

FEDERAL GOVERNMENT ENERGY PROGRAMS

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COMPUTER SERVICES IN
FEDERAL GOVERNMENT ENERGY PROGRAMS

INDUSTRY REPORT

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**COMPUTER SERVICES MARKETS IN
FEDERAL GOVERNMENT ENERGY PROGRAMS**

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FEDERAL GOVERNMENT ENERGY PROGRAMS**

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I INTRODUCTION

I INTRODUCTION

- This report is produced by INPUT as part of the Market Analysis Service and analyzes the use of computer services in Federal Government energy programs.
- A report on the Federal Government was selected as the result of the high level of interest in this section displayed by INPUT's clients.
- Since the Federal Government is too large and complex to be treated meaningfully in a single report, INPUT polled its clients in September 1977 to determine the correct focus. The highest interest levels were in the areas of HEW and Energy; Energy was finally selected for several reasons:
 - The Department of Energy (DOE) is newly formed, coming into being officially on October 1, 1977. Consequently, relatively little information was available on the integrated aspects of the department.
 - The constituent parts of DOE were known to employ outside contractors freely, to be one of the largest users of computing equipment in the Federal Government, and to contain a large number of knowledgeable computer professionals. DOE, therefore, potentially provides an excellent environment for computer services opportunities.

- The activities of the Department of Energy are nationwide in scope with national laboratories and research facilities spread throughout the U. S. This provides opportunities for computer services firms in widespread geographic locations in a similar manner to those offered by NASA in the late 1960s and early 1970s.
- It was also determined that such a study could serve as the vehicle for determining the effectiveness of the teleprocessing services program (TSP) which is managed by the General Services Administration (GSA). This is nominally the mandatory means by which federal agencies acquire computational data processing and network services from the private sector.
- Before the research began, INPUT clients were asked to suggest particular questions and specific areas of interest to be incorporated into the study. Discussions were held with approximately 40 persons representing 18 different firms. Over 40 specific questions were raised covering present and future aspects of the following topics:
 - Expenditures for services by type.
 - Procurement policies.
 - Applications needs.
 - Organizational structure and functions.
 - Expectations with regard to organizational consolidation.
 - Overall direction.
- Research conducted for this report included a series of interviews as specified in Appendix A. Separate interview questionnaires were used for vendors and users. Sample questionnaires are included in Appendix C.

- All effort associated with this report took place during the fourth quarter of 1977.
- Inquiries and comments on the information presented in this report are invited from clients.

II EXECUTIVE SUMMARY

II EXECUTIVE SUMMARY

A. FINDINGS

I. MARKET SIZE AND GROWTH

- Federal Government energy programs, particularly those under the direction of the newly formed Department of Energy, provide a sizeable and growing opportunity for computer services. Federal regulation, in general, has provided markets for computer services vendors, and the increasing regulation of energy will be a new source of such opportunities.
- This market is important not only in its own right but also because it serves as a stepping stone to the entire energy industry:
 - Vendors can participate in the development and operation of data systems which will eventually involve both the public and private sectors.
 - Vendors can use applications "know-how" from federal programs in providing services to the energy industry.
- The federal energy market is complex, involving as many as 100 different government units spread throughout the U.S. This report focuses on the Department of Energy which operates with a total budget of \$10.4 billion, and a staff of 20,000 full-time employees supported by 90,000 contractor personnel.

- The Department of Energy (DOE) spent \$66 million with commercial vendors for computer services in fiscal 1977. This will grow at an average annual growth rate of 16% to a total of \$136 million by fiscal 1982, as shown in Exhibit II-1.

2. MARKET STRUCTURE

- The main organizations transferred to form DOE were Energy Research and Development Administration (ERDA), Federal Energy Administration (FEA), Federal Power Commission (FPC), and major functions from Department of Interior - Bureau of Mines. These groups constitute nearly 99% of DOE in terms of personnel and sources of funds. ERDA is the largest component in terms both of people (45%) and funding (67% or \$6.9 billion).
- The distribution of DOE personnel is such that some 7,500 are located in headquarters locations (about a dozen facilities in Washington D.C. and Germantown, Maryland) with the remaining 12,500 spread across some 75 facilities throughout the U.S. Because of DOE's mission, many of these field locations are in remote and relatively inaccessible places, making commercial support difficult and expensive.
- DOE field locations and headquarters locations activities represent two entirely different markets for computer services:
 - Headquarters locations are much more receptive than field locations to the use of computer services and are geared almost totally to the services approach. Headquarters locations currently account for 51% of the computer services expenditures within DOE, and this percentage will increase to 58% by 1982.
 - Most DOE field locations are government-owned, contractor-operated (GOCO) facilities (including national laboratories). These operators tend to oppose the use of services, opting to "make" rather than "buy."

EXHIBIT II-1
DEPARTMENT OF ENERGY EXPENDITURES FOR COMPUTER SERVICES

TYPE OF SERVICE	HEADQUARTERS LOCATIONS			FIELD LOCATIONS			TOTALS		
	FISCAL 1977 (\$ M)	FISCAL 1982 (\$ M)	AAGR* (%)	FISCAL 1977 (\$ M)	FISCAL 1982 (\$ M)	AAGR* (%)	FISCAL 1977 (\$ M)	FISCAL 1982 (\$ M)	AAGR* (%)
REMOTE COMPUTING AND BATCH**	\$ 3.0	\$ 12.0	32%	\$ 3.5	\$ 7.0	15%	\$ 6.5	\$ 19.0	24%
FACILITIES MANAGEMENT	12.0	25.0	16	10.5	21.0	15	22.5	46.0	15
TOTAL PROCESSING	\$ 15.0	\$ 37.0	20%	\$ 14.0	\$ 28.0	15%	\$ 29.0	\$ 65.0	18%
SOFTWARE PRODUCTS	1.0	5.0	38	1.5	4.5	25	2.5	9.5	31
PROFESSIONAL SERVICES	18.0	37.0	15	16.5	24.5	8	34.5	61.5	12
TOTALS	\$ 34.0	\$ 79.0	18%	\$ 32.0	\$ 57.0	12%	\$ 66.0	\$136.0	16%

*AVERAGE ANNUAL GROWTH RATE

**OVER 90% IS REMOTE COMPUTING.

They are sophisticated in terms of computer systems and support. They are exempt from procurement practices and other regulations which are mandatory for other federal activities and which promote the purchase of services. However, there is evidence that field locations are beginning to consider services more seriously.

- Within the DOE headquarters, there are several main marketing contact points:
 - Energy Information Administration.
 - Office of the Controller - OPMS.
 - Division of Administration - OADPM.
 - Other key areas include the Office of the Assistant Secretary for Energy Technology and the Office of the Director of Energy Research.
- Primary contact with the private sector by DOE will be through the Energy Information Administration. Among other duties, EIA is charged with developing an integrated financial accounting system for the energy industry.

3. DATA PROCESSING USE BY DEPARTMENT OF ENERGY (DOE)

- DOE's 2,500 computer installations represent about 25% of all computers installed in the federal sector. For the past eight years, the growth in the number of computers in DOE facilities has been double that of the Federal Government overall.
- DOE, though tenth in terms of cabinet-level departments in personnel, ranks fourth in terms of its annual data processing budget. For fiscal 1978, this budget is 3.5% of the total DOE budget, or \$375 million.

- INPUT estimates that 80% of DOE's EDP budget (termed "ADP" within the Federal Government) is allocated to field locations. Based on responses to interviews conducted for this study, 80 - 85% of field location data processing is devoted to scientific and engineering applications. This means current expenditures of \$250 million for non-business, non-administrative activities at the field locations.
- DOE operates approximately 75 large-scale computers including many of the most advanced. The recent selection of the CRAY 1, valued at \$8 million, marks the beginning of a new cycle of super-computer buying which should result in the development of a DOE super-computer policy for the early 1980s. With this change comes an opportunity for software and facilities management services.
- There are 2,300 minicomputers currently installed in DOE locations supporting data collection, process control, engineering design, and a host of research and development applications. Responses to this study point to the continuing growth of minicomputers in DOE spurred by the increased availability of improved systems and data management software.
- Batch processing is the traditional in-house method of computing in the agency. Survey results show a backlog of applications to be implemented.
- Some of the large administrative computing systems in DOE are operating at or near saturation. At least two remote locations have turned to outside sources (in one case an insurance company) for overflow workload. The large in-house center in Germantown, Maryland is now considering contracting some applications to outside vendors to "make room." Several other users surveyed for this study indicated that they planned to upgrade out-of-date IBM 360 systems.

- The overall DOE data processing policy is not defined at this time. Field locations appear to have a "business as normal" attitude with expectations of continued growth and sufficient budget to "make it happen." Headquarters personnel generally have a more guarded outlook and view their first priorities as keeping the existing systems running while planning and developing new requirements. Despite the presidential mandate to develop a comprehensive energy data system, nothing is yet underway.

4. COMPUTER SERVICES OPPORTUNITIES

- Facilities management and large professional services contracts account for most of the computer services expenditures by DOE as shown in the percentage analysis in Exhibit II-2. Six contracts (four in headquarters locations and two in field locations) account for nearly \$30 million of annual expenditures at the present time, roughly half of the total amount available to outside commercial vendors.
- Software product sales, estimated to be \$2.5 million in FY 1978, will grow at a rate of 31% through 1982. The known need for data management systems and word processing, coupled with the desire for interactive capability and graphics, will serve as the catalyst.
- The planned development of agency-wide, administrative, planning, control and reporting systems is the driving force for Remote Computing Services (RCS), which are currently quite small in terms of expenditures (10% of total computer services expenditures).
- The growing use of RCS is spurred by the high degree of acceptance of data base management systems. In contrast to the private sector, there is little use of IBM's IMS, with only one installation at DOE and that with an FM vendor. The de facto standard appears to be MRI's System 2000 with no less than eight installations noted and 16 to 20 applications in use with RCS vendors. This predominance of System 2000 has become worrisome to at least two RCS vendors interviewed in this study.

EXHIBIT II-2

PERCENTAGE ANALYSIS OF COMPUTER SERVICES EXPENDITURES BY DEPARTMENT OF ENERGY

-- HEADQUARTERS VERSUS FIELD LOCATIONS

TYPE OF SERVICE	HEADQUARTERS LOCATIONS		FIELD LOCATIONS		TOTALS	
	FISCAL 1977	FISCAL 1982	FISCAL 1977	FISCAL 1982	FISCAL 1977	FISCAL 1982
REMOTE COMPUTING AND BATCH	9%	15%	11%	12%	10%	14%
FACILITIES MANAGEMENT	35	32	33	37	34	34
SOFTWARE PRODUCTS	3	6	5	8	4	7
PROFESSIONAL SERVICES	53	47	51	43	52	45
TOTALS	100%	100%	100%	100%	100%	100%

- The GSA/TSP is being used at DOE headquarters, and while it is not completely effective yet, it has facilitated contracting for services. Workable, intra-department procedures are in place with a single DOE/GSA contact point designated. DOE field locations are not usually aware of the program and have not made use of it. Under the present scheme of things, this will continue to be the case until such time as GOCOs are required to operate as other federal installations (as proposed in the OMB A-76 rewrite).

5. COMPETITIVE ENVIRONMENT

- In the marketing of computer services to DOE, vendors face a broad variety of competition. Not only are there dozens of commercial services firms involved, but the potential vendor must also contend with large contractors such as Union Carbide, EG&G, Rockwell International, and large university-based facility managers such as University of California and the university consortium which manages Brookhaven National Laboratories.
- Except for some special cases, commercial computer services companies have been precluded from competing for the large EDP dollar outlays at DOE field locations. While some progress is being made to change this situation (as evidenced by INPUT survey responses), no dramatic changes are anticipated. Even with the rewrite of OMB Circular A-76 as proposed, there appears to be a sufficient number of loopholes to permit continuing blockage of computer services.
- The two largest vendors of computer services to DOE hold large facilities management contracts: Boeing Computer Services and Optimum Systems, Inc. Each received approximately 15% of the \$66 million in expenditures by DOE for computer services in 1977.
- Vendors interviewed for this study have been marketing to the Federal Government for over six years on the average, and for three years to energy agencies.

- Remote Computing Services and software products are relatively new concepts at DOE. Professional services (systems analysis and contract programming) and facilities management (contractor provided) have been accepted for a longer time.

B. RECOMMENDATIONS

I. MARKETING STRATEGIES

- Remote Computing Services vendors should begin working with those DOE groups in the Washington, D.C. area which are responsible for the agency-wide applications identified in this report. Not only are there large revenue potentials in Washington, D.C., but these applications will serve as entry points to DOE field locations.
- Vendors should specifically become acquainted with the plans, needs, and personnel of the Energy Information Administration. Although EIA currently works with a limited number of vendors, new data system mandates will cause this situation to "open-up." Furthermore, EIA's two new major "energy industry" systems provide a stepping stone into the entire national energy industry marketplace, including the petroleum, utility, transportation, mining, construction and engineering industries.
- Particular attention must be paid to the "oversight" activities of agencies such as OMB, GSA, and GAO:
 - A revision of the Office of Management and Budget Circular A-76 will be published between now and the summer of 1978. (Responsible vendor opinions are being solicited at the present time). This revision could have an important impact on all federal marketing programs.

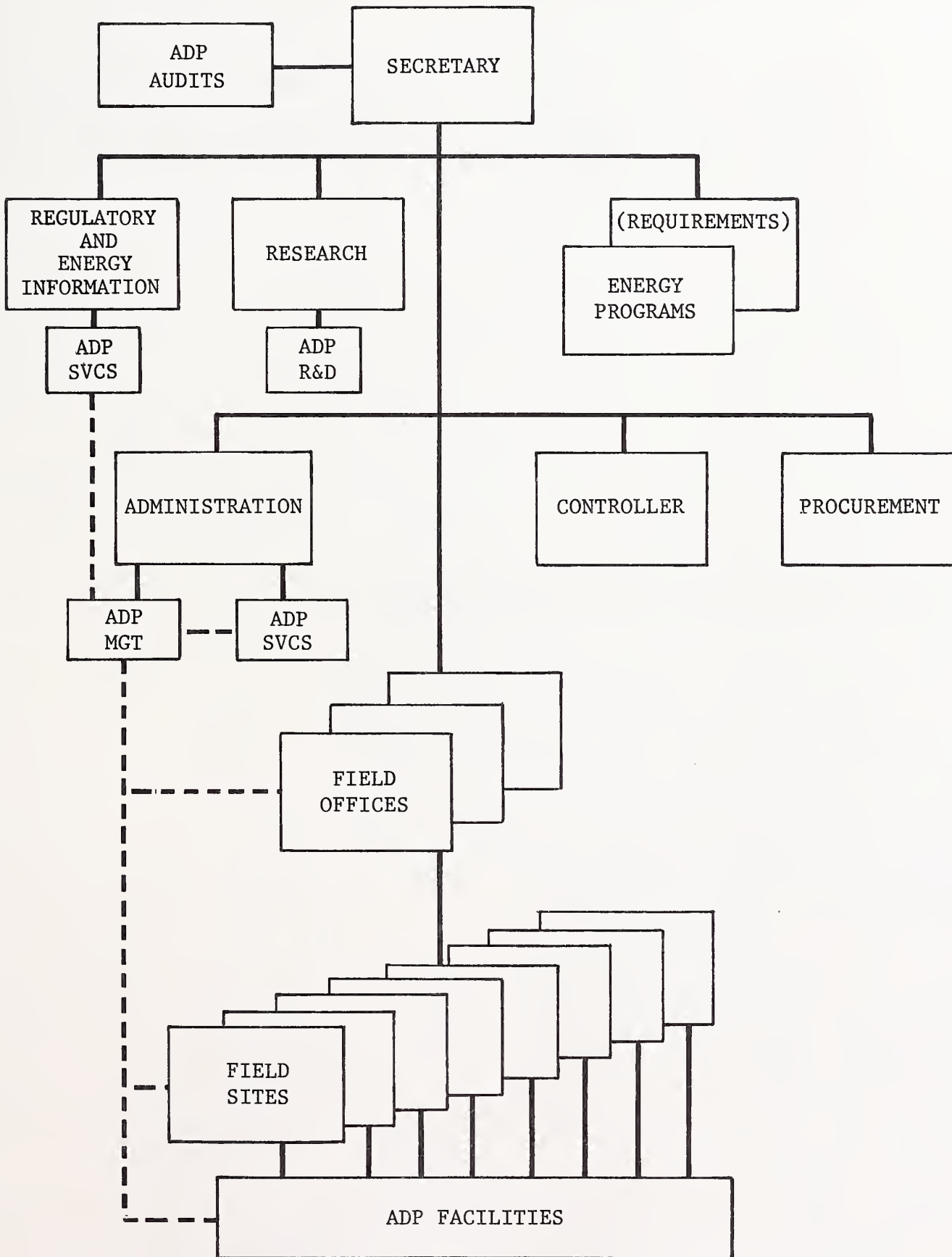
- Other policy and/or regulatory developments that deserve attention are the security/privacy hearings beginning early in 1978, and the activities of the Office of Management and Budget task force studying the government's \$4 billion installed computer base.
- Vendors should be alert to temporary overflow conditions which will occur during the first few years of DOE's life. These "foot in the door" opportunities can lead to larger scale contracts.
- Vendors of both systems and applications packages should market to both DOE headquarters and field locations. These markets will grow at 38% and 25% respectively. Opportunities for the sale of interactive operating systems, graphics, and word processing packages exist now and will grow.
- It is particularly important to be aware of the DOE data processing management structure and the interaction between headquarters and field locations. Field EDP facilities report through the field office with a dotted line relationship to headquarters administration as shown on Exhibit II-3.
- Vendors should be poised to react quickly as soon as the national energy program has been approved. Demands on regulatory agencies in particular will be rapid and heavy.

2. TECHNICAL PRODUCT STRATEGIES

- Data base management applications are growing in use. Vendors should use DBMS as a competitive weapon by making certain that the distinctions/advantages of their DBMS products are well understood by the prospective user.
- Software product pricing should embody an alternative to the current practice of multiple license fees for multiple installations of a package at the same site. Some users interviewed voiced dissatisfaction with the current practice which does not recognize the lower maintenance costs inherent in multiple installations at the same site.

EXHIBIT II-3

DEPARTMENT OF ENERGY ADP ORGANIZATION



- Vendor support is overwhelmingly the most important vendor characteristic to DOE users. New vendors to DOE must understand support requirements and insure that commitments are kept.
- Processing services vendors should concentrate on applications specialized to DOE which accounted for 61% of processing revenues in 1977, and will account for 62% in 1982. Applications include energy data bases, and regulatory support systems.

III FEDERAL GOVERNMENT ENERGY
ORGANIZATION STRUCTURE

III FEDERAL GOVERNMENT ENERGY ORGANIZATION STRUCTURE

A. RELATIONSHIP BETWEEN ORGANIZATIONAL UNITS

- To effectively market to DOE, it is necessary to appreciate the interrelationship between the various groups. Therefore, a fairly detailed description is presented in this section.
- Although this report focuses on the newly formed Department of Energy (DOE), it is important to recognize that many other government organizational units are involved in federal energy programs. Exhibit III-1 presents the major organizational components which participate directly in the various development, implementation, administration and regulatory aspects of the overall U. S. energy program. Exhibit III-2 relates the energy agencies within the Executive Branch; it is taken from President Carter's report to Congress in January 1977.
- Energy legislation falls under the jurisdiction of more than a dozen congressional committees. Of these, the major committees include:
 - House (and Senate) Appropriations Committee: Jurisdiction over legislation to appropriate funds for DOE through both the Subcommittee on the Interior and the Subcommittee on Public Works.

EXHIBIT III-1
 ORGANIZATION OF OVERALL
 FEDERAL ENERGY PROGRAM

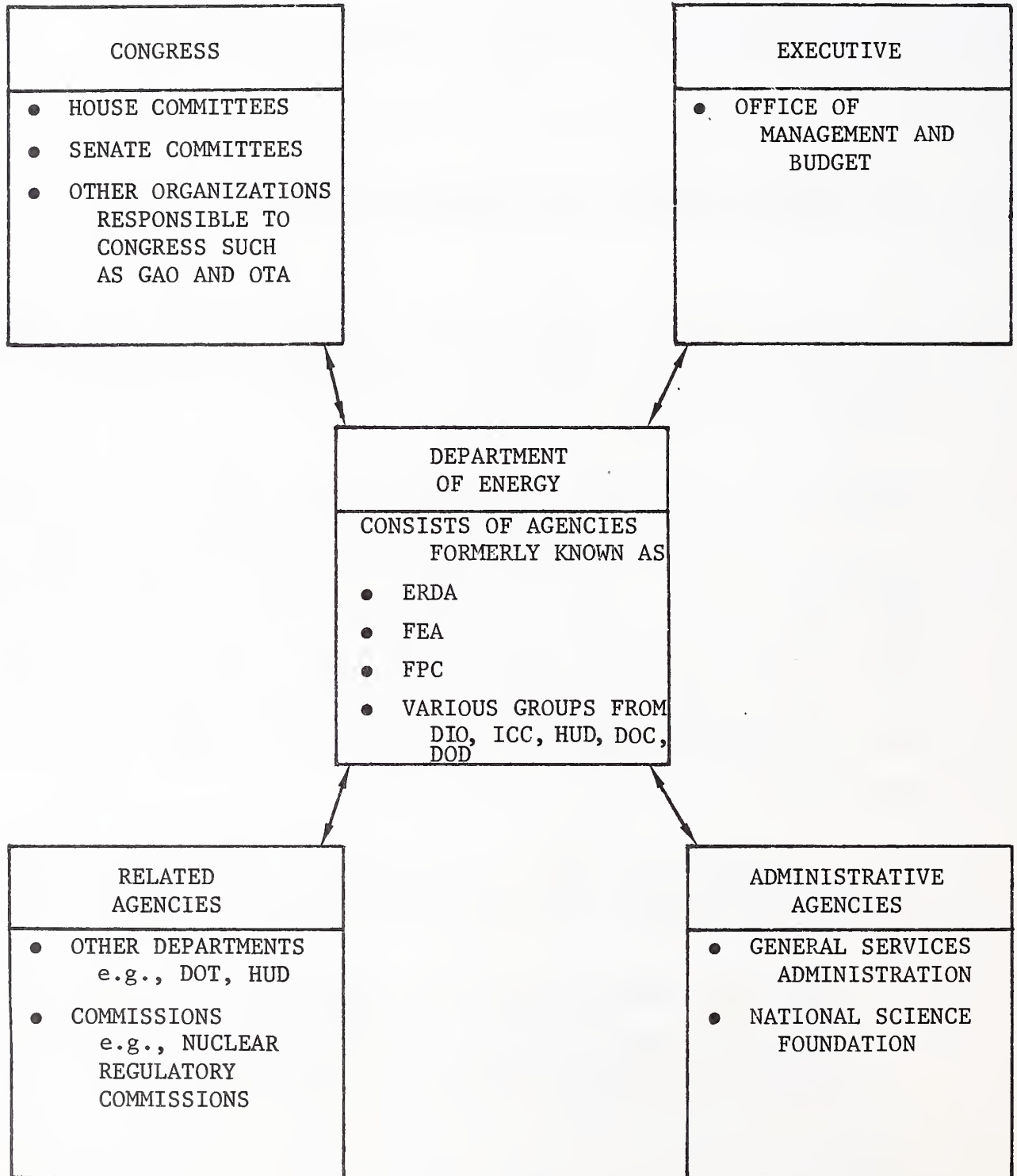
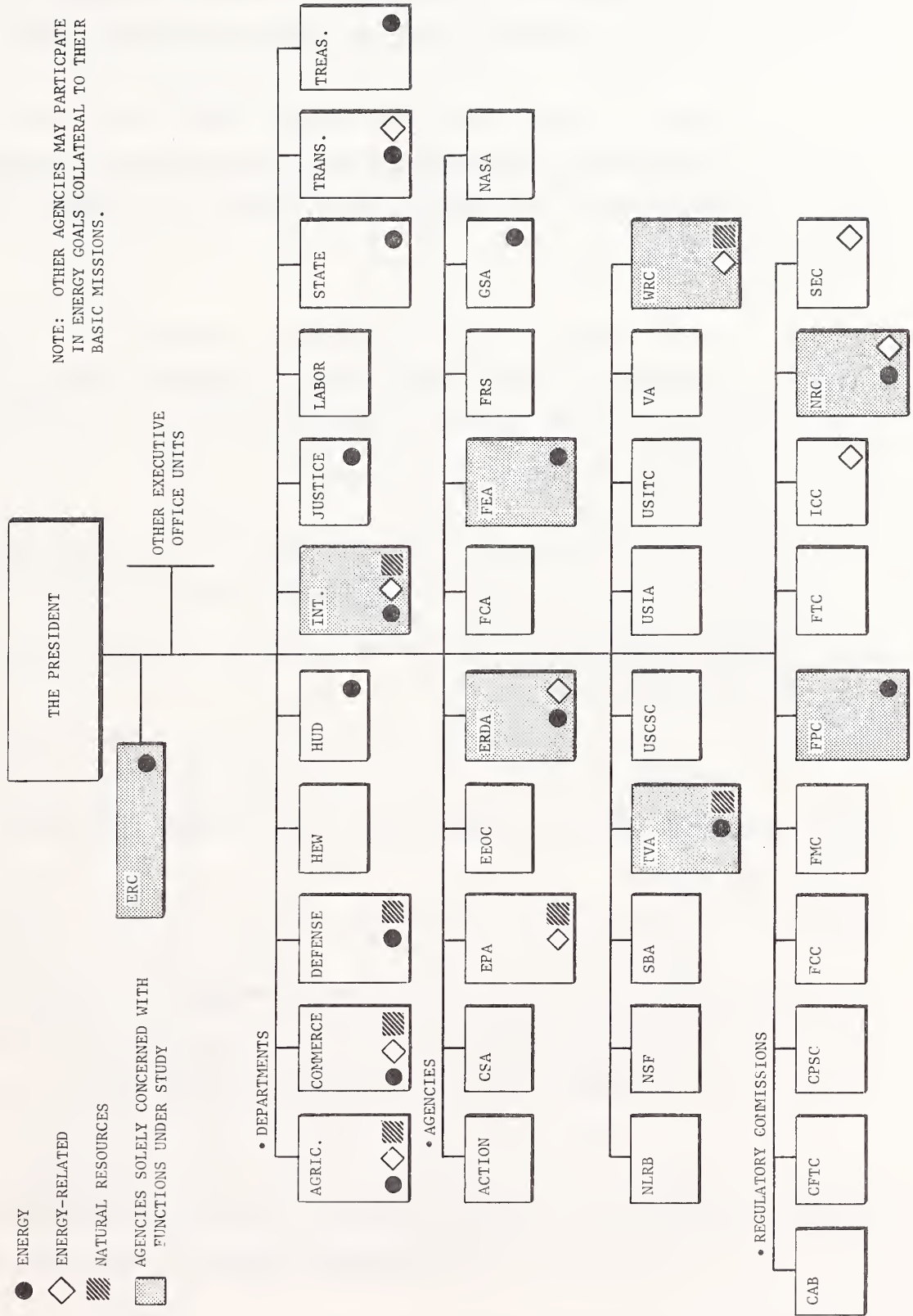


EXHIBIT III-2

LOCATION OF ENERGY, ENERGY-RELATED,
AND NATURAL RESOURCE FUNCTIONS
IN THE EXECUTIVE BRANCH



- House (and Senate) Science and Technology Committee: Jurisdiction over legislation on non-nuclear energy research and development including resources, personnel, equipment and facilities.
 - Senate National Fuels and Energy Policy Study Group: Bi-partisan policy study group with representatives from nine subcommittees which investigates and makes recommendations on national fuel and energy policies.
 - Joint Atomic Energy Committee: Jurisdiction over legislation on all aspects of nuclear energy including research and development, radiological health and safety, security and safeguards, licensing and plant siting.
- A number of other government agencies outside of the Department of Energy continue to play an active role in energy related matters, many of which represent business opportunities for computer services firms. A few agencies included in this group are:
 - Nuclear Regulatory Commission: Regulates commercial uses of nuclear energy and has responsibilities for licensing, inspection, and enforcement.
 - National Science Foundation: Makes grants for selected programs related to energy research and development, including energy supply technologies, energy demand and conservation, and energy-related areas of environmental, economic, and sociological research.
 - General Accounting Office, Energy Staff: Independent non-political agency in the legislative branch which audits, analyzes, and reports on the efficiency of federal energy programs.

- Commerce Department, National Bureau of Standards: Oversees and coordinates standards for energy conservation in such areas as appliance labelling, heating and cooling of residential buildings, and community and industry energy systems.
 - State Department, Bureau of Economic and Business Affairs, Office of Fuels and Energy: Formulates international energy policy and negotiates agreements with other countries to participate in an international energy agency.
 - Transportation Department, Materials Transportation Bureau: Administers safety regulations and issues exemptions for the transportation of hazardous materials, including nuclear materials; enforces federal regulations on liquid pipeline safety, including oil and petroleum products.
 - Treasury Department, Office of Tax Policy: Provides economic analysis of business taxation relating to energy such as oil depletion allowances, excess profits (windfall), tax for petroleum, and income tax rebates.
 - National Aeronautics and Space Administration, Office of Energy Programs: Conducts research and development on solar heating and cooling, and experimental work on solar energy in commercial buildings.
- As part of this study, INPUT analyzed the impact of the formation of the Department of Energy on other cabinet-level departments (not included in the reorganization) and selected the Department of Transportation (DOT) as an example. Following are the major findings in the analysis:
 - DOT funds several energy-related projects aimed at minimizing the adverse impact of energy constraints.
 - Energy-related projects are budgeted for \$16.5 million, about 0.1% of DOT's \$16.5 billion total budget.

- Included in the DOT energy-related programs are three groups - Office of the Secretary, Federal Railroad Administration and National Highway Traffic Safety Administration. Two of the three have higher energy budgets for 1978 than they did for 1977.
- Although some projects are phasing out (primarily in the conservation area) others are increasing in scope. The overall energy budget for DOT has risen from \$8.2 million in fiscal 1976 to \$16.5 million in fiscal 1978. This represents an increase from 2.6% to 4.1% of the total DOT research and development budget.
- In addition to the many government agencies involved in energy programs, a variety of professional associations and "lobby groups", many with substantial budgets, are active in the Washington D.C. area. These organizations not only provide valuable information to vendors serving the energy marketplace but also have some need for computer services in the development of data management and reporting systems. Exhibit III-3 provides a listing of some of the more important associations.

B. DEPARTMENT OF ENERGY

- While the Federal Government has been active in energy matters for decades, it was not until the events of the past few years, precipitated by the oil embargo of 1973, that the need for a national energy policy became apparent.
- In January 1977, President Carter submitted a report to the Congress entitled "The Organization of Federal Energy Functions." This report proposed the establishment of a Department of Energy and provided the findings, analyses and conclusions which supported the proposal.

EXHIBIT III-3

ENERGY RELATED PROFESSIONAL ASSOCIATIONS

ASSOCIATIONS

AMERICAN CHEMICAL SOCIETY
AMERICAN COKE & COAL CHEMICALS INSTITUTE
AMERICAN GAS ASSOCIATION
AMERICAN MINING CONGRESS
AMERICAN PETROLEUM INSTITUTE
AMERICAN PUBLIC GAS ASSOCIATION
AMERICAN PUBLIC POWER ASSOCIATION

ASSOCIATION OF BITUMINOUS CONTRACTORS
ASSOCIATION OF OIL PIPE LINES
ATOMIC INDUSTRIAL FORUM

BITUMINOUS COAL OPERATORS ASSOCIATION

EDISON ELECTRIC INSTITUTE
ELECTRIC POWER RESEARCH INSTITUTE
ENERGY POLICY TASK FORCE OF CONSUMER FEDERATION OF AMERICA

INDEPENDENT PETROLEUM ASSOCIATION OF AMERICA
INTERSTATE NATURAL GAS ASSOCIATION OF AMERICA

NATIONAL ASSOCIATION OF ELECTRIC COMPANIES
NATIONAL ASSOCIATION OF REGULATORY COMMISSIONERS
NATIONAL COAL ASSOCIATION
NATIONAL PETROLEUM COUNCIL
NATIONAL PETROLEUM REFINERS ASSOCIATION
NATIONAL RURAL ELECTRIC COOPERATIVE ASSOCIATION

RESOURCES FOR THE FUTURE
SOLAR ENERGY INDUSTRIES ASSOCIATION
TASK FORCE AGAINST NUCLEAR POLLUTION
UNITED MINE WORKERS OF AMERICA

- On March 1, 1977, the White House released the major provisions of legislation to create a Department of Energy. Included in the information package were descriptions of:
 - Components of the department.
 - Internal structure of the department.
 - Regulatory functions.
 - Public lands leasing.
 - A bill entitled the "Department of Energy Organization Act."
- By August 3, 1977, the Congress completed action on the bill and the President signed Public Law 95-91, authorizing the Department. On August 5, 1977, James R. Schlesinger was sworn in as the first Secretary of Energy.
- On October 1, 1977, the DOE was officially activated with most of the key positions approved by Congress. DOE is the 12th Cabinet agency and the first to be formed since the Department of Transportation was created in 1966.
- DOE began with almost 20,000 employees and a first year budget of \$10.4 billion. In terms of personnel, it ranks as the 10th largest Cabinet Department and in terms of budget, it ranks 8th:
 - A staffing comparison of DOE to other departments and agencies is provided in Exhibit III-4. As shown, DOE ranks 13th among the largest departments and agencies in the Federal Government, preceded by nine cabinet-level departments plus VA, GSA, and NASA.
 - It is important to note that DOE is very heavily contractor oriented and that an estimated 90,000 contractor employees are engaged in full-time DOE activities.

EXHIBIT III-4

STAFFING COMPARISON OF DEPARTMENT OF ENERGY
 TO OTHER DEPARTMENTS AND AGENCIES
 (JANUARY 1977 FIGURES)

DEPARTMENT	AGENCY	TOTAL FULL-TIME PERMANENT POSITIONS
<u>DEFENSE</u> (CIVILIAN ONLY)		926,000
	VETERANS ADMINISTRATION	197,000
HEALTH, EDUCATION AND WELFARE		140,000
TREASURY		112,000
AGRICULTURE		88,000
TRANSPORTATION		75,000
INTERIOR		65,000
JUSTICE		54,000
	GENERAL SERVICES ADMINISTRATION	37,000
COMMERCE		31,000
STATE		24,000
	NASA	24,000
<u>ENERGY</u>		20,000
	TENNESSEE VALLEY AUTHORITY	19,000
HUD		16,000
LABOR		16,000
	EPA	10,000

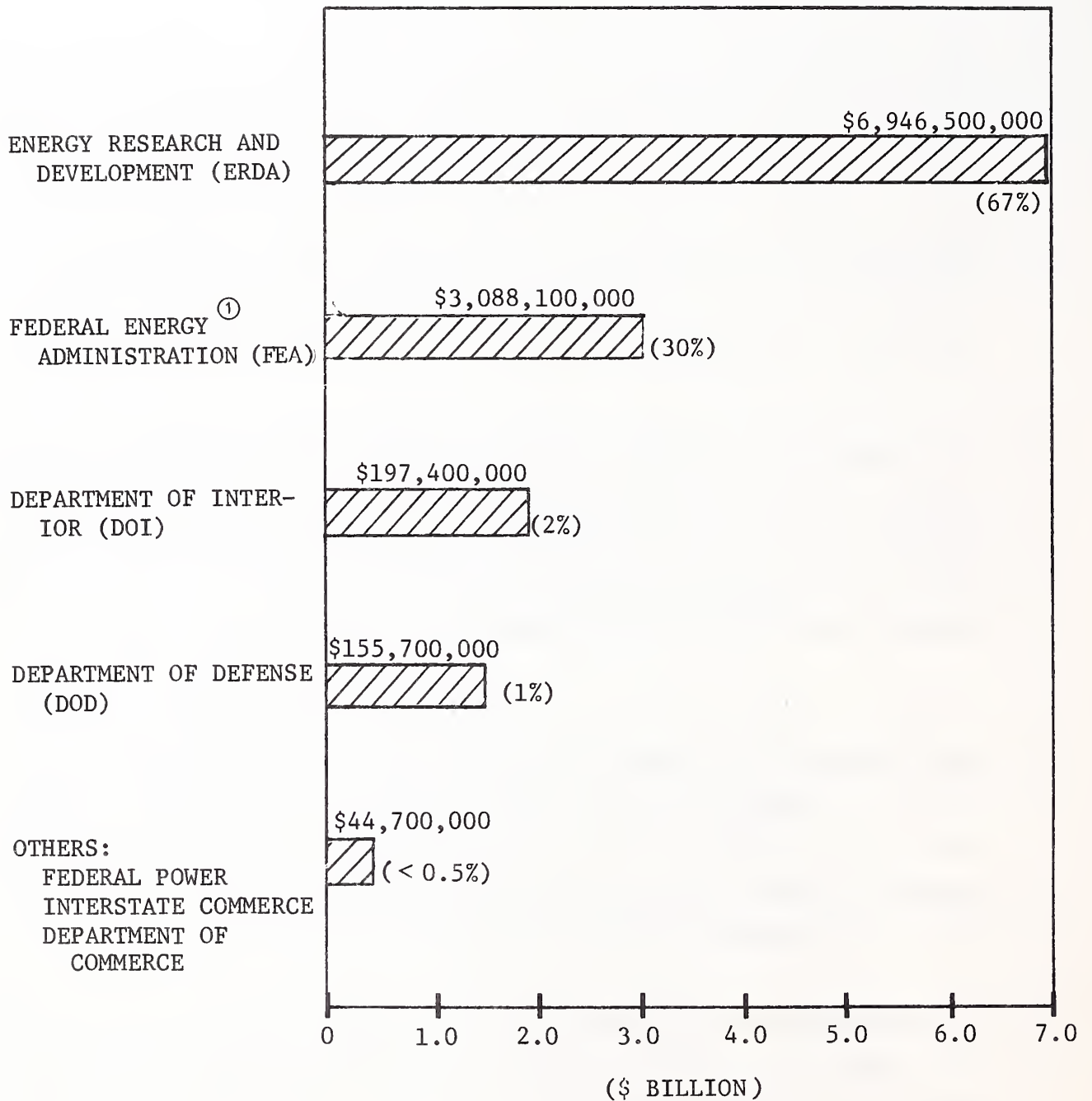
- The principal functions transferred to form the Department of Energy are:
 - Energy Research and Development Administration: All functions including R & D in fossil, nuclear, fusion, solar, geothermal, and conservation; uranium enrichment and production military applications and safeguards; environment and health research.
 - Federal Energy Administration: All functions including oil pricing and allocation, conservation, coal use, strategic petroleum reserve, energy information, and resource development.
 - Federal Power Commission: All functions including natural gas regulation, interstate wholesale electric rate setting, and hydroelectric licensing.
 - Department of Interior: Authority over the Southeastern, Southwestern, Alaska, and Bonneville power administrations, and the power marketing functions of the Bureau of Reclamation. Also, the setting of economic terms for leasing public land for energy development, mineral lands containing geothermal resources, and authority of the Bureau of Mines for gathering data on fuel supplies, R & D on mining technology, and coal preparation analysis.
 - Department of Navy: Administration of and jurisdiction over three Naval oil reserves and three Naval oil shale reserves.
 - Interstate Commerce Commission: Functions related to transportation of oil by pipeline including valuation and rate setting.
 - Department of Commerce: Functions related to industrial energy conservation.
 - Department of Housing and Urban Development: Authority to set energy conservation standards for new buildings.

This amalgamation of functions results in a somewhat unusual hybrid situation in that DOE has regulatory, research and development (implementation), and operations responsibilities.

- As shown in Exhibits III-5 and III-6, ERDA is the largest source of funding and personnel for DOE.
- The structure of DOE entails several new concepts which differ from other Federal Government departments or agencies. For example, the organization reflects the decision of Congress to have three principal officers - the Secretary, Deputy Secretary, and Under Secretary. The entire department supports all three as a group. Also, the department groups new or emerging technologies at the Assistant Secretary level by their evolution through the research, development and application process, rather than by fuel type (e.g., solar, fossil, nuclear, etc.).
- The organization of DOE is depicted in Exhibit III-7. It should be noted, however, that despite attempts by the administration to reshape programs and functions into the new organizational structure, the DOE personnel interviewed during the course of this study, for the most part, still associate themselves with their pre-DOE agencies.
- In support of DOE personnel in the headquarters offices (primarily Germantown, Maryland and several Washington D.C. locations) there exists an extensive field organization. Field locations were assigned to Assistant Secretaries according to their primary missions. Exhibit III-8 shows the reporting structure of the more than 75 laboratories, plants, facilities, and offices comprising the DOE field organizations.
- It is reasonable to expect that during the first several years of its life, DOE will undergo adjustments in organization and operating style. As mentioned above, the new organization concept contains innovations which must be tested and proven.

EXHIBIT III-5

DEPARTMENT OF ENERGY SOURCES OF FUNDING,
 FISCAL 1978 BUDGET AUTHORITY
 (TOTAL: \$10,432,400,000)

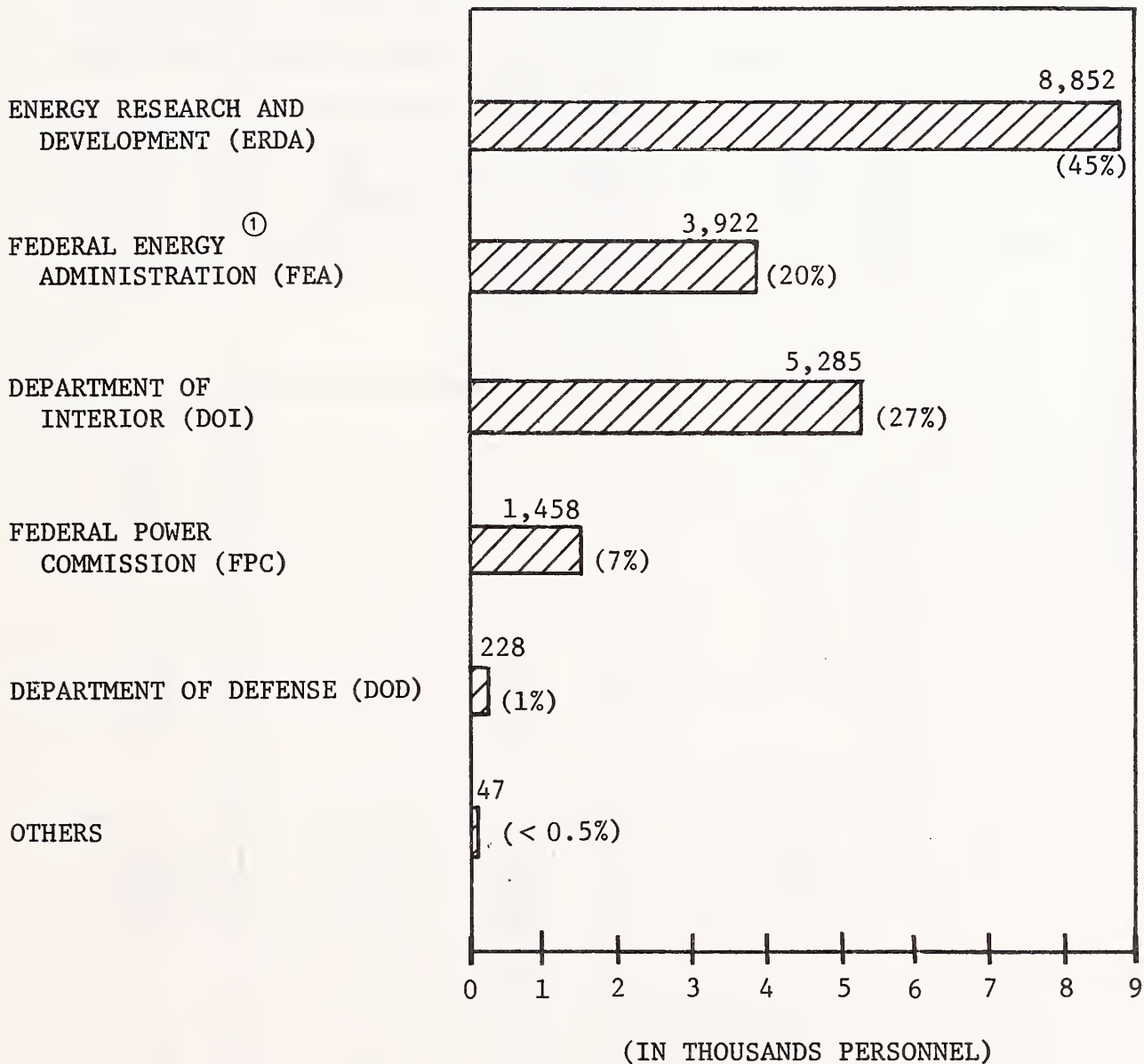


① EXCLUDES \$1.2 BILLION FEA SUPPLEMENTAL

EXHIBIT III-6

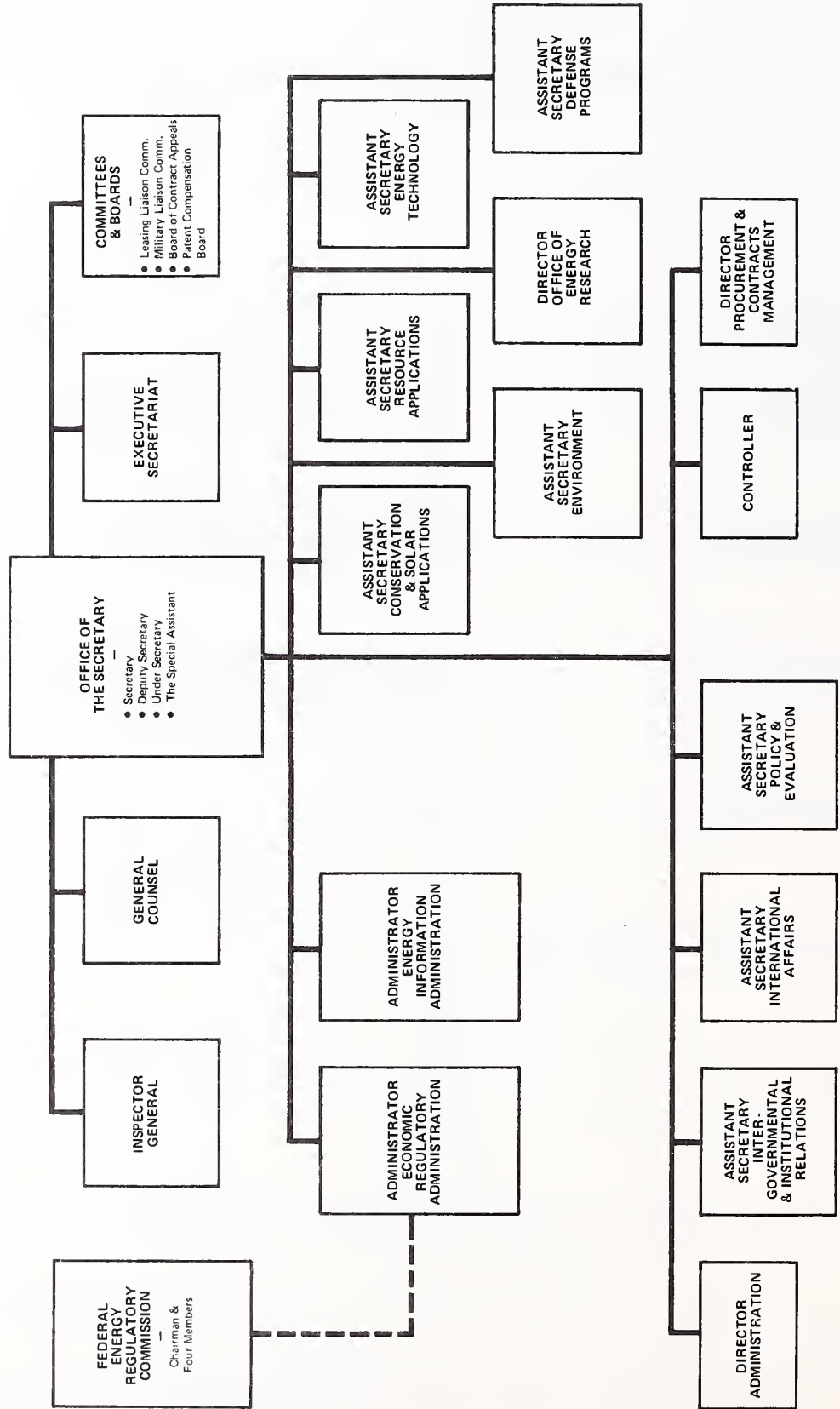
DEPARTMENT OF ENERGY SOURCES OF STAFFING
- FULL TIME PERMANENT POSITIONS

(TOTAL: 19,792)



^① EXCLUDES 284 POSITIONS ASSOCIATED WITH SUPPLEMENTAL CONTRACTORS

ORGANIZATION OF
DEPARTMENT OF ENERGY



- Personnel must adjust to belonging to DOE instead of ERDA, FEA, FPC or DOI. Program and mission overlaps must be eliminated which means that some groups will be reduced in size and prominence. Already, Secretary James R. Schlesinger has come under attack by both sides of Capitol Hill with a number of complaints having been sent to the White House centering on his selection of top level personnel.
- The DOE program is broad and complex. After a settling-in period of one to two years, during which time the organization and its budget will be monitored and controlled rather tightly, DOE will experience a period of tremendous expansion, if not in staff, at least in budget. The initial emphasis on energy resource conservation will give way to the expansion of production of existing resources and the development of new sources. These actions will most likely result in a dramatic increase in the use of data processing systems and services.

IV USE OF EDP IN THE
DEPARTMENT OF ENERGY

IV USE OF EDP IN THE DEPARTMENT OF ENERGY

A. FACTORS AFFECTING USE OF EDP

- DOE possesses nearly 25% of the computers identified in the fiscal 1976 GSA EDP inventory. While it ranks eighth in budget size and tenth in personnel size among the twelve cabinet-level departments, DOE ranks fourth in terms of its data processing telecommunications budget, with only DOD, HEW and Treasury ranking higher.
- In terms of the numbers of computers installed, DOE computers have increased by 600% in the ten year period since 1968. As shown in Exhibit IV-1, DOE computers have increased from 10% of all Federal Government installations in 1968 to the present level of 25%.
- Since 1970, DOE has installed an average of 249 computers per year, reflecting an annual average growth rate of 18.8% per year (Exhibit IV-2). This compares to an average annual growth rate of 9.6% for the Federal Government overall which averaged 674 new computers installed each year since 1970. (Note: The first year of the Nixon/Ford and the Carter administrations both show significant dips in the growth rate for computers installed.)
- Because of the orientation of DOE's precedent organizational components, primarily the Atomic Energy Commission which gave way to ERDA in 1973, several important characteristics exist with regard to its data processing structure:

EXHIBIT IV-1

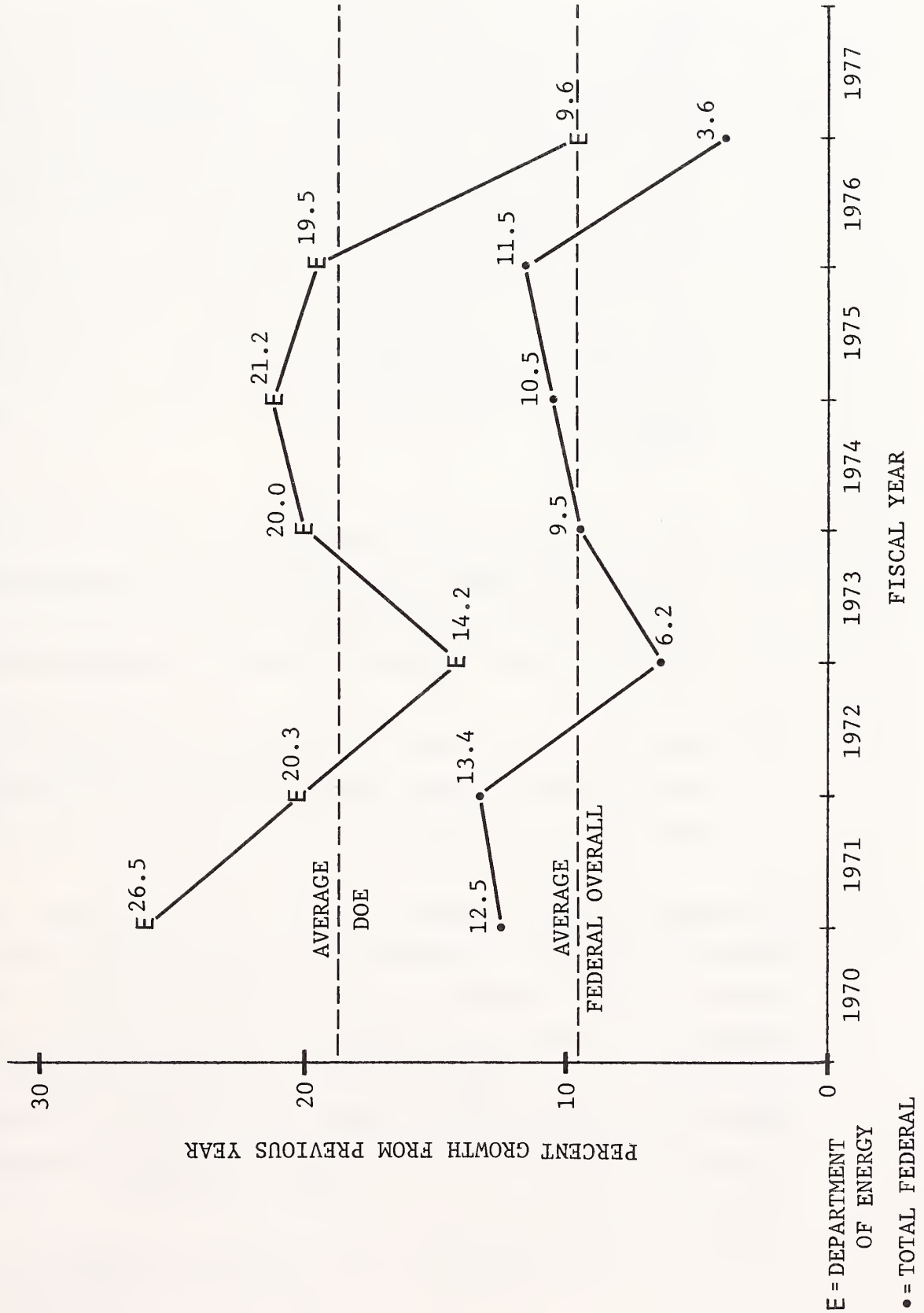
COMPUTERS INSTALLED IN DEPARTMENT OF ENERGY
AND TOTAL FEDERAL GOVERNMENT

FISCAL YEAR	DEPARTMENT OF ENERGY (DOE)	TOTAL FEDERAL GOVERNMENT	DOE AS % OF TOTAL
1968	415	4,232	9.8%
1969	559	4,666	12.0%
1970	754	5,277	14.3%
1971	954	5,934	18.1%
1972	1,148	6,731	17.1%
1973	1,311	7,149	18.3%
1974	1,574	7,830	20.1%
1975	1,904	8,649	22.0%
1976	2,279	9,648	23.6%
1977	2,498	9,992 (EST.)	25.0%

EXHIBIT IV-2

COMPARISON OF COMPUTER INSTALLATION GROWTH RATES

DEPARTMENT OF ENERGY VS. FEDERAL GOVERNMENT



- Applications are heavily scientific, engineering and process control oriented, with possibly as much as 85% of its workload falling in these categories.
- DOE has many of the computer industry's largest and most powerful computers installed. Several of the now extinct Atomic Energy Commission organizations played a prominent role in the encouragement, development, and use of high-speed, large-scale computer systems. These groups, including the sites referred to as Westinghouse BETTIS, General Electric KAPL, and Livermore, played significant roles in the design, development, and implementation of systems such as the Univac LARC in the 1950s, the CDC 6000 series in the 1960s, and the CDC 7600 and STAR systems in the 1970s. Exhibit IV-3 provides a breakdown of large scale systems currently in use by DOE by manufacturer.
- DOE is one of the government's largest users of minicomputers with well over 2000 installed, almost all of which are used in process control, monitoring of R&D experiments, and data acquisition. They are classified as special management systems in the GSA inventory.
- Data processing activities within DOE are highly decentralized with almost complete autonomy existing in the dozens of government owned, contractor operated (GOCO) locations nationwide.
- The computer equipment installed in DOE is purchased from many sources. Exhibit IV-4 provides a distribution of computer (CPU) systems by manufacturer. It also provides a measure of DOE's hardware preference by comparing the number of installations of each type to the total Federal Government base. As indicated, DEC is by far the dominant minicomputer vendor to DOE with more than 1,100 PDP 8, 9, 11, and 15s installed. This number represents 56% of all of the DEC installations in the federal sector as of June 30, 1976.

EXHIBIT IV-3

LARGE SCALE COMPUTER INSTALLATIONS IN DEPARTMENT OF ENERGY*

BASED ON GSA INVENTORY 1976

RESPONSIBLE ORGANIZATION	IBM ^①	CDC ^②	DEC ^③	OTHER ^④	TOTAL
ALBUQUERQUE OFFICE	4	15	1	2	22
CHICAGO OFFICE	4	2	11	-	17
IDAHO FALLS OFFICE	1	-	-	-	1
NEVADA OFFICE	-	1	1	-	2
OAK RIDGE OFFICE	3	-	4	-	6
RICHLAND OFFICE	-	-	-	2	2
SAN FRANCISCO OFFICE	2	4	6	-	12
SAVANNAH RIVER OFFICE	1	-	-	-	1
PITTSBURGH NR OFFICE	-	1	1	-	2
SCHENECTADY NR OFFICE	-	3	1	-	4
TECHNICAL INFORMATION OFFICE	-	-	1	-	1
HEADQUARTERS OFFICE**	4	-	-	-	4
TOTALS	19	26	26	4	74

NOTES:

- ① 360/65 AND ABOVE, AND 370/165 AND ABOVE
- ② CDC 6000, 7000 AND STAR SERIES SYSTEMS, BUT NOT CYBER SERIES
- ③ DEC-ID SERIES
- ④ UNIVAC AND HONEYWELL SYSTEMS

* ALL GOVERNMENT OWNED WITH EXCEPTION OF LEASED 370/168S SYSTEMS AT HEADQUARTERS LOCATION

** INCLUDES ERDA, FPC, AND FEA

EXHIBIT IV-4

INSTALLATIONS OF COMPUTERS IN THE DEPARTMENT OF ENERGY
 BY MANUFACTURER COMPARED TO TOTAL FEDERAL GOVERNMENT

-- ALL TYPES AS OF JUNE 30, 1976

MANUFACTURER	DEPARTMENT OF ENERGY (DOE)*	TOTAL FEDERAL GOVERNMENT	DEPARTMENT OF ENERGY (DOE) % OF TOTAL
BURROUGHS	0	304	0%
CDC	83	519	16
DEC	1,174	2,095	56
DATA GENERAL	138	526	26
HONEYWELL	63	752	8
HEWLETT-PACKARD	136	499	27
IBM	98	1,202	8
UNIVAC**	84	1,612	5
OTHER	456	1,788	26
TOTAL	2,279	9,648	24%

* DOES NOT INCLUDE DEPARTMENT OF INTERIOR FUNCTIONS TRANSFERRED TO DOE.

** INCLUDES 71 VARIAN COMPUTERS IN DOE AND 267 IN TOTAL.

B. EXPENDITURES ON EDP

- As of September 1977, the computer equipment inventory within DOE had a book value of \$550 million placed on 2,498 systems, an increase of 219 systems (9.6%) from June 30, 1976. Of these, 195 were classified as general management systems. Virtually all of the large scale computers shown in Exhibit IV-3 fall into this category. The remaining 2,300 systems are classified as special management systems and consist primarily of minicomputers. Over 99% of all systems are government owned; only 15 are leased.
- The current book value of DOE computers is 12% of the total value of computers installed in the Federal Government. Exhibit IV-5 shows the dollar value growth rate since 1970 for Federal Government computers; it has been 8%, and the average annual increase has been \$268 million.
- According to a recent (September 1977) publication, DOE's fiscal 1978 data processing budget is 3.5% of the total department budget of \$10.4 billion, a figure approximating \$375 million. Pre-DOE preliminary budgets for ERDA, FEA, and FPC (as shown in Exhibit IV-6) make up \$271.5 million or 72% of the total. The other DOE groups transferred from Interior, Commerce, and Defense, combined with new DOE budget allocations for such activities as the Energy Information Administration, contribute the remaining \$95 million (28%).
- As indicated in Exhibit IV-6, the average annual increase in the EDP budgets for the three groups shown is 24%. Based on determinations made in this study, INPUT estimates another increase of 10% for the fiscal 1979 budget with a return to a 20% growth rate through the early 1980s.

EXHIBIT IV-5

GROWTH RATE OF COMPUTERS IN THE FEDERAL GOVERNMENT
BY DOLLAR VALUE

FISCAL YEAR	TOTAL VALUE OF COMPUTER SYSTEMS (\$ BILLION)	\$ ADDED PER YEAR (\$ BILLION)	AVERAGE ANNUAL GROWTH RATE
1970	\$2.801	\$0.271	9.67%
1971	3.027	0.122	3.97
1972	3.194	0.266	8.33
1973	3.460	0.340	9.83
1974	3.800	0.240	6.32
1975	4.040	0.370	9.16
1976	4.410		
AVERAGE		\$0.268	7.88%

EXHIBIT IV-6

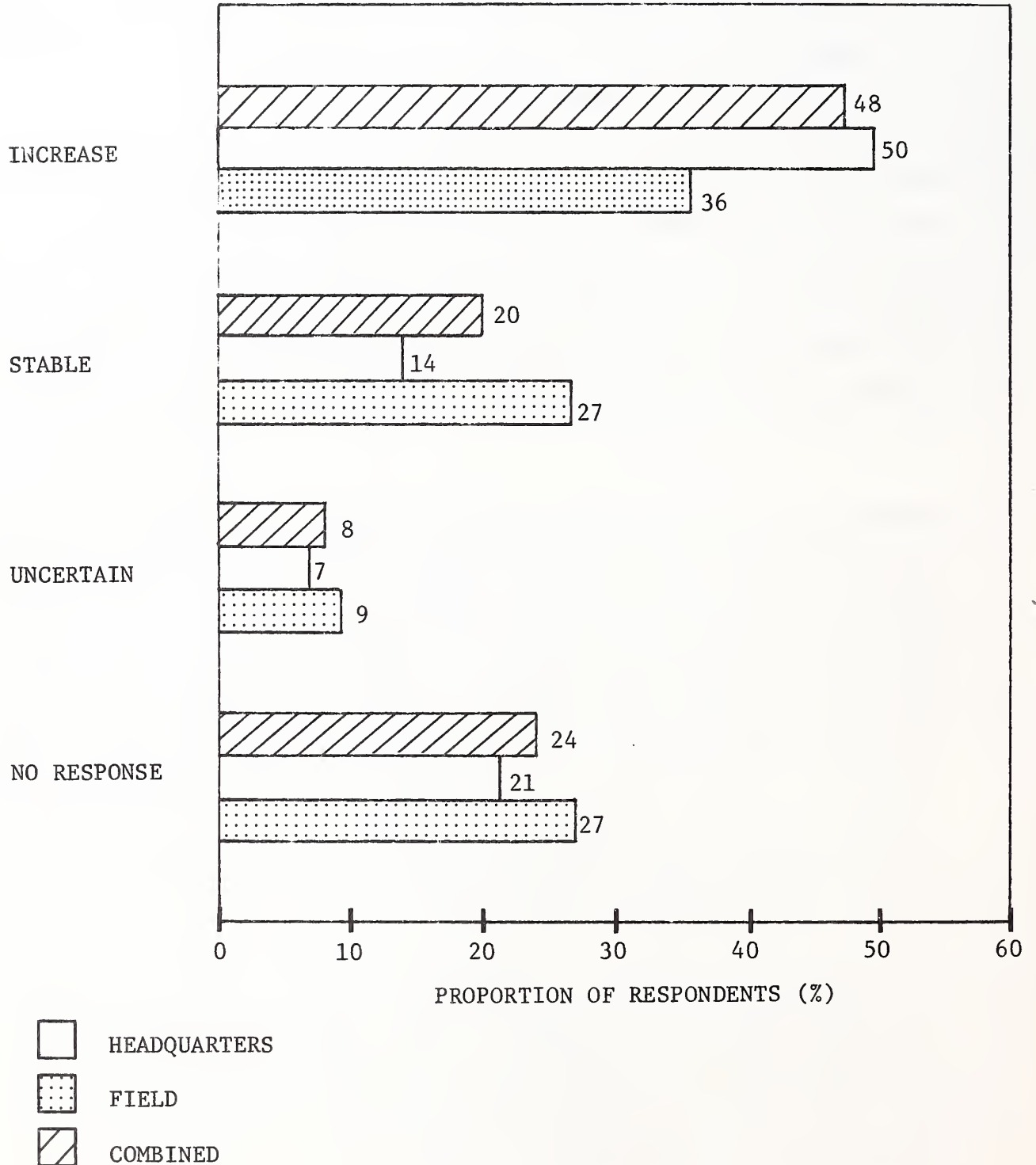
EDP BUDGETS FOR
DEPARTMENT OF ENERGY ORGANIZATION COMPONENTS

COMPONENT	EDP BUDGETS (\$ MILLION)		
	FISCAL 1976	FISCAL 1977	FISCAL 1978
ERDA	\$164.0	\$222.0	\$248.0
FPC	3.8	5.2	5.0
FEA	15.2	18.8	18.5
TOTAL	\$183.0	\$246.0	\$271.5
PERCENTAGE INCREASE FROM PREVIOUS YEAR		34%	34%

- The low rate for next year stems from a number of factors:
 - In the year prior to the formation of DOE, several large systems were installed and a number of large contracts were awarded. These are now in operation with corresponding stabilized budget outlooks.
 - DOE, being newly formed, has its share of organizational integration difficulties which require top management time. Further, Schlessinger and his senior aides have been heavily preoccupied with national energy policy and obtaining approvals from the Congress. Their return to full-time Energy Department management will bring about new activities and programs but is not expected until the end of the current fiscal year. As described to INPUT by a DOE official, this is consistent with past organizational formations such as NASA which, like DOE, was an aggregation of several existing agencies with a new integrated, common mission.
 - During this first year, internal surveys are being conducted and system requirements are being analyzed, both formally and informally. The initial thrust is to eliminate overlapping or redundant systems especially in administrative areas. As an example, three or four separate payrolls are no longer required. Another major effort at this time is the determination of where additional emphasis and staffing must be provided for in-place systems.
 - Growth is also somewhat curtailed at present because of some major program conversions. For example, 40 data systems involving some 600 individual programs are being converted from the Bureau of Mines (DOI) computers (B6700) in Colorado to the Energy Information Administration computers (IBM 370/168) in Rockville, Maryland. This conversion is scheduled to take 14 months and includes modification of the systems to become more on-line in orientation. This conversion effort removes the personnel involved from new system development.

- After 1979, a return to the higher (20%) growth rate is expected:
 - Several new administrative systems are now being formulated. As an example, a uniform contractor reporting system is under development in the Controller's office. When implemented late this fiscal year, this system will eventually be installed in all DOE locations and will include major on-line features. These systems will create a buildup of requirements in the fiscal 1980 period and beyond.
- Minicomputers now represent about 60% of the federal inventory. These systems have been growing at the overall annual average rate of 22% per year for the past seven or eight years, paced to a great extent by DOE (ERDA). After a slowdown in fiscal 1978, the higher pace is expected to resume as more useful software and support services for minicomputers become available in the areas of interactive graphics, small stand-alone data management systems, text processing, and distributed data processing.
- Because of the nature of DOE's mission, a policy with regard to the new generation of super-computers can be expected in the early 1980s. The recent (December 1977) selection of the \$8 million Cray I super-computer for fusion energy research at Lawrence Livermore Laboratories marks the beginning of a new cycle. Included in the bidding for that system were the CDC Star IDDA and the Burroughs BSP, both of which have other DOE installations as target markets for the next few years. As has been the case traditionally, the introduction of a new generation of super-computers has brought a corresponding need for software development, training, and other support services, as well as the development of backup concepts.
- While DOE personnel were not generally willing to provide quantitative estimates of future EDP budget changes, they did provide qualitative indications. As shown in Exhibit IV-7, no one expected a budget decline. Also, DOE field personnel are less optimistic about budget increases in the future than are headquarters personnel.

EXHIBIT IV-7
 DEPARTMENT OF ENERGY RESPONSES REGARDING
 EDP BUDGET EXPECTATIONS



- Vendors interviewed for this study were more optimistic than users about future EDP growth. Respondents indicated an expected increase in expenditures based on known requirements. Forecasted annual growth rates for the most part ranged from 5% to 20%, with one vendor expecting 300% growth by 1981 in his client agencies' services use.

V APPLICATIONS ANALYSIS

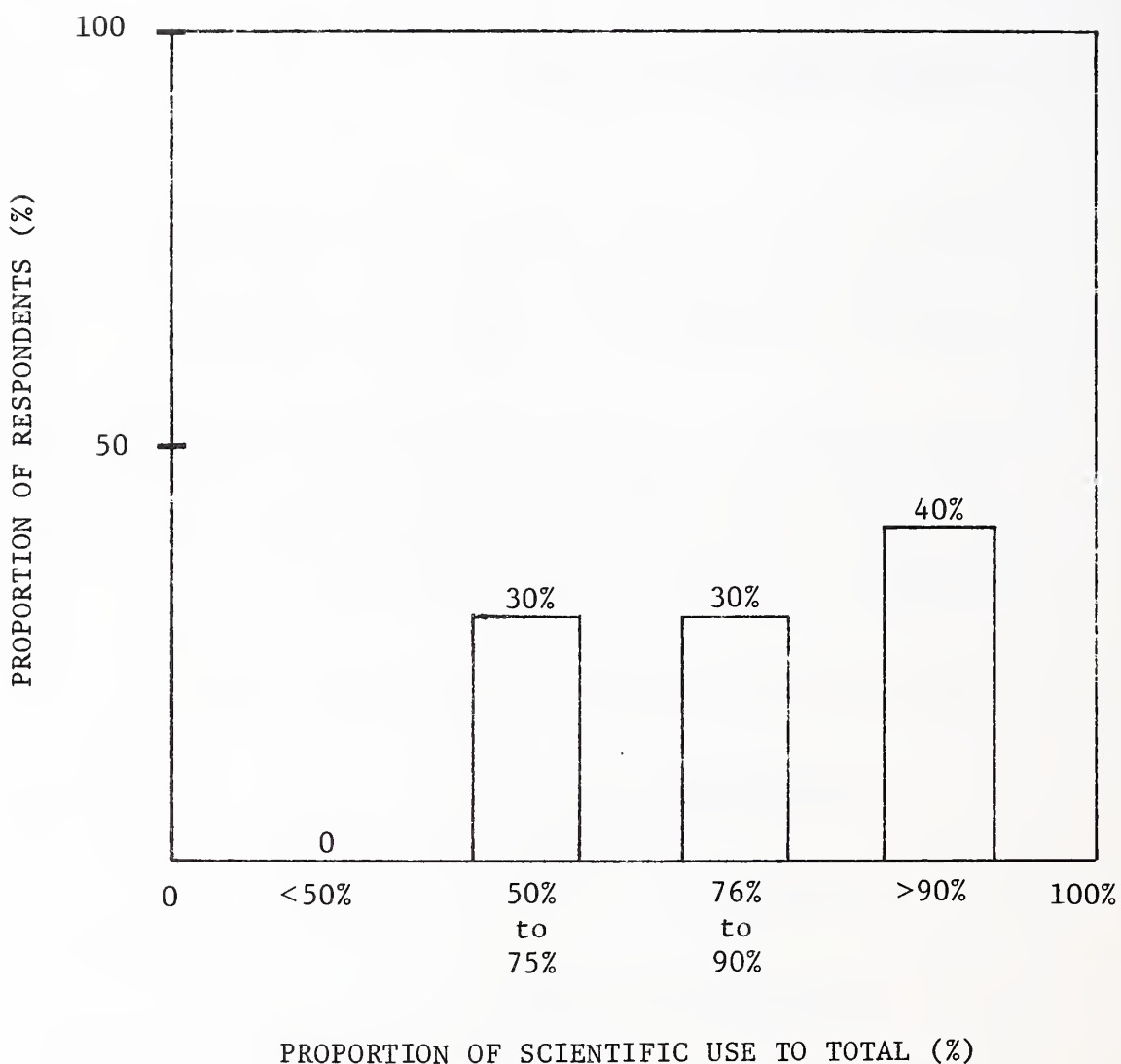
V APPLICATIONS ANALYSIS

A. SCIENTIFIC AND ENGINEERING

- The primary use of data processing in the Department of Energy is scientific and engineering computation performed in support of DOE's vast array of research and development, and demonstration programs.
- DOE respondents at field locations cited scientific applications as ranging from 50% to 100% of their total EDP use as shown in Exhibit V-1. Seventy percent of the respondents estimated that scientific applications require more than 80% of computer use at their facilities.
- Specific scientific applications in use at DOE include:
 - Data acquisition.
 - Data reduction.
 - Energy model development.
 - Numeric modeling.
 - Process control.

EXHIBIT V-1

DEPARTMENT OF ENERGY FIELD LOCATION
USER ESTIMATES OF THE PERCENT
OF SCIENTIFIC COMPUTING



- Weapons production support.
 - Nuclear code development.
 - Simulation.
 - High energy physics.
- With few exceptions scientific and engineering applications are performed on in-house systems; many of these, especially the large systems, are contractor operated.
 - Many of these applications are either classified or at least sensitive. They do not represent good opportunities for computer services vendors.
 - One area which is an adjunct to scientific applications, but where a potential market exists for computer services vendors, is in the graphics area. The need for graphics software and graphics-oriented data services surfaced in discussions with several users.

B. GENERAL BUSINESS

- Although this area represents a small portion of the data processing in DOE field locations, it is one which will grow under the present DOE management as new administrative systems are developed and implemented.
- Many of the large field locations (such as Los Alamos) employ IBM 360 and 370 medium and large scale equipment which serves as the business and administrative complement to large scientific processors. In some cases, 360/30s and even 1401s are still employed.

- During the forecast period covered by this report, many new business control and management systems will be developed at DOE headquarters locations. This action will in turn cause the field to automate existing systems and also to replace relatively antiquated computers used for business computing purposes. Included in these planned applications are:
 - Field office procurement reporting.
 - Field office funds tracking.
 - Agency-wide budget planning.
- Related to these field location systems are existing and planned applications which will be run at DOE headquarters locations. The responsibility for these applications is spread through several different organizations such as the Division of Procurement, the Division of Administration, and the Controller's Office.
- In the procurement area, applications such as the contract information system, procurements in process system, and procurement execution plan will be upgraded, updated, and possibly replaced. In the new versions, agency-wide considerations, confidence statistics, and a higher level of integration will be included.
- The Division of Administration which is responsible for the management of the large in-house computer complex in the headquarters area, operates application systems with the following functions:
 - Financial.
 - Accounting and budgeting.

- Human resources.
 - . Personnel information and payroll.
- Administration.
 - . Mail control and correspondence, contracts and procurement, security, and project management.
- Within the Office of the Controller for DOE there exists the Office of Program Management and Support. The stated mission of this group includes the development of financially oriented DOE-wide management information systems. Current responsibilities include financial planning, budgeting, and a variety of project and program management systems.
- The three DOE headquarters organizations mentioned above make widespread use of computer services at the present time. Based on the near saturation level of the in-house equipment which supports them, and also on the agency-wide emphasis of the new systems being planned and developed, they are susceptible and ready for additional services from remote computing and professional services vendors.

C. INDUSTRY SPECIALTY

- Industry specialized applications within DOE fall into two major categories:
 - The first category contains those applications closely related to the six major outlay programs headed by the Assistant Secretaries for Conservation and Solar Applications, Resource Applications, Energy Technology, Environment, Defense Programs, and by the Director of Energy Research.

- The second category contains those applications under the control of the Energy Information Administration.
- Those applications contained in the first category cited above range from nuclear weapons design and laser fusion to Hi-BTU coal gasification and ocean thermal electric conversion. For the main, these applications are scientific in nature, performed on in-house equipment, and depend little if at all on commercial software or services.
- The second category cited above under the responsibility of the EIA can be best understood by reviewing the functions of that organization. EIA is responsible for:
 - Collection, processing, and publication of data on energy reserves, energy-producing companies (including financial status), production, demand, and consumption.
 - Analysis of data to assist both government and non-government users in understanding energy trends.
 - Auditing to determine the accuracy of data contained in EIA systems.
 - Analysis of energy industry competition, capital/financial structure of energy companies, interfuel substitution, and economic impact of energy trends on regional and industrial sectors.
 - Development of two new systems: a national fuel reserve estimating system, and a financial reporting system for energy-producing companies.
 - At the present time, EIA activities are supported by two facilities management contracts with PRC and Optimum Systems, Inc.

D. DATA BASE AND UTILITY

- Many of the applications currently in use which are supported by remote computing services employ data base management systems (DBMS) or involve access to utility software such as graphics packages or statistical program libraries. This is true both at DOE headquarters as well as DOE field locations.

- Based on responses to the survey, this application segment will see substantial growth with the implementation of project management systems, active management control systems (performance vs objectives), and other non-financial reporting systems such as:
 - Federal inventory of energy projects.

 - Energy research project information system.

 - Bibliographic tracking system.

 - Unsolicited proposal tracking.

- Even DOE field locations whose normal emphasis is on custom batch applications anticipate changes in this area. More than 35% of the respondents said that applications "on the drawing board" include on-line data base management systems.

- A review of the Requests for Computer Services (Form 2068) that were submitted by DOE users to the General Services Administration - Region 3 for approval for the three months prior to the formation of DOE, indicated that 61% of the applications included specific DBMS software. A list of some of the applications taken from that review is shown in Exhibit V-2.

EXHIBIT V-2

LIST OF APPLICATIONS REQUIRING
DATA BASE MANAGEMENT SYSTEMS

APPLICATION	USER*
ON-LINE PROCUREMENT AND PLANNING STATUS REPORTING	ASSISTANT ADMINISTRATOR FOR FOSSIL ENERGY
ON-LINE PENDING ACTION SYSTEM	ASSISTANT ADMINISTRATOR FOR ENVIRONMENT AND SAFETY
ON-LINE FOSSIL ENERGY UNSOLICITED PROPOSAL TRACKING SYSTEM	ASSISTANT ADMINISTRATOR FOR FOSSIL ENERGY
ON-LINE SYSTEM FOIL COMPREHENSIVE PROJECT EVALUATION AND RISK ANALYSIS	DIVISION OF BUILDINGS AND COMMUNITY SYSTEMS
CONTRACT MANAGEMENT SYSTEM	DIVISION OF NUCLEAR RESEARCH AND APPLICATIONS
TRANSPORTATION MAILING LIST DATA BASE	DIVISION OF TRANSPORTATION ENERGY CONSERVATION
FIELD PROCUREMENT SYSTEMS	ALBUQUERQUE OPERATIONS OFFICE
PROCUREMENT MANAGEMENT SYSTEM	OFFICE OF PROGRAM ADMINISTRATION
ON-LINE OPERATIONS REPORTING SYSTEM	ASSISTANT DIRECTOR OF OPERATIONS
ON-LINE SYSTEM FOR WORLD ENERGY DATA	ASSISTANT ADMINISTRATOR FOR NUCLEAR ENERGY AND INTERNATIONAL AFFAIRS

*ALL USERS' TITLES GIVEN ARE PRE-DOE TITLES. ALL USERS WERE PART OF THE ERDA ORGANIZATION AT THAT TIME.

- Management graphics capability is already in use in several DOE systems, both at headquarters and field locations. Based on the number of mentions, INPUT forecasts a growing need for graphics.
- Word processing applications are also coming into play. As an example, the system for World Energy Data mentioned in Exhibit V-2 specifies an interface with the VYDEC word processing system. Also, because of huge report generation requirements, DOE field locations have a growing need for some form of word processing capability. At Oak Ridge, seven of the ten functional groups are in the process of acquiring word processing equipment.

VI COMPUTER SERVICES MARKETS

VI COMPUTER SERVICES MARKETS

A. TWO MARKETS EXIST

- DOE provides two distinct markets for computer services firms. One of these is in the DOE headquarters region represented by facilities in about a dozen Washington D.C. locations and the large facility in Germantown, Maryland:
 - Some 7,000 of DOE's 20,000 personnel are located in the region.
 - In general, DOE headquarters personnel are receptive to computer services.
 - They currently use some \$34 million per year, of computer services, made up of batch and remote computing (\$3 million), facilities management (\$12 million), professional services (\$18 million), and software products (\$1 million).
- The second market exists in the 75 DOE field locations which house the remaining 13,000 DOE employees and virtually all of the 90,000 contractor personnel:
 - This environment is contractor oriented and is anti-computer services for the most part.

- Although DOE field locations do employ professional services and software products, and do purchase data services and facilities management, the overall use of services is low relative to the number of personnel employed, and extremely low compared to the total amount of EDP.
- A graphic indication of the difference in the outlook of these two markets can be seen in Exhibit VI-1. The two groups had almost completely opposite viewpoints as to the ability of current EDP budget levels to support growth of DOE programs.
- As reported in INPUT's 1977 Annual Report on the Computer Services Industry, growth in the Federal Government sector since 1975 has been 20% per year. Energy has been no exception with a 21% rate from 1976 to 1977.

B. EXPENDITURE ANALYSIS AND FORECAST

- The analysis of expenditures for computer services by DOE is complicated by several factors:
 - The recent formation of the department and uncertainties with regard to some of the functions transferred from other departments.
 - The integrated nature of published statistics which intermix services provided by government facility operators and universities with commercial computer services companies.
 - Widespread use of computers throughout DOE with attendant software and maintenance needs, coupled with the classified nature of some of its activities.
 - The high degree of integration of minicomputers into process control and data collection systems.

EXHIBIT VI-1

RESPONDENTS' EVALUATIONS OF EDP BUDGET

CAPABILITY TO SUPPORT DEPARTMENT OF ENERGY PROGRAM GROWTH

<u>HEADQUARTERS RESPONSES</u>	
YES	15%
NO	77%
MAYBE	8%

<u>FIELD RESPONSES</u>	
YES	88%
NO	12%
MAYBE	0%

- By combining ERDA, FEA, FPC and Bureau of Mines data for 1976 and 1977 and then estimating requirements based on preliminary 1978 data, INPUT's estimate of DOE's use of computer services is shown in Exhibit VI-2.
- Based on fiscal 1977 expenditures, INPUT estimates that \$66.0 million or about 45% of DOE outlays for services was available to commercial services vendors, as shown in Exhibit VI-3. The remaining expenditures went to universities and government facility operators spread throughout DOE's complex of laboratories, research centers and production facilities.
- Exhibit VI-3 also indicates that approximately one-half (\$34 million) of the total expenditures for services available to commercial vendors took place in the DOE headquarters area. This figure does not include intra-department spending (such as the use of the FEA computers by ERDA) or inter-agency spending.
- Using budget values provided in Chapter IV, services constitute slightly less than 40% of the total EDP budget for DOE with approximately 17% available to commercial vendors. INPUT expects this percentage to increase through 1982.
- By combining DOE's expenditures for services with expenditures made by other energy-related organizations such as the Nuclear Regulatory Commission and the Tennessee Valley Authority and with energy programs still operated in other cabinet-level departments, the total available services market for federal energy programs in fiscal 1978 approaches \$90 million.
- Based on the stated needs of existing services users determined in this study, and the known plans for new programs, this \$90 million will increase to \$164 million by 1982, as indicated in Exhibit VI-4.

EXHIBIT VI-2

FORECAST OF DEPARTMENT OF ENERGY
TOTAL EXPENDITURES FOR COMPUTER SERVICES

TYPE OF SERVICE	EXPENDITURES				
	FY 1976 (\$M)	FY 1977 (\$M)	GROWTH 1976/77 (%)	FY 1978 (\$M)	GROWTH 1977/78 (%)
REMOTE COMPUTING/BATCH SERVICES ①	\$ 6.5	\$ 8.5	31%	\$ 9.0	6%
FACILITIES MANAGEMENT ②	43.0	51.0	19	57.5	13
SOFTWARE PACKAGES ③	2.0	2.5	25	3.0	20
PROFESSIONAL SERVICES ④	64.0	80.0	25	88.0	4
TOTAL	\$115.5	\$142.0	21%	\$157.5	11%

NOTES:

- ① Includes Batch, Remote Computing, Data Entry, and Data Output Services from Commercial Service companies and Universities.
- ② Includes F/M and Operations Contracts from Commercial Services companies and GOCOs.
- ③ Includes Independent Software only and not software unbundled from hardware manufacturers.
- ④ Includes Software and System Design, Software System maintenance and consulting contracts with Commercial Services companies, GOCO contractors, and F/M contractors.

EXHIBIT VI-3

1977 DEPARTMENT OF ENERGY COMPUTER SERVICES EXPENDITURES --

HEADQUARTERS VERSUS FIELD

TYPE OF SERVICE	EXPENDITURES		
	HEADQUARTERS LOCATIONS	FIELD LOCATIONS	TOTAL
REMOTE COMPUTING/BATCH	\$ 3.0	\$ 5.5	\$ 8.5
FACILITIES MANAGEMENT	12.0	39.0	51.0
SOFTWARE PACKAGES	1.0	1.5	2.5
PROFESSIONAL SERVICES	18.0	62.0	80.0
TOTAL	\$ 34.0	\$108.0*	\$142.0*
% OF TOTAL	24%	76%	100%
AVAILABLE TO COMMERCIAL SERVICE COMPANIES	\$ 34.0	\$ 32.0**	\$ 66.0

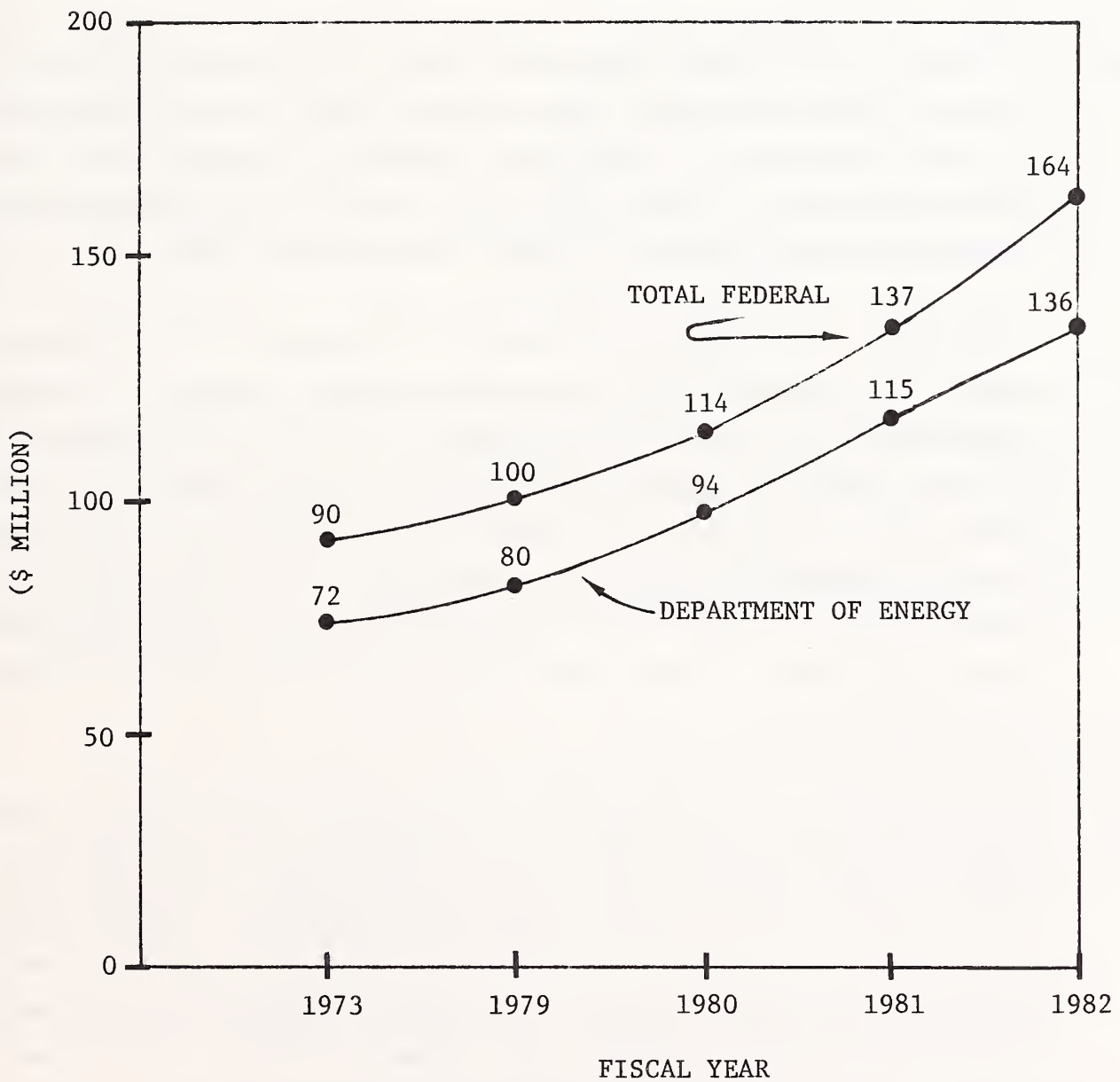
(\$ MILLION)

*INCLUDING EXPENDITURES TO UNIVERSITIES AND GOVERNMENT FACILITY (GOCO) OPERATORS

**SEE EXHIBIT II-1 FOR DETAILED BREAKDOWN

EXHIBIT VI-4

FORECAST OF AVAILABLE COMPUTER
SERVICES EXPENDITURES
IN FEDERAL ENERGY PROGRAMS



C. SERVICE MODE ANALYSIS

- The large facilities management and professional services contract has been the most popular way of obtaining computer services by the Department of Energy. Six such contracts which are multi-year and multi-million dollar in nature were reviewed as part of this study and found to account for \$25-30 million in 1977. Further details are included in Chapter VII of this report.
- It is likely that the issuance of large contracts of this type will continue. For one reason, DOE management, with somewhat limited authority over personnel, views contractors as having more flexibility in changing the mix of personnel required as systems move from the definition stage through design, development implementation, and finally to a maintenance stage.
- Traditionally, energy-related field locations have operated autonomously with regard to the purchase of EDP equipment and services, preferring to maintain complete control through the use of in-house (or GOCO operator) installations. Very often the highly classified nature of their activity served as the main justification for this approach. Under the new DOE structure, the highly classified activities such as weapons development are clearly separated and distinct, making it more difficult for field activities to "hide" behind the classification excuse. To some extent, this represents an opening of the doors to computer services.
- In addition to each of the organizational components which make up DOE having its own plans and programs prior to the formation of the Department, several new requirements are now mandatory. These include the development of substantial data systems in EIA and the creation of large agency-wide, administrative systems in several other divisions. These all require personnel currently not available in DOE, and because of the "peak load" type of situation, suggest that additional large contracts will be issued.

- As stated by one senior DOE official, "DOE has an enormous need for information with which to manage." He went on to state that the use of services in management and administrative applications would grow, and forecasted a "mild explosion" in the next one to two year period.
- Remote computing will experience a growth as a result of the new DOE administrative responsibilities coupled with the relative ease with which teleprocessing services can be contracted under the GSA/TSP. These factors, therefore, indicate increased usage will be experienced more rapidly at the headquarters locations than in the field. Agency-wide systems are being designed and tested at headquarters after which they will be "rolled out" to the field locations. The GSA/TSP is already being used at headquarters, but under present regulations is not required by field locations (i.e., National Laboratory and GOCOs are exempt). Exhibit VI-5 provides an analysis of Remote Computing Services vendors currently being used at DOE headquarters.
- A very important factor influencing computer services market growth will be the ability of computer services vendors to respond quickly to the new agency-wide administrative systems which will be implemented during the first few years of the Department. This in turn will provide an entry for services vendors to the field locations which heretofore have operated autonomously and have been generally unavailable.
- Little growth is anticipated in batch services, although several recent cases involving contracting with local data centers for overflow processing have been identified. Traditionally, this has been precluded because large DOE data centers have been equipped with sufficient redundant computing capacity and, therefore, were completely self-sufficient.
- Some opportunities continue to exist for data entry and output services.
- Data base management systems software is facilitating the development of new applications and contributing to the growth of remote computing. As stated by a DOE user, "We had 16 DBMS application systems working when we had less than 9,000 people (ERDA). We surely will have a lot more

EXHIBIT VI-5

REMOTE COMPUTING SERVICES
 EXPENDITURES TO MAJOR VENDORS^①
 BY DEPARTMENT OF ENERGY HEADQUARTERS

VENDOR	1978 CONTRACT ADWARDS VALUE	NUMBER OF APPLICATION SYSTEMS	NUMBER OF SOLE SOURCE AWARDS	VALUE OF SOLE SOURCE AWARDS
BCS	\$ 87,000	2	0	\$ 0
CDC	125,000	4	1	35,000
CSC	780,000	9	4	369,200
GEIS	20,000	2	1	5,000
LITTON	834,000	14	8	608,900
TYMSHARE	126,000	2	1	120,000
TOTAL	\$1,972,000	33 ^②	15	\$1,138,100

① Does not include Data Base vendors or services provided by other government facilities. These vendors are:

DATA BASE - DRI, LOCKHEED, NEW YORK TIMES, SDC
 GOVERNMENT - BROOKHAVEN, HARRY DIAMOND LABS, FEA (OSI),
 NATIONAL LIBRARY OF MEDICINE

② Vendors referenced in Note ① provide an additional 41 application systems, accounting for an estimated additional \$1 million per year.

(applications) now that we have 20,000 people." Assisting in the acceptance of the DBMS approach is the attempt on the part of data processing management personnel to standardize on one system. The system being promoted is MRI's System 2000.

- Another major opportunity exists for vendors with minicomputer software.
- In response to the question, "What services would you consider if they were available to you?", DOE users provided the following responses:
 - "Improved data management systems for serially updating and randomly accessing very large files." (Headquarters)
 - "Reliable gas and oil data base information." (Headquarters)
 - "Market research and survey services for energy-related data." (Headquarters)
 - "Access to international network." (Field)
 - "Graphics capability, especially improved interactive graphics." (Field)
 - "High speed composition and printing services." (Field)
 - "Contract programming in modeling area." (Field)
- Less specific responses included:
 - "Services involving lower hardware prices but more equitable support and software pricing."
 - "All new development work should go outside."

D. FACTORS INFLUENCING COMPUTER SERVICES MARKETS

I. GSA/TSP

- After a long and controversial startup period, on August 1, 1977, the General Services Administration's Teleprocessing Services Program finally became the mandatory method by which most computing services are procured in the federal sector.
- Under the GSA/TSP concept, two methods are available for using agencies to contract for services, the BA or Basic Agreement, and the MASC or Multiple Award Schedule Contract. Initial comments from vendors suggest that better "deals" are available to government users through use of the BA, despite the fact that the MASC is a much more complex and difficult contract for which to qualify.
- As of November 1, 1977, GSA had announced the qualification of 32 vendors under MASC and 57 vendors under the BA. Also, as of the same date, about 500 requests for service (Form 2068) had been filed throughout the ten GSA regions. Of this number, 398 requests were submitted by users in GSA Region 3, the Washington, D.C. area, totaling approximately \$75 million of annual expenditures.
- A review of the 2068s submitted by energy groups in Region 3 indicated that about one-half (36 of 73) of the known RCS applications had been filed with GSA. Of those not on file, most were applications involving services provided by other government agencies (such as Brookhaven and Harry Diamond Labs).
- In addition to the 2068s submitted for Remote Computer Services, the Federal Power Commission (now part of DOE/EIA) submitted requests for keypunching and photo-composition/typesetting services totaling more than \$115,000 annually.

- INPUT also contacted two other GSA regions as part of this investigation - GSA Region 4 - Atlanta because its responsibilities include several large DOE facilities including Oak Ridge, and GSA Region 9 - San Francisco. The investigation revealed that no DOE originated requests had been submitted in either region. Subsequent discussions with DOE personnel revealed that National Laboratories and government-owned facility operators are exempt from the GSA/TSP procedures. As an aside, the Tennessee Valley Authority had submitted 2068s totaling more than \$1 million annually for energy-related services.

- In summary, the TSP is being used extensively by DOE headquarters personnel but not at field locations. Form 2068 submissions by DOE in Region 3 as of 11/30/77 totaled more than \$2.1 million in annual expense with only two requests made after 10/1/77, the official DOE formation date and also the start of the federal fiscal year. Since then, there has been little TSP activity by DOE.

- Several TSP users stated that they favored the TSP because it enabled them to acquire services more easily. However, there was also concern expressed:
 - In one case, a user stated that vendors would provide considerably less support (without a separate charge structure) which he considered to be a serious problem.

 - The second concern was related to the recompetition aspects of the TSP. It should be noted that 19 of DOE's TSP requests were awarded sole source and require recompetition within one year.

- 2. OMB CIRCULAR A-76
 - Circular A-76, issued in 1966, states that federal agencies will not operate an activity to provide a product or service that is obtainable from a private source, unless that activity has been justified in the national interest.

- Criteria for such justification are a necessity for military readiness, lack of a suitable commercial source, and more costly commercial performance.
- Excluded from this policy are those government management functions which must be performed by government personnel, and management advisory services for which separate guidelines are being developed.
- With the advent of the Carter Administration, increasing attention has been given to this policy. On November 21, 1977, the Office of Management and Budget released new guidelines for enabling federal agencies to decide whether to do a job internally or to contract with a private firm. This action is one of several aimed at rewriting OMB Circular A-76.
- Although the newly released guidelines contain provisions which impact commercial vendors negatively (such as lowering the government personnel cost figure used in comparison with cost by contract), the guideline document contains discussions of proposals which would have a positive effect if implemented. Examples include:
 - Proposed Action 2E
 - "Require government-owned, contractor-operated (GOCO) activity management to apply A-76 policy principles to in-house vs. contract considerations; also, require that in-house aspects of GOCO activities (ownership and related management) be considered as government, commercial, or industrial (C/I) activity subject to A-76 review requirements."
 - Proposed Action 2F
 - "After revision of OMB Circular A-76, develop supplements addressing its application to special areas such as telecommunications and automatic data processing."

- Clearly, if these proposals are accepted, implemented, and enforced, a significant change in the projections for computer services in the federal sector would be required. INPUT's projections for this study do not contemplate the near-term implementation of proposed action statements cited above, or the immediate assumption of the "New Start" definition.
- Due to significant differences between actual new starts and expansions of existing activities (both of which have traditionally been included in the A-76 definition of "New Starts"), OMB is now proposing that these two situations should be individually treated with appropriately different provisions.
- The OMB task force for the A-76 rewrite, made up of senior government personnel from many agencies, is scheduled to continue meeting until late summer 1978.
- During the course of this study, several lengthy discussions regarding the A-76 rewrite took place. Two vendor spokesmen and a senior DOE staff member felt that the revised A-76 was the single most important issue affecting the growth of computer services at DOE.

3. PROLIFERATION OF MINICOMPUTERS

- As shown earlier in Section IV of this report, the Department of Energy is a very large user of minicomputers with more than 2,000 installed. Although the "official" DOE position is that DOE's minicomputer situation is being reviewed, especially with regard to capacity, INPUT's survey indicates that DOE users are considering minicomputers by a better than 2 to 1 margin (Exhibit VI-6). Although some of the growth is in support of laboratory and data collection efforts, two DOE field locations stated emphatically that they would continue to consider minis before services.
- Vendors interviewed for this study also felt that minis would continue to grow in DOE:

EXHIBIT VI-6

RESPONDENTS' CONSIDERATION OF MINICOMPUTERS
INSTEAD OF COMPUTER SERVICES

RESPONSES TO QUESTION: "ARE MINICOMPUTERS BEING CONSIDERED TO REPLACE SERVICES AND/OR TO IMPLEMENT NEW APPLICATIONS?"

RESPONSE	HEADQUARTERS LOCATION	FIELD LOCATION	COMBINED
YES	36%	55%	44%
NO	21	18	20
MAYBE	7	0	4
NO RESPONSE	31%	27%	32%

- The availability of the Bell Laboratories UNIX system software provides a method for DOE field locations to have complete interactive capability on DEC PDP-8s and PDP-11s for considerably under \$20,000.
- This is a capability that several users expressed a desire to have, can almost certainly afford, and will most surely buy, as soon as the "word gets around."
- With improved system and data management software available, the use of minicomputers in DOE field locations will increase for interactive graphics and word processing, as well as the more traditional applications of engineering design, experimentation, and data collection.
- Despite the general feeling that DOE could effectively employ distributed processing, INPUT's survey revealed no vendor who has provided or has even been requested to provide that capability.

4. SECURITY, PRICING, OTHER

- In general, the issue of security/privacy is not considered to pose a significant problem to users. As shown in Exhibit VI-7, more than half of the DOE users interviewed who responded to the question considered the matter not to be a problem.
- In those cases where there was concern, the types of action being taken included:
 - The inclusion of audit controls in systems.
 - Passwording added to batch systems (considered to be awkward).
 - Increase in the level of physical security.

Only one interviewee considered that the privacy/security issue could have a big impact on the use of EDP within DOE.

EXHIBIT V1-7

IMPORTANCE OF THE SECURITY/PRIVACY ISSUE
TO DEPARTMENT OF ENERGY RESPONDENTS

USER RESPONSES	HEADQUARTERS LOCATION	FIELD LOCATION	COMBINED
NOT A PROBLEM	29%	55%	40%
BECOMING IMPORTANT	14	18	16
ACTION BEING TAKEN-CONCERN	36	0	20
NO RESPONSE	21%	27%	24%

- The attitude of DOE users toward vendor pricing was completely different between headquarters and field personnel.
 - 100% of the respondents in the Washington area signified that they were satisfied with vendor prices with responses ranging from OK to happy.
 - Field location users expressed a 72% dissatisfaction.

- An important suggestion for vendors to consider was made by a user who felt that the practice of multiple license fees for software packages installed at the same site was unfair. His feeling was that there should be a discount arrangement for multiple installations. This will be an important consideration for such applications as text processing.

VII COMPETITIVE ENVIRONMENT

VII COMPETITIVE ENVIRONMENT

A. COMMERCIAL SERVICES VENDORS

- The use of computer services by energy agencies is a well-established concept in that, unlike certain agencies such as DOD, DOE organizational units have traditionally worked with contractors almost exclusively. Consequently, facilities management contracts and large software services contracts are well-accepted methods for accomplishing EDP objectives.
- However, software packages and remote computing are relatively new and undeveloped services areas. This is due primarily to the large, decentralized, batch orientation of DOE computer centers where hardware vendors historically have been responsible for systems software.
- The average vendor of computer services interviewed for this study (primarily remote computing and software packages) has been providing services for only 3 years to energy agencies compared to an average of 6.5 years to the Federal Government overall.
- The following summaries of commercial services vendors are intended to provide a brief overview of their DOE and energy related activities. More detailed information (Highlights) on the following DOE vendors are available in INPUT's Company Analysis and Monitoring Program (CAMP):

- Automatic Data Processing.
- Boeing Computer Services.
- Boole & Babbage, Inc.
- CACI, Inc.
- CompuServe, Inc.
- Computer Corporation of America.
- Control Data Corporation.
- Computer Sciences Corporation.
- Data Resources, Inc.
- Dial Com, Inc.
- Foresight Systems, Inc.
- General Electric Information Systems.
- MRI Systems Corporation.
- Optimum Systems, Inc.
- Planning Research Corporation.
- Software AG of North America.
- Tymshare, Inc.
- University Computing Company.

I. VENDORS WITH MAJOR CONTRACTS

a. Boeing Computer Services

- BCS is one of the largest computer services vendors to DOE with annual revenues in the range of \$8-10 million:
 - The majority of these revenues come from the \$35 million, five-year facilities management contract with DOE's Richland Operations Office, Hanford site.
 - This activity supports DOE and other contractor personnel using government-owned, large scale, Univac computers in an open-shop environment.

- BCS is also a remote computing vendor for several applications at headquarters locations.
- In a related area, BCS is a major supplier of professional services to the Nuclear Regulatory Commission.
- Boeing Computer Services has significant strengths as a vendor to DOE including:
 - Knowledge of the use of minicomputers in a technical/scientific environment.
 - Experience of the operation of large-scale computing equipment in support of technological missions.
 - Awareness of DOE needs as the result of other Boeing Company experience.

b. Computer Sciences Corporation

- CSC activities related to federal energy are widespread and diverse, ranging from remote computing in several areas such as DOE Procurement and DOE Office of Fossil Energy to a multi-million dollar systems and programming contract in support of DOE headquarters activities:
 - A significant award is the three-year facilities management contract with DOE's Las Vegas test facility.
 - CSC has been very active in the energy area with both the Infonet and CSC Systems Divisions participating.
- As the result of CSC's bid for ERDA's system analysis and programming business in early 1977, CSC's annual revenues at DOE are now in the \$5 million range.

c. Optimum Systems, Inc.

- Perhaps the most widely publicized facilities management contract is OSI's agreement with what was the Federal Energy Administration and is now part of DOE's Energy Information Administration.
 - This multi-year agreement with renewal clauses consolidated a multitude of individual vendor's contracts into a centralized facility supporting a nationwide telecommunications network.
 - In addition, OSI provides micrographics services and a variety of support services such as training and technical assistance.
 - The total contract approaches a \$10 million per year level. This value could change significantly depending on the outcome of activity aimed at changing the contract to reflect government-owned rather than vendor-owned computer equipment (dual IBM 370/168 with 7 million byte memories).
 - The current level of personnel support provided by OSI stands at 62 people.

d. Planning Research Corporation

- One of the several facilities management contracts with federal agencies held by PRC is one that was awarded by the Federal Power Commission prior to the formation of DOE. This contract valued at approximately \$2.5 million is now managed within the Energy Information Administration.

e. Auerback Associates, Inc. (AAI)

- This organization, licensed to use the Auerbach name for a five-year period, is a spin-off group from the original Philadelphia-based Auerbach Associates.

- One of the contracts that was retained in the spin-off process was a \$2 million plus contract for providing programming and support services to DOE, primarily in support of the Office of Administration.
- Although the 100 - 125 personnel are involved in some development work, their major function now is program maintenance, as a significant part of this once larger contract was awarded to Computer Sciences Corporation earlier in 1977.

f. Other Professional Services Vendors

- Referenced as services vendors during INPUT's interviews of DOE users were the following firms:
 - Mechanics Research (subsidiary of Systems Development Corporation).
 - International Nuclear Energy Systems Co., Inc.
 - Kentron.
 - Techna Associates.
 - Softec, Inc.
 - Harbridge House.
 - Applied Urbanetics.

2. REMOTE COMPUTING SERVICES VENDORS

a. Litton Computer Services

- This division of Litton located in Reston, Virginia provides IBM-based services to the federal sector in the D.C. area.
 - Its primary function is the data processing support of other Litton operations (a major defense contractor) in Washington.
 - However, with a relatively small cadre of marketing and technical support personnel, LCS has been able to attain significant penetration in several agencies.

- At the present time, Litton has 14 DOE remote computing applications which generate \$0.75 to \$1 million of annual revenue.
- Their approach to the market is pure utility in nature with low cost and IBM compatibility as the primary selling features.

b. Tymshare

- Tymshare provides Remote Computing Services to DOE through three contracts which currently generate about \$400,000 of annual revenue:
 - These contracts were originally initiated with users in ERDA and FPC.
 - Like many other vendors, Tymshare used specific software package capabilities to gain entry to the market. In the case of DOE, the graphics capabilities of EXPRESS and SITE together with System 1022 (DBMS) provided that vehicle.
- Tymshare's IBM capability together with System 2000 are becoming increasingly important in support of their DOE business.

c. CompuServe

CompuServe is included here as an example of the remote computing companies which have been able to successfully market to DOE field locations. Through CompuServe's Chicago marketing office, Argonne National Laboratories (Experimental Breeder Reactor #2 group) is provided with remote computing tools for statistical analysis and graphics. In addition to the interactive nature of the service, DOE personnel look to RCS vendors to provide technical assistance in the development of applications.

d. RCS

- RCS are provided to a lesser extent by General Electric Information Systems, Control Data Corporation, and a variety of data base specialty firms including Data Resources, Lockheed, New York Times, and Systems Development Corporation. These companies as a group provide approximately 10-15% of the current headquarters location services at the present time.

3. SOFTWARE PRODUCTS VENDORS

a. MRI

- The most widely used Data Base Management System (DBMS) package at DOE is System 2000 (or System 2K as it is also referenced) developed by MRI of Austin, Texas:

- In addition to eight or ten installations on DOE in-house equipment, System 2000 is used on several RCS vendors' systems including Litton, Tymshare, and CSC.
- System 2000 is being promoted by DOE's CSTM group as the de facto standard for data management applications and, at present, 16 major applications are in use on external commercial remote computing vendors alone.
- The unit price of System 2000 ranges from \$50,000 to \$150,000 with the average price being \$65,000.

b. Software AG of North America, Inc.

- The primary DBMS package in use on the Energy Information System's IBM computers is ADABAS (Adaptable Data Base System) available from Software AG of Reston, Virginia:

- Unit prices for ADABAS range from \$90,000 to \$120,000.
- Software AG has installed more than 80 copies of this package in the United States.
- 30% of the installations are in the Federal Government.

c. Software House

- Another data base management systems growing in popularity is System 1022 developed by Software House of Cambridge, Massachusetts. System 1022 is designed for use on DEC System 10s and is available for purchase for in-house hardware systems, as well as through several remote computing vendors including Tymshare, ADP Network Services, and CompuServe.

d. Integrated Software Systems Corporation (ISSCO)

- ISSCO of San Diego, California is the developer of DISSPLA (Display Integrated Software System and Plotting Language) which is in widespread use throughout DOE. Available for use on a number of hardware systems, DISSPLA has been installed on in-house DOE computers and is also growing in use via Remote Computer Services vendors.

e. United Computing Systems (UCS)

- UCS acquired Foresight Systems in August 1975. Developed in 1969 and subsequently offered by a number of remote computing vendors, the Foresight financial planning, reporting and modeling program is used in a variety of administrative applications at DOE.

f. Other Software Product Vendors

- A variety of system and application products are in use within DOE. Included as vendors are:
 - Boole & Babbage.
 - Bonner & Moore.
 - CAPEX.
 - CACI.
 - CCA.
 - Haverly.
 - Infodata.
 - Informatics.
 - Innovation Data Processing.
 - UCC.

B. ALTERNATIVE SOURCES OF COMPUTER SERVICES

- As mentioned throughout this report, the data processing objectives of DOE are heavily implemented by the contractors who operate government owned facilities. Over the years, these contractors have tended to block the entry of commercial services vendors by establishing local facilities and local capability as "add-ons" to their existing contracts in much the same fashion as "spin-off" groups have done in the computer services industry.
- Nearby universities have also served as a primary source of data processing services for DOE field locations. The support provided ranges from extremely large-scale and formal arrangements such as with the University of California and the nine university consortium which services Brookhaven National Laboratories, to relatively loose and unstructured arrangements as exist with the five energy research centers. In these cases, local service is provided on an almost "as available" basis with academic institutions such as the University

of Wyoming, the University of West Virginia, the University of Pittsburgh and Carnegie Mellon. User satisfaction ranges from poor to good based on interview responses to this study. Services also include university developed software packages.

- Although not new, there is an increased emphasis on using existing government EDP facilities where possible before looking outside. This practice results in both inter-agency, as well as intra-agency charges being amassed by users, and also serves as a source of income for providing agencies. Examples defined during this study include:
 - Harry Diamond Laboratories is listed as the vendor for nine DOE applicaitons.
 - Prior to DOE's formation, ERDA ran 17 applications on the FEA system. These applications still exist as applications run with intra-agency charges.
 - The Smithsonian Institute was a major vendor to the Department of Interior, Bureau of Mines until the formation of DOE.
 - The Division of Environment headquarters group in Washington purchased software to be installed on a DEC System 10 in Oak Ridge and is expected to develop data management systems to run remotely.

C. USER ATTITUDES TOWARD VENDORS

- In the course of this study, INPUT asked a number of questions aimed at determining the attitude of DOE users toward computer services vendors. A direct question was, "Under what circumstances would you consider changing vendors?":

- As shown in Exhibit VII-1, price is far more important at the field level than at headquarters as a consideration in changing vendors. This is consistent with earlier findings that the field level is less receptive to services and would tend to insist on a price advantage before selecting services.
- As shown in Exhibit VII-2, vendor support is the most important characteristic in selecting a computer services vendor, followed by software capability and price.
- Users provided a series of recommendations for improvements to vendors. These responses tended to be much more technical in nature from field personnel and more marketing oriented from headquarters personnel. Exhibit VII-3 contains some of the more significant responses.
- As a final request, DOE users were asked to advise vendors on how to improve the value of their services. Exhibit VII-4 provides a summary of their responses. It should be noted that only 20% of the field location users were willing to participate.

EXHIBIT VII-1

CIRCUMSTANCES LEADING
TO CHANGE IN VENDORS

CIRCUMSTANCES	HEADQUARTERS LOCATION	FIELD LOCATION	COMPOSITE
PRICE RELATED	21%	45%	32%
PERFORMANCE RELATED	43	9	28
SUPPORT RELATED	7	9	8
NO RESPONSE	28%	36%	32%

EXHIBIT VII-2

USER RANKING OF VENDOR CHARACTERISTICS

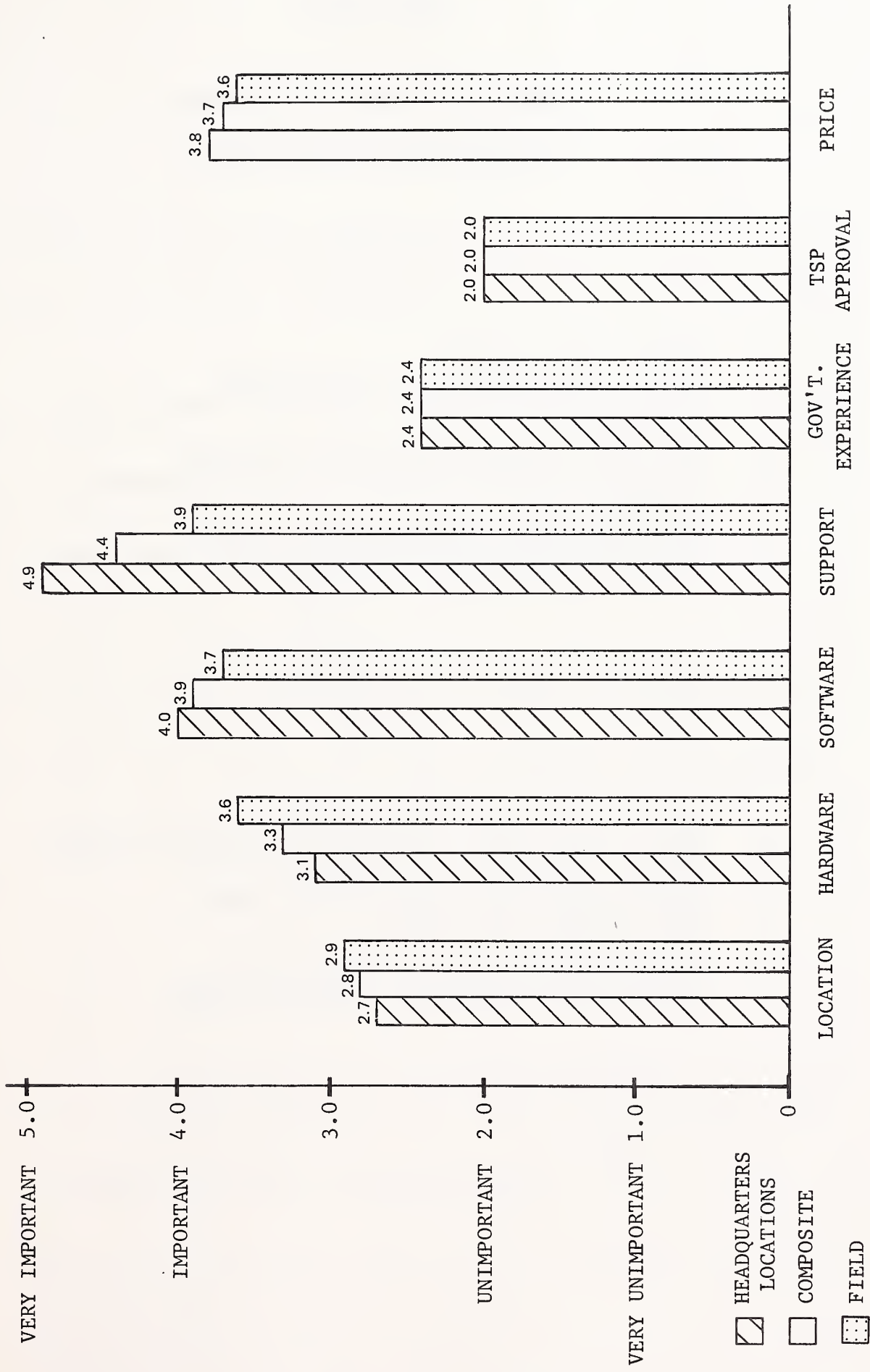


EXHIBIT VII-3

VENDOR IMPROVEMENTS RECOMMENDED

BY DEPARTMENT OF ENERGY USERS

MARKETING

- IMPROVED PUBLICATIONS
- USE OF BETTER GRAPHICS IN PRESENTATIONS
- BETTER LITERATURE TO HELP DISTINGUISH PRODUCTS AND SERVICES
- SHOW MORE FAMILIARITY WITH ENERGY PROBLEMS
- IMPROVED PRICING POLICY WITH REGARD TO SOFTWARE PACKAGES
- MORE UNIFORMITY IN COMMUNICATIONS COSTS
- LESS USE OF "HONEYMOON VS MARRIAGE" TECHNIQUE WHEREBY THE A TEAM SELLS AND B TEAM SUPPORTS

TECHNICAL

- STANDARDIZE DATA MANAGEMENT SYSTEMS
- SIMPLIFY USER INPUT REQUIREMENTS IN SOFTWARE PACKAGES
- BETTER SOFTWARE FOR MINI-COMPUTERS
- PROVIDE DISTRIBUTED PROCESSING CAPABILITY
- MORE RELIABLE MASS STORAGE
- IMPROVED INTERACTIVE HARDWARE/SOFTWARE
- MORE PORTABLE SOFTWARE
- IMPROVED SERVICES FOR MINI COMPUTER VENDORS

EXHIBIT VII-4

DEPARTMENT OF ENERGY USERS' ADVICE
TO COMPUTER SERVICES VENDORS

COMMENTS

- "MARKET HONESTLY."
- "KEEP IN MIND THAT PERSONNEL ARE THE DECIDING FACTORS."
- "BE A GOOD CONSULTANT; KNOW THE PROBLEM YOU ARE SOLVING."
- "SECURE COPIES OF INTERNAL STUDIES WHICH DESCRIBE PROBLEMS BEFORE CALLING TO SELL."
- "DEVELOP BETTER LITERATURE."
- "LOOK FOR SHORT DURATION 'SPIKES'; BUDGETS ARE GEARED TO STABLE OPERATION."
- "DON'T LET YOURSELF BE SEEN ONLY AT CONTRACT RENEWAL TIME."
- "BE AS RESPONSIVE WHEN SERVICING THE ACCOUNT AS YOU ARE WHEN SELLING."
- "ADJUST TO CHANGES QUICKLY."
- "GET THE JOB DONE ON TIME."
- "REVIEW YOUR PRICING METHODS."
- "IMPROVE YOUR PRESENTATION MATERIALS."
- "WATCH FOR THE A76 REWRITE."
- "LOOK AT DEVELOPING ACTIVITIES IN FIELD LOCATIONS."
- "PAY ATTENTION TO SCIENTIFIC AND EDUCATION APPLICATIONS, NOT JUST TO ADMINISTRATIVE."
- "FOR VENDORS WANTING TO SELL TO THE FIELD LOCATIONS, WORK THROUGH THE OFFICE OF ADMINISTRATION."

APPENDIX A: DATA BASE

EXHIBIT A-1
 FORECAST USER EXPENDITURES FOR COMPUTER SERVICES
 BY MODE OF SERVICE,
 1977 TO 1982
 INDUSTRY NAME: FEDERAL GOVERNMENT-ENERGY PROGRAMS

MODE OF SERVICE	EXPENDITURES (\$ MILLION)					AVERAGE ANNUAL GROWTH RATE (%)
	1977	1978	GROWTH RATE (%)	1980	1982	
REMOTE COMPUTING	\$ 6.0	\$ 7.0	17.0%	\$13.0	\$ 18.5	25.0%
INTERACTIVE	3.0	3.5	17.0	6.5	9.5	26.0
REMOTE BATCH	2.5	2.5	0	4.0	5.0	15.0
DATA BASE	0.5	1.0	100.0	2.5	4.0	51.0
FACILITIES MANAGEMENT	22.5	24.0	7.0	33.0	46.0	-
BATCH SERVICES	0.5	0.5	0	0.5	0.5	0
TOTAL PROCESSING SERVICES	\$29.0	\$31.5	8.6%	\$46.5	\$65.0	18.0%
SOFTWARE PRODUCTS	2.5	3.0	20.0	6.0	9.5	31.0
PROFESSIONAL SERVICES	34.5	39.0	11.0	46.0	61.5	12.0
TOTAL	\$66.0	\$73.5	10.0%	\$98.5	\$136.0	16.0%

EXHIBIT A-2

FORECAST USER EXPENDITURES FOR COMPUTER SERVICES
BY TYPE OF SERVICE

INDUSTRY NAME: FEDERAL GOVERNMENT-ENERGY PROGRAMS

APPLICATION AREA	EXPENDITURES (\$ MILLION)		AVERAGE ANNUAL GROWTH RATE (%)
	1977	1982	
GENERAL BUSINESS	\$ 5	\$ 16	26%
SCIENTIFIC AND ENGINEERING	10	20	15
INDUSTRY SPECIALTY	45	80	12
UTILITY	6	20	27
TOTAL	\$ 66	\$ 136	16%

EXHIBIT A-3

DISTRIBUTION OF USER EXPENDITURES FOR PROCESSING SERVICES, 1977,
BY MODE AND TYPE OF SERVICE

INDUSTRY NAME: FEDERAL GOVERNMENT-ENERGY PROGRAMS

APPLICATION AREA	MODE OF SERVICE (EXPENDITURES: \$ MILLION)					TOTAL (\$ M)
	INTER- ACTIVE	REMOTE BATCH	DATA BASE	FM	BATCH	
GENERAL BUSINESS	\$ 0.5	\$ 0.0	\$ 0.1	\$ 3.5	\$ 0.2	\$ 4.3
SCIENTIFIC AND ENGINEERING	0.5	0.5	0.0	2.0	0.0	3.0
INDUSTRY SPECIALTY	1.5	1.5	0.1	14.5	0.1	17.7
UTILITY	0.5	0.5	0.3	2.5	0.2	4.0
TOTAL	\$ 3.0	\$ 2.5	\$ 0.5	\$22.5	\$ 0.5	\$29.0

EXHIBIT A-4

DISTRIBUTION OF USER EXPENDITURES FOR PROCESSING SERVICES, 1982
BY MODE AND TYPE OF SERVICEINDUSTRY NAME: FEDERAL GOVERNMENT-ENERGY PROGRAMS

APPLICATION AREA	MODE OF SERVICE (EXPENDITURES: \$ MILLION)					TOTAL (\$ M)
	INTER- ACTIVE	REMOTE BATCH	DATA BASE	FM	BATCH	
GENERAL BUSINESS	\$ 1.5	\$ 0.6	\$ 0.2	\$ 5.0	\$ 0.2	\$ 7.5
SCIENTIFIC AND ENGINEERING	1.0	2.0	1.0	3.0	0.0	7.0
INDUSTRY SPECIALTY	3.0	2.4	2.0	33.0	0.1	40.5
UTILITY	3.0	1.0	0.8	5.0	0.2	10.0
TOTAL	\$ 8.5	\$ 6.0	\$ 4.0	\$46.0	\$ 0.5	\$ 65.0

EXHIBIT A-5

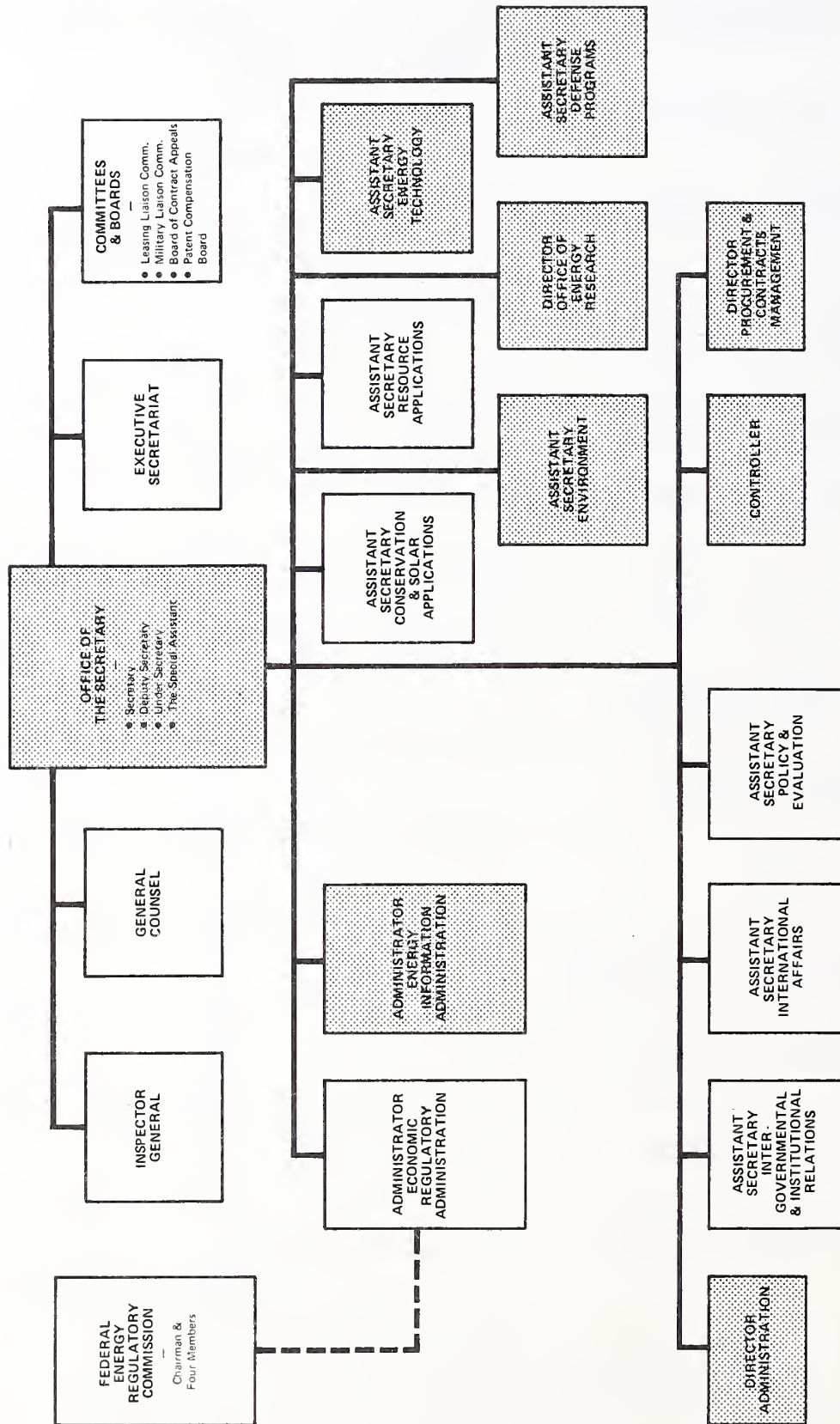
DEPARTMENT OF ENERGY ORGANIZATIONAL SOURCE OF USER INTERVIEWS;
 VENDOR INTERVIEWS

SOURCE OF USER INTERVIEWS	NUMBER OF INTERVIEWS		
	HEADQUARTERS	FIELD	TOTAL
OFFICE OF THE SECRETARY	0	1	1
ASSISTANT SECRETARY FOR ENERGY TECHNOLOGY	1	4	5
ASSISTANT SECRETARY FOR ENVIRONMENT	1	0	1
DIRECTOR OF ENERGY RESEARCH	0	3	3
ASSISTANT SECRETARY FOR DEFENSE PROGRAMS	0	3	3
ENERGY INFORMATION ADMINISTRATION	4	-	4
CONTROLLER	4	-	4
DIRECTOR OF PROCUREMENT AND CONTRACT MANAGEMENT	1	-	1
DIRECTOR OF ADMINISTRATION	3	-	3
TOTAL	14	11	25

VENDOR INTERVIEWS	NUMBER OF INTERVIEWS
	11

EXHIBIT A-6

PORTIONS OF DEPARTMENT OF ENERGY INCLUDED IN INTERVIEWS



Source of interview

NOTE: Interviewed portions represent approximately 50% of the total Department of Energy population of 20,000.

APPENDIX B: DEFINITIONS

APPENDIX B: DEFINITIONS

- **COMPUTER SERVICES**

These are services provided by vendors which perform data processing functions using vendor computers, or assist users to perform such functions on their own computers.

- The following are the definitions of the modes of service used in this report:

- **REMOTE COMPUTING SERVICES (RCS)**

Provision of data processing to a user by means of terminals at the user's site(s) connected by a data communications network to the vendor's central computer. The three sub-modes of RCS are:

- **INTERACTIVE** (timesharing) is characterized by interaction of the user with the system, primarily for problem solving time-sharing, but also for data entry and transaction processing -the user is on-line to the program/files.
- **REMOTE BATCH** is where the user hands over control of a job to the vendor's computer which schedules job execution according to priorities and resource requirements.
- **DATA BASE** is characterized by the retrieval of information from a vendor-maintained data base - this may be owned by the vendor or a third party.

- **BATCH SERVICES**

This includes data processing performed at vendors' sites of user programs and/or data which are physically transported (as opposed to electronically by telecommunications media) to and/or from those sites. Data entry and data output services, such as keypunching and COM processing, are also included. Batch services include those expenditures by users which take their data to a vendor site which has a terminal connected to a remote computer used for the actual processing.

- **FACILITIES MANAGEMENT (FM)** (also referred to as "Resource Management" or "Systems Management")

The management of all or a part of a user's data processing functions under long-term contract (not less than one year). To qualify as FM, the contractor must directly plan and control, as well as operate, the facility provided to the user on-site, through communications lines, or in mixed mode. Simply providing resources even though under a long term contract and/or for all of a user's processing needs does not necessarily qualify as FM.

- **PROFESSIONAL SERVICES**

Management consulting related to EDP, systems consulting, systems design and programming, and other professional services are included in this category. Services can be provided on a basis of: "Time and Materials," whereby the user pays for the time used of an individual on a daily or other fixed rate, or "Fixed Price," where the user pays a fixed fee for a specific task or series of tasks.

- **SOFTWARE PRODUCTS**

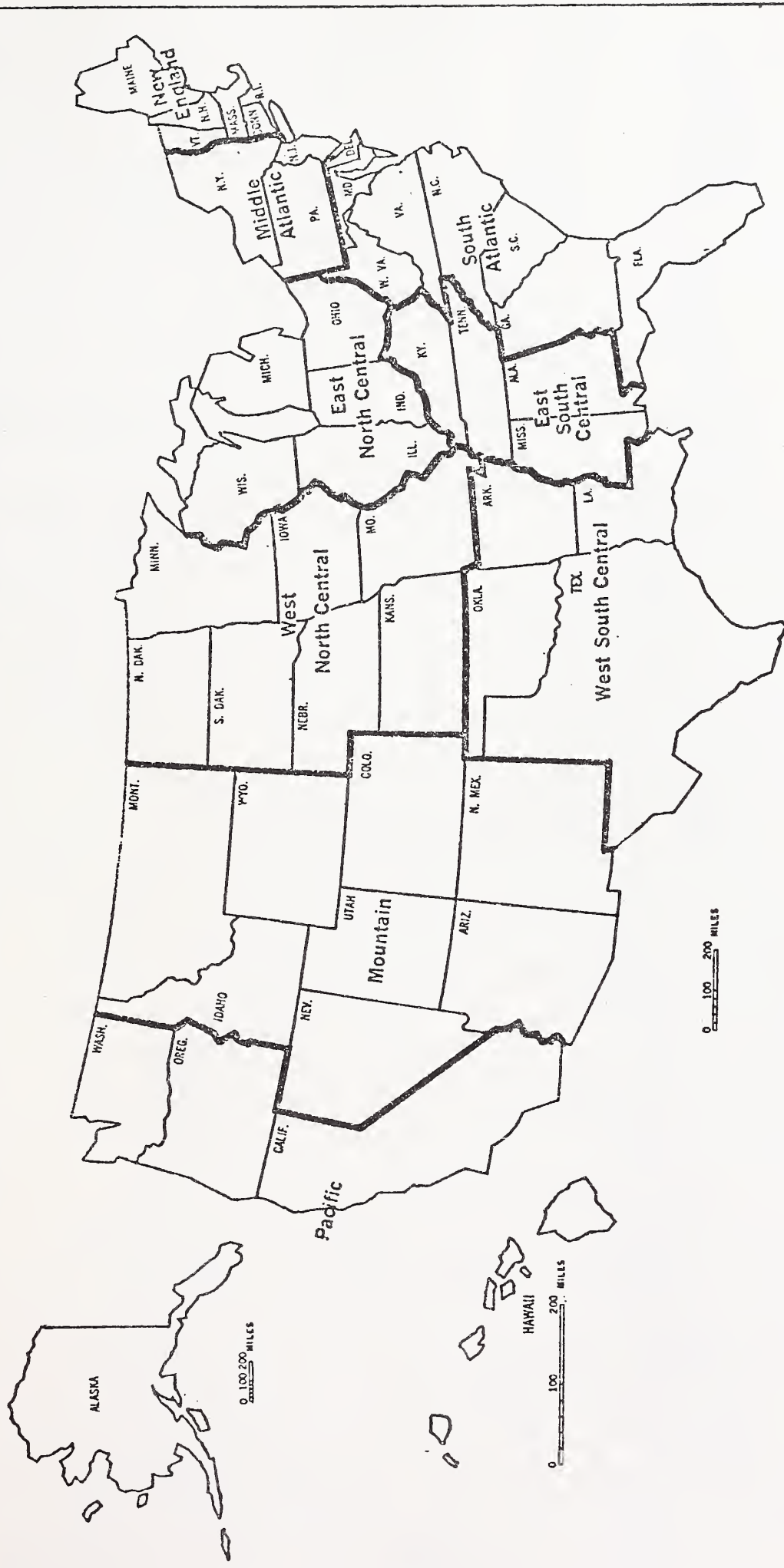
This category is for users' purchases of systems and applications packages for use on in-house computer systems. The figures quoted include lease and purchase expenditures, as well as fees for work performed by the vendor to implement and maintain the package at the users' sites. Fees for work performed by organizations other than the package vendor are counted in Professional Services. The two sub-categories are:

- . **SYSTEMS PACKAGES** are operating systems, utilities, and language routines that enable the computer/communications system to perform basic functions. This software is provided by the mainframe manufacturers with their hardware; other vendors provide improved versions of this and special-purpose routines. This classification includes compilers, data base management software, communications packages, simulators, performance measurement software, diagnostic software, and sorts.
- . **APPLICATIONS PACKAGES** are software which perform processing to serve user functions: they consist of general purpose packages, such as for accounting and inventory controls, and special purpose packages, such as personal trust, airline scheduling, and demand deposit accounting.
- **PROCESSING SERVICES**
Encompasses FM, RCS, and Batch Services: they are categorized by type of service, as distinguished from mode of service, bought by users as follows:
 - **GENERAL BUSINESS** services are processing services for applications which are common to users across industry categories. Software is provided by the vendor; this can be complete package, such as a payroll package, or an application "tool," such as a budgeting model, where a user provides much of the customizing of the finished product it uses. General Business Processing is often repetitive and transaction oriented.
 - **SCIENTIFIC AND ENGINEERING** services are the processing of scientific and engineering problems for users across industries. The problems usually involve the solution of mathematical equations. Processing is generally problem solving and is non-repetitive, except in the sense that the same packages or 'tools' are used to address different, but similar, problems.

- **SPECIALTY APPLICATIONS** services provide processing for particular functions or problems unique to an industry or industry group. The software is provided by the vendor either as a complete package or as an application 'tool' which the user employs to produce its unique solution. Specialty applications can be either business or scientific in orientation; data base services where the vendor supplies the data base and controls access to it (although it may be owned by a third party) are also included under this category. Examples of Specialty Applications are: seismic data processing, numerically-controlled machine tool software development, and demand deposit accounting.

- **UTILITY** services are those where the vendor provides access to computer and/or communications network with basic software that enables any user to develop its own problem solution or processing system. These basic tools include terminal handling software, sorts, language compilers, data base management systems, information retrieval software, scientific library routines, and other systems software.

GEOGRAPHIC DIVISIONS OF THE UNITED STATES



U. S. DEPARTMENT OF COMMERCE
BUREAU OF THE CENSUS

EXHIBIT B-2
 GEOGRAPHIC DIVISIONS OF THE
 UNITED STATES BY STATE

STATE	
<u>NEW ENGLAND</u> MAINE NEW HAMPSHIRE VERMONT MASSACHUSETTS RHODE ISLAND CONNECTICUT <u>MIDDLE ATLANTIC</u> NEW YORK NEW JERSEY PENNSYLVANIA <u>EAST NORTH CENTRAL</u> OHIO INDIANA ILLINOIS MICHIGAN WISCONSIN <u>WEST NORTH CENTRAL</u> MINNESOTA IOWA MISSOURI NORTH DAKOTA SOUTH DAKOTA NEBRASKA KANSAS <u>SOUTH ATLANTIC</u> DELAWARE MARYLAND DISTRICT OF COLUMBIA VIRGINIA WEST VIRGINIA NORTH CAROLINA SOUTH CAROLINA GEORGIA FLORIDA	<u>EAST SOUTH CENTRAL</u> KENTUCKY TENNESSEE ALABAMA MISSISSIPPI <u>WEST SOUTH CENTRAL</u> ARKANSAS LOUISIANA OKLAHOMA TEXAS <u>MOUNTAIN</u> MONTANA IDAHO WYOMING COLORADO NEW MEXICO ARIZONA UTAH NEVADA <u>PACIFIC</u> WASHINGTON OREGON CALIFORNIA ALASKA HAWAII

APPENDIX C: QUESTIONNAIRES

INPUT QUESTIONNAIRE

USER

STUDY: COMPUTER SERVICES OPPORTUNITIES IN FEDERAL GOVERNMENT - ENERGY PROGRAMS

SECTION I

- 1. Name of Agency: a. after DOE b. before DOE
 Department of: _____
- 2. Agency Mission: _____
- 3. Primary Locations: _____
 Remote Locations: _____
- 4. Procurement office: _____
- 5. How many personnel in agency? _____
 How many in data processing? _____

SECTION II

- 6. Does your agency have in-house computer installation(s)? YES NO
- a. What make and size computers?

	CURRENT	FUTURE
Make	_____	_____
Memory size	_____	_____
Operating system	_____	_____
Data Base languages	_____	_____
- b. Minicomputers _____ (makes)

Sites	_____	_____
No. of installations	_____	_____

7. Does your agency operate on-line systems? YES NO

a. If on-line, number & type terminals	<u>CURRENT</u>	<u>FUTURE</u>
Make	_____	_____
Speed	_____	_____
Number	_____	_____
Locations	_____	_____
b. Network and software		
Comm support package	_____	_____
Protocol	_____	_____

8. What applications are supported with in-house system(s)?

APPLICATIONS	% OF TOTAL UTILIZATION
_____	_____
_____	_____
_____	_____

9. What new applications are planned for next 3 years?

APPLICATIONS	IN-HOUSE	OUTSIDE SERVICE
_____	_____	_____
_____	_____	_____
_____	_____	_____

10. a. Can agencies EDP budget (FY 78) be given?

<u>Total Budget</u>	<u>FY77</u>	<u>FY78</u>	<u>FY80</u>	<u>FY82</u>
Outside	_____	_____	_____	_____
Inside	_____	_____	_____	_____
People	_____	_____	_____	_____
Hardware	_____	_____	_____	_____
Other	_____	_____	_____	_____

b. Describe reasons for relative changes.

c. Will planned EDP budget levels support growth from new and existing programs?

SECTION III

11. Are outside services used by agency? YES NO

	%	\$	% change 1977-78
Remote Computing	_____	_____	_____
Batch Processing	_____	_____	_____
Facilities Mgmt.	_____	_____	_____
Software Products	_____	_____	_____
System packages	_____	_____	_____
Application Pkgs	_____	_____	_____
Professional Services	_____	_____	_____
Consulting	_____	_____	_____
Software Design	_____	_____	_____
Data Bases (explain)	_____	_____	_____
Other	_____	_____	_____

12. Who buys or authorizes purchases of services?

13. Are any services under (or planned for) GSA/TSP?

14. Please describe outside services and applications.

<u>COMPANY</u>	<u>APPLICATION</u>	<u>PERFORMANCE</u>	<u>% OF TOTAL</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

15. Software/Data Bases

<u>VENDOR COMPANY</u>	<u>PACKAGE NAME</u>	<u>FUNCTION</u>	<u>PERFORMANCE</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

16. a. Have outside services been considered to replace any in-house applications or systems? YES NO

Application: _____

b. Have outside services been brought inside? Which ones and why?

SECTION IV

17. What changes, if any, do you foresee in the procurement of services?

18. Please rank these vendor characteristics (1 = unimportant; 5 = very important)

	<u>Rank</u>	<u>Notes</u>
a. Geographic location	_____	_____
b. Vendor hardware	_____	_____
c. Vendor software	_____	_____
d. Vendor support	_____	_____
e. Vendor experience in federal government	_____	_____
f. GSA/TSP approval	_____	_____
g. Price	_____	_____
H. Other (Explain)	_____	_____

19. Have you changed or added vendors recently? YES NO

20. Under what conditions might you change vendors?

21. What outside services would you consider using if they were currently available?

22. a. What changes or improvements would you like to see vendors adopt in the next 2-5 years in order to make services more valuable?

b. What is your opinion of vendor pricing systems? Have prices changed recently?

23. a. Are there any developments occurring (or likely to be occurring) which would increase/decrease your use of outside computer services?

b. How about security/privacy?

24. How much vendor support ?

At time of installation?

Now?

Future?

25. Have minicomputers been considered to replace outside computer services?

26. Do you have any advice to offer service vendors so they can better help serve your needs?

27. Is there any one else in your organization who should be contacted regarding above subjects and issues?

28. The current administration's energy policy appears to focus on energy conservation rather than developing new sources. What impact is this likely to have on the use of EDP, either in-house systems or out-house services.

What will be impact on private sector EDP of your future programs?

INPUT QUESTIONNAIRE

VENDOR

STUDY: COMPUTER SERVICES OPPORTUNITIES IN FEDERAL GOVERNMENT - ENERGY PROGRAMS

1. Do you provide services directly to DOE or to related departments or agencies?

- a. DOE
 FPC FEC ERDA Other (explain)

- b. Related
 Transport Commerce Interior Other (explain)

- c. Tied to GSA/TSP

2. Location of service users?

- a. Washington (general area)? _____ % ?
 b. Elsewhere in U.S.? Where? _____ % ?
 c. Abroad? Where? _____ % ?

3. Which services are provided? How much (\$ or %)?

	<u>1977</u>	<u>1979</u>	<u>1981</u>
Data Processing			
Batch			
On Line (Remote Computing)			
F/M			
Software Products			
Professional Services			

4. How long have you been involved in providing services to:

- a. The federal government ?
- b. To energy related agencies ?

5. Have government expenditures grown during this time?
 How much? Future projections?

a. What issues will affect the growth of services you provide?

6. What are the main reasons the energy agencies use your services?

7. What features of your service are most important to energy agency users?

8. Are you about to offer a new or improved service in the future? Describe:

9. What computer equipment do you use to support energy related business?

Current

Future

a. Mainframes

Memory size

Terminals

Remote Processors

b. Is business tied to hardware? Explain:

10. What software do you use to support energy related business?

Operating system

Commercial support

Data base management

Data bases

Other.

11. Describe the level of people support provided to client.

12. Do you believe that expenditures for outside services by energy agencies will increase? YES NO

If yes: a. because of need? _____

b. because DOE is new agency? _____

If no: a. because of combining separate agencies into DOE? _____

13. Which companies do you compete with? What are your advantages/
disadvantages?

14. Do you now, or do you plan to offer distributed processing capability?
Have you been asked to?

- a. At all?
- b. To federal government ?
- c. To energy agencies ?

APPENDIX D: RELATED INPUT
REPORTS

APPENDIX D

RELATED INPUT REPORTS

- COMPUTER SERVICES MARKETS IN GOVERNMENT FUNDED HEALTH INSURANCE
 - INPUT INDUSTRY REPORT NO. 6
 - FEBRUARY 1977

- EDP PLANS AND BUDGETS FOR 1977
 - INPUT IMPACT REPORT NO. 3
 - JANUARY 1977

- PLUG COMPATIBLE MAINFRAMES: THE NEW HARDWARE ECONOMICS
 - INPUT IMPACT REPORT NO. 6
 - JUNE 1977

- COMPUTER SERVICES MARKETS IN THE PETROLEUM INDUSTRY
 - INPUT INDUSTRY REPORT NO. 1
 - MAY 1976

- DATA BASE MANAGEMENT SYSTEMS SERVICES
 - INPUT INDUSTRY REPORT NO. 7
 - JULY 1977

- COMPUTER SERVICES INDUSTRY - 1977
 - INPUT 1977 ANNUAL REPORT
 - NOVEMBER 1977

- IMPACT OF MARKETING COMPENSATION PLANS IN THE REMOTE COMPUTING INDUSTRY
- DECEMBER 1977

APPENDIX E: KEY ORGANIZATIONS
WITHIN DOE FOR
COMPUTER SERVICES
VENDORS

APPENDIX E

KEY ORGANIZATIONS WITHIN DOE FOR COMPUTER SERVICES VENDORS

I. ENERGY INFORMATION ADMINISTRATION

The Energy Information Administration (EIA) will bring together many different energy data systems now being operated separately. Fragmentation of data responsibilities has increased the reporting and information analysis burdens on the energy industries without necessarily improving the Federal Government's or the public's understanding of the energy problem.

By consolidating the most important energy data functions in the Federal Government, the EIA will be better able to provide comprehensive and coordinated data-gathering and analysis.

The EIA will be responsible for timely, accurate collection, processing, and publication of data on energy reserves, financial status of energy-producing companies, production, demand, consumption, and other areas. It will provide analyses of data to assist government and non-government users in understanding energy trends.

To ensure the validity of regulatory and other energy data, the EIA will conduct extensive field audits to determine the accuracy of data contained within the EIA system.

The EIA also will be responsible for complex, long-term analysis of energy trends. It will focus on the micro and macroeconomic impact of energy trends on regional and industrial sectors. It also will perform special-purpose analyses involving competition within the energy industries, capital/financial structure of energy companies, and interfuel substitution.

The EIA will provide data publication and distribution services within the DOE, throughout government, and for the public. It will be a clearinghouse for general information on energy and will coordinate with the Department's Technical Information Center.

In addition, two important new systems will be developed by EIA: a national reserves system to determine the best estimates of fuel reserves, and a financial reporting system for the energy-producing companies.

In exercising professional judgement on collecting and analyzing information, and with respect to the substance of any statistical or forecasting technical reports prepared in accordance with law, the EIA acts without having to obtain the prior approval of any other official in the Department.

a. General Functions:

- Perform the primary DOE role in collection of data, including regulatory and international energy data, as provided in the DOE Act.
- Organize and operate data systems, including data base maintenance.

- Provide data interpretation.
- Perform data validation.
- Provide analysis and forecasting services, including economic impact evaluation services.
- Disseminate information as provided in DOE Act.
- Provide reports to Congress required by law.

2. DIRECTOR, OFFICE OF ENERGY RESEARCH

- The Director of Energy Research will advise the Secretary on the physical research and energy research and development programs of the Department, the use of multi-purpose laboratories, education and training for basic and applied research activities, and financial assistance for these research activities. The Director will provide independent advice to the Secretary and Under Secretary on budgetary priorities for energy research and development programs as well as physical research programs and basic and applied research activities.
- The Director will chair the Department's R&D Coordination Council, composed of the program Assistant Secretaries. The Council will assure that the research and development activities of all program Assistant Secretaries are coordinated.
- The Director will also manage the Department's basic sciences programs, including high-energy physics, and will administer a financial support program for high-quality research and development projects not funded elsewhere in the Department. The Director will administer those Department's programs supporting university researchers, including pre- and post-doctoral fellowships.

a. General Functions:

- Monitor DOE's R&D program to detect gaps or duplication.
- Advise with respect to:
 - . Physical research programs.
 - . Well-being and management of DOE's multi-purpose labs (except weapons laboratories).
 - . Education and training research.
 - . Financial mechanisms for research support.
- Provide staff support for Field and Laboratory Coordination Council and R&D Coordination Council.
- Monitor international exchange of scientific and technical personnel (with International Affairs).
- Conduct basic research programs not carried out by Energy Technology.
- Support special research and development programs not otherwise provided for.

3. ASSISTANT SECRETARY FOR ENERGY TECHNOLOGY

- Research, development, and technology demonstration in all energy areas -- including solar, geothermal, fossil and nuclear -- will be essential in reducing the Nation's dependence on depletable oil and natural gas supplies.
- Activities coordinated under the Assistant Secretary for Energy Technology will focus primarily on making new energy technologies available for

commercial (public or private) application as early as possible. Since technologies grouped under this Assistant Secretary are still in the development stage, the problems to be addressed will largely be technological ones.

- Once a specific project in a technology has been developed sufficiently for commercial demonstration the project will be transferred to either the Assistant Secretary for Resource Applications or the Assistant Secretary for Conservation and Solar Applications. At the same time, further development of the base technology will continue under Energy Technology to improve efficiency, costs, etc.
- In general, most of the research, development and demonstration programs under this Assistant Secretary originated in ERDA. Research into more advanced coal and oil shale mining technology, formerly a part of the Interior Department, also will be transferred to Energy Technology.
- Research and development projects involving energy storage, electric energy systems, and improved energy conversion efficiency, each of which was formerly in ERDA's Conservation office, also have been assigned to Energy Technology because they are primarily developmental and long-term and because they support other technology development programs besides conservation. Energy Technology will support specialized projects in both Resource Applications and Conservation and Solar Applications. For example, Energy Technology may conduct applied research on materials for solar collectors, as requested and funded by the Assistant Secretary for Conservation and Solar Applications.

a. General Functions:

- Develop mid- and long-term energy technology development strategies.
- Serve as the primary DOE source of energy technology information.

- Implement assigned programs in:
 - . Solar.
 - . Geothermal.
 - . Fossil.
 - . Nuclear.
 - . Fusion.
 - . Other technologies.

- Conduct nuclear waste storage activities.

- Naval reactor development.

