T/.TRUE./                                                    00037700
C                                                                       00037710
C STAGES                                                                00037720
C   1 2 3 CEP(I,IY,IS)- MW OF TYPE I THAT HAVE COMPLETED STAGE IS       00037730
C                       BY YEAR IY.                                     00037740
C 1 2 3   AMW(I,IS)- MW AVAILABLE TO COMMIT TO STAGE IS FROM           00037750
C         STAGE IS-1.                                                   00037760
C 1 2 3   LEAD(I,IS)- YEARS NEEDED TO COMPLETE STAGE IS FROM           00037770
C         STAGE IS-1.                                                   00037780
C IF IT IS A FIRST FORWARD STEP, REMOVE UNNECESSARY COMMITMENTS.        00037790
      IF(.NOT.FFS)GOTO 8                                                00037800
C     DO 6 I=1,10                                                       00037810
      DO 6 I=1,16                                                       MOD11950
      IYRFP=IAVYR(I)                                                    00037820
      DO 6 IST=1,NS                                                     00037830
      ISTAGE=NS+1-IST                                                   00037840
      IYRFC=IYRDEC+LEAD(I,ISTAGE)                                       00037850
      IF(IYRFC.LT.IYRFP)IYRFC=IYRFP                                     00037860
      IYRFP=IYRFP-LEAD(I,ISTAGE)                                        00037870
      IF(IYRFC.GT.LR)GOTO 6                                             00037880
      IF(IYRFC.EQ.1)GOTO 5                                              00037890
      DO 4 IY=IYRFC,LR                                                  00037900
4     CEP(I,IY,ISTAGE)=CEP(I,IYRFC-1,ISTAGE)                            00037910
      GOTO 6                                                            00037920
5     DO 3 IY=1,LR                                                      00037930
3     CEP(I,IY,ISTAGE)=0.                                               00037940
6     CONTINUE                                                          00037950
C                                                                       00037960
C FOR THE FIRST LYR, COMPUTE CAPACITY ALREADY PLANNED BOTH BY           00037970
C TYPE AND IN TOTAL.                                                    00037980
8     LYR=IYRDEC+LEADMN                                                 00037990
      IF(LYR.GT.LR)GOTO 400                                             00038000
      TPLAN=0.                                                          00038010
C     DO 15 I=1,10                                                      00038020
      DO 15 I=1,16                                                      MOD11960
      TEP(I)=0.                                                         00038030
      PLAN(I)=CCAP78(I)-RETIRE(I,LYR)+CEP(I,LYR,NS)                     00038040
15    IF(RMYES(I))TPLAN=TPLAN+PLAN(I)                                   00038050
C                                                                       00038060
C FOR THE FIRST APPLICABLE YEAR, SET AVAILABLE MEGAWATTS BY             00038070
C TYPE AND STAGE.                                                       00038080
```

```
C                                                                       00038090
C     DO 30 I=1,10                                                      00038100
      DO 30 I=1,16                                                      MOD11970
      IF(.NOT.AVL(I))GOTO 30                                            00038110
      IYRFP=IYRDEC                                                      00038120
      IF(NS.EQ.1)GOTO 23                                                00038130
      DO 25 IST=2,NS                                                    00038140
      ISTAGE=NS+2-IST                                                   00038150
C IYRFC IS THE FIRST YEAR THAT MEGAWATTS IN STAGE  ISTAGE-1             00038160
C COULD COME ON LINE.                                                   00038170
      IYRFP=IYRFP+LEAD(I,ISTAGE)                                        00038180
      IYRFC=IYRFP                                                       00038190
      IF(IYRFC.LT.IAVYR(I))IYRFC=IAVYR(I)                               00038200
      IF(IYRFC.GT.LR)GOTO 30                                            00038210
      ISPREV=ISTAGE-1                                                   00038220
25    AMW(I,ISTAGE)=CEP(I,IYRDEC,ISPREV)-CEP(I,IYRFC,ISTAGE)            00038230
23    IYRFC=IYRFP+LEAD(I,1)                                             00038240
      IF(IYRFC.LT.IAVYR(I))IYRFC=IAVYR(I)                               00038250
      IF(IYRFC.GT.LR)GOTO 30                                            00038260
      AMW(I,1)=CAPLIM(I)-CCAP78(I)+RETIRE(I,IYRFC)-CEP(I,IYRFC,1)       00038270
30    CONTINUE                                                          00038280
C                                                                       00038290
C                                                                       00038300
C                                                                       00038310
C FIND TARGET CAPACITY FOR LYR AND COMPUTE TOTAL ADDITIONS              00038320
C REQUIRED TO MEET THE PLANNING RESERVE MARGIN.                         00038330
20    L=LYR-IYRDEC                                                      00038340
      TARGET=CEXDEM(L)*(1.+PRMG(L))                                     00038350
      REQADD=TARGET-TPLAN                                               00038360
      IF(REQADD.LE.0.)GOTO 300                                          00038370
C                                                                       00038380
C                                                                       00038390
C INITIALIZE AVAILABLE TYPES FOR LYR.                                   00038400
C     DO 40 I=1,10                                                      00038410
      DO 40 I=1,16                                                      MOD11980
      AVLLYR(I)=F                                                       00038420
      IF(.NOT.AVL(I).OR.REQADD.LT.AJ(I).OR.LYR.LT.IAVYR(I))GOTO 40      00038430
      IYRFC=IYRDEC                                                      00038440
      DO 35 IST=1,NS                                                    00038450
      ISTAGE=NS+1-IST                                                   00038460
      IYRFC=IYRFC+LEAD(I,ISTAGE)                                        00038470
      AMWAVL(I,ISTAGE)=IYRFC.LE.LYR.AND.AMW(I,ISTAGE).GE..1             00038480
35    IF(AMWAVL(I,ISTAGE))AVLLYR(I)=T                                   00038490
40    CONTINUE                                                          00038500
C                                                                       00038510
C                                                                       00038520
      IF(L.NE.50.OR.IYRDEC.NE.1)GOTO 55                                 00038530
      CALL DSTAT(CEP,T,F,F,LYR,IYRDEC,L,REQADD,TARGET,                  00038540
     +TPLAN,ADD,ITYP,TKNAM,AJ,PLAN,ERROR,AMW,LR,ISTAGE,                 00038550
     +TEP,AVL,AVLLYR,AMWAVL)                                            00038560
C FIND FIRST AVAILABLE TYPE.  IF NONE ARE AVAILABLE, SKIP TO            00038570
C THE NEXT LYR.                                                         00038580
C55   DO 60 I=1,10                                                      00038590
 55   DO 60 I=1,16                                                      MOD11990
      IF(.NOT.AVLLYR(I))GOTO 60                                         00038600
      ITYP=I                                                            00038610
      GOTO 70                                                           00038620
```

```
60    CONTINUE                                                          00038630
      GOTO 300                                                          00038640
C                                                                       00038650
C FIND AVAILABLE TYPE WITH HIGHEST ERROR.                               00038660
C70   DO 80 I=1,10                                                      00038670
 70   DO 80 I=1,16                                                      MOD12000
      IF(.NOT.AVLLYR(I))GOTO 80                                         00038680
      ERROR(I)=TARGET*AMIX90(I)-PLAN(I)                                 00038690
      IF(ERROR(I).GT.ERROR(ITYP))ITYP=I                                 00038700
80    CONTINUE                                                          00038710
C                                                                       00038720
C FIND MOST ADVANCED STAGE WITH AVAILABLE CAPACITY.  IF NO              00038730
C CAPACITY IS AVAILABLE, GO BACK TO CHOOSE ANOTHER ITYP.                00038740
      ISTAGE=NS+1                                                       00038750
90    ISTAGE=ISTAGE-1                                                   00038760
      IF(ISTAGE.GT.0)GOTO 100                                           00038770
      AVLLYR(ITYP)=.FALSE.                                              00038780
      GOTO 55                                                           00038790
100   IF(.NOT.AMWAVL(ITYP,ISTAGE))GOTO 90                               00038800
C                                                                       00038810
C FIND AMOUNT OF CAPACITY TO BE ADDED.                                  00038820
      ADD=SIZE(ITYP)                                                    00038830
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12010
C              - - USE AMWINC (INPUTTED AS MWINC) INSTEAD OF 50.        MOD12020
C     IF(ADD.LT.50.)ADD=50.                                             00038840
      IF (ADD .LT. AMWINC) ADD=AMWINC                                   MOD12030
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12040
      IF(ADD*1.5.GT.AMW(ITYP,ISTAGE))ADD=AMW(ITYP,ISTAGE)               00038850
C                                                                       00038860
C UPDATE.                                                               00038870
      REQADD=REQADD-ADD                                                 00038880
      PLAN(ITYP)=PLAN(ITYP)+ADD                                         00038890
      AMW(ITYP,ISTAGE)=AMW(ITYP,ISTAGE)-ADD                             00038900
      IF(AMW(ITYP,ISTAGE).LE..1)AMWAVL(ITYP,ISTAGE)=.FALSE.             00038910
C                                                                       00038920
C IF IRREVOKABLE COMMITMENTS ARE REQUIRED, MAKE THEM.                   00038930
C IF NOT, MAKE TENTATIVE COMMITMENTS.                                   00038940
      IYRFC=IYRDEC                                                      00038950
      DO 120 IST=ISTAGE,NS                                              00038960
120   IYRFC=IYRFC+LEAD(ITYP,IST)                                        00038970
      IF(IYRFC.LT.LYR)GOTO 170                                          00038980
      IYRADD=IYRDEC+LEAD(ITYP,ISTAGE)                                   00038990
      DO 130 IY=IYRADD,LR                                               00039000
130   CEP(ITYP,IY,ISTAGE)=CEP(ITYP,IY,ISTAGE)+ADD                       00039010
      IF(ISTAGE.EQ.NS)GOTO 180                                          00039020
170   TEP(ITYP)=TEP(ITYP)+ADD                                           00039030
180   CONTINUE                                                          00039040
C                                                                       00039050
      IF(L.NE.50.OR.IYRDEC.NE.1)GOTO 190                                00039060
      CALL DSTAT(CEP,T,F,F,LYR,IYRDEC,L,REQADD,TARGET,                  00039070
     +TPLAN,ADD,ITYP,TKNAM,AJ,PLAN,ERROR,AMW,LR,ISTAGE,                 00039080
     +TEP,AVL,AVLLYR,AMWAVL)                                            00039090
C IF NO MORE ADDITIONS ARE REQUIRED GOTO NEXT LYR.                      00039100
190   IF(REQADD.LE.0.)GOTO 300                                          00039110
C                                                                       00039120
C RE-CHECK AVAILABILITY FOR EACH TYPE.  THEN RETURN TO ADD              00039130
C MORE CAPACITY.                                                        00039140
```

```
C     DO 200 I=1,10                                                    00039150
      DO 200 I=1,16                                                    MOD12050
200   IF(REQADD.LT.AJ(I))AVLLYR(I)=.FALSE.                             00039160
      GOTO 55                                                          00039170
C                                                                      00039180
C IF NO MORE DECISIONS ARE REQUIRED IN THIS DECISION YEAR,             00039190
C RETURN TO THE MAIN PROGRAM.                                          00039200
300   IF(L.EQ.LEADMX.OR.LYR.EQ.LR)GOTO 400                             00039210
C                                                                      00039220
C IF MORE DECISIONS ARE REQUIRED IN THIS DECISION YEAR, UPDATE         00039230
C FOR THE NEXT LEAD YEAR AND RETURN TO COMPUTE NEW REQUIRED            00039240
C ADDITIONS.                                                           00039250
      LYR=LYR+1                                                        00039260
      TPLAN=0.                                                         00039270
C     DO 310 I=1,10                                                    00039280
      DO 310 I=1,16                                                    MOD12060
      PLAN(I)=CCAP78(I)-RETIRE(I,LYR)+CEP(I,LYR,NS)+TEP(I)             00039290
310   IF(RMYES(I))TPLAN=TPLAN+PLAN(I)                                  00039300
      CALL AMWUP(NS,AVL,IYRDEC,LYR,LEAD,CEP,RETIRE,AMW)                00039310
      GOTO 20                                                          00039320
C                                                                      00039330
400   CONTINUE                                                         00039340
      RETURN                                                           00039350
      END                                                              00039360
```

```
      SUBROUTINE CEXD (LEADMX,NYPP,IYR,CURDEM,ALPHA,BETA,AL,CURDGR,      MOD12070
     +                 NP,CEXDEM,DEM78,FCPER3)                           MOD12080
C     SUBROUTINE CEXD(LEADMX,NYPP,IYR,CURDEM,ALPHA,BETA,AL,CURDGR,       00039370
C    +NYL,GCOR,NP,GC,IP,CEXDEM,DEM78)                                    00039380
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12090
      DIMENSION CEXDEM(25)                                               00039390
C                                                                        00039400
C      THIS SUBROUTINE CALCULATES THE CONDITIONAL EXPECTED DEMAND        00039410
C GIVEN THE CURRENT AND LONG RUN DEMAND GROWTH RATES.  CEXDEM(I)         00039420
C IS THE EXPECTED DEMAND IN MEGAWATTS  I  YEARS FROM THE PRESENT.        00039430
C                                                                        00039440
      L=1                                                                00039450
      CEXDEM(L)=CURDEM                                                   00039460
      DO 10 I=2,LEADMX                                                   00039470
C     IF(IYR-1+I.GE.IP*NYPP+1)GOTO 20                                    00039480
      IF (I .GE. IFIX(FCPER3)) GO TO 20                                  MOD12100
      L=I                                                                00039490
C     IF(IYR-1+L.GT.NYL)GOTO 8                                           00039500
C     GCOR=GCOR+GC                                                       00039510
C     GOTO 10                                                            00039520
C8    GCOR=0.                                                            00039530
C10   CEXDEM(L)=CEXDEM(L-1)+(CURDGR+GCOR)*DEM78                          00039540
10    CEXDEM(L)=CEXDEM(L-1) + CURDGR*DEM78                               MOD12110
C                                                                        00039550
20    DO 40 JP=1,NP                                                      00039560
      CURDGR=CURDGR*ALPHA+AL*BETA                                        00039570
      DO 30 I=1,NYPP                                                     00039580
      L=L+1                                                              00039590
      IF(L.GT.LEADMX.OR.IYR-1+L.GT.NP*NYPP)GOTO 50                       00039600
C     IF(IYR-1+L.GT.NYL)GOTO 25                                          00039610
C     GCOR=GCOR+GC                                                       00039620
C     GOTO 30                                                            00039630
C25   GCOR=0.                                                            00039640
C30   CEXDEM(L)=CEXDEM(L-1)+(CURDGR+GCOR)*DEM78                          00039650
30    CEXDEM(L)=CEXDEM(L-1) + CURDGR*DEM78                               MOD12120
40    CONTINUE                                                           00039660
50    CONTINUE                                                           00039670
      RETURN                                                             00039680
      END                                                                00039690
```

```
      SUBROUTINE AMWUP(NS,AVL,IYRDEC,LYR,LEAD,CEP,RETIRE,AMW)           00039700
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12130
C              - - DIMENSIONS AND DO LOOP FINAL VALUES HAVE BEEN       MOD12140
C                    MODIFIED TO ACCOMMODATE THE 16 TECHNOLOGIES.      MOD12150
      DIMENSION AMW(16,3),CEP(16,31,3),RETIRE(16,31),LEAD(16,3)         00039710
      LOGICAL AVL(16)                                                   00039720
C                                                                       00039730
C THIS SUBROUTINE UPDATES  AMW  FOR THE NEW  LYR.  SPECIFICALLY,        00039740
C AMW  FOR EACH TYPE AND STAGE IS INCREASED BY THE AMOUNT OF            00039750
C CAPACITY THAT IS AVAILABLE TO COMMIT FOR  LYR  THAT WAS NOT           00039760
C PREVIOUSLY AVAILABLE.                                                 00039770
C                                                                       00039780
      DATA ISTAGE/0/                                                    00039781
C     DO 330 I=1,10                                                     00039790
      DO 330 I=1,16                                                     MOD12160
      IF(.NOT.AVL(I))GOTO 330                                           00039800
      IYRFC=IYRDEC                                                      00039810
      IYRC=LYR                                                          00039820
      IF(NS.EQ.1)GOTO 325                                               00039830
      DO 320 IS=2,NS                                                    00039840
      ISTAGE=NS+2-IS                                                    00039850
      IYRFC=IYRFC+LEAD(I,ISTAGE)                                        00039860
      IF(IYRFC.GE.LYR)GOTO 330                                          00039870
      IYRC=IYRC-LEAD(I,ISTAGE)                                          00039880
      IF(IYRC.LT.2)GOTO 320                                             00039890
      AMW(I,ISTAGE)=AMW(I,ISTAGE)+CEP(I,IYRC,ISTAGE-1)                  00039900
     +-CEP(I,IYRC-1,ISTAGE-1)                                           00039910
320   CONTINUE                                                          00039920
325   IYRFC=IYRFC+LEAD(I,1)                                             00039930
      IF(IYRFC.GE.LYR)GOTO 330                                          00039940
      IYRC=IYRC-LEAD(I,1)                                               00039950
      IF(IYRC.LT.2)GOTO 330                                             00039960
      AMW(I,1)=AMW(I,1)+RETIRE(I,IYRC)-RETIRE(I,IYRC-1)                 00039970
330   CONTINUE                                                          00039980
      RETURN                                                            00039990
      END                                                               00040000
```

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      SUBROUTINE OPRINT(YEARS,TKNAM,IS,NP,IYR,CEP,DEM,PR,PRM,DECDET,     00040010
     +RETIRE,NS,CTOT78,RRM,IFRMYR,ILRMYR)                                00040020
C                                                                         00040030
C     THIS SUBROUTINE PRINTS OUT CAPACITY ADDITIONS TO THE                00040040
C REPORT CADD.                                                            00040050
C                                                                         00040060
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12170
C              - - DIMENSIONS AND DO LOOP FINAL VALUES HAVE BEEN          MOD12180
C                    MODIFIED TO ACCOMMODATE THE 16 TECHNOLOGIES.         MOD12190
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12200
      DIMENSION YEARS(5),CEP(16,31,3),DEM(30),TKNAM(16,2),                00040070
     +RRM(30),IS(30),TPRINT(16,30),TNAM(16,2),RETIRE(16,31)               00040080
      LOGICAL ADDED(16),DECDET,T,F                                        00040090
      DATA T,F,BLANK/.TRUE.,.FALSE.,1H /                                  00040100
      DATA TNAM,TPRINT/32*0.,480*0./                                      00040101
      TOTAL=0.                                                            00040110
C     DO 3 I=1,10                                                         00040120
      DO 3 I=1,16                                                         MOD12210
3     TOTAL=TOTAL+CEP(I,IYR+1,NS)-RETIRE(I,IYR+1)                         00040130
C                                                                         00040140
      IF(DECDET)WRITE(2,90)                                               00040150
      IFYR=IFIX(YEARS(1))+1                                               00040160
      LYEAR=IFYR+IYR-1                                                    00040170
      WRITE(2,100)IFYR,LYEAR,TOTAL,IFRMYR,ILRMYR,PRM,(IS(I),I=1,NP)       00040180
      IF(.NOT.DECDET)GOTO 150                                             00040190
C     DO 10 I=1,10                                                        00040200
      DO 10 I=1,16                                                        MOD12220
      ADDED(I)=F                                                          00040210
      IF(CEP(I,IYR+1,NS)+RETIRE(I,IYR+1).GE..1)ADDED(I)=T                 00040220
10    CONTINUE                                                            00040230
      IHAT=0                                                              00040240
C     DO 20 I=1,10                                                        00040250
      DO 20 I=1,16                                                        MOD12230
      IF(.NOT.ADDED(I))GOTO 20                                            00040260
      IHAT=IHAT+1                                                         00040270
      TNAM(IHAT,1)=TKNAM(I,1)                                             00040280
      TNAM(IHAT,2)=TKNAM(I,2)                                             00040290
      DO 15 J=1,IYR                                                       00040300
15    TPRINT(IHAT,J)=CEP(I,J+1,NS)-CEP(I,J,NS)-RETIRE(I,J+1)              00040310
     ++RETIRE(I,J)                                                        00040320
20    CONTINUE                                                            00040330
C                                                                         00040340
      IF(IHAT.NE.0)GOTO 35                                                00040350
      TNAM(1,1)=BLANK                                                     00040360
      TNAM(1,2)=BLANK                                                     00040370
      IHAT=1                                                              00040380
C             - - UP TO 15 TECHNOLOGIES ON A LINE                         MOD12240
C35   IF(IHAT.GE.6)GOTO 355                                               00040390
 35   IF (IHAT .GE. 15) GO TO 355                                         MOD12250
      WRITE(2,120)((TNAM(I,J),J=1,2),I=1,IHAT)                            00040400
      GOTO 365                                                            00040410
355   WRITE(2,125)((TNAM(I,J),J=1,2),I=1,IHAT)                            00040420
365   CONTINUE                                                            00040430
      DO 37 K=1,IYR                                                       00040440
      IYEAR=IFIX(YEARS(1))+K                                              00040450
C     IF(IHAT.GE.6)GOTO 375                                               00040460
      IF (IHAT .GE. 15) GO TO 375                                         MOD12260
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      WRITE(2,130)IYEAR,DEM(K),RRM(K),(TPRINT(I,K),I=1,IHAT)            00040470
      GOTO 37                                                           00040480
375   WRITE(2,135)IYEAR,DEM(K),RRM(K),(TPRINT(I,K),I=1,IHAT)            00040490
37    CONTINUE                                                          00040500
      IF(IYR.EQ.1)GOTO 40                                               00040510
      DO 30 I=1,IHAT                                                    00040520
      DO 30 J=2,IYR                                                     00040530
30    TPRINT(I,1)=TPRINT(I,1)+TPRINT(I,J)                               00040540
C40   IF(IHAT.GE.6)GOTO 450                                             00040550
 40   IF (IHAT .GE. 15) GO TO 450                                       MOD12270
      WRITE(2,140)(TPRINT(I,1),I=1,IHAT)                                00040560
      GOTO 470                                                          00040570
450   WRITE(2,145)(TPRINT(I,1),I=1,IHAT)                                00040580
470   CONTINUE                                                          00040590
90    FORMAT(//)                                                        00040600
100   FORMAT('CAPACITY ADDED ',I4,'-',I4,':',F7.0,' MW',                00040610
C+*, PRM =*,F5.3,*, LYRM =*,F5.3,*, TREE PATH =*,1X,30I1)               00040620
     +', PRM(',I4,'-',I4,')=',F6.3,', TREE PATH = ',30I1)               00040630
C              - - FORMATS MODIFIED FOR 14 OR 16 TECHNOLOGIES PER LINE   MOD12280
120   FORMAT(/'YEAR  ','DEMAND  ','   RM  ',14(1X,A4,A2))              00040640
130   FORMAT(I4,1X,F7.0,2X,F5.3,2X,14F7.0)                              00040650
125   FORMAT(/'YEAR  ','DEMAND  ','  RM  ',16(A4,A2))                  00040660
135   FORMAT(I4,1X,F7.0,1X,F5.3,2X,16F6.0)                              00040670
140   FORMAT(/'TOTALS',15X,14F7.0)                                      00040680
145   FORMAT(/'TOTALS',14X,16F6.0)                                      00040690
150   CONTINUE                                                          00040700
      RETURN                                                            00040710
      END                                                               00040720
```

```
      SUBROUTINE PRTPD(MWHY,HYENLM,NCAPS,ICAP,MWINC,ITYP,NSIZE,AVAIL,    00040730
     +RRM,DEM,TKNAM,EOUT,OUTTYP,OUTAV,OUTOUT,OUTXL,FTIME,               00040740
     +HYPROB,NH,NHY,IS,IYR,IP,NP,NYPP,NVCPP,YEARS,TERMIN,DFO,PRM)       00040750
C     INCLUDE (AREEPPR)                                                 MOD12290
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12300
C            - - DIMENSIONS MODIFIED TO ACCOMMODATE THE 7 HYDRO         MOD12310
C                  TECHNOLOGIES.                                       MOD12320
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12330
      DIMENSION HYENLM(3,2),ICAP(100,2),ITYP(100),                      00040760
     +NSIZE(16),AVAIL(9,2),TKNAM(16,2),                                 00040770
     +EOUT(100,3,2),OUTTYP(8,2),OUTAV(7),OUTOUT(3,2),                   00040780
     +OUTXL(3,2),HYPROB(3),IS(30),YEARS(5),FTIME(2),MWHY(2)             00040790
      DIMENSION TEN(3,2),RRM(30),DEM(30),OUTXLL(3),DFO(16)              00040800
      LOGICAL TERMIN                                                    00040810
      INTEGER W                                                         00040820
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12340
C            - - MWINC IS REAL TO ACCOMMODATE SMALL SYSTEMS             MOD12350
      REAL MWINC                                                        MOD12360
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12370
      DATA ILYR,IFYR,KN/0,0,0/                                          00040821
C THIS SUBROUTINE PRINTS OUT PRODUCTION DETAIL TO THE FILE              00040830
C PDET(W=3) OR TPDET(W=8).                                              00040840
      W=3                                                               00040850
      IF(TERMIN)W=8                                                     00040860
      IF(NH.NE.1)GOTO 5                                                 00040870
      I1=NHY                                                            00040880
      I2=I1                                                             00040890
      GOTO 8                                                            00040900
5     I1=1                                                              00040910
      I2=3                                                              00040920
8     CONTINUE                                                          00040930
      IYR1=IFIX(YEARS(1))                                               00040940
      IF(NVCPP.NE.1)GOTO 9                                              00040950
      IFYR=IYR1+(IP-1)*NYPP+1                                           00040960
      ILYR=IFYR+NYPP-1                                                  00040970
      IF(IP.EQ.1)IFYR=IFYR-1                                            00040980
9     IAYR=IYR1+IYR                                                     00040990
      WRITE(W,731)                                                      00041000
      IF(NVCPP.EQ.1.AND..NOT.TERMIN)GOTO 30                             00041010
      WRITE(W,611)IAYR,RRM(IYR),PRM,(IS(I),I=1,IP)                      00041020
      GOTO 40                                                           00041030
30    WRITE(W,613)IFYR,ILYR,RRM(IYR),PRM,(IS(I),I=1,IP)                 00041040
40    CONTINUE                                                          00041050
      WRITE(W,731)                                                      00041060
      IF(NH.EQ.1)GOTO 42                                                00041070
      WRITE(W,621)                                                      00041080
      GOTO 44                                                           00041090
42    WRITE(W,622)                                                      00041100
44    CONTINUE                                                          00041110
      IF(MWHY(1).LT.1.AND.MWHY(2).LT.1)GOTO 45                          00041120
      IF(NH.EQ.1)GOTO 47                                                00041130
      WRITE(W,625)(HYPROB(I),I=11,I2)                                   00041140
      GOTO 48                                                           00041150
47    WRITE(W,623)(HYPROB(I),I=I1,I2)                                   00041160
48    CONTINUE                                                          00041170
45    CONTINUE                                                          00041180
      IF(NH.EQ.1)GOTO 60                                                00041190
```

```
      WRITE(W,631)                                                      00041200
      WRITE(W,641)                                                      00041210
      GOTO 65                                                           00041220
60    WRITE(W,634)                                                      00041230
      WRITE(W,644)                                                      00041240
65    IF(MWHY(1).LT.1.AND.MWHY(2).LT.1)GOTO 50                          00041250
      WRITE(W,652)TKNAM(10,1),                                          00041260
     +TKNAM(10,2),(MWHY(I),I=1,2),((HYENLM(I,J),J=1,2),                 00041270
     +I=I1,I2)                                                          00041280
50    CONTINUE                                                          00041290
      WRITE(W,731)                                                      00041300
      DO 6002 K=1,NCAPS                                                 00041310
      L=ITYP(K)                                                         00041320
      IF(L.GT.10)GOTO 6005                                              00041330
      KN=NCAPS-K                                                        00041340
      IF(ICAP(K,1).LE.NSIZE(L)*MWINC)GOTO 6001                          00041350
      WRITE(W,662)TKNAM(L,1),                                           00041360
     +TKNAM(L,2),(ICAP(K,J),J=1,2),((EOUT(K,I,J),J=1,2),                00041370
     +I=I1,I2)                                                          00041380
      GOTO 6002                                                         00041390
6001  WRITE(W,661)(TKNAM(L,J),J=1,2),DFO(L),(ICAP(K,J),J=1,2),          00041400
     +((EOUT(K,I,J),J=1,2),I=I1,I2)                                     00041410
6002  CONTINUE                                                          00041420
      WRITE(W,731)                                                      00041430
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12380
C              - - AVOID PRINT OUT IF KN=0                            MOD12390
      IF (KN .EQ. 0) GO TO 6008                                         MOD12400
6005  DO 6007 K=1,KN                                                    00041440
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12410
C              - - 16 IS NOW THE BASE FOR OUTAGE DATA                 MOD12420
C     L=ITYP(NCAPS-KN+K)-10                                             00041450
      L=ITYP(NCAPS-KN+K)-16                                             MOD12430
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12440
6007  WRITE(W,661)OUTTYP(L,1),                                          00041460
     +OUTTYP(L,2),OUTAV(L),(ICAP(NCAPS-KN+K,J),J=1,2),                  00041470
     +((EOUT(NCAPS-KN+K,I,J),J=1,2),I=I1,I2)                            00041480
6008  CONTINUE                                                          MOD12450
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12460
      WRITE(W,671)(OUTTYP(8,J),J=1,2),((OUTOUT(I,J),J=1,2),I=I1,I2)     00041490
      DO 6009 I=I1,I2                                                   00041500
      DO 6009 J=1,2                                                     00041510
      TEN(I,J)=HYENLM(I,J)+OUTOUT(I,J)                                  00041520
      DO 6009 K=1,NCAPS                                                 00041530
      TEN(I,J)=TEN(I,J)+EOUT(K,I,J)                                     00041540
6009  CONTINUE                                                          00041550
      WRITE(W,691)((TEN(I,J),J=1,2),I=I1,I2)                            00041560
      WRITE(W,681)((OUTXL(I,J),J=1,2),I=I1,I2)                          00041570
      WRITE(W,731)                                                      00041580
      DO 6010 I=I1,I2                                                   00041590
6010  TEN(I,1)=TEN(I,1)+TEN(I,2)                                        00041600
      WRITE(W,711)(TEN(I,1),I=I1,I2)                                    00041610
      DO 6020 I=I1,I2                                                   00041620
6020  OUTXLL(I)=OUTXL(I,1)*FTIME(1)+OUTXL(I,2)*FTIME(2)                 00041630
      WRITE(W,721)(OUTXLL(I),I=I1,I2)                                   00041640
613   FORMAT('PROD. DETAIL ',I4,                                        00041650
     +'-',I4,', RM=',F6.3,', PRM=',F6.3,', TREE PATH =',1X,3011/)       00041660
611   FORMAT('PROD. DETAIL ',I4,', RM=',F6.3,', PRM=',F6.3,             00041670
```

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     +', TREE PATH =',1X,30I1/)                                                00041680
621   FORMAT(16X,'CAPACITY(MW)',15X,'PRODUCTION ENERGY(GWH)')                  00041690
622   FORMAT(16X,'CAPACITY(MW)',1X,'PRODUCTION ENERGY(GWH)')                   00041700
623   FORMAT(15X,'(NORM WEATHER)',3X,'HYD PROB=',F5.3)                         00041710
625   FORMAT(15X,'(NORM WEATHER)',3X,3('HYD PROB=',F5.3,3X))                   00041720
631   FORMAT(19X,'SEASON',4X,3(6X,'SEASON',5X))                                00041730
641   FORMAT('PLANTS      AVL   PEAK OFF PK ',3(4X,'PEAK',                     00041740
     +3X,'OFF PK'))                                                           00041750
634   FORMAT(19X,'SEASON',4X,6X,'SEASON',5X)                                   00041760
644   FORMAT('PLANTS      AVL   PEAK OFF PK ',4X,'PEAK',                       00041770
     +3X,'OFF PK')                                                            00041780
652   FORMAT(/A4,A2,4X,4X,2I7,1X,3(F8.0,F9.0))                                 00041790
661   FORMAT(2A4,F6.3,2I7,1X,3(F8.0,F9.0))                                     00041800
662   FORMAT(2A4,2X,4X,2I7,1X,3(F8.0,F9.0))                                    00041810
671   FORMAT(2A4,2X,19X,3(F8.0,F9.0))                                          00041820
681   FORMAT('LOLP(DAYS/10 YR)',13X,3(F8.2,F9.2))                              00041830
691   FORMAT(/'TOTAL',24X,3(F8.0,F9.0))                                        00041840
711   FORMAT('YEARLY TOTAL',17X,3(8X,F9.0))                                    00041850
721   FORMAT('YEARLY LOLP(DAYS/10 YR)',6X,3(8X,F9.2))                          00041860
731   FORMAT(' ')                                                              00041870
      WRITE(W,731)                                                             00041880
      RETURN                                                                   00041890
      END                                                                      00041900
```

```
      SUBROUTINE PRTAPC(YEARS,IS,NVCPP,IYR,NP,IP,EOUT,ITYP,CAP,OUTCAP,  00041910
     +AMM,ENYEAR,OUTXL,APCDET,TVC,NYPP,TKNAM,OUTTYP,NLP,NTPO,TERMIN,    00041920
     +LBMAX,PRM)                                                        00041930
C     INCLUDE (AREEPPR)                                                 MOD12470
      LOGICAL APCDET                                                    00041940
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12480
C              - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES.  MOD12490
      DIMENSION YEARS(5),IS(30),EOUT(100,3,2),ITYP(100),                00041950
     +CAP(16),OUTCAP(7),                                                00041960
     +OUTXL(3,2),TKNAM(16,2),OUTTYP(8,2),TOT(5),TOTOUT(3)               00041970
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12500
      INTEGER W                                                         00041980
      LOGICAL TERMIN                                                    00041990
      DATA ILYR,IFYR/0,0/                                               00041991
C                                                                       00042000
C THIS SUBROUTINE PRINTS THE PRODUCTION COST TABLES OUT TO THE          00042010
C REPORT PCOS(W=4) OR TPCOS(W=9).                                       00042020
C                                                                       00042030
      W=4                                                               00042040
      IF(TERMIN)W=9                                                     00042050
      AMM=TVC*1000./ENYEAR                                              00042060
      IYR1=IFIX(YEARS(1))                                               00042070
      IF(NVCPP.NE.1)GOTO 10                                             00042080
      IFYR=IYR1+(IP-1)*NYPP+1                                           00042090
      ILYR=IFYR+NYPP-1                                                  00042100
      IF(IP.EQ.1)IFYR=IFYR-1                                            00042110
10    IAYR=IYR1+IYR                                                     00042120
C                                                                       00042130
      IF(.NOT.APCDET)GOTO 400                                           00042140
      IF(APCDET)WRITE(W,120)                                            00042150
      IF(NVCPP.NE.1.OR.TERMIN)GOTO 20                                   00042160
      WRITE(W,100)IFYR,ILYR,ENYEAR,AMM,PRM,(IS(I),I=1,IP)               00042170
      GOTO 30                                                           00042180
20    WRITE(W,110)IAYR,ENYEAR,AMM,PRM,(IS(I),I=1,IP)                    00042190
30    IF(.NOT.APCDET)GOTO 400                                           00042200
      WRITE(W,130)                                                      00042210
      WRITE(W,140)                                                      00042220
      IF(TERMIN)IYR1=IAYR-NP*NYPP-LBMAX                                 00042230
      WRITE(W,150)IYR1                                                  00042240
      WRITE(W,130)                                                      00042250
      DO 40 I=1,5                                                       00042260
40    TOT(I)=0.                                                         00042270
      DO 50 I=1,NLP                                                     00042280
      L=ITYP(I)                                                         00042290
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12510
C              - - CHECK IF CAP(L) EQUALS ZERO                          MOD12520
      CF=0.                                                             MOD12530
      IF (CAP(L) .EQ. 0.) GO TO 45                                      MOD12540
      CF=EOUT(I,1,2)/(8.76*CAP(L))                                      00042300
  45  CONTINUE                                                          MOD12550
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12560
      WRITE(W,160)TKNAM(L,1),                                           00042310
     +TKNAM(L,2),CAP(L),EOUT(I,1,2),CF,EOUT(I,2,1),EOUT(I,2,2)          00042320
     +,EOUT(I,3,1)                                                      00042330
      TOT(1)=TOT(1)+CAP(L)                                              00042340
      TOT(2)=TOT(2)+EOUT(I,1,2)                                         00042350
      TOT(3)=TOT(3)+EOUT(I,2,1)                                         00042360
```

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      TOT(4)=TOT(4)+EOUT(I,2,2)                                          00042370
      TOT(5)=TOT(5)+EOUT(I,3,1)                                          00042380
50    CONTINUE                                                           00042390
      CF=TOT(2)/(8.76*TOT(1))                                            00042400
      WRITE(W,170)TOT(1),TOT(2),CF,(TOT(I),I=3,5)                        00042410
      NLPP1=NLP+1                                                        00042420
      DO 55 I=1,3                                                        00042430
55    TOTOUT(I)=0.                                                       00042440
      DO 70 I=NLPP1,NTPO                                                 00042450
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12570
C              - - 16 IS NOW THE BASE FOR OUTAGE DATA                   MOD12580
C     L=ITYP(I)-10                                                       00042460
      L=ITYP(I) - 16                                                     MOD12590
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12600
      IF(L.EQ.8)GOTO 57                                                  00042470
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12610
C              - - CHECK IF OUTCAP(L) EQUALS ZERO                       MOD12620
      CF=0.                                                              MOD12630
      IF (OUTCAP(L) .EQ. 0.) GO TO 56                                    MOD12640
      CF=EOUT(I,1,2)/(8.76*OUTCAP(L))                                    00042480
  56  CONTINUE                                                           MOD12650
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12660
      WRITE(W,180)OUTTYP(L,1),                                           00042490
     +OUTTYP(L,2),OUTCAP(L),EOUT(I,1,2),CF,EOUT(1,3,1),                  00042500
     +EOUT(I,3,1)                                                        00042510
      TOTOUT(1)=TOTOUT(1)+OUTCAP(L)                                      00042520
      GOTO 60                                                            00042530
57    CONTINUE                                                           00042540
      WRITE(W,190)(OUTTYP(L,J),J=1,2),EOUT(I,1,2),EOUT(I,3,1),           00042550
     +EOUT(I,3,1)                                                        00042560
60    CONTINUE                                                           00042570
      TOTOUT(2)=TOTOUT(2)+EOUT(I,1,2)                                    00042580
      TOTOUT(3)=TOTOUT(3)+EOUT(I,3,1)                                    00042590
70    CONTINUE                                                           00042600
      WRITE(W,200)(TOTOUT(I),I=1,3),TOTOUT(3)                            00042610
      TOT(1)=TOT(1)+TOTOUT(1)                                            00042620
      TOT(2)=TOT(2)+TOTOUT(2)                                            00042630
      TOT(3)=TOT(3)+TOTOUT(3)                                            00042640
      TOT(5)=TOT(5)+TOTOUT(3)                                            00042650
      WRITE(W,210)(TOT(I),I=1,5)                                         00042660
C                                                                        00042670
100   FORMAT('ANNUAL PROD ',I4,'-',I4,':',F8.0,' GWH,',F6.1,             00042680
     +' M/KWH, PRM=',F6.3,', TREE PATH=',1X,30I1)                        00042690
110   FORMAT('ANNUAL PROD ',I4,':',F8.0,' GWH,',F6.1,                    00042700
     +' M/KWH, PRM=',F6.3,', TREE PATH=',1X,30I1)                        00042710
120   FORMAT(/)                                                          00042720
130   FORMAT(' ')                                                        00042730
140   FORMAT('TECHNOLOGY',6X,'CAPACITY',4X,'ENERGY',2X,                  00042740
     +'CAPACITY',2X,' V/O COST',2X,'ENV COST',2X,'TOTAL COST')           00042750
150   FORMAT(20X,'(MW)',5X,'(GWH)    FACTOR',5X,'(',I4,' DOLLARS - '     00042760
     +,'MILLIONS)')                                                      00042770
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12670
C              - - FORMATS 160-210 MODIFIED TO SHOW 3 PLACES TO THE      MOD12680
C                    RIGHT OF THE DECIMAL ON THE PRICES OUTPUT           MOD12690
C160  FORMAT(A4,A2,11X,F7.0,2X,F8.0,2X,F8.3,5X,F6.0,4X,F6.0,06X,F6.0)    00042780
160   FORMAT (A4,A2,11X,F7.0,2X,F8.0,2X,F8.3,3X,F8.3,2X,F8.3,4X,F8.3)    MOD12700
C170  FORMAT(/'SYSTEM TOTAL',4X,F8.0,2X,F8.0,2X,F8.3,5X,F6.0,4X,         00042790
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```
170   FORMAT (/'SYSTEM TOTAL',4X,F8.0,2X,F8.0,2X,F8.3,3X,F8.3,2X,          MOD12710
C     +F6.0,06X,F6.0/)                                                     00042800
      +F8.3,4X,F8.3/)                                                      MOD12720
C180  FORMAT(2A4,8X,F8.0,2X,F8.0,2X,F8.3,3X,F8.0,14X,F8.0)                 00042810
180   FORMAT (2A4,8X,F8.0,2X,F8.0,2X,F8.3,3X,F8.3,14X,F8.3)                MOD12730
C190  FORMAT(2A4,18X,F8.0,13X,F8.0,14X,F8.0)                              00042820
190   FORMAT (2A4,18X,F8.0,13X,F8.3,14X,F8.3)                              MOD12740
C200  FORMAT(/'OUTAGE TOTAL',4X,F8.0,2X,F8.0,13X,F8.0,14X,F8.0)           00042830
200   FORMAT (/'OUTAGE TOTAL',4X,F8.0,2X,F8.0,13X,F8.3,14X,F8.3)           MOD12750
C210  FORMAT(/'TOTAL',11X,F8.0,2X,F8.0,13X,F8.0,2X,F8.0,04X,F8.0)         00042840
210   FORMAT (/'TOTAL',11X,F8.0,2X,F8.0,13X,F8.3,2X,F8.3,4X,F8.3)         MOD12760
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12770
400   CONTINUE                                                           00042850
      RETURN                                                             00042860
      END                                                                00042870
```

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      SUBROUTINE PRTFIN(IFFYR,ILFYR,CURD,ANNFX,ANNEX,IS,NP,FINDET,PRM)   00042880
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12780
C              - - DIMENSIONS MODIFIED TO ACCOMMODATE 16 TECHNOLOGIES    MOD12790
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -    MOD12800
      COMMON /C1/ ITCRAT,NCONM,PHORZN,HORIZN,INFLA,NPRDS,NGTEC,LB(16),   00042890
     +DBTRT,FAIADJ,ITCNOR,TAXMAR,EQRT,PRERT                             00042900
      COMMON /C3/ EXCPLM(100),CWIP(100),CC ,DINT(100),LAGR(16)          00042910
     + ,AFUDC(100),DITC(100),CAPCST(16),DINVST(100),RTBASE(100),        00042920
     + FCWIP(16,13),NCON(16),FAFUDC(16,13),LEN(100),PCWIP,BONDRT(100),  00042930
     + EGRO(100),ASSETS(100),EXCOST(100),FIXCHG(100),ASS78              00042940
     + ,AAMORT(100),CURCAP(16,100),ESC(16),ADDION(100),DEPREC(100),     00042950
     +TAXES(100),COVER(100),RATINT(100),DELTA(100),COFCAP(100),         00042960
     +RETINT(100),PREFER(100),COFCOM(100),ADDPON(100)                   00042970
      INTEGER PHORZN,HORIZN                                             00042980
      LOGICAL CURD,FINDET                                               00042990
      DIMENSION IS(30)                                                  00043000
C                                                                       00043010
C THIS SUBROUTINE PRINTS THE FINANCIAL OUTPUT TO THE REPORT             00043020
C FINOUT.                                                               00043030
C                                                                       00043040
      IF(.NOT.FINDET)GOTO 10                                            00043050
      WRITE(1,100)                                                      00043060
10    WRITE(1,110)IFFYR,ILFYR,ANNFX,PRM,(IS(I),I=1,NP)                  00043070
      IF(.NOT.FINDET)GOTO 200                                           00043080
      IF(CURD)GOTO 20                                                   00043090
      WRITE(1,120)IFFYR                                                 00043100
      GOTO 30                                                           00043110
20    WRITE(1,130)                                                      00043120
30    WRITE(1,140)                                                      00043130
      WRITE(1,150)                                                      00043140
      DO 40 I=1,PHORZN                                                  00043150
      IY=IFFYR+I-1                                                      00043160
40    WRITE(1,160)IY,COVER(I),RATINT(I),COFCAP(I),EXCOST(I),            00043170
     +ASSETS(I),RTBASE(I),DINT(I),DITC(I),FIXCHG(I)                     00043180
      WRITE(1,100)                                                      00043190
      GOTO 200                                                          00043200
C P1=PHORZN+1                                                           00043210
C DO 50C I=P1,HORIZN                                                    00043220
C IY=IFFYR+I-1                                                          00043230
C 50 WRITE(1,180)IY,EXCOST(I),RTBASE(I),DINT(I),FIXCHG(I)               00043240
C                                                                       00043250
100   FORMAT(' ')                                                       00043260
110   FORMAT('FINANCES ',I4,'-',I4,': LEVEL FC=',-3PF8.1,               00043270
     +' M/KWH, PRM=',0PF6.3,', TREE PATH=',1X,30I1)                     00043280
120   FORMAT(/43X,I4,' DOLLARS IN MILLIONS'/)                           00043290
130   FORMAT(/41X,'CURRENT DOLLARS IN MILLIONS'/)                       00043300
140   FORMAT(7X,'INTERST INTERST COST OF  EX FIN',13X,                  00043310
     +'RATE',13X,'ITC    FIXED')                                        00043320
150   FORMAT('YEAR  COVERAGE    RATE CAPITAL   COSTS   ASSETS',         00043330
     +'    BASE INTERST    USED   CHARGE'/)                            00043340
160   FORMAT(I4,2X,F8.2,2F8.3,-6PF8.0,-6PF9.0,-6P3F8.0,-6PF9.0)         00043350
180   FORMAT(I4,26X,-6PF8.0,9X,-6P2F8.0,8X,-6PF9.0)                     00043360
200   CONTINUE                                                          00043370
      RETURN                                                            00043380
      END                                                               00043390
```

```
      SUBROUTINE WRIPRC(FIXPRC,VARPRC,AIF,IFFYR,ILFYR,HORIZN,IS,NP,      00043400
     +PRM,ANNVC,ANNFX,OMM)                                               00043410
      DIMENSION FIXPRC(100),VARPRC(100),IS(30)                           00043420
      INTEGER HORIZN                                                     00043430
C                                                                        00043440
C THIS SUBROUTINE PRINTS OUT PRICES BY YEAR FOR EACH COMPLETE            00043450
C TREE PATH.  OUTPUT GOES TO THE REPORT PRICES.                          00043460
C                                                                        00043470
C     ANNTOT=ANNVC+ANNFX                                                 00043480
      WRITE(7,140)                                                       00043490
      WRITE(7,100)IFFYR,ILFYR,ANNVC,ANNFX,PRM,(IS(I),I=1,NP)             00043500
      WRITE(7,110)                                                       00043510
      WRITE(7,120)IFFYR                                                  00043520
      WRITE(7,140)                                                       00043530
      IY=IFFYR                                                           00043540
      AF=1.                                                              00043550
      OMF=OMM                                                            00043560
C                                                                        00043570
      DO 10 I=1,HORIZN                                                   00043580
      VARP=VARPRC(I)                                                     00043590
      TOT=VARP+FIXPRC(I)                                                 00043600
      OMF=OMM*AF                                                         00043610
      VF=VARPRC(I)*AF                                                    00043620
      FF=FIXPRC(I)*AF                                                    00043630
      TF=VF+FF+OMF                                                       00043640
      WRITE(7,130)IY,VARP,FIXPRC(I),TOT,VF,FF,TF                         00043650
      AF=AF*AIF                                                          00043660
10    IY=IY+1                                                            00043670
      WRITE(7,140)                                                       00043680
100   FORMAT('PRICES(M/KWH) ',I4,'-',I4,':',-3PF6.1,' V+E+O,',           00043690
     +F6.1,' FIX,',' PRM=',0PF5.3,', TREE PATH= ',30I1)                  00043700
110   FORMAT(/'YEAR',2(7X,'    V+E+O  FIXED  TOTAL'))                    00043710
120   FORMAT(11X,'(M/KWH - ',I4,' DOLLARS)',6X,                          00043720
     +' (M/KWH - CURRENT DOLLARS)')                                      00043730
130   FORMAT(I4,2(9X,-3PF7.1))                                           00043740
140   FORMAT(' ')                                                        00043750
      RETURN                                                             00043760
      END                                                                00043770
```

```
      SUBROUTINE PTCOST(SIDE,CNDOL,PVAEN,COST,NUM,IFFYR,IFRMYR,          00043780
     +ILRMYR,PRM,ANIZE,CNSYS,EN78)                                       00043790
C                                                                        00043800
      LOGICAL SIDE,CNDOL,CNSYS                                           00043810
      DIMENSION COST(7,5),SUM(7)                                         00043820
C                                                                        00043830
C THIS SUBROUTINE PRINTS OUT THE SUMMARY COST TO CONSUMERS IN            00043840
C FIXED COST, VARIABLE COST, REVENUE REQUIREMENT, ENVIRONMENTAL          00043850
C COST, OUTAGE COST, AND TOTAL COST CATAGORIES FOR EACH                  00043860
C PLANNING RESERVE MARGIN.  IF THERE ARE  8  OR MORE PLANNING            00043870
C RESERVE MARGINS, THE TRANSPOSE OF THIS TABLE IS PRINTED.               00043880
C                                                                        00043890
C WRITE SUMMARY TABLE WHEN THERE ARE 8 OR MORE PLANNING RESERVE          00043900
C MARGINS.                                                               00043910
C                                                                        00043920
      DATA FRAC/0./                                                      00043921
      IF(.NOT.SIDE)GOTO 20                                               00043930
      IF(NUM.NE.1)GOTO 10                                                00043940
      WRITE(10,200)                                                      00043950
      WRITE(10,200)                                                      00043960
      IF(CNDOL)WRITE(10,300)IFFYR                                        00043970
      IF(.NOT.CNDOL)WRITE(10,310)                                        00043980
      IF(CNSYS)WRITE(10,315)IFFYR                                        00043990
      IF(.NOT.CNSYS)WRITE(10,317)                                        00044000
      WRITE(10,320)                                                      00044010
      WRITE(10,330)                                                      00044020
      WRITE(10,340)                                                      00044030
      WRITE(10,350)                                                      00044040
      WRITE(10,360)IFRMYR,ILRMYR                                         00044050
C                                                                        00044060
10    WRITE(10,370)PRM,((COST(I,J),J=1,5),I=1,2)                         00044070
      GOTO 800                                                           00044080
C                                                                        00044090
C WRITE SUMMARY TABLE IN STANDARD FORM                                   00044100
C WRITE COSTS IN MILLIONS OF DOLLARS PER YEAR.                           00044110
C                                                                        00044120
20    WRITE(10,200)                                                      00044130
C                                                                        00044140
      WRITE(10,400)IFRMYR,ILRMYR                                         00044150
      WRITE(10,200)                                                      00044160
      WRITE(10,405)(COST(I,1),I=1,NUM)                                   00044170
      WRITE(10,200)                                                      00044180
      IF(.NOT.CNDOL)WRITE(10,410)                                        00044190
      IF(CNDOL)WRITE(10,415)IFFYR                                        00044200
      IF(CNSYS)WRITE(10,417)IFFYR                                        00044210
      IF(.NOT.CNSYS)WRITE(10,418)                                        00044220
      WRITE(10,420)                                                      00044230
      WRITE(10,200)                                                      00044240
      WRITE(10,430)(COST(I,2),I=1,NUM)                                   00044250
      WRITE(10,440)(COST(I,3),I=1,NUM)                                   00044260
      WRITE(10,200)                                                      00044270
      DO 30 I=1,NUM                                                      00044280
30    SUM(I)=COST(I,2)+COST(I,3)                                         00044290
      WRITE(10,450)(SUM(I),I=1,NUM)                                      00044300
      WRITE(10,200)                                                      00044310
      WRITE(10,460)(COST(I,4),I=1,NUM)                                   00044320
      WRITE(10,470)(COST(I,5),I=1,NUM)                                   00044330
```

```
      WRITE(10,200)                                                    00044340
      DO 40 I=1,NUM                                                    00044350
40    SUM(I)=SUM(I)+COST(I,4)+COST(I,5)                                00044360
      WRITE(10,480)(SUM(I),I=1,NUM)                                    00044370
      NUM1=NUM-1                                                       00044380
      IF(NUM1.LT.1)GOTO 47                                             00044390
      DO 45 I=1,NUM1                                                   00044400
45    SUM(I)=SUM(I+1)-SUM(I)                                           00044410
      WRITE(10,490)(SUM(I),I=1,NUM1)                                   00044420
47    CONTINUE                                                         00044430
C                                                                      00044440
C WRITE COSTS IN MILLS/KWH                                             00044450
C                                                                      00044460
      WRITE(10,200)                                                    00044470
      WRITE(10,200)                                                    00044480
      IF(.NOT.CNDOL)WRITE(10,410)                                      00044490
      IF(CNDOL)WRITE(10,415)IFFYR                                      00044500
      WRITE(10,425)                                                    00044510
      WRITE(10,200)                                                    00044520
      IF(CNSYS)FRAC=1000./EN78                                         00044530
      IF(.NOT.CNSYS)FRAC=1000./(PVAEN*ANIZE)                           00044540
      DO 50 I=1,NUM                                                    00044550
      DO 60 J=2,5                                                      00044560
60    COST(I,J)=COST(I,J)*FRAC                                         00044570
50    CONTINUE                                                         00044580
C                                                                      00044590
      WRITE(10,530)(COST(I,2),I=1,NUM)                                 00044600
      WRITE(10,540)(COST(I,3),I=1,NUM)                                 00044610
      WRITE(10,200)                                                    00044620
      DO 70 I=1,NUM                                                    00044630
70    SUM(I)=COST(I,2)+COST(I,3)                                       00044640
      WRITE(10,550)(SUM(I),I=1,NUM)                                    00044650
      WRITE(10,200)                                                    00044660
      WRITE(10,560)(COST(I,4),I=1,NUM)                                 00044670
      WRITE(10,570)(COST(I,5),I=1,NUM)                                 00044680
      WRITE(10,200)                                                    00044690
      DO 80 I=1,NUM                                                    00044700
80    SUM(I)=SUM(I)+COST(I,4)+COST(I,5)                                00044710
      WRITE(10,580)(SUM(I),I=1,NUM)                                    00044720
      IF(NUM1.LT.1)GOTO 87                                             00044730
      DO 85 I=1,NUM1                                                   00044740
85    SUM(I)=SUM(I+1)-SUM(I)                                           00044750
      WRITE(10,590)(SUM(I),I=1,NUM1)                                   00044760
87    CONTINUE                                                         00044770
C                                                                      00044780
C                                                                      00044790
200   FORMAT(' ')                                                      00044800
300   FORMAT(28X,'LEVELIZED ',I4,' DOLLARS')                           00044810
310   FORMAT(27X,'LEVELIZED CURRENT DOLLARS')                          00044820
315   FORMAT(20X,I4,' SYSTEM SIZE')                                    00044830
317   FORMAT(17X,'CURRENT SYSTEM SIZE')                                00044840
320   FORMAT(12X,'MILLIONS OF DOLLARS PER YEAR',11X,                   00044850
     +'MILLS PER KILOWATT-HOUR')                                       00044860
330   FORMAT('PLANNING')                                               00044870
340   FORMAT('RESERVE',2('   FIXED    VAR    ENV OUTAGE  TOTAL'))     00044880
350   FORMAT('MARGIN ',2('    COST   COST   COST   COST   COST'))      00044890
360   FORMAT('(',I4,'-',I4,')'/)                                       00044900
```

```
370   FORMAT(F5.3,3X,5F7.0,1X,5F7.2)                                    00044910
C                                                                       00044920
400   FORMAT(25X,'PLANNING RESERVE MARGIN (',I4,'-',I4,')')             00044930
405   FORMAT(23X,7F8.3)                                                 00044940
410   FORMAT('LEVELIZED CURRENT $ COST,')                               00044950
415   FORMAT('LEVELIZED ',I4,' $ COST,')                                00044960
417   FORMAT(I4,' SYSTEM SIZE,')                                        00044970
418   FORMAT('CURRENT SYSTEM SIZE,')                                    00044980
420   FORMAT('MILLIONS OF $ PER YEAR ',7F8.3)                           00044990
425   FORMAT('MILLS PER KILOWATT-HOUR')                                 00045000
430   FORMAT('FIXED COST             ',7F8.0)                           00045010
440   FORMAT('VARIABLE COST          ',7F8.0)                           00045020
450   FORMAT('REVENUE REQUIREMENT    ',7F8.0)                           00045030
460   FORMAT('ENVIRONMENTAL COST     ',7F8.0)                           00045040
470   FORMAT('OUTAGE COST            ',7F8.0)                           00045050
480   FORMAT('TOTAL COST TO CONSUMERS',7F8.0)                           00045060
490   FORMAT('CHANGE IN TOTAL COST   ',4X,6F8.0)                        00045070
530   FORMAT('FIXED COST             ',7F8.2)                           00045080
540   FORMAT('VARIABLE COST          ',7F8.2)                           00045090
550   FORMAT('REVENUE REQUIREMENT    ',7F8.2)                           00045100
560   FORMAT('ENVIRONMENTAL COST     ',7F8.2)                           00045110
570   FORMAT('OUTAGE COST            ',7F8.2)                           00045120
580   FORMAT('TOTAL COST TO CONSUMERS',7F8.2)                           00045130
590   FORMAT('CHANGE IN TOTAL COST   ',4X,6F8.2)                        00045140
800   CONTINUE                                                          00045150
      RETURN                                                            00045160
      END                                                               00045170
```

```
      SUBROUTINE TERM(AMM,EEVC,DF,AIF,DLR,ALR,LR,LBMAX,AL,ALPHA,          00045180
     +BETA,DEM,EGRO,YLF,CUMY,TOTCAP,FIXCHG,PRM,RRM,TFC,                  00045190
     +TERMVC,VARPRC,EN78,CGR,DEM78,ADAHOR,TEROAM,FOMRET,DFLEV,DESC,      00045200
     +DISTRA,PRMBEF,PRMAFT,IFFYR,IFRMYR,ILRMYR,LBAVE,DIS,                00045210
     +TOM,TEM,TERMEC,TERMOC,CSENVT,CSOUTT)                               00045220
      DIMENSION DEM(30),EGRO(100),FIXCHG(100),RRM(30),ADAHOR(100),       00045230
     +VARPRC(100),TFC(100),TEROAM(100),FOMRET(100),DIS(100)              00045240
      LOGICAL LONG                                                       00045250
C                                                                        00045260
C THIS SUBROUTINE COMPUTES THE TERMINAL FIXED AND                        00045270
C VARIABLE CHARGES.  INPUT FOR VARIABLE COST IS THE CURRENT              00045280
C VARIABLE COST AMM IN FYR M/KWH AND THE LONG RUN VARIABLE COST          00045290
C EEVC.  INPUT FOR THE FIXED COST                                        00045300
C IS THE TERMINAL FIXED CHARGE TFC IN $/MW-YR AND SYSTEM CAPACITY.       00045310
C SYSTEM CAPACITY IS USED TO RETIRE  LR  CAPACITY (EXCEPT HYDRO)         00045320
C AT A LINEAR RATE OVER THE BOOK LIFE.  OUTPUT ARE THE TERMINAL          00045330
C TERMEC,TERMOC,TERMVC, AND FIXCHG.                                      00045340
C                                                                        00045350
C                                                                        00045360
C                                                                        00045370
      TERMVC=0.                                                          00045380
      TERMEC=0.                                                          00045390
      TERMOC=0.                                                          00045400
      DDF=DLR                                                            00045410
      AAF=ALR                                                            00045420
      GCUM=1.+CGR                                                        00045430
      TEC=EEVC*1000.                                                     00045440
      C=AMM*1000.                                                        00045450
      RETIRE=(TOTCAP-CUMY)/FLOAT(LBAVE)                                  00045460
      SYSCAP=TOTCAP                                                      00045470
C                                                                        00045480
      FCT=0.                                                             00045490
      ADDT=0.                                                            00045500
      RETT=0.                                                            00045510
C                                                                        00045520
      DO 100 I=1,LBMAX                                                   00045530
      MORE=I-LBAVE                                                       00045540
      LONG=MORE.GT.0                                                     00045550
      DDF=DDF*DF                                                         00045560
      AAF=AAF*AIF                                                        00045570
      GCUM=GCUM+EGRO(LR+I)                                               00045580
      ENERGY=EN78*GCUM                                                   00045590
      RHO=FLOAT(I)/FLOAT(LBMAX)                                          00045600
      RH=1.                                                              00045610
      IF(I.LT.2)RH=FLOAT(I)/2.                                           00045620
C                                                                        00045630
C                                                                        00045640
C CALCULATE VARIABLE COSTS                                               00045650
C                                                                        00045660
      ECTEMP=AAF*ENERGY*((1.-RHO)*TEM+RHO*CSENVT)*1000.                  00045670
      OCTEMP=AAF*ENERGY*((1.-RHO)*TOM+RHO*CSOUTT)*1000.                  00045680
      TERMEC=TERMEC+DDF*ECTEMP                                           00045690
      TERMOC=TERMOC+DDF*OCTEMP                                           00045700
      VCTEMP=AAF*ENERGY*((1.-RHO)*C+RHO*TEC)                             00045710
      TERMVC=TERMVC+DDF*VCTEMP                                           00045720
      VARPRC(LR+1+I)=VCTEMP/(ENERGY*AAF)                                 00045730
C                                                                        00045740
```

```
C SET UP AND CALCULATE FIXED COSTS                                              00045750
      ADDCST=TFC(I)*AAF                                                         00045760
      DISCST=DISTRA*(1.+DESC)**(LR+I)*AAF*DFLEV                                 00045770
      FOMR=FOMRET(I)*AAF                                                        00045780
      TERO=TEROAM(I)*AAF                                                        00045790
      IF(LONG)RETIRE=0.                                                         00045800
      SYSCAP=SYSCAP-RETIRE                                                      00045810
      IF(LONG)SYSCAP=SYSCAP-ADAHOR(MORE)                                        00045820
      DEMAND=DEM78*GCUM                                                         00045830
      CALL PRMGN(PRMBEF,PRM,PRMAFT,IFRMYR,ILRMYR,IFFYR+I+LR,                    00045840
     +PRMGIN)                                                                   00045850
      RM=RH*PRMGIN+(1.-RH)*RRM(LR)                                              00045860
      IF(RM.GT.PRMGIN)RM=PRMGIN                                                 00045870
      TARGET=(1.+RM)*DEMAND                                                     00045880
      ADD=TARGET-SYSCAP                                                         00045890
      IF(ADD.LT.0.)ADD=0.                                                       00045900
      ADAHOR(I)=ADD                                                             00045910
      ADDT=ADDT+ADD                                                             00045920
      RETT=RETT+RETIRE                                                          00045930
      IF(LONG)RETT=RETT+ADAHOR(MORE)                                            00045940
      DIS(I)=ENERGY*DISCST                                                      00045950
      FCT=FCT+ADD*ADDCST+ENERGY*DISCST                                          00045960
      IF(LONG) FCT=FCT-ADAHOR(MORE)*TFC(MORE)*ALN*AIF**MORE-DIS(MORE)           00045970
      FIXCHG(LR+I+1)=FCT+(ADDT*TERO-RETT*FOMR)*1000.                            00045980
      SYSCAP=SYSCAP+ADD                                                         00045990
100   CONTINUE                                                                  00046000
      RETURN                                                                    00046010
      END                                                                       00046020
```

```
      SUBROUTINE INTEG(MATRIX,NSTGS,LR)                                 00046030
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12810
C              - - DIMENSIONS AND DO LOOP FINAL VALUES HAVE BEEN        MOD12820
C                     MODIFIED TO ACCOMMODATE THE 7 HYDRO TECHNOLOGIES. MOD12830
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12840
      REAL MATRIX(16,31,1)                                              00046040
      DO 20 IS=1,NSTGS                                                  00046050
      ISTAGE=NSTGS+1-IS                                                 00046060
C     DO 15 I=1,10                                                      00046070
      DO 15 I=1,16                                                      MOD12850
      DO 10 IY=1,LR                                                     00046080
10    MATRIX(I,IY+1,ISTAGE)=MATRIX(I,IY+1,ISTAGE)+MATRIX(I,IY,ISTAGE)   00046090
15    CONTINUE                                                          00046100
20    CONTINUE                                                          00046110
      RETURN                                                            00046120
      END                                                               00046130
```

```
      SUBROUTINE DIFF(MATRIX,NSTGS,LR)                                  00046140
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD12860
C              - - DIMENSIONS AND DO LOOP FINAL VALUES MODIFIED TO       MOD12870
C                    ACCOMMODATE THE 16 TECHNOLOGIES.                    MOD12880
      REAL MATRIX(16,31,1)                                              00046150
      DO 20 IS=1,NSTGS                                                  00046160
      ISTAGE=NSTGS+1-IS                                                 00046170
C     DO 15 I=1,10                                                      00046180
      DO 15 I=1,16                                                      MOD12890
      DO 10 IYE=1,LR                                                    00046190
      IY=LR+1-IYE                                                       00046200
10    MATRIX(I,IY+1,ISTAGE)=MATRIX(I,IY+1,ISTAGE)-MATRIX(I,IY,ISTAGE)   00046210
15    CONTINUE                                                          00046220
20    CONTINUE                                                          00046230
      RETURN                                                            00046240
      END                                                               00046250
```

```
      SUBROUTINE USTAT(CEP,L1,L2,L3,LYR,IYRDEC,L,REQADD,TARGET,          00046260
     +TPLAN,ADD,ITYP,TKNAM,AJ,PLAN,ERROR,AMW,LRP1,ISTAGE,               00046270
     +TEP,AVL,AVLLYR,AMWAVL)                                            00046280
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12900
C              - - DIMENSIONS AND DO LOOP FINAL VALUES HAVE BEEN       MOD12910
C                    MODIFIED TO ACCOMMODATE THE 16 TECHNOLOGIES.      MOD12920
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12930
      DIMENSION CEP(16,31,3),TKNAM(16,2),AJ(16),PLAN(16),ERROR(16),     00046290
     +AMW(16,3),TEP(16)                                                 00046300
      LOGICAL L1,L2,L3,AVL(16),AVLLYR(16),AMWAVL(16,3)                  00046310
      WRITE(11,100)                                                     00046320
      WRITE(11,110)LYR,IYRDEC,L                                         00046330
      WRITE(11,120)REQADD,TARGET,TPLAN                                  00046340
      WRITE(11,130)ADD,ITYP,ISTAGE                                      00046350
      WRITE(11,140)((TKNAM(I,J),J=1,2),I=1,16)                          00046360
      WRITE(11,150)                                                     00046370
      WRITE(11,200)(AJ(I),I=1,16),(PLAN(I),I=1,16),                     00046380
     +(ERROR(I),I=1,16),(TEP(I),I=1,16)                                 00046390
      WRITE(11,210)                                                     00046400
      WRITE(11,200)((AMW(I,IS),I=1,16),IS=1,3)                          00046410
      WRITE(11,220)                                                     00046420
      WRITE(11,250)(AVL(I),I=1,16),(AVLLYR(I),I=1,16),                  00046430
     +((AMWAVL(I,IS),I=1,16),IS=1,3)                                    00046440
      IF(.NOT.L1.AND..NOT.L2.AND..NOT.L3)GOTO 20                        00046450
      CALL DIFF(CEP,3,LRP1)                                             00046460
      WRITE(11,260)                                                     00046470
      IF(L1)WRITE(11,300)((CEP(I,IY,1),I=1,16),IY=1,LRP1)               00046480
      IF(L2)WRITE(11,300)((CEP(I,IY,2),I=1,16),IY=1,LRP1)               00046490
      IF(L3)WRITE(11,300)((CEP(I,IY,3),I=1,16),IY=1,LRP1)               00046500
      CALL INTEG(CEP,3,LRP1)                                            00046510
20    WRITE(11,400)                                                     00046520
100   FORMAT(/'DECISION STATUS'/)                                       00046530
110   FORMAT('LYR =',I3,'  IYRDEC =',I3,'   L =',I3)                    00046540
120   FORMAT('REQADD =',F8.0,'      TARGET =',F8.0,'  TPLAN =',         00046550
     +F8.0)                                                             00046560
130   FORMAT('ADD =',F8.0,' MW OF TECHNOLOGY',I2,' FROM STAGE',I2)      00046570
140   FORMAT(8X,16(1X,A4,A2))                                           00046580
150   FORMAT('ADD JUST, PLAN, ERROR, TEP:')                             00046590
200   FORMAT((8X,16F7.0))                                               00046600
210   FORMAT('AMW 1 2 3:')                                              00046610
220   FORMAT('AVL, AVLLYR, AMWAVL 1 2 3:')                              00046620
250   FORMAT((8X,16(6X,L1)))                                            00046630
260   FORMAT(/'CEP L1 L2 L3:')                                          00046640
300   FORMAT(/(8X,16F7.0))                                              00046650
400   FORMAT(' ')                                                       00046660
      RETURN                                                            00046670
      END                                                               00046680
```

```
      SUBROUTINE FALPHA(CLDC,SIGMA,SIGALR,NP,NPMAX,ALPHA)                00046690
      DIMENSION CLDC(10,1)                                               00046700
C                                                                        00046710
C  THIS SUBROUTINE FINDS ALPHA FOR USE IN GENERATING THE PROBABILITY     00046720
C  TREE.                                                                 00046730
      IF(NP.NE.1)GOTO 20                                                 00046740
      ALPHA=.73                                                          00046750
      GOTO 100                                                           00046760
20    CONTINUE                                                           00046770
C                                                                        00046780
      DO 1 I=2,NPMAX,2                                                   00046790
      INP=I                                                              00046800
      IF(NP.LE.INP)GOTO 2                                                00046810
1     CONTINUE                                                           00046820
2     INC=INP/2                                                          00046830
      IF(NP.EQ.INP)GOTO 4                                                00046840
      DO 3 I=1,10                                                        00046850
3     CLDC(I,INC)=(CLDC(I,INC)+CLDC(I,INC-1))/2.                         00046860
4     CONTINUE                                                           00046870
      RATIO=SIGALR/SIGMA                                                 00046880
      IF(RATIO.LT.CLDC(1,INC).AND.RATIO.GT.CLDC(10,INC))GOTO 5           00046890
      IF(RATIO.GE.CLDC(1,INC))ALPHA=1.0                                  00046900
      IF(RATIO.LE.CLDC(10,INC))ALPHA=-.8                                 00046910
      GOTO 100                                                           00046920
C                                                                        00046930
5     DO 10 I=2,10                                                       00046940
      N=I                                                                00046950
      IF(RATIO.GE.CLDC(N,INC))GOTO 40                                    00046960
10    CONTINUE                                                           00046970
40    REALN=FLOAT(N)-(RATIO-CLDC(N,INC))/(CLDC(N-1,INC)-CLDC(N,INC))     00046980
      ALPHA=1.-(REALN-1.)*.2                                             00046990
C                                                                        00047000
100   CONTINUE                                                           00047010
      RETURN                                                             00047020
      END                                                                00047030
```

```
      SUBROUTINE CEPMOD(CEPTEM,NS,CEP,LRP1,ISTART,ADAHOR,AMIX90)          00047040
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12940
C              - - DIMENSIONS AND DO LOOP FINAL VALUES MODIFIED TO        MOD12950
C                    ACCOMMODATE THE 16 TECHNOLOGIES.                    MOD12960
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -  MOD12970
      DIMENSION CEP(16,31,1),CEPTEM(16,1),ISTART(16),ADAHOR(1),AMIX90(1)00047050
C     DO 2 I=1,10                                                         00047060
      DO 2 I=1,16                                                         MOD12980
      IF(ISTART(I).EQ.0)GOTO 2                                            00047070
      DO 1 IY=1,LRP1                                                      00047080
1     CEPTEM(I,IY)=CEP(I,IY,NS)                                           00047090
2     CONTINUE                                                            00047100
C     DO 15 I=1,10                                                        00047110
      DO 15 I=1,16                                                        MOD12990
      IF(ISTART(I).EQ.0)GOTO 15                                           00047120
      DO 10 IY=1,LRP1                                                     00047130
      IYP=IY-ISTART(I)                                                    00047140
      IF(IYP.LT.1)GOTO 10                                                 00047150
      CEP(I,IYP,NS)=CEP(I,IY,NS)                                          00047160
10    CONTINUE                                                            00047170
      DO 5 IY=1,LRP1                                                      00047180
      IYP=IY-ISTART(I)                                                    00047190
      IF(IYP.GT.0) GOTO 15                                                00047200
5     CEP(I,LRP1+IYP,NS)=ADAHOR(IY)*AMIX90(I)+CEP(I,LRP1+IYP-1,NS)        00047210
15    CONTINUE                                                            00047220
      RETURN                                                              00047230
      END                                                                 00047240
```

```
      SUBROUTINE CEPFIX(CEPTEM,NS,CEP,LRP1,ISTART)                      00047250
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD13000
C            - - DIMENSIONS AND DO LOOP FINAL VALUE MODIFIED TO         MOD13010
C                    ACCOMMODATE 16 TECHNOLOGIES                        MOD13020
C  - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - -   MOD13030
      DIMENSION CEPTEM(16,LRP1),CEP(16,31,1),ISTART(16)                 00047260
C     DO 20 I=1,10                                                      00047270
      DO 20 I=1,16                                                      MOD13040
      IF(ISTART(I).EQ.0)GOTO 20                                         00047280
      DO 10 IY=1,LRP1                                                   00047290
10    CEP(I,IY,NS)=CEPTEM(I,IY)                                         00047300
20    CONTINUE                                                          00047310
      RETURN                                                            00047320
      END                                                               00047330
```

```
      SUBROUTINE CEXS(ALPHA,BETA,NYPP,NP,DLTA,IS,CEXDEM,GC,NYL,FNYL,     00047340
     +DEM78,NB,AL,LR)                                                    00047350
C                                                                        00047360
C THIS SUBROUTINE FINDS THE CLAIRVOYANT'S DEMAND FORECAST FOR            00047370
C EACH SELECTED TREE PATH.                                               00047380
C                                                                        00047390
      DIMENSION IS(30),CEXDEM(30)                                        00047400
C                                                                        00047410
      CGR=0.                                                             00047420
      GRW=AL                                                             00047430
      DO 300 J=1,NP                                                      00047440
      IYR=(J-1)*NYPP                                                     00047450
      GRW=ALPHA*GRW+BETA*AL                                              00047460
      IF(NB.EQ.2)GRW=GRW+2.*DLTA*(FLOAT(IS(J))-1.5)                      00047470
      IF(NB.EQ.3)GRW=GRW+DLTA*FLOAT(IS(J)-2)                             00047480
C                                                                        00047490
      DO 200 I=1,NYPP                                                    00047500
      CGR=CGR+GRW                                                        00047510
      IYR=IYR+1                                                          00047520
      FIYR=FLOAT(IYR)                                                    00047530
      GSUM=GC*FIYR*(FIYR-FNYL)/2.                                        00047540
      IF(IYR.GT.NYL)GSUM=0.                                              00047550
      CEXDEM(IYR)=(1.+CGR+GSUM)*DEM78                                    00047560
200   CONTINUE                                                           00047570
300   CONTINUE                                                           00047580
C                                                                        00047590
      WRITE(11,350)                                                      00047600
      WRITE(11,400)(CEXDEM(I),I=1,LR)                                    00047610
350   FORMAT('CEXDEM UNDER PERFECT DEMAND FORECAST:')                    00047620
400   FORMAT((10F8.0))                                                   00047630
      RETURN                                                             00047640
      END                                                                00047650
```

```
      SUBROUTINE INCONS (ALPHA,FCPER1,FCPER2,FCPER3,                    MOD13050
     +                   ALLINT,                                        MOD13060
     +                   NP,NYPP,NB,Q,RSNOT,NSCEN,PERFCS,COINF)         MOD13070
C                                                                       MOD13080
C                                                                       MOD13090
C            THIS SUBROUTINE INITIALIZES VARIOUS CONSTANTS              MOD13100
C                AND FORMER INPUT PARAMETERS                            MOD13110
C                                                                       MOD13120
C                                                                       MOD13130
      LOGICAL RSNOT,PERFCS                                              MOD13140
C                                                                       MOD13150
C                                                                       MOD13160
      ALPHA=0.5                                                         MOD13170
      FCPER1=20.0                                                       MOD13180
      FCPER2=5.0                                                        MOD13190
      FCPER3=6.0                                                        MOD13200
C                                                                       MOD13210
C     - - ALLOWABLE GENERATION FROM ANCHORAGE TO FAIRBANKS              MOD13220
C           IN YEARS 5-9 (ASSUME 0 ALLOWABLE IN YEARS 1-4)              MOD13230
C                                                                       MOD13240
      ALLINT=260.                                                       MOD13250
C                                                                       MOD13260
C                                                                       MOD13270
C     NUMBER OF PERIODS                                                 MOD13280
      NP=6                                                              MOD13290
C                                                                       MOD13300
C     NUMBER OF YEARS PER PERIOD                                        MOD13310
      NYPP=5                                                            MOD13320
C                                                                       MOD13330
C     NUMBER OF BRANCHES                                                MOD13340
      NB=1                                                              MOD13350
C                                                                       MOD13360
C     1 - PROBABILITY FOR THE MIDDLE BRANCH (MED PATH) OF THE           MOD13370
C           3 PATH SYSTEM                                               MOD13380
      Q=0.5                                                             MOD13390
C                                                                       MOD13400
C     CALCULATIONS FOR FULL DEMAND? - (NOT USED IN THIS PROGRAM         MOD13410
C                     VERSION;  ONLY INCLUDED HERE FOR COMPLETENESS)    MOD13420
      RSNOT=.FALSE.                                                     MOD13430
C                                                                       MOD13440
C     NUMBER OF PATHS                                                   MOD13450
      NSCEN=3                                                           MOD13460
C                                                                       MOD13470
C     PERFECT FORECASTING? - (NOT USED IN THIS PROGRAM VERSION;         MOD13480
C                             ONLY INCLUDED HERE FOR COMPLETENESS)      MOD13490
      PERFCS=.FALSE.                                                    MOD13500
C                                                                       MOD13510
C     COINCIDENCE FACTOR                                                MOD13520
      COINF=0.97                                                        MOD13530
C                                                                       MOD13540
      RETURN                                                            MOD13550
      END                                                               MOD13560
```

```
      SUBROUTINE SETPAR (HYPROB,HYEN,HYMULT,HYINC,FENG,FTIME,          MOD13570
C               - - PARAMETERS COV, PRERT, AND DBTRT ADDED             MOD13580
     +                    COV, PRERT,DBTRT)                           MOD13590
C                                                                      MOD13600
C                                                                      MOD13610
C     THIS SUBROUTINE INITIALIZES THE VALUES OF VARIABLES              MOD13620
C          ELIMINATED FROM THE INPUT STREAM                            MOD13630
C                                                                      MOD13640
C                                                                      MOD13650
      DIMENSION HYPROB(3),HYEN(3),HYMULT(3),FENG(2),FTIME(2)           MOD13660
C                                                                      MOD13670
      DIMENSION COV(6)                                                 MOD13680
C                                                                      MOD13690
C                                                                      MOD13700
      DO 5 J=1,3                                                       MOD13710
         HYEN(J)=0.0                                                   MOD13720
         HYMULT(J)=1.0                                                 MOD13730
 5    CONTINUE                                                         MOD13740
C                                                                      MOD13750
      HYPROB(1)=0.0                                                    MOD13760
      HYPROB(2)=1.0                                                    MOD13770
      HYPROB(3)=0.0                                                    MOD13780
C                                                                      MOD13790
      HYINC=0.0                                                        MOD13800
C                                                                      MOD13810
      FTIME(1)=1.0                                                     MOD13820
      FENG(1)=1.0                                                      MOD13830
C                                                                      MOD13840
      PRERT=.150                                                       MOD13850
      DBTRT=.490                                                       MOD13860
      DO 10 J=1,6                                                      MOD13870
      COV(J)=FLOAT(J+1)                                                MOD13880
 10   CONTINUE                                                         MOD13890
C                                                                      MOD13900
      RETURN                                                           MOD13910
      END                                                              MOD13920
```

```
      SUBROUTINE READSF (SFILE,NPP1,PEAKDM,AVENGY,LRP1,                 MOD13930
     +                   AECONS,PKCONS,TCCONS,PCCONS,                   MOD13940
     +                   FPEAK,FENE,APEAK,AENE,                         MOD13950
     +                   GPEAK,GENE)                                    MOD13960
C                                                                       MOD13970
C                                                                       MOD13980
C                                                                       MOD13990
C     THIS SUBROUTINE READS THE SECONDARY FILE CONTAINING               MOD14000
C          AVERAGE ENERGY AND PEAK DEMAND VALUES FOR EACH AREA,         MOD14010
C          EACH PATH AND EACH PERIOD.                                   MOD14020
C          THE AVERAGE ENERGY AND PEAK DEMAND ARE COMBINED              MOD14030
C          FOR ALL AREAS (ANCHORAGE, FAIRBANKS AND GLENNALLEN)          MOD14040
C          THE CONSERVATION DATA FOR EACH OF THE AREAS IS ALSO          MOD14050
C          READ FROM THIS SECONDARY FILE.                               MOD14060
C                                                                       MOD14070
C     PARAMETER DESCRIPTION:                                            MOD14080
C                                                                       MOD14090
C     SFILE  - -  FILE NAME OF SECONDARY FILE (INPUT)                   MOD14100
C      NPP1  - -  THE NUMBER OF PERIODS PLUS 1                          MOD14110
C    PEAKDM  - -  RESULTING TOTAL DEMAND ARRAY FOR EACH PATH AND        MOD14120
C                     EACH PERIOD                                       MOD14130
C    AVENGY  - -  RESULTING TOTAL AVERAGE ENERGY ARRAY FOR EACH         MOD14140
C                     PATH AND EACH PERIOD                              MOD14150
C     LRP1   - -  PLANNING HORIZON PLUS 1                              MOD14160
C    AECONS  - - RESULTING YEARLY TOTAL AVERAGE ENERGY FOR CONSERVATION MOD14170
C    PKCONS  - - RESULTING YEARLY TOTAL DEMAND FOR CONSERVATION         MOD14180
C    TCCONS  - - RESULTING YEARLY TOTAL COSTS FOR CONSERVATION          MOD14190
C    PCCONS  - - RESULTING YEARLY TOTAL POWER COSTS FOR CONSERVATION    MOD14200
C                                                                       MOD14210
C                                                                       MOD14220
C                                                                       MOD14230
      DIMENSION SFILE(5), PEAKDM(3,11), AVENGY(3,11)                    MOD14240
      DIMENSION FPEAK(3,11), FENE(3,11), APEAK(3,11), AENE(3,11)        MOD14250
      DIMENSION GPEAK(3,11), GENE(3,11)                                 MOD14260
      DIMENSION AECONS(3,31),PKCONS(3,31),TCCONS(3,31),PCCONS(3,31)     MOD14270
C                                                                       MOD14280
C                                                                       MOD14290
C     OPEN (UNIT=20,NAME=SFILE,STATUS='OLD',READONLY)                   MOD14300
C                                                                       MOD14310
C                                                                       MOD14320
C     READ DELIVERED ELECTRICITY DATA                                   MOD14330
C                                                                       MOD14340
C     ANCHORAGE                                                         MOD14350
      READ (20,100)                                                     MOD14360
C                                                                       MOD14370
      DO 1 J=1,NPP1                                                     MOD14380
      READ (20,101) APEAK(1,J),AENE(1,J),APEAK(2,J),AENE(2,J),          MOD14390
     *              APEAK(3,J),AENE(3,J)                                MOD14400
 1    CONTINUE                                                          MOD14410
C                                                                       MOD14420
C     FAIRBANKS                                                         MOD14430
      READ (20,105)                                                     MOD14440
C                                                                       MOD14450
      DO 2 J=1,NPP1                                                     MOD14460
      READ (20,101) FPEAK(1,J),FENE(1,J),FPEAK(2,J),FENE(2,J),          MOD14470
     *              FPEAK(3,J),FENE(3,J)                                MOD14480
 2    CONTINUE                                                          MOD14490
```

```
C                                                                       MOD14500
C     GLENWALLEN                                                        MOD14510
      READ (20,105)                                                     MOD14520
      DO 3 J=1,NPP1                                                     MOD14530
      READ (20,101) GPEAK(1,J),GENE(1,J),GPEAK(2,J),GENE(2,J),          MOD14540
     *              GPEAK(3,J),GENE(3,J)                                MOD14550
 3    CONTINUE                                                          MOD14560
C                                                                       MOD14570
C                                                                       MOD14580
      DO 10 I=1,3                                                       MOD14590
      DO 10 J=1,NPP1                                                    MOD14600
         PEAKDM(I,J)=0.                                                 MOD14610
         AVENGY(I,J)=0.                                                 MOD14620
 10   CONTINUE                                                          MOD14630
C                                                                       MOD14640
      DO 11 I=1,3                                                       MOD14650
      DO 11 J=1,LRP1                                                    MOD14660
         AECONS(I,J)=0.                                                 MOD14670
         PKCONS(I,J)=0.                                                 MOD14680
         TCCONS(I,J)=0.                                                 MOD14690
         PCCONS(I,J)=0.                                                 MOD14700
 11   CONTINUE                                                          MOD14710
C                                                                       MOD14720
C                                                                       MOD14730
      DO 15 I=1,3                                                       MOD14740
      DO 15 J=1,NPP1                                                    MOD14750
         PEAKDM(I,J)=PEAKDM(I,J) + APEAK(I,J) + FPEAK(I,J)              MOD14760
         AVENGY(I,J)=AVENGY(I,J) + AENE(I,J) + FENE(I,J)                MOD14770
         PEAKDM(I,J)=PEAKDM(I,J) + GPEAK(I,J)                           MOD14780
         AVENGY(I,J)=AVENGY(I,J) + GENE(I,J)                            MOD14790
 15   CONTINUE                                                          MOD14800
C                                                                       MOD14810
C                                                                       MOD14820
C     READ CONSERVATION AND LOAD MANAGEMENT DATA                        MOD14830
C          (J (INDEX) = 1, LOW;  = 2, MED;  = 3, HIGH)                  MOD14840
C                                                                       MOD14850
C                                                                       MOD14860
      READ (20,106)                                                     MOD14870
C                                                                       MOD14880
      DO 500 I=1,3                                                      MOD14890
      READ (20,105)                                                     MOD14900
      DO 490 J=1,3                                                      MOD14910
      READ (20,105)                                                     MOD14920
      DO 480 K=1,LRP1                                                   MOD14930
C                                                                       MOD14940
      READ (20,106) AEC,PKC,TCC,PCC                                     MOD14950
      AECONS(J,K)=AECONS(J,K) + AEC                                     MOD14960
      PKCONS(J,K)=PKCONS(J,K) + PKC                                     MOD14970
      TCCONS(J,K)=TCCONS(J,K) + TCC                                     MOD14980
      PCCONS(J,K)=PCCONS(J,K) + PCC                                     MOD14990
      GO TO 480                                                         MOD15000
C                                                                       MOD15010
 470  READ (20,107)                                                     MOD15020
C                                                                       MOD15030
 480  CONTINUE                                                          MOD15040
 490  CONTINUE                                                          MOD15050
 500  CONTINUE                                                          MOD15060
```

```
C                                                                       MOD15070
C                                                                       MOD15080
C                                                                       MOD15090
                                                                        MOD15100
  100  FORMAT (7(/))                                                    MOD15110
  101  FORMAT (7X,3(2F9.0,1X))                                          MOD15120
  105  FORMAT (/)                                                       MOD15130
  106  FORMAT (///)                                                     MOD15140
  107  FORMAT (1X)                                                      MOD15150
  108  FORMAT (6X,2F10.0,12X,F10.0,5X,F10.0)                            MOD15160
C                                                                       MOD15170
       RETURN                                                           MOD15180
       END                                                              MOD15190
```

```
      SUBROUTINE DEMPYR (PEAKDM,AVENGY,YRLYDM,YRLYEN,ISPN,NYPP,NP,NSCEN,MOD15200
     +            FPEAK,FENE,APEAK,AENE,FPYRLY,FEYRLY,APYRLY,AEYRLY,     MOD15210
     +            GPEAK,GENE,GPYRLY,GEYRLY)                              MOD15220
C                                                                         MOD15230
C                                                                         MOD15240
C             THIS SUBROUTINE CALCULATES YEARLY DEMAND AND YEARLY ENER.   MOD15250
C                  FOR EACH PATH FROM THE DEMAND AND AVERAGE              MOD15260
C                  ENERGY FOR EACH PERIOD.                                MOD15270
C             THE METHOD IS LINEAR INTERPOLATION FROM ONE PERIOD          MOD15280
C                 TO THE NEXT.                                            MOD15290
C                                                                         MOD15300
C                                                                         MOD15310
C  VARIABLES:                                                             MOD15320
C                                                                         MOD15330
C     PEAKDM  =  PEAK DEMAND BY PATH AND PERIOD                           MOD15340
C     APEAK   =  . . . . . FOR ANCHORAGE                                  MOD15350
C     FPEAK   =  . . . . . FOR FAIRBANKS                                  MOD15360
C     GPEAK   =  . . . . . FOR GLENNALLEN                                 MOD15370
C     AVENGY  =  AVERAGE ENERGY BY PATH AND PERIOD                        MOD15380
C     AENE    =  . . . . . FOR ANCHORAGE                                  MOD15390
C     FENE    =  . . . . . FOR FAIRBANKS                                  MOD15400
C     GENE    =  . . . . . FOR GLENNALLEN                                 MOD15410
C                                                                         MOD15420
C     YRLYDM  =  YEARLY DEMAND TO BE CALCULATED                           MOD15430
C     APYRLY  =  . . . . . FOR ANCHORAGE                                  MOD15440
C     FPYRLY  =  . . . . . FOR FAIRBANKS                                  MOD15450
C     GPYRLY  =  . . . . . FOR GLENNALLEN                                 MOD15460
C     YRLYEN  =  YEARLY AVERAGE ENERGY TO BE CALCULATED                   MOD15470
C     AEYRLY  =  . . . . . FOR ANCHORAGE                                  MOD15480
C     FEYRLY  =  . . . . . FOR FAIRBANKS                                  MOD15490
C     GEYRLY  =  . . . . . FOR GLENNALLEN                                 MOD15500
C                                                                         MOD15510
C       ISPN  =  PATH INDEX ARRAY                                         MOD15520
C                                                                         MOD15530
C       NYPP  =  NUMBER OF YEARS PER PERIOD                               MOD15540
C                                                                         MOD15550
C         NP  =  NUMBER OF PERIODS                                        MOD15560
C                                                                         MOD15570
C      NSCEN  =  NUMBER OF PATHS                                          MOD15580
C                                                                         MOD15590
C                                                                         MOD15600
      DIMENSION PEAKDM(3,11), YRLYDM(3,30), ISPN(10)                      MOD15610
      DIMENSION AVENGY(3,11), YRLYEN(3,30)                                MOD15620
      DIMENSION APEAK(3,11), FPEAK(3,11), AENE(3,11), FENE(3,11)          MOD15630
      DIMENSION APYRLY(3,30), FPYRLY(3,30),AEYRLY(3,30),FEYRLY(3,30)      MOD15640
C                                                                         MOD15650
C           = = FOR GLENNALLEN                                            MOD15660
      DIMENSION GPEAK(3,11),GENE(3,11),GPYRLY(3,30),GEYRLY(3,30)          MOD15670
C                                                                         MOD15680
C                                                                         MOD15690
      DO 50 I=1,NSCEN                                                     MOD15700
         IYR=0                                                            MOD15710
         NPP1=NP + 1                                                      MOD15720
         DO 40 J=2,NPP1                                                   MOD15730
            DELTA=PEAKDM(ISPN(I),J) - PEAKDM(ISPN(I),J-1)                 MOD15740
            XINCR=DELTA/FLOAT(NYPP)                                       MOD15750
            DELTA=AVENGY(ISPN(I),J) - AVENGY(ISPN(I),J-1)                 MOD15760
```

```
            XINCR2=DELTA/FLOAT(NYPP)                                        MOD15770
            DELTA=APEAK(ISPN(I),J) - APEAK(ISPN(I),J-1)                     MOD15780
            XINCR3=DELTA/FLOAT(NYPP)                                        MOD15790
            DELTA=FPEAK(ISPN(I),J) - FPEAK(ISPN(I),J-1)                     MOD15800
            XINCR4=DELTA/FLOAT(NYPP)                                        MOD15810
            DELTA=AENE(ISPN(I),J) - AENE(ISPN(I),J-1)                       MOD15820
            XINCR5=DELTA/FLOAT(NYPP)                                        MOD15830
            DELTA=FENE(ISPN(I),J) - FENE(ISPN(I),J-1)                       MOD15840
            XINCR6=DELTA/FLOAT(NYPP)                                        MOD15850
C             - - FOR GLENNALLEN                                            MOD15860
            DELTA=GPEAK(ISPN(I),J) - GPEAK(ISPN(I),J-1)                     MOD15870
            XINCR7=DELTA/FLOAT(NYPP)                                        MOD15880
            DELTA=GENE(ISPN(I),J) - GENE(ISPN(I),J-1)                       MOD15890
            XINCR8=DELTA/FLOAT(NYPP)                                        MOD15900
            DO 30 K=1,NYPP                                                  MOD15910
               IYR=IYR + 1                                                  MOD15920
               YRLYDM(ISPN(I),IYR)=PEAKDM(ISPN(I),J-1) + K*XINCR            MOD15930
               YRLYEN(ISPN(I),IYR)=AVENGY(ISPN(I),J-1) + K*XINCR2           MOD15940
               APYRLY(ISPN(I),IYR)=APEAK(ISPN(I),J-1) + K*XINCR3            MOD15950
               FPYRLY(ISPN(I),IYR)=FPEAK(ISPN(I),J-1) + K*XINCR4            MOD15960
               AEYRLY(ISPN(I),IYR)=AENE(ISPN(I),J-1) + K*XINCR5             MOD15970
               FEYRLY(ISPN(I),IYR)=FENE(ISPN(I),J-1) + K*XINCR6             MOD15980
C              - - FOR GLENNALLEN                                           MOD15990
               GPYRLY(ISPN(I),IYR)=GPEAK(ISPN(I),J-1) + K*XINCR7            MOD16000
               GEYRLY(ISPN(I),IYR)=GENE(ISPN(I),J-1) + K*XINCR8             MOD16010
 30         CONTINUE                                                        MOD16020
 40      CONTINUE                                                           MOD16030
 50   CONTINUE                                                              MOD16040
C                                                                          MOD16050
      RETURN                                                               MOD16060
      END                                                                  MOD16070
```

```
      SUBROUTINE DETLDC (BLDC,PW,VMLDC,YRLYDM,YRLYEN,DEM78,AVE78,        MOD16080
     +                   LR,NSCEN,ISPN,XLDC,XALF,FYLDC,FYALF)            MOD16090
C                                                                        MOD16100
C                                                                        MOD16110
C                                                                        MOD16120
C     THIS SUBROUTINE CALCULATES LOAD DURATION CURVES FOR EACH           MOD16130
C          YEAR OF EACH PATH GIVEN THE INPUT LOAD DURATION CURVE         MOD16140
C          AND THE DEMAND AND AVERAGE ENERGIES FOR EACH YEAR OF          MOD16150
C          EACH PATH.                                                    MOD16160
C                                                                        MOD16170
C                                                                        MOD16180
C     PARAMETER DESCRIPTION:                                             MOD16190
C                                                                        MOD16200
C     BLDC   - -  INPUT LOAD DURATION CURVE                              MOD16210
C       PW   - -  INPUT PEAK WIDTH                                       MOD16220
C     VMLDC  - -  INPUT ARRAY OF DECIMAL PERCENTAGES OF AREA TO          MOD16230
C                       INCREASE OR DECREASE LDC AREA BY                 MOD16240
C    YRLYDM  - -  YEARLY DEMAND (EACH YEAR OF EACH PATH)                 MOD16250
C    YRLYEN  - -  YEARLY AVERAGE ENERGY (EACH YEAR OF EACH PATH)         MOD16260
C     DEM78  - -  FIRST YEAR DEMAND                                      MOD16270
C     AVE78  - -  FIRST YEAR AVERAGE ENERGY                              MOD16280
C       LR   - -  TOTAL NUMBER OF YEARS IN PLANNING HORIZON              MOD16290
C     NSCEN  - -  NUMBER OF PATHS                                        MOD16300
C      ISPN  - -  ARRAY OF INDEXES FOR PATHS                             MOD16310
C      XLDC  - -  RESULTING LDC CURVES FOR EACH YEAR OF EACH PATH        MOD16320
C      XALF  - -  RESULTING AREAS UNDER LDC'S FOR EACH YEAR OF EACH PATH MOD16330
C                       ON RETURN, THEY ARE THE YLF VALUES CALCULATED    MOD16340
C                       FROM THE AVE ENERGY AND DEMAND FOR THE GIVEN     MOD16350
C                       PATH AND YEAR                                    MOD16360
C     FYLDC  - -  RESULTING FIRST YEAR LDC                               MOD16370
C     FYALF  - -  RESULTING FIRST YEAR AREA UNDER LDC                    MOD16380
C                       ON RETURN, IT IS THE YLF VALUE CALCULATED FROM   MOD16390
C                       THE AVE ENERGY AND DEMAND FOR THE GIVEN PATH     MOD16400
C                                                                        MOD16410
C                                                                        MOD16420
C                                                                        MOD16430
      DIMENSION BLDC(12,2), VMLDC(10), YRLYDM(3,30), YRLYEN(3,30)        MOD16440
      DIMENSION ISPN(10), XLDC(3,30,12), XALF(3,30), FYLDC(12)           MOD16450
C                                                                        MOD16460
C                                                                        MOD16470
C                                                                        MOD16480
C                                                                        MOD16490
C     CALCULATE LDC FOR FIRST YEAR                                       MOD16500
C                                                                        MOD16510
      DO 5 I=1,12                                                        MOD16520
         FYLDC(I)=BLDC(I,1)                                              MOD16530
 5    CONTINUE                                                           MOD16540
C                                                                        MOD16550
C     COMPUTE YEARLY LOAD FACTOR FROM AVERAGE ENERGY AND PEAK DEMAND     MOD16560
      YLFK=AVE78/(DEM78*8.76)                                            MOD16570
C     TOLERANCE FOR CONVERGENCE IS 1% OF YLFK                            MOD16580
      TOLER=.01*YLFK                                                     MOD16590
      NITER=0                                                            MOD16600
C                                                                        MOD16610
 30   NITER=NITER + 1                                                    MOD16620
      IF (NITER .LE. 10) GO TO 32                                        MOD16630
      PRINT 31, (FYLDC(I),I=1,12),FYALF,YLFK                             MOD16640
```

```
      STOP                                                              MOD16650
 51   FORMAT (' SUB DETLDC:  ITERATION LIMIT OF 10 REACHED',/,          MOD16660
     1        ' FIRST YEAR: FYLDC= ',/,                                 MOD16670
     2        12F6.3,/,                                                 MOD16680
     3        ' FYALF= ',F7.4,'   YLFK= ',F7.4)                         MOD16690
C                                                                       MOD16700
C                                                                       MOD16710
 32   CONTINUE                                                          MOD16720
      FYALF=0.0                                                         MOD16730
      DO 40 I=3,11                                                      MOD16740
      FYALF=FYALF + .05*(FYLDC(I) + FYLDC(I+1))                         MOD16750
 40   CONTINUE                                                          MOD16760
      FYALF=FYALF + .5*(.1 - PW)*(FYLDC(2) + FYLDC(3))                  MOD16770
      FYALF=FYALF + .5*PW*(FYLDC(1) + FYLDC(2))                         MOD16780
C                                                                       MOD16790
      XDIFF=YLFK - FYALF                                                MOD16800
      IF (ABS(XDIFF) .LE. TOLER) GO TO 50                               MOD16810
      AREA=XDIFF*VMLDC(1)                                               MOD16820
      FYLDC(3)=FYLDC(3) + 2.*(AREA/.1)                                  MOD16830
      FYLDC(2)=(FYLDC(1) + FYLDC(3))/2.0                                MOD16840
C                                                                       MOD16850
      DO 45 I=4,12                                                      MOD16860
         AREA=XDIFF*VMLDC(I-2)                                          MOD16870
         FYLDC(I)=FYLDC(I) + (AREA/.1)                                  MOD16880
 45   CONTINUE                                                          MOD16890
C                                                                       MOD16900
C     TRY AGAIN WITH MODIFIED LDC                                       MOD16910
      GO TO 30                                                          MOD16920
C                                                                       MOD16930
C                                                                       MOD16940
 50   CONTINUE                                                          MOD16950
C     SET FYALF TO THE 'CORRECT' YLF                                    MOD16960
      FYALF=YLFK                                                        MOD16970
C     NORMALIZE LDC VALUES                                              MOD16980
      DO 51 I=1,12                                                      MOD16990
         FYLDC(I)=FYLDC(I)/FYALF                                        MOD17000
 51   CONTINUE                                                          MOD17010
C                                                                       MOD17020
C                                                                       MOD17030
C     REPEAT THE PROCEDURE FOR EACH YEAR OF EACH PATH                   MOD17040
C                                                                       MOD17050
C                                                                       MOD17060
      DO 90 K=1,NSCEN                                                   MOD17070
      DO 85 L=1,LR                                                      MOD17080
         DO 55 I=1,12                                                   MOD17090
            XLDC(ISPN(K),L,I)=BLDC(I,1)                                 MOD17100
 55      CONTINUE                                                       MOD17110
C                                                                       MOD17120
         YLFK=YRLYEN(ISPN(K),L)/(YRLYDM(ISPN(K),L)*8.76)                MOD17130
         TOLER=.01*YLFK                                                 MOD17140
         NITER=0                                                        MOD17150
C                                                                       MOD17160
 60      NITER=NITER + 1                                                MOD17170
         IF (NITER .LE. 10) GO TO 62                                    MOD17180
         PRINT 61, K,L,(XLDC(ISPN(K),L,I),I=1,12),XALF(ISPN(K),L),YLFK  MOD17190
         STOP                                                           MOD17200
 61      FORMAT (' SUB DETLDC: ITERATION LIMIT OF 10 REACHED',/,        MOD17210
```

```
     1         ' PATH= ',I1,' YEAR= ',I2,'  XLOC=',/,                          MOD17220
     2          12F6.3,/,                                                      MOD17230
     3         ' XALF= ',F7.4,'     YLFK= ',F7.4)                             MOD17240
C                                                                             MOD17250
 62       CONTINUE                                                            MOD17260
          XALF(ISPN(K),L)=0.0                                                 MOD17270
          DO 65 I=3,11                                                        MOD17280
             XALF(ISPN(K),L)=XALF(ISPN(K),L) +                                MOD17290
     +                    .05*(XLOC(ISPN(K),L,I) + XLOC(ISPN(K),L,I+1))      MOD17300
 65       CONTINUE                                                            MOD17310
          XALF(ISPN(K),L)=XALF(ISPN(K),L) + .5*(.1 - PW)*                     MOD17320
     +                    (XLOC(ISPN(K),L,2) + XLOC(ISPN(K),L,3))           MOD17330
          XALF(ISPN(K),L)=XALF(ISPN(K),L) + .5*PW*                            MOD17340
     +                    (XLOC(ISPN(K),L,1) + XLOC(ISPN(K),L,2))           MOD17350
C                                                                             MOD17360
          XDIFF=YLFK - XALF(ISPN(K),L)                                        MOD17370
          IF (ABS(XDIFF) .LE. TOLER) GO TO 80                                 MOD17380
          AREA=XDIFF*VMLOC(1)                                                 MOD17390
          XLOC(ISPN(K),L,3)=XLOC(ISPN(K),L,3) + 2.*(AREA/.1)                  MOD17400
          XLOC(ISPN(K),L,2)=(XLOC(ISPN(K),L,1) + XLOC(ISPN(K),L,3))/2.0       MOD17410
C                                                                             MOD17420
          DO 70 I=4,12                                                        MOD17430
             AREA=XDIFF*VMLOC(I-2)                                            MOD17440
             XLOC(ISPN(K),L,I)=XLOC(ISPN(K),L,I) + (AREA/.1)                  MOD17450
 70       CONTINUE                                                            MOD17460
C                                                                             MOD17470
          GO TO 60                                                            MOD17480
C                                                                             MOD17490
 80       CONTINUE                                                            MOD17500
C         SET XALF TO THE 'CORRECT' YLF                                       MOD17510
          XALF(ISPN(K),L)=YLFK                                                MOD17520
          DO 81 I=1,12                                                        MOD17530
             XLOC(ISPN(K),L,I)=XLOC(ISPN(K),L,1)/XALF(ISPN(K),L)              MOD17540
 81       CONTINUE                                                            MOD17550
C                                                                             MOD17560
 85    CONTINUE                                                               MOD17570
 90    CONTINUE                                                               MOD17580
C                                                                             MOD17590
       RETURN                                                                 MOD17600
       END                                                                    MOD17610
```

```
      SUBROUTINE FAIRCK (TKNAM,FAIR,ITFAIR,CCAP78,CEP,RETIRE)          MOD17620
C                                                                      MOD17630
C                                                                      MOD17640
C     THIS SUBROUTINE DETERMINES IF THERE EXISTS NON-HYDRO             MOD17650
C        TECHNOLOGIES FOR FAIRBANKS (INDICATED BY THE TECHNOLOGY       MOD17660
C        NAME BEGINNING WITH AN 'F')                                   MOD17670
C        AND IF CAPACITY EXISTS FOR EACH OF THESE TECHNOLOGIES         MOD17680
C        FOR YEARS 1-9 (1981-1989)                                     MOD17690
C        FOR SUCH TECHNOLOGIES, THE TECHNOLOGY NUMBER IS STORED        MOD17700
C        IN ITFAIR                                                     MOD17710
C                                                                      MOD17720
C                                                                      MOD17730
C  VARIABLES - -                                                       MOD17740
C                                                                      MOD17750
C     TKNAM  -  ARRAY OF TECHNOLOGY NAMES                              MOD17760
C                                                                      MOD17770
C      FAIR  -  FLAG TO INDICATE IF FAIRBANKS NON-HYDRO                MOD17780
C               TECHNOLOGIES EXIST                                     MOD17790
C                                                                      MOD17800
C    ITFAIR  -  RETURN ARRAY OF NON-HYDRO TECHNOLOGY NUMBERS           MOD17810
C               ASSOCIATED WITH FAIRBANKS                              MOD17820
C                                                                      MOD17830
C    CCAP78  -  FIRST YEAR CAPACITY                                    MOD17840
C                                                                      MOD17850
C       CEP  -  EACH YEAR'S ADDITIONAL CAPACITY                        MOD17860
C                                                                      MOD17870
C    RETIRE  -  EACH YEAR'S RETIREMENTS                                MOD17880
C                                                                      MOD17890
C                                                                      MOD17900
C                                                                      MOD17910
      LOGICAL FAIR(9)                                                  MOD17920
      DIMENSION TKNAM(16,2),ITFAIR(9,9),ITFR(9)                        MOD17930
      DIMENSION CCAP78(16),CEP(16,31,3),RETIRE(16,31)                  MOD17940
C                                                                      MOD17950
C     TNAME IS USED TO ACCESS ALL THE CHARACTERS                       MOD17960
C        IN A TECHNOLOGY NAME                                          MOD17970
C                                                                      MOD17980
      LOGICAL*1 TNAME(6),BLNK,FCHR,ACHR                                MOD17990
      EQUIVALENCE (XNAM1,TNAME(1)),(XNAM2,TNAME(5))                    MOD17993
      DATA BLNK,FCHR,ACHR /' ','F','A'/                                MOD17995
C                                                                      MOD18000
C                                                                      MOD18010
C                                                                      MOD18020
      DO 2 I=1,9                                                       MOD18030
      DO 1 J=1,9                                                       MOD18040
         ITFAIR(I,J)=0                                                 MOD18050
    1 CONTINUE                                                         MOD18060
      ITFR(I)=0                                                        MOD18070
    2 CONTINUE                                                         MOD18080
C                                                                      MOD18090
      DO 3 J=1,9                                                       MOD18100
      FAIR(J)=.FALSE.                                                  MOD18110
    3 CONTINUE                                                         MOD18120
C                                                                      MOD18130
C                                                                      MOD18140
C     ONLY INTERESTED IN THE FIRST 9 TECHNOLOGIES, WHICH ARE           MOD18150
C     ASSUMED TO BE NON-HYDRO                                          MOD18160
```

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C                                                                       MOD18170
      ITF=0                                                             MOD18180
C                                                                       MOD18190
      DO 10 I=1,9                                                       MOD18200
         XNAM1=TKNAM(I,1)                                               MOD18210
         XNAM2=TKNAM(I,2)                                               MOD18220
         DO 5 J=1,6                                                     MOD18230
            IF (TNAME(J) .EQ. BLNK) GO TO 5                             MOD18240
            GO TO 6                                                     MOD18250
    5    CONTINUE                                                       MOD18260
C     TECHNOLOGY NAME ALL BLANKS, SO SKIP IT                            MOD18270
      GO TO 10                                                          MOD18280
    6 CONTINUE                                                          MOD18290
C     CHECK IF FIRST NON-BLANK CHARACTER IS 'F'                         MOD18300
C     (THIS INDICATES A FAIRBANKS TECHNOLOGY)                           MOD18310
      IF (TNAME(J) .NE. FCHR) GO TO 10                                  MOD18320
      ITF=ITF + 1                                                       MOD18330
      ITFR(ITF)=I                                                       MOD18340
   10 CONTINUE                                                          MOD18350
C                                                                       MOD18360
C     CHECK IF CAPACITY IS AVAILABLE FOR EACH OF THE FAIRBANKS          MOD18370
C     TECHNOLOGIES IN EACH YEAR 1-9                                     MOD18380
C                                                                       MOD18390
      IF (ITF .LE. 0) GO TO 20                                          MOD18400
C                                                                       MOD18410
      DO 15 J=1,9                                                       MOD18420
      IT=0                                                              MOD18430
      DO 14 I=1,ITF                                                     MOD18440
      CAP=CCAP78(ITFR(I)) + CEP(ITFR(I),J+1,3) - RETIRE(ITFR(I),J+1)    MOD18450
      IF (CAP .LE. 0.) GO TO 14                                         MOD18460
      IT=IT + 1                                                         MOD18470
      ITFAIR(IT,J)=ITFR(I)                                              MOD18480
   14 CONTINUE                                                          MOD18490
      IF (IT .GE. 1) FAIR(J)=.TRUE.                                     MOD18500
   15 CONTINUE                                                          MOD18510
   20 CONTINUE                                                          MOD18520
C                                                                       MOD18530
C                                                                       MOD18540
      RETURN                                                            MOD18550
      END                                                               MOD18560
```

```
      SUBROUTINE FLORDR (VC,ENV,LOAD,ITFAIR,LCFAIR)                     MOD18570
C                                                                       MOD18580
C                                                                       MOD18590
C     THIS SUBROUTINE IS A MODIFICATION OF SUBROUTINE LORDER.           MOD18600
C     UNDER CERTAIN CONDITIONS, THIS SUBROUTINE IS CALLED TO            MOD18610
C     MODIFY THE NORMAL LOADING ORDER TO FORCE THE 2 LEAST              MOD18620
C     COST NON-HYDRO FAIRBANKS TECHNOLOGIES WITH CAPACITY FIRST         MOD18630
C     IN THE LOADING ORDER.                                             MOD18640
C                                                                       MOD18650
C                                                                       MOD18660
C  VARIABLES - -                                                        MOD18670
C                                                                       MOD18680
C  ITFAIR  -  ARRAY OF TECHNOLOGY NUMBERS ASSOCIATED WITH FAIRBANKS     MOD18690
C                                                                       MOD18700
C  LCFAIR  -  2 LEAST COST FAIRBANKS TECHNOLOGIES WITH CAPACITY         MOD18710
C                                                                       MOD18720
C                                                                       MOD18730
C                                                                       MOD18740
      DIMENSION VC(9),ENV(9),LOAD(9),INDEX(9)                           MOD18750
C                                                                       MOD18760
      DIMENSION ITFAIR(9),LCFAIR(2)                                     MOD18770
C                                                                       MOD18780
C                                                                       MOD18790
C     DETERMINE 2 LEAST COST FAIRBANKS TECHNOLOGIES                     MOD18800
C                                                                       MOD18810
      ILOW=1                                                            MOD18820
      DO 1 I=1,9                                                        MOD18830
    1 INDEX(I)=1                                                        MOD18840
C                                                                       MOD18850
      DO 4 K=1,2                                                        MOD18860
      DO 2 I=1,9                                                        MOD18870
      IF (ITFAIR(I) .EQ. 0) GO TO 21                                    MOD18880
      IF (INDEX(I) .EQ. 0) GO TO 2                                      MOD18890
      IF (VC(ITFAIR(I)) + ENV(ITFAIR(I)) .LT.                           MOD18900
     *    VC(ITFAIR(ILOW)) + ENV(ITFAIR(ILOW))) ILOW=I                  MOD18910
    2 CONTINUE                                                          MOD18920
   21 CONTINUE                                                          MOD18930
C                                                                       MOD18940
C     AVOID DOUBLE COUNTING IF ONLY 1 FAIRBANKS TECHNOLOGY              MOD18950
      IF (K .EQ. 2 .AND. LCFAIR(1) .EQ. ITFAIR(ILOW)) GO TO 4           MOD18960
C                                                                       MOD18970
      LCFAIR(K)=ITFAIR(ILOW)                                            MOD18980
      INDEX(ILOW)=0                                                     MOD18990
      DO 3 I=1,9                                                        MOD19000
      IF (ITFAIR(I) .EQ. 0) GO TO 4                                     MOD19010
      IF (INDEX(I) .EQ. 1) ILOW=I                                       MOD19020
      IF (INDEX(I) .EQ. 1) GO TO 4                                      MOD19030
    3 CONTINUE                                                          MOD19040
    4 CONTINUE                                                          MOD19050
C                                                                       MOD19060
C                                                                       MOD19070
      DO 6 I=1,9                                                        MOD19080
    6 INDEX(I)=1                                                        MOD19090
C                                                                       MOD19100
      IS=1                                                              MOD19110
      DO 7 I=1,2                                                        MOD19120
      IF (LCFAIR(I) .EQ. 0) GO TO 8                                     MOD19130
```

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      LOAD(I)=LCFAIR(I)                                                 MOD19140
      INDEX(LCFAIR(I))=0                                                MOD19150
      IS=IS + 1                                                         MOD19160
    7 CONTINUE                                                          MOD19170
    8 CONTINUE                                                          MOD19180
C                                                                       MOD19190
      DO 9 I=1,9                                                        MOD19200
      IF (INDEX(I) .EQ. 1) ILOW=I                                       MOD19210
      IF (INDEX(I) .EQ. 1) GO TO 10                                     MOD19220
    9 CONTINUE                                                          MOD19230
   10 CONTINUE                                                          MOD19240
C                                                                       MOD19250
      DO 40 J=IS,9                                                      MOD19260
      DO 20 I=1,9                                                       MOD19270
      IF(INDEX(I).EQ.0) GOTO 20                                         MOD19280
      IF(VC(I)+ENV(I).LT.VC(ILOW)+ENV(ILOW))ILOW=I                      MOD19290
   20 CONTINUE                                                          MOD19300
      LOAD(J)=ILOW                                                      MOD19310
      INDEX(ILOW)=0                                                     MOD19320
      DO 30 I=1,9                                                       MOD19330
      IF(INDEX(I).EQ.1)ILOW=I                                           MOD19340
      IF(INDEX(I).EQ.1)GOTO 40                                          MOD19350
   30 CONTINUE                                                          MOD19360
   40 CONTINUE                                                          MOD19370
      RETURN                                                            MOD19380
      END                                                               MOD19390
```

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      SUBROUTINE SVNUMS (IYR,TKNAM,CAP,EOUT,ITYP1,NLP,OUTXL,            MOD19400
     +                   ACAP,AGEN,FCAP,FGEN,XLOLP)                     MOD19410
C                                                                       MOD19420
C                                                                       MOD19430
C             - - THIS SUBROUTINE CALCULATES AND SAVES THE DATA         MOD19440
C                   RELEVANT TO THE ANCHORAGE-FAIRBANKS INTERTIE        MOD19450
C                   REPORT GENERATED BY SUBROUTINE WRTINT.              MOD19460
C                   IN ESSENCE, EACH TECHNOLOGY'S INSTALLED             MOD19470
C                   CAPACITY AND ENERGY GENERATION IS CATAGORIZED       MOD19480
C                   AS ANCHORAGE OR FAIRBANKS DEPENDING ON THE          MOD19490
C                   FIRST NON-BLANK CHARACTER IN THE TECHNOLOGY         MOD19500
C                   NAME (A OR F).                                      MOD19510
C                                                                       MOD19520
C                                                                       MOD19530
C  VARIABLES:                                                           MOD19540
C                                                                       MOD19550
C      IYR    -   CURRENT YEAR                                         MOD19560
C    TKNAM    -   ARRAY OF TECNOLOGY NAMES                             MOD19570
C      CAP    -   INSTALLED CAPACITY FOR EACH TECHNOLOGY               MOD19580
C     EOUT    -   ARRAY CONTAINING THE ENERGY GENERATION FOR EACH TECH. MOD19590
C    ITYP1    -   ARRAY INDEXING EOUT ACCORDING TO TECHNOLOGY          MOD19600
C      NLP    -   NUMBER OF TECNOLOGIES USED                           MOD19610
C    OUTXL    -   ARRAY CONTAINING LOSS OF LOAD PROBABILITY            MOD19620
C     ACAP    -   SUBROUTINE OUTPUT OF INSTALLED CAPACITY FOR ANCHORAGE MOD19630
C     FCAP    -   . . . . . . . . . . . . . . . . . . . . . FAIRBANKS   MOD19640
C     AGEN    -   SUBROUTINE OUTPUT OF ENERGY GENERATION FOR ANCHORAGE  MOD19650
C     FGEN    -   . . . . . . . . . . . . . . . . . . . . . FAIRBANKS   MOD19660
C    XLOLP    -   SUBROUTINE OUTPUT OF LOSS OF LOAD PROBABILITY        MOD19670
C                                                                       MOD19680
C                                                                       MOD19690
C                                                                       MOD19700
      DIMENSION TKNAM(16,2), CAP(16), EOUT(100,3,2), ITYP1(100)         MOD19710
      DIMENSION OUTXL(3,2),ACAP(30),FCAP(30),AGEN(30),FGEN(30)          MOD19720
      DIMENSION XLOLP(30)                                               MOD19730
C                                                                       MOD19740
C     TNAME IS USED TO ACCESS EACH CHARACTER                            MOD19750
C         IN A TECHNOLOGY'S NAME.                                       MOD19760
C                                                                       MOD19770
      LOGICAL*1 TNAME(6),BLNK,FCHR,ACHR                                 MOD19780
      EQUIVALENCE (XNAM1,TNAME(1)),(XNAM2,TNAME(5))                     MOD19783
      DATA BLNK,FCHR,ACHR /' ','F','A'/                                 MOD19785
C                                                                       MOD19790
C                                                                       MOD19800
C                                                                       MOD19810
C                                                                       MOD19820
C     ONLY INTERESTED IN THE FOLLOWING SUBSCRIPTS OF EOUT AND OUTXL     MOD19830
C         (SEE SUBROUTINE EXPEN)                                        MOD19840
      IH=1                                                              MOD19850
      IP=2                                                              MOD19860
C                                                                       MOD19870
C                                                                       MOD19880
C     SAVE LOLP FOR THIS YEAR                                           MOD19890
      XLOLP(IYR)=OUTXL(IH,IP)                                           MOD19900
C                                                                       MOD19910
      ACAP(IYR)=0.0                                                     MOD19920
      FCAP(IYR)=0.0                                                     MOD19930
      AGEN(IYR)=0.0                                                     MOD19940
```

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      FGEN(IYR)=0.0                                                     MOD19950
C                                                                       MOD19960
C                                                                       MOD19970
      DO 50 I=1,NLP                                                     MOD19980
         L=ITYP1(I)                                                     MOD19990
         XNAM1=TKNAM(L,1)                                               MOD20000
         XNAM2=TKNAM(L,2)                                               MOD20010
         DO 45 J=1,6                                                    MOD20020
            IF (TNAME(J) .EQ. BLNK) GO TO 45                            MOD20030
            GO TO 47                                                    MOD20040
   45    CONTINUE                                                       MOD20050
C        TECHNOLOGY NAME ALL BLANKS, SO SKIP                            MOD20060
         GO TO 50                                                       MOD20070
   47    CONTINUE                                                       MOD20080
C        TECHNOLOGY NOT ASSOCIATED WITH ANCHORAGE OR FAIRBANKS, SO SKIP MOD20090
         IF (TNAME(J) .NE. ACHR .AND. TNAME(J) .NE. FCHR) GO TO 50      MOD20100
C                                                                       MOD20110
         IF (TNAME(J) .NE. ACHR) GO TO 49                               MOD20120
C        ANCHORAGE                                                      MOD20130
         ACAP(IYR)=ACAP(IYR) + CAP(L)                                   MOD20140
         AGEN(IYR)=AGEN(IYR) + EOUT(I,IH,IP)                            MOD20150
         GO TO 50                                                       MOD20160
C                                                                       MOD20170
C        FAIRBANKS                                                      MOD20180
   49    CONTINUE                                                       MOD20190
         FCAP(IYR)=FCAP(IYR) + CAP(L)                                   MOD20200
         FGEN(IYR)=FGEN(IYR) + EOUT(I,IH,IP)                            MOD20210
C                                                                       MOD20220
C                                                                       MOD20230
   50 CONTINUE                                                          MOD20240
C                                                                       MOD20250
      RETURN                                                            MOD20260
      END                                                               MOD20270
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      SUBROUTINE SVENG (IYR,EOUT,ITYP1,NLP,TECHEN)                      MOD20280
C                                                                       MOD20290
C                                                                       MOD20300
C                                                                       MOD20310
C     THIS SUBROUTINE SAVES THE ENERGY GENERATION FOR EACH TECHNOLOGY   MOD20320
C         AND EACH YEAR                                                 MOD20330
C                                                                       MOD20340
C                                                                       MOD20350
C  VARIABLES - -                                                        MOD20360
C                                                                       MOD20370
C     IYR   -  CURRENT YEAR                                             MOD20380
C    EOUT   -  ARRAY CONTAINING THE ENERGY GENERATION FOR EACH OLOGY    MOD20390
C   ITYP1   -  ARRAY INDEXING EOUT ACCORDING TO TECHNOLOGY              MOD20400
C     NLP   -  THE NUMBER OF TECHNOLOGIES USED                          MOD20410
C  TECHEN   -  ENERGY GENERATED FOR EACH TECHNOLOGY AND EACH YEAR       MOD20420
C                                                                       MOD20430
C                                                                       MOD20440
C                                                                       MOD20450
      DIMENSION EOUT(100,3,2), ITYP1(100), TECHEN(16,30)                MOD20460
C                                                                       MOD20470
C                                                                       MOD20480
C                                                                       MOD20490
C     ONLY INTERESTED IN THE FOLLOWING SUBSCRIPTS OF EOUT               MOD20500
C         (SEE SUBROUTINE EXPEN)                                        MOD20510
C                                                                       MOD20520
      IH=1                                                              MOD20530
      IP=2                                                              MOD20540
C                                                                       MOD20550
C                                                                       MOD20560
      DO 5 I=1,16                                                       MOD20570
      TECHEN(I,IYR)=0.0                                                 MOD20580
    5 CONTINUE                                                          MOD20590
C                                                                       MOD20600
C                                                                       MOD20610
      DO 50 I=1,NLP                                                     MOD20620
         L=ITYP1(I)                                                     MOD20630
         TECHEN(L,IYR)=EOUT(I,IH,IP)                                    MOD20640
   50 CONTINUE                                                          MOD20650
C                                                                       MOD20660
C                                                                       MOD20670
      RETURN                                                            MOD20680
      END                                                               MOD20690
```

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      SUBROUTINE DEMPRT (TITLE,YEARS,TKNAM,IS,NP,IYR,CEP,DEM,DEM78,      MOD20700
     +                   PRM,RETIRE,NS,CCAP78,                           MOD20710
     +                   AVE78,YRLYEN,TECHEN)                            MOD20720
C                                                                        MOD20730
C                                                                        MOD20740
C                                                                        MOD20750
C                THIS SUBROUTINE SETS UP THE DATA FOR PRINTING           MOD20760
C                (FOR EACH TECHNOLOGY)                                   MOD20770
C                THE CAPACITY BY YEAR AND ENERGY GENERATION BY YEAR.     MOD20780
C                                                                        MOD20790
C                                                                        MOD20800
      DIMENSION TITLE(15),YEARS(5),CEP(16,31,3),DEM(30),TKNAM(16,2)      MOD20810
      DIMENSION IS(30),RETIRE(16,31),CEPCUM(31),CCAP78(16)               MOD20820
      DIMENSION YRLYEN(3,30),TECHEN(16,30)                               MOD20830
C                                                                        MOD20840
C     LOCAL VARIABLES                                                    MOD20850
      DIMENSION TECCAP(10), INDTEC(9)                                    MOD20860
      LOGICAL ADDED(16), T, F                                            MOD20870
C                                                                        MOD20880
      DATA T, F/ .TRUE., .FALSE./                                        MOD20890
C                                                                        MOD20900
C                                                                        MOD20910
C     OUTPUT UNIT NUMBER                                                 MOD20920
      LOUT=12                                                            MOD20930
C                                                                        MOD20940
C     DETERMINE TECHNOLOGIES USED                                        MOD20950
      NT=0                                                               MOD20960
      DO 5 I=1,16                                                        MOD20970
         ADDED(I)=F                                                      MOD20980
         IF (CCAP78(I) + CEP(I,IYR+1,NS) + RETIRE(I,IYR+1) .LT. .1)      MOD20990
     *      GO TO 5                                                      MOD21000
         ADDED(I)=T                                                      MOD21010
         IF (I .GE. 10) GO TO 5                                          MOD21020
         NT=NT + 1                                                       MOD21030
         INDTEC(NT)=I                                                    MOD21040
   5  CONTINUE                                                           MOD21050
C                                                                        MOD21060
C                                                                        MOD21070
C     CAPACITY                                                           MOD21080
C                                                                        MOD21090
C     WRITE HEADINGS                                                     MOD21100
      WRITE (LOUT,100) TITLE                                             MOD21110
      IFYR=IFIX(YEARS(1))                                                MOD21120
      LYEAR=IFYR + IYR                                                   MOD21130
      WRITE (LOUT,110) IFYR,LYEAR,PRM,(IS(I),I=1,NP)                     MOD21140
      WRITE (LOUT,115) (TKNAM(INDTEC(I),1),TKNAM(INDTEC(I),2),I=1,NT)    MOD21150
      WRITE (LOUT,120)                                                   MOD21160
C                                                                        MOD21170
C                                                                        MOD21180
      IIYR=IYR+1                                                         MOD21185
      DO 50 J=1,IIYR                                                     MOD21190
         LYEAR=IFYR + (J-1)                                              MOD21200
         TECCAP(1)=0.0                                                   MOD21210
         DO 30 I=10,16                                                   MOD21220
            IF (.NOT. ADDED(I)) GO TO 30                                 MOD21230
            TECCAP(1)=TECCAP(1) + CCAP78(I) + CEP(I,J,NS) - RETIRE(I,J)  MOD21240
  30     CONTINUE                                                        MOD21250
```

```
      DO 40 I=1,NT                                                      MOD21260
         TECCAP(I+1)=CCAP78(INDTEC(I)) +                                MOD21270
     *               CEP(INDTEC(I),J,NS) - RETIRE(INDTEC(I),J)          MOD21280
40    CONTINUE                                                          MOD21290
C                                                                       MOD21300
      IF (J .EQ. 1)                                                     MOD21310
     * WRITE (LOUT,125) LYEAR, DEM78, TECCAP(1),                        MOD21320
     *                  (TECCAP(INDTEC(I)+1),I=1,NT)                   MOD21330
      IF (J .NE. 1)                                                     MOD21340
     * WRITE (LOUT,125) LYEAR, DEM(J-1), TECCAP(1),                     MOD21350
     *                  (TECCAP(INDTEC(I)+1),I=1,NT)                   MOD21360
C                                                                       MOD21370
C                                                                       MOD21380
50    CONTINUE                                                          MOD21390
C                                                                       MOD21400
C                                                                       MOD21410
C     ENERGY GENERATION TABLE                                           MOD21420
C                                                                       MOD21430
C     WRITE HEADINGS                                                    MOD21440
C                                                                       MOD21450
      WRITE (LOUT,100) TITLE                                            MOD21460
      LYEAR=IFYR + IYR                                                  MOD21470
      WRITE (LOUT,111) IFYR,LYEAR,PRM,(IS(I),I=1,NP)                    MOD21480
      WRITE (LOUT,116) (TKNAM(INDTEC(I),1),TKNAM(INDTEC(I),2),I=1,NT)   MOD21490
      WRITE (LOUT,120)                                                  MOD21500
C                                                                       MOD21510
C                                                                       MOD21520
      WRITE (LOUT,130) IFYR,AVE78                                       MOD21530
C                                                                       MOD21540
C                                                                       MOD21550
      DO 60 J=1,IYR                                                     MOD21560
         LYEAR=IFYR + J                                                 MOD21570
         HYENG=0.0                                                      MOD21580
         DO 55 I=10,16                                                  MOD21590
            IF (.NOT. ADDED(I)) GO TO 55                                MOD21600
            HYENG=HYENG + TECHEN(I,J)                                   MOD21610
55       CONTINUE                                                       MOD21620
         WRITE (LOUT,125) LYEAR,YRLYEN(IS(1),J),HYENG,                  MOD21630
     +                   (TECHEN(INDTEC(I),J),I=1,NT)                   MOD21640
60    CONTINUE                                                          MOD21650
C                                                                       MOD21660
C                                                                       MOD21670
100   FORMAT ('1',15A4,36X,'CPRT REPORT')                               MOD21680
110   FORMAT (' ',' PEAK DEMAND & CAPACITY (MW) BY YEAR:',              MOD21690
     1        2X,I4,'-',I4,', PRM= ',F6.3,', TREE PATH= ',              MOD21700
     2        30I1,/,1X)                                                MOD21710
111   FORMAT (' ',' ENERGY GENERATION (GWH) BY YEAR:    ',              MOD21720
     1        2X,I4,'-',I4,', PRM= ',F6.3,', TREE PATH= ',              MOD21730
     2        30I1,/,1X)                                                MOD21740
115   FORMAT ('0','YEAR',2X,' DEMAND ',4X,'  HYDRO ',9(2X,'  ',A4,A2))  MOD21750
116   FORMAT ('0','YEAR',2X,' ENERGY ',4X,'  HYDRO ',9(2X,'  ',A4,A2))  MOD21760
120   FORMAT (1X)                                                       MOD21770
125   FORMAT (1X,I4,2X,F8.0,4X,F8.0,9(2X,F8.0))                         MOD21780
130   FORMAT (1X,I4,2X,F8.0)                                            MOD21790
C                                                                       MOD21800
      RETURN                                                            MOD21810
      END                                                               MOD21820
```

```
      SUBROUTINE WRISUM (FIXPRC,VARPRC,YRLYDM,DEM78,YRLYEN,AVE78,      MOD21830
     +                   IFFYR,LR,PRM,IS,NP,INFLA,CDSC,ISPN,NSC,      MOD21840
     +                   AECONS,PKCONS,TCCONS,PCCONS,TITLE)           MOD21850
C                                                                      MOD21860
C                                                                      MOD21870
C               THIS SUBROUTINE PRODUCES THE FINAL COST SUMMARY        MOD21880
C                    TABLE REPORT                                      MOD21890
C                                                                      MOD21900
C                THIS SUBROUTINE ALSO OUTPUTS POWER COSTS FOR EACH     MOD21910
C                    PRM AND PLANNING YEAR UNDER THE MEDIUM PATH.      MOD21920
C                    THE OUTPUT FILE IS 'AREEP.DAT' (UNIT 19).         MOD21930
C                    THIS FILE IS USED BY PROGRAM RED VIA PROGRAM      MOD21940
C                    RATE.                                             MOD21950
C                                                                      MOD21960
C                                                                      MOD21970
C                                                                      MOD21980
C     PARAMETER DESCRIPTIONS:                                          MOD21990
C                                                                      MOD22000
C    FIXPRC  - -  ARRAY OF FIXED PRICES BY YEAR                        MOD22010
C    VARPRC  - -  ARRAY OF VARIABLE PRICES BY YEAR                     MOD22020
C    YRLYDM  - -  YEARLY DEMAND BY PATH                                MOD22030
C     DEM78  - -  FIRST YEAR DEMAND                                    MOD22040
C    YRLYEN  - -  YEARLY ENERGY BY PATH                                MOD22050
C     AVE78  - -  FIRST YEAR ENERGY                                    MOD22060
C     IFFYR  - -  FIRST YEAR                                           MOD22070
C        LR  - -  PLANNING HORIZON BY YEAR                             MOD22080
C       PRM  - -  RESERVE MARGIN                                       MOD22090
C        IS  - -  ARRAY INDEXING THE PERIODS OF EACH PATH              MOD22100
C        NP  - -  NUMBER OF PERIODS                                    MOD22110
C     INFLA  - -  INFLATION RATE                                       MOD22120
C      CDSC  - -  CONSUMER DISCOUNT RATE                               MOD22130
C      ISPN  - -  ARRAY INDEXING THE PATH                              MOD22140
C       NSC  - -  CURRENT PATH                                         MOD22150
C    AECONS  - -  YEARLY AVERAGE ENERGY FOR CONSERVATION               MOD22160
C    PKCONS  - -  YEARLY DEMAND FOR CONSERVATION                       MOD22170
C    TCCONS  - -  YEARLY TOTAL COST FOR CONSERVATION                   MOD22180
C    PCCONS  - -  YEARLY POWER COST FOR CONSERVATION                   MOD22190
C    TITLE   - -  INPUT TITLE OF RUN                                   MOD22200
C                                                                      MOD22210
C                                                                      MOD22220
      DIMENSION FIXPRC(100),VARPRC(100),YRLYDM(3,30),YRLYEN(3,30)      MOD22230
      DIMENSION IS(10),ISPN(10),TITLE(15)                              MOD22240
      DIMENSION AECONS(3,31),PKCONS(3,31),TCCONS(3,31),PCCONS(3,31)    MOD22250
      REAL INFLA                                                       MOD22260
C                                                                      MOD22270
C                                                                      MOD22280
      LOUT=13                                                          MOD22290
      IYR=IFFYR                                                        MOD22300
      FACTOR=(1.0 + INFLA)/(1.0 + CDSC)                                MOD22310
C                                                                      MOD22320
C     OUTPUT HEADINGS                                                  MOD22330
      WRITE (LOUT,100) TITLE                                           MOD22340
  100 FORMAT ('1',15A4,16X,'CSUM REPORT')                              MOD22350
      WRITE (LOUT,101) PRM,(IS(I),I=1,NP)                              MOD22360
  101 FORMAT ('   PRM= ',F6.3,27X,                                     MOD22370
     1        '   TREE PATH= ',30I1)                                   MOD22380
      WRITE (LOUT,105)                                                 MOD22390
```

```
 105  FORMAT ('0',80X,15X,'LOAD MANAGEMENT AND')                          MOD22400
      WRITE (LOUT,110)                                                    MOD22410
 110  FORMAT (5X,4X,' TOTAL ELECTRICAL REQUIREMENTS ',3X,10X,7X,          MOD22420
     1        'DELIVERED ENERGY',10X,4X,3X,'CONSERVATION ELECTRICITY')    MOD22430
      WRITE (LOUT,115)                                                    MOD22440
 115  FORMAT ('0',4X,3(4X,'ANNUAL',2X,5X,2X,'  TOTAL ',                  MOD22450
     1        2X,' POWER',2X,3X))                                         MOD22460
      WRITE (LOUT,120)                                                    MOD22470
 120  FORMAT (1X,'YEAR',3(4X,'ENERGY',2X,' PEAK',2X,'  COST  ',2X,        MOD22480
     1        ' COST ',2X,3X))                                            MOD22490
      WRITE (LOUT,125) (IYR,I=1,3)                                        MOD22500
 125  FORMAT (5X,3(4X,' (GWH)',2X,' (MW)',2X,' ',I4,'$ -',                MOD22510
     1        2X,' M/KWH',2X,3X))                                         MOD22520
      WRITE (LOUT,126)                                                    MOD22530
 126  FORMAT (5X,3(19X,'MILLIONS',13X),/,1X)                              MOD22540
C                                                                         MOD22550
C                                                                         MOD22560
C     L IS THE PATH (1=LOW; 2=MED; 3=HIGH)                                MOD22570
      L=ISPN(NSC)                                                         MOD22580
C                                                                         MOD22590
C                                                                         MOD22600
C               - -  IF THIS IS THE MEDIUM PATH THEN WRITE OUT PRM        MOD22610
C                    TO AREEP.DAT                                         MOD22620
C                                                                         MOD22630
      IF (L .EQ. 2) WRITE (19,127) PRM                                    MOD22640
 127  FORMAT (F5.3)                                                       MOD22650
C                                                                         MOD22660
C                                                                         MOD22670
C     NOTE: FIXPRC AND VARPRC ARE IN THE UNITS OF $/KWH                   MOD22680
C                                                                         MOD22690
C     SPECIAL CASE - - FIRST YEAR                                         MOD22700
C                                                                         MOD22710
C     DELIVERED                                                           MOD22720
      TODEPC=(FIXPRC(1) + VARPRC(1))/1000.                                MOD22730
      TODECO=TODEPC*AVE78/1000.                                           MOD22740
C                                                                         MOD22750
C     LOAD MANAGEMENT AND CONSERVATION                                    MOD22760
      TCC=TCCONS(L,1)/1000.                                               MOD22770
      IF (AECONS(L,1) .EQ. 0.) PCC=0.                                     MOD22780
      IF (AECONS(L,1) .NE. 0.) PCC=TCCONS(L,1)/AECONS(L,1)                MOD22790
C                                                                         MOD22800
C     TOTAL                                                               MOD22810
      TOAE=AVE78 + AECONS(L,1)                                            MOD22820
      TOPK=DEM78 + PKCONS(L,1)                                            MOD22830
      TOCO=TODECO + TCC                                                   MOD22840
      TOPC=TOCO/TOAE*1000.                                                MOD22850
C                                                                         MOD22860
C     PRESENT VALUE VARIABLES                                             MOD22870
C     DELIVERED                                                           MOD22880
      DEPVTC=TODECO                                                       MOD22890
      DELPC=AVE78                                                         MOD22900
C                                                                         MOD22910
C     CONSERVATION                                                        MOD22920
      COPVTC=TCC                                                          MOD22930
      COLPC=AECONS(L,1)                                                   MOD22940
C                                                                         MOD22950
C     TOTAL                                                               MOD22960
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      TOPVTC=TOCO                                                       MOD22970
      TOLPC=TOAE                                                        MOD22980
C                                                                       MOD22990
      WRITE (LOUT,150) IYR,TOAE,TOPK,TOCO,TOPC,AVE78,DEM78,TODECO,      MOD23000
     +                 TODEPC,AECONS(L,1),PKCONS(L,1),TCC,PCC           MOD23010
  150 FORMAT (1X,I4,3(4X,F6.0,2X,F5.0,2X,F8.2,2X,F6.1,2X,3X))           MOD23020
C                                                                       MOD23030
C                                                                       MOD23040
C              - -  IF THIS IS THE MEDIUM PATH THEN WRITE OUT THE       MOD23050
C                   POWER COST FOR THIS YEAR (1ST CONVERT TO $/KWH)     MOD23060
C                   TO AREEP.DAT                                        MOD23070
C                                                                       MOD23080
      TODEPC=TODEPC/1000.                                               MOD23085
      IF (L .EQ. 2) WRITE (19,151) TODEPC                               MOD23090
  151 FORMAT (F10.4)                                                    MOD23100
C                                                                       MOD23110
C                                                                       MOD23120
C                                                                       MOD23130
C     NOW REPEAT FOR EACH YEAR OF THE PLANNING HORIZON                  MOD23140
C                                                                       MOD23150
C                                                                       MOD23160
      PFACT=1.0                                                         MOD23170
      DO 50 J=1,LR                                                      MOD23180
      IYR=IYR + 1                                                       MOD23190
      PFACT=PFACT*FACTOR                                                MOD23200
C                                                                       MOD23210
      TODEPC=(FIXPRC(J+1) + VARPRC(J+1))/1000.                          MOD23220
      TODECO=TODEPC*YRLYEN(L,J)/1000.                                   MOD23230
C                                                                       MOD23240
      TCC=TCCONS(L,J+1)/1000.                                           MOD23250
      IF (AECONS(L,J+1) .EQ. 0.) PCC=0.                                 MOD23260
      IF (AECONS(L,J+1) .NE. 0.) PCC=TCCONS(L,J+1)/AECONS(L,J+1)        MOD23270
C                                                                       MOD23280
      TOAE=YRLYEN(L,J) + AECONS(L,J+1)                                  MOD23290
      TOPK=YRLYDM(L,J) + PKCONS(L,J+1)                                  MOD23300
      TOCO=TODECO + TCC                                                 MOD23310
      TOPC=TOCO/TOAE*1000.                                              MOD23320
C                                                                       MOD23330
      DEPVTC=DEPVTC + (TODECO*PFACT)                                    MOD23340
      DELPC=DELPC + (YRLYEN(L,J)*PFACT)                                 MOD23350
C                                                                       MOD23360
      COPVTC=COPVTC + (TCC*PFACT)                                       MOD23370
      COLPC=COLPC + (AECONS(L,J+1)*PFACT)                               MOD23380
C                                                                       MOD23390
      TOPVTC=TOPVTC + (TOCO*PFACT)                                      MOD23400
      TOLPC=TOLPC + (TOAE*PFACT)                                        MOD23410
C                                                                       MOD23420
C                                                                       MOD23430
      WRITE (LOUT,150) IYR,TOAE,TOPK,TOCO,TOPC,YRLYEN(L,J),             MOD23440
     +       YRLYDM(L,J),TODECO,TODEPC,AECONS(L,J+1),                   MOD23450
     +       PKCONS(L,J+1),TCC,PCC                                      MOD23460
C                                                                       MOD23470
C               - - IF THIS IS THE MEDIUM PATH THEN WRITE OUT THE       MOD23480
C                   POWER COST FOR THIS YEAR (1ST CONVERT TO $/KWH)     MOD23490
C                   TO AREEP.DAT                                        MOD23500
C                                                                       MOD23510
      TODEPC=TODEPC/1000.                                               MOD23515
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      IF (L .EQ. 2) WRITE (19,151) TODEPC                               MOD23520
C                                                                       MOD23530
C                                                                       MOD23540
   50 CONTINUE                                                          MOD23550
C                                                                       MOD23560
C     LEVELIZED COSTS                                                   MOD23570
      DELPC=DEPVTC/DELPC*1000.                                          MOD23580
      IF (COLPC .NE. 0.) COLPC=COPVTC/COLPC*1000.                       MOD23590
      TOLPC=TOPVTC/TOLPC*1000.                                          MOD23600
C                                                                       MOD23610
C                                                                       MOD23620
      WRITE (LOUT,155) TOPVTC,DEPVTC,COPVTC                             MOD23630
      WRITE (LOUT,160) TOLPC,DELPC,COLPC                                MOD23640
  155 FORMAT ('0','PVTC',3(18X,F9.2,13X))                               MOD23650
  160 FORMAT (' ',' LPC',3(29X,F6.1,5X))                                MOD23660
C                                                                       MOD23670
      RETURN                                                            MOD23680
      END                                                               MOD23690
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      SUBROUTINE WRTINT (TITLE,TKNAM,CCAP78,AP78,FP78,AE78,FE78,          MOD23700
     +                   APYRLY,FPYRLY,AEYRLY,FEYRLY,ACAP,AGEN,          MOD23710
     +                   FCAP,FGEN,XLOLP,IFFYR,LR,PRM,IS,NP,ISPN,        MOD23720
     +                   NSC,                                            MOD23730
     +                   GP78,GE78,GPYRLY,GEYRLY)                        MOD23740
C                                                                        MOD23750
C                                                                        MOD23760
C     THIS ROUTINE PRODUCES THE ANCHORAGE-FAIRBANKS INTERTIE REPORT      MOD23770
C                                                                        MOD23780
C             - - GLENNALLEN DEMAND AND ANNUAL ENERGY ADDED TO           MOD23790
C                 THE ANCHORAGE FIGURES.  THE INTERTIE CALCULATIONS      MOD23800
C                 ARE BASED ON THESE SUMS.                               MOD23810
C                                                                        MOD23820
C                                                                        MOD23830
C     PARAMETER DESCRIPTIONS:                                            MOD23840
C                                                                        MOD23850
C                                                                        MOD23860
C      TKNAM   -   ARRAY OF TECHNOLOGY NAMES                            MOD23870
C     CCAP78   -   FIRST YEAR CAPACITY                                   MOD23880
C       AP78   -   FIRST YEAR PEAK DEMAND FOR ANCHORAGE                  MOD23890
C       FP78   -   . . . . . . . . . . . . . . FAIRBANKS                 MOD23900
C       GP78   -   . . . . . . . . . . . . . . GLENNALLEN                MOD23910
C       AE78   -   FIRST YEAR ANNUAL ENERGY FOR ANCHORAGE               MOD23920
C       FE78   -   . . . . . . . . . . . . . . . . FAIRBANKS            MOD23930
C       GE78   -   . . . . . . . . . . . . . . . . GLENNALLEN           MOD23940
C     APYRLY   -   YEARLY PEAK DEMAND FOR ANCHORAGE                     MOD23950
C     FPYRLY   -   . . . . . . . . . . . . FAIRBANKS                    MOD23960
C     GPYRLY   -   . . . . . . . . . . . . GLENNALLEN                   MOD23970
C     AEYRLY   -   YEARLY ANNUAL ENERGY FOR ANCHORAGE                   MOD23980
C     FEYRLY   -   . . . . . . . . . . . . . FAIRBANKS                  MOD23990
C     GEYRLY   -   . . . . . . . . . . . . . GLENNALLEN                 MOD24000
C       ACAP   -   INSTALLED CAPACITY FOR ANCHORAGE                     MOD24010
C       FCAP   -   . . . . . . . . . . . . FAIRBANKS                    MOD24020
C       AGEN   -   ENERGY GENERATION FOR ANCHORAGE                      MOD24030
C       FGEN   -   . . . . . . . . . . . . FAIRBANKS                    MOD24040
C      XLOLP   -   LOSS OF LOAD PROBABILITY                             MOD24050
C      IFFYR   -   FIRST YEAR                                           MOD24060
C         LR   -   PLANNING HORIZON                                     MOD24070
C        PRM   -   RESERVE MARGIN                                       MOD24080
C         IS   -   ARRAY INDEXING THE PERIODS OF EACH PATH              MOD24090
C         NP   -   NUMBER OF PERIODS                                    MOD24100
C       ISPN   -   ARRAY INDEXING THE PATH                              MOD24110
C        NSC   -   CURRENT PATH                                         MOD24120
C                                                                        MOD24130
C                                                                        MOD24140
C                                                                        MOD24150
      DIMENSION GPYRLY(3,30),GEYRLY(3,30)                                MOD24160
C                                                                        MOD24170
      DIMENSION APYRLY(3,30),FPYRLY(3,30),AEYRLY(3,30),FEYRLY(3,30)      MOD24180
      DIMENSION ACAP(30),AGEN(30),FCAP(30),FGEN(30),XLOLP(30)            MOD24190
      DIMENSION IS(10),ISPN(10),TITLE(15),CCAP78(16),TKNAM(16,2)         MOD24200
      DIMENSION CMAX(30),ETRANS(30)                                      MOD24210
C                                                                        MOD24220
C     TNAME IS USED TO ACCESS ALL THE                                    MOD24230
C         CHARACTERS IN A TECHNOLOGY NAME                                MOD24240
      LOGICAL*1 TNAME(6),BLNK,FCHR,ACHR                                  MOD24250
      EQUIVALENCE (XNAM1,TNAME(1)),(XNAM2,TNAME(5))                      MOD24253
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```
      DATA BLNK,FCHR,ACHR /' ','F','A'/                                 MOD24255
C                                                                       MOD24260
C                                                                       MOD24270
C                                                                       MOD24280
C     OUTPUT UNIT #                                                     MOD24290
      LOUT=14                                                           MOD24300
      IYR=IFFYR                                                         MOD24310
C                                                                       MOD24320
C     DETERMINE FIRST YEAR CAPACITY FOR ANCHORAGE AND FAIRBANKS         MOD24330
      ACAP78=0.0                                                        MOD24340
      FCAP78=0.0                                                        MOD24350
C                                                                       MOD24360
      DO 10 I=1,16                                                      MOD24370
         XNAM1=TKNAM(I,1)                                               MOD24380
         XNAM2=TKNAM(I,2)                                               MOD24390
         DO 5 J=1,6                                                     MOD24400
            IF (TNAME(J) .EQ. BLNK) GO TO 5                             MOD24410
            GO TO 6                                                     MOD24420
   5     CONTINUE                                                       MOD24430
C        TECHNOLOGY NAME ALL BLANKS, SKIP IT                            MOD24440
         GO TO 10                                                       MOD24450
   6     CONTINUE                                                       MOD24460
C        TECHNOLOGY NOT ASSOCIATED WITH ANCHORAGE OR FAIRBANKS, SKIP IT MOD24470
         IF (TNAME(J) .NE. ACHR .AND. TNAME(J) .NE. FCHR) GO TO 10      MOD24480
         IF (TNAME(J) .NE. ACHR) GO TO 9                                MOD24490
C        ANCHORAGE                                                      MOD24500
         ACAP78=ACAP78 + CCAP78(I)                                      MOD24510
         GO TO 10                                                       MOD24520
C                                                                       MOD24530
C        FAIRBANKS                                                      MOD24540
   9     CONTINUE                                                       MOD24550
         FCAP78=FCAP78 + CCAP78(I)                                      MOD24560
  10  CONTINUE                                                          MOD24570
C                                                                       MOD24580
C                                                                       MOD24590
C     ANCHORAGE                                                         MOD24600
C     OUTPUT HEADINGS                                                   MOD24610
      WRITE (LOUT,100) TITLE                                            MOD24620
      WRITE (LOUT,101) PRM,(IS(I),I=1,NP)                               MOD24630
      WRITE (LOUT,102)                                                  MOD24640
      WRITE (LOUT,105)                                                  MOD24650
C                                                                       MOD24660
C     FIRST YEAR                                                        MOD24670
      APNGP=AP78 + GP78                                                 MOD24673
      AENGE=AE78 + GE78                                                 MOD24675
      WRITE (LOUT,110) IYR,APNGP,ACAP78,AENGE                           MOD24680
C                                                                       MOD24690
C     YEARS IN PLANNING HORIZON                                         MOD24700
      DO 20 I=1,LR                                                      MOD24710
         IYR=IYR + 1                                                    MOD24720
         APNGP=APYRLY(ISPN(NSC),I) + GPYRLY(ISPN(NSC),I)                MOD24723
         AENGE=AEYRLY(ISPN(NSC),I) + GEYRLY(ISPN(NSC),I)                MOD24725
         WRITE (LOUT,115) IYR,APNGP,                                    MOD24730
     +                    ACAP(I),                                      MOD24740
     +                    AENGE,                                        MOD24750
     +                    AGEN(I),XLOLP(I)                              MOD24760
  20  CONTINUE                                                          MOD24770
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C                                                                       MOD24780
C     ANCHORAGE-FAIRBANKS INTERTIE CALCULATIONS                         MOD24790
C                                                                       MOD24800
      DO 50 I=1,LR                                                      MOD24810
         ADIFFC=ACAP(I) - (APYRLY(ISPN(NSC),I) + GPYRLY(ISPN(NSC),I))   MOD24820
         FDIFFC=FCAP(I) - FPYRLY(ISPN(NSC),I)                           MOD24830
         CMAX(I)=0.0                                                    MOD24840
         IF (ADIFFC .GE. 0. .AND. FDIFFC .LT. 0.)                       MOD24850
     *      CMAX(I)=AMIN1(ABS(ADIFFC),ABS(FDIFFC))                      MOD24860
         IF (ADIFFC .LT. 0. .AND. FDIFFC .GE. 0.)                       MOD24870
     *      CMAX(I)=-1.0*AMIN1(ABS(ADIFFC),ABS(FDIFFC))                 MOD24880
C                                                                       MOD24890
         ADIFFE=AGEN(I) - (AEYRLY(ISPN(NSC),I) + GEYRLY(ISPN(NSC),I))   MOD24900
         FDIFFE=FGEN(I) - FEYRLY(ISPN(NSC),I)                           MOD24910
         ETRANS(I)=0.0                                                  MOD24920
         IF (ADIFFE .GE. 0. .AND. FDIFFE .LT. 0.)                       MOD24930
     +      ETRANS(I)=AMIN1(ABS(ADIFFE),ABS(FDIFFE))                    MOD24940
         IF (ADIFFE .LT. 0. .AND. FDIFFE .GE. 0.)                       MOD24950
     +      ETRANS(I)=-1.0*AMIN1(ABS(ADIFFE),ABS(FDIFFE))               MOD24960
 50   CONTINUE                                                          MOD24970
C                                                                       MOD24980
      IYR=IFFYR                                                         MOD24990
C                                                                       MOD25000
C     FAIRBANKS AND INTERTIE OUTPUT                                     MOD25010
C     HEADINGS                                                          MOD25020
      WRITE (LOUT,100) TITLE                                            MOD25030
      WRITE (LOUT,101) PRM, (IS(I),I=1,NP)                              MOD25040
      WRITE (LOUT,202)                                                  MOD25050
      WRITE (LOUT,205)                                                  MOD25060
C                                                                       MOD25070
C     FIRST YEAR                                                        MOD25080
      WRITE (LOUT,110) IYR,FP78,FCAP78,FE78                             MOD25090
C                                                                       MOD25100
C     EACH YEAR IN PLANNING HORIZON                                     MOD25110
      DO 70 I=1,LR                                                      MOD25120
         IYR=IYR + 1                                                    MOD25130
         WRITE (LOUT,210) IYR,FPYRLY(ISPN(NSC),I),FCAP(I),              MOD25140
     +                    FEYRLY(ISPN(NSC),I),FGEN(I),CMAX(I),         MOD25150
     +                    ETRANS(I)                                    MOD25160
 70   CONTINUE                                                          MOD25170
C                                                                       MOD25180
C                                                                       MOD25190
 100  FORMAT ('1',15A4,26X,'INTR REPORT')                               MOD25200
 101  FORMAT ('   PRM= ',F6.3,15X,'   TREE PATH= ',30I1)                MOD25210
 102  FORMAT ('0',24X,'ANCHORAGE')                                      MOD25220
 105  FORMAT ('0',6X,'   PEAK    ',2X,' INSTALLED',2X,                  MOD25230
     1        '  ANNUAL  ',2X,'  ANNUAL  ',5X,/,                        MOD25240
     2        7X,'  DEMAND  ',2X,' CAPACITY ',2X,'  ENERGY  ',         MOD25250
     3        2X,'GENERATION',5X,'   LOLP   ',/,                       MOD25260
     4        1X,'YEAR',2X,'   (MW)   ',2X,'   (MW)   ',2X,           MOD25270
     5        '   (GWH)  ',2X,'   (GWH)  ',5X,'DAYS/10 YR')            MOD25280
 110  FORMAT ('0',I4,2X,F10.1,2X,F10.1,2X,F10.1)                        MOD25290
 115  FORMAT (1X,I4,2X,F10.1,2X,F10.1,2X,F10.1,2X,F10.1,5X,             MOD25300
     1        F10.3)                                                   MOD25310
 202  FORMAT ('0',24X,'FAIRBANKS',30X,'INTERTIE')                       MOD25320
 205  FORMAT ('0',6X,'   PEAK    ',2X,' INSTALLED',2X,                  MOD25330
     1        '  ANNUAL  ',2X,'  ANNUAL  ',5X,'  MAXIMUM ',             MOD25340
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     2         2X,'  ENERGY  ',/,                                          MOD25350
     3         7X,'  DEMAND  ',2X,' CAPACITY ',2X,                         MOD25360
     4         '  ENERGY  ',2X,'GENERATION',5X,' CAPACITY ',2X,            MOD25370
     5         ' TRANSFER ',/,                                            MOD25380
     6         1X,'YEAR',2X,'   (MW)   ',2X,'   (MW)   ',2X,             MOD25390
     7         '   (GWH)  ',2X,'   (GWH)  ',5X,'   (MW)   ',2X,          MOD25400
     8         '   (GWH)  ')                                              MOD25410
C                                                                         MOD25420
 210  FORMAT (1X,I4,2X,F10.1,2X,F10.1,2X,F10.1,2X,F10.1,5X,               MOD25430
     1         F10.1,2X,F10.1)                                            MOD25440
C                                                                         MOD25450
      RETURN                                                              MOD25460
      END                                                                 MOD25470
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