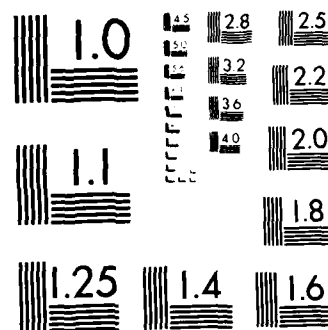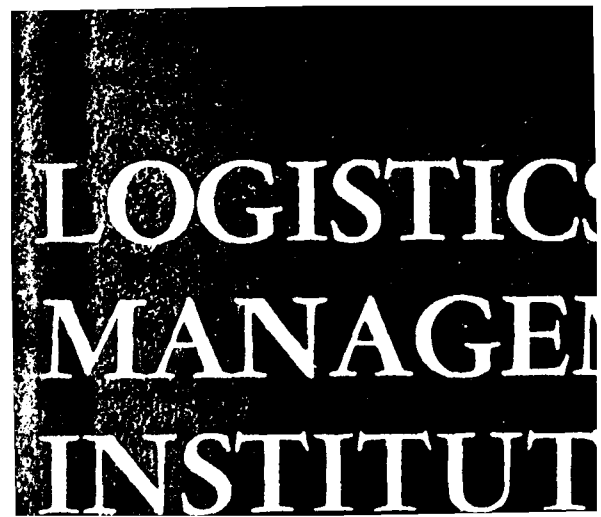END
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IMPROVING THE
DEFENSE ENERGY INFORMATION SYSTEM
(DEIS)


January 1985

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Executive Summary

IMPROVING THE DEFENSE ENERGY INFORMATION SYSTEM (DEIS)

The Defense Energy Information System (DEIS) is an automated management information system used by the Department of Defense (DoD) to monitor its supplies and consumption of energy worldwide. Data collected from more than 2,100 activities are used for supply management, energy-conservation management, energy-policy analysis, readiness assessment, and research and development by the Office of the Secretary of Defense, Military Services, and DoD agencies.

Until recently, DEIS data were not readily available to DoD energy managers or to the personnel who had collected the data. Now, however, DEIS is supported by an on-line, interactive, data base management system resident on a computer in San Antonio, Texas.

Though accessing the data has become easier, operational problems -- communication line difficulties, slow response times, and inadequate storage capacity -- have discouraged widespread use of DEIS. Those problems should disappear when DEIS is moved to a computer in The Pentagon; the move is scheduled for spring 1985.

Yet, even then, DEIS usage will continue to be inadequate until three changes take place: a) energy managers can acquire software that makes it simpler for them to develop their own reports; b) more preprogrammed and flexible reports become available to them; and c) the system has been made less complex.

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We recommend that the Director of Energy Programs, Office of the Secretary of Defense, encourage timely movement of DEIS to the Pentagon. In addition, he should take action to effect:

- Changes in the DEIS computer system:

    -- Upgrade the data base management software to its most recent version as soon as possible;

    -- Modify the data base design to improve accessibility and usefulness; and

    -- Install software that will reduce the costs of on-line usage and direct the attention of users to efficient use of DEIS.

- Enhanced capability for on-line reports:

    -- Develop on-line energy reports on conservation progress, trends, and consumption;

    -- Create on-line reports for the Services;

    -- Provide graphics and statistical analysis software;

    -- Add an expert in data base query language to the DEIS support team; and

    -- Provide DEIS users with documentation and training in design and preparation of energy reports.

- Use of microcomputers by energy managers: Many offices have microcomputers. We recommend they be used to: carry out automatically the now cumbersome procedure for gaining access to the DEIS computer; process, store, and print standard reports; produce graphs and analyze energy trends; help develop and format reports; and access other energy data bases, such as those at the Department of Energy.

# ACKNOWLEDGMENTS

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# 1. INTRODUCTION

## DEFENSE ENERGY INFORMATION SYSTEM

The Defense Energy Information System (DEIS) is an automated management information system with which the Department of Defense (DoD) monitors its supplies and consumption of energy. DEIS provides information about DoD's bulk petroleum products -- inventory, consumption, resupply, and sale -- as well as inventory and consumption of energy for utility services.

DEIS receives data from more than 2,100 military bases and facilities, naval vessels, and DoD agencies. The information is reported monthly to the Defense Logistics Agency's (DLA's) computer center at Cameron Station, Alexandria, Virginia, via AUTODIN or DoD's message communication system. The data are edited, sorted, and added to on-line data bases on an Air Force computer in San Antonio, Texas. The data are used for reports that are distributed to energy management offices throughout the Military Services and DoD agencies for supply management, energy conservation management, energy policy analysis, readiness assessment, and research and development.

DEIS consists of two related data systems. DEIS-I, the Bulk Petroleum Product Report, provides information on inventory, consumption, resupply, and sale of bulk petroleum products in DoD. It also identifies all DLA petroleum, including petroleum in transit by Military Sealift Command tankers. DEIS-II, the Utility Energy Report, provides information on inventory and consumption of energy for utility services at DoD installations. DEIS contains a wide variety of data each month. Figure 1-1 shows the types of data submitted to DEIS by each installation.

FIGURE 1-1.    DATA IN THE DEFENSE ENERGY INFORMATION SYSTEM (DEIS)

DEIS-I:   PETROLEUM REPORT

   Opening inventory
   Total issues
   Commercial receipts
   Receipts from DoD
   Closing inventory
   Primary, secondary, and tertiary use
   Downgrade/loss
   Credit card/Into-plan contract
   Quantities issued to other Services and non-DoD activities
   Intra-service transfer
   Consumption

DEIS-II:   UTILITY REPORT

   Inventory
   BTU[1] content
   Total consumption
   Consumption cost
   Environmental data, including heating and cooling
   Degree-days
   Activity population and building information

[1]British Thermal Units.

Monitoring this information on inventory, consumption, and receipts is important to DoD supply assurance.  DoD consumes approximately two percent of the nation's energy.  Table 1-1 lists the products reported in each system and an example of DoD's annual consumption of them.

DEIS is based on a commercial data base management system (DBMS) which allows for data retrieval and display by Department of Energy (DoE) region, Military Service, state, country, or product aggregation.  The DBMS provides the capability to develop ad hoc queries of energy data.  On-line access to the DEIS system is available to users through remote terminals.

RESPONSIBILITIES FOR DEIS

Operational responsibilities for DEIS are shared by a number of DoD agencies.  The Directorate of Energy and Transportation Policy, under the

TABLE 1-1.   DoD PRODUCT CONSUMPTION

| PRODUCT | TRILLIONS OF BTUs[1] (FY83)[2] |
|---|---|
| DEIS-I (Petroleum Report) | |
| Aviation gasolines | 2.1 |
| Jet fuels | 666.9 |
| Motor gasolines | 27.1 |
| Distillates | 235.6 |
| Residuals | 73.3 |
| | 1005.0 |
| DEIS-II (Utility Report) | |
| Electricity | 318.7 |
| Natural Gas | 105.8 |
| Propane or liquefied | 2.2 |
| petroleum gas | 2.2 |
| Heating fuel | 109.8 |
| Coal | 41.0 |
| Steam and hot water | 4.6 |
| Renewable energy sources | 0.2 |
| | 582.3 |

[1]British Thermal Units.

[2]Fiscal year 1983.

Deputy Assistant Secretary of Defense for Logistics and Materiel Management (DASD(L&MM)), has overall project management responsibility for DEIS. The Energy Programs (EP) office in this directorate relies on DEIS data for its reports to the DoE, Congress, and others who request information. It is the source of official DoD energy data.

The 1st Information Systems Group (1ISG) (formerly the Air Force Data Services Center) programmed and implemented DEIS as it is used today and now provides the programming and technical support for DEIS. The Defense Fuel Supply Center (DFSC), part of DLA, is the DEIS system operator. DFSC receives the data from the reporting activities, transmits it to the San Antonio,

Code (DoDAAC)). In each record, a separate field is maintained for each month of the year. This makes it extremely awkward to write a general-purpose query to retrieve cooling and heating degree-days for any specified period. For example, to retrieve heating degree-days for fiscal year 1984 (FY84) for a specific DoDAAC, the query would have to include the following:

...RPTYR=84 ..., COMPUTE HEAT(OCTH + NOVH + DECH + JANH +... + SEPH).

The process for extracting calendar-year totals is even more complex.

A more flexible approach, one that would allow more general retrievals, would be to use a separate data base for weather data. This data base would contain a record for each DoDAAC for each month. The fields in each record would be: DoDAAC, report date, heating degree-days, cooling degree-days, and the source of the degree-day data. This approach does have disadvantages: the need for more mass storage and a separate data base.

The 1ISG should be tasked to evaluate the current design of the weather data fields to determine whether a more flexible data structure can be implemented or whether standard macros should be developed for users to incorporate in their queries to simplify retrieval of weather data.

Another problem with the weather data has to do with the value for the source of the heating or cooling degree-day. For every month of the fiscal year, there is a "source" field to indicate where the data were obtained -- whether from the Air Force Weather Service or from the installation itself. As the system is now designed, if no data are submitted, the default value for a heating or cooling degree-day defaults to zero. Zero, of course, may also represent a legitimate value for these fields. We recommend an additional code in the source field to indicate that no data were submitted.

TABLE 3-1.   DEIS-II ENVIRONMENTAL DATA BASE (DEIS2E)

| DATA FIELD | FIELD NAME | STORED LENGTH (IN CHARACTERS) |
|---|---|---|
| DoD Activity Address Code | DODAAC | 6 |
| Fiscal year | RPTYR | 2 |
| October heating degree days | OCTH | 4 |
| Source of October heating degree days | OCTHSRCE | 1 |
| October cooling degree days | OCTC | 4 |
| Source of October cooling degree days | OCTCSRCE | 1 |
| November heating degree days | NOVH | 4 |
| Source of November heating degree days | NOVHSRCE | 1 |
| November cooling degree days | NOVC | 4 |
| Source of November cooling degree days | NOVCSRCE | 1 |
| . | | |
| .            1 | | |
| . | | |
| September heating degree days | SEPH | 4 |
| Source of September heating degree days | SEPHSRCE | 1 |
| September cooling degree days | SEPC | 4 |
| Source of September cooling degree days | SEPCSRCE | 1 |
| Sq. ft. owned buildings | SOWN | 4 |
| Sq. ft. new owned buildings | SOWNN | 4 |
| Sq. ft. leased buildings | SLEASE | 4 |
| Sq. ft. new leased buildings | SLEASEN | 4 |
| Sq. ft. process energy buildings | SPROCESS | 4 |
| Sq. ft. new process energy buildings | SPROCESN | 4 |
| Number - owned buildings | BOWN | 4 |
| Number - new owned buildings | BOWNN | 4 |
| Number - leased buildings | BLEASE | 4 |
| Number - new leased buildings | BLEASEN | 4 |
| Number - process energy buildings | BPROCESS | 4 |
| Number - new process energy buildings | BPROCESN | 4 |
| Number - personnel | PERSONS | 4 |

[1] Heating degree day, cooling degree day, and source-of-data for December through August are also fields in the environmental data record.

Fiscal Year and Quarter

The most commonly used DEIS reports include data aggregated by fiscal quarter or fiscal year. The data base includes the report dates by calendar year and calendar month. The user must include logic in his query to determine into what fiscal quarter or year the particular report month falls. For example, to obtain 1984 fiscal year information, the query instruction must contain:

FIND IN ... RPTDATE=(8310 to 8309).

This becomes even more of a problem when the data are archived to the quarterly data base. The report date changes from calendar-year month form to fiscal year, fiscal quarter form. This means the form of the query instruction must change to:

FIND IN ... RPTDATE=(84Q*).

And if the data are in both the monthly and quarterly data bases, the query must contain both forms. Adding fiscal quarter and fiscal year fields to each record would simplify these queries as follows:

FIND IN ... FYEAR=84Q*.

The query would be the same regardless of the data base being queried and queries would be much easier to develop. Adding these two fields to each record on the data base would only require 5 percent more storage and would require approximately 40 hours of IISG programmer time to develop. There would be no reporting burden on field activities.

Weather Data

The DEIS-II environmental data base is shown in Table 3-1. Currently the heating and cooling degree-days are stored -- along with square footage, building, and personnel data -- in a single record for each fiscal year each installation (identified by a Department of Defense Activity Address

### Improved Documentation

The INQUIRE language used to develop reports is powerful, but it is also complex. The documentation of IQ/NET Release 2 is incomplete and poorly organized. INQUIRE Release 84-2 appears to provide better documentation.

### SAS and SAS/Graph Interface

Another important feature of Release 84-2 is its interface with the SAS and the SAS/Graph. SAS, a mainframe software package, has statistical analysis and report-writing capabilities. SAS/Graph, a graphics package, provides pie chart, bar chart, and other graphic display formats. Both are now available on the DEIS computer system, but there is no easy way to transfer DEIS data to them. Reports for DEIS now provide basic management report summaries. With Release 84-2 and its interface to SAS, more sophisticated analysis and reporting can be accomplished.

## DATA BASE DESIGN IMPROVEMENTS

This section describes changes in the current data base design that will help users to extract data more easily from the system data bases. As users continue to use DEIS, some types of queries arise repeatedly. Current data base design features make it difficult to develop a number of these queries. The changes we propose will use 5 percent more computer storage space and will significantly simplify query development to answer some common questions.

We recommend, therefore, the following changes in the data base design:

- Add a fiscal year and fiscal quarter data field to the DEIS-I and DEIS-II product records;

- Add latitude and longitude locations to the installation header records; and

- Redesign the environmental data base to improve the flexibility of the weather data.

The following paragraphs describe these recommendations in more detail.

means that many queries, such as those to compare baseline consumption to current consumption, become complex and usually costly. An example: Federal Energy Usage Reports, quarterly reports to the DoE, cost approximately $100 for each report. Furthermore, these one-pass queries take a significant amount of programming expertise to develop. Even with that expertise, producing the report takes considerable development time -- three or four days to develop one such report. As a result, a bottleneck has developed in the preparation of useful energy management reports for DEIS. Few people have the training needed to prepare these reports using the single-pass technology of Release 2. Under Release 84-2, it will be possible to make a single pass through a DEIS data base to compute and aggregate data and create another (external) file. A second manipulation of the extracted data will process the special cases and exceptions involved in a typical DEIS report. Much less time and expertise will be required. And because handling the exceptions will involve a much smaller set of data -- the extracted information only -- the reports will cost less.

### Improved Operating System Interface

The new INQUIRE release also works better with the TSO command language used on the DEIS computer system. With Release 84-2, more useful macro-instructions and computer operating system procedures can be developed. Currently, these procedures are developed within the user language using the macro-instruction capability of INQUIRE. This is awkward, and it requires an INQUIRE expert. Under Release 84-2, less INQUIRE expertise will be needed. Since the technical support personnel are generally more experienced in TSO capabilities than in INQUIRE, sophisticated procedures -- invisible to the user -- can be developed to make it easier to extract information from DEIS.

The remoteness and saturation of the SADSC facility make it less than an ideal home for DEIS, despite the close contact and responsive actions of the technical and management personnel of 1ISG and SADSC. Nevertheless, the overall communication problems will be solved only when DEIS is installed on a computer in the Washington, D.C., area. Present plans call for DEIS to move to an IBM 3032 computer in The Pentagon and be supported by 1ISG. An IBM classified computer in The Pentagon is scheduled to be available for unclassified processing in January 1985. DEIS should be installed on a computer in Washington, D.C., by April 1985.

## UPGRADE OF INQUIRE

DEIS is based on a commercial DBMS called INQUIRE, which Infodata Systems, Inc., developed and supports. DEIS now uses IQ/Net Release 2, an old version of INQUIRE. Infodata has two newer versions of this DBMS. The current plan is to upgrade to the newest version (INQUIRE Release 84-2) in April 1985, when DEIS is moved to The Pentagon. We strongly endorse the upgrade. We recommend that the upgrade to INQUIRE Release 84-2 not be delayed, even if the move to The Pentagon is delayed. The new version includes features that can be useful and important to DEIS. The following paragraphs summarize some of the important features of Release 84-2 relevant to the improved operation of DEIS.

### External File Access

The key feature of Release 84-2, one that promises substantial benefits to the DEIS system, is external file access. This is the ability to query files that are not in the standard INQUIRE data base format. The most important element of this new feature is the ability to perform multi-pass queries on DEIS data. In the DEIS data bases, records are now read one at a time, and the information is aggregated or displayed as it is processed. This

delays occur, and the system is difficult for EP to manage. Therefore, they are looking for ways to improve DEIS. The remainder of this chapter describes areas for improvement, including relocation of DEIS, upgrading of the INQUIRE DBMS, and improvements in data base design.

## RELOCATION OF DEIS

Since early 1982, many of the organizations involved in DEIS thought that the computer on which DEIS resides should be in the Washington, D.C., area. An original objective of this project was to determine the feasibility of moving DEIS from SADSC to another computer. DEIS was originally implemented on an IBM computer at The Pentagon; the system was supported by IISG. In December 1981 that computer was dedicated to classified work, and all unclassified processing, including DEIS, was temporarily assigned to the equipment of an outside service organization. This arrangement proved costly; DEIS was transferred to an unclassified computer at SADSC in March 1982.

DEIS now operates on an IBM 4341 at SADSC, but the system operator, technical support, and most of the users are located in the Washington, D.C., area. This "long-distance" arrangement has caused continuing problems. The communication lines (leased and dial-up) are unreliable and expensive. Moreover, computers at both DLA and SADSC have had operational difficulties. For example, when a thunderstorm warning is received, SADSC shuts down the computer, for lack of an uninterruptible power supply. This shutoff prevents massive losses of data. But, since severe storms are common in Texas during the summer, access of users to DEIS is also disrupted.

SADSC supports many other applications and does not have adequate disk storage and memory capacity for DEIS. As a result, users are sometimes denied access to the system, and response time is often long. The system operator (DFSC) is most affected by these problems and must work overtime to avoid delays in processing data.

FIGURE 3-1. DEIS SYSTEM FLOW

LEGEND

--- DIAL ACCESS

—— DIRECT LINE

⟋⟍ COMMUNICATIONS CIRCUIT

••• HAND CARRIED MESSAGES
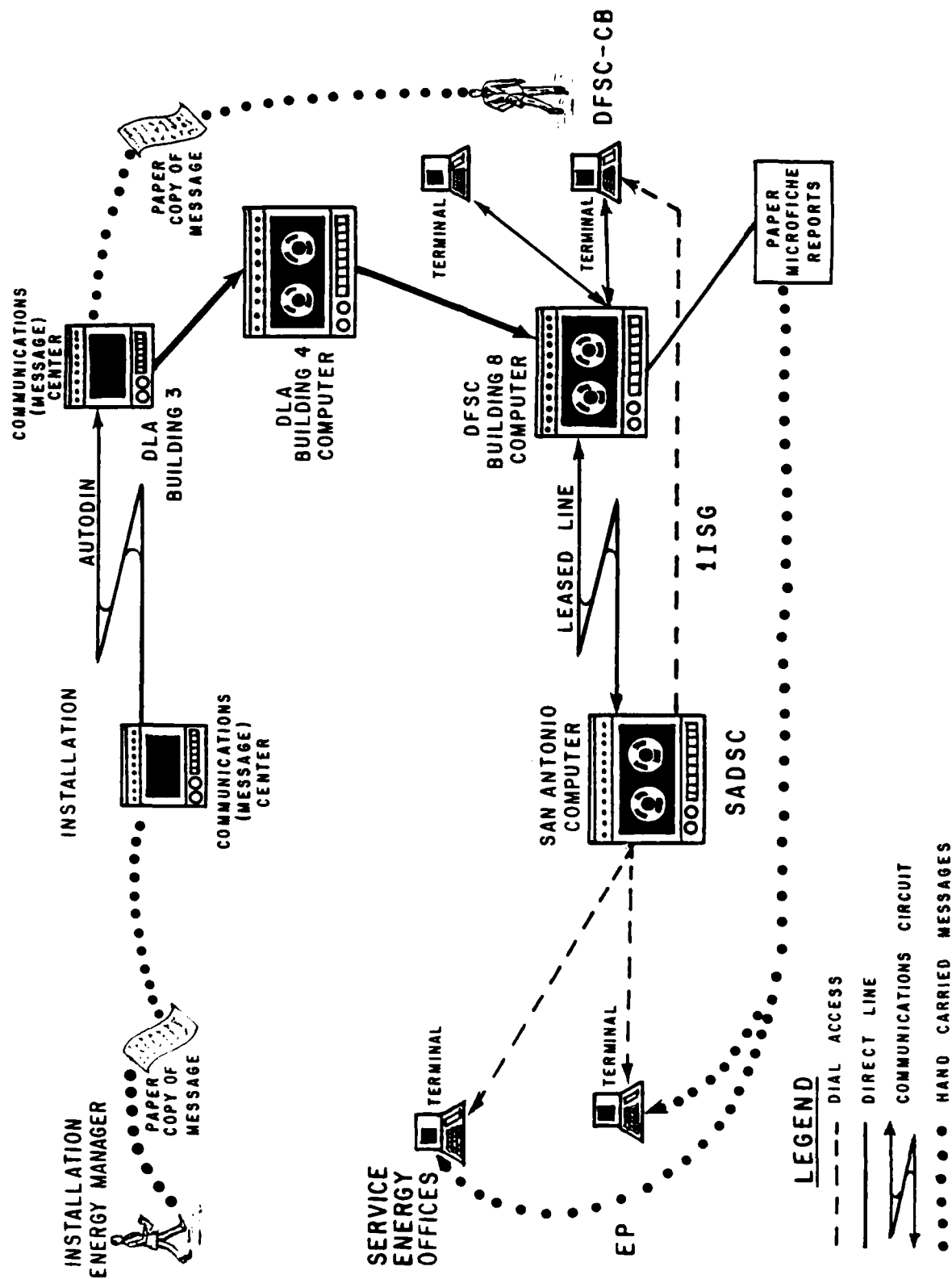
## 3. SYSTEM ENVIRONMENT

DEIS is a large, complex system of energy-related data. As Figure 3-1 shows, installations submit data to their message center, where it is transmitted via AUTODIN or DoD's message system to DLA, Cameron Station, Virginia. DLA transfers the data through a series of its computers and then transmits it by leased line to the SADSC computer in San Antonio, Texas. The data are then validated with automated edits and corrected by DFSC personnel. The corrected data are entered into the on-line data base, which is based on the commercial DBMS named INQUIRE. Data can then be retrieved through ad hoc queries and batch reports by Service energy managers at installation, major command, and headquarter activities and by the DoD Energy Programs office.

The system involves the following organizations:

- Energy Programs -- overall management;

- Each Service -- collects data and transmits them to DLA, corrects data, reviews reports, manages their own energy program;

- DLA -- captures AUTODIN traffic, provides hardware and software support for DFSC, works with telephone company on problems with the leased-line to SADSC;

- DFSC -- transmits data from AUTODIN files to SADSC, runs edits, examines errors, enters corrections, runs data base update program;

- 1ISG -- provides programming support for edit and report programs, serves as technical interface between the Office of the Secretary of Defense (OSD) and DFSC to SADSC;

- SADSC -- furnishes hardware, DBMS, and system software; and

- Infodata Systems, Inc. -- maintains the proprietary DBMS (INQUIRE) it developed.

Ultimately the system should be such that there is direct communication from installations to The Pentagon computer, thus eliminating many of the steps shown in Figure 3-1. With so many organizations involved, processing

3-1

mainframe computer costs would also be lowered. Areas that merit immediate application include:

- Automating the access procedure for DEIS;

- Use of microcomputer graphics and statistical software packages;

- Use of microcomputer word processing editors to develop DEIS queries and send these queries to the DEIS computer; and

- Combination and analysis of DEIS data with data from various energy information systems.

For many energy offices, the cost of a microcomputer system cannot be justified solely for use with DEIS. However, microcomputers are appearing in many offices for word processing and other office automation functions. We recommend that these offices consider the benefits of acquiring a system that can also communicate with DEIS.

We also recommend that the new software package, PC/INQUIRE, a microcomputer version of the mainframe DBMS used for DEIS, be evaluated for use in training DEIS users and operators, testing and developing DEIS applications, and reducing computer costs.

We recommend the following changes to reduce the cost of queries:

- Change the TOTALS and SAVEQRY queries to reduce region-size requirements.

- Change the END option to print total Central Processing Unit (CPU) time. This will focus users' attention on costs and efficient query procedures.

## MANAGEMENT REPORTS

Although on-line DEIS has extensive report capabilities, the number of on-line users is still small. There must be more development of on-line energy management reports (queries) that are tailored to various user needs. DEIS needs more flexible generalized queries, allowing users to access, display, and combine energy data into various levels of aggregation. In particular, queries focusing on Service, Major Command, and installation progress toward energy goals are needed.

There is a backlog of unfinished reports because many of them are complex. There is a shortage of the technical personnel who could either develop these specialized queries or train DEIS users to extract and display the energy data they need. We recommend the following:

- Add to the DEIS support team a specialist in the development of DEIS energy reports. This individual should work closely with the Service energy offices, the DFSC operators, and EP to develop management reports suitable for their needs.

- Add more documentation on existing DEIS queries, on-line reporting techniques, data element definitions, and cost-effective query techniques. More documentation on these topics would improve DEIS accessibility.

- Develop procedures to transfer DEIS data to the mainframe graphics and statistical software packages (Statistical Analysis System (SAS) and SAS/Graph) and use this software for graphic display and energy trend analysis.

## USE OF MICROCOMPUTERS

Microcomputer systems now in energy offices can enhance significantly the accessibility and usefulness of DEIS in answering energy management questions;

## 2. CONCLUSIONS AND RECOMMENDATIONS

This chapter summarizes our conclusions and recommendations concerning the DEIS operational environment, the need for more energy management reports, and the use of microcomputers with DEIS. Chapters 3, 4, and 5 discuss these recommendations in more detail.

### OPERATIONAL ENVIRONMENT

A variety of improvements can be made in DEIS operations, ranging from moving DEIS to providing users with more cost information. We recommend the following actions to improve the operating environment:

- Return DEIS to a computer in the Washington, D.C., area in the spring of 1985 as planned. Since the inception of this project, plans have been made to move DEIS to an International Business Machines (IBM) 3032 computer at The Pentagon (operated and supported by the 1ISG). We strongly endorse this plan, and if this move is canceled for some reason, we recommend that another site be found in the Washington, D.C., area.

- Upgrade the INQUIRE DBMS software used by DEIS to the latest release, Release 84.2. This upgrade provides significant features that will enhance DEIS on-line query development and user language documentation. The 1ISG plans to upgrade the software when DEIS returns to The Pentagon; if this move is delayed, we recommend that the upgrade be made at SADSC.

We recommend the following changes in the data base design to improve the users' ability to develop queries to answer their data needs:

- Add fiscal year and fiscal quarter fields;

- Add latitude and longitude fields;

- Add a code to weather data source-of-submission to indicate no data were submitted; and

- Change weather data base design to facilitate developing queries that compare energy consumption and heating or cooling degree-days.

Even though DEIS has the capacity for interactive analysis and display of reports by DoE region, state, country, Service, o product aggregation, the number of on-line users is still quite small. Energy managers are not using the on-line system because extracting the reports they want is a complex and time-consuming process. Use of DEIS will continue to be limited to a few users unless steps are taken to enable energy managers to use it more easily, with preprogrammed reports or report development tools.

Chapter 2 summarizes our recommendations for improving DEIS. Chapter 3 describes various hardware- and systems-related problems in more detail and recommends solutions to them. Chapter 4 describes more fully the significant limitation of inadequate report capability. Chapter 5 discusses use of micro-computers with DEIS; this would enhance the capabilities of DEIS, overcome some of the limitations of a large DBMS on a large multi-user mainframe, and enable the system to become more capable and more flexible.

Texas, computer, validates and edits data for accuracy, and performs all data base updates. DFSC also prints and distributes several DEIS reports.

The Defense Energy Data Analysis Panel (DEDAP) is composed of representatives of the Services and other DEIS participants. The DEDAP serves as a forum for discussing the information needs of energy management, reviews problems or policies that affect the flow of energy management information in DoD, and makes recommendations.

The foregoing paragraphs provide an overview of DEIS and the DoD organizations responsible for its operation. The remainder of the chapter describes problems that have hindered effective DEIS operations and use.

PROBLEMS

In 1982 DEIS data became accessible to DoD energy managers through an on-line, interactive, data base management system resident on a computer in San Antonio, Texas. Despite improvements in the ability to access DEIS data, operational problems have hindered widespread use of DEIS.

One problem is that DEIS data arrive at DLA via AUTODIN or DoD message. Many of these messages cannot be processed by the DLA computer because of coding errors. Thus, DFSC must type much of the data before it can be transmitted to the DEIS computer at the San Antonio Data Services Center (SADSC). This adds to DFSC's workload and the availability of DEIS data is delayed.

There are problems with DEIS at the SADSC. The communications links (both leased and dial-up telephone lines) between DLA and San Antonio, Texas, are expensive and unreliable. Moreover, the SADSC computer lacks storage capacity, and response delays are frequent.

Because of these problems, the system operator must work overtime, processing is delayed and, consequently, DEIS data are not current and all of DoD lacks information about consumption and conservation of energy.

## Latitude and Longitude

Static information about DEIS reporting installations is contained in the DEIS-I and DEIS-II data bases named MEA1 (for DEIS-I) and MEB1 (for DEIS-II). This information includes the state, country, and DoE region for each installation. Using this information energy consumption can be displayed in various aggregations, for example, the continental United States, the European theatre, etc. In some instances, this information is too aggregate for management purposes. For example, a DEIS user may want to compute the energy consumption for DoD installations in northern California. To accommodate a wider range of aggregations, we recommend that geographic latitude and longitude data (an additional 11 characters per record) be added to the MEA1 and MEB1 data bases. This can be achieved at a small cost since latitude and longitude data for DEIS reporting installations were collected so that the Air Force Weather Service could provide degree-day data. It would require relatively little programming effort to add these fields to the existing DEIS MEA1 and MEB1 data bases. The increase in storage requirements would be slight (approximately 44,000 characters).

## OTHER IMPROVEMENTS

Because DEIS has few active users and the EP office has provided all funds, computer costs have not been a significant concern. However, as the number of users grows, costs will escalate. Cost-reduction steps should be taken so that the DEIS budget does not get out of hand. The following actions would reduce DEIS costs:

- Decrease region-size requirements for user sessions;

- Provide feedback about CPU usage and cost for each user session; and

- Identify and distribute information about efficient query procedures.

The following paragraphs describe these recommendations in more detail.

### Region-Size Requirements

A significant cost factor each time a user accesses DEIS is the "region-size" requirement. The region size is the maximum number of bytes of storage the user must reserve while using the system. For DEIS-II the requirement is 2,048 kilobytes (KB); for DEIS-I it is 1,500 KB. These requirements are due to two preprogrammed queries, SAVEQRY for DEIS-I and TOTALS for DEIS-II. We recommend that these queries be redesigned to decrease the storage requirements. Approximately 40 hours of programmer time would be required and significant amounts of capacity (and cost) would be saved, particularly as the number of users increases.

### User Session Feedback

Many computer systems provide their users with information about the amount of CPU time used and the approximate cost after each use. This provides users with information on computer resources and enables them to assess the costs of various query techniques and procedures. With this information the user can choose the cost effective techniques and make DEIS usage more efficient.

DEIS provides no cost or CPU time information to the user. SADSC accounting algorithms do not provide appropriate cost information; however, there is an INQUIRE statement that provides CPU time information. Adding an "OPTION TIME" macro-instruction to the END macro (users select the END option to sign off from DEIS) will provide the total CPU time for each use of DEIS.

We recommend that this technique be adopted immediately and that a costing procedure be installed when DEIS is moved to the computer in the Pentagon. Such information is essential to developing efficient resource-usage habits in DEIS users.

## Efficient Query Procedures

Not much information is available about the cost considerations involved in DEIS queries. As more and more standard queries are developed, determining and disseminating this type of information will become more important. As a first step in this direction, Logistics Management Institute (LMI) developed a manual of DEIS query techniques that point out our experiences in this area. We recommend that this information be distributed to all Service energy offices and all DEIS users.

## 4. MANAGEMENT REPORTS

The DoD uses DEIS data as a basis for managing inventory, managing energy consumption, and setting defense energy policy. Since timely, accurate data are the basis for making many of these management decisions, system managers have concentrated on making sure that accurate, timely, and reliable data are collected, processed, and available on-line. The major efforts of the system operators have been devoted to developing and refining procedures for collecting and validating the data and updating and maintaining DEIS data bases.

Data collection emphasis, however, has succeeded at the expense of data analysis. To ensure that accurate and timely DoD energy data are collected, meaningful, and easy to use analysis reports applicable for energy managers at all levels need to be produced.

The following sections discuss the need for more standard reports, more trained report writers, and more documentation. We identify some of the reasons for the limited number of on-line DEIS users, describe standard management reports that would improve the usefulness of DEIS, and recommend actions to ease the growing backlog of DEIS management report requests.

### MORE STANDARD DEIS REPORTS

Queries have been developed for individual energy offices, but they are not generally available to other DEIS users. DoD energy managers need more flexible queries so they can develop their own standard reports. They need answers to questions such as:

- What is the status of energy inventories and consumption for my organization and its components?

- How does this year's energy consumption compare with last year's? How does it compare with the FY75 baseline year?

- Are the energy goals mandated by Congress being met?

- Has the weather affected energy consumption?

- Have changes in personnel or building requirements affected energy consumption?

- Which installations have not submitted data for the most recent reporting period?

The DEIS on-line system includes only two queries that enable users to retrieve DEIS data by answering a series of questions. A query named "TOTALS" enables the user to specify a product category, geographical region, time period, and either the Military Service or Major Command. Figure 4-1 gives an example of a DEIS-I TOTALS query. The second query type, named "DoDAAC," allows the user to specify a DoDAAC, product code, and report date. The user can then verify that the data submitted have been entered into the data base accurately. Figure 4-2 shows a sample of a DEIS-I DoDAAC query. These queries are useful for validating user data submissions or receiving overall totals, but they are inadequate.

The TOTALS query provides total inventory and consumption information for either Services, Major Commands, or DoDAACs. But users also need energy totals for their subordinates; e.g., the Services want a report with information summarized by their Major Commands, the Major Commands want a report with information summarizing installations energy, and OSD is interested in summaries by Service. Thus, DEIS needs queries that provide aggregate totals as well as totals at the next lower level of management. Most standard reports developed for DEIS should provide energy data with these types of totals. Figures 4-3 and 4-4 are examples of such reports. Figure 4-3 shows total Air Force aviation gasoline consumption by Major Command. Figure 4-4 shows total DoD facility energy consumption by DoD Components.

FIGURE 4-1.  DEIS-I TOTALS QUERY

```
MAJCOM/SERVICE:   A
REGION/STATE:     REGION 3
PRODUCT           AUTO GAS
REPORT PERIOD:    FY82 QTR4

        CLOSINV         CONSUM          ISSUES
        15,243          41,779          41,861
```

FIGURE 4-2.  DEIS-I DoDAAC QUERY

```
SELECT OPTION>dodaac


PLEASE SELECT DODAAC, PRODUCT CODE AND RPTDATE

        DODAAC>af6155

   PRODUCT CODE>jp4

    REPORT DATE>8401
```

| | MEA 2 | | MEA 3 | | MEA 4 |
|---|---|---|---|---|---|
| OPENINV | 374 | PRIMARY | 1,635 | QIARMY | 0 |
| ISSUES | 1,635 | SECOND | 0 | QIAF | 0 |
| COMMER | 0 | THIRD | 0 | QIMC | 0 |
| DODRCPT | 1,767 | LOSSD | 0 | QINAVY | 0 |
| CLOSINV | 506 | CREDIT | 0 | NONDOD | 0 |
| | | SERVICE3 | 0 | INTRATRN | 0 |
| | | | | INTERTRN | 0 |
| | | | | SERVICE4 | 0 |

## FIGURE 4-3.  DEIS-I SERVICE SUMMARY REPORT

### AIR FORCE
### AVIATION GASOLINES
### (IN BARRELS)

| MAJCOM | FY 75 MAY | FY 84 MAY | % | FY 75 CUMULATIVE | FY 84 CUMULATIVE | % |
|---|---|---|---|---|---|---|
| AAC | 1,276 | 212 | -83% | 11,032 | 1,479 | -87% |
| ADC | 928 | 0 | -100% | 7,450 | 0 | -100% |
| AFLC | 15,160 | 159 | -99% | 145,434 | 1,967 | -99% |
| AFRES | 19,210 | 183 | -99% | 118,397 | 209 | -100% |
| AFSC | 2,227 | 388 | -83% | 39,798 | 2,927 | -93% |
| AIR U | 1,617 | 5 | -100% | 13,901 | 310 | -98% |
| ANG | 37,781 | 3,316 | -91% | 253,816 | 28,834 | -89% |
| ATC | 1,625 | 0 | -100% | 34,273 | 0 | -100% |
| MAC | 5,642 | 271 | -95% | 52,212 | 2,013 | -96% |
| MISCELL | 64,220 | 0 | -100% | 606,917 | 0 | -100% |
| PACAF | 2,799 | 137 | -95% | 46,950 | 923 | -98% |
| SAC | 19,104 | 0 | -100% | 143,426 | 0 | -100% |
| SPACE C | 3,795 | 0 | -100% | 20,569 | 0 | -100% |
| TAC | 10,248 | 819 | -92% | 105,649 | 7,027 | -93% |
| USAFE | 3,770 | 0 | -100% | 35,288 | 51 | -100% |
| TOTAL | 189,402 | 5,490 | -97% | 1,635,112 | 45,740 | -97% |

FIGURE 4-4.  DoD SUMMARY QUERY

```
                    FACILITIES ENERGY CONSUMPTION
                            (in MBTUs)


                        FY 75           FY 83     % Difference
                     -----------     -----------  ------------
Total DoD            633,562,726     563,356,571        -11.1%

Army                 242,275,738     207,027,613        -14.5%
Air Force            213,742,054     190,114,859        -11.1%
Navy                 151,489,900     140,429,027         -7.3%
Marine Corps          22,399,015      22,414,770          0.1%
DLA                    3,610,647       3,157,110        -12.6%
Other DoD Agencies        45,372         213,192        369.9%


** Quantities calculated in same manner as
   Line 15 of Federal Energy Usage Report
** % expressed relative to FY 75
** Navy quantities do not include Cold Iron
** Source: DEIS as of 30 Apr 84
```

Figures 4-3 and 4-4 also illustrate another common need of DEIS users. Energy managers determine energy trends by comparing energy consumption for different time periods (months, years). Presently, no on-line queries provide comparison or trend data. We believe queries should be developed to support these comparisons. Comparisons between the current fiscal year and FY75, the baseline consumption year for energy progress goals, are especially important.

A primary purpose of DEIS is to provide uniform data for all DoD activities to measure progress in meeting Defense Facilities Energy Resource Management (DFERM) goals established by Congress and the President. For example, one goal is to reduce energy use per square foot of all existing buildings by 20 percent from FY75 to FY85. DEIS queries should be developed to provide energy managers with information about their progress in meeting DFERM goals.

Figure 4-5 is a report developed independently by the Air Force that shows progress in meeting its goals. Similar reports for all Services should be available from DEIS.

FIGURE 4-5. <u>AIR FORCE ENERGY PROGRESS REPORT</u>

MAJCOM CUMULATIVE ENERGY PROGRESS REPORT

FY75 VS FY84 (OCT THRU MAR)

DATE PREPARED: 04 MAY 84

| MAJOR COMMAND | FY 1975 TOTAL MBTU/SF* | DEGREE DAYS | FY 1984 TOTAL MBTU/SF | DEGREE DAYS | MBTU/SF REDUCTION | DEGREE DAY FACTOR** |
|---|---|---|---|---|---|---|
| AAC | 0.2793 | 86794 | 0.2348 | 166076 | -16% | 1.9 |
| CLSBS | 0.1635 | No data | 0.0000 | No data | -100% | --- |
| AFLC | 0.1876 | 14028 | 0.1731 | 26787 | -8% | 1.9 |
| AFRES | 0.2098 | 27208 | 0.1716 | 49787 | -18% | 1.8 |
| AFSC | 0.2799 | 19801 | 0.2406 | 38267 | -14% | 1.9 |
| ANG | 0.1654 | 133635 | 0.1001 | 249813 | -39% | 1.9 |
| ATC | 0.1463 | 22282 | 0.1321 | 40538 | -10% | 1.8 |
| MAC | 0.1617 | 54384 | 0.1425 | 98466 | -12% | 1.8 |
| PACAF | 0.1396 | No data | 0.1266 | No data | -9% | --- |
| SAC | 0.1906 | 75015 | 0.1733 | 135225 | -9% | 1.8 |
| TAC | 0.1483 | 48239 | 0.1251 | 102545 | -16% | 2.1 |
| USAFA | 0.1770 | 3803 | 0.1605 | 5981 | -9% | 1.6 |
| USAFE | 0.1485 | No data | 0.1279 | No data | -14% | --- |
| SPCOM | 0.3313 | 7271 | 0.2885 | 45379 | -13% | 6.2 |
| AU | 0.1299 | No data | 0.1211 | No data | -7% | --- |
| USAF TOTAL | 0.1757 | 493154 | 0.1530 | 1116336 | -13% | 2.3 |

* Million BTU used by command divided by square feet of buidings in command.
** Number of FY84 degree days experienced by command installations divided by number of FY75 degree days.

For analyses of the effects of weather changes on energy consumption, weather data in the form of heating and cooling degree-days are collected from the various reporting activities and the Air Force Weather Service. The Air Force report in Figure 4-5 compares degree-days for FY75 and FY84 to determine

possible effects of weather on energy use at each Major Command. Similar reports and analyses could be available from DEIS.

Another management report is a "DEIS non-reporters" query. The report should list (at any management level selected) installations which have not submitted data for the current DEIS reporting cycle. This report would allow energy managers to ensure that their installations are submitting DEIS data on a timely basis. This report should be available and used at the DoD, Service, and Major Command levels since timely submissions are critical to the success of DEIS. A version of this report is shown in Figure 4-6.

FIGURE 4-6.  DEIS NON-REPORTERS QUERY

```
┌─────────────────────────────────────────────────────────────────┐
│         AIR FORCE NON-REPORTING DODAACS (AS OF 10/16/84)          │
│                                                                   │
│                 DEIS-II REPORT DATE: SEP 84                       │
│                                                                   │
│                                                                   │
│     DODAAC    INSTALLATION                          MAJCOM        │
│     -------   ------------------------------------  ----------    │
│     FP2047    MCCLELLAN AFB SACRAMENTO CA           AFLC          │
│                                                                   │
│     EY1525    ANDERSON PEAK CA                      AFSC          │
│     EY7396    LOS ANGELES AFS CA                    AFSC          │
│     RY7396    LOS ANGELES AFS CA/MFH                AFSC/MFH      │
│     EY7765    PILLAR POINT AFS CA                   AFSC          │
│     FY7895    SUNNYVALE AFS CA                      AFSC          │
│     EY9887    SANTA YNEZ PEAK CA                    AFSC          │
│                                                                   │
│     FP6021    ARIZONA ANG                           ANG           │
│     FP6281    NEVADA ANG                            ANG           │
│                                                                   │
│     RP3044    WILLIAMS AFB CHANDLER AZ/MFH          ATC/MFH       │
│     FP3067    MATHER AFB SACRAMENTO CA              ATC           │
│     RP3067    MATHER AFB SACRAMENTO CA/MFH          ATC/MFH       │
│                                                                   │
│     FP4610    VANDENBERG AFB LOMPOX CA              SAC           │
│     RP4664    MARCH AFB RIVERSIDE CA/MFH            SAC/MFH       │
│     RP4686    BEALE AFB MARYSVILLE CA/MFH           SAC/MFH       │
│                                                                   │
│     RP4852    NELLIS AFB LAS VEGAS NV/MFH           TAC/MFH       │
│     FP4877    DAVIS MONTHAN AFB TUSCON AZ           TAC           │
│     RP4877    DAVIS MONTHAN AFB TUSCON AZ/MFH       TAC/MFH       │
│                                                                   │
│                                                                   │
│          300 DODAACS TOTAL  ----  18 NON-REPORTERS (  6%)         │
└─────────────────────────────────────────────────────────────────┘
```

The reports described in this section demonstrate basic query capabilities needed for DEIS. They do not address the more advanced capabilities available, such as statistical analysis and graphical display software. For example, energy-estimating relationships could be analyzed using regression models that relate energy consumption to controllable and uncontrollable variables. To date, no use has been made of these software packages for energy analyses. Procedures should be developed to use these packages with DEIS data.

## MORE TRAINED REPORT WRITERS

One reason for the lack of available on-line reports is a shortage of experts in the INQUIRE User Language, the query report language for DEIS. Many of the queries described above have a complex coding structure and require a significant amount of experience and training to develop. In addition, it takes approximately a week to design, implement, and test one of these complex queries. The shortage of User Language experts has resulted in a bottleneck in the implementation of on-line DEIS reports.

We recommend that one member of the DEIS technical support team specialize in developing interactive DEIS reports and work actively with the Service energy offices and their Major Commands, the DFSC system operators, and EP. This person would develop on-line queries tailored to each organization's needs and train and aid users in developing their own reports. This person should be trained and experienced in IBM operating systems, INQUIRE, and User Languages.

One objective of using a large commercial DBMS is to have a query language that is powerful enough to write complex reports, yet simple enough for non-technical users to develop their own reports and requests for information. Unfortunately, INQUIRE, the query language for the DEIS DBMS,

has proved to be too complex for most users to develop any more than very simple reports. Consequently, most reports are written by the technical support personnel of DEIS. That represents a significant bottleneck; there are simply not enough trained specialists.

MORE DOCUMENTATION

Another way to improve the accessibility and usefulness of DEIS is to increase its documentation. At present, a user who wants to use DEIS can use the following documents for information on extracting data:

- DEIS-I and DEIS-II Users' Guides -- these describe procedures to access DEIS from remote terminals, tell how to use the available on-line queries, list the data base formats, and contain an introduction to writing simple queries. These guides provide an excellent introduction to the system. If the query language and the types of energy data collected were not complex, this document would be sufficient.

- Infodata publishes several User Language manuals on query development; however, these manuals are voluminous, have no relationship to the DEIS system, and are, therefore, not a good source for learning to develop DEIS queries.

The following documents provide information on submitting data to DEIS and its processing:

- DoD Manual 4140.26-M provides detailed definitions of the data collected for DEIS and a description of the products represented by the product codes in DEIS. However, there is no cross-reference to data element names in the data base so the user does not have detailed definitions of these elements.

- The Military Services have regulations which describe procedures for DEIS data submissions and define some of the data elements; but again, there is no cross-reference between these definitions and DEIS data base field names.

- The DEIS System Specification contains details about the inner workings of DEIS, but this type of document is inappropriate for most users.

There is no documentation beyond a basic introduction to the DEIS system. Where does a user get detailed definitions of the DEIS data elements? How does a user know that a ship is indicated by a DoDAAC with REGIONC=98 unless

he happens to be scanning the list of possible region codes? A detailed data dictionary for energy managers is needed to define all data elements, structures, and characteristics of the DEIS data bases.

Additional documentation is also needed so that users can extract data using advanced query techniques and procedures. The DEIS Users' Guides introduce the subject, but there is no information that would help the user develop queries to answer questions such as:

- How is consumption data aggregated into fiscal quarters?

- How can you compare current fiscal year consumption with FY75 baseline consumption?

- How can you list the consumption of only family housing DoDAACs?

- What are cost-effective techniques to extract data? What types of queries should be avoided because they are expensive?

To enable users to develop their own applications requires a DEIS manual on query development, aimed at the intermediate and advanced levels.

A third category of documentation that is missing is a list of sample outputs of available on-line DEIS queries together with the source code that produced these outputs. Many of the queries which have been developed for various energy offices would be useful to other energy offices. A document containing sample output would provide examples of DEIS capabilities, and the source code for the queries would provide an excellent teaching tool so that users may develop similar queries. The Defense Energy Program Policy Memorandum (DEPPM) 84-5 recommended specific procedures for collecting and disseminating these DEIS queries and standardized reports, but as yet no action has been taken.

# 5. MICROCOMPUTERS AND DEIS

Before we can improve user access and enhance the user's ability to develop on-line reports, we must consider two points. First, DEIS is a large data system that resides on a large mainframe with a sophisticated operating system and is used by many other users for many other applications. Second, DEIS users are a diverse set of energy managers who have different management needs. It would take a significant programming effort to convert DEIS to a system that is (1) simple enough for non-computer experts to access DEIS and write relatively complex queries and formatted reports and (2) flexible enough to support sophisticated, generalized queries. Examining the use of microcomputers to interface with the DEIS system shows that they reduce the need for this significant programming effort. Microcomputers offer enormous promise for enhancing the accessibility and usefulness of DEIS in answering energy management questions.

Purchasing a microcomputer system solely for DEIS may not be justified for many offices; however, many DEIS users are planning to acquire micro-computers for other office functions such as word processing and office auto-mation. We recommend that these users purchase a modem and communication software (for a total cost of approximately $600); as we explain in the fol-lowing sections, this would significantly enhance their ability to use DEIS. (Figure 5-1 displays a typical hardware and software configuration that can be used not only with DEIS but for other office functions.) In addition, we recommend that microcomputer applications developed by DEIS users be docu-mented and distributed to the entire DEIS user community.

FIGURE 5-1.  $5,000 MICROCOMPUTER SYSTEM

```
HARDWARE

$2,450      IBM PC W/256K, 2 360K DRIVES

  800       EPSON MX-100 PRINTER (160 CPS)

  450       HAYES 1200 BAUD MODEM

  800       HP 7470 2-PEN PLOTTER
 ------
$4,500


            SOFTWARE

 $100       CROSSTALK
            (COMMUNICATION PROGRAM)

  300       LOTUS 1-2-3
            (SPREADSHEET, GRAPHICS, DATABASE)

  100       PERSONAL EDITOR
            (WORD-PROCESSING PROGRAM)
 ------
$5,000
```

The following sections describe some of the applications and areas in which microcomputers can be used effectively and immediately with DEIS.

AUTOMATING DEIS ACCESS

The sign-on procedure for DEIS has always been an impediment to on-line use of DEIS.  The procedure is lengthy and cumbersome; at some points in the process even one typographical error forces the user to start the process all over again.  Figure 5-2 displays the commands that the user must type to access the on-line DEIS-II subsystem.  The commands consist of 82 keystrokes. It takes several minutes to reach the DEIS-II (DEIS2) level.  With extensive use of the on-line DEIS, the keystrokes become second nature.  However, for

users with little computer experience or who use the system infrequently, this sign-on procedure is extremely difficult. In DEIS training classes, at least one hour of the class is spent teaching DEIS sign-on procedures, often with frustrating results.

FIGURE 5-2. CURRENT DEIS-II SIGN-ON PROCEDURE

```
A

<CTL-H><CTL-R>XXXXXXX

XXXXXXXXX

<return key>

BTSO

LOGON XXXXXX SIZE(2048)

XXXXXX

IQNLOGON

DEIS2

USER
```

A microcomputer with appropriate communications software can eliminate the problem completely. The procedure can be reduced to inserting a floppy disk and turning on the microcomputer. The software stored on the disk will dial the appropriate phone number and type the sign-on instructions automatically. The microcomputer software to do this can be written (even by novice users), as can instructions to execute standard queries. The query results can be captured automatically by the microcomputer and printed on the user's printer. Microcomputer communication software to support these capabilities is readily available for less than $150.

## GRAPHICS AND TREND ANALYSIS

As noted in Chapter 4, only limited use has been made of DEIS data in displaying energy data and analyzing energy trends. This is due to a lack of the graphics terminals necessary to use mainframe graphics software, the complexity of developing queries, and complex procedures to use the DEIS data with the graphics packages. Moreover, developing the queries and interfacing the results with the available mainframe statistical packages requires an experienced computer user, trained in both DEIS and the statistical package. Most users cannot justify the investment of time and training to learn graphics and statistical packages only for DEIS.

Microcomputer software offers an excellent solution to this problem. A variety of graphics and statistical analysis programs are available. These packages are easy to use, support a variety of options, and are relatively inexpensive. It is fairly easy to develop a query to extract the DEIS data of interest, capture it on a microcomputer, and use microcomputer graphics or statistical packages to display or analyze the data. The energy manager frequently uses these packages in other office functions and is familiar with them. The user need only learn some basic query instructions and the structure of the DEIS data bases to aggregate and extract the data of interest. The user captures this subset of data generated by the query on the microcomputer. Further processing (sorting, summing) is done on the microcomputer. Besides being easier and less frustrating for energy managers, this approach reduces the cost of complex queries run on the mainframe.

Microcomputer usage is a productive approach for increasing the usefulness and accessibility of DEIS data. We recommend that more standard procedures be developed and disseminated for exploiting the mainframe-to-micro link that allows DEIS data to be captured and processed by microcomputers.

## ENERGY DATA FROM OTHER COMPUTER SYSTEMS

Another important capability of microcomputers is the ability to integrate data from different computer systems with different formats. With communications software, it is easy to access one computer, capture the data of interest, and then access the DEIS computer and extract the necessary DEIS data. For example, this approach could be used to capture the data from the monthly petroleum report on the Energy Information Administration computer and compare or combine the data with summary petroleum data from DEIS. With large data sets, capturing data over phone lines is not feasible; transmission costs and error rates are unacceptable. However, in many situations this is a worthwhile approach.

One other situation lends itself to using microcomputers to combine energy data from several sources. That is integrating classified energy data with unclassified DEIS (or other) data. A Tempest microcomputer is needed for classified work (and Tempest equipment doubles the cost of the microcomputer), but the classified data can be stored on removable disks (which can be kept in safes), and the unclassified system can be accessed through the phone lines.

## MICROCOMPUTER QUERY DEVELOPMENT

Another important application of microcomputers with DEIS is to develop queries on the microcomputer. The user can develop a query using microcomputer word-processing software and transmit the file to the DEIS computer just as the sign-on instructions are sent. This is helpful because the line-by-line communication with the DEIS computer and the limited editing capabilities of the INQUIRE User Language make it tedious to develop nontrivial queries using INQUIRE. The query may be tested (and minor changes made) on the mainframe system.

This approach can significantly increase productivity. Users can develop queries faster and with less frustration. It has the added benefit of reducing the amount of on-line DEIS usage thus reducing charges for processing and telephone connect time.

## PC/INQUIRE

Infodata, the company that developed and supports INQUIRE, is developing a microcomputer version of INQUIRE. This software, called PC/INQUIRE, will be released in April 1985 and will be functionally compatible with the mainframe INQUIRE. It will cost between $200 and $500. PC/INQUIRE will support data management, report writing, query development, and screens in a manner similar to INQUIRE. It will also support transferring data from the microcomputer to the mainframe and back to the microcomputer. Infodata demonstrations of this product have been impressive because of its similarity to INQUIRE and its ease of use.

PC/INQUIRE could be a valuable tool for use with DEIS. It would provide an excellent way to train new DEIS users and operators. Some DEIS applications could be shifted to the microcomputer environment, reducing dependence on the mainframe computer system. Obviously, DEIS data storage requirements exceed the capacity of present microcomputer systems, but query procedures could be developed and tested in a microcomputer environment. Subsets of DEIS data could be moved back and forth between the mainframe and microcomputer for testing and evaluation. We recommend that as soon as PC/INQUIRE is available, it be evaluated carefully for use in conjunction with DEIS.

| REPORT DOCUMENTATION PAGE | | READ INSTRUCTIONS BEFORE COMPLETING FORM |
|---|---|---|
| 1. REPORT NUMBER | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER |
| 4. TITLE *(and Subtitle)*<br><br>Improving the Defense Energy Information System (DEIS) | | 5. TYPE OF REPORT & PERIOD COVERED |
| | | 6. PERFORMING ORG. REPORT NUMBER<br>LMI Task No. ML405 |
| 7. AUTHOR(s)<br><br>Michael J. Konvalinka<br>Joan E. Lengel | | 8. CONTRACT OR GRANT NUMBER(s)<br><br>MDA903-81-C-0166 |
| 9. PERFORMING ORGANIZATION NAME AND ADDRESS<br><br>Logistics Management Institute<br>6400 Goldsboro Road<br>Bethesda, MD 20817-5886 | | 10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS |
| 11. CONTROLLING OFFICE NAME AND ADDRESS<br><br>Office of the Assistant Secretary of Defense (Manpower, Installations and Logistics)<br>Washington, DC 20301 | | 12. REPORT DATE<br>January 1985 |
| | | 13. NUMBER OF PAGES<br>48 |
| 14. MONITORING AGENCY NAME & ADDRESS*(If different from Controlling Office)* | | 15. SECURITY CLASS. *(of this report)*<br><br>Unclassified |
| | | 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE |

16. DISTRIBUTION STATEMENT *(of this Report)*

Approved for public release; distribution unlimited

17. DISTRIBUTION STATEMENT *(of the abstract entered in Block 20, if different from Report)*

18. SUPPLEMENTARY NOTES

19. KEY WORDS *(Continue on reverse side if necessary and identify by block number)*

Information System, Defense, Energy, DoD Installations, Management Systems

20. ABSTRACT *(Continue on reverse side if necessary and identify by block number)*

This report provides recommendations for improvements to the Defense Energy Information System (DEIS), an automated management information system with which DoD monitors its supplies and consumption of energy. DEIS provides information about DoD's bulk petroleum products -- inventory, consumption, resupply, and sale -- as well as inventory and consumption of energy for utility services. The recommendations focus on the DEIS operational environment, the need for more energy management reports, and the use of microcomputers with DEIS.

# END

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