MASTER

Year-End Report

National Energy Peak Leveling Program (NEPLP)

Energy Research and Development Agency

Contract E(04-3)-1152

AC03-76CS20012

November 10, 1976

See letter dtd Feb. 19, 1977

ENGINEERING SUPERVISION COMPANY
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YEAR-END REPORT

NATIONAL ENERGY-PEAK-LEVELLING PROGRAM

(NEPLP)

ENERGY RESEARCH
AND DEVELOPMENT AGENCY

Contract E(04-2)-1152

November 10, 1976

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SECTION I

MANAGEMENT OVERVIEWGENERAL

This year-end report, responsive to the requirements of Items 12 and 13, Exhibit II, Contract E(04-3)-1152, is organized into eight sections, as follows:

Section I	-	Management Overview
Section II	-	Audit (Task 1)
Section III	-	Operating Profiles (Task 2)
Section IV	-	Load Shedding Determination (Task 3)
Section V	-	Remote Data Entry (Task 4)
Section VI	-	Analysis (Task 5)
Section VII	-	Feedback (Task 6)
Section VIII	-	Socio-Economic

There are also five appendices, providing additional detailed data, as follows:

Appendix A	-	Financial Management
Appendix B	-	Audit
Appendix C	-	Operating Profiles
Appendix D	-	Analysis and Feedback
Appendix E	-	Computer Programs

Section I, "Management Overview", contents include:

- A. General
- B. Project Progress

- C. Project Costs
- D. Program Effectiveness
- E. Recommendations and Conclusions

The scope of the report includes:

1. An overview of the project, with emphasis upon the last quarter.
2. A presentation of data (e.g., computer programs) not already provided.
3. Other data and information that illustrates the direction of this on-going major project.

Duplication of material from previous reports has been limited to the data necessary to the clear understanding and delineation of the topic.

PROJECT PROGRESS

The Phase I effort was initially programmed to: audit the five building complexes, establish the operating profiles for each complex and integrate them into a composite profile; determine the load shedding potentials and establish a priority schedule for each client, and install the equipment for remote data entry and initiate the collection of operating data (electrical demand in real time and equipment operating information through computer terminal entry). Analysis of the collected data and feedback of demand levelling procedures would also be initiated dependent upon time availability. It was not anticipated that validation of the computer-based peak levelling programs would be accomplished during the Phase I effort.

To transmit energy demand pulse data from the utility company meters to the computer via data lines required the development of a new device -- a communications terminator. This decision came after the careful search of all standard products available and analysis to make sure the development could be done within the time frame of the scheduled work effort. The development of a data communications link was completed despite a delay in the delivery of critical terminal equipment. As an interim step to maintain the momentum of the project effort, a slower manual technique is being substituted

until the equipment is delivered and installed. This turn of events during the project has demonstrated the willingness of individual building owners and their operating personnel to mutually join - without a directive - in a cooperative energy conservation venture under the anticipated computer-directed control. (See also Section VIII, "Socio-Economic"). Active reduction of energy utilization is being demonstrated.

The technical expertise to support the ownership-management objectives has been demonstrated. Moreover, it has been shown that personnel at the operating level can function as a team with a high degree of mutual cooperation under centralized technical cooperative direction. (See especially Section III, "Operating Profiles," and Section IV, "Load Shedding Determination," and the respective appendices).

PROJECT COSTS

As of September 30, the total funds authorized have not been expended. This is due in part to the delay in delivery of the Communications Terminators for Remote Data Entry (RDE). ESCO requested a contract extension to cover a total twelve month period for Phase I.

PROGRAM EFFECTIVENESS

Within the defined parameters, the program has demonstrated that an energy reduction is realistic on a cooperative basis. While there is insufficient data to quantify meaningfully the percentage of savings, the defined goal of 10% appears attainable. Data expected to become available in the next quarter should provide an excellent review of this goal.

A significant adjunct is the ability to expand the present program to include more sites and to export the technology to other locales. As reported in the following section, the basis for this future activity has been formed.

RECOMMENDATIONS AND CONCLUSIONS

The following recommendations and/or conclusions are presented:

- . The total funds authorized have not been expended. This correlates with the delay in receiving the Communications Terminators. Therefore, these funds should be programmed for expenditure early in the following quarter.

The feasibility of the defined program has been justified. The project should, therefore, continue along its presently-charted course to provide:

- Peak leveling for present buildings/sites and the associated network are practicable.
- Expansion capability appears practicable.
- Data and experience upon which to base similar projects in other localities is being accumulated and validated.

SECTION II

AUDITI. CONTENTS

The section is organized as follows:

- Introduction
- Methodology
- Data (Summary only)

II. INTRODUCTION AND SUMMARY

The Mechanical and Electrical Equipment Audit is defined as:

"An inventory of all existing equipment in the building/complex to be surveyed. Included are air handling units, cooling towers, chillers, pumps, fans, electrical panels, lighting information, etc."

This effort was responsive to the requirements of Task 1 of the Statement of Work, i.e.:

"Audit ... An audit survey of each facility will be made in order to become aware of the operating characteristics of each building and its equipment components, collect operating data for the development of data base, survey all real time operating procedures and determine logical steps of equipment turn off/turn on. Essentially, the audit will review what and how equipment is being utilized. Typical systems will be selected for data monitoring and obvious discrepancies of equipment operation in respect to optimization will be analyzed and corrected."

The effort was essentially completed and reported in the first Quarterly Report dated February 10, 1976. A small amount of the task budget was held in reserve for several months to formally permit necessary modifications and/or updating of the audit information to support other tasks.

The allocation of effort to support this task represented approximately 8% of the ESCO total direct labor costs.

III. METHODOLOGY

ESCO personnel conducted audits with direct and full cooperation of the operating engineers of each building/complex. This assured early and on-going direct interfacing at the operating level. This climate of cooperation contributed greatly to the proper understanding of the project by building operating personnel. ESCO personnel were able to explain the project objectives in detail and to forestall apathy and misconceptions at the working level.

The Mechanical and Electrical Equipment Audit included five diverse building complexes in the Central City areas of downtown Los Angeles: Occidental Center, United California Bank, The May Company, The Southern California Gas Company and the Department of Water and Power. Each represented a particular usage, type and class and age of structure.

- A. Occidental Center is a modern complex.
- B. The May Company, a major retail store, is an older building (1907 et seq.) with many additions over the past seventy years.
- C. Southern California Gas Company is a fifty-year old structure with various add-on buildings employed for office space and demonstration facilities. This set of buildings uses more gas-energized equipment than other buildings in the audit.
- D. United California Bank, very recently occupied (1973), is a high-rise (63 stories) with modern mechanical and electrical equipment and controls.
- E. Department of Water and Power is a highly electrified building designed to demonstrate the use of electricity as the sole energy source for the building environmental systems, and is entirely occupied by a municipal public utility.

IV. DATA

The Audit consisted of an inventory and records inspection, and a physical verification and inspection of the building/complex. The following specific data were generated by equipment items:

- Unit Identification and Marking (e.g., Air Handler #5; Exhaust Fan #7).
- Location (e.g., Return Air Fan, Sixth Floor Roof).
- Horsepower (e.g., 150).
- Voltage/Rated Amps/Running Amps, if needed.
- Scheduled Start/Stop (e.g., 8:00 a.m. - 6:00 p.m.).
- Office Schedule, From/To (e.g., 10:00 a.m. - 6:00 p.m.)

A detailed review of the data described in this section is presented in Appendix B and is organized by operational audit site: Occidental Center, United California Bank, The May Company, Southern California Gas Company, and the Department of Water and Power.

An extensive detailed report of these data also was presented earlier in the First Quarterly Report.

SECTION III

OPERATING PROFILES

I. CONTENTS

This section is organized as follows:

- Introduction
- Methodology
- Data

II. INTRODUCTION AND SUMMARY

The Operating Profiles task is defined as:

"(Establish) from existing records and interview of operating personnel how the various Mechanical and Electrical equipment is being operated and what their characteristics are."

This effort was responsive to the requirement of Task 2 of the Statement of Work, i.e.:

'Specific Building Operating Profiles ... Through the information gathered in Task 1 and through the input of prescribed data from the building engineers, each building will have its I/O device installed in the first month. The operating profiles for each facility will be determined by the use of the ESCO EML analyzed against the actual operating data from each facility. Types of data to be utilized will be end use requirements, system energy outputs and inputs in the total system and components categories as well as alternate energy sources, outside air, etc."

The allocation of effort to support this complete task represented approximately 9% of the ESCO total direct (Man-hour) costs on the project.

III. METHODOLOGY

Two separate but compatible methodologies were utilized in obtaining the surveys:

- Light and Power Meters (May Company) only.
- Standardized Reporting Forms, Without Meters (all others).

With minimal available engineering data, the oldest (1907) building, The May Company, lent itself to the use of the light-and-power-meter approach by ESCO personnel. This test equipment was available at the site. The other buildings, without readily available test equipment, were surveyed with specially-designed, standardized form. The form not only assured standardization of recorded information, but provided step-by-step instructions for obtaining the data and calculating the resultant information. Complete cooperation and support was provided by the building operating staffs which had sufficient qualified personnel to assist. The data provides the capability to meaningfully establish building/complex power demand and leads to the establishment of demand statistics and demand profiles.

IV. DATA

The electrical consumption raw data are contained in Appendix C. (See also Section VI, Analysis.") The data bases are graphed for all five buildings in Figure III-1 through III-5.

Complete surveys were done in each building concerned to gain pertinent information for studying the KWH load supplied to these buildings. The May Company profile had been finished earlier and this profile was used as a guide in preparing the profiles for Occidental Center, United California Bank Center, the Southern California Gas Company, and the Department of Water and Power.

ESCO designed a complete form providing step-by-step instructions in obtaining needed survey information and calculating this information into KWH consumption data for lighting, elevators, air handling equipment, etc. Complete cooperation was given from all subject buildings in providing survey information except Southern California Gas Company. They requested that all surveys be done by ESCO staff because their man-power was limited. Therefore, ESCO did this survey.

The survey information supplied the data needed to establish a consumption baseline for each building. Any consumption above the top line of constant consumption will vary according to the air conditioning needs and other variable load requirements. These may occur because of severe outside air temperature variations, increased building population such as retail store during a "sale" period, adding more office personnel and equipment, etc.

SECTION IV

LOAD SHEDDING DETERMINATIONI. CONTENTS

This section is organized as follows:

- Introduction and Summary
- Methodology
- Data

II. INTRODUCTION AND SUMMARY

The Load Shedding Determination is defined as follows:

"To establish the priority and times each Mechanical/Electrical item is being or could be turned on/off."

This effort is responsive to the requirements of Task 3 of the Statement of Work, i.e.,:

"Load Shedding Determination... will be established based on Task 1 and 2 and will be checked for validity of sensor information, calibration, readout devices, etc. Determination will take place in those buildings having remote controls and readouts from the remote points, and from those buildings not having these devices the information will be read at point of origin. (An important by-product of this phase of work will be the analysis of load shedding capability in respect to local or remote control of peripheral equipment).

If additional sensory information is required, in particular areas or complexes, the building owners will be notified and their cooperation solicited for the installation of that equipment."

Designed specifically to make use of the Remote Data Sensors/Communications Termination/Computer (Remote Data Entry) capability, this effort was held up because of delay in the delivery of the

Communications Terminators. The effort was, therefore, redirected to reinforce the preparation and programming efforts, as outlined in the Monthly and Quarterly Reports.

The work to support this task represented approximately 10% of the ESCO total direct labor costs.

III. METHODOLOGY

Each building/complex has its own unique work schedule and associated equipment operating schedule. The first step was, therefore, to define the work (W)/holiday (H) schedules and to group buildings/complexes where possible. Scheduling was compiled by day-number (1 to 365 or 366), as shown in the example:

<u>Day-Number</u>	<u>May Co.</u>		<u>UCB</u>		<u>OCC</u>		<u>DWP & SCGC</u>	
	<u>W</u>	<u>H</u>	<u>W</u>	<u>H</u>	<u>W</u>	<u>H</u>	<u>W</u>	<u>H</u>
1		x		x		x		x
2	x			x	x			x
3		x		x		x		x
4		x		x		x		
5	x		x		x		x	
6	x		x		x		x	
7	x		x		x		x	

Equipment operating schedules were then defined for each location. These were programmed for CRT read-out at each building/complex, as shown in the following example:

Work-Day	Southern California Gas Company
Time: 0500	Start the following Units: S-2, R-2*
Time: 0515	Start the following Units: S-11, S-12, S-13, S-14, S-15, S-16, S-17, S-18, S-19, S-20, S-21, S-22, S-23, S-24
Time: 0530	Start the following Units: S-1, R-1, S-9, S-10, S-3, S-4, S-5, S-6, S-7, S-8, S-24, S-25, S-26, S-27

.....

*Equipment Mark Number R2 = Return #2. Also see Appendix B, Audit.

With sensors and via communications equipment, the computer records the KW-demand to confirm compliance at the site. If non-compliance is sensed, the Building Engineer will be queried via the communications link to the CRT display at his location.

Present and projected outside air temperatures are critical to chiller scheduling. Such equipment undergoes surges during start-up. A peak electrical demand can be created on the network by building operators attempting to bring too much equipment simultaneously on-line. Therefore, their daily initialization schedule requires coordination.

To remedy this, the order of precedence would be:

1. Turn on chilled and condenser water pumps.
2. Then, turn on cooling tower fans.
3. Finally, turn on individual chillers, time-phased.

The objective of the program is to reduce by 10% both the network peak KW demand and the individual site peak KW demand from previous (historical) usage. This is done on a day-to-day basis, as demand loads vary daily and even hourly. Examples extracted from the June, 1976, Monthly Report are shown in Appendix D.

Kilowatt demand data is sampled at 15-minute intervals. See Appendix E, Analysis. If network demand as projected remains within predicted limits, no action is taken. If network demand projects above the limits, "Load Shedding" procedure is initiated to reduce the network demand.

Based upon the time of day, each building/complex is assigned a priority for load-shedding. After determining which site is to shed loads, an equipment list for that building/complex is accessed to select the appropriate equipment items for turn off. The building is polled and maximum turn-off time requested is 20 minutes. There is a specific KW limit requested from each site. If still more load-shedding is required to bring the network demand within limits, the next building/complex on the priority list is polled and the turn-off request process repeated until the network demand is levelled.

Additionally, during periods of chiller operation, the operating engineer continually receives a query for specific data to determine the tonnage loads. This assists in the further analysis of operational efficiency and determines the next step required in load shedding.

SECTION V
REMOTE DATA ENTRY

I. CONTENTS

- Introduction and Summary
- Methodology
- Data

II. INTRODUCTION AND SUMMARY

Remote Data Entry is defined as:

"The entering of the operating and mechanical / electrical operating characteristics with the computer, such as outside air temperatures vs. room temperatures, chiller temperatures, etc.

The work completed in response to the requirements of Task 4 of the Statement of Work:

"Remote Data Entry ... The operating engineers in each building will be collecting data in written form (ESCO forms) as well as direct data entry into the computer from their I/O device. Those buildings having existing monitoring and reporting systems will be utilized if possible directly to the central computer system. As the RDE continues and the data base builds, the operating profiles of each facility will become more and more succinct with the respondent program update and validation continuing."

The work to support this Task represents approximately 27% of the ESCO total direct labor costs.

III. METHODOLOGY

ESCO personnel in close cooperation with building operating personnel have collected data in sufficient quantity to design computer software and a real time hardware system for automatic monitoring data entry from remote locations to a central computer facility. This includes software for the communications terminators (CT's).

IV. DATA

The computer programs developed for the National Energy Peak Levelling Program constitute three major groups:

- . RDE (Remote Data Entry)
  - Manual Backup
  - On-line System
- . Analysis (See Section VI, "Analysis," and Appendix D "Analysis and Feedback")
- . Feedback
  - Background Reporting

The manual backup program provided a means of obtaining electrical demand information from each of the participating complexes prior to the installation of the remote communications equipment. All information was manually logged in at each of the complex display terminals and then transmitted by telephone data line to ESCO for analysis.

The on-line system programs continuously monitor the electric consumption of the complexes using the remote communications equipment. The background reporting programs allow ESCO to obtain acquired data in report form for analysis.

The effort needed to accomplish the programming effort is included in the appropriate Statement of Work task allocation of resources. Additional program methodology is included in Appendix E, "Computer Programs."

MANUAL BACK UP PROGRAM

Because of the delays in acquiring some of the remote communications equipment, a manual backup program was developed so that preliminary demand information could be obtained from each of the five CCA complexes without the use of the on-line system.

The backup program required the manual input of demand information via display terminals. The demand information nominally is obtained through the use of electronic pulse counters one of which was installed on location for each of the ten demand meters. Each counter records a digital signal which is generated each time a specified KWH value has been consumed as determined by the demand meter. Each counter cycled and recycled from 0 to 999,999 pulses. At a maximum rate of one pulse per second (1PPS), therefore, it requires several days for the counter to recycle.

Each complex/building engineer logs the counter meter readings as frequently as possible during the course of normal business hours. Other information logged includes general building conditions and comments on existing conditions which might have affected the electrical load. At the engineer's discretion (usually once daily) and utilizing the building/complex's display terminal, the logged information is transmitted via data phone lines to ESCO for recording. The process is tutorial in that the user is prompted or is requested to supply specific input information.

The manual backup program has provided several unforeseen benefits. First, the installation of the devices and subsequent activities helped establish a rapport between the building engineers and ESCO employees. Secondly, the logging of data provided the building/complex personnel an opportunity to become familiar with the computer display terminals and their use. Finally, the analysis of data gave ESCO and CCA a benchmark of electrical consumption expectancies prior to the installation of the "black box" communications equipment.

The manual backup program is entitled "NEPLP." A user's manual, a program listing, a sample log, and a sample report are included as part of "NEPLP" documentation. (See Appendix E, "Computer Programs").

ON-LINE SYSTEM

The on-line system program is used for the continuous monitoring of the CCA electrical consumption. Of prime importance in the development of the program was the requirement for software that could not fail except in case of catastrophic equipment failure. Because of this requirement, the real-time features of FORTRAN were incorporated (through the use of sub-routines) into an enhanced version of the basic programming language. The use of "BASIC" provides a programming language that is simple to use and debug. "FORTRAN" provides an efficient language for the system.

The program driver called "SCAN," was tested thoroughly before being put on-line because of the aforementioned stringent requirement.

See also Appendix E, "Computer Programs."

SECTION VI

ANALYSISI. CONTENTS

- Introduction and Summary
- Methodology
- Data

II. INTRODUCTION AND SUMMARY

The analysis is defined as the review of data collected from all buildings /complexes. This effort is in response to the requirements of Task 5 of the Statement of Work:

"Analysis ... Once the sufficient quantity of raw data is in storage in the computer, interactive programs will collate and organize the data into a graphic form for evaluation of energy flow and management. The computer will trend all data in a variety of ways, providing a multifaceted view of the energy flows within each complex, and the impact of those energy flows on the utility network. From this analysis alternate or reduced flow patterns will be derived. The computer will present the actual conditions of the facility graphed against the projected energy flow patterns with the resultant of a model analysis program showing actual versus theoretical consumption expectancy patterns. Through this source, the optimized operating programs will be developed."

The work to support this Task represents approximately 23% of the ESCO total direct labor costs.

III. METHODOLOGY

ESCO personnel have designed computer software programs which analyze real time data. This is in recognition that most of the analysis is computer assisted. An overview understanding of the software is essential to the final appreciation of the analysis.

IV. DATA

Analysis programs are an integral part of the background reporting programs. Background reporting programs report the electrical demand/consumption data stored by the on-line system program. As the on-line system program executes, and as the various types of analysis are determined, the number of report types will increase and the reporting function will expand.

Currently, two types of reports are available. The first type will report data in list form. Presently, "RPT#1" and "RPT#2" print out one day's electrical consumption for the CCA and one day's electrical consumption for individual complexes, respectively.

The second type will report data in graphical form. "Plots" provide a list of the various plotting capabilities accessible to the analyst. The list is in menu form and allows the user to select the type of graphs(s) he desires. The program then chains to the proper plotting program. Program listings for "RPT#1", "RPT#2", and "Plots" are included in Appendix D "Analysis and Feedback." See also Appendix E, "Computer Programs."

SECTION VII

FEED BACKI. CONTENTS

- Introduction
- Methodology
- Data

II. INTRODUCTION AND SUMMARY

The Feedback and Corrections are defined as those which will be performed by building management and ESCO coordinators after the survey has been reviewed by building management. The data utilized will be primarily that generated by the Remote Data Entry Task (Section V) and analyzed prior to making specific recommendations to the building operators.

This effort is responsive to the requirements of Task 6 of the Statement of Work:

"Feedback ... As the actual and theoretical trending graphs are produced, the program will alert the analysis to possible areas of re-define and adjustment to the on-line system. As the corrections are made through the continued data monitoring program, effectiveness will be trended and measured."

III. METHODOLOGY

ESCO personnel and building management will review all phases and tasks of the study to determine where correction, redefinition, refinements and adjustments to the on-line system and the software are required.

IV. DATA

Only numerical efforts have been accomplished this year in this area. See also Section V, "Remote Data Entry" and Section VI, "Analysis" for corollary information, and Appendix D, "Analysis and Feedback," and Appendix E, "Computer Programs."

SECTION VIII

SOCIO-ECONOMICI. CONTENTS

This section is organized as follows:

- Introduction and Summary
- Methodology
- Data

II. INTRODUCTION AND SUMMARY

This study task's goal is to determine the effects the program will have on the operation of each building/complex when all of the set objectives are achieved. The particular concern on this task is the impact such as a cut-back on energy demand and consumption, on all levels from management to operations to tenant/occupants. The task involves the obtaining of insights from these various levels.

III. METHODOLOGY

During the execution of the Audit and Remote Data Entry Tasks, ESCO personnel have involved building/complex management and operating level personnel in the program. This had the effect of gaining additional cooperation as the program progressed.

The methods used were emperical and based on personal observation and contact.

As the other tasks progress, particularly Load Shedding Determination, and Remote Data Entry and Feedback, it becomes very evident that more formal research methods must be employed to gain insights particularly at tenant/occupant levels. For this reason, ESCO has requested that the services of a consultant in an appropriate field of behavior psychology be retained. Preliminary steps have been taken for the hiring of such a consultant through ERDA channels, but firm confirmation for the hiring of a competent consultant with professional expertise in the socio-economic area has yet to be made.

ESCO, in its other building service operations, has modified its course of study for building/complex supervisory personnel to include material on centralized electronic data and control systems as an aid to more effective supervision.

IV. DATA

During this year's progress in the Audit and Remote Data Entry Tasks, ESCO professional personnel found an attitude of enthusiastic cooperation on the part of all five building/complex managements involved in the program and to the wholly sincere attitude toward energy conservation on the part of building management.

The direct hands-on involvement with building operating personnel can be credited for their cooperating in the installation and operation of manual backup programs for Remote Data Entry equipment. Operating personnel have adopted an attitude of cooperation and curiosity in the program. The installation of the backup devices and subsequent activities helped establish a rapport between the building engineers and ESCO employees. The logging of the data provided another opportunity for building/complex personnel to become familiar (and to get a feel for the idiosyncrasies of electronic computer display terminals). See also Section V, "Remote Data Entry."

APPENDIX

APPENDICES
TO
NATIONAL ENERGY PEAK LEVELLING PROGRAM
YEAR-END REPORT
FOR
ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION
CONTRACT E(04-3)-1152

November 10, 1976

ENGINEERING SUPERVISION COMPANY

APPENDIX A

FINANCIAL MANAGEMENT

ENGINEERING SUPERVISION COMPANY

U.S. Energy Research and Development Administration
FINANCIAL MANAGEMENT REPORT
 (See Instructions on Reverse)

4. REPORTING PERIOD
September, 1976
 (Monthly)

1. CONTRACT TITLE National Energy Peak Levelling Program (ESCO Ref. #305.)	2. ADDRESSEE (Name, Title, Address, and ZIP Code) Energy Research and Development Admin. 350 S. Figueroa, #285, Los Angeles, CA 6. CONTRACTOR (Name, Address and ZIP Code) Engineering Supervision Company (ESCO) 170 Newport Ctr. Dr., Ste. 150, Los Angeles, CA 92660	3. CONTRACT NUMBER E(04-3)-1152	5. CONTRACT VALUE \$ 217,724.00 PROGRESS PAYMENTS RECEIVED \$																
7. REPORTING CATEGORY (Brief Description of Task)	8. COST ACCRUED <table border="1"> <tr> <th data-bbox="570 404 734 586" rowspan="2">CUMULATIVE ACTUAL END OF PRIOR PERIOD (a)</th> <th colspan="2" data-bbox="734 404 989 437">DURING PERIOD</th> <th colspan="2" data-bbox="989 404 1266 437">CUMULATIVE TO DATE</th> </tr> <tr> <th data-bbox="734 437 861 586">ACTUAL (b)</th> <th data-bbox="861 437 989 586">ESTIMATED (c)</th> <th data-bbox="989 437 1117 586">ACTUAL (a + b) (d)</th> <th data-bbox="1117 437 1266 586">ESTIMATED (a + c) (e)</th> </tr> </table>				CUMULATIVE ACTUAL END OF PRIOR PERIOD (a)	DURING PERIOD		CUMULATIVE TO DATE		ACTUAL (b)	ESTIMATED (c)	ACTUAL (a + b) (d)	ESTIMATED (a + c) (e)	9. ESTIMATED FUTURE COSTS <table border="1"> <tr> <th data-bbox="1266 404 1457 586">SUBSEQUENT MONTH (a)</th> <th data-bbox="1457 404 1638 586">BALANCE OF FISCAL YEAR JUNE-30 SEP-30 (b)</th> <th data-bbox="1638 404 1808 586">BALANCE OF CONTRACT (c)</th> </tr> </table>		SUBSEQUENT MONTH (a)	BALANCE OF FISCAL YEAR JUNE-30 SEP-30 (b)	BALANCE OF CONTRACT (c)	10. ESTIMATED FINAL COSTS 8(d) + 9(c)
CUMULATIVE ACTUAL END OF PRIOR PERIOD (a)	DURING PERIOD		CUMULATIVE TO DATE																
	ACTUAL (b)	ESTIMATED (c)	ACTUAL (a + b) (d)	ESTIMATED (a + c) (e)															
SUBSEQUENT MONTH (a)	BALANCE OF FISCAL YEAR JUNE-30 SEP-30 (b)	BALANCE OF CONTRACT (c)																	
Direct Labor	51703.84	9271.20		60975.04	(NOTE: This is a phase -		1581.96	62557.00											
Overhead	70317.23	12608.84	(See	82926.07	end and year-end summary.		2150.93	85077.00											
Direct Material	4293.27	3280.00	Note)	7573.27	"Balance of Contract" values,		20511.73	28085.00											
Special Equipment	7092.42	1121.58		8214.00	therefore, are unspent funds,		666.00	8888.00											
Travel	1536.36	255.50		1791.86	with no "Estimated Future		1483.14	3275.00											
Consultants	10409.84	0.00		10409.84	Costs" for this portion of the		1440.16	11850.00											
Sub-Contractors	0.00	0.00		0.00	contract.)		0.00	0.00											
Other Direct Costs	1101.78	372.16		1473.94			1526.06	3000.00											
Sub-Total	146454.74	26909.28		173364.02			29359.98	202724.00											
General and Administration		INCLUDED WITH OVERHEAD																	
Sub-Total	146454.74	26909.28		173364.02			29359.98	202724.00											
Fixed Fee	10830.00	1920.00		12750.00			2250.00	15000.00											
TOTAL	157284.74	28829.28		186114.02			31609.98	217724.00											
11. FINANCIAL MANAGEMENT REPORT NUMBER	12. DATE	13. APPROVAL (Signature of Contractor's Project Manager)			13. DATE	APPROVAL (Signature of ERDA Program Manager)													

U.S. Energy Research and Development Administration
FINANCIAL MANAGEMENT REPORT
 (See Instructions on Reverse)

4. REPORTING PERIOD
 September, 1-30, '76
 (Monthly)

1. CONTRACT TITLE

National Energy Peak
 Levelling Program

(ESCO Ref. #305.)

2. ADDRESSEE (Name, Title, Address, and ZIP Code)

Energy Research and Development Admin.
 350 S. Figueroa, #285, Los Angeles, CA

3. CONTRACT NUMBER

E(04-3)-1152

5. CONTRACT VALUE

\$ 217,724.00

PROGRESS PAYMENTS
 RECEIVED

\$

6. CONTRACTOR (Name, Address and ZIP Code)

Engineering Supervision Company (ESCO)
 170 Newport Ctr. Dr., Ste. 150, Newport Bch, CA 92660

7. REPORTING CATEGORY (Brief Description of Task)	8. COST ACCRUED					9. ESTIMATED FUTURE COSTS			10. ESTIMATED FINAL COSTS 8(d) + 9(c)
	CUMULATIVE ACTUAL END OF PRIOR PERIOD (a)	DURING PERIOD		CUMULATIVE TO DATE		SUBSEQUENT MONTH (a)	BALANCE OF FISCAL YEAR JUNE-30 SEP-30 (b)	BALANCE OF CONTRACT (c)	
		ACTUAL (b)	ESTIMATED (c)	ACTUAL (a + b) (d)	ESTIMATED (a + c) (e)				
Task 1, Audit	4724.68	0.0		4724.68					4724.68
Task 2, Bldg. Operating Profile	5575.02	1210.66		6785.68					5575.02
Task 3, Load Shed. Determ.	3607.64	508.24		4115.88					5986.12
Task 4, Remote Data Entry	14501.02	3791.33		18292.35					17127.52
Task 5, Analysis	12425.46	1180.00		13605.46					14724.79
Task 6, Feedback	1527.95	816.07		2344.02					2156.86
Socio-Economic	4225.00	11.58		4236.58					5426.86
Project Management	5117.07	1753.32		6870.39					6835.16
TOTAL	51703.84	9271.20		60975.04					62557.00
11. FINANCIAL MANAGEMENT REPORT NUMBER	12. DATE	APPROVAL (Signature of Contractor's Project Manager)			13. DATE	APPROVAL (Signature of ERDA Program Manager)			

U.S. Energy Research and Development Administration
MANPOWER UTILIZATION REPORT
(See Instructions on Reverse)

4. REPORTING PERIOD
September 1-30, '76
(Monthly)

1. CONTRACT TITLE

National Energy Peak
 Levelling Program

(ESCO Ref. #305.)

2. ADDRESSEE (Name, Title, Address, and ZIP Code)

Energy Research and Development Admin.
 350 S. Figueroa, #285, Los Angeles, CA

3. CONTRACT NUMBER

E(04-3)-1152

5. CONTRACT VALUE

\$ 217,724.00

PROGRESS PAYMENTS
 RECEIVED

\$

6. CONTRACTOR (Name, Address and ZIP Code)

Engineering Supervision Company (ESCO)
 170 Newport Ctr. Dr., Ste. 150, Newport Bch, CA 92660

7. REPORTING CATEGORY (Brief Description of Task)	8. MAN-HOURS WORKED					9. ESTIMATED FUTURE MAN-HOURS			10. ESTIMATED FINAL MAN-HOURS 8(d) + 9(c)
	CUMULATIVE ACTUAL END OF PRIOR PERIOD (a)	DURING PERIOD		CUMULATIVE TO DATE		SUBSEQUENT MONTH (a)	BALANCE OF FISCAL YEAR JUNE 30 (b)	BALANCE OF CONTRACT (c)	
		ACTUAL (b)	ESTIMATED (c)	ACTUAL (a + b) (d)	ESTIMATED (a + c) (e)				
Task 1, Audit	424.0	0.0		424.0					424.0
Task 2, Bldg. Operat. Profile	522.0	121.0		643.0					522.0
Task 3, Load Shed. Determ.	336.0	46.5		382.5					666.0
Task 4, Remote Data Entry	1509.0	437.0		1946.0					1907.0
Task 5, Analysis	1213.5	113.5		1327.0					1640.0
Task 6, Feedback	188.0	35.0		223.0					241.0
Socio-Economic	190.5	3.3		193.8					226.0
Project Management	304.0	107.0		411.0					392.0
TOTAL	4687.0	863.0		5550.0					6018.0

**11. MANPOWER UTILIZATION
 REPORT NUMBER**

12. DATE

**APPROVAL (Signature of Contractor's Project
 Manager)**

13. DATE

APPROVAL (Signature of ERDA Project Manager)

SCHEDULAR PERFORMANCE REPORT

(See Instructions on Reverse)

4. REPORTING PERIOD
Sept. 1-30, '76
(Monthly)
ERDA USE ONLY
PROJECT MANAGER

1. CONTRACT TITLE National Energy Peak Levelling Program (ESCO Ref. #305.)		2. ADDRESSEE (Name, Title, Address and ZIP Code) Energy Research and Development Admin. 350 S. Figueroa, #285, Los Angeles, CA		3. CONTRACT NUMBER E(04-3)-1152		6. APPROVED SCHEDULE DATE		EVALUATION DATE									
7. REPORTING CATEGORY		5. CONTRACTOR (Name, Address and ZIP Code) Engineering Supervision Company 170 Newport Ctr. Dr., Newport Bch, CA YEARS 1976												8. TECHNICAL OBJECTIVE % COMPLETED		EVALUATION	
		MONTHS 2 3 4 5 6 7 8 9 10 11 12															
Task 1, Audit														100%		Complete	
Task 2, Bldg. Operating Profile														100%		Complete	
Task 3, Load Shed. Determination														70%			
Task 4, Remote Data Entry														80%			
Task 5, Analysis														80%			
Task 6, Feedback														75%			
Socio-Economic														65%			
Project Management														75%			

LEGEND:

ERDA Approved Schedule
Contractor's Working Schedule

DATE

9. SUBMISSION APPROVAL (Signature of Contractor's Project Manager)

APPENDIX B

AUDIT

ENGINEERING SUPERVISION COMPANY

CONTENTS

This appendix is organized as follows:

A detailed review of the data described is presented here and is organized by operational audit site: Occidental Center, United California Bank, The May Company, Southern California Gas Company, and the Department of Water and Power.

An extensive detailed report of these data also has appeared earlier in the First Quarterly Report, February 1, 1976.

A. OCCIDENTAL CENTER

1. BUILDING LOCATION:

Occidental Center is located in the southern end of downtown Los Angeles, California. It is bounded by 12th Street, North, 11th Street, South, Olive Street, West and Broadway, East. Hill Street passes through the complex between two of the buildings.

2. GENERAL DESCRIPTION:

Occidental Center consists of three main buildings as follows:

- . Tower, west end, 32 floors above street level
- . Hill or Service Building, 11 floors above street level
- . Broadway Building, 10 floors above street level

In addition to the main buildings, this complex contains an auditorium attached to the north side of the Service Building. It includes two parking facilities, one at Olive Street with six floors, and one at Hill Street, three floors. Other open air parking facilities surround the Center. The entire complex accommodates 6000 office type personnel.

Occidental Center's main buildings are joined above and below ground. The Bridge Building is 11 floors above ground and connects 11 floors of the Tower with 11 floors of the Service

Building. The Service Building connects with the Broadway Building by an enclosed bridge at the third floor levels of the two buildings. This bridge also spans Hill Street which runs north and south.

The three buildings interconnect below ground with a Garden Level which encompasses the entire complex including the auditorium. The major part of the Garden Level houses the main cafeteria, and the remainder includes the elevator lobbies and sub-office space.

A sub-basement is under the Broadway and Tower Buildings. The Broadway Building sub-basement mainly houses custodial office space, the transformer vault and UPS facilities. The Tower sub-basement mainly houses custodial office space, transformer vault and the Central Plant.

In addition to the Main Cafeteria, there is a rooftop restaurant located at the 32nd floor of the Tower, and a restaurant located on the first floor of the Broadway Building. The roof of the Tower Building is a seldom-used Heliport.

3. AREA:

Gross Complex Area	1,592,000 sq. ft.
Net Rentable Area	1,137,776 sq. ft.
Tower Building Gross Area	608,000 sq. ft.
Service Building Gross Area	264,000 sq. ft.
Broadway Building Gross Area	378,000 sq. ft.
Auditorium Gross Area (496 seats)	15,000 sq. ft.
Bridge Building Gross Area	28,000 sq. ft.
Garden Level Gross Area	100,000 sq. ft.
Olive Street Parking Gross Area	91,500 sq. ft.
Hill Street Parking Gross Area	65,700 sq. ft.
Sub-basement Gross Area	67,200 sq. ft.

4. ELECTRICAL:

Two main feeders are supplied to the project. One feeder originates from the Velasko - 24th Street Sub-station, and the other originates from the Santee-Trinity Sub-station. Both feeders enter the Tower Building. The Velasko feeder is "closed switch" to the Central Plant and is the preferred power. The Santee feeder is "open switch" to the Central Plant and is the alternate power source. The Santee feeder is closed switch to the main switchboard which also feeds the Service Building. The Velasko feeder is open switch to the main switchboard and is the alternate power.

Two main feeders enter the Broadway Building. The same arrangement applies as in the Tower with preferred power into Bank Number 1 from Velasko and preferred power into Bank Number 2 from Trinity. Bank Number 1 supplies the main switchboard, and Bank Number 2 supplies UPS, east and west emergency bus, and a main switchboard. Preferred and alternate switches into each building are manually closed. Either power sources are available with prior clearance from the Department of Water and Power. Switches are interlocked to prevent two sources going on-line at the same time.

The Broadway Building houses the UPS facility for T.I.S. computer facilities. Main components are three 350-KW inverters and rectifiers, battery bank, and two 350-KW UPS emergency generators. The two 400HZ motor generator sets are located in the tenth floor.

Lighting through the building is 277 volts and is manually controlled from eight panels by the Guards. Normal operating hours are 6:30 a.m. to 6:30 p.m.

The convenience outlets receive their power from a single transformer located in each floor in the Tower Building and each floor in the Service Building and with two transformers per floor in the Broadway Building.

5. EMERGENCY GENERATORS:

The Tower and Service Buildings are served by 750-KW diesel-powered generator equipped with an automatic changeover

switch. The generator is located in the sub-basement of the Tower Building next to the low pressure boiler room. This generator provides the electrical power required for emergency lighting throughout this building.

All the elevators are returned to the first floor in a sequential order (automatic changeover). Then full power is supplied for one elevator for emergency operations.

The Broadway Building is served by a 1000 KW diesel-powered generator, equipped with an automatic changeover and located in the sub-basement floor. This generator has two main bus ducts:

- a. 400 amps
- b. 1000 amps

The 400-amp bus duct provides electrical power to the emergency lighting throughout the building and to the elevators which operate as in the Tower and Service Buildings. The 1000-amp bus duct provides electrical power to Cooling Tower No. 1, two condenser water pumps in the sixth floor, lighting in the computer room, two water chillers and package A/C units in the computer room, and a 10-ton package unit located in the tenth floor.

There are also two 350-KW emergency generators to support the UPS system which supplies electrical power to the computers located in the sixth floor.

6. COOLING SYSTEM:

Two complete systems provide all the chilled water required by the Occidental Center.

- a. Two centrifugal machines, 2000-ton capacity each, with their two cooling towers located on the roof of the Broadway Building. The chillers are located in the sub-basement of the Tower Building.
- b. Three absorption machines, located next to the chillers with their four cooling towers located on the roof of the Service Building.

Both systems have common chilled water supply and return pipes, but each has its separate chilled and condenser water pumps.

There are several package A/C units, located in the sixth floor of the Broadway Building where the computer room is located.

7. HEATING SYSTEM:

Five steam boilers, three low pressure (15 psi) and two high pressure (125 psi), supply all the steam coils in the Center's air handling units and the domestic hot water heat exchangers located in the sub-basement of the Tower Building.

8. AIR HANDLING UNITS:

Tower Building:

Basement Floor: Draw-through located in the sub-basement floor.

First Floor: Main lobby, double duct air handling unit located in the basement floor.

Second through 29th Floors: Typical double duct air handling unit in every floor.

30th Floor: Apartment and wine storage, double duct air handling unit located in the same floor.

31st Floor: Storage, no A/C.

32nd Floor: Double duct air handling unit for restaurant.

Services Building:

Basement Floor: Cafeteria and kitchen, two draw-through air handling units.

First Floor: Bank and stores, one multi-zone air handling unit located in the basement.

Second through 11th Floors: Office area, two double duct built-up units located in the second floor and two in the ninth floor, which supply all the air required by these floors.

Broadway Building:

Basement: Storage area, draw-through air handling unit located in the sub-basement.

First Floor: Main lobby and bank, two double duct air handling units located in the basement floor. Coffee shop has its own air handling unit located in the second floor fan room.

Second through 10th Floors: Office area, two double duct air handling units per floor located in their own fan room.

9. VERTICAL TRANSPORTATION:

Tower Building:

Four high-riser elevators which serve B, 1st, 11th, 21st through 30th floors (one down to sub-basement).

Four middle-riser elevators which serve basement, 1st, 11th through 20th floors.

Two elevators which serve 28th through 32nd floors.

One freight elevator which serves sub-basement through 32nd floors.

Bridge Building:

Four low-riser elevators which serve sub-basement through 11th floors.

Escalators (up and down) basement through the fifth floors.

Service Building:

Four passenger elevators which serve basement through 11th floors.

Broadway Building:

Four passenger elevators: basement through tenth floors.

Two passenger elevators: sub-basement through tenth floors.

One freight elevator: sub-basement through tenth floors.

One freight elevator: sub-basement through sixth floors.

Escalators (up and down) basement through second floors.

10. DOMESTIC COLD WATER:

There are house pumps at the bottom of the Tower, Service and Broadway Buildings with two domestic cold water storage tanks on top of each building.

There are two additional water make-up pumps for each set of cooling towers (Service and Broadway Buildings).

11. MAINTENANCE PERSONNEL:

The Occidental Center operating engineer's staff consists of 22 men: one Chief Engineer, two Assistant Chief Engineers, one Engineering Coordinator, one Operational Supervisor, and 17 Maintenance Persons.

12. EQUIPMENT OPERATION:

One of the two 2000-ton centrifugal chillers goes on-line whenever buildings require over 800 tons; below that, one

750-ton absorption machine handles the load. When building requirements exceed 2000 tons, one 750-ton absorption machine comes on-line, along with a 2000-ton chiller.

Air handling units generally are turned on at 6:30 a.m. and off at 6:30 p.m. except for those which operate 24 hours per day.

At present, there is a central control panel (Honeywell) capable of remote start-stop of all air handling units, cooling towers, and pumps, beside indicating temperature read-outs of the existing sensors, (return, mixed cold and hot supply air in most of the air handling units) and some alarm conditions, (filters, water pressures, fire alarms).

B. UNITED CALIFORNIA BANK

1. BUILDING LOCATION:

The United California Bank Building is located in downtown Los Angeles, California, and is bounded by Sixth Street, Hope Street and Wilshire Boulevard.

2. BUILDING DESCRIPTION:

Constructed in 1971 and occupied in October, 1973, the building occupies one-half of a city block and consists of 62 levels above street and four levels below.

LOWER LEVEL (LL03) - Mechanical Equipment Room

- a. Transformer Vault (two connected - one standby)
- b. One Sewage Pump, One Sump Pump
- c. Two Fire Pumps and Panels
- d. One Oil Pump

LOWER LEVEL (LL02) - Parking Area and Mechanical Equipment
Electrical Switch Panel

UPPER FIRST LEVEL (LL01) - Parking

- a. Security Office - Delta Alarm Panel
- b. Trash Room - One Compactor
- c. House Pump Control Panel

LOWER BASEMENT - Ramp - Loading Dock
No equipment on this level.

MAIN FLOOR (Lobby) Bank Area
Normal use bank-type office machines.

SECOND FLOOR - Elevator Pits
Escalator Machine Room

MEZZANINE (Third) FLOOR - Elevator Lobby

- a. Two Stairwells
- b. Thirty-three Elevators
- c. Warm Air System - WA-7

FOURTH FLOOR - Office and Mechanical-Electrical Areas

- a. Fan Room 442 -
  - Air System ACS-1 (Fans R1, E7)
  - Air Handling Systems AH-1, AH-2
  - Cooling Coil (1)
- b. Fan Room 444 -
  - Air System ACS-2
  - Air Handling Systems AH-3
- c. Fan Room 448 -
  - Air Handling Systems AH-4, AH-5
- d. Building Management Office

FIFTH FLOOR - Mechanical Equipment Room Office Area

- a. Fan Room 541 -
Air Systems ACS-5, ACC-6
- b. Fan Room 532 -
Air Systems ACS-3, ACS-4
- c. General Office Areas

SIXTH - 21st FLOORS - General Office Areas
Normal office machine equipment for tenants.

22nd FLOOR - Mechanical Equipment Room and Office Areas

- a. Mechanical Room 2218 -
Air Systems ACC-11, ACC-16, ACS-18
- b. Mechanical Room 2236 -
Air Systems WA-12
- c. Mechanical Room
Air Systems ACS-10, ACS-15, ACS-14, ACS-9
Cooling Coils (4)

23rd FLOOR - Office Areas, Mechanical Equipment Room
Warm Air System WA-17

24th - 40th FLOORS - General Office Areas
Normal office machines and equipment for tenants.

41st FLOOR - General Offices, Mechanical Equipment Room

- a. Mechanical Room 4318 -
Air System ACC21, ACS-25, ACS-20

- b. Mechanical Room 4230 -

Air Systems ACC-26

- c. Mechanical Room 4203 -

Air Systems ACS-19, ACS-24, ACS-23, ACS-18

Warm Air System WA-27

43rd - 60th FLOORS - General Office Areas

Normal office machines and equipment for tenants.

61st FLOOR - Mechanical Equipment Room, Dining and Kitchen

- a. Mechanical Room 6125 -

Air System ACC-31

- b. Room 6114 - Operating Center

Delta 2000 Central Control Panel

- c. Room 6116 -

Warm Air System WA-32

- d. Room 6122 -

Air Systems ACS-29, ACS-28

- e. Chiller Area -

Chillers CH-1, CH-2, CH-3, CH-4

500 KVA Emergency Generator (1)

Pumps P-1 to P-12

Variable Pump Panel

62nd FLOOR - Mechanical Equipment Areas

- a. Domestic Water Storage Tank

- b. Cooling Towers (4)
- c. Air System ACS-30
- d. Air System ACS-33

3. BUILDING AREA:

Lower Level LL03	32,650 sq. ft.
Lower Level LL02	32,650 sq. ft.
Lower Level LL01	32,650 sq. ft.
Lower Level LLBL	32,650 sq. ft.
Main Floor	21,740 sq. ft.
Mezzanine Floor	
Fourth Floor	21,580 sq. ft.
Fifth to 62nd Floors	
21,540 decreasing by 40 sq. ft. per floor	
62nd Floor	<u>19,260 sq. ft.</u>
TOTAL GROSS AREA	1,400,360 sq. ft.
APPROX. TOTAL RENTAL AREA	<u>1,250,000 sq. ft.</u>
UNUSABLE SPACE*	150,360 sq. ft.

NOTE: The building is estimated to be 55-60% occupied.

*Consists of mechanical space, vertical shafts and access space.

4. ELECTRICAL SYSTEM:

Three DWP transformers are located in the LL03, third lower level area; one feeds the entire building, the second one is connected as standby, and a third transformer is housed in this area as a backup unit not to be connected until required.

The demand meter is located in the transformer vault.

Incoming voltage is 1280V, stepped down to 480V with several electrical distribution busses feeding step-down transformers throughout the building.

All lighting is 277V and consists mainly of fluorescent fixtures operated from a central control panel.

5. EMERGENCY GENERATORS (Diesel Powered):

A 500 KVA diesel powered generator located on the 61st floor supplies the required emergency lighting throughout the building, any one elevator in the bank of 33, and other emergency equipment.

6. COOLING AND HEATING SYSTEMS:

Three types of built-up units are designated respectively as ACS, ACC and WA.

ACS - Air Cooling System - cooling only

ACC - Air Cooling Combination, also equipped with electric strip heater. Can provide cooling and heating as required.

WA - Warm Air Supply only. Supply fan with electric strip heater.

7. COOLING SYSTEM:

Four 896-ton centrifugal chillers (Carrier Model No. 19EA56 644) are located on the 61st floor.

Each chiller has its own primary chiller and condenser water pump. On the chill water side, four secondary chill water pumps are operated (one per chiller) as they are brought on-line.

The total connected tonnage is 3584 tons. Their operation is based on a combination of existing solar and return air temperatures. They are started manually.

8. HEATING SYSTEM:

This system consists of electric strip heaters located in several of the built-up air system units, designated as the ACC and WA systems. They are designed to provide the necessary air to the perimeter supply duct on every floor throughout the building.

Additional heat is supplied by the lighting system when the temperatures drop to 57° or below at night time. The fluorescent tubes necessary to raise the temperature are thermostatically switched on.

With the light heating method, interior zones do not require extra heating systems. Therefore, only the exterior zones are equipped with variable volume and double duct mixing boxes.

During cold weather seasons, the perimeter ducts supply the required heat. Conversely, during the cooling months the same ducts convey the necessary cooling.

9. AIR HANDLING UNITS:

- a. AH-1 Draw-through unit, located on the fourth floor, CHW-coil and reheat electric strip heater. This unit supplies air to the first and mezzanine floors, north zone.
- b. AH-2 Same as AH-1, except supplies air to the west zone.
- c. AH-3 Same as AH-1, except supplies air to the north zone.
- d. AH-4, AH-5 Same as AH-1, except supply the east side.
- e. AH-6 Draw-through unit located at LL03 with chilled water coil and reheat electric strip heater. This unit supplies air to the Fire Pump Room, B311.

10. VERTICAL TRANSPORTATION:

A total of 33 elevators and two escalators provide vertical transportation in the building.

Elevators 1-7	Mezzanine to 22nd floor
Elevators 9-16	Medium high rise, mezzanine - 42nd floor
Elevators 17-21	21 to 42nd floors
Elevators 22-26	High rise, mezzanine to 61st floors
Elevators 27-30	Shuttle, from garage levels to mezzanine floor
Elevators 31-32	"In bank" use only, main to mezzanine floor
Elevators 8-33	Freight elevators, serving entirety of building
Escalators 1-2	From main floor to mezzanine floors

All elevators are connected to the emergency generator, and operable one at a time when under emergency power supply conditions.

11. DOMESTIC COLD WATER:

Three main house pumps and one jockey pump, located on the lower level LL03.

A domestic water storage tank is located on the 61st floor.

During the day time the three pumps respond to all needs, at night time only the jockey pump responds.

12. MAINTENANCE PERSONNEL:

Chief Engineer	1
Assistant Chiefs	2
Carpenter	1
Mechanics	7
Apprentice	1
Electrical Engineers	<u>2</u>
TOTAL	14

The entire building operation is covered for 24 hours, five days a week.

13. CENTRAL MONITORING STATION:

A Honeywell Delta 2000 is located at the engineering operations center on the 61st floor. This is monitored by engineering operating personnel.

All major equipment can be started or stopped from this system.

In addition, sensor recording points can be monitored from this system.

C. MAY COMPANY

1. BUILDING LOCATION:

The May Company Building is located in downtown Los Angeles, California, and is bounded by Eighth Street, Broadway Street, and Hill Street.

2. BUILDING DESCRIPTION:

This building was constructed in 1906 as a dry goods store, and The May Company (major retail chain) took it over in 1926.

The building occupies about three-quarters of a city block and consists of ten full floors above street level and two floors below.

The first, second, third and fifth floors each have a mezzanine floor level.

Sub-basement: loading dock and package area

Basement: budget store floor

First Floor: general retail space and main entrance

First Floor Mezzanine: kitchen, coffee shop and office space

Second Floor: general retail space

Third Floor: general retail space

Fourth Floor: general retail space

Fifth Floor: general retail space

Fifth Floor Mezzanine: accounting, computer room, training room, etc.

Sixth Floor: storage area

Seventh Floor: office and storage area

Eighth and Ninth Floor: storage and maintenance area

3. BUILDING AREA:

Sub-basement	22,400 sq. ft.
Basement	104,000 sq. ft.

First Floor	104,000 sq. ft.
Mezzanine	32,000 sq. ft.
Second Floor	104,000 sq. ft.
Mezzanine	24,000 sq. ft.
Third Floor	104,000 sq. ft.
Mezzanine	8,000 sq. ft.
Fourth Floor	104,000 sq. ft.
Fifth Floor	104,000 sq. ft.
Mezzanine	24,000 sq. ft.
Sixth Floor	104,000 sq. ft.
Seventh Floor	32,000 sq. ft.
Eighth Floor	32,000 sq. ft.
Ninth Floor	32,000 sq. ft.

4. ELECTRICAL SYSTEM:

The total lack of any current building plans made a complete electrical system audit very difficult.

The lighting and power are on separate power service and each has its own electric meter.

Lighting panels are located throughout the building and are manually operated.

5. EMERGENCY GENERATOR:

None exist in the building.

6. COOLING SYSTEM:

- a. A 300-ton chiller located in the sub-basement provides chilled water to two built-up units located in the basement which cool the Budget Floor. This chiller has its own chilled condenser and water pump and cooling tower.
- b. Two 675-ton centrifugal chillers, located on the sixth floor roof, supply chilled water to four built-up units and one small draw-through unit. Each chiller has its own chilled and condenser water pumps and a common cooling tower.
- c. Three direct-expansion (DX) split systems are located on:
  - The ninth floor which conditions the accounting department on the fifth floor mezzanine.
  - The fifth floor mezzanine which conditions the computer room also on that floor.
  - The sixth floor roof which conditions the seventh floor office area.

7. HEATING SYSTEM:

None under present operation. Existing boilers in sub-basement not in operation.

8. AIR HANDLING UNITS:

- AH-1 This is a built-up unit located on the sixth floor roof with a cooling coil only, supply and return air fan, and economy cycle. This unit conditions the first and mezzanine floor.
- AH-2 Same type unit as AH-1, except it conditions the second and third floors.

- AH-3 Same as AH-1, except it conditions the fourth floor.
- AH-4 Same as AH-1, except it conditions the fifth floor.
- AH-5 This is an old built-up unit located in the basement with a cooling coil only and 100% outside air at all times. It conditions half of the basement (Budget Floor).
- AH-6 Same type unit as AH-5.
- AH-7 Draw-through unit, DX - coil with air-cooled condenser next to it, located on the sixth floor roof. It conditions part of the seventh floor office area.
- AH-8 Draw-through unit, with a chilled water coil, unit located on the sixth floor roof. It conditions part of the seventh floor office area.
- AH-9 Draw-through unit, with a chilled water coil also located on the sixth floor roof, presently is abandoned.
- AH-10 Draw-through unit, DX - coils, located on the fifth floor mezzanine, conditions the computer room. This unit has three air-cooled condensers located on the sixth floor roof. Operation is 24 hours per day.
- AC-1 Package A/C unit (three 5-ton compressors) with DX - coil located on the ninth floor, conditions the accounting department on the fifth floor. A small cooling tower with condenser water pump is located close to package unit.

9. VERTICAL TRANSPORTATION:

The building has 12 elevators, four in the center core of the building and eight in the south end.

Elevators No. 1 through 4: Customer Service Elevators located in the building center core (basement through fifth floors).

Elevators No. 5 through 8: Employees and freight located in the south end of the building (basement through ninth floor).

Elevators No. 9 through 12: Freight elevators located in the south end of the building (basement through ninth floor).

10. DOMESTIC COLD WATER:

House pumps are in the sub-basement with storage tanks located on the ninth floor roof. This constitutes the domestic water system and is completely manually controlled. When the water level is low in storage tanks, an alarm bell sounds and engineering personnel start the house pumps manually until the water level reaches normal operational level.

A gas heater in the sub-basement supplies the domestic hot water required in the building. Dishwashers in the coffee shop (first floor mezzanine) have electric booster coils as required.

Fire protection operates in a similar manner.

11. MAINTENANCE PERSONNEL:

The total maintenance staff consists of eleven people:

Chief Engineer	1
Electrician	1
Elevator and escalator man	1
Plumber	1
Air Conditioning man	1
Boiler man	1
Cash Register repair man	1
Helpers	4

12. EQUIPMENT OPERATIONAL PROCEDURES:

All air handling units are manually started about 8:00 a.m. and turned off about 6:00 p.m.

Chiller No. 1 and 3 are started when outside air reaches 68°F. Before that, all units are taking in 100% outside air. When the temperature reaches about 78°F, Chiller No. 2 is brought on-line to satisfy the building load.

D. SOUTHERN CALIFORNIA GAS COMPANY COMPLEX

1. BUILDING LOCATION:

The Southern California Gas Company Buildings are located in downtown Los Angeles, California, and are bounded by Flower Street, Hope Street, Eighth Street and Ninth Street.

2. BUILDING GENERAL DESCRIPTION:

The Complex consists of the following buildings:

- a. 12-story building of 111,200 sq. ft. completed in 1960 and located at 800 South Flower Street.
- b. 12-story building of 199,454 sq. ft. completed in 1926 and located at 810 South Flower Street.
- c. 5-story building of 60,994 sq. ft. completed in 1941 and located at 820 South Flower Street.
- d. 5-story building of 122,031 sq. ft. completed in 1955 and located at 830 South Flower Street.

All four buildings have a mezzanine floor and a basement.

Occupancy is general offices and customer service area. A computer facility is located on the fifth floor of the "830" Building. The executive offices are located on the 12th floor of the "810" Building.

At the time of the audit, the buildings were occupied by approximately 1530 employees.

The basement of the "820" Building includes an auditorium with adjoining kitchen facilities.

3. BUILDING AREA:

	<u>800</u>	<u>810</u>	<u>820</u>	<u>830</u>
Basement	8,000	18,290	8,642	17,433
1st Floor	7,200	17,582	8,642	17,433
2nd Floor	8,000	17,582	↓	↓
3rd Floor	8,000	14,568		
4th Floor		14,568		
5th Floor		14,568		
6th Floor		13,434		
7th Floor		13,434		
8th Floor				
9th Floor				
10th Floor				
11th Floor				
12th Floor				
TOTAL	↓	↓	↓	↓
	<u>111,200</u>	<u>199,459</u>	<u>60,494</u>	<u>122,031</u>

Total all buildings, 493,179 sq. ft.

4. ELECTRICAL SYSTEM:

800 Building:

One 4,800 volt feeder, designated "CS 443" is served from distribution Station #9 located at 926 Francisco Street.

One 460-volt transformer is located in the basement, with 120/208 volt transformers located in the basement and in the stairwells on alternate floors. The 277-volt lighting is controlled from lighting panels in the electrical closet on each floor.

810 Building:

The transformer at the rear of the 810 Building is serviced by two 34,500 volt feeders "Market Feeder E" and "Market Feeder F" which are supplied from a station at 560 South Wall Street. Switching from regular to preferred service is by means of an automatic transfer switch.

The "810," "820" and "830" Buildings are supplied from 4800 volt primary transformers and switchgear in the basement of the "810" Building.

Four combination kilowatt hour and demand meters are used to meter incoming power. Two of the meters located in the "810" Building are totalized on one billing.

Mechanical equipment in the "810", "820" and "830" Buildings on 220-volt power and 110-volts is used for lighting.

The majority of lighting in "810" and "820" is switched locally. Lighting in the "830" Building is switched from panels in the mechanical rooms.

Lighting throughout office areas is provided by fluorescent fixtures using F-40 lamps. Fixtures are either three-tube or four-tube depending on the area. In January, 1974, approximately 7,300 lamps were removed. Most three-tube fixtures were reduced to two tubes and four-tube fixtures to two tubes where possible.

As of July 1, 1975, a lighting level of 80 - 100 foot candles for office areas and 20 - 25 foot candles for corridors and restrooms is specified for Gas Company buildings.

5. EMERGENCY GENERATOR:

A 10 KW 120/240 volt single phase, natural gas fueled emergency generator is located on the roof of the "810" Building. It serves the upper floors of the "810" Building as well as security and communications equipment.

A 15 KW 120/240 volt single phase natural gas fueled emergency generator is located on the roof of the "830" Building. It serves stairwell lighting in "800", "810", "820" and "830" Buildings.

6. COOLING SYSTEM:

Each of the buildings has absorption water chilling equipment located on the roof which utilizes low pressure steam from boilers on the roof. The "810" Building has four 75-ton reciprocating compressors located in the basement which were in standby service.

The four buildings interconnect to form a common chilled water system. This allows chillers to be operated in various combinations as required by cooling load conditions.

One of the 150-ton absorbers on the roof of the "830" Building is operated continuously to provide cooling for a data processing facility on the fifth floor of the "830" Building. Supplemental cooling for the computer area is provided by chilled water fan coil units located on the computer floor.

Approximately thirty 18,000 BTU window units are still in use on the fourth floor of the "810" Building.

7. HEATING SYSTEM:

Heating hot water is produced by heat exchangers powered by low pressure steam.

Each air handler contains a heating and cooling coil. Plenum temperatures are reset from outside air temperature. Re-heat coils are provided in some zones.

Both steam and condensate return systems are interconnected to form a common system for all four buildings.

8. AIR HANDLERS:

The "800" Building contains a high pressure double duct system with supply and return fans located on the roof and in the basement.

Each floor in the "810", "820" and "830" Buildings is served by its own air handling unit. Typical floor units have hot and cold decks discharging into a single supply duct. Supply temperatures on most fan systems are reset from outside air.

The "800" and "810" Buildings have outside air dampers of sufficient size to permit some degree of outside air economization. All dampers do not have controls installed at the present time.

Ceilings are utilized for return air plenums. Typical ceiling construction is gypsum board covered with acoustic tile.

9. VERTICAL TRANSPORTATION:

800 Building:

Three passenger elevators

810 Building:

Four passenger elevators

One freight elevator (manually operated)

820 Building:

One freight elevator

830 Building:

Three passenger elevators

At 1830 hours, all but one car is secured in each bank of elevators.

10. DOMESTIC COLD WATER:

Domestic water pressure is maintained on the upper floors of the "800" and "810" Buildings by pneumatic pressure tanks mounted on the roof of each building.

"820" and "830" Buildings are supplied from City water pressure.

11. MAINTENANCE PERSONNEL:

Building Equipment Supervisor	1
Operating Engineers	4
Maintenance Men	4

Twenty-four hour coverage is required due to operation of the data processing area. One man is normally on duty nights and weekends.

Maintenance and repair work normally is performed in-house, including the absorption chillers and Honeywell automation system.

12. CONTROL SYSTEM:

All four headquarters have Honeywell pneumatic control systems.

Primary equipment in the "810", "820" and "830" Buildings is controlled from a Honeywell System 6 console. System 6 functions include manual and automatic start/stop supply, return and mixed air temperature readout, change of status and filter maintenance alarms, and intercom. Supply temperature reset is available only on the third floor of the "810" Building.

All equipment in the "800" Building is started and stopped manually at the present time.

E. DEPARTMENT OF WATER AND POWER BUILDING (DWP)

1. BUILDING LOCATION:

The Department of Water and Power Building is located in downtown Los Angeles, California, and is bounded by First Street and Hope Street.

2. BUILDING DESCRIPTION:

The Building consists of 15 floors above street level and two floors below, designated levels "A" and "B".

- "B" Level

Equipment rooms, print shop, photo shop, reproduction room.

- "A" Level

Kitchen, cafeteria, laboratory, auditorium, maintenance shops.

- First Floor

Main lobby, bank area and customers area.

- Second Floor

Computer room, key punch area.

- Third through 15th Floors

General Office.

3. BUILDING AREA:

"B" Level	(No A/C)
"A" Level	40,000 sq. ft.
1st Floor	40,000 sq. ft.

2nd Floor	40,000 sq. ft.
3rd Floor	40,000 sq. ft.
4th Floor	40,000 sq. ft.
5th Floor	40,000 sq. ft.
6th Floor	40,000 sq. ft.
7th Floor	40,000 sq. ft.
8th Floor	40,000 sq. ft.
9th Floor	40,000 sq. ft.
10th Floor	40,000 sq. ft.
11th Floor	40,000 sq. ft.
12th Floor	40,000 sq. ft.
13th Floor	40,000 sq. ft.
14th Floor	40,000 sq. ft.
15th Floor	<u>40,000 sq. ft.</u>
TOTAL NET A/C SPACE	640,000 sq. ft.

4. ELECTRICAL SYSTEM:

Two main electrical feeders come into the transformer and from there to the main distribution panel.

Power and lighting panels are located on every floor. All lighting systems are controlled from the central monitoring station in the "A" Level. Each panel has its own override switch (when used, pilot light indication in central panel). All lighting systems are 277 volts, chillers 4160 volts and motors 440 volts.

Lighting system is used as the source of heat for the building, (in combination with the operation of chillers C-2 or C-3).

5. EMERGENCY GENERATOR:

The building has one 500-KW emergency generator which provides the power for emergency lighting and the computer on the second floor.

6. COOLING SYSTEM:

There are three centrifugal chillers, designated C-1, C-2 and C-3, which provide all of the chilled water required by the building.

Chillers 2 and 3 have split condensers: one part of the condenser provides the heat required by the heating hot water supply to built-up units, Sl - 1 and Sl - 2. The other part of the condenser dissipates through heat cooling towers located on the roof.

Chiller 1 condenser heat is dissipated in the water pond surrounding the first floor of the building.

Chilled water circulates through all chillers in a common supply and return pipe system. The normal chiller operation is with C-2 or C-3 on-line. If additional capacity is required (about 80° DB outside temperature), C-2 comes on-line. There is seldom, if ever, a requirement for all three chillers on-line.

7. HEATING SYSTEM:

C-2 and C-3 have split condensers (see Cooling System) which supply heating hot water to the only two air handling units with heating coils in the building.

8. AIR HANDLING UNITS:

Sl-1 Double duct, built-up unit with heating and cooling coils which supply air to north half of building

perimeter of the typical floors (1st through 14th floors) and half of the entire 15th floor (supply device, mixing boxes).

- S1-2 Same as above, but supplies south end of building.
- S-2 Built-up unit with cooling coil only. Supplies air to induction units in ceiling, interior zones second and third floors.
- S-3 Same as S-2, except it supplies first and "A" Level floors.
- S-4 Same as S-2, except it supplies 4th, 5th and 6th floors.
- S-5 Same as S-2, except it supplies 7th, 8th, 9th and 10th floors.
- S-6 Same as S-2, except it supplies 11th, 12th, 13th and 14th floors.
- S-7 Double duct built-up unit with cooling coil only, which supplies air to mixing units located in the "B" Level floor.
- S-8 Draw-through unit with cooling coil only, which supplies conditioned air to the chiller room. A heat pump designated C-4 provides chilled water to this unit.
- S-9 Draw-through unit with DX-coil only which supplies conditioned air to the elevator equipment room in the building penthouse.

9. VERTICAL TRANSPORTATION:

There is a total of 20 elevators in the building.

Elevator No. 1 serves A, B Levels and 15th Floor.

Elevators No. 2 through 6 serve A, B Levels, 1st and 5th through 10th floors.

Elevators No. 7 through 12 cover A, B Levels, 1st and 10th through 15th floors.

Elevators No. 13 through 16 cover A, B Levels and 1st through 5 floors.

Elevator No. 17 covers 13th and 15th floor and the roof level.

Elevator No. 18 covers 15th floor, 15th floor mezzanine and the heliport level.

Elevators No. 19 and 20 cover A and B Levels.

An existing supervisory panel in the "A" Level shows each elevator's location at all times.

10. DOMESTIC COLD WATER:

Two house pumps with storage tank on roof. Domestic hot water is provided through the operation of the heat pump, C-4.

11. MAINTENANCE PERSONNEL:

General Chief Engineer (1), in charge of all the administration and the mechanical and electrical personnel.

a. Electrical Section:

Chief Electrician	1
Electricians	6
Helpers	4

b. Mechanical Section:

Chief Mechanic	1
Mechanics	8
Helpers	5

The building is under 24-hour supervision.

12. EQUIPMENT OPERATION:

Centrifugal chiller C-2 or C-3 is on-line 24 hours per day because of the second floor computer room which requires chilled water for the built-up units S1-1 and S1-2 and for S-2 during night and weekend operation.

Centrifugal chiller C-3 is on-line only when C-2 is incapable of taking care of the building load. This usually occurs when the outside air temperature reaches 80°F.

During the winter, the split-condenser in centrifugal chiller C-2 or C-3 provides the heating hot water required by the building. To operate the chiller, an A/C load is created by turning on nearly all of the fluorescent lights. At night, the time of operating the lights varies in reaction with the outside air temperature.

A heat pump, C-4, provides the necessary heat for the domestic hot water used by the building and the normal operating time is from 7:00 a.m. to 8:00 p.m. To operate C-4, air handling S-8 (chiller room) must be on.

APPENDIX C

ELECTRICAL CONSUMPTION BASE

This appendix contains detailed supporting information for Section III - Electrical Consumption Base, in the main report.

1. Occidental Center
2. The May Company
3. United California Bank
4. Southern California Gas Company
5. Department of Water and Power

METHODOLOGY

Two separate but compatible methodologies were utilized in obtaining the surveys:

- Light and power-meters (May Company) only.
- Standardized reporting forms, with meters (all others).

With minimal available engineering data, the oldest (1907) building, The May Company, lent itself to the use of the light- and power-meter approach by ESCO personnel. This test equipment was available at the site. The other buildings, without readily available test equipment, were surveyed with specially-designed, standardized form. The form not only assured standardization of recorded information, but provided step-by-step instructions for obtaining the data and calculating the resultant information. Complete cooperation and support was provided by the building operating staffs which had sufficient qualified personnel to assist. The data provides the capability to meaningfully establish building/complex power consumption.

APPENDIX C-1

ELECTRICAL CONSUMPTION BASE

OCCIDENTAL CENTER

NOTE: All spaces not filled in are not applicable to
this particular building.

ENGINEERING SUPERVISION COMPANY

LIGHTING SYSTEM

1. Fluorescent bulbs. (Lit only)

a.	No. F-40 lamps	<u>45,722</u>	X	40 watts	=	<u>1,828,880</u>	W
b.	No. F-30 lamps	<u>2,573</u>	X	30 watts	=	<u>77,190</u>	W
c.	No. F-20 lamps	<u>2,042</u>	X	20 watts	=	<u>600</u>	W
d.	No. F-96 lamps	<u> </u>	X	20 watts	=	<u> </u>	W
e.	No. F-15 lamps	<u> </u>	X	15 watts	=	<u> </u>	W
f.	No. F-__ lamps	<u> </u>	X	__ watts	=	<u> </u>	W
g.	TOTAL WATTS					1,906,670	W

2. Incandescent bulbs. (Lit only)

a.	No. 100 w lamps	<u>383</u>	X	100 watts	=	<u>38,300</u>	W
b.	No. 160 w lamps	<u>1</u>	X	160 watts	=	<u>160</u>	W
c.	No. 50 w lamps	<u>382</u>	X	50 watts	=	<u>6,600</u>	W
d.	No. 20 w lamps	<u>42</u>	X	20 watts	=	<u>840</u>	W
e.	No. <u> </u> w lamps	<u> </u>	X	<u> </u> watts	=	<u> </u>	W
f.	TOTAL WATTS					45,900	W

3. Mercury bulbs (Lit only)

a. No.   lamps   X   watts =   W

b. No.   lamps   X   watts =   W

c. TOTAL WATTS   W

4. Total Watts, all fixtures ($1g + 2f + 3c$) = 1,952,570 W

5.	Total Kilowatts (line 4 X 1000)	<u>1,953</u>	KW
6.	Operating Hours *		
a.	Monday <u>17</u>	hrs.	
b.	Tuesday <u>17</u>	hrs.	
c.	Wednesday <u>17</u>	hrs.	
d.	Thursday <u>17</u>	hrs.	
e.	Friday <u>17</u>	hrs.	
f.	Saturday <u>6</u>	hrs.	
g.	Sunday <u>6</u>	hrs.	
* If operating hours vary for different floors, add operating hours for for every floor and divide by the number of floors.			
7.	Total hours/week (6a + b + c + d + e + f + g)	<u>97</u>	hrs/wk.
8.	Total hours/month (line 7 X 4.3)	<u>417</u>	hrs/mo.
9.	KWH/month (line 5 X line 8)	<u>814,401</u>	kwh/mo.
10.	Total BTU lighting (line 9 X 3415)	<u>2,781,179,415</u>	BTU
11.	BTU/gross sq. ft. (line 10/gross sq. ft.)	<u>1,747</u>	BTU
12.	Watts/gross sq. ft.	<u>1.3</u>	W/sq. ft.

COOLING SYSTEM

13.	Single Zone _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
14.	Terminal Reheat _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
15.	Variable Volume _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
16.	Induction _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
17.	Double Duct _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
18.	Multi-Zone <u> X </u>	a. No. Air Handling Units	<u> 96 </u>	
19.	Total HP Air Handling Units (Add 13 to 19)		<u> 1,010 </u>	KW
20.	KW, Fans (line 19 X 0.746)		<u> 754 </u>	hrs/day
21.	Operating hours/day		<u> 18 </u>	hrs/day
22.	Operating hours/week		<u> 110 </u>	hrs/wk.
23.	Operating hours/month (line 22 X 43.)		<u> 473 </u>	hrs/mo.
24.	KWH/month (line 20 X line 23)		<u> 356,642 </u>	kwh/mo.

SUPPLY AND EXHAUST SYSTEM

25. Supply Fans:

a. No. Fans	<u>14</u>	
b. Total HP	<u>62</u>	HP
c. KW (line 25b X 0.746)	<u>47</u>	KW

26. Exhaust Fans:

a. No. Fans	<u>20</u>	
b. Total HP	<u>154</u>	HP
c. KW (line 26b X 0.746)	<u>115</u>	KW

27. Total Systems KW (line 25 + line 26)	<u>162</u>	KW
28. Operating hours/day	<u>15</u>	hrs/day
29. Operating hours/week	<u>85</u>	hrs/wk.
30. Operating hours/month (line 29 X 4.3)	<u>323</u>	hrs/mo.
31. KWH/month (line 27 X line 30)	<u>52,245</u>	kwh/mo.

SEWAGE AND SUMP SYSTEM

32. Sewage Pumps:

a. No. Pumps	<u>5</u>	
b. Total HP	<u>46</u>	HP
c. Kilowatts (line 32b X 0.746)	<u>36</u>	KW

33. Sump Pumps:

a. No. Pumps	<u>5</u>	
b. Total HP	<u>10</u>	HP
c. Kilowatts (line 33b X 0.746)	<u>8</u>	KW

34. Total System KW (line 32c + 33c)	<u>43</u>	KW

35. Operating hours/day	<u>8</u>	hrs/day

36. Operating hours/week	<u>56</u>	hrs/wk.

37. Operating hours/month (line 36 X 4.3)	<u>241</u>	hrs/mo.

38. KWH/month (line 34 x line 37)	<u>10,363</u>	kwh/mo.

COMPUTER SYSTEM SUPPORT

39. UPS:

a. KW capacity 700 KWb. KW used 400 KW

40. Computer Air Conditioners:

a. No. Units 30b. Total HP 68 HPc. Kilowatts (line 40b X 0.746) 51 KW41. Total System KW (line 39b + line 40c) 451 KW42. Operating hours/day 24 hrs/day43. Operating hours/week 168 hrs/wk.44. Operating hours/month (line 43 X 4.3) 722 hrs/mo.45. KWH/month (line 41 X line 44) 325,803 kwh/mo.

46. Elevators: (midrise)

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>14</u>	Ft.
b. No. floors travelled by elevator		<u>20</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>280</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>560</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>9.4</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{3.5}{60}$ Min	<u>.06</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.6</u>	hrs/mile
h. No. operating hours/day		<u>15</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	$\frac{.6}{15}$	<u>45</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>1,125</u>	kwh/mo.
k. No. of elevators		<u>4</u>	
l. Total elevators KWH/month (line 46j X 46k)	1125×4	<u>4,500</u>	kwh/mo.

47. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>14</u>	Ft.
b. No. floors travelled by elevator		<u>32</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>448</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>892</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>6</u>	Cycles Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{4.3}{60}$ Min	<u>.07</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.5</u>	hrs/mile
h. No. operating hours/day		<u>15</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW}}{\text{hrs.}} - \text{mile X line 46g X 46h}$		<u>38</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>950</u>	kwh/mo.
k. No. of elevators		<u>7</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>6,650</u>	kwh/mo.

48. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>14</u>	Ft.
b. No. floors travelled by elevator		<u>11</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>154</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>308</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>17.1</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{5.2}{60} \text{ Min}$	<u>.87</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.09</u>	hrs/mile
h. No. operating hours/day		<u>15</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	$.09 \quad 15$	<u>6.8</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>170</u>	kwh/mo.
k. No. of elevators		<u>10</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>1,700</u>	kwh/mo.

49. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>14</u>	Ft.
b. No. floors travelled by elevator		<u>10</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>140</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>280</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>19</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{3.7}{60} \text{ Min}$	<u>.06</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>1.14</u>	hrs/mile
h. No. operating hours/day		<u>24</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW}}{\text{hrs.}} - \text{mile X line 46g X 46h}$		<u>.37</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>3,425</u>	kwh/mo.
k. No. of elevators		<u>15</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>51,375</u>	kwh/mo.

50. Total facility elevators KWH/month

(line 46 1 + 47 1 + 48 1 + 49 1) 64,225 kwh/mo.

51. Escalators:

a. No. units	<u>18</u>	
b. Total HP	<u>105</u>	HP
c. Total system KW (line 51b X 0.746)	<u>79</u>	KW
d. Operating hours/day	<u>15</u>	hrs/day
e. Operating hours/week	<u>75</u>	hrs/wk.
f. Operating hours/month (line 51e X 4.3)	<u>323</u>	hrs/mo.
g. KWH/month (line 51c X 51f)	<u>25,517</u>	kwh/mo.

52. Elevator and Escalator total system KWH/month

(line 50 + 51g) 89,742 kwh/mo.

53. Total Energy:

Total Lighting System (line 9)	<u>814,401</u>	kwh/mo.
Total Cooling System (line 24)	<u>356,642</u>	kwh/mo.
Total Supply and Exhaust System (line 31)	<u>52,245</u>	kwh/mo.
Total Sewage and Sump System (line 38)	<u>10,363</u>	kwh/mo.
Total Computer Support System (line 45)	<u>325,803</u>	kwh/mo.
Total Elevator and Escalator System (line 49)	<u>89,742</u>	kwh/mo.
Grand Total Consumption	<u>1,649,196</u>	kwh/mo.

54.	<u>Electric Bill Consumption, KWH</u>	<u>Base Load</u>	<u>Central Plant</u>	
	January	2,950,700	1,649,196	1,301,504
	February	3,306,600	"	1,657,404
	March	2,800,400	"	1,151,204
	April	2,819,900	"	1,170,704
	May	2,908,000	"	1,258,804
	June	2,950,200	"	1,301,004
	July	2,978,000	"	1,328,804
	August	3,232,400	"	1,583,204
	September	2,970,200	"	1,321,004
	October	3,051,800	"	1,402,604
	November	2,849,600	"	1,200,404
	December	2,806,300	"	1,157,104

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OCCIDENTAL CENTER

ELECTRICAL CONSUMPTION BASE

APPENDIX C-2

ELECTRICAL CONSUMPTION BASE

THE MAY COMPANY

ENGINEERING SUPERVISION COMPANY

POWER

<u>PERIOD</u>	<u>KWH</u>	<u>KW DEMAND</u>
December, 1974	307,200	1,718
January, 1975	262,400	1,718
February, 1975	260,800	1,718
March, 1975	243,200	1,718.4
April, 1975	224,000	1,718.4
May, 1975	272,000	1,718.4
June, 1975	318,400	1,718.4
July, 1975	401,600	1,713.6
August, 1975	406,400	1,708
September, 1975	411,200	1,708
October, 1975	374,400	1,708
November, 1975	291,200	1,708

TOTAL KWH = 4,050,000

LIGHTING

<u>PERIOD</u>	<u>KWH</u>	<u>KW DEMAND</u>
December, 1974	417,000	1,193.4
January, 1975	370,800	1,224
February, 1975	389,100	1,227.6
March, 1975	366,000	1,229.4
April, 1975	356,700	1,229.4
May, 1975	364,200	1,229.4
June, 1975	393,900	1,229.4
July, 1975	377,700	1,229.4
August, 1975	359,100	1,229.4
September, 1975	384,000	1,229.4
October, 1975	394,500	1,229.4
November, 1975	400,800	1,261.8

TOTAL KWH = 4,573,800

POWER SERVICE

LIGHTING

C-2-1190

LIGHTING AND POWER

APPENDIX C-3

ELECTRICAL CONSUMPTION BASE

UNITED CALIFORNIA BANK

NOTE: All spaces not filled in are not applicable to
this particular building.

ENGINEERING SUPERVISION COMPANY

5. Total Kilowatts (line 4 X 1000) 1,368.6 KW

6. Operating Hours *

a. Monday 16 hrs.

b. Tuesday 16 hrs.

c. Wednesday 16 hrs.

d. Thursday 16 hrs.

e. Friday 16 hrs.

f. Saturday 2 hrs.

g. Sunday 0 hrs.

* If operating hours vary for different floors, add operating hours for
for every floor and divide by the number of floors.

7. Total hours/week (6a + b + c + d + e + f + g) 82 hrs/wk.

8. Total hours/month (line 7 X 4.3) 353 hrs/mo.

9. KWH/month (line 5 X line 8) 483,115.8 kwh/mo.

10. Total BTU lighting (line 9 X 3415) 1,649,840,457 BTU

11. BTU/gross sq. ft. (line 10/gross sq. ft.) 11.78 BTU

12. Watts/gross sq. ft. .977 W/sq. ft.

COOLING SYSTEM

13.	Single Zone _____	a. No. Air Handling Units	<u>5</u>	
		b. Total HP	<u> </u>	
14.	Terminal Reheat _____	a. No. Air Handling Units	<u>52.5</u>	
		b. Total HP	<u> </u>	
15.	Variable Volume _____	a. No. Air Handling Units	<u>60</u>	
		b. Total HP	<u>2,540.0</u>	
16.	Induction _____	a. No. Air Handling Units	<u> </u>	
		b. Total HP	<u> </u>	
17.	Double Duct _____	a. No. Air Handling Units	<u> </u>	
		b. Total HP	<u> </u>	
18.	Multi-Zone _____	a. No. Air Handling Units	<u> </u>	
19.	Total HP Air Handling Units (Add 13 to 19)		<u>2,592.5</u>	KW
20.	KW, Fans (line 19 X 0.746)		<u>1,934.0</u>	hrs/day
21.	Operating hours/day		<u>12</u>	hrs/day
22.	Operating hours/week		<u>65</u>	hrs/wk.
23.	Operating hours/month (line 22 X 43.)		<u>279.5</u>	hrs/mo.
24.	KWH/month (line 20 X line 23)		<u>538,620.</u>	kwh/mo.

SUPPLY AND EXHAUST SYSTEM

25. Supply Fans:

a. No. Fans	<u>9</u>	
b. Total HP	<u>42.75</u>	HP
c. KW (line 25b X 0.746)	<u>31.89</u>	KW

26. Exhaust Fans:

a. No. Fans	<u>15</u>	
b. Total HP	<u>134.08</u>	HP
c. KW (line 26b X 0.746)	<u>100.02</u>	KW

27. Total Systems KW (line 25 + line 26)	<u>131.91</u>	KW
28. Operating hours/day	<u>12</u>	hrs/day
29. Operating hours/week	<u>65</u>	hrs/wk.
30. Operating hours/month (line 29 X 4.3)	<u>279.5</u>	hrs/mo.
31. KWH/month (line 27 X line 30)	<u>36,869.0</u>	kwh/mo.

SEWAGE AND SUMP SYSTEM

32. Sewage Pumps:

a. No. Pumps	<u>3</u>	
b. Total HP	<u>22.5</u>	HP
c. Kilowatts (line 32b X 0.746)	<u>16.785</u>	KW

33. Sump Pumps:

a. No. Pumps	<u>3</u>	
b. Total HP	<u>22.5</u>	HP
c. Kilowatts (line 33b X 0.746)	<u>16.785</u>	KW

34. Total System KW (line 32c + 33c)	<u>33.57</u>	KW
35. Operating hours/day	<u>12</u>	hrs/day
36. Operating hours/week	<u>65</u>	hrs/wk.
37. Operating hours/month (line 36 X 4.3)	<u>279.5</u>	hrs/mo.
38. KWH/month (line 34 x line 37)	<u>9,383.0</u>	kwh/mo.

COMPUTER SYSTEM SUPPORT

39. UPS:

- a. KW capacity _____ KW
- b. KW used _____ KW

40. Computer Air Conditioners:

- a. No. Units _____
- b. Total HP _____ HP
- c. Kilowatts (line 40b X 0.746) _____ KW

41. Total System KW (line 39b + line 40c) _____ KW
42. Operating hours/day _____ hrs/day
43. Operating hours/week _____ hrs/wk.
44. Operating hours/month (line 43 X 4.3) _____ hrs/mo.
45. KWH/month (line 41 X line 44) _____ kwh/mo.

46. Elevators: (midrise)

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>60</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>900</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>1,800</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>2.93</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{10}{60}$ Min	<u>.166</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.486</u>	hrs/mile
h. No. operating hours/day		<u>12</u>	hrs/day
i. KWH/day: $\frac{(5 \text{ KW} - \text{mile X line 46g X 46h})}{\text{hrs.}}$	24.69	<u>123.45</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>3,086.25</u>	kwh/mo.
k. No. of elevators		<u>11</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>33,948.75</u>	kwh/mo.

47. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>22</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>330</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>660</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>8.5</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{9}{60}$ Min	<u>.15</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>1.2</u>	hrs/mile
h. No. operating hours/day		<u>12</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW}}{\text{hrs.}} - \text{mile X line 46g X 46h}$	10	<u>50</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>1,250</u>	kwh/mo.
k. No. of elevators		<u>16</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>20,000</u>	kwh/mo.

48. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>3</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>45</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>90</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>58.66</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{3}{60}$ Min	<u>.05</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>2.93</u>	hrs/mile
h. No. operating hours/day		<u>12</u>	hrs/day
i. KWH/day: $\frac{(5 \text{ KW} - \text{mile X line 46g X 46h})}{\text{hrs.}}$	$\frac{4.095}{\text{hrs.}}$	<u>20.47</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>511.47</u>	kwh/mo.
k. No. of elevators		<u>5</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>2,559.72</u>	kwh/mo.

49. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

- a. Typical floor to ceiling height. _____ Ft.
- b. No. floors travelled by elevator _____ Floors
- c. Ht. travelled by elevator (line 46a X 46b) _____ Ft.
- d. One elevator cycle = (46c X 2) _____ Ft.
- e. No. cycles per elevator mile $\frac{5280}{\text{Line 46d}} =$ _____ $\frac{\text{Cycles}}{\text{Mile}}$
- f. No. hours/cycle _____
- (Time elevator from your starting point and back.
Repeat five times and average your times).
- _____ Min _____ hrs/cycle
- g. No. hours/mile (line 46f X 46e) _____ hrs/mile
- h. No. operating hours/day _____ hrs/day
- i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$ _____ kwh/day
- j. KWH/month (line 46i X 25 days) _____ kwh/mo.
- k. No. of elevators _____
- l. Total elevators KWH/month (line 46j X 46k) _____ kwh/mo.

50.	Total facility elevators KWH/month		
	(line 46 l + 47 l + 48 l + 49 l)	<u>56,508.47</u>	kwh/mo.
51.	Escalators:		
a.	No. units	<u>2</u>	
b.	Total HP	<u>120</u>	HP
c.	Total system KW (line 51b X 0.746)	<u>89.52</u>	KW
d.	Operating hours/day	<u>12</u>	hrs/day
e.	Operating hours/week	<u>60</u>	hrs/wk.
f.	Operating hours/month (line 51e X 4.3)	<u>258.0</u>	hrs/mo.
g.	KWH/month (line 51c X 51f)	<u>23,096.16</u>	kwh/mo.
52.	Elevator and Escalator total system KWH/month		
	(line 50 + 51g)	<u>79,604.63</u>	kwh/mo.
53.	Total Energy:		
	Total Lighting System (line 9)	<u>483,115.</u>	kwh/mo.
	Total Cooling System (line 24)	<u>538,620.0</u>	kwh/mo.
	Total Supply and Exhaust System (line 31)	<u>36,869.0</u>	kwh/mo.
	Total Sewage and Sump System (line 38)	<u>9,383.0</u>	kwh/mo.
	Total Computer Support System (line 45)	<u>-----</u>	kwh/mo.
	Total Elevator and Escalator System (line 49)	<u>79,604.63</u>	kwh/mo.
	Grand Total Consumption	<u>1,147,591</u>	kwh/mo.

54.	<u>Electric Bill Consumption, KWH</u>	<u>Base Load</u>	<u>Central Plant</u>
	January	1,605,600	
	February	1,591,200	
	March	1,540,800	
	April	1,483,200	
	May	1,555,200	
	June	1,548,000	
	July	1,605,600	
	August	1,720,800	
	September	1,728,000	
	October	1,706,400	
	November	1,468,800	
	December	1,476,000	

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UNITED CALIFORNIA BANK

ELECTRICAL CONSUMPTION BASE

APPENDIX C-4

ELECTRICAL CONSUMPTION BASE

SOUTHERN CALIFORNIA GAS COMPANY

NOTE: All spaces not filled in are not applicable to
this particular building.

ENGINEERING SUPERVISION COMPANY

LIGHTING SYSTEM

1. Fluorescent bulbs. (Lit only)

a.	No. F-40 lamps	_____	X	40 watts	=	_____	W
b.	No. F-30 lamps	_____	X	30 watts	=	_____	W
c.	No. F-20 lamps	_____	X	20 watts	=	_____	W
d.	No. F-96 lamps	_____	X	20 watts	=	_____	W
e.	No. F-15 lamps	_____	X	15 watts	=	_____	W
f.	No. F-__ lamps	_____	X	__ watts	=	_____	W
g.	TOTAL WATTS	_____					W

2. Incandescent bulbs. (Lit only)

a.	No. 100 w lamps	_____	X	100 watts	=	_____	W
b.	No. 160 w lamps	_____	X	160 watts	=	_____	W
c.	No. 50 w lamps	_____	X	50 watts	=	_____	W
d.	No. 20 w lamps	_____	X	20 watts	=	_____	W
e.	No. __ w lamps	_____	X	__ watts	=	_____	W
f.	TOTAL WATTS	_____					W

3. Mercury bulbs (Lit only)

a.	No. __ lamps	_____	X	__ watts	=	_____	W
b.	No. __ lamps	_____	X	__ watts	=	_____	W
c.	TOTAL WATTS	_____					W

4. Total Watts, all fixtures (1g + 2f + 3c) = 608,680 W

5.	Total Kilowatts (line 4 X 1000)	<u>608.68</u>	KW
6.	Operating Hours *		
a.	Monday <u>11</u> hrs.		
b.	Tuesday <u>11</u> hrs.		
c.	Wednesday <u>11</u> hrs.		
d.	Thursday <u>11</u> hrs.		
e.	Friday <u>11</u> hrs.		
f.	Saturday <u>0</u> hrs.		
g.	Sunday <u>0</u> hrs.		

* If operating hours vary for different floors, add operating hours for for every floor and divide by the number of floors.

7.	Total hours/week (6a + b + c + d + e + f + g)	<u>55</u> hrs/wk.
8.	Total hours/month (line 7 X 4.3)	<u>236.5</u> hrs/mo.
9.	KWH/month (line 5 X line 8)	<u>143,953.</u> kwh/mo.
10.	Total BTU lighting (line 9 X 3415)	<u>491,599,495</u> BTU
11.	BTU/gross sq. ft. (line 10/gross sq. ft.)	<u>997.9</u> BTU
12.	Watts/gross sq. ft.	<u>1.234</u> W/sq. ft.

COOLING SYSTEM

13.	Single Zone _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
14.	Terminal Reheat _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
15.	Variable Volume _____	a. No. Air Handling Units	<u>1</u>	
		b. Total HP	<u>15</u>	
16.	Induction _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
17.	Double Duct _____	a. No. Air Handling Units	<u>17</u>	
		b. Total HP	<u>196.5</u>	
18.	Multi-Zone _____	a. No. Air Handling Units	<u>20</u>	
			<u>236.65</u>	
19.	Total HP Air Handling Units (Add 13 to 19)		<u>448.15</u>	KW
20.	KW, Fans (line 19 X 0.746)		<u>334.32</u>	hrs/day
21.	Operating hours/day		<u>13</u>	hrs/day
22.	Operating hours/week		<u>65</u>	hrs/wk.
23.	Operating hours/month (line 22 X 43.)		<u>279.5</u>	hrs/mo.
24.	KWH/month (line 20 X line 23)		<u>93,442.44</u>	kwh/mo.

SUPPLY AND EXHAUST SYSTEM

25.	Supply Fans:	13 hrs.		24 hrs.	
a.	No. Fans			2	
b.	Total HP		HP	5.5	HP
c.	KW (line 25b X 0.746)		KW	4.103	KW
26.	Exhaust Fans:				
a.	No. Fans	18		4	
b.	Total HP	43.40	HP	5	HP
c.	KW (line 26b X 0.746)	32.3764	KW	3.73	KW
27.	Total Systems KW (line 25 + line 26)	32.3764		7.833	KW
28.	Operating hours/day	13		24	hrs/day
29.	Operating hours/week	65		168	hrs/wk.
30.	Operating hours/month (line 29 X 4.3)	279.5		722.4	hrs/mo.
31.	KWH/month (line 27 X line 30)	9049.2038		5658.5592	kwh/mo.
				14707.763	

SEWAGE AND SUMP SYSTEM

32. Sewage Pumps:

a. No. Pumps 6

b. Total HP 13 HP

c. Kilowatts (line 32b X 0.746) 10.44 KW

33. Sump Pumps:

a. No. Pumps 2

b. Total HP 4 HP

c. Kilowatts (line 33b X 0.746) 2.98 KW

34. Total System KW (line 32c + 33c) 13.42 KW

35. Operating hours/day 10 hrs/day

36. Operating hours/week 50 hrs/wk.

37. Operating hours/month (line 36 X 4.3) 215 hrs/mo.

38. KWH/month (line 34 x line 37) 2,885.3 kwh/mo.

COMPUTER SYSTEM SUPPORT

39. UPS:

a. KW capacity _____ KW

b. KW used _____ KW

40. Computer Air Conditioners:

a. No. Units _____

b. Total HP _____ HP

c. Kilowatts (line 40b X 0.746) _____ KW

41. Total System KW (line 39b + line 40c) _____ KW

42. Operating hours/day _____ hrs/day

43. Operating hours/week _____ hrs/wk.

44. Operating hours/month (line 43 X 4.3) _____ hrs/mo.

45. KWH/month (line 41 X line 44) _____ kwh/mo.

46. Elevators: (midrise)

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>14</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>210</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>420</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>12.57</u>	$\frac{\text{Cycles}}{\text{Mile}}$
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{2}{60}$ Min	<u>.033</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.415</u>	hrs/mile
h. No. operating hours/day		<u>12</u>	hrs/day
i. KWH/day: $\frac{(5 \text{ KW} - \text{mile X line 46g X 46h})}{\text{hrs.}}$	28.9	<u>144.5</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>3,600</u>	kwh/mo.
k. No. of elevators		<u>7</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>25,200</u>	kwh/mo.

47. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>7</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>105</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>210</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>25.14</u>	Cycles Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{3}{60}$ Min	<u>.05</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>1.257</u>	hrs/mile
h. No. operating hours/day		<u>12</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	9.546	<u>47.73</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>11.93</u>	kwh/mo.
k. No. of elevators		<u>4</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>5,180</u>	kwh/mo.

48. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.	_____	Ft.
b. No. floors travelled by elevator	_____	Floors
c. Ht. travelled by elevator (line 46a X 46b)	_____	Ft.
d. One elevator cycle = (46c X 2)	_____	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	$\frac{\text{Cycles}}{\text{Mile}}$
f. No. hours/cycle		
(Time elevator from your starting point and back. Repeat five times and average your times).		
	$\frac{\text{Min}}{60}$	hrs/cycle
g. No. hours/mile (line 46f X 46e)	_____	hrs/mile
h. No. operating hours/day	_____	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	_____	kwh/day
j. KWH/month (line 46i X 25 days)	_____	kwh/mo.
k. No. of elevators	_____	
l. Total elevators KWH/month (line 46j X 46k)	_____	kwh/mo.

49. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.	_____	Ft.
b. No. floors travelled by elevator	_____	Floors
c. Ht. travelled by elevator (line 46a X 46b)	_____	Ft.
d. One elevator cycle = (46c X 2)	_____	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	$\frac{\text{Cycles}}{\text{Mile}}$
f. No. hours/cycle		
(Time elevator from your starting point and back. Repeat five times and average your times).		
	$\frac{\quad}{60}$ Min	hrs/cycle
g. No. hours/mile (line 46f X 46e)	_____	hrs/mile
h. No. operating hours/day	_____	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	_____	kwh/day
j. KWH/month (line 46i X 25 days)	_____	kwh/mo.
k. No. of elevators	_____	
l. Total elevators KWH/month (line 46j X 46k)	_____	kwh/mo.

50.	Total facility elevators KWH/month		
	(line 46 1 + 47 1 + 48 1 + 49 1)	<u>30,380</u>	kwh/mo.
51.	Escalators:		
	a. No. units	<u> </u>	
	b. Total HP	<u> </u>	HP
	c. Total system KW (line 51b X 0.746)	<u> </u>	KW
	d. Operating hours/day	<u> </u>	hrs/day
	e. Operating hours/week	<u> </u>	hrs/wk.
	f. Operating hours/month (line 51e X 4.3)	<u> </u>	hrs/mo.
	g. KWH/month (line 51c X 51f)	<u> </u>	kwh/mo.
52.	Elevator and Escalator total system KWH/month		
	(line 50 + 51g)	<u>30,380</u>	kwh/mo.
53.	Total Energy:		
	Total Lighting System (line 9)	<u>143,953</u>	kwh/mo.
	Total Cooling System (line 24)	<u>93,442.44</u>	kwh/mo.
	Total Supply and Exhaust System (line 31)	<u>14,707.76</u>	kwh/mo.
	Total Sewage and Sump System (line 38)	<u>2,885.30</u>	kwh/mo.
	Total Computer Support System (line 45)	<u>-----</u>	kwh/mo.
	Total Elevator and Escalator System (line 49)	<u>30,380</u>	kwh/mo.
	Grand Total Consumption	<u>285,368.5</u>	kwh/mo.

54.	<u>Electric Bill Consumption, KWH</u>	<u>Base Load</u>	<u>Central Plant</u>
	January	601,960	
	February	616,850	
	March	633,860	
	April	596,965	
	May	604,325	
	June	598,240	
	July	660,960	
	August	592,330	
	September	651,160	
	October	637,110	
	November	617,880	
	December	602,170	

SOUTHERN CALIF. GAS COMPANY

ELECTRICAL CONSUMPTION BASE

APPENDIX C-5

ELECTRICAL CONSUMPTION BASE

DEPARTMENT OF WATER AND POWER

NOTE: All spaces not filled in are not applicable to
this particular building.

ENGINEERING SUPERVISION COMPANY

LIGHTING SYSTEM

1. Fluorescent bulbs. (Lit only)

a.	No. F-40 lamps	<u>26,000</u>	X	40 watts	=	<u>1,040,000</u>	W
b.	No. F-30 lamps	<u> </u>	X	30 watts	=	<u> </u>	W
c.	No. F-20 lamps	<u> </u>	X	20 watts	=	<u> </u>	W
d.	No. F-96 lamps	<u> </u>	X	20 watts	=	<u> </u>	W
e.	No. F-15 lamps	<u> </u>	X	15 watts	=	<u> </u>	W
f.	No. F-__ lamps	<u> </u>	X	__ watts	=	<u> </u>	W
g.	TOTAL WATTS	<u> </u>				<u>1,040,000</u>	W

2. Incandescent bulbs. (Lit only)

a.	No. 100 w lamps	<u>50</u>	X	100 watts	=	<u>5,000</u>	W
b.	No. 160 w lamps	<u> </u>	X	160 watts	=	<u> </u>	W
c.	No. 50 w lamps	<u> </u>	X	50 watts	=	<u> </u>	W
d.	No. 20 w lamps	<u> </u>	X	20 watts	=	<u> </u>	W
e.	No. __w lamps	<u> </u>	X	__ watts	=	<u> </u>	W
f.	TOTAL WATTS	<u> </u>				<u>5,000</u>	W

3. Mercury bulbs (Lit only)

a.	No. __ lamps	<u> </u>	X	__ watts	=	<u> </u>	W
b.	No. __ lamps	<u> </u>	X	__ watts	=	<u> </u>	W
c.	TOTAL WATTS	<u> </u>				<u> </u>	W

4. Total Watts, all fixtures (1g + 2f + 3c) = 1,045,000 W

5.	Total Kilowatts (line 4 X 1000)	<u>1,045</u>	KW
6.	Operating Hours *		
a.	Monday <u>11</u> hrs.		
b.	Tuesday <u>11</u> hrs.		
c.	Wednesday <u>11</u> hrs.		
d.	Thursday <u>11</u> hrs.		
e.	Friday <u>11</u> hrs.		
f.	Saturday <u>3</u> hrs.		
g.	Sunday <u>0</u> hrs.		
* If operating hours vary for different floors, add operating hours for for every floor and divide by the number of floors.			
7.	Total hours/week (6a + b + c + d + e + f + g)	<u>58</u>	hrs/wk.
8.	Total hours/month (line 7 X 4.3)	<u>249.4</u>	hrs/mo.
9.	KWH/month (line 5 X line 8)	<u>260,623</u>	kwh/mo.
10.	Total BTU lighting (line 9 X 3415)	<u>890,027,545</u>	BTU
11.	BTU/gross sq. ft. (line 10/gross sq. ft.)	<u>1,483</u>	BTU
12.	Watts/gross sq. ft.	<u>1.7416</u>	W/sq. ft.

COOLING SYSTEM

13.	Single Zone _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
14.	Terminal Reheat _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
15.	Variable Volume _____	a. No. Air Handling Units	6	2
		b. Total HP	1.975 HP	700 HP
16.	Induction _____	a. No. Air Handling Units	_____	
		b. Total HP	_____	
17.	Double Duct _____	a. No. Air Handling Units	2	
		b. Total HP	900 HP	
18.	Multi-Zone _____	a. No. Air Handling Units	1	
19.	Total HP Air Handling Units (Add 13 to 19)		20	HP
			2,895	
20.	KW, Fans (line 19 X 0.746)	700	2,159.67 KW	hrs/day
		522.2		
21.	Operating hours/day	24	11	hrs/day
22.	Operating hours/week	120	55	hrs/wk.
23.	Operating hours/month (line 22 X 43.)	516	236.5	hrs/mo.
24.	KWH/month (line 20 X line 23)	269,455.2	510,761.95	kwh/mo.
			780,217.15	TOTAL kwh/mo.

SUPPLY AND EXHAUST SYSTEM

25.	Supply Fans:	<u>11 Hrs.</u>	<u>24 Hrs.</u>
a.	No. Fans	<u>4</u>	<u>6</u>
b.	Total HP	<u>450</u> HP	<u>650</u> HP
c.	KW (line 25b X 0.746)	<u>335.7</u> KW	<u>484.9</u> KW
26.	Exhaust Fans:		
a.	No. Fans	<u>13</u>	<u>4</u>
b.	Total HP	<u>204.5</u> HP	<u>35</u> HP
c.	KW (line 26b X 0.746)	<u>152.5</u> KW	<u>26.11</u> KW
27.	Total Systems KW (line 25 + line 26)	<u>488.6</u> ^{11 Hrs.}	<u>511.01</u> ^{24 Hrs.} KW
28.	Operating hours/day	<u>11</u>	<u>24</u> hrs/day
29.	Operating hours/week	<u>55</u>	<u>120</u> hrs/wk.
30.	Operating hours/month (line 29 X 4.3)	<u>236.5</u>	<u>516</u> hrs/mo.
31.	KWH/month (line 27 X line 30)	<u>115,473.49</u>	<u>263,681.16</u> kwh/mo.
		<u>379,154.65</u> TOTAL kwh/mo.	

SEWAGE AND SUMP SYSTEM

32. Sewage Pumps:

a. No. Pumps _____

b. Total HP _____ HP

c. Kilowatts (line 32b X 0.746) _____ KW

33. Sump Pumps:

a. No. Pumps 2

b. Total HP 2 HP

c. Kilowatts (line 33b X 0.746) 1.492 KW

34. Total System KW (line 32c + 33c) 1.492 KW

35. Operating hours/day 24 hrs/day

36. Operating hours/week 168 hrs/wk.

37. Operating hours/month (line 36 X 4.3) 722.4 hrs/mo.

38. KWH/month (line 34 x line 37) 1,077.82 kwh/mo.

COMPUTER SYSTEM SUPPORT

39. UPS:

a. KW capacity _____ KW

b. KW used _____ KW

40. Computer Air Conditioners:

a. No. Units _____

b. Total HP _____ HP

c. Kilowatts (line 40b X 0.746) _____ KW

41. Total System KW (line 39b + line 40c) _____ KW

42. Operating hours/day _____ hrs/day

43. Operating hours/week _____ hrs/wk.

44. Operating hours/month (line 43 X 4.3) _____ hrs/mo.

45. KWH/month (line 41 X line 44) _____ kwh/mo.

46. Elevators: (midrise)

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>17</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>255</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>510</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>10.35</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{5}{60}$ Min	<u>.083</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.089</u>	hrs/mile
h. No. operating hours/day		<u>10.5</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	<u>12.22</u>	<u>61.1</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>1,527.5</u>	kwh/mo.
k. No. of elevators		<u>7</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>10,692.5</u>	kwh/mo.

47. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>12</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>180</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>360</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>14.66</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{4}{60}$ Min	<u>.066</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.967</u>	hrs/mile
h. No. operating hours/day		<u>10.5</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$		<u>54.3</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>1,357.5</u>	kwh/mo.
k. No. of elevators		<u>5</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>6,787.5</u>	kwh/mo.

48. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>7</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>105</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>210</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>25.14</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{2}{60}$ Min	<u>.033</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>.837</u>	hrs/mile
h. No. operating hours/day		<u>10.5</u>	hrs/day
i. KWH/day: $\frac{5 \text{ KW} - \text{mile X line 46g X 46h}}{\text{hrs.}}$	12.54	<u>62.74</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>1,568.1</u>	kwh/mo.
k. No. of elevators		<u>4</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>6,272.4</u>	kwh/mo.

49. Elevators:

(Assume elevator is 2500# capacity, makes 150 stops/car miles and consumes 5 KWH per car mile)

a. Typical floor to ceiling height.		<u>15</u>	Ft.
b. No. floors travelled by elevator		<u>3</u>	Floors
c. Ht. travelled by elevator (line 46a X 46b)		<u>45</u>	Ft.
d. One elevator cycle = (46c X 2)		<u>90</u>	Ft.
e. No. cycles per elevator mile	$\frac{5280}{\text{Line 46d}} =$	<u>58.66</u>	<u>Cycles</u> Mile
f. No. hours/cycle			
(Time elevator from your starting point and back. Repeat five times and average your times).			
	$\frac{3}{60}$ Min	<u>.05</u>	hrs/cycle
g. No. hours/mile (line 46f X 46e)		<u>2.933</u>	hrs/mile
h. No. operating hours/day		<u>10.5</u>	hrs/day
i. KWH/day: $\frac{(5 \text{ KW} - \text{mile X line 46g X 46h})}{\text{hrs.}}$	3.97	<u>19.85</u>	kwh/day
j. KWH/month (line 46i X 25 days)		<u>496.25</u>	kwh/mo.
k. No. of elevators		<u>4</u>	
l. Total elevators KWH/month (line 46j X 46k)		<u>1,985.</u>	kwh/mo.

50.	Total facility elevators KWH/month		
	(line 46 1 + 47 1 + 48 1 + 49 1)	<u>25,737.4</u>	kwh/mo.
51.	Escalators:		
a.	No. units	<u> </u>	
b.	Total HP	<u> </u>	HP
c.	Total system KW (line 51b X 0.746)	<u> </u>	KW
d.	Operating hours/day	<u> </u>	hrs/day
e.	Operating hours/week	<u> </u>	hrs/wk.
f.	Operating hours/month (line 51e X 4.3)	<u> </u>	hrs/mo.
g.	KWH/month (line 51c X 51f)	<u> </u>	kwh/mo.
52.	Elevator and Escalator total system KWH/month		
	(line 50 + 51g)	<u> </u>	kwh/mo.
53.	Total Energy:		
	Total Lighting System (line 9)	<u>260,623</u>	kwh/mo.
	Total Cooling System (line 24)	<u>780,217.15</u>	kwh/mo.
	Total Supply and Exhaust System (line 31)	<u>379,154.65</u>	kwh/mo.
	Total Sewage and Sump System (line 38)	<u>1,077.82</u>	kwh/mo.
	Total Computer Support System (line 45)	<u>-----</u>	kwh/mo.
	Total Elevator and Escalator System (line 49)	<u>25,737.4</u>	kwh/mo.
	Grand Total Consumption	<u>1,446,809.9</u>	kwh/mo.

54.	<u>Electric Bill Consumption, KWH</u>	<u>Base Load</u>	<u>Central Plant</u>
	January	4,392,000	
	February	4,233,600	
	March	4,320,000	
	April	3,964,800	
	May	4,132,800	
	June	4,272,000	
	July	3,796,800	
	August	7,924,800	
	September	4,276,800	
	October	3,998,400	
	November	4,281,600	
	December	4,089,600	

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DEPARTMENT OF WATER AND POWER

ELECTRICAL CONSUMPTION BASE

APPENDIX D

ANALYSIS AND FEEDBACK

This appendix contains graphs of average demand history over a three-year period and for the combined meters demand history for 1975.

CCA PILOT PROJECT BUILDINGS
AVERAGE DEMAND HISTORY FOR
1973, 1974 AND 1975

27000	!												
26500	!							===	===				26417
26000	!							===	===	===	===		25826
25500	!						===	===	===	===	===		25574
25000	!					===	===	===	===	===	===	===	24757
24500	!					===	===	===	===	===	===	===	
24000	!	===			===	===	===	===	===	===	===	===	24018
23500	!	===		===	===	===	===	===	===	===	===	===	23320
23000	!	===	===	===	===	===	===	===	===	===	===	===	23140
22500	!	===	===	===	===	===	===	===	===	===	===	===	
22000	!	===	===	===	===	===	===	===	===	===	===	===	
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

CCA PILOT PROJECT BUILDINGS
COMBINED METERS
DEMAND HISTORY FOR 1975

26000	!								===				25766.8
25500	!							===	===	===			25333.8
25000	!							===	===	===			
24500	!					===	===	===	===	===			24478.2
24000	!				===	===	===	===	===	===	===		23931.2
23500	!		===	===	===	===	===	===	===	===	===	===	23439.6
23000	!	===	===	===	===	===	===	===	===	===	===	===	23120.6
22500	!	===	===	===	===	===	===	===	===	===	===	===	22479.4
22000	!	===	===	===	===	===	===	===	===	===	===	===	
21500	!	===	===	===	===	===	===	===	===	===	===	===	
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

APPENDIX E

COMPUTER PROGRAMS

ENGINEERING SUPERVISION COMPANY

CONTENTS

This appendix contains the following appended supporting information:

1.   Programming Methodology
2.   General Program Comments
3.   NEPLP User's Guide for Manual System Backup
4.   Scan Program for Monitoring Electrical Loads
5.   Report No. 1
6.   Report No. 2
7.   Plot 1-D
8.   Plot 2-D

PROGRAMMING METHODOLOGY

This system is driven by one time-shared user as a phantom-user which does all its communication through two assigned AMLC lines. The program is started as a phantom user with the command PH PHSCAN. Lines 5 and 6 must have previously been set up as assignable AMLC lines by configuring the system during startup with the following Config Command:

```
CONFIG      6    51    51    5/2    6/3
```

5 normal use is

+1 system terminal

paging and command
device

2 assigned
AMLC lines

3 phantom
users

After the system is configured, the lines must be assigned by the phantom user in the command file "PHSCAN." This is done as follows:

As AMLC 5

As AMLC 6

BASFRD SCAN

Notice that the version of BASIC used by SCAN is titled "BASFRD."

EVENT TABLE

Everything that occurs in the SCAN program is the result of a scheduled event. There are no interrupts. The event table is a series of occurrences to be executed at a certain time. Each event has the following information associated with it:

- Time of event
- Pointer to the next event
- Pointer to the previous event
- Event type code specifying what even is to occur
- Permanent/Temporary Code to indicate if the event is remaining in the event after it is executed or removed from the event table after execution.
- From zero to six parameters that further specify what type of an event is to be executed depending on what type of an event it is.

The event table might be visualized like the following example:

GENERAL PROGRAM COMMENTS

The system is started as a phantom user by giving the command PH PHSCAN and then entering any character into the System CRT. The System does not begin monitoring until the next quarter hour. If the program is being tested then enter "*" as the start character and the System will begin immediately instead of waiting for the next quarter hour and it will not initialize the canned messages.

If the system is reconfigured such that the assigned AMLC lines are changed, the variable L5 and L6 must be changed to reflect the new line numbers. The command file PHSCAN would also have to be changed.

NATIONAL ENERGY PEAK LEVELING PROGRAM (NEPLP)

USER'S GUIDE FOR MANUAL SYSTEM BACKUP

DEVELOPED FOR ERDA
BY
ENGINEERING SUPERVISION COMPANY

AUGUST 1976

SECTION A

THE PURPOSE OF SECTION A OF THIS USER'S GUIDE IS TO OUTLINE THE PROCEDURES FOR KEEPING LOGS OF REQUIRED GENERAL INFORMATION AND METER INFORMATION FOR USE IN SECTION B.

TRY TO LOG THE REQUIRED INFORMATION FROM 7:00 A.M. TO 6:00 P.M. EVERY DAY INCLUDING HOLIDAYS AND WEEKENDS. THE MORE INFORMATION THAT IS PROVIDED THE GREATER THE ENERGY SAVINGS. THE MOST IMPORTANT TIMES FOR THE RECORDING OF INFORMATION ARE WHEN THE ELECTRICAL LOAD IS THE GREATEST.

1.0 METER LOG

1.1 TIME: THIS LOG SHOULD BE KEPT FOR EACH ELECTRICAL METER IN THE BUILDING. WRITE DOWN THE DATE AND THE METER NUMBER AS SHOWN ON THE METER. THE TIME SHOULD BE RECORDED IN MILITARY TIME (FOR EXAMPLE: 8:00 A.M. = 0800 AND 5:00 P.M. = 1700). THE METER READING IS A NUMBER BETWEEN 0 AND 999,999. THIS DEVICE CAN BE CLEARED BUT THIS SHOULD NOT BE DONE BECAUSE INFORMATION WILL BE LOST WHEN THIS HAPPENS.

1.2 PULSES: TIME THE INTERVAL BETWEEN TWO PULSES OR METER INCREMENTS WHEN THE CURRENT METER READING IS RECORDED. IF THE TIME INTERVAL IS LESS THAN 10 SECONDS, TIME THE INTERVAL FOR FIVE TO TEN PULSES AND WRITE DOWN THE AVERAGE. EACH PULSE REPRESENTS A CONSTANT KWH CONSUMPTION. FROM THE TIME PERIOD BETWEEN PULSES, THE CURRENT ELECTRICAL LOAD ON THE METER IS CALCULATED AS FOLLOWS:

$$\text{ELECTRICAL LOAD (KW)} = (K/T) * 3600 \text{ (SECONDS/HOUR)}$$

WHERE K = KWH/PULSE FOR A METER (LABELED ON EACH METER)
AND T = TIME BETWEEN 2 PULSES (SECONDS)

1.3 COMMENTS: COMMENTS MAY ALSO BE ENTERED. IF YOU HAVE JUST TURNED ON OR OFF A MAJOR PIECE OF EQUIPMENT, PLEASE INDICATE SO HERE. ANY OTHER EXPLANATION FOR THE CURRENT ELECTRICAL LOAD MAY BE RECORDED IN THIS COLUMN.

2.0 GENERAL LOG

2.1 TIME PERIOD: WRITE DOWN THE TIME IN MILITARY TIME AS SHOWN IN SECTION 1.0 ABOVE.

2.2 AIR TEMPERATURE: ENTER THE OUTSIDE AIR DRY BULB TEMPERATURE (IF IT IS AVAILABLE) IN THE OAT COLUMN.

2.3 BUILDING OCCUPANCY: ENTER THE APPROXIMATE BUILDING OCCUPANCY IN THE BLDG OCC % COLUMN. THIS SHOULD RANGE FROM 0 (EMPTY BUILDING) TO 100 (WHEN THE BUILDING IS AS FULL AS IT EVER GETS).

2.4 COMMENTS: ENTER GENERAL COMMENTS ABOUT THE ENTIRE BUILDING AS IT RELATES TO THE BUILDING'S ELECTRICAL CONSUMPTION IN THE COMMENTS COLUMN.

SECTION B

THE PURPOSE OF SECTION B OF THIS USER'S GUIDE IS TO OUTLINE THE STANDARD OPERATING PROCEDURE FOR MANUALLY BACKING UP THE NEPLP SYSTEM FOR DATA ACQUISITION AND ANALYSIS. THE GUIDE IS WRITTEN IN SUCH A MANNER THAT IT MAY BE USED AS A CHECKLIST TO ENSURE PROPER PROGRAM EXECUTION. IN THIS SENSE, SEQUENTIALLY FOLLOW THE PROCEDURE UNLESS DIRECTED OTHERWISE.

NOTE THAT DURING PROGRAM EXECUTION, ALL REQUIRED INPUTS ARE REQUESTED. A ' / ' DENOTES STRIKING THE DISPLAY TERMINAL'S 'RETURN' KEY.

1.0 PROGRAM INITIALIZATION

1.1 EQUIPMENT CHECK:

1. LOCATE THE 'ON/OFF' SWITCH IN THE LOWER LEFT HAND RECESS IN THE BACK OF THE DISPLAY TERMINAL. FLIP THE SWITCH TO THE 'ON' POSITION. ENSURE THE TERMINAL IS ON BY STRIKING ANY OF THE KEYS ON THE KEYBOARD. WHEN THE CHARACTERS ARE ECHOED BACK ON THE DISPLAY, THE TERMINAL IS OPERATIONAL.

2. LOCATE THE 'ON/OFF' SWITCH IN THE RIGHT HAND SIDE OF THE RECESS IN THE FRONT OF THE ACOUSTIC COUPLER. TURN THE SWITCH 'ON'. WHEN THE RED LIGHT IS ON, THE ACOUSTIC COUPLER IS FUNCTIONAL.

3. LIFT THE TELEPHONE RECEIVER AND CALL THE OPERATOR. REQUEST A 'NON-INTERRUPTABLE DATA LINE CALL' TO 714-640-4807 AND CHARGE IT TO CREDIT CARD NUMBER 176-0092-182-N. IF THERE IS A BUSY SIGNAL, HANG UP, THEN TRY AGAIN IN ABOUT 10 MINUTES. AFTER THE PHONE RINGS ONCE, IT WILL EMIT A HIGH-PITCHED NOISE. CONNECT THE RECEIVER TO THE ACOUSTIC COUPLER. WHEN THE WHITE LIGHT IN THE COUPLER'S FRONT RECESS COMES ON, THE SYSTEM IS OPERATIONAL.

1.2 USER LOGIN:

1. TYPE 'LOGIN DEMAND / ' ON THE DISPLAY KEYBOARD. THE TERMINAL WILL SHOW SOME COMPUTER ACCOUNTING INFORMATION THEN IT WILL DISPLAY 'OK,'.

2. TYPE 'BASIC NEPLP / '. 'GO' WILL BE SHOWN AND AFTER A FEW SECONDS OF DELAY, THE PROMPT 'DO YOU WISH TO LOOK AT A USERS GUIDE (Y OR N):' WILL APPEAR. THE SYSTEM IS NOW READY FOR PROGRAM EXECUTION.

2.0 PROGRAM EXECUTION

2.1 EXECUTION TIME USERS GUIDE: A USERS GUIDE LISTING SOME GENERAL USER CONSIDERATIONS WHICH MAY NOT BE READILY APPARENT WILL BE DISPLAYED PRIOR TO EXECUTION IF 'Y' IS TYPED IN RESPONSE TO THE ABOVE PROMPT. OTHERWISE, THE GUIDE WILL NOT BE SHOWN.

2.2 TUTORIAL APPROACH: AS MENTIONED ABOVE, ALL REQUIRED USER INPUTS WILL BE REQUESTED. AS PER THE INSTRUCTIONS IN THE USERS GUIDE, ENTER INFORMATION IN THE PROPER FORMATS.

2.3 PASSWORDS: IF INITIATED PROPERLY, THE PROGRAM WILL REQUEST A 'PASSWORD' ENTRY PRIOR TO ANY DATA ACQUISITION AND PROCESSING. EACH USER WILL BE PROVIDED A UNIQUE PASSWORD. IF AN IMPROPER PASSWORD IS ENTERED, THE USER WILL BE LOGGED OFF THE SYSTEM. TO RESTART THE PROCEDURE, BEGIN AT STEP 1.2 ABOVE. OTHERWISE, CONTINUE AT STEP 3.0 BELOW.

2.4 ERROR MESSAGES: ANY OTHER IMPROPER INPUT OF INFORMATION WILL CAUSE AN ERROR TO BE FLAGGED TO THE USER VIA THE DISPLAY TERMINAL. PROPER DATA WILL BE REQUESTED.

2.5 FORCED EXIT: IF FOR ANY REASON THE USER DESIRES TO EXIT THE PROGRAM WITHOUT COMPLETION, STRIKE THE 'BREAK' KEY AND TYPE 'C ALL /' WHEN 'OK,' APPEARS. TO RESTART THE PROGRAM, GO TO STEP 1.2.2 ABOVE WHEN 'OK,' APPEARS ON THE SCREEN. TO TERMINATE PROGRAM EXECUTION, CONTINUE AT STEP 3.0 BELOW.

2.6 PROGRAM SYMBOLS: SHOWN BELOW IS A LIST OF SEVERAL PROGRAM VARIABLES.

OA TEMP	OUTSIDE AIR TEMPERATURE
ZOCC	PERCENTAGE OCCUPANCY OF THE BUILDING
/\KWH	CHANGE IN KWH SINCE PREVIOUS READING
LOAD IN KW	CURRENT KW LOAD
PULSE /\T	TIME IN SECONDS BETWEEN EACH PULSE

3.0 PROGRAM TERMINATION

3.1 USER LOGOUT:

1. AFTER SOME SYSTEM INFORMATION IS DISPLAYED SUBSEQUENT TO AUTOMATIC LOGOUT OF THE USER FROM THE SYSTEM, AN 'OK,' WILL BE DISPLAYED.

3.2 EQUIPMENT SHUTDOWN:

1. REMOVE THE RECEIVER FROM THE ACOUSTIC COUPLER AND REPLACE IT ON THE PHONE.

2. TURN THE ACOUSTIC COUPLER 'ON/OFF' SWITCH TO OFF. THE RED LIGHT WILL TURN OFF.

3. TURN THE DISPLAY TERMINAL'S 'ON/OFF' SWITCH TO THE OFF POSITION.

4.0 PROBLEM SOLVING

SHOULD THE USER HAVE ANY QUESTIONS, COMMENTS, OR PROBLEMS CONCERNING THE SYSTEM, PLEASE CALL ANY OF THE INDIVIDUALS LISTED BELOW AT 714-640-6700 .

JOHNNY ALBANO, JR.
JOHN R. SHERRIFF, JR.

DAILY BACKUP INFORMATION LOG

E-13

TODAY'S DATE -----

TIME   OA TEMP   %BLDG OCC   # CHILLERS   COMMENTS

METER READING

PULSE /\T

COMMENTS

1
2
3
4

TIME   OA TEMP   %BLDG OCC   # CHILLERS   COMMENTS

METER READING

PULSE /\T

COMMENTS

1
2
3
4

TIME   OA TEMP   %BLDG OCC   # CHILLERS   COMMENTS

METER READING

PULSE /\T

COMMENTS

1
2
3
4

TIME   OA TEMP   %BLDG OCC   # CHILLERS   COMMENTS

METER READING

PULSE /\T

COMMENTS

1
2
3
4

TIME   OA TEMP   %BLDG OCC   # CHILLERS   COMMENTS

METER READING

PULSE /\T

COMMENTS

1
2
3
4

TIME   OA TEMP   %BLDG OCC   # CHILLERS   COMMENTS

METER READING

PULSE /\T

COMMENTS

1
2
3
4

DATE: 09 / 01 /76

SCG GENERAL INFORMATION

TIME	OA TEMP	% OCC	# OF CHILLERS	COMMENTS
0830	89	-99	-99	
1130	89	-99	-99	
1430	89	-99	-99	

DATE: 09 / 01 /76

SCG ~~METER~~ INFORMATION

METER # 13

METER TIME READING	/\ KWH	PULSE /\T	LOAD IN KW	COMMENTS
0830 229348	31038	2.4	4320	
1130 233062	10696	2.4	4320	
1430 236921	11114	2.5	4147	

METER # 23

METER TIME READING	/\ KWH	PULSE /\T	LOAD IN KW	COMMENTS
0830 153794	17392	3.4	3049	
1130 155869	5976	4.9	2116	
1430 158383	7240	5.2	1994	

METER # 33

METER TIME READING	/\ KWH	PULSE /\T	LOAD IN KW	COMMENTS
0830 158775	36904	4.7	4412	
1130 160885	12154	5.2	3988	
1430 163490	15005	4.4	4713	

METER # 43

METER TIME READING	/\ KWH	PULSE /\T	LOAD IN KW	COMMENTS
0830 180838	16462	2.8	2962	
1130 183358	5806	3.7	2242	
1430 186418	7050	4.8	1728	

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100 PRINT 'PLEASE CALL UP 640-4805 NOW INSTEAD OF 640-4807'
500 REM-----NEPLP DRIVER-----
510 REM
520 REM     DEM1 = UFD FOR MAY COMPANY
530 REM     DEM2 = UFD FOR UCB
540 REM     DEM3 = UFD FOR SCG
550 REM     DEM4 = UFD FOR DWP
560 REM     DEM5 = UFD FOR OCCIDENTAL
570 REM
580 REM-----
1000 PRINT 'WHICH COMPLEX ?'
1100 PRINT 'ENTER:'
1200 PRINT '1 MAY COMPANY'
1300 PRINT '2 UCB'
1400 PRINT '3 GAS COMPANY'
1500 PRINT '4 DWP'
1600 PRINT '5 OCCIDENTAL'
1700 INPUT X
1800 A$='LO'
1900 IF X=1 THEN A$='A DEM1'
2000 IF X=2 THEN A$='A DEM2'
2100 IF X=3 THEN A$='A DEM3'
2200 IF X=4 THEN A$='A DEM4'
2300 IF X=5 THEN A$='A DEM5'
2400 DEFINE FILE #1='CFILE1'
2500 WRITE #1,A$
2550 WRITE #1,'CO CFILE2'
2600 CLOSE #1
2700 CALL 2
2800 END
```

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100 REM-----GENERAL INFORMATION-----
110 REM
120 REM      PROGRAM NAME:  NATIONAL ENERGY PEAK LEVEL PROGRAM
130 REM      PROGRAMMER:    J. ALBANO, JR.
140 REM      DATE - REV 1:  AUGUST 25, 1976
999 REM
1000 REM-----USER GUIDE-----
1005 CLOSE #1
1010 PRINT 'USERS GUIDE (Y OR N) ?':
1020 INPUT G$
1025 IF G$='QUIT' THEN CALL 2
1030 IF G$='N' THEN 1300
1040 IF G$<>'Y' THEN 1000
1050 PRINT '1. AFTER ENTERING A RESPONSE TO ANY PROMPT, STRI
      KE THE RETURN KEY.'
1055 PRINT
1060 PRINT '2. TO CLEAR THE CURRENT RESPONSE, TYPE ? PRIOR
      TO STRIKING'
1065 PRINT '  THE RETURN KEY, RE-ENTER THE PROPER RESPONSE,
      THEN HIT'
1070 PRINT '  THE RETURN KEY TO COMPLETE THE ENTRY.'
1075 PRINT
1080 PRINT '3. UNLESS OTHERWISE SPECIFIED, ANSWER Y TO ANSWE
      R YES OR N FOR NO.'
1085 PRINT
1087 PRINT '4. IF A VALUE IS UNAVAILABLE OR NOT DESIRED FOR
      ENTRY, TYPE -99.'
1088 PRINT
1090 PRINT '          *** TYPE C TO CONTINUE ***':
1095 INPUT G$
1096 IF G$='QUIT' THEN CALL 2
1100 PRINT '5. ENTER THE DATE AS FOR EXAMPLE  JULY 12 = 0712.'
1102 PRINT '  THE DATE TO BE ENTERED IS THE DATE OF THE RE
      PORT.'
1103 PRINT '  EACH REPORT MUST BE ENTERED CHRONOLOGICALLY
      IN ORDER.'
1105 PRINT
1110 PRINT '6. ENTER THE TIME IN MILITARY FORMAT AS FOR EXAMPLE'
1115 PRINT
1120 PRINT '          1:00 A.M.      =      0100'
1125 PRINT '          12:00 NOON      =      1200'
1130 PRINT '          5:00 P.M.        =      1700'
1135 PRINT '          MIDNIGHT        =      2400'
1140 PRINT
1145 PRINT '          *** TYPE C TO CONTINUE ***':
1150 INPUT G$
1151 IF G$='QUIT' THEN CALL 2
1155 PRINT '7. THE NUMBER OF TIME PERIODS WHICH MAY BE INPU
      T PER REPORT'
1160 PRINT '  DATE IS LIMITED TO 50 ENTRIES. THE TIME PERI
      ODS MUST BE'

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1165 PRINT ' ENTERED IN CHRONOLOGICAL ORDER.'
1170 PRINT
1175 PRINT '8. DATA FIELD (1 2 3 4 OR 5) REFERS TO THE VALU
      E SHOWN'
1180 PRINT ' IN LEFT TO RIGHT SEQUENTIAL ORDER OF THE DIS
      PLAYED LINE.'
1185 PRINT
1190 PRINT '9. ENTER ALL COMMENTS 1 LINE AT A TIME. EACH LI
      NE OF'
1195 PRINT ' COMMENT IS TO BE LESS THAN 30 CHARACTERS LONG.'
1198 PRINT
1199 PRINT '10. IN MOST INSTANCES,TYPE QUIT TO LOGOUT AT AN
      Y TIME.'

1204 PRINT ' *** TYPE C TO CONTINUE ***':
1205 INPUT G$
1206 IF G$='QUIT' THEN CALL 2
1300 REM-----DEFINE FILES-----
1430 DEFINE FILE #3='(A)'
1440 DEFINE FILE #8='METER'
1500 REM-----DIMENSION STATEMENTS-----
1520 DIM I(200,6),I$(200)
1540 DIM G(50,5),G$(50)
1560 DIM M(10,3),Z(5,2),N(4)
1570 DIM P(4,2),L(4)
1580 DIM C$(5,2),M$(10)
1600 REM-----SET DEFAULTS-----
1605 DATA 'MAY COMPANY','UCB','SCG','DWF','OCCIDENTAL'
1610 READ C$(1,2),C$(2,2),C$(3,2),C$(4,2),C$(5,2)
1630 DATA 'A','B','C','D','E'
1640 READ C$(1,1),C$(2,1),C$(3,1),C$(4,1),C$(5,1)
1650 ON END #8 GOTO 1740
1655 FOR N1=1,10
1660 READ #8,M(N1,1),M(N1,2),M(N1,3)
1670 NEXT N1
1740 DATA 1,2,3,1,4,4,8,1,9,2
1770 READ Z(1,1),Z(1,2),Z(2,1),Z(2,2),Z(3,1),Z(3,2),Z(4,1),
      Z(4,2),Z(5,1),Z(5,2)
1900 GOSUB 2000
1910 PRINT 'INPUT COMPLETED'
1920 GOSUB 5000
1930 REWIND #8
1950 FOR N1=1,10
1960 WRITE #8,M(N1,1)
1970 WRITE #8,M(N1,2)
1980 WRITE #8,M(N1,3)
1985 NEXT N1
1990 PRINT 'ANOTHER REPORT?':
1992 INPUT G$
1993 IF G$='QUIT' THEN CALL 2
1994 IF G$='N' THEN CALL 2
1995 IF G$<>'Y' THEN 1990

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1996  RESTORE
1997  GOTO 100
2000  REM-----GATHER INPUT DATA-----
2020  PRINT 'DATE OF REPORT:':
2021  INPUT D$
2022  IF LEN(D$)>4 THEN 2020
2023  IF D$='QUIT' THEN CALL 2
2024  IF D$='99' THEN CALL 2
2025  IF D$='-99' THEN CALL 2
2026  X=VAL(SUB(D$,1,2),X9)
2028  IF X>0 THEN IF X<13 THEN 2035
2030  GOTO 2020
2035  X=VAL(SUB(D$,3,4),X9)
2036  IF X>0 THEN IF X<32 THEN 2040
2038  GOTO 2020
2040  PRINT 'IS DATE CORRECT?':
2041  INPUT G$
2042  IF G$='99' THEN CALL 2
2043  IF G$='QUIT' THEN CALL 2
2044  IF G$='-99' THEN CALL 2
2045  IF G$='N' THEN 2020
2046  IF G$<>'Y' THEN 2040
2048  DEFINE FILE #1='LAST'
2050  READ #1,W$,X$
2055  IF W$<>D$ THEN X$='0'
2060  I$=STR$(VAL(X$,X9)+1)
2080  C=1
2251  PRINT 'PASSWORD?':
2252  INPUT G$
2253  IF G$='DAVE' THEN 2260
2258  PRINT 'WRONG PASSWORD - YOU ARE NOW BEING LOGGED OFF'
2259  CALL 2
2260  F$=C$(C,1)
2262  F9=0
2270  GOSUB 3000
2280  PRINT '# OF TIME PERIODS (MAX 50)?':
2300  INPUT N
2305  IF N<>INT(N) THEN 2280
2310  IF N>0 THEN IF N<51 THEN 2320
2312  GOTO 2280
2320  FOR I0=1,N
2340  PRINT 'PERIOD #':I0:'TIME ?':
2345  INPUT X
2346  IF X=99 THEN 2995
2347  IF X=-99 THEN 2995
2350  IF X<=0 THEN 2340
2355  IF X>2400 THEN 2340
2356  IF X<=X5 THEN 2340
2357  X$=STR$(X)
2360  GOSUB 4300
2365  G$(I0)=X$
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2370 X5=X
2380 PRINT 'OUTSIDE AIR TEMP?':
2400 INPUT G(I0,1)
2420 PRINT '% BLIG OCCUPANCY?':
2440 INPUT G(I0,2)
2442 IF G(I0,2)=-99 THEN 2460
2445 IF G(I0,2)>=0 THEN IF G(I0,2)<=100 THEN 2460
2450 PRINT 'ILLEGAL PERCENTAGE'
2455 GOTO 2420
2460 PRINT '# OF CHILLERS ON LINE?':
2480 INPUT G(I0,3)
2870 GOSUB 4000
2872 IF F9=F8 THEN 2890
2874 G(I0,4)=F8+1
2876 G(I0,5)=F9
2890 L8=1
2898 GOSUB 7100
2900 WRITE #3,TAB(5):G$(I0):TAB(10+2):G(I0,1):TAB(20):G(I0,
    2):TAB(30):
2904 WRITE #3,G(I0,3):TAB(45):I$(G(I0,4))
2906 GOTO 9300
2910 L9=1
2914 L1=G(I0,4)
2916 L2=G(I0,5)
2920 IF L2>L1 THEN 6000
2930 GOSUB 3400
2980 NEXT I0
2990 RETURN
2995 N=I0-1
2997 RETURN
3000 REM-----SELECT METER READINGS-----
3020 M=0
3040 FOR I1=0,Z(C,2)-1
3060 A=M(Z(C,1)+I1,1)
3100 PRINT 'ARE THERE READINGS FOR METER #':A:':?':
3120 INPUT G$
3130 IF G$='QUIT' THEN CALL 2
3140 IF G$<>'Y' THEN IF G$<>'N' THEN 3100
3160 IF G$='N' THEN 3280
3180 M=M+1
3200 N(M)=A
3220 P(M,1)=M(Z(C,1)+I1,3)
3225 P(M,2)=Z(C,1)+I1
3230 L(M)=M(Z(C,1)+I1,2)
3280 NEXT I1
3300 IF M<>0 THEN RETURN
3310 PRINT 'NO METERS ARE SPECIFIED'
3320 PRINT 'TYPE QUIT TO QUIT'
3330 PRINT 'TYPE A TO TRY AGAIN'
3340 INPUT G$
3345 IF G$='QUIT' THEN CALL 2

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3360 IF G$='A' THEN 3000
3370 GOTO 3320
3400 REM-----GATHER METER READINGS-----
3420 FOR I2=1,M
3430 K1=(I2-1)*10
3432 K2=K1+10
3440 PRINT 'INFO FOR METER #':N(I2)
3460 PRINT 'METER READING?':
3480 INPUT I(K2,1)
3481 IF I(K2,1)<>INT(I(K2,1)) THEN 3484
3482 IF I(K2,1)<=999999 THEN 3488
3484 PRINT 'PLEASE RE-ENTER'
3486 GOTO 3460
3488 IF I(K2,1)<0 THEN 3484
3490 GOSUB 8100
3500 PRINT 'TIME (SECONDS) BETWEEN PULSES?':
3520 INPUT I(K2,3)
3530 IF I(K2,3)<=0 THEN 3500
3540 I(K2,4)=3600*L(I2)/I(K2,3)
3550 I(K2,4)=INT(I(K2,4)+.5)
3860 GOSUB 4000
3862 IF F9=F8 THEN 3870
3864 I(K2,5)=F8+1
3866 I(K2,6)=F9
3870 L8=2
3876 GOSUB 7170
3878 WRITE #3,TAB(5):G$(I0):TAB(10):I(K2,1):TAB(20):I(K2,2)
      :TAB(30):
3880 WRITE #3,I(K2,3):TAB(40):I(K2,4):TAB(45):I$(I(K2,5))
3882 GOTO 9300
3884 GOSUB 9920
3886 L9=2
3888 L1=I(I0,5)
3890 L2=I(I0,6)
3892 IF L2>L1 THEN 6000
3900 NEXT I2
3920 RETURN
4000 REM-----COMMENTS-----
4010 F8=F9
4020 PRINT 'COMMENTS (TYPE 99 WHEN NONE OR DONE):':
4040 INPUT G$
4060 IF G$='99' THEN RETURN
4070 IF G$='-99' THEN RETURN
4080 IF LEN(G$)>30 THEN 4150
4100 F9=F9+1
4120 I$(F9)=G$
4140 GOTO 4040
4150 PRINT 'LENGTH OF LINE TOO LONG'
4160 GOTO 4040
4300 IF LEN(X$)=1 THEN X$='000'+X$
4310 IF LEN(X$)=2 THEN X$='00'+X$

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4320 IF LEN(X$)=3 THEN X$='0'+X$
4330 RETURN
5000 REM-----REPORT GENERATOR-----
5020 F$=F$+D$+I$
5040 DEFINE FILE #4=F$
5050 WRITE #4,'.H ///':F$:''
5055 WRITE #4,'.B'
5060 WRITE #4,'.N'
5080 WRITE #4,'.NFILE'
5100 WRITE #4,'.TT-Y'
5180 WRITE #4,TAB(5):'DATE':SUB(D$,1,2):'/'':SUB(D$,3,4):'/76'
5185 WRITE #4,''
5190 WRITE #4,TAB(20):C$(C,2):'GENERAL INFORMATION'
5200 WRITE #4,''
5215 WRITE #4,TAB(10+3):'DA':TAB(30):' * OF'
5220 WRITE #4,TAB(5):'TIME':TAB(10+2):'TEMP':TAB(20):'% OCC':
5240 WRITE #4,TAB(30):'CHILLERS':TAB(60):'COMMENTS'
5260 FOR I0=1,N
5270 WRITE #4,''
5290 WRITE #4,TAB(5):G$(I0):TAB(10+2):G(I0,1):TAB(20):G(I0,
      2):TAB(30):
5300 WRITE #4,G(I0,3):TAB(45):I$(G(I0,4))
5304 L9=3
5306 L1=G(I0,4)
5310 L2=G(I0,5)
5314 IF L2>L1 THEN 6000
5320 NEXT I0
5340 WRITE #4,'.E'
5370 WRITE #4,TAB(5):'DATE':SUB(D$,1,2):'/'':SUB(D$,3,4):'/76'
5375 WRITE #4,''
5380 WRITE #4,TAB(20):C$(C,2):'METER INFORMATION'
5440 FOR I2=1,M
5450 WRITE #4,''
5460 WRITE #4,TAB(5):'METER #':N(I2)
5480 WRITE #4,''
5490 WRITE #4,TAB(10):'METER':TAB(30):'PULSE':TAB(40):'LOAD'
5500 WRITE #4,TAB(5):'TIME':TAB(10):'READING':TAB(20):'/\ K
      WH':TAB(30):'/\T':
5520 WRITE #4,TAB(40):'IN KW':TAB(60):'COMMENTS'
5540 FOR I8=1,N
5542 K1=(I2-1)*10
5544 I0=K1+I8
5550 WRITE #4,''
5570 WRITE #4,TAB(5):G$(I8):TAB(10):I(I0,1):TAB(20):I(I0,2)
      :TAB(30):
5580 WRITE #4,I(I0,3):TAB(40):I(I0,4):TAB(45):I$(I(I0,5))
5588 L9=4
5590 L1=I(I0,5)
5592 L2=I(I0,6)
5594 IF L2>L1 THEN 6000
5600 NEXT I8

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5620 NEXT I2
5660 CALL 6(10)
5680 REWIND #1
5700 WRITE #1,D$
5720 WRITE #1,I$
5740 RETURN
5999 REM-----WRITE COMMENTS-----
6000 FOR L3=L1+1,L2
6005 ON L9 GOTO 6010,6010,6030,6030
6010 L8=3
6020 WRITE #3,TAB(45):I$(L3)
6025 GOTO 9300
6027 GOTO 6040
6030 WRITE #4,TAB(45):I$(L3)
6040 NEXT L3
6060 ON L9 GOTO 2930,3900,5320,5600
7100 REM-----CRT HEADERS-----
7120 WRITE #3,TAB(10+3):'DA':TAB(30):' # OF'
7130 WRITE #3,TAB(5):'TIME':TAB(10+2):'TEMP':TAB(20):'% OCC':
7135 WRITE #3,TAB(30):'CHILLERS':TAB(60):'COMMENTS'
7140 RETURN
7170 WRITE #3,TAB(10):'METER #':N(I2):TAB(30):'PULSE':TAB(4
    0):'LOAD'
7180 WRITE #3,TAB(5):'TIME':TAB(10):'READING':TAB(20):'/\ K
    WH':TAB(30):'/\T':
7190 WRITE #3,TAB(40):'IN KW':TAB(60):'COMMENTS'
7195 RETURN
8100 REM-----FIND DELTA METER READINGS-----
8110 I(K2,2)=I(K2,1)+1000000-P(I2,1)
8115 IF I(K2,2)>=1000000 THEN I(K2,2)=I(K2,2)-1000000
8116 I(K2,2)=I(K2,2)*L(I2)
8117 I(K2,2)=INT(I(K2,2)+.5)
8118 RETURN
9300 REM-----CORRECTIONS-----
9320 PRINT 'ABOVE INFO CORRECT?':
9340 INPUT Y$
9360 IF Y$='Y' THEN ON L8 GOTO 2910,3884,6040:
9380 IF Y$<>'N' THEN 9320
9400 ON L8 GOTO 9420,9600,9800
9420 PRINT 'WHICH DATA FIELD(1 2 3 4 OR 5) NEEDS CHANGE?':
9440 INPUT Y1
9450 IF Y1>=6 THEN 9420
9460 ON Y1 GOTO 9500,9520,9540,9560,9580
9480 GOTO 9420
9500 INPUT X
9502 IF X>0 THEN IF X<=2400 THEN 9507
9504 PRINT 'PLEASE RE-ENTER TIME'
9506 GOTO 9500
9507 X$=STR$(X)
9508 GOSUB 4300
9509 G$(I0)=X$

```


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```
9510 GOTO 2898
9520 INPUT G(I0,1)
9530 GOTO 2898
9540 INPUT G(I0,2)
9542 IF G(I0,2)=-99 THEN 2898
9545 IF G(I0,2)>=0 THEN IF G(I0,2)<=100 THEN 2898
9550 PRINT 'ILLEGAL PERCENTAGE'
9555 GOTO 9540
9560 INPUT G(I0,3)
9570 GOTO 2898
9580 INPUT I$(G(I0,4))
9582 IF I$(G(I0,4))='99' THEN I$(G(I0,4))=''
9583 IF I$(G(I0,4))='-99' THEN I$(G(I0,4))=''
9584 IF LEN(I$(G(I0,4)))<=30 THEN 9590
9586 PRINT 'LENGTH OF LINE TOO LONG'
9588 GOTO 9580
9590 GOTO 2898
9600 PRINT 'WHICH DATA ITEM (1 2 4 OR 6) NEEDS CHANGE?':
9620 INPUT Y1
9630 IF Y1>=7 THEN 9600
9640 ON Y1 GOTO 9660,9670,9600,9700,9600,9720
9650 GOTO 9600
9660 INPUT X
9661 IF X>0 THEN IF X<=2400 THEN 9665
9662 PRINT 'PLEASE RE-ENTER TIME'
9663 GOTO 9660
9665 X$=STR$(X)
9666 GOSUB 4300
9667 G$(I0)=X$
9668 GOTO 3876
9670 INPUT I(K2,1)
9671 IF I(K2,1)<>INT(I(K2,1)) THEN 9674
9672 IF I(K2,1)<=999999 THEN 9678
9674 PRINT 'PLEASE RE-ENTER READING'
9676 GOTO 9670
9678 IF I(K2,1)<0 THEN 9674
9684 GOSUB 8100
9690 GOTO 3876
9700 INPUT I(K2,3)
9702 IF I(K2,3)>0 THEN 9705
9703 PRINT 'PLEASE RE-ENTER'
9704 GOTO 9700
9705 I(K2,4)=3600*L(I2)/I(K2,3)
9707 I(K2,4)=INT(I(K2,4)+.5)
9710 GOTO 3876
9720 INPUT I$(I(K2,5))
9722 IF I$(I(K2,5))='99' THEN I$(I(K2,5))=''
9723 IF I$(I(K2,5))='-99' THEN I$(I(K2,5))=''
9724 IF LEN(I$(I(K2,5)))<=30 THEN 3876
9726 PRINT 'LENGTH OF LINE TOO LONG'
9728 GOTO 9720
```

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```
9800 PRINT 'ENTER CHANGE:':
9820 INPUT I$(L3)
9825 IF I$(L3)='99' THEN I$(L3)=''
9826 IF I$(L3)='-99' THEN I$(L3)=''
9830 IF LEN(I$(L3))>30 THEN 9800
9840 GOTO 6020
9920 P(I2,1)=I(K2,1)
9925 M(P(I2,2),3)=P(I2,1)
9930 X$=STR$(M(P(I2,2),1))
9940 W$='M'+X$
9945 DEFINE FILE #5=W$
9950 ON END #5 GOTO 9975
9955 READ #5,T$
9960 GOTO 9955
9975 WRITE #5,D$:G$(I0):G(I0,3):G(I0,1):P(I2,1):I(K2,4)
9980 RETURN
```

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```
10 REM; REV 11.03 VERSION OF SCAN ; SEPT. 5 1976
20 REM: AUTHOR: JOHN SHERRIFF
30 REM: DEVELOPED FOR THE ERDA NATIONAL ENERGY PEAK
35 REM: LEVELING PROGRAM
40 DEF FNA(X)=INT(X/100)
45 DEF FNB(X)=FNA(X)*60+X-FNA(X)*100
50 DEF FNC(X)=INT(X*100)/100
55 DEF FND(X)=INT(X/60)*100+INT(X)-INT(X/60)*60
60 DIM B(10),C(16,4),C$(10,2)
65 DIM D(5,2),E(200,3),G(10,3)
70 DIM H(10),H$(5),I(4),J(5)
75 DIM L(200),Y$(5)
80 DEFINE FILE #1='TEMP1'
85 REM:----- INITIALIZE GENERAL VARIABLES-----
90 FOR Y=200 TO 4 STEP -1
95 L1=L1+1
100 L(L1)=Y
105 NEXT Y
110 DATA 17,6,70,60,5
115 READ E9,L6,D1,W1,L5
120 DEFINE READ FILE #3='METER1',BIN
125 MAT READ #3,D,G
130 DEFINE READ FILE #3='METER2',ASC SEP
135 FOR Y=1 TO 10
140 READ #3,C$(Y,1),C$(Y,2)
145 NEXT Y
150 Y$(1)='01'
155 Y$(2)='02'
160 Y$(3)='03'
165 Y$(4)='04'
170 Y$(5)='05'
175 H$(1)='MAY'
180 H$(2)='UCB'
185 H$(3)='SCG'
190 H$(4)='DWP'
195 H$(5)='OCC'
200 CALL 9(4)
205 F$='ERDCON>C'+SUB(D$,2,6)
210 DEFINE FILE #2=F$,BIN
220 F$='ERDEXP>E'+SUB(D$,2,6)
225 DEFINE FILE #6=F$
230 F$='NM'+SUB(D$,2,4)
235 DEFINE FILE #7=F$
240 WRITE #7,'DATE = '+D$
245 CALL 4(26,L6,K,K1)
250 IF K=0 THEN 245
260 K=0
350 REM:----- RESET REMOTE CLOCKS-----
360 REM: AND START MICROS MONITORING
370 REM: AT THE NEXT QUARTER HOUR
380 CALL 7(T2,T3)
```

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```
390 T4=T2+T3/60
400 IF Z$='*' THEN 420
410 CALL 6(T4-INT(T4/15)*15)
420 X$='REMOTE UNITS STARTED'
430 CALL 3(24,L6,LEN(X$))
440 U$='*900*'
450 CALL 3(21,L5,LEN(U$))
500 REM:----- INITIALIZE THE EVENT TABLE-----
      -----
510 DEFINE READ FILE #3='INVENT',BIN DA,49
520 DEFINE FILE #5='REVENT',BIN DA,45
530 GOSUB 9400
535 IF E9=0 THEN 660
540 FOR Y=1 TO E9
550 READ #3,Y$
570 IF SUB(Y$,1,7)='*****' THEN 640
580 T5=FNR(VAL(SUB(Y$,1,7),X9))
610 Y$=SUB(Y$,8,95)
620 GOSUB 9800
630 GOTO 650
640 GOSUB 9600
650 NEXT Y
660 X$='EVENT TABLE INITIALIZED'
670 CALL 3(24,L6,LEN(X$))
1100 REM:----- SCAN DRIVER-----
1110 REM: T1 IS THE TIME OF THE NEXT EVENT
1120 REM: N1 IS THE POINTER TO THE
1130 REM: NEXT SCHEDULED EVENT
1140 CALL 7(T2,T3)
1200 T4=T2+T3/60
1210 IF T4<T1 THEN 1240
1215 IF T4>1200 THEN IF T1<120 THEN 1270
1220 GOSUB 5000
1225 GOSUB 5500
1230 GOTO 1140
1240 IF T4<3 THEN IF T1>1430 THEN 1220
1250 IF T1-T4>.01 THEN CALL 6((T1-T4-.01)*60)
1260 GOTO 1140
1270 CALL 6(1440-T4+T1-.01)
1280 GOTO 1140
5000 REM:-----EXECUTE THE NEXT EVENT-----
5010 REM: IN THE EVENT TABLE
5020 REM: N1 IS THE POINTER INTO THE
5030 REM: EVENT TABLE
5060 POSITION #5 TO N1
5065 READ #5,E$
5070 X=VAL(SUB(E$,1,2),X9)
5076 IF X<1 THEN RETURN
5077 IF X>10 THEN RETURN
5078 IF X>6 THEN 5090
5080 ON X GOTO 5100,5130,5160,5190,5220,5250
```

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```
5090  ON X-6 GOTO 5280,5310,5340,5370
5100  GOSUB 6000
5120  RETURN
5130  GOSUB 6250
5150  RETURN
5160  GOSUB 6500
5180  RETURN
5190  GOSUB 6750
5210  RETURN
5220  GOSUB 7000
5240  RETURN
5250  GOSUB 7250
5260  RETURN
5280  GOSUB 7500
5290  RETURN
5310  GOSUB 8000
5320  RETURN
5340  GOSUB 8500
5350  RETURN
5370  GOSUB 8600
5380  RETURN
5500  REM:-----SET UP THE NEXT EVENT-----
5505  REM: THIS SUBPROGRAM INCREMENTS N1
5510  REM: WHICH IS THE POINTER TO THE NEXT
5520  REM: SCHEDULED EVENT AND REMOVES THE
5530  REM: LAST EVENT IF IT WAS TEMPORARY
5540  N2=N1
5550  REM: N2 IS THE LAST EVENT POINTER
5560  N1=E(N2,1)
5562  T1=E(N1,3)
5565  IF SUB(E$,3)='1' THEN RETURN
5580  REM: IF THE LAST EVENT IS PERMANENT
5590  REM: THEN THE SUBPROGRAM RETURNS
5600  REM: OTHERWISE THE LAST EVENT IS
5610  REM: REMOVED FROM THE EVENT TABLE
5620  REM: THE L ARRAY IS THE LIST OF
5630  REM: EMPTY SLOTS IN THE EVENT TABLE
5640  REM: L1 IS THE STACK POINTER INTO
5650  REM: THE L ARRAY
5660  L1=L1+1
5670  L(L1)=N2
5680  E(E(N2,2),1)=E(N2,1)
5690  E(E(N2,1),2)=E(N2,2)
5700  REM: THE ABOVE FIXES UP THE FORWARD
5710  REM: AND BACKWARD POINTERS IN THE
5720  REM: EVENT TABLE IN ORDER TO DELETE
5730  REM: THE LAST TIME EVENT
5740  RETURN
6000  REM:----- EVENT #1-----
6010  REM: BROADCAST FREE TEXT IN P6 TO COMPLEX P1
6015  REM: (0 IF ALL COMPLEXES ARE TO RECIEVE MESSAGE)
```

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```

6100  U$='*F'+SUB(E$,9,10)+'*'+SUB(E$,39,LEN(E$))
6101  CALL 3(21,L5,LEN(U$))
6110  RETURN
6250  REM:----- EVENT #2-----
6255  REM: THIS SUBPROGRAM BROADCASTS CANNED MESSAGE P1
6260  REM: TO COMPLEX P2 (0 IF ALL COMPLEXES)
6410  U$='*1'+SUB(E$,16,17)+'*'+SUB(E$,9,10)
6411  CALL 3(21,L5,LEN(U$))
6420  RETURN
6500  REM:----- EVENT #3-----
6510  REM: CHANGE CANNED MESSAGE P1 TO P6
6580  U$='*3'+SUB(E$,9,10)+'*'+SUB(E$,39,LEN(E$))
6581  CALL 3(21,L5,LEN(U$))
6590  RETURN
6750  REM:----- EVENT #4-----
      -----
6752  REM: PERFORM SYSTEM COMMANDS
6754  IF K<>3 THEN 6765
6755  CALL 4(25,L6,K,K1)
6756  IF K1=99 THEN B$=''
6757  IF K1<0 THEN B$=SUB(B$,1,LEN(B$)-K1)
6758  IF K=0 THEN 6990
6759  IF K<>-1 THEN B$=B$+Y$
6760  IF K=3 THEN 6990
6761  Y$=B$
6762  B$=''
6763  GOTO 6800
6765  CALL 4(25,L6,K,K1)
6772  IF K=0 THEN 6990
6774  IF K<>3 THEN 6800
6776  B$=Y$
6780  GOTO 6990
6800  REM: PROCESS COMMAND
6802  IF SUB(Y$,3)<>'*' THEN 6820
6805  X=VAL(SUB(Y$,1,2),X9)
6806  IF X9=1 THEN 6820
6808  IF X<1 THEN 6820
6810  IF X<5 THEN 6840
6812  IF X=5 THEN 6905
6814  IF X=6 THEN 6935
6816  IF X>9 THEN IF X<13 THEN 6834
6820  X$=Y$+'*ILLEGAL COMMAND'
6822  CALL 3(24,L6,LEN(X$))
6824  GOTO 6985
6834  ON X-9 GOTO 6940,6965,6980
6840  X1=X
6842  X=VAL(SUB(Y$,4,5),X9)
6843  IF X9=1 THEN 6848
6846  IF X>0 THEN IF X<6 THEN IF X=INT(X) THEN 6854
6848  X$=Y$+'*ILLEGAL COMPLEX NUMBER*'
6850  CALL 3(24,L6,LEN(X$))

```

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```
6852 GOTO 6985
6854 ON X1 GOTO 6892,6900,6856,6856
6856 IF J(X)=1 THEN 6864
6858 IF X1=3 THEN GOTO 6892
6860 GOTO 6900
6864 X$=H$(X)+' HAS A QUESTION PENDING - MESSAGE NOT SENT'
6866 CALL 3(24,L6,LEN(X$))
6868 GOTO 6985
6892 U$='*1'+SUB(Y$,4,5)+'*0'+SUB(Y$,7,8)
6893 CALL 3(21,L5,LEN(U$))
6894 WRITE #7,'*SYSTEM'+U$
6895 GOTO 6985
6900 U$='*F'+SUB(Y$,4,5)+'*'+SUB(Y$,7,LEN(Y$))
6901 CALL 3(21,L5,LEN(U$))
6902 WRITE #7,'*SYSTEM'+U$
6903 GOTO 6985
6905 P6=P5
6910 IF P6=0 THEN P6=3
6911 W$=' 5 MINUTE '
6915 Z$=SUB(Y$,4,5)
6916 GOSUB 9550
6917 IF X1>0 THEN 6925
6920 IF X1=-2 THEN X$=Y$+'*NON-EXISTENT COMPLEX'
6921 IF X1=-1 THEN X$=Y$+'*NON-EXISTENT METER'
6922 CALL 3(24,L6,LEN(X$))
6923 GOTO 6985
6925 X$=STR$(C(X1,P6))
6927 IF X1<=10 THEN Y$=C$(X1,2)+' '+C$(X1,1)+' METER'
6928 IF X1>10 THEN Y$=H$(X2)
6929 IF X1=16 THEN Y$='CCA'
6930 X$=Y$+W$+'KWH TOTAL = '+X$
6931 CALL 3(24,L6,LEN(X$))
6932 GOTO 6985
6935 P6=4
6936 W$=' 15 MINUTE '
6937 GOTO 6915
6940 Z$=SUB(Y$,4,5)
6941 GOSUB 9550
6942 IF X1<=0 THEN 6920
6943 IF X1<11 THEN 6950
6944 X$=Y$+'*NON-EXISTENT METER'
6945 CALL 3(24,L6,LEN(X$))
6946 GOTO 6985
6950 X=VAL(SUB(Y$,7,LEN(Y$)),X9)
6951 IF X9=1 THEN 6960
6953 IF X<0 THEN 6960
6954 G(X1,3)=X
6955 GOTO 6985
6960 X$=Y$+'*ILLEGAL KWH VALUE'
6961 CALL 3(24,L6,LEN(X$))
6962 GOTO 6985
```

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```
6965 X$='CCA METER INFO'
6966 CALL 3(24,L6,LEN(X$))
6967 X$='METER      KWH/CHANGE'
6968 CALL 3(24,L6,LEN(X$))
6969 FOR Y=1 TO 10
6970 X$=C$(Y,2)+'      '+STR$(FNC(G(Y,3)))
6973 CALL 3(24,L6,LEN(X$))
6974 NEXT Y
6975 GOTO 6985
6980 REM: STATUS ON EVENT TABLE
6983 X$='THERE ARE '+STR$(L1)+' AVAILABLE SLOTS IN THE EVEN
      T TABLE'
6984 CALL 3(24,L6,LEN(X$))
6985 REM: SEE IF THERE ARE ANY MORE COMMANDS IN BUFFER
6987 IF K=1 THEN 6990
6988 GOTO 6765
6990 REM: SCHEDULE NEXT EVENT #4 IN 6 SECONDS
6992 Y$=E$
6994 T5=T1+.1
6996 GOSUB 9800
6998 RETURN
7000 REM:----- EVENT #5-----
7005 REM: MONITOR AND RECORD KWH CONSUMPTION
7010 Y=1
7012 P5=P5+1
7015 GOSUB 9160
7020 IF I(3)>=300 THEN 7045
7025 REM: RESCHEDULE THE EVENT
7027 IF I(3)<0 THEN I(3)=0
7028 IF I(3)>300 THEN I(3)=300
7030 T5=T1+(300-I(3))/60+.05
7032 P5=P5-1
7035 Y$=E$
7038 GOSUB 9800
7040 RETURN
7045 GOSUB 9060
7050 U$='*F00*TIME '+X$
7051 CALL 3(21,L5,LEN(U$))
7053 IF P5<3 THEN 7057
7054 X$='TIME : '+X$
7056 CALL 3(24,L6,LEN(X$))
7057 X$=STR$(C(1,P5))
7059 U$='*F01*'+C$(1,1)+' METER 5 MINUTE KWH TOTAL = '+X$
7060 CALL 3(21,L5,LEN(U$))
7061 FOR Y=2 TO 10
7068 GOSUB 9160
7070 U$='*F0'+SUB(C$(Y,2),2)+'*'+C$(Y,1)
7076 U$=U$+' METER 5 MINUTE KWH TOTAL = '+STR$(FNC(C(Y,P5)))
7078 CALL 3(21,L5,LEN(U$))
7098 NEXT Y
7100 IF P5<3 THEN 7225
```


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```
7102 P5=0
7105 FOR Y=1 TO 10
7110 H(Y)=C(Y,4)
7115 NEXT Y
7120 FOR Y=1 TO 16
7125 C(Y,4)=C(Y,1)+C(Y,2)+C(Y,3)
7130 NEXT Y
7132 WRITE #2,T1,D1,W1
7135 MAT WRITE #2,C
7140 FOR Y=1 TO 5
7146 U$='*F'+Y$(Y)+'*'+H$(Y)+' 15 MINUTE KWH TOTAL = '+STR$(
      (FNC(C(10+Y,4)))
7148 CALL 3(21,L5,LEN(U$))
7153 X$=H$(Y)+' 15 MINUTE KWH TOTAL = '+STR$(FNC(C(10+Y,4)))
7154 CALL 3(24,L6,LEN(X$))
7155 NEXT Y
7158 X$='CCA 15 MINUTE KWH TOTAL = '+STR$(FNC(C(16,4)))
7159 CALL 3(24,L6,LEN(X$))
7160 IF H(1)=0 THEN IF H(2)=0 THEN IF H(3)=0 THEN 7225
7161 FOR Y1=1 TO 10
7165 IF ABS(C(Y1,4)-H(Y1))<G(Y1,3) THEN 7205
7167 Y=G(Y1,1)
7168 IF J(Y)=1 THEN 7205
7169 Y$='0'+SUB(C$(Y1,2),2)
7170 GOSUB 9700
7172 U$='*1'+Y$+'*009'
7174 GOSUB 9270
7176 J9=J9+1
7177 B(Y1)=H(Y1)
7178 X$=C$(Y1,1)+' METER '+C$(Y1,2)+' AT '+H$(Y)+' HAD A'
7179 CALL 3(24,L6,LEN(X$))
7185 X$='SIGNIFICAN KWH CNANGE FROM '+STR$(FNC(H(Y1)))+ ' TO
      '+STR$(FNC(C(Y1,4)))
7186 CALL 3(24,L6,LEN(X$))
7187 J(Y)=1
7188 REM: SCHEDULE EVENT #9 TO RETRIEVE
7189 REM: ANSWER IN 3 MINUTES
7190 Y$='09000000'+Y$
7195 T5=T1+3
7200 GOSUB 9800
7205 NEXT Y1
7207 CALL 9(24)
7209 IF D$=X$ THEN 7225
7213 F$='ERDCON>C'+SUB(X$,2,6)
7215 DEFINE FILE #2=F$,BIN
7217 F$='ERDEXP>'+ 'E'+SUB(X$,2,6)
7219 DEFINE FILE #6=F$
7220 IF SUB(D$,2,4)=SUB(X$,2,4) THEN 7223
7221 F$='NM'+SUB(X$,2,4)
7222 DEFINE FILE #7=F$
7223 WRITE #7,'DATE = '+X$
```

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```
7224 D$=X$
7225 REM: SCHEDULE ANOTHER EVENT #5
7226 U$='*500'
7227 CALL 3(21,L5,LEN(U$))
7228 CALL 10(1,24,0,0,0,1,K9,L5)
7229 IF K9=1 THEN 7234
7230 CALL 6(15)
7231 GOTO 7227
7234 T=VAL(X$,X9)
7236 CALL 7(T2,T3)
7237 IF T<0 THEN T=0
7238 IF T>300 THEN T=300
7240 T5=T2+T3/60+(300-T)/60
7245 Y$='050'
7248 GOSUB 9800
7249 RETURN
7250 REM:----- EVENT #6-----
      -----
7255 REM: THIS SUBPROGRAM ASKS COMPLEX P1
7265 REM: WHAT THE OAT DB IS
7266 Y$=SUB(E$,9,10)
7272 X=VAL(Y$,X9)
7273 IF J(X)=1 THEN 7405
7274 IF L3=1 THEN 7405
7275 GOSUB 9700
7276 J9=J9+1
7277 J(X)=1
7279 L3=1
7280 U$='*1'+SUB(E$,9,10)+'*006*'
7281 CALL 3(21,L5,LEN(U$))
7310 T5=T1+.25
7320 X=T1
7330 X1=7
7340 GOSUB 9200
7350 Y$='070'+SUB(E$,4,10)+X$
7390 GOSUB 9800
7400 RETURN
7405 REM: RESCHEDULE IN 5 MINUTES
7410 Y$=E$
7412 T5=T1+5
7415 GOSUB 9800
7425 RETURN
7500 REM:----- EVENT #7-----
      -----
7505 REM: GET DB ANSWER FROM COMPLEX P1
7510 REM: PLACE IN D1
7515 REM: P2 IS THE LAST 5 MINUTE PERIOD WHEN
7516 REM: THE OAT DB WAS ASKED
7530 U$='*2'+SUB(E$,9,10)+'*'
7531 CALL 3(21,L5,LEN(U$))
7540 CALL 10(2,25,23,0,0,1,K9,L5)
```

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```
7545 IF K9=1 THEN 7550
7547 CALL 6(15)
7548 GOTO 7531
7550 IF W$<>'NONE' THEN 7770
7560 X=VAL(SUB(E$,11,17),X9)
7590 IF X+30>T1 THEN 7730
7600 Y$=SUB(E$,9,10)
7610 GOSUB 9300
7620 GOSUB 9060
7630 Z$=X$
7640 X$=Y$
7650 X=VAL(X$,X9)
7660 X$='NO DB ANSWER AT '+H$(X)+' AT '+Z$
7664 WRITE #7,X$
7666 CALL 3(24,L6,LEN(X$))
7667 J1=VAL(SUB(E$,9,10),X9)
7668 J(J1)=0
7669 J9=J9-1
7670 L3=0
7675 RETURN
7730 Y$=E$
7740 T5=T1+.25
7750 GOSUB 9800
7760 RETURN
7770 X$=W$
7777 IF ABS(D2-D1)>15 THEN 7880
7778 Y$=SUB(E$,9,10)
7780 GOSUB 9700
7790 U$='*1'+SUB(E$,9,10)+'*007*'
7791 CALL 3(21,L5,LEN(U$))
7810 X=T1
7820 X1=7
7830 GOSUB 9200
7840 Y$='080'+SUB(E$,4,10)+X$
7850 T5=T1+.25
7860 GOSUB 9800
7865 V1=0
7868 D1=D2
7869 D3=0
7870 RETURN
7880 IF V1<>1 THEN 7900
7890 IF D2=D3 THEN 7790
7900 U$='*1'+SUB(E$,9,10)+'*010*'
7901 CALL 3(21,L5,LEN(U$))
7910 V1=1
7920 D3=D2
7930 X=T1
7940 X1=7
7950 GOSUB 9200
7960 Y$=SUB(E$,1,10)+X$
7970 T5=T1+.25
```

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```
7980 GOSUB 9800
7990 RETURN
8000 REM:----- EVENT #8-----
      -----
8010 REM: GET WB ANSWER FROM COMPLEX P1
8020 REM: PLACE IN W1
8030 U$='*2'+SUB(E$,9,10)+'*'
8031 CALL 3(21,L5,LEN(U$))
8040 CALL 10(2,25,23,0,0,1,K9,L5)
8043 IF K9=1 THEN 8050
8045 CALL 6(15)
8046 GOTO 8040
8050 IF W$<>'NONE' THEN 8260
8060 X=VAL(SUB(E$,11,17),X9)
8090 IF X+30>T1 THEN 8230
8100 Y$=SUB(E$,9,10)
8110 GOSUB 9300
8120 GOSUB 9060
8130 Z$=X$
8140 X=VAL(Y$,X9)
8156 X$='NO WB ANSWER AT '+H$(X)+' AT '+Z$
8158 WRITE #7,X$
8160 CALL 3(24,L6,LEN(X$))
8162 J1=VAL(SUB(E$,9,10),X9)
8165 J(J1)=0
8168 J9=J9-1
8170 L3=0
8175 RETURN
8230 Y$=E$
8240 T5=T1+.25
8250 GOSUB 9800
8255 RETURN
8260 W2=VAL(W$,X9)
8270 IF ABS(W2-W1)>15 THEN 8300
8280 V1=0
8285 W3=0
8290 W1=W2
8291 J1=VAL(SUB(E$,9,10),X9)
8292 J(J1)=0
8294 J9=J9-1
8295 L3=0
8296 RETURN
8300 IF V1<>1 THEN 8320
8310 IF W2=W3 THEN 8420
8320 U$='*1'+SUB(E$,9,10)+'*011*'
8321 CALL 3(21,L5,LEN(U$))
8330 V1=1
8340 W3=W2
8350 X=T1
8360 X1=7
8370 GOSUB 9200
```

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```
8380 Y$=SUB(E$,1,10)+X$
8390 T5=T1+.25
8400 GOSUB 9800
8410 RETURN
8420 W1=W2
8430 J1=VAL(SUB(E$,9,10),X9)
8440 J(J1)=0
8460 J9=J9-1
8470 RETURN
8495 L3=0
8500 REM:----- EVENT #9-----
8502 REM: GET KWH-CHANGE EXPLANATION
8505 REM: FROM COMPLEX P1
8510 U$='*2'+SUB(E$,9,10)+'*'
8511 CALL 3(21,L5,LEN(U$))
8512 CALL 10(2,24,25,0,0,1,K9,L5)
8514 IF K9=1 THEN 8517
8515 CALL 6(15)
8516 GOTO 8510
8517 X=VAL(X$,X9)
8518 IF X>=0 THEN IF X<6 THEN 8520
8519 GOTO 8510
8520 IF Y$='NONE' THEN 8530
8525 WRITE #6,SUB(E$,9,10):FND(T1-4):B(X):H(X):Y$
8526 X$=H$(X)+' EXPLANATION: '+Y$
8527 CALL 3(24,L6,LEN(X$))
8528 GOTO 8510
8530 J(X)=0
8531 J9=J9-1
8540 Y$=SUB(E$,9,10)
8550 GOSUB 9300
8555 RETURN
8600 REM:----- EVENT #10-----
8603 REM: DISPLAYS MESSAGES FROM ANY
8606 REM: OF THE COMPLEXES IF THEY DO
8609 REM: NOT HAVE A QUESTION PENDING
8610 IF J9=0 THEN 8640
8612 FOR Y=1 TO 5
8615 IF J(Y)=1 THEN 8633
8620 Y$=Y$(Y)
8625 GOSUB 9700
8633 NEXT Y
8636 GOTO 8666
8640 Y$='00'
8645 GOSUB 9700
8666 REM: SCHEDULE ANOTHER EVENT #10 IN 1 MINUTE
8669 Y$=E$
8672 T5=T1+1
8675 GOSUB 9800
8678 RETURN
9060 REM:----- RETURN TIME IN X$ LIKE (08:00) -----
```

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```

9062 CALL 7(T2,T3)
9064 X$=STR$(FND(T2+T3/60))
9068 IF LEN(X$)>=4 THEN 9074
9070 X$='0'+X$
9072 GOTO 9068
9074 X$=SUB(X$,1,2)+':'+SUB(X$,3,4)
9076 RETURN
9160 REM:----- INPUT KWH DATA ON THE YTH METER -----
-----
9161 U$='*4'+C$(Y,2)+'*'
9162 CALL 3(21,L5,LEN(U$))
9163 CALL 10(4,22,23,25,26,1,K9,L5)
9164 IF K9=1 THEN 9173
9165 IF K9=2 THEN Y$='TRANS. ERROR - TIME LIMIT EXCEEDED '
9166 IF K9<>2 THEN Y$='TRANS. ERROR - INCOREECT # OF VARIA
      BLES '
9167 CALL 3(25,L6,LEN(Y$))
9168 CALL 6(15)
9169 GOSUB 9060
9170 X$=Y$+X$
9171 WRITE #7,X$
9172 GOTO 9161
9173 IF V$=C$(Y,2) THEN 9179
9175 Y$='TRANS. ERROR - WRONG REMOTE RECIEVED'
9177 GOTO 9167
9179 I(3)=VAL(Y$,X9)
9185 IF I(3)<300 THEN RETURN
9187 I(2)=VAL(W$,X9)
9193 C(10+G(Y,1),P5)=C(10+G(Y,1),P5)-C(Y,P5)
9194 C(16,P5)=C(16,P5)-C(Y,P5)
9195 C(Y,P5)=I(2)*G(Y,2)
9196 C(10+G(Y,1),P5)=C(10+G(Y,1),P5)+C(Y,P5)
9197 C(16,P5)=C(16,P5)+C(Y,P5)
9198 RETURN
9200 REM:----- CONVERTS X TO X$ WITH LENGTH X1 -----
9210 X$=STR$(X)
9220 IF LEN(X$)>=X1 THEN 9250
9230 X$='0'+X$
9240 GOTO 9220
9250 X$=SUB(X$,1,X1)
9260 RETURN
9270 REM:----- TELL COMPLEX ABOUT KWH CHANGE -----
-----
9272 U$='*1'+Y$+'*009'
9274 CALL 3(21,L5,LEN(U$))
9276 U$='*1'+Y$+'*012'
9278 CALL 3(21,L5,LEN(U$))
9280 U$='*F'+Y$+'*ON THE '+C$(Y1,1)+' METER'
9282 CALL 3(21,L5,LEN(U$))
9284 U$='*1'+Y$+'*013'
9286 CALL 3(21,L5,LEN(U$))

```

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```
9288 RETURN
9300 REM:----- CLEAR SCREEN OF COMPLEX Y$ -----
9320 U$='*1'+Y$+'*008*'
9321 CALL 3(21,L5,LEN(U$))
9340 RETURN
9400 REM:----- SET UP THE FIRST 3 EVENTS -----
9410 E(1,1)=2
9420 E(1,2)=3
9430 E(2,1)=3
9440 E(2,2)=1
9444 E(3,1)=1
9446 E(3,2)=2
9450 CALL 7(T2,T3)
9460 T1=T2+T3/60
9470 E(1,3)=T1
9480 E(2,3)=T1
9490 E(3,3)=T1
9500 WRITE #5,'040'
9510 WRITE #5,'050'
9515 WRITE #5,'100'
9520 N1=1
9530 RETURN
9550 REM:----- SET X1 TO INDEX IN CONSUMPTION TABLE G -
      -----
9551 REM: & X2 TO COMPLEX INDEX
9552 REM: FROM STRING Z$='XY'
9554 X2=VAL(SUB(Z$,2),X9)
9556 IF X9=1 THEN 9562
9559 IF X2=0 THEN 9580
9560 IF X2=INT(X2) THEN IF X2>=0 THEN IF X2<6 THEN 9566
9562 X1=-2
9564 RETURN
9566 X1=VAL(SUB(Z$,1),X9)
9568 IF X9=1 THEN 9572
9570 IF X1>=0 THEN IF X1<=D(X2,2) THEN IF X1=INT(X1) THEN 9576
9572 X1=-1
9574 RETURN
9576 IF X1=0 THEN X1=X2+10
9580 IF X2=0 THEN X1=16
9581 IF X1<11 THEN X1=D(X2,1)+X1
9582 RETURN
9600 REM:----- ENTER A CURRENT EVENT INTO THE EVENT TABLE
      -----
9602 CALL 7(T2,T3)
9605 N3=L(L1)
9610 L1=L1-1
9615 IF L1=0 THEN 9930
9620 POSITION #5 TO N3
9625 WRITE #5,SUB(Y$,8,95)
9630 CALL 7(T2,T3)
9640 T4=T2+T3/60
```

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```

9645 IF T4>E(N1,3) THEN T4=E(N1,3)
9650 E(N3,3)=T4
9655 E(N3,2)=E(N1,2)
9665 E(E(N1,2),1)=N3
9667 E(N1,2)=N3
9670 E(N3,1)=N1
9675 N1=N3
9680 T1=T4
9685 RETURN
9700 REM:----- CLEAR THE INPUT BUFFER FOR COMPLEX Y$---
      -----
9720 U$='*2'+Y$+'*'
9721 CALL 3(21,L5,LEN(U$))
9730 CALL 10(2,26,23,0,0,1,K9,L5)
9735 IF K9=1 THEN 9740
9736 CALL 6(15)
9737 GOTO 9720
9740 IF W$='NONE' THEN RETURN
9742 X=VAL(Z$,X9)
9744 IF X<0 THEN X=0
9745 IF X>5 THEN X=0
9746 X$=H$(X)+' MESSAGE : '+W$
9748 CALL 3(24,L6,LEN(X$))
9750 WRITE #7,X$
9760 GOTO 9720
9800 REM:----- THIS SUBPROGRAM PLACES THE EVENT Y$ -----
9805 REM: INTO THE EVENT TABLE
9810 REM: T5 IS THE TIME OF THE
9815 REM: NEW EVENT IN Y$
9830 IF T5>T1 THEN 9860
9835 N4=E(N1,2)
9840 N5=N1
9845 IF T5>=E(N4,3) THEN 9900
9848 N5=N4
9850 N4=E(N4,2)
9851 IF N5=N1 THEN 9900
9852 IF E(N4,3)>E(N5,3) THEN 9900
9855 GOTO 9845
9860 N5=E(N1,1)
9870 N4=N1
9875 IF E(N4,3)>E(N5,3) THEN 9900
9880 IF T5<=E(N5,3) THEN 9900
9885 N4=N5
9890 N5=E(N5,1)
9892 IF N5=N1 THEN 9900
9895 GOTO 9875
9900 N3=L(L1)
9910 L1=L1-1
9920 IF L1>=0 THEN 9955
9930 X$='EVENT TABLE FULL - PROGRAM TERMINATED'
9940 CALL 3(24,L6,LEN(X$))

```


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```
9950 CALL 2
9955 POSITION #5 TO N3
9960 WRITE #5,Y$
9965 E(N3,3)=T5
9970 E(N3,2)=N4
9975 E(N5,2)=N3
9980 E(N4,1)=N3
9985 E(N3,1)=N5
9986 IF N5<>N1 THEN RETURN
9987 CALL 7(T2,T3)
9988 IF T5<T2+T3/60 THEN RETURN
9989 N1=N3
9990 T1=T5
9991 RETURN
```

RPT#1

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```
75 DEF FNA(X)=INT(X/60)*100+INT(X)-INT(X/60)*60
100 DIM C(16,4)
110 DEFINE FILE #1='TEMP3'
120 PRINT 'INPUT DATE (LIKE 0802 FOR AUG. 2) - 99 IF DONE'
130 INPUT D$
135 IF D$='99' THEN QUIT
140 F$='ERDCON>C6'+D$
150 DEFINE READ FILE #2=F$,BIN
160 ON END #2 GOTO 2000
170 CALL 1
180 CALL 6(10)
190 S$='TIME DB/WB MAY UCB SCG DWP OCC TOTAL'
200 DEFINE FILE #3='(A)'
210 WRITE #3,TAB(20):'CCA ELECTRICAL CONSUMPTION'
220 WRITE #3,TAB(24):'DATE ':SUB(D$,1,2)+'/' +SUB(D$,3,4)+'/76'
230 PRINT
240 WRITE #3,TAB(8):S$
250 PRINT
1000 READ #2,T1,D1,W1
1010 MAT READ #2,C
1020 X=FNA(T1)
1025 GOSUB 9000
1030 IF LEN(X$)>=4 THEN 1060
1040 X$='0'+X$
1050 GOTO 1030
1060 T$=SUB(X$,1,2)+' ':SUB(X$,3,4)
1062 X=D1
1064 GOSUB 9000
1070 Y$=X$
1080 X=W1
1090 GOSUB 9000
1100 Y$=Y$+'/' +X$
1110 WRITE #3,TAB(8):T$:TAB(15):Y$:TAB(23):INT(C(11,4)):
1120 WRITE #3,TAB(30):INT(C(12,4)):TAB(37):INT(C(13,4)):
1130 WRITE #3,TAB(44):INT(C(14,4)):TAB(51):INT(C(15,4)):
1140 WRITE #3,TAB(58):INT(C(16,4))
1150 GOTO 1000
2000 CALL 1
2010 CALL 6(10)
2020 GOTO 120
9000 REWIND #1
9010 WRITE #1,X
9020 REWIND #1
9030 READ #1,X$
9040 RETURN
```

RPT#2

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```

30 DIM C$(10,2),C(16,4),G(10,3),D(5,2),H$(5)
40 DEFINE READ FILE #1='METER1',BIN
45 MAT READ #1,D,G
52 H$(1)='MAY'
53 H$(2)='UCB'
54 H$(3)='SCG'
55 H$(4)='DWP'
56 H$(5)='OCC'
60 DEFINE READ FILE #1='METER2',ASC SEP
62 FOR Y=1 TO 10
64 READ #1,C$(Y,1),C$(Y,2)
66 NEXT Y
75 DEF FNA(X)=INT(X/60)*100+INT(X)-INT(X/60)*60
110 DEFINE FILE #1='TEMP3'
120 PRINT 'INPUT DATE (LIKE 0802 FOR AUG. 2) - 99 IF DONE'
130 INPUT D$
135 IF D$='99' THEN QUIT
140 F$='ERDCON>C6'+D$
150 DEFINE READ FILE #2=F$,BIN
160 ON END #2 GOTO 2000
164 FOR Y=1 TO 10
166 REWIND #2
170 CALL 1
180 CALL 6(10)
190 S$='TIME DB/WB FIRST SECOND THIRD TOTAL'
195 U$='5 MIN. 5 MIN. 5 MIN.'
200 DEFINE FILE #3='(A)'
210 WRITE #3,TAB(12):'ELECTRICAL CONSUMPTION':C$(Y,1):'METER AT':H$(G(Y,1))
220 WRITE #3,TAB(24):'DATE ':SUB(D$,1,2)+'/'+SUB(D$,3,4)+'/76'
230 PRINT
240 WRITE #3,TAB(8):S$
245 WRITE #3,TAB(23):U$
250 PRINT
1000 READ #2,T1,D1,W1
1010 MAT READ #2,C
1020 X=FNA(T1)
1025 GOSUB 9000
1030 IF LEN(X$)>=4 THEN 1060
1040 X$='0'+X$
1050 GOTO 1030
1060 T$=SUB(X$,1,2)+'/'+SUB(X$,3,4)
1062 X=D1
1064 GOSUB 9000
1070 Y$=X$
1080 X=W1
1090 GOSUB 9000
1100 Y$=Y$+'/'+X$
1110 WRITE #3,TAB(8):T$:TAB(15):Y$:TAB(23):INT(C(11,4)):
1120 WRITE #3,TAB(23):INT(C(P4,1)):TAB(34):INT(C(P4,2)):
1130 WRITE #3,TAB(45):INT(C(P4,3)):TAB(56):INT(C(P4,4)):

```

RPT#2

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1150 GOTO 1000
2000 NEXT Y
2010 CALL 1
2020 CALL 6(10)
2030 GOTO 120
9000 REWIND #1
9010 WRITE #1,X
9020 REWIND #1
9030 READ #1,X\$
9040 RETURN

PLOTS

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```

100 REM*****
101 REM*
102 REM*          PLOTS
103 REM*
104 REM* PLOTS PROVIDES A LIST OF THE VARIOUS PLOTTING
105 REM* CAPABILITIES ACCESSIBLE TO THE ANALYST FOR USE
106 REM* IN THE ERDA NATIONAL ENERGY PEAK LEVELING
107 REM* PROGRAM. THE LIST IS IN MENU FORM AND ALLOWS
108 REM* THE USER TO SELECT THE TYPE OF GRAPH(S) HE
109 REM* DESIRES. THE PROGRAM THEN CHAINS TO THE PROPER
110 REM* PLOTTING PROGRAM.
111 REM*
112 REM* REVISION 0 SEPTEMBER 9 1976 JOHNNY ALBANO, JR.
198 REM*
199 REM*****
200 REM-----GRAPH SELECTION-----
220 PRINT 'SELECT THE DESIRED TYPE OF GRAPH'
240 PRINT 'TYPE 1 FOR HOURLY CONSUMPTION OF ALL COMPLEXES'
250 PRINT '      2      DAILY'
260 PRINT '      3      WEEKLY'
280 PRINT '      4      MONTHLY'
300 PRINT '      5      HOURLY CONSUMPTION OF ONE COMPLEX'
310 PRINT '      6      DAILY'
320 PRINT '      7      WEEKLY'
340 PRINT '      8      MONTHLY'
360 PRINT '      9      HOURLY CONSUMPTION OF ONE METER'
370 PRINT '     10      DAILY'
380 PRINT '     11      WEEKLY'
400 PRINT '     12      MONTHLY'
980 PRINT '      0      WHEN DONE'
1000 REM-----PROGRAM CHAIN-----
1005 INPUT G$
1010 IF G$='0' THEN 9997
1020 IF G$='1' THEN CHAIN 'PLOT1H'
1040 IF G$='2' THEN CHAIN 'PLOT1D'
1060 IF G$='3' THEN CHAIN 'PLOT1W'
1080 IF G$='4' THEN CHAIN 'PLOT1M'
1100 IF G$='5' THEN CHAIN 'PLOT2H'
1120 IF G$='6' THEN CHAIN 'PLOT2D'
1140 IF G$='7' THEN CHAIN 'PLOT2W'
1160 IF G$='8' THEN CHAIN 'PLOT2M'
1180 IF G$='9' THEN CHAIN 'PLOT3H'
1200 IF G$='10' THEN CHAIN 'PLOT3D'
1220 IF G$='11' THEN CHAIN 'PLOT3W'
1240 IF G$='12' THEN CHAIN 'PLOT3M'
2000 GOTO 1000
9997 CALL 1
9998 QUIT
9999 END

```

PLOT1D

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```

1  PRINT 'P
100  REM*****
101  REM*
102  REM*  PLOT1D
103  REM*
104  REM*  DAILY CONSUMPTION OF ALL
105  REM*  QUIRED INPUT IS THE DATE
106  REM*  FORMATION. THE INPUT FORMAT
107  REM*  AUGUST 2 .
108  REM*
109  REM*  T 14 1976  JOHNNY ALBANO, JR.
198  REM*
199  REM*****
200  REM---NPUT NECESSARY INFORMATION-----
201  S$(1)=
202  S$(2)=
203  S$(3)=
204  S$(4)=
205  S$(5)=
206  S$(6)=
207  A=20
208  B=A
210  DEF FNA))+.5)*2.5*A
225  DIM C((6),S$(6)
230  PRINT AUGUST 8 = 0802)';
240  INPUT
260  IF D$=
280  GOSUB
285  GOSUB
300  F$='ER
320  DEFINEBIN
330  ON END
340  FOR MO
360  GOSUB
380  FOR M1
400  READ #
420  MAT RE
440  FOR K=
460  M(K)=M
480  NEXT K
500  NEXT M
505  FOR K=
510  M(K)=F
515  NEXT K
520  FOR M1
540  FOR K=
560  IF M(K)GOSUB 9400
580  NEXT K
600  NEXT M
620  NEXT M
1000  REM---RATE GRAPHS-----

```

PLOT1D

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```

1001 M$(40,25)='          LEGEND'
1002 M$(39,25)='-----'
1003 M$(38,25)=S$(1)+' = MAY COMPANY'
1005 M$(37,25)=S$(2)+' = UNITED'
1006 M$(36,25)='          CALIFORNIA BANK'
1007 M$(35,25)=S$(3)+' = SOUTHERN'
1008 M$(34,25)='          CALIFORNIA GAS'
1009 M$(33,25)=S$(4)+' = DEPARTMENT OF'
1010 M$(32,25)='          WATER AND POWER'
1011 M$(31,25)=S$(5)+' = OCCIDENTAL'
1012 M$(30,25)='          CENTER'
1013 M$(29,25)=S$(6)+' = COMPLEXES TOTAL'
1014 M$(28,25)='-----'
1020 CLOSE #2
1040 E$='ERDRPT>D1'+D$
1060 DEFINE FILE #2=E$
1080 DEFINE FILE #4='(A)'
1100 WRITE #2,'.W 130'
1105 WRITE #2,'.TM 2'
1110 WRITE #2,'.SM 1'
1115 WRITE #2,'.BM 2'
1120 WRITE #2,'.B'
1140 WRITE #2,'.N'
1160 WRITE #2,'.NFILE'
1180 WRITE #2,'.TT-Y'
1200 CALL 1
1220 CALL 6(10)
1240 WRITE #2,'DATE:':SUB(D$,1,2):'-':SUB(D$,3,4):'- 76':TA
      B(65):F$
1241 WRITE #4,'DATE:':SUB(D$,1,2):'-':SUB(D$,3,4):'- 76':TA
      B(65):F$
1245 WRITE #2,TAB(65):E$
1246 WRITE #4,TAB(65):E$
1250 GOSUB 9300
1251 GOSUB 9300
1255 WRITE #2,TAB(19):'NATIONAL ENERGY PEAK LEVELING PROGRAM'
1256 WRITE #4,TAB(19):'NATIONAL ENERGY PEAK LEVELING PROGRAM'
1260 WRITE #2,TAB(20):'DAILY CONSUMPTION FOR ALL COMPLEXES'
1261 WRITE #4,TAB(20):'DAILY CONSUMPTION FOR ALL COMPLEXES'
1330 S$='-----'
1333 M$='0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 2 2 2 2 2'
1334 N$='0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4'
1335 D$='0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0'
1340 WRITE #2,'CONSUMPTION'
1341 WRITE #4,'CONSUMPTION'
1342 WRITE #2,'IN KWH'
1343 WRITE #4,'IN KWH'
1350 WRITE #2,TAB(10):S$
1351 WRITE #4,TAB(10):S$
1360 FOR M1=40,1,-1
1365 A=B

```

PLOT1D

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```
1370 IF M1<>INT(M1/2)*2 THEN A=0
1372 K$=STR$(M1*2.5*A)
1374 IF K$='0' THEN K$=''
1380 WRITE #2,K$:TAB(12):M$(M1,1):M$(M1,2):M$(M1,3):M$(M1,4)
      ):M$(M1,5):
1381 WRITE #4,K$:TAB(12):M$(M1,1):M$(M1,2):M$(M1,3):M$(M1,4)
      ):M$(M1,5):
1382 WRITE #2,M$(M1,6):M$(M1,7):M$(M1,8):M$(M1,9):M$(M1,10):
1383 WRITE #4,M$(M1,6):M$(M1,7):M$(M1,8):M$(M1,9):M$(M1,10):
1384 WRITE #2,M$(M1,11):M$(M1,12):M$(M1,13):M$(M1,14):M$(M1,15):
1385 WRITE #4,M$(M1,11):M$(M1,12):M$(M1,13):M$(M1,14):M$(M1,15):
1386 WRITE #2,M$(M1,16):M$(M1,17):M$(M1,18):M$(M1,19):M$(M1,20):
1387 WRITE #4,M$(M1,16):M$(M1,17):M$(M1,18):M$(M1,19):M$(M1,20):
1388 WRITE #2,M$(M1,21):M$(M1,22):M$(M1,23):M$(M1,24):TAB(6
      1):M$(M1,25)
1389 WRITE #4,M$(M1,21):M$(M1,22):M$(M1,23):M$(M1,24):TAB(6
      1):M$(M1,25)
1440 NEXT M1
2000 WRITE #2,'0':TAB(10):S$
2001 WRITE #4,'0':TAB(10):S$
2020 WRITE #2,TAB(10):M$
2021 WRITE #4,TAB(10):M$
2040 WRITE #2,TAB(10):N$
2041 WRITE #4,TAB(10):N$
2060 WRITE #2,TAB(10):O$
2061 WRITE #4,TAB(10):O$
2080 WRITE #2,TAB(10):O$
2081 WRITE #4,TAB(10):O$
2090 GOSUB 9300
2100 WRITE #2,TAB(30):'TIME'
2101 WRITE #4,TAB(30):'TIME'
2300 CALL 1
2320 CALL 6(10)
2340 CLOSE #2
2360 CLOSE #4
2380 GOTO 200
9100 REM-----CHECK INPUT DATE FORMAT-----
9110 IF LEN(D$)>4 THEN 240
9120 IF VAL(SUB(D$,1,2),X5)<1 THEN 240
9130 IF VAL(SUB(D$,1,2),X5)>12 THEN 240
9140 IF VAL(SUB(D$,3,4),X5)<1 THEN 240
9150 IF VAL(SUB(D$,3,4),X5)>31 THEN 240
9160 RETURN
9200 REM-----DEFAULT COMPLEX TOTALS-----
9210 FOR K=1,6
9220 M(K)=0
9230 NEXT K
9240 RETURN
9300 REM-----SPACER-----
9310 WRITE #2,''
9320 WRITE #4, ''
```


PLOT1D

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```
9330 RETURN
9400 REM-----CHARACTER FILL-----
9405 IF M$(M1,M0) <> '' THEN M$(M1,M0)=M$(M1,M0)+'+S$(K)
9410 IF M$(M1,M0)='' THEN M$(M1,M0)=S$(K)
9420 RETURN
9500 REM-----RESET GRID-----
9510 FOR I1=1,40
9520 FOR I2=1,25
9530 M$(I1,I2)=''
9540 NEXT I2
9550 NEXT I1
9560 RETURN
9997 PRINT 'PLOT1D END'
9998 CHAIN 'PLOTS'
9999 END
```

PLOT2D

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```

1  PRINT 'PLOT2D BEGIN'
100 REM*****
101 REM*
102 REM*          PLOT2D
103 REM*
104 REM* PLOT2D PLOTS THE DAILY CONSUMPTION OF ONE
105 REM* COMPLEX. ONE REQUIRED INPUT IS THE DATE
106 REM* OF THE DESIRED INFORMATION. THE INPUT FORMAT
107 REM* IS 0802 FOR AUGUST 2 . ANOTHER INPUT
108 REM* IS THE SPECIFIC COMPLEX OF WHICH INFORMATION
109 REM* IS REQUIRED.
110 REM*
111 REM* REVISION 0   SEPT 14 1976   JOHNNY ALBANO, JR.
198 REM*
199 REM*****
200 REM-----INPUT NECESSARY INFORMATION-----
201 S$(1)='>'
202 S$(2)='+'
203 S$(3)='X'
204 S$(4)='0'
205 S$(5)='<'
206 S$(6)='*'
207 A=20
208 B=A
210 DEF FNA(X)=INT((X/(2.5*A))+.5)*2.5*A
225 DIM C(16,4),M$(40,25),M(6),T$(5),S$(6)
230 PRINT 'DATE (EXAMPLE: AUGUST 8 = 0802)';
240 INPUT D$
260 IF D$='99' THEN 9997
280 GOSUB 9100
285 GOSUB 9500
290 GOSUB 8000
295 G=VAL(G$,X5)
300 F$='ERIDCON>C6'+D$
320 DEFINE READ FILE #2=F$,BIN
330 ON END #2 GOTO 1000
340 FOR M0=1,24
360 GOSUB 9200
380 FOR M1=1,4
400 READ #2,T1,D1,W1
420 MAT READ #2,C
460 M(G)=M(G)+C(10+G,4)
480 M(6)=M(6)+C(16,4)
500 NEXT M1
510 M(G)=FNA(M(G))
515 M(6)=FNA(M(6))
520 FOR M1=1,40
540 FOR K=1,6
560 IF M(K)=M1*2.5*A THEN GOSUB 9400
580 NEXT K
600 NEXT M1

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620  NEXT MO
1000  REM-----GENERATE GRAPHS-----
1001  M$(40,25)='      LEGEND'
1002  M$(39,25)='-----'
1003  M$(38,25)=S$(1)+' = MAY COMPANY'
1005  M$(37,25)=S$(2)+' = UNITED'
1006  M$(36,25)='      CALIFORNIA BANK'
1007  M$(35,25)=S$(3)+' = SOUTHERN'
1008  M$(34,25)='      CALIFORNIA GAS'
1009  M$(33,25)=S$(4)+' = DEPARTMENT OF'
1010  M$(32,25)='      WATER AND POWER'
1011  M$(31,25)=S$(5)+' = OCCIDENTAL'
1012  M$(30,25)='      CENTER'
1013  M$(29,25)=S$(6)+' = COMPLEXES TOTAL'
1014  M$(28,25)='-----'
1020  CLOSE #2
1040  E$='ERDRFT>D1'+D$
1060  DEFINE FILE #2=E$
1080  DEFINE FILE #4='(A)'
1100  WRITE #2,'.W 130'
1105  WRITE #2,'.TM 2'
1110  WRITE #2,'.SM 1'
1115  WRITE #2,'.BM 2'
1120  WRITE #2,'.B'
1140  WRITE #2,'.N'
1160  WRITE #2,'.NFILE'
1180  WRITE #2,'.TT-Y'
1200  CALL 1
1220  CALL 6(10)
1240  WRITE #2,'DATE:':SUB(D$,1,2):'-':SUB(D$,3,4):'- 76':TA
      B(65):F$
1241  WRITE #4,'DATE:':SUB(D$,1,2):'-':SUB(D$,3,4):'- 76':TA
      B(65):F$
1245  WRITE #2,TAB(65):E$
1246  WRITE #4,TAB(65):E$
1250  GOSUB 9300
1251  GOSUB 9300
1255  WRITE #2,TAB(19):'NATIONAL ENERGY PEAK LEVELING PROGRAM'
1256  WRITE #4,TAB(19):'NATIONAL ENERGY PEAK LEVELING PROGRAM'
1260  WRITE #2,TAB(20):'DAILY CONSUMPTION OF':T$(G)
1261  WRITE #4,TAB(20):'DAILY CONSUMPTION OF':T$(G)
1330  S$='-----'
1333  M$='0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 2 2 2 2'
1334  N$='0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4'
1335  O$='0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0'
1340  WRITE #2,'CONSUMPTION'
1341  WRITE #4,'CONSUMPTION'
1342  WRITE #2,'IN KWH'
1343  WRITE #4,'IN KWH'
1350  WRITE #2,TAB(10):S$
1351  WRITE #4,TAB(10):S$

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1360 FOR M1=40,1,-1
1365 A=B
1370 IF M1<>INT(M1/2)*2 THEN A=0
1372 K$=STR$(M1*2.5*A)
1374 IF K$='0' THEN K$=''
1380 WRITE #2,K$:TAB(12):M$(M1,1):M$(M1,2):M$(M1,3):M$(M1,4)
      ):M$(M1,5):
1381 WRITE #4,K$:TAB(12):M$(M1,1):M$(M1,2):M$(M1,3):M$(M1,4)
      ):M$(M1,5):
1382 WRITE #2,M$(M1,6):M$(M1,7):M$(M1,8):M$(M1,9):M$(M1,10):
1383 WRITE #4,M$(M1,6):M$(M1,7):M$(M1,8):M$(M1,9):M$(M1,10):
1384 WRITE #2,M$(M1,11):M$(M1,12):M$(M1,13):M$(M1,14):M$(M1,15):
1385 WRITE #4,M$(M1,11):M$(M1,12):M$(M1,13):M$(M1,14):M$(M1,15):
1386 WRITE #2,M$(M1,16):M$(M1,17):M$(M1,18):M$(M1,19):M$(M1,20):
1387 WRITE #4,M$(M1,16):M$(M1,17):M$(M1,18):M$(M1,19):M$(M1,20):
1388 WRITE #2,M$(M1,21):M$(M1,22):M$(M1,23):M$(M1,24):TAB(6
      1):M$(M1,25)
1389 WRITE #4,M$(M1,21):M$(M1,22):M$(M1,23):M$(M1,24):TAB(6
      1):M$(M1,25)
1440 NEXT M1
2000 WRITE #2,'0':TAB(10):S$
2001 WRITE #4,'0':TAB(10):S$
2020 WRITE #2,TAB(10):M$
2021 WRITE #4,TAB(10):M$
2040 WRITE #2,TAB(10):N$
2041 WRITE #4,TAB(10):N$
2060 WRITE #2,TAB(10):O$
2061 WRITE #4,TAB(10):O$
2080 WRITE #2,TAB(10):O$
2081 WRITE #4,TAB(10):O$
2090 GOSUB 9300
2100 WRITE #2,TAB(30):'TIME'
2101 WRITE #4,TAB(30):'TIME'
2300 CALL 1
2320 CALL 6(10)
2340 CLOSE #2
2360 CLOSE #4
2380 GOTO 200
8000 REM-----SELECT COMPLEX-----
8001 T$(1)='MAY COMPANY'
8002 T$(2)='UNITED CALIFORNIA BANK'
8003 T$(3)='SOUTHERN CALIFORNIA GAS'
8004 T$(4)='DEPT OF WATER & POWER'
8005 T$(5)='OCCIDENTAL CENTER'
8020 PRINT 'SELECT THE COMPLEX:'
8040 PRINT 'TYPE 1 FOR MAY COMPANY'
8060 PRINT '      2      UCB'
8080 PRINT '      3      SCG'
8100 PRINT '      4      DWP'
8120 PRINT '      5      OCCIDENTAL'
8140 INPUT G$

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8160 IF G$='1' THEN RETURN
8180 IF G$='2' THEN RETURN
8200 IF G$='3' THEN RETURN
8220 IF G$='4' THEN RETURN
8240 IF G$='5' THEN RETURN
8260 GOTO 8140
9100 REM-----CHECK INPUT DATE FORMAT-----
9110 IF LEN(D$)>4 THEN 240
9120 IF VAL(SUB(D$,1,2),X5)<1 THEN 240
9130 IF VAL(SUB(D$,1,2),X5)>12 THEN 240
9140 IF VAL(SUB(D$,3,4),X5)<1 THEN 240
9150 IF VAL(SUB(D$,3,4),X5)>31 THEN 240
9160 RETURN
9200 REM-----DEFAULT COMPLEX TOTALS-----
9210 FOR K=1,6
9220 M(K)=0
9230 NEXT K
9240 RETURN
9300 REM-----SPACER-----
9310 WRITE #2,''
9320 WRITE #4,''
9330 RETURN
9400 REM-----CHARACTER FILL-----
9405 IF M$(M1,M0)<>'' THEN M$(M1,M0)=M$(M1,M0)+'+S$(K)
9410 IF M$(M1,M0)='' THEN M$(M1,M0)=S$(K)
9420 RETURN
9500 REM-----RESET GRID-----
9510 FOR I1=1,40
9520 FOR I2=1,25
9530 M$(I1,I2)=''
9540 NEXT I2
9550 NEXT I1
9560 RETURN
9997 PRINT 'PLOT2D END'
9998 CHAIN 'PLOTS'
9999 END
```